Nebraska Department
of Environmental Quality

NEBRASKA's Keystone XL Pipeline Evaluation

NEBRASKA'S KEYSTONE XL PIPELINE EVALUATION

DRAFT EVALUATION REPORT

VOLUME ONE | Executive Summary, Chapters 1–10

October 2012

STATE OF NEBRASKA

Dave Heineman
Governor

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Dear Reader:

The Nebraska Department of Environmental Quality (NDEQ) is pleased to provide you this Draft Evaluation Report (DER) on the Keystone XL Pipeline Nebraska Reroute. This report was prepared in response to Nebraska law that directed the NDEQ to analyze the environmental, economic, social, and other impacts of a pipeline in Nebraska. The report analyzes the proposed 194.5 mile long Nebraska Reroute starting one mile south of the South Dakota border in Keya Paha County and terminating in the northwestern corner of York County. The proposed Reroute, which avoids the Sand Hills region of Nebraska, was developed in response to concerns raised by the State of Nebraska and its citizens.

The DER sets forth potential impacts associated with the Nebraska Reroute and discusses mitigation plans and measures required by law and additional measures provided by Keystone. The DER also reflects the comments of Nebraska citizens – more than 1,000 comments received to date.

NDEQ invites public comment on all aspects of the DER and is providing a comment period that extends until December 4, 2012. Instructions on where the document is available for viewing and how to submit comments can be found on the final page of the Executive Summary included in the DER. In addition, information is presented concerning the Information Session and Public Hearing to be held on December 4, 2012, in Albion, NE. We would appreciate your comments. Comments from Nebraskans to date have had a substantial effect on the project and we urge your continued diligence. The more specific your comments are, the more accurately we are able to respond to them.

After the close of the comment period on December 4, 2012, NDEQ will prepare a Final Evaluation Report that includes responses to comments received on this DER. The NDEQ will then submit the final report to the Governor who will inform the U.S. Department of State of his decision to approve or disapprove of the proposed Nebraska Reroute.

NDEQ appreciates your efforts in reviewing the Nebraska portion of the pipeline. We look forward to receiving your comments.

Sincerely,

Mike Linder, Director

An Equal Opportunity/Affirmative Action Employer

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GUIDE TO THE DRAFT EVALUATION REPORT

This Draft Evaluation Report evaluates potential environmental impacts that could result from construction of the proposed Nebraska Reroute of the Keystone XL Pipeline. The Nebraska Department of Environmental Quality (NDEQ) has examined and evaluated concerns expressed by Nebraska citizens, its Legislators, and the Governor. NDEQ has prepared this report in accordance with directives in Legislative Bill (LB) 4 and LB 1161. This report describes the proposed Nebraska Reroute, the existing environment potentially affected by the Reroute, the potential environmental impacts associated with the proposed Nebraska Reroute, and the proposed environmental commitments made by TransCanada Keystone Pipeline, LP (Keystone). Specifically, the Draft Evaluation Report contains the following volumes:

Volume One: Executive Summary, Chapters 1 through 8

This volume of the Draft Evaluation Report describes the proposed alignment for the Nebraska Reroute along with the existing environment, potential environmental impacts, and proposed mitigation measures for addressing impacts identified in Chapter 4, Affected Environment and Environmental Consequences. This volume contains:

- Executive Summary – Provides a brief synopsis of the Keystone XL Pipeline project and the Nebraska Reroute, including a description of the proposed Nebraska Reroute, potential impacts, and mitigation measures. The Executive Summary also briefly describes public involvement efforts and NDEQ's process for developing the Draft Evaluation Report.
- Chapter 1, Introduction and Background – Specifies the background and chronology of previous Keystone XL Pipeline project work, State legislation governing the evaluation of the Nebraska Reroute, an overview of the environmental review process, the organization of the environmental evaluation, and issues of concern identified by the public and resource agencies.
- Chapter 2, Project Description – Presents conceptual details of the pipeline and ancillary features in Nebraska. This chapter discusses plans for facility construction, environmental compliance, operation and maintenance, future plans, and ultimate project decommissioning.
- Chapter 3, Project Regulatory Requirements – Describes permits and approvals needed from federal, State, and local agencies if the proposed Nebraska Reroute were to be approved for construction and operation.
- Chapter 4, Affected Environment and Environmental Consequences – Addresses the known existing condition of each potentially affected environmental resource, including natural and built resources. This chapter also analyzes effects of the Nebraska Reroute on the existing environment.
- Chapter 5, Mitigation Measures – Summarizes mitigation commitments made by Keystone to avoid or minimize impacts.

- Chapter 6, Pipeline Safety and Potential Spills – Discusses information pertinent to accidental oil releases, including applicable standards and regulations, recent spill incident history, characteristics of oil that would be transported in the Keystone XL Pipeline, potential consequences of a spill, and specific spill response plans proposed by NDEQ and Keystone for the Nebraska Reroute.
- Chapter 7, Outreach and Agency Coordination – Describes NDEQ's role in the public involvement process, specific public and agency coordination efforts undertaken as part of the proposed Nebraska Reroute, issues identified as part of the process, and opportunities available to the public to comment on the document.
- Chapter 8, List of Preparers – Describes qualifications of NDEQ and contractor personnel responsible for conducting the evaluation and preparing the report.

Volume Two: Appendices A, C, D, F, and G

- Appendix A presents copies of Nebraska LB 1, LB 4, LB 845, and LB 1161. Also presented is a copy of the Memorandum of Understanding between NDEQ and the U.S. Department of State.
- Appendix C presents Keystone's Construction, Mitigation, and Reclamation Plan, which would control all measures to be taken by NDEQ to avoid, minimize, or mitigate impacts on the environment during construction. Included are measures for spill prevention and containment, upland construction, drain tile systems, wetland crossings, waterbody crossings, and hydrostatic testing.
- Appendix D presents photographs taken during an NDEQ field tour of the Gulf Coast Project.
- Appendix F presents selected portions of Keystone's May 2012 Application for Presidential Permit. It also presents the 57 Special Conditions approved by the U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration, which were first proposed in the U.S. Department of State's Final Environmental Impact Statement. Appendix F also provides portions of Keystone's Emergency Response Plan.
- Appendix G presents materials used for public information meetings and related public involvement activities.

Volume Three: Appendix E

- Appendix E provides technical memoranda supporting some of the impact analyses discussed in Chapter 4. Specifically, technical memoranda are provided for geology, soils, groundwater, surface water, wetlands, threatened and endangered species, and employment and fiscal impacts. In addition, tabular information is provided for other resources.

Volume Four: Appendix H

- Appendix H presents responses to NDEQ's formal requests to Keystone for additional project information. These requests cover a wide range of data—from materials shipped in the pipeline to how Keystone plans to restore disturbed areas with fragile soils.

Volume Five: Appendix B

- Appendix B presents maps of the proposed Nebraska Reroute from its beginning in Keya Paha County to York County, where it would join with the original Keystone XL Pipeline Route. The maps show the pipeline's alignment on aerial photographs, along with access roads, pump stations, and horizontal directional drilling locations. The Western Alternative's location in Saline and Jefferson Counties is also shown in this appendix.

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EXECUTIVE SUMMARY

ES.1 INTRODUCTION AND BACKGROUND

TransCanada Keystone Pipeline, LP (Keystone), proposes to construct, operate, and maintain a crude oil pipeline and ancillary facilities from Hardisty, Alberta, Canada, to Steele City, Nebraska, referred to as the Keystone XL Pipeline project. In 2008, Keystone filed an initial Presidential Permit application with the U.S. Department of State (DOS) to construct and operate the original Keystone XL Pipeline. DOS evaluated the original pipeline alignment in an environmental impact statement (EIS) and published a Final EIS in August 2011. The original Keystone XL Pipeline project would have traversed the northeastern portion of the Sand Hills, an environmentally sensitive region in northcentral Nebraska. Based on concerns expressed by Nebraska citizens, the Nebraska Legislature, and the Nebraska Governor in late fall 2011, Keystone agreed to avoid the Sand Hills by proposing a new route.

In a 2011 special session, the Nebraska Legislature passed Legislative Bill (LB) 4, which authorized the Nebraska Department of Environmental Quality (NDEQ) to review the rerouted portion of the proposed pipeline in Nebraska. LB 4 was approved by the Governor on November 22, 2011. However, the President denied the Presidential Permit without prejudice in January 2012 and subsequently NDEQ halted active review of the pipeline.

In April 2012, the Nebraska Legislature passed LB 1161, which clarified its direction to NDEQ to evaluate a pipeline in Nebraska, and was signed on April 17 by the Governor. On April 18, 2012, Keystone proposed a new alignment in Nebraska with the goal of avoiding the Sand Hills. On July 17, 2012, NDEQ provided Keystone with public and agency feedback on its proposed route. In response, Keystone proposed several modifications to the route in its *Supplemental Environmental Report*, submitted on September 5, 2012.

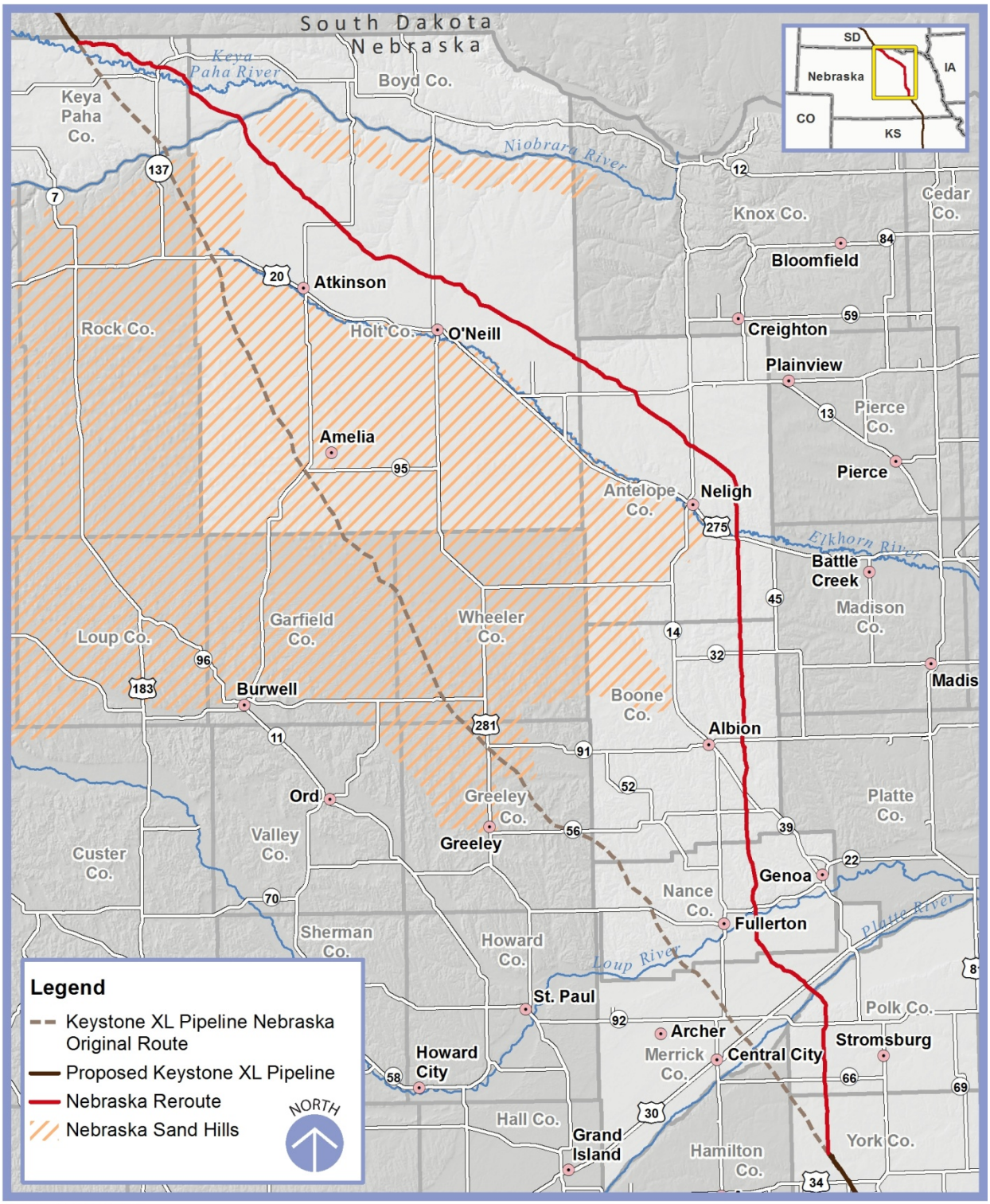
NDEQ's evaluation of the rerouted portion of the proposed Keystone XL Pipeline (referred to in this document as the "Nebraska Reroute") (see Figure ES-1) is the subject of this Draft Evaluation Report.

ES.2 NEBRASKA DEPARTMENT OF ENVIRONMENTAL QUALITY'S EVALUATION PROCESS

In response to public concerns, the Nebraska Legislature passed bills in a special session held in the fall of 2011 and again in regular session in the spring of 2012. LB 4 and LB 1161 directed NDEQ to analyze the environmental, economic, social, and other impacts of a pipeline in Nebraska. The purposes of this Draft Evaluation Report are:

- To determine if Keystone's rerouted alignment avoids the Sand Hills as defined by NDEQ in its press release of December 29, 2011
- To evaluate the environmental, economic, social, and other impacts of the proposed pipeline
- To provide an opportunity for the public to review and comment on the proposed pipeline

Figure ES-1. Proposed Nebraska Reroute



Source: NDEQ 2012

NDEQ describes the evaluation of the impacts of the proposed Nebraska Reroute in this Draft Evaluation Report. NDEQ's evaluation of the route considers the major features of the pipeline as well as the existing conditions of the affected environment. NDEQ's evaluation also identifies and evaluates the potential effects of building and operating the pipeline, which would carry crude oil produced from oil sands in central Alberta and may also transport crude oil from the Bakken Formation in the Williston Basin in Montana and North Dakota. The evaluation identifies specific measures that are intended to mitigate those impacts. Lastly, NDEQ's evaluation also includes an examination of:

- Keystone's emergency planning process
- Effects a spill might have on Nebraska's environmental resources
- Measures Keystone would take to prevent a spill

NDEQ invites the public to review this report and provide comments regarding the potential effects and proposed mitigation measures. NDEQ will conduct a hearing on December 4, 2012, to obtain further testimony from the public. After this hearing, NDEQ will prepare a Final Evaluation Report that will be submitted to the Governor.

ES.3 RELATIONSHIP WITH DEPARTMENT OF STATE

On September 19, 2008, Keystone filed a Presidential Permit application with DOS to construct and operate a new facility, the Keystone XL Pipeline, to connect Canada to the Texas Gulf Coast. Facilities that cross the international borders of the United States require a Presidential Permit. DOS is the lead federal agency that receives and considers applications for Presidential Permits pursuant to Executive Order 13337 of April 30, 2004,[1] as amended. To issue a Presidential Permit, DOS must find that a proposed project or action would serve the national interest. DOS consults with other federal and state agencies and invites public comment prior to arriving at its determination.

The Presidential Permit would have authorized construction and operation of the proposed Keystone XL Pipeline project at the United States-Canada border crossing in Montana. At that time, the proposed project consisted of a 2,232-mile-long, 36-inch-diameter pipeline and appurtenant facilities to transport crude oil from Hardisty, Alberta, Canada, to Nederland/Port Arthur, Texas. Upon receipt of Keystone's application, DOS conducted an environmental review of the proposed Keystone XL Pipeline project and published its Final EIS on August 26, 2011.

On November 10, 2011, DOS announced it was delaying its decision on the Presidential Permit application to allow additional time to gather information regarding potential alternative routing in Nebraska. In a special session, the Nebraska Legislature passed LB 4, which authorized NDEQ to review the Nebraska portion of the pipeline.

A provision of the Temporary Payroll Tax Cut Continuation Act of 2011 required the president to act on Keystone's application within 60 days. On January 18, 2012, President Barack Obama denied the Presidential Permit without prejudice, stating that 60 days was an insufficient period to obtain and assess the necessary information and that the Keystone XL Pipeline project, as

[1] 69 Federal Register 25299.

presented and analyzed at that time, would not serve the national interest.[2] Following the Presidential Permit denial, NDEQ halted active evaluation of the pipeline in Nebraska. To reaffirm the Legislature's intention to have NDEQ continue its evaluation of major oil pipeline projects, the Nebraska Legislature passed LB 1161 in April 2012, which the Governor signed on April 17, 2012.

LB 4 and LB 1161 authorized NDEQ to collaborate with U.S. Department of State (DOS) on the Nebraska Reroute and to enter into a Memorandum of Understanding (MOU) with DOS that sets forth the responsibilities and schedules that will lead to an effective and timely review of the environmental document consistent with the National Environmental Policy Act (NEPA). NDEQ and DOS finalized a MOU on May 24, 2012 (see Appendix A).

On June 15, 2012, DOS published in the Federal Register a notice of intent to prepare a Supplemental EIS evaluation of the reconfigured Keystone XL Pipeline project consistent with NEPA and other relevant statutes. Under the MOU, NDEQ is a cooperating agency in DOS's environmental review process. DOS will fully consider the views of the State of Nebraska and the State's Evaluation Report as it conducts its environmental review.

DOS's Supplemental EIS will evaluate the proposed Keystone XL Pipeline, including the proposed Nebraska Reroute. The proposed Keystone XL Pipeline would consist of an approximately 875-mile-long, 36-inch-diameter steel pipeline to transport crude oil from Hardisty, Alberta, Canada, to Steele City, Nebraska. At Steele City, the Keystone XL Pipeline would connect with the existing Keystone Pipeline Cushing Extension. At the terminus of the Cushing Extension, the crude oil would be delivered into a new 36-inch-diameter steel pipeline being constructed as the Gulf Coast Project for transportation to refinery markets on the Gulf Coast.

ES.4 SUMMARY OF THE NEBRASKA REROUTE

NDEQ provided Keystone with a definition of the Sand Hills on December 29, 2011 (see Figure ES-1). The purpose of the Nebraska Reroute (the subject of this report) is to avoid the Sand Hills of Nebraska. Using information provided by NDEQ, Keystone on April 18, 2012 submitted a revised alignment (the Nebraska Reroute), with the goal of avoiding the Sand Hills. NDEQ sought out public comments on Keystone's new alignment and provided feedback to Keystone on July 17, 2012. Keystone considered this information and further refined its Nebraska Reroute in response to those concerns.

Keystone's September 5, 2012, *Supplemental Environmental Report* proposes three further refinements to the Nebraska Reroute. Keystone made refinements at two of these locations to address environmental concerns raised by the public and NDEQ. These are referred to by Keystone as the Northern Alternative and the Clarks Alternative. The Northern Alternative was developed to avoid an area with fragile soils, although the area is not a part of the defined Sand Hills. The Northern Alternative would pass through Keya Paha and Boyd Counties, crossing the Niobrara River southwest of Naper. The Clarks Alternative was developed to address NDEQ's concerns regarding the location of Keystone's preferred reroute corridor in an area where the aquifer is very thin, wells are shallow, and bedrock is close to the surface. This area was upgradient (west) of the boundary of the Clarks Wellhead Protection Area (WHPA). The Clarks Alternative would route the proposed pipeline downgradient (east) of the WHPA.

[2] 77 Federal Register 5614.

A third refinement is also proposed in the *Supplemental Environmental Report*. This adjustment to the Keystone XL Pipeline alignment is located near Western, Nebraska, which is located in Saline and Jefferson Counties, and is south of the Nebraska Reroute. This route variation was developed by Keystone to avoid crossing the expanded wellhead protection area for the village of Western.

ES.4.1 Pipeline Facilities

The proposed 194.5-mile-long Nebraska Reroute would start about one mile south of the Nebraska-South Dakota border in Keya Paha County, Nebraska, at milepost 601.8 of the Keystone XL Pipeline. The proposed pipeline route would run southeastward through Keya Paha and Boyd Counties, where it would cross the Keya Paha River, and would then enter Holt County as it crosses the Niobrara River. The route would continue southeastward and turn to the south in Antelope County northeast of Neligh, where it would cross the Elkhorn River, and then pass through Boone County and into Nance County, passing east of Albion and Fullerton. In Nance County, the route would cross the Loup River and then turn southeast across the northeastern corner of Merrick County. After crossing the Platte River and entering Polk County, the route would turn south. The Nebraska Reroute would terminate in the northwestern corner of York County, Nebraska, at milepost 796.3. At that location, the Nebraska Reroute would join the original Keystone XL Pipeline alignment (as described in DOS's Final EIS) (see Figure ES-1).

The 36-inch-diameter steel pipe would meet or exceed American Petroleum Institute specifications. The standard pipe wall thickness of 0.465 inch would be thicker in High Consequence Areas,[3] at lower elevations, downstream of pump stations, at major river crossings, and at road and railway crossings.

ES.4.2 Aboveground and Ancillary Facilities

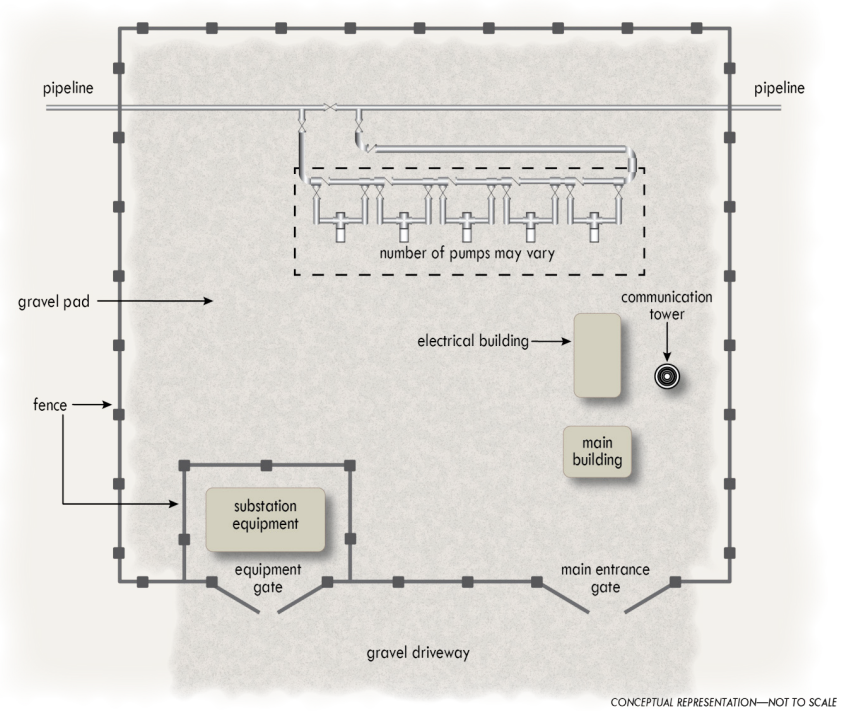
The Nebraska Reroute, while largely a buried pipeline, includes aboveground and ancillary facilities needed for the construction, operation, and maintenance of the pipeline. These components would include pump stations, mainline and intermediate valves, permanent and temporary access roads, pipe storage sites, contractor yards, railroad sidings, and a construction camp.

[3] U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) defines High Consequence Areas in 49 Code of Federal Regulations (CFR) Part 195 as areas where a release could have significant adverse consequences, requiring additional focus, efforts, and analysis to ensure the integrity of pipelines. High Consequence Areas are identified based on proximity to populated areas, drinking water sources, and unusually sensitive ecological areas (PHMSA, 2012).

Pump Stations

Pump stations are positioned along a liquid pipeline to increase the pressure in order to keep the product (crude oil) moving. Pump stations would be located in Holt, Antelope, and Nance Counties and are shown in Appendix B (see Figure ES-2).

Figure ES-2. Conceptual Illustration of a Pump Station and Photo of Pump Station



Keystone Oil Pipeline Pump Station, near Crete, Nebraska. October 2012. Photo: NDEQ

Mainline Valves

Mainline valves (MLV) can be manually or remotely closed to isolate a section of pipeline and limit the volume in the event of a leak. Keystone would install MLVs a minimum of every 20 miles, at pump stations, at major river crossings, and upstream of sensitive waterbodies.

Temporary and Permanent Access Roads

Temporary access roads would be used to gain access to the construction right-of-way (ROW) where existing roads are lacking or unavailable for use. The typical access road would be 30 feet wide. Permanent access roads would be used to gain access to pump stations and MLVs. The approximate locations are identified in Appendix B. Keystone would be responsible for maintenance of the new access roads.

Pipe Storage Sites, Contractor Yards, and Railroad Sidings

Temporary pipe storage sites, contractor yards, and railroad sidings are needed to store materials and equipment for pipeline construction. Prior to construction, Keystone would determine the numbers and locations of pipe storage sites, contractor yards, and railroad sidings that would be needed for the proposed Nebraska Reroute.

Keystone XL Pipeline Gulf Coast Segment Pipe Storage Yard, northeast Texas. September 2012. Photo: HDR Engineering, Inc.

Construction Camp

A construction camp houses construction workers in areas that do not have adequate temporary housing capacity. Because of the distance of the proposed Nebraska Reroute from larger population centers, Keystone has stated that a temporary construction camp might be needed in northern Holt County to house construction workers.

ES.4.3 Construction Procedures and Schedule

Contingent on obtaining the necessary permits and approvals, construction of the proposed pipeline would involve standard cross-country pipeline construction techniques. Keystone proposes to divide the proposed pipeline in Nebraska into three segments, called "spreads," on which separate crews could work simultaneously. Spread 8 includes Keya Paha, Boyd, Holt, and Antelope Counties. Spread 9 includes Antelope, Boone, Nance, Merrick, and Polk Counties, and Spread 10 includes Polk and York Counties. Each spread would take 6 to 8 months to complete.

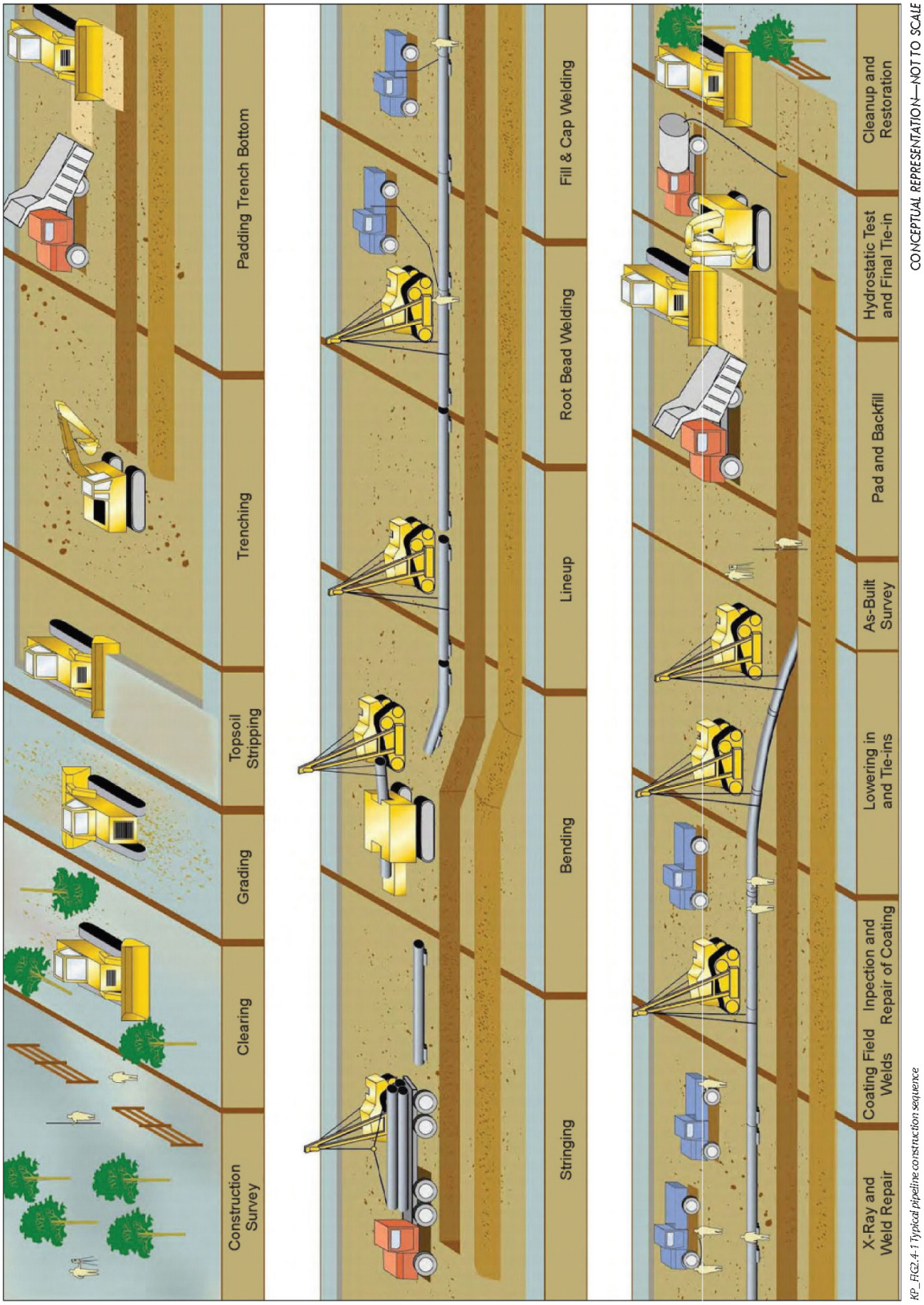
The typical construction sequence is shown in Figure ES-3. Pipeline construction would generally proceed as a moving assembly line, comprising:

- Surveying and staking the construction ROW
- Clearing and grading
- Trenching
- Stringing and bending
- Welding and coating
- Lowering-in and backfilling
- Hydrostatic testing
- Cleaning and restoring

Special techniques would be used when constructing the pipeline across wetlands; waterbodies; roads and railroads; utilities; agricultural, residential, and commercial areas; steep terrain; and areas of fragile soils. Although the pipeline was rerouted to avoid the designated Sand Hills region, the pipeline would cross some areas with fragile soils. Keystone has proposed that special procedures would be used in those locations, and NDEQ has reviewed those procedures.

Construction of the new pump stations would take 18 to 24 months.

Figure ES-3. Typical Construction Sequence



ES.4.4 Operation and Maintenance

The proposed pipeline would be operated, maintained, monitored, and inspected in accordance with 49 CFR §§ 194 and 195 and other applicable federal and State regulations. Keystone would also comply with the 57 Special Conditions developed by U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration (PHMSA) (see Appendix F.2).

A 50-foot-wide permanent ROW would be maintained along the proposed route during operation of the pipeline. Woody vegetation along the permanent easement would be cleared periodically to maintain accessibility for pipeline integrity surveys. Mechanical mowing or cutting would be carried out from time to time, as needed, along the permanent easement for normal vegetation maintenance. Most agricultural crops could be grown within this permanent ROW, but structures and deep-rooted vegetation such as trees would not be allowed. In areas where the pipeline would be installed using horizontal directional drilling, the pipeline would be deeper and trees could remain in the ROW.

ES.4.5 Future Plans and Decommissioning

Keystone expects to operate the Keystone XL Pipeline for approximately 50 years. Keystone typically does not abandon large-diameter pipelines but generally idles or deactivates pipe as market conditions dictate. This allows a dormant pipeline to be reactivated or converted to another purpose in the future.

Decommissioning activities would be governed by applicable regulatory requirements that are in place at the time of decommissioning, as well as ROW agreements with affected landowners.

Prior to decommissioning the proposed Nebraska Reroute, Keystone would identify the decommissioning procedures it would use along each portion of the route, identify the regulations it would be required to comply with, and submit applications for the appropriate environmental permits.

ES.5 ENVIRONMENTAL CONSEQUENCES

The Nebraska Legislature's directive to NDEQ was: "Evaluate any route for an oil pipeline within … the state … for the stated purposes of being included in a federal agency's or agencies' National Environmental Policy Act review process. Any such evaluation shall include … an analysis of the environmental, economic, social, and other impacts associated with the proposed route …"

The proposed Nebraska Reroute would pass through nine Nebraska counties and would cross a variety of environmental conditions. In the northern portion, the soils are fragile and susceptible to erosion. Through the middle portion, the environment consists of rich, irrigated farmlands typified by thousands of acres of corn and soybeans. Through the Platte River valley, the land is used for agricultural purposes although water tables are high (only a few feet below ground surface). Then the land transitions back into rich farmland and deep water tables in Polk and York Counties.

NDEQ assessed impacts on the environment crossed by the proposed Nebraska Reroute—its soils and geology, its water and economy, and other resources in Nebraska. NDEQ also describes how the Nebraska Reroute could affect those resources, from short-term effects during construction to long-term effects associated with reclamation and restoration after construction.

Impacts that would result from the construction, maintenance and operation of the proposed Nebraska Reroute are summarized below.

ES.5.1 Environment

NDEQ's evaluation included an assessment of the proposed Nebraska Reroute's impact on geology, soils and sediment, groundwater resources, surface water, wetlands, terrestrial vegetation, wildlife, fisheries, protected species, air quality, noise, and waste management.

Geology

Geological conditions determine the depth at which the pipeline would be placed and the migration pathways that spilled substances would follow if pipeline releases were to occur. Furthermore, geological hazards and the locations of mineral and paleontological resources are important considerations in routing the pipeline and protecting it from natural hazards. NDEQ found that potential impacts would include disturbance of topography, loss of access to underlying mineral resources, disturbance of paleontological resources, and potential damage to the pipeline due to flooding and landslides.

Soils and Sediment

Soil is made up of solids (minerals and organic matter), liquid, and gases that occurs on the land surface and occupies space. NDEQ found that potential impacts associated with construction activities, such as trenching, include soil erosion, sandy soil loss attributable to cave-ins, topsoil loss or degradation, soil compaction, increased rock content in near-surface soil, drainage tile system damage, and soil contamination attributable to product releases. NDEQ found that potential impacts associated with operation and maintenance of the proposed pipeline include erosion, compaction, temperature effects, and contamination attributable to potential leaks.

Groundwater Resources

Groundwater is both an important resource in Nebraska and an important issue to the citizens of Nebraska. Within the alignment of the Nebraska Reroute, groundwater aquifers are the principal supply for drinking water and agriculture. NDEQ found the Nebraska Reroute would increase demand for groundwater resources during the construction phase because it would use those resources to supply construction-related activities. During construction, contamination of shallow aquifers from releases of fuel or other chemical contaminants from equipment could also occur. NDEQ found that normal operation of the proposed pipeline would have no effect on groundwater quality or use. Impacts could result from a leak or accidental discharge of crude oil from the pipeline.

Surface Water

Surface water in Nebraska includes all rivers, streams, lakes, ponds, impounded reservoirs, canal systems, drainage systems, or wetlands. The Nebraska Reroute would cross 163[4] waterbodies within six major watersheds: Niobrara, Elkhorn, Lower Platte, Loup, Middle Platte, and Big

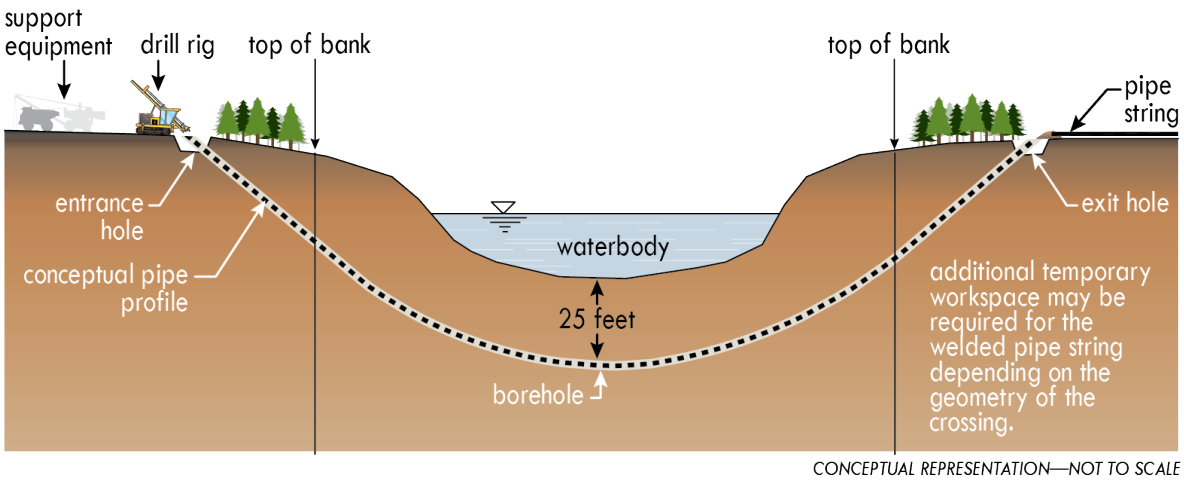
[4] Based on evaluation of data taken National Hydrologic Database (the U.S. Department of the Interior, U.S. Geological Survey, 2011).

Blue. NDEQ found that potential impacts on surface water during construction activities include:

- Temporary increases in sedimentation during stream crossings
- Short-term degradation of aquatic habitat during stream crossings
- Changes in channel morphology and stability due to channel and bank modifications
- Temporary-to-long–term bank instability during the period when removed vegetation was being reestablished

Five large streams would be crossed using horizontal directional drilling (see Figure ES-4), other streams would be crossed by either wet or dry open-cut methods. NDEQ found the Nebraska Reroute would increase demand for surface water during the construction phase because it would use those resources to supply construction-related activities. NDEQ found that normal operation of the proposed pipeline would have no effect on surface water quality or use. Impacts could result from a leak or accidental discharge of crude oil from the pipeline.

Figure ES-4. Conceptual Horizontal Directional Drilling at a Waterbody Crossing



Wetlands

Wetlands are areas that are inundated or saturated by surface water or groundwater and support wetland vegetation that grows in saturated soil conditions. Wetlands support many species of fish and wildlife and provide flood protection and pollution control. NDEQ found that approximately 33 acres of freshwater emergent wetlands, 16 acres of freshwater forested/scrub wetlands, 12 acres of riverine wetlands, 1 acre of freshwater pond and less than 1 acre of other wetlands would be temporarily affected by the following construction actions:

- Removal of vegetation
- Loss and degradation of topsoil
- Soil compaction and rutting from construction equipment
- Introduction and dispersal of invasive weeds
- Alteration of topography and water flow

Permanent impacts on approximately 10 acres of freshwater forested/shrub wetlands would occur within the permanent easement by conversion of forested wetland to emergent wetland. Wetlands in the proposed Nebraska Reroute corridor fall under the jurisdiction of the U.S. Army Corps of Engineers Omaha District, the U.S. Environmental Protection Agency (EPA), and NDEQ.

Terrestrial Vegetation

Terrestrial vegetation is found in prairies, rangeland, agricultural land, riparian corridors, and wetlands. NDEQ found that vegetation cover in the Nebraska Reroute construction corridor would be removed during the initial phases of construction and restored after construction. In some areas, vegetation would be permanently displaced after construction because of ROW maintenance and new ancillary facilities (such as roads, mainline valves, and pump stations) or altered in type. NDEQ found that vegetation could also be temporarily or permanently affected in the event of a spill or release from the pipeline.

Wildlife

Big-game animals, small-game animals, furbearers, waterfowl, and game birds use habitats in and around the proposed Nebraska Reroute. Nongame wildlife species are also common. Many different types of invertebrates are present. Constructing the Nebraska Reroute would affect approximately 1,500 acres of primarily agricultural, grassland, and rangeland habitats. Although much of this area would be revegetated after the pipeline is installed, periodic maintenance activities could alter or fragment the existing habitat. NDEQ found that impacts on wildlife resources include:

- Habitat loss, alteration, and fragmentation
- Wildlife mortality during construction and operation of the pipeline
- Reduced mating and/or reproductive success
- Reduced survival from movement barriers, stress, displacement, and increased human activity

NDEQ found that the impacts from construction and operation of the pipeline would be small on a landscape level because the permanent corridor would be narrow, disturbed habitats would be reclaimed, and the majority of the affected habitats would be rangeland and cropland.

Fisheries

Fisheries occur in the streams crossed by the proposed Nebraska Reroute. NDEQ found that impacts on fisheries could occur during construction (open-cut methods at stream crossings) and in the event of spills or leaks.

Protected Species

Protected species are those listed as threatened or endangered or species of concern by the federal government and the State of Nebraska (Nebraska Game and Parks Commission). U.S. Department of State (DOS) is the lead agency in consultation with the U.S. Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act. DOS and USFWS are consulting agencies, and NDEQ and the Nebraska Game and Parks Commission are participating agencies.

American burying beetle. Photo by Doug Backlund. <www.wildsphotophotography.com>

Air Quality

The air quality analysis focused on the measurement of pollutants in the air. The proposed Nebraska Reroute has the potential to affect air quality during construction as a result of increased emissions from the operation of vehicles and equipment and from dust. During the operational phase of the proposed pipeline, air quality may be minimally affected by intermittent operation of back up generators at MLV stations. NDEQ found that the proposed Nebraska Reroute would not significantly affect regional or national air quality.

Noise

NDEQ's construction noise assessment indicates that construction noise could vary considerably, depending on the equipment used and the distance between the noise source and the receiver. Typically, the highest noise levels during construction are associated with drilling operations, such as those at an HDD crossing. NDEQ generally found that noise levels would be clearly audible at 1,000 feet from construction of the proposed pipeline. During pipeline operation, analysis showed that the estimated noise level experienced at 1,000 feet from a pump station would be equivalent to conversational speech.

Waste Management

Waste materials, hazardous materials, or contamination may exist along the proposed Nebraska Reroute as a result from a variety of current or past activities. Contaminants could also be present that have migrated to a project site from off-site sources through groundwater flow. NDEQ found that hazardous materials (lubricant, fuels, oils and other materials commonly found on a construction site) could cause environmental damage to local surface and groundwater supplies, vegetation, and local wildlife in the event of an accidental release. If contamination is found, it would be managed according to federal, State, and/or local regulations.

ES.5.2 Economic

NDEQ's economic analysis included an assessment of the proposed Nebraska Reroute's impact on agriculture and other land uses, employment and fiscal resources, public services, and energy.

Agriculture and Other Land Uses

Agriculture is the primary land use along the proposed Nebraska Reroute; approximately 60 percent of agricultural land is in crop cultivation or pasture and 40 percent is in rangeland.

Other land uses within or adjacent to the right-of-way include residential, power generation, and uses supporting agricultural activities. NDEQ found the following:

- Ancillary facilities (such as pump stations) would permanently convert agricultural land to a nonagricultural use.
- Construction of the proposed pipeline would temporarily disrupt agricultural activities on the affected land, diminishing crop yields for one growing season.
- Indirect effects on crop yields and livestock would occur due to the loss of irrigation and stock watering systems during construction. NDEQ estimates lost production at approximately 0.1 percent of the total for all crops in each county. Agricultural producers would be compensated for losses with payments based on crop values, expected yields, and acres of land needed for access.
- There are no farmsteads or residences within the 110-foot-wide construction easement. There are 22 residences within 500 feet of the pipeline centerline that could experience construction dust, vibration, and noise during the construction period.
- All land uses could also be temporarily or permanently affected in the event of a spill from the proposed pipeline.

Employment and Fiscal

Much local, state, national, and international attention has focused on potential employment opportunities that the proposed Keystone XL Pipeline[5] could provide as well as the general economic benefits and fiscal effects that would accrue with its proposed implementation. Employment and fiscal impacts were assessed by reviewing data on unemployment rates; employment sectors; personal income; personal income per capita; median household income; and property, sales, and lodging tax revenues. Because of the rural and agricultural nature of the area through which the proposed pipeline would be constructed, the economic downturn that began in 2007 was less severe than in other parts of the country where dependency on manufacturing and services is greater and where the collapse in the housing market caused damaging economic and fiscal repercussions.

NDEQ found that construction and operation of the proposed Keystone XL Pipeline are expected to generate economic benefits to counties along the proposed Nebraska Reroute through increases in economic output, employment, and income. Construction-related spending and labor income would cycle through the local and state economies through secondary economic consumption, employment, and income—"the multiplier effect." Direct impacts on the region would be due to the project's generating sales of goods and services and to labor income. A summary of those impacts follows:

- Spending by construction workers would account for approximately $31.4 million of new total economic activity during construction, which would multiply through the local economies to generate a total of nearly $50.8 million of new economic activity attributable to constructing the pipeline.
- Keystone expects to employ approximately 270 Nebraska workers during construction, or 110 average annual jobs.

[5] Economic and fiscal impacts were evaluated for the entire proposed Keystone XL Pipeline in Nebraska, which includes the Nebraska Reroute.

- Construction of the pipeline would result in $278 million in economic benefits and would support up to 2,740 new or existing jobs in the state of Nebraska.
- Average per worker annual incomes would be $37,200, for a total of $102.1 million in labor incomes.
- Operation of the pipeline would generate about 50 new jobs through secondary economic growth.
- Local property tax revenues, after the first full year of valuation, would be between $11 million and $13 million.

Public Services

Increased demands from proposed Nebraska Reroute work crews and construction traffic could adversely affect public services, including law enforcement (local police and sheriff), fire protection, medical facilities, public roads, railroads and utilities, and school busing. NDEQ found that these effects would be short-term.

Energy

Energy would be needed to construct the proposed Nebraska Reroute, its associated facilities (such as pump stations and MLVs), power distribution lines, and substations to supply power to pump stations. NDEQ found that equipment and vehicles needed for construction would use diesel and gasoline fuel as well as electrical power. These would all involve short-term energy expenditures. NDEQ notes that the pump stations would have a continuous demand for energy, purchased from the local power provider.

ES.5.3 Social

NDEQ's social analysis included an assessment of the Nebraska Reroute's impact on recreation and visual resources, population and vulnerable groups (racial and ethnic minorities, low-income populations, elderly and others), and cultural resources.

Recreation and Visual Resources

Recreational areas include waterbodies, State and local parks, national historic trails, wildlife management areas, and wildlife refuges. Areas of visual interest are areas such as residences, recreational areas, rivers, and highways with landscape characteristics and sensitive viewpoints that have an aesthetic value to residents and visitors. NDEQ found the following impacts:

- Short-term impacts on scenic, recreational, and historical trails
- Short-term impacts on hunting, depending on timing and season
- Short-term impacts on visual resources because of land disruption, construction of the pipeline, and installation of the ancillary facilities
- Long-term visual impacts due to pump stations and power lines

Population and Vulnerable Groups

The population analysis evaluated the potential for the proposed Nebraska Reroute to cause disproportionate impacts on vulnerable groups. NDEQ found that there would be no disproportionate impact on vulnerable groups. NDEQ identified the following:

- Construction of the proposed pipeline would bring a temporary influx of construction workers, but that this influx would not affect long-term population trends in the counties along the proposed Nebraska Reroute.
- Housing impacts along the proposed Nebraska Reroute would be short-term as temporary workers would lodge in available hotels, motels, inns, campgrounds, and rental homes.
- Air pollutants, noise levels, and traffic congestion would not disproportionately affect any low income populations.
- Low-income populations would benefit from a temporary increase in economic activity.

Cultural Resources

Cultural resources are physical evidence of culturally and historically valued aspects of the human and natural environment on the landscape or are represented by the landscape itself. DOS, as the lead federal agency, negotiated a Programmatic Agreement with 19 federal and state agencies and 44 interested Native American tribes to meet its responsibilities under federal law. The Nebraska State Historic Preservation Officer was a consulting party and a principal signatory to the Programmatic Agreement. Keystone surveyed 40 percent of the proposed Nebraska Reroute corridor as of August 2012 and identified nine sites that are considered potentially eligible for listing in the National Register of Historic Places.

ES.6 MITIGATION

ES.6.1 Nebraska Department of Environmental Quality's Approach to Mitigation

This evaluation began with public meetings to collect Nebraskans' concerns regarding the proposed Nebraska Reroute. The concerns set the foundation for this report and focused NDEQ on impacts that needed to be mitigated. In conducting the evaluation of the Nebraska Reroute, NDEQ performed the following:

- Careful and thorough review of all public comments
- Consultations with federal, regional, State, and local agencies
- Site visits
- Review of existing documentation including the Final EIS
- Full consideration of the proposed Nebraska Reroute information supplied by Keystone

Throughout its evaluation of the Nebraska Reroute, NDEQ's approach to mitigation of impacts is (1) seek ways to avoid impacts, (2) minimize impacts, and (3) restoration.

Keystone refined the proposed Nebraska Reroute to avoid fragile soils in the northern portion. The Clarks Alternative was developed to address NDEQ's concerns regarding the location of Keystone's preferred reroute corridor in an area where the aquifer is very thin, wells are shallow,

and bedrock is close to the surface. This area was upgradient (west) of the boundary of the Clarks Wellhead Protection Area (WHPA). The Clarks Alternative would route the proposed pipeline downgradient (east) of the WHPA.

When impacts cannot be avoided, NDEQ identifies opportunities that minimize impacts on resources. Lastly, when impacts cannot be avoided and are minimized to the extent possible, residual impacts are mitigated through compensation or restoration by Keystone.

ES.6.2 Mitigation Commitments and Landowner Agreements

NDEQ encourages Keystone to negotiate mutually acceptable agreements with adversely affected landowners to address potential construction and restoration issues. According to Keystone, all landowner agreements would comply with federal, State, and local permits.

ES.6.3 Public Review of Mitigation Measures

NDEQ encourages the public and agencies to review and comment on the mitigation measures in the Draft Evaluation Report. For NDEQ to assess the comments effectively, the public must be specific about any mitigation and the reasons why the suggested mitigation would be appropriate. NDEQ will consider suggested mitigation measures before presenting the Final Evaluation Report to the Governor.

DOS is in the process of supplementing the Final EIS based on a revised Presidential Permit application from Keystone. Additional commitments may be developed during DOS's Supplemental EIS process.

ES.6.4 Commitments Made by Keystone

Mitigation commitments by Keystone have been made in the following documents:

- DOS's Final EIS
- Keystone's *Supplemental Environmental Report*
- Keystone's letter to NDEQ dated October 18, 2012

Please refer to Chapter 5 and Appendix C in this report for a listing of mitigation commitments.

ES.7 PIPELINE SAFETY AND POTENTIAL SPILLS

Product releases from the pipeline are a threat to the environment. In response to those concerns, NDEQ has assessed the safeguards that would be incorporated to prevent a release and Keystone's actions that would be taken if a release were to occur.

ES.7.1 Pipeline Safety Regulations and Special Conditions

To provide consistency across the nation, pipeline safety is regulated by the federal government. U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration (PHMSA) is responsible for safety regulations pertaining to the construction, operation, maintenance, and spill-response planning for pipelines, including the proposed Keystone XL Pipeline. Federal regulations governing pipeline safety are described in 49 CFR §§ 190 through 199.

PHMSA and DOS worked with Keystone to establish a set of 57 Special Conditions that would apply to the construction, operation, and maintenance of the Keystone XL Pipeline, including the Nebraska Reroute (see Appendix F.2). NDEQ reviewed the 57 Special Conditions and compared them with 49 CFR § 195 and industry design standards. The review concluded that many of the conditions would result in more rigorous adherence to industry standards and would require specific timelines and management activities, rather than leaving interpretation of the code up to the pipeline operator. Incorporation of the 57 Conditions would result in Keystone having more specific and frequent communication with PHMSA's regulatory personnel and should provide a well-defined set of management practices to be followed during pipeline operation.

ES.7.2 Relevant Pipeline Spill Incident History

Recent spills in Nebraska and elsewhere in the United States were frequently mentioned by the public during the public information meetings. NDEQ reviewed historical spills to understand how they occurred and the effectiveness of response. This analysis was used when considering impacts on resources from a potential spill.

NDEQ reviewed these spills and provided the summary of each in Chapter 6 of this Draft Environmental Evaluation:

- Keystone Oil Pipeline Spills, 2010–2011
- Enbridge Oil Spill, Kalamazoo River, Michigan, July 2010
- Magellan Oil Products Pipeline Spill, Nemaha County, Nebraska, December 2011
- ExxonMobil Crude Oil Pipeline Spill, Yellowstone River, Montana, July 2011
- Enbridge Oil Spill, Grand Marsh, Wisconsin, July 2012

ES.7.3 Characteristics of Crude Oil Transported in Pipeline

The environmental consequence of a product release is dependent on the material that is carried in the pipeline. Concerns have been raised by the public that some of the physical and chemical characteristics of the materials carried by the proposed pipeline could make a release more likely or that the material could be more toxic if spilled.

The bitumen (a soft tar-like substance) mined in the Alberta oil sands is too heavy and thick to be transported by pipeline. Therefore, bitumen is blended or treated in an upgrading facility to form crude oil products with a viscosity and density that makes them suitable to be carried by a pipeline. This is accomplished by refining, upgrading, or blending with a diluent, depending upon various logistic and economic considerations.

Crude Oils Transported Through the Pipeline

According to Keystone, the following are a list of crude oils that could be transported through the proposed pipeline:

- Synthetic crude oil, produced from the Alberta oil sands in Canada
- Dilbit, produced from the Alberta oil sands
- Synbit, produced from the Alberta oil sands
- Dilsynbit, produced from the Alberta oil sands
- Conventional light crude oil, produced from the Bakken Formation in Montana and North Dakota

Synthetic crude oil is refined bitumen. Dilbit is produced by the blending of bitumen with a diluent such as natural gas condensate. Synbit is produced by adding synthetic crude oil to the bitumen. Dilsynbit is produced by blending bitumen with synthetic crude oil and a diluent. These products would not be created by Keystone but by the producers in Western Canada. Keystone is the common carrier of the product and is hired by the producers/shippers to transport their crude oil. The composition of crude oil is determined by the producers or shippers, but must meet Keystone's specifications.

NDEQ found that the physical and chemical properties of synthetic crude oil and Bakken crude oil are similar to those of other light crude oils commonly transported by pipeline. The properties of dilbit, synbit, and dilsynbit are similar in many respects to other heavy sour crude oils.

ES.7.4 Consequences of a Pipeline Spill

An accidental release of crude oil from the proposed pipeline is a concern to Nebraskans. Comments have been voiced about the effect a spill could have on sensitive environments such as shallow groundwater, flowing surface water, and wetlands. Crude oil spills such as the July 25, 2010, Enbridge spill near Marshall, Michigan, have served to reinforce these concerns.

The impacts of a crude oil release depend on many different factors, such as the spill size, terrain, ground cover, soil type, depth to groundwater, weather conditions, and proximity to surface water. In addition, rapid and effective emergency response is paramount to mitigating the impacts of a spill. Keystone is required by 49 CFR § 194 to prepare an Emergency Response Plan specific to the Keystone XL Pipeline.

In this Draft Evaluation Report, NDEQ evaluated:

- Causes of pipeline incidents
- Movement and fate of spilled oil
- Potential impacts on resources

ES.7.5 Spill Prevention and Detection during Pipeline Operation

Keystone has integrated a number of measures intended to prevent or detect releases during pipeline operation. NDEQ has reviewed and evaluated the following proposed measures:

- Prevention of material, weld, and equipment failures through design, manufacture, and construction of the pipeline
- Implementation of a corrosion prevention program, for both internal and external pipe
- Prevention of excavation damage through depth of cover, pipeline markers, and puncture resistance
- Detection of leaks through:
  - A Pipeline Maintenance Program that performs annual valve maintenance, periodic in-line inspections, and cathodic protection readings
  - A Supervisory Control and Data Acquisition (SCADA) system that continuously and remotely monitors the pipeline system in accordance with the requirements of 49 CFR § 195 and the 57 Special Conditions
  - Computer-based, non-realtime, accumulated gain/loss volume trending to assist in identifying low-rate or seepage releases
  - Both aerial and ground surveillance inspections

ES.7.6 Planning for Pipeline Spills

By federal regulation, Keystone would be responsible for developing an Emergency Response Plan for a product release associated with the operation of the Keystone XL Pipeline and ancillary facilities. In addition, spill-response planning is conducted by EPA, PHMSA, the National Response Center, and other federal agencies. NDEQ and local emergency responders in communities throughout Nebraska conduct spill response planning and training.

ES.7.7 Response to Pipeline Emergencies

In the case of an accidental release from the proposed pipeline or of other emergency, primary responsibility for spill containment and cleanup would rest with Keystone. Because local fire departments or other local emergency service responders might be first on the scene, Keystone will invite emergency services agencies to participate in company training and exercises at no expense to the responders.

Local emergency service agencies would protect themselves and the public by controlling access to the affected area, in the event of a spill. Keystone personnel have the training to be first and on-going responders. Keystone would contract with spill-response contractors and would store equipment at various locations along the pipeline route. NDEQ would respond to the spill as needed and would request assistance from EPA if the size of the spill or deficiencies in Keystone's response were to create a need for additional resources. Depending on the magnitude and location of the spill, NDEQ would cooperate with other local, State and federal agencies, and would establish an on-site incident command structure. If NDEQ determined that a federal response were required for a spill from the Keystone XL Pipeline, an EPA On-Scene Coordinator would be designated.

Keystone Emergency Exercise, Yankton, South Dakota. September, 2012.
Photo: HDR Engineering, Inc.

NDEQ has requested that Keystone provide a timely and detailed accounting of any material spilled from the pipe. Keystone would make regulatory notifications immediately upon recognition of the spill as required by federal and State regulations. In the event of a spill, Keystone would provide the applicable Material Safety Data Sheets to NDEQ and other authorities at the same time it makes regulatory notifications.[6]

The Nebraska Environmental Protection Act; the Nebraska Administrative Code, Title 126, Chapter 18; and the federal Oil Pollution Act of 1990 place liability on the operator if a pipeline were to release crude oil or other hazardous substance in or on land or waters of the state.

In response to public concerns, Keystone has committed to filing with NDEQ a certificate of insurance. This certificate would be filed annually, by May 1 of each year. The certificate would provide evidence that Keystone is carrying a minimum of $200 million in third-party liability insurance[7] which would cover "sudden and accidental pollution incidents from Keystone XL Pipeline in Nebraska."

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6 Keystone response to NDEQ's September 10, 2012, Data Request, Question #57 (see Appendix H.2).

7 Keystone states that the $200-million value of the insurance would be "adjusted by calculating the GDP-IPD from the date a Presidential Permit is issued for the Project and adjusting the amount of the third-party liability insurance policy by this percentage."

ES.8 OUTREACH AND AGENCY COORDINATION

ES.8.1 Public Involvement

Public outreach was conducted by NDEQ to inform and educate the public, along with soliciting public input. NDEQ's public involvement and outreach efforts included in-person public information meetings, an online meeting, a Nebraska Reroute website, a telephone information line, press releases to multiple media outlets, and map book distribution to local libraries for public review.

Public Information Meetings

In May 2012, NDEQ held four public information meetings over the course of 2 weeks. The purpose of the public information meetings was to inform and educate the public regarding NDEQ's review process and to solicit additional public input. The following public information meetings were held:

- O'Neill Community Center, 501 South 4th Street, O'Neill, on May 9
- Neligh-Oakdale High School, 600 J Street, Neligh, on May 10
- Boone County Fairgrounds, 2616 Fairgrounds Road, Casey's Building, 11th Street and Fairview Avenue, Albion, on May 16
- City Hall, Central City Community Room, 1515 17th Street, Central City, on May 17

DOS representatives made themselves available at all four of the public information meetings to interact with the individuals who attended the meetings and answer questions concerning the DOS process and issues related to the Keystone XL Pipeline outside of Nebraska.

Online Meeting

A self-guided, online meeting tool was established to provide an online version of the in-person May 2012 public information meetings. The online meeting provided an easy and convenient alternative method to gain access to Nebraska Reroute information. Access to the updated online meeting is through NDEQ's Nebraska Reroute website at <https://ecmp.nebraska.gov/deq-seis/>.

Website

In December 2011, NDEQ established a Nebraska Reroute website, Nebraska's Keystone XL Pipeline Evaluation, located at <https://ecmp.nebraska.gov/deq-seis/>. The website is updated regularly, and will be available, monitored, and maintained until the Governor makes his recommendation regarding the Nebraska Reroute.

Information Line

To provide information to all interested parties, a telephone information line (800-295-8912) was installed on April 27, 2012, and will be maintained as the proposed Nebraska Reroute progresses. The information line will remain open until the Final Evaluation Report is published and available for public review.

ES.8.2 Agency Coordination

NDEQ invited agencies with jurisdiction, expertise, or interest in the Nebraska Reroute to participate in the environmental review process. The agencies were asked to help identify potential environmental issues and concerns.

NDEQ coordinated with State and federal agencies. In May 2012, coordination letters were sent to key resource agencies: six federal agencies, six State agencies, and nine local Natural Resources Districts (NRDs). To help facilitate coordination with NRDs, NDEQ also invited comments from the Nebraska Association of Resources Districts, the professional association for Nebraska's 23 NRDs. NDEQ met with seven NRDs located along the proposed Nebraska Reroute.

Following the May 2012 public information meetings, NDEQ met with representatives from the following agencies:

- Nebraska Department of Health and Human Services
- Nebraska Department of Natural Resources
- Nebraska Department of Revenue
- Nebraska Department of Roads
- Nebraska Game and Parks Commission
- Nebraska State Historic Preservation Office
- U.S. Department of Agriculture Natural Resources Conservation Service

NDEQ coordinated with USFWS and NGPC under the Nebraska Nongame and Endangered Species Conservation Act. NDEQ continues to participate in coordination meetings with USFWS, NGPC, and DOS.

NDEQ also met with EPA regarding EPA's role in the DOS environmental and Presidential Permit review process.

ES.8.3 Comments Received

NDEQ has had a continuous comment period which began April 19, 2012. NDEQ sought out public comments on Keystone's new alignment and provided feedback to Keystone on July 17, 2012. Keystone responded on September 5, 2012, with its *Supplemental Environmental Report* which proposed three further refinements to the Nebraska Reroute. NDEQ sought public comments on Keystone's *Supplemental Environmental Report* which it considered in developing this Draft Evaluation Report. Comments will continue to be accepted through the close of the Public Hearing on December 4, 2012.

ES.9 COMMENTING ON THE DRAFT EVALUATION REPORT

NDEQ encourages all interested parties to submit written comments on any aspect of this Draft Evaluation Report. NDEQ will consider all comments in preparing the Final Evaluation Report.

ES.9.1 Draft Evaluation Report Distribution

NDEQ made this Draft Evaluation Report available to the public for review through:

- Electronic placement of the Draft Evaluation Report on the Nebraska Reroute website, <https://ecmp.nebraska.gov/deq-seis/>
- Printed copy placement in local libraries along the pipeline corridor
- Printed copy placement at the NDEQ's Main Office in Lincoln and in each of NDEQ's regional field offices throughout the state: Omaha, Norfolk, Holdrege, North Platte, Scottsbluff, and Chadron
- Direct mail notice and/or e-mail notice of the document's availability on the Nebraska Reroute website and at local libraries
- Direct mail to key resource agencies

ES.9.2 Comment Opportunities

NDEQ's comment period for the Draft Evaluation Report will remain open through the Public Hearing on December 4, 2012. Multiple opportunities to comment on the Draft Evaluation Report are provided, including:

- Online comment form using the Nebraska Reroute website: <https://ecmp.nebraska.gov/deq-seis/>
- Email: <NDEQ.SEISpubliccomment@Nebraska.gov>
- Comment form available at the Information Session
- Verbal testimony left with court reporter at the December Public Hearing
- Direct mail:

  Nebraska Department of Environmental Quality
  1200 N Street, Suite 400
  P.O. Box 98922
  Lincoln, NE 68509

ES.9.3 Information Session and Public Hearing

NDEQ will host an Information Session and Public Hearing on December 4, 2012. The Information Session will be conducted in an open house format and will take place immediately before the Public Hearing. The open house format provides an opportunity for one-on-one interactions with members of the project team and for learning about the evaluation process from display and outreach materials. The Information Session will provide the public with information regarding the Nebraska Reroute and the Draft Evaluation Report and will gather comments from the public regarding the evaluation process and the anticipated impacts of the Nebraska Reroute. The Public Hearing will provide a formal opportunity for the public to provide testimony for inclusion in the public record—it is also a requirement of LB 1161.

Planned activities for the December 4, 2012, Information Session and Public Hearing are:

Location:	Event Center and Casey's Building (S. 11th Street and Fairview Road) located at the Boone County Fairgrounds, 2616 Fairgrounds Road Albion, Nebraska
Date:	December 4, 2012
Time:	Information Session: 3:00 p.m.–5:30 p.m. Public Hearing: 6:00 p.m.

ES.10 NEXT STEPS TO COMPLETE THE NEBRASKA EVALUATION

Following the public information session and public hearing, all comments received on this Draft Evaluation Report will be considered in NDEQ's Final Evaluation Report. The Final Evaluation Report will be submitted to Nebraska's Governor. In accordance with the process directed in LB 1161, the Governor will indicate to DOS "whether he or she approves any of the routes reviewed in the supplemental environmental impact statement" [LB 1161, Sec. 3. (4)] regarding the Nebraska Reroute. DOS will complete its Final Supplemental EIS and incorporate the Governor's decision.

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ABBREVIATIONS AND ACRONYMS

Abbreviation or Acronym	Definition
°F	degrees Fahrenheit
APE	area of potential effects
API	American Petroleum Institute
bgs	below ground surface
BMP	best management practice
BTEX	benzene, toluene, ethylbenzene, and xylene
CAFO	concentrated animal feeding operation
CAPP	Canadian Association of Petroleum Producers
CD	compact disc
CFR	Code of Federal Regulations
CMRP	Construction, Mitigation, and Reclamation Plan
CRP	Conservation Reserve Program
CWA	Clean Water Act
dBA	A-weighted decibel
dilbit	diluted bitumen
DOS	U.S. Department of State
EDR	Environmental Data Resources Inc.
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ERP	Emergency Response Plan
ESA	Endangered Species Act
et seq.	*et sequens* (and the following)
FBE	fusion-bonded epoxy
FERC	Federal Energy Regulatory Commission
FSA	U.S. Department of Agriculture, Farm Service Agency
gal/min	gallons per minute
GAP	Gap Analysis Program
HCA	high consequence area

Abbreviation or Acronym	Definition
HDD	horizontal directional drilling
HMR	hazardous materials review
HPSA	Health Professional Shortage Area
Keystone	TransCanada Keystone Pipeline, LP
kV	kilovolt
LB	Legislative Bill
LEPC	Local Emergency Planning Committee
Liquid IM Rule	Liquid Pipeline Integrity Management in High Consequence Areas for Hazardous Liquid Operators
µg/L	micrograms per liter
MLV	mainline valve
MOU	Memorandum of Understanding
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NDEQ	Nebraska Department of Environmental Quality
NDNR	Nebraska Department of Natural Resources
NDNR	Nebraska Department of Natural Resources
NEPA	National Environmental Policy Act
NGPC	Nebraska Game and Parks Commission
NHPA	National Historic Preservation Act
NIA	Noise Impact Assessment
NLCD	National Land Cover Database
NLT	Nebraska Land Trust
NPDES	National Pollutant Discharge Elimination System
NPPD	Nebraska Public Power District
NRC	National Response Center
NRCS	U.S. Department of Agriculture, Natural Resources Conservation Service
NRD	Natural Resources District
NRHP	National Register of Historic Places
NTSB	National Transportation Safety Board
NWI	National Wetland Inventory
OSC	On Scene Coordinator

Abbreviation or Acronym	Definition
PA	Programmatic Agreement
PAH	polycyclic aromatic hydrocarbon
PD	police department
PHMSA	U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter of 10 micrometers or less
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 micrometers or less
PSRP	Pipeline Spill Response Plan
Reroute Report	*Initial Report Identifying Alternative and Preferred Corridors for Nebraska Reroute* (April 18, 2012)
ROW	right-of-way
SCADA	supervisory control and data acquisition
SER	*TransCanada Keystone XL Pipeline Project Supplemental Environmental Report for the Nebraska Reroute* (September 5, 2012)
SHPO	State Historic Preservation Office
SPCC	Spill Prevention, Containment, and Countermeasure
SSURGO	Soil Survey Geographic
UNL	University of Nebraska–Lincoln
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Department of the Interior, U.S. Fish and Wildlife Service
USGS	U.S. Department of the Interior, U.S. Geological Survey
VOC	volatile organic compound
WHPA	wellhead protection area

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GLOSSARY

alluvium. Loose soils and materials that have been deposited by streams or rivers in a river valley or delta.

area of potential effects (***APE***). The geographic area within which an undertaking may directly or indirectly cause changes in the character or use of historic properties (if such properties exist). It is influenced by the scale and nature of the undertaking and may be different for different kinds of effects caused by the undertaking. Generally, an area larger than the project footprint is considered.

A-weighted decibel **(*dBA*)**. A sound measurement that uses a weighting scale to approximate how humans perceive sound, emphasizing the frequencies we hear while deemphasizing frequencies we do not hear. A conversation would be measured at around 50 dBA.

barrel. A unit used to measure oil volumes. Each barrel of oil is equivalent to 42 gallons.

bedrock. The solid, unbroken rock that occurs underneath overlying soils and rock fragments.

benthic. Describes fish and other aquatic species that live on or in the bottom of a waterbody.

benzene. A colorless liquid with a sweet odor. It quickly evaporates into the air and dissolves slightly in water. It is highly flammable and occurs both naturally and as a product of human activities. Benzene is classified as a known human carcinogen.

boom. Used as a containment measure during an oil spill, a boom floats on the surface of the water and extends below the surface for a certain distance. It can be used to contain the extent of the spill or to protect a sensitive area from the spread of oil. The effectiveness of a boom depends on weather and water conditions.

carcinogen. A substance or agent that tends to cause cancer. Exposure to a carcinogen doesn't mean you will develop cancer. Many factors are involved, such as the type of carcinogen, how long you were exposed, and the frequency of exposure.

cathodic protection. Used by the pipeline industry to control corrosion of pipeline surfaces that are immersed in water or exposed to soil. In this system, electricity creates an electrical circuit in which the pipeline is made a cathode and is connected to buried underground anodes. The system works by causing the anode to be oxidized or corroded instead of the pipeline, thus protecting the pipeline.

census block. The smallest geographic area for which the U.S. Census Bureau collects and tabulates decennial census data. Census blocks are formed by streets, roads, railroads, streams and other bodies of water, other visible physical and cultural features, and the legal boundaries shown on U.S. Census Bureau maps.

center pivot irrigation. An irrigation method where the irrigation equipment rotates around a center pivot as it irrigates the surrounding field using sprinklers.

common carrier. An individual or business that advertises to the public that it is available for hire to transport people or property (in the case of the proposed pipeline, synthetic crude oil) in exchange for a fee.

***concentrated animal feeding operation* (*CAFO*)**. An agricultural operation where animals are kept in confined areas, congregating live and dead animals, feed, manure, urine, and production operations on a small land area. The "concentrated" designation is applied when such an operation meets criteria set by the U.S. Environmental Protection Agency.

corrosion. With regard to pipelines, corrosion occurs when the pipeline material is worn away or eaten away. Internal corrosion issues of concern for the proposed pipeline include sulfur content, total acid number, and levels of abrasive solids in the crude oil being transported. External corrosion is an issue for the proposed pipeline where it would pass through wet soil or water and be exposed to salts.

county subdivisions. The primary divisions of counties and equivalent entities used by the U.S. Census Bureau for reporting demographic data.

criteria pollutants. Air pollutants that the U.S. Environmental Protection Agency considers to be common across the United States and that have adverse public health and environmental effects. The six criteria pollutants are carbon monoxide, nitrogen dioxide, sulfur dioxide, ozone, particulate matter, fine particulate matter, and lead.

critical habitat. A term defined and used in the Endangered Species Act. It is a specific geographic area that is essential for the conservation of a threatened or endangered species. It may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but will be needed for its recovery.

crude oil. A mixture of hundreds of organic (and a few inorganic) compounds. Crude oil is delivered to refineries for processing into products such as gasoline. It is generally classified as heavy, medium, or light, based on its density (weight relative to volume). Crude oil is also classified as "sour" or "sweet," based on its sulfur content.

***diluted bitumen* (*dilbit*)**. Consists of bitumen mixed with a light hydrocarbon liquid such as natural gas condensate or refinery naphtha. The bitumen is diluted to improve its viscosity, making it a more liquid form that can be transported by pipeline.

dilsynbit. Bitumen blended with synthetic crude oil and a dilutant similar to natural gas condensate.

drainage tiles. Pipe-shaped clay tiles used to drain excessive subsurface water from fields. Plastic pipes are now used for similar purposes rather than the traditional clay tiles.

deposition. The process of "dropping off" materials into a basin.

dry open-cut method. A construction technique for building the proposed pipeline across major waterbodies or environmentally sensitive waterbodies where the waterbody would be diverted at the crossing point using a flume or a dam and pump to enable construction of the pipeline trench in the dry bed of the waterbody.

ecoregions. Regions with a similar climate where ecosystems recur in predictable patterns.

environmental justice. Fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. No group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of negative environmental consequences resulting from industrial, municipal, and commercial operations or federal, State, local, and tribal programs and policies.

floodplain. The portion of a stream valley, adjacent to the channel, that is covered with water when the stream overflows its banks at flood stage. The 100-year floodplain encompasses an area that would be inundated during a flood with a 1 percent probability of occurring annually.

forested wetlands. Characterized by woody vegetation with a height of 6 meters and taller. Forested wetlands are most common in areas where moisture is relatively abundant, particularly along rivers and in the mountains.

frac-out. This occurs when drilling fluid used for horizontal directional drilling (see definition below) is released through fractured bedrock and sands. The fluid may then enter a wetland or waterbody.

eolian sands. Sand deposits arranged by the wind.

emergent wetlands. Freshwater emergent wetlands are characterized by erect, rooted, herbaceous plants, excluding mosses and lichens. In areas with relatively stable climates, emergent wetlands maintain the same appearance year after year. In other areas, substantial seasonal and annual climatic fluctuations can result in a range of conditions in the same wetland, from vegetated to open-water pond habitats. Emergent wetlands are known by many names, including marsh, meadow, fen, prairie pothole, and slough.

eminent domain. The ability of a corporate entity to obtain land for public use without agreement of the landowner, who would be compensated for the land.

***environmental impact statement* (*EIS*)**. A document prepared in accordance with the National Environmental Policy Act when a project is anticipated to have a significant impact on the environment.

erosion. Removal of material physically by water, wind, and ice from its original position.

fault. A fracture along which blocks of earth materials on either side of the fault have moved relative to each other. An active fault is one with demonstrable evidence of movement having taken place within the last 10,000 years

geographic information system. A system used for gathering, analyzing, and displaying geographically referenced information. It encompasses the geographic data and the hardware and software used to gather and process such data.

***high consequence area* (*HCA*)**. A commercially navigable waterway, high-population area, other populated area, or unusually sensitive area that would be affected by a pipeline spill of hazardous liquids.

High Plains Aquifer. A regional water-table aquifer that extends from southcentral South Dakota to the southern part of the Texas panhandle. It stores about 3.25 billion acre-feet of water.

***horizontal directional drilling* (*HDD*)**. A trenchless construction technique that uses guided drilling and is used to drill under long distances, such as under rivers, lagoons, and roadways. The technique involves drilling a pilot hole under the feature to be crossed and enlarging that hole through successive reamings until the hole is large enough to accommodate the pipeline. While drilling and enlarging the hole, a slurry (called drilling mud) made of naturally occurring nontoxic materials, such as bentonite clay and water, would be circulated through the drilling tools to lubricate the drill bit, remove drill cuttings, and hold the hole open.

hydromulching. Applying a slurry of seed and mulch to the ground for revegetation purposes.

hydrostatic testing. A process that involves filling a segment of pipe with water and pressurizing the pipe to a prescribed value.

loess. A fine-grained accumulation of clay and silt particles deposited by the wind.

low-income. Describes a person living in poverty, as defined by the U.S. Census Bureau.

***mainline valve* (*MLV*)**. A valve within a pipeline that can be manually or electronically closed when a leak is detected to isolate a section of pipeline and to limit the volume of the pipeline leak.

***megawatt* (*MW*)**. A unit used to measure the energy output of electric power generating facilities. A typical coal power plant in the United States produces 500 MW of energy.

medically underserved area. A county or group of contiguous counties, a group of county or civil divisions, or a group of urban census tracts where residents have a shortage of personal health services.

medically underserved population. A group of people that faces economic, cultural, or linguistic barriers to health care.

***National Ambient Air Quality Standards* (*NAAQS*)**. Standards that set limits for the six criteria pollutants: carbon monoxide, nitrogen dioxide, sulfur dioxide, ozone, particulate matter, fine particulate matter, and lead. The primary NAAQS are intended to protect public health. The secondary NAAQS are intended to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

***National Environmental Policy Act* (*NEPA*)**. The federal law that established a national policy for the environment. It requires federal agencies to become aware of the environmental ramifications of their proposed actions, to fully disclose to the public proposed federal actions, to provide a mechanism for public input to federal decision making, and to prepare environmental impact statements for every action that would significantly affect the environment.

***National Register of Historic Places* (*NRHP*)**. The nation's official list of cultural resources worthy of preservation.

noxious species. Plant or animal species that are not native to an area and are often able to outcompete native species for resources such as water and nutrients, slowing or preventing the reestablishment of native plants or animals in areas where the native habitat has been disturbed. Also described as invasive, nonnative, or exotic species.

Ogallala Aquifer. Part of the High Plains Aquifer, the Ogallala Aquifer is an important source of water supplies for much of the Midwest.

oil sands. A combination of clay, sand, water, and bitumen (which is a material similar to soft asphalt). Also referred to as tar sands.

paleontological resources. Physical remains of floral and faunal species that have mineralized into or left impressions in solid rock.

pigging facilities. Facilities including pig launchers and pig receivers. Pigs are used to clean the pipeline and can measure pipe thickness and corrosion.

***polycyclic aromatic hydrocarbons* (*PAHs*)**. A group of chemicals that occurs naturally in bitumen and crude oil. PAHs contain multiple, linked carbon rings and are relatively heavy and less likely to evaporate. Over 100 different chemicals are classified as PAHs. Most PAHs do not readily dissolve in water and in the environment—they tend to stick to solid particles and sink to the bottom. PAHs spilled on soil also are most likely to stick tightly to particles, although certain PAHs can move through soil to contaminate groundwater. Many PAHs are known to be carcinogenic.

prime farmland. Land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion. Prime farmland generally has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, and few or no rocks.

***Programmatic Agreement* (*PA*)**. An agreement that governs the implementation of a particular program or the resolution of adverse effects to cultural resources resulting from certain complex projects or multiple undertakings. Signatories to the agreement may include federal, State, and local agencies and Native American tribes.

racial minority. Describes a person classified by the U.S. Census Bureau as Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, some other race, or two or more races.

***right-of-way* (*ROW*)**. The land needed for construction, maintenance, and operation of the proposed pipeline and associated facilities, to be acquired through purchase or easements.

riparian. An aquatic or terrestrial ecosystem associated with bodies of water, such as streams, lakes, or wetlands, or dependent on the presence of perennial, intermittent, or ephemeral surface or subsurface water drainage. Riparian areas are usually characterized by dense vegetation and abundant and diverse wildlife.

Sand Hills. An environmentally sensitive region in northcentral Nebraska comprising fragile soils that, when disturbed, are highly erodible and very difficult to restore.

supervisory control and data acquisition* (*SCADA*) *system. The primary purpose of SCADA is to monitor, control, and send alarms for a system such as a pipeline system from a central location. SCADA facilities would be located in the control center and along the pipeline system, and all pump stations and delivery facilities would have communication software that sends data back to the control center. The pipeline SCADA system would allow the control center to remotely read intermediate MLV positions, tank levels, and delivery flow and total volume. Control center personnel would also be able to start and stop pump stations and open and close MLVs using SCADA. The SCADA system would notify operators immediately with an alarm if the pipeline or the product flow exceeded normal operating parameters.

shelterbelt. A hedge or fence of trees or shrubs that is meant to reduce the force of wind and prevent erosion. Also known as a windbreak.

skimmer. A machine used to remove oil that is floating on water.

synbit. Produced by diluting bitumen with synthetic crude oil. The combination of the lighter synthetic crude oil with the heavier bitumen typically results in a product that shares many characteristics with conventional crude oils. Synbit has a higher concentration of sulfur than synthetic crude oil, and a higher density; thus, it is classified as a heavy crude oil. The ratio of bitumen to synthetic crude oil is about 1:1, although this ratio may vary.

synthetic crude oil. Produced by refining bitumen through a process termed "upgrading." Upgrading facilities treat the bitumen using a number of steps to create a product that can be transported by pipeline without adding a solvent or diluent. Synthetic crude oil is usually low in sulfur and metals. The upgrading process removes enough of the heavier hydrocarbons naturally occurring in bitumen that the synthetic crude oil is classified as a light crude oil.

terrestrial. That which pertains to the earth. Terrestrial vegetation grows on land, not in water.

topsoil. The top layer of soil (above the subsoil) that is usually rich in organic matter. Plants' root systems gather most nutrients from this layer.

traditional cultural property. A place that is eligible for listing in the National Register of Historic Places because of its association with cultural practices and beliefs that are rooted in a community's history and are important to maintaining the continuity of that community's traditional beliefs and practices.

turbidity. Describes the clouded or opaque condition of water attributable to stirred-up sediment.

unusually sensitive area. An area that would be unusually sensitive to environmental damage in the event of a hazardous liquid pipeline spill.

***volatile organic compounds* (*VOCs*)**. While these compounds can occur naturally, many are human-made chemicals associated with paints, adhesives, petroleum products, pharmaceuticals, and refrigerants. They evaporate readily, and many are toxic and are known or suspected human carcinogens.

vulnerable age. Describes a child who is under 18 years of age (with additional consideration given to children under 5 years of age) or an elderly adult above 65 years of age.

watershed. The ground surface that contributes runoff from precipitation to streams or rivers.

***wellhead protection area* (*WHPA*)**. A surface and subsurface land area that is regulated to prevent contamination of a well or well field that provides drinking water. WHPAs are established on a voluntary basis by local communities and State governments to protect municipal groundwater resources.

wetlands. Areas inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of wetland vegetation typically adapted for life in saturated soil. Wetlands are essential breeding, rearing, and feeding grounds for many fish and wildlife species. They serve flood protection and pollution control functions.

wet open-cut method. A construction technique for building the proposed pipeline across waterbodies where the trench would be excavated through flowing water.

xylene. A colorless, sweet-smelling liquid that catches fire easily. It occurs naturally in petroleum and coal tar. Xylene is generally not considered to be present in toxic concentrations in crude oil, and is less toxic than benzene. Xylene causes headache, dizziness, and other mild effects to the central nervous system. When inhaled, it irritates the eyes, skin, and mucous membranes and impairs breathing. There is no definitive evidence showing that xylene causes cancer in humans.

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CHAPTER 1

INTRODUCTION AND BACKGROUND

This Draft Evaluation Report presents an evaluation of the rerouted portion of the proposed Keystone XL Pipeline in Nebraska. The pipeline route has raised concerns among Nebraska residents about its potential effects on Nebraska's environmental, economic, and social resources. In response to these concerns, the Nebraska Legislature directed the Nebraska Department of Environmental Quality (NDEQ) to evaluate the impacts of the proposed pipeline rerouting and to prepare this report describing its potential effects.

This report describes the rerouted portion of the Keystone XL Pipeline and provides the Nebraska Governor and Legislature an objective analysis of the pipeline's impacts on the natural and agricultural resources, economy, communities, and aesthetic resources along the route.

The Legislature did not give NDEQ siting authority for this pipeline—the route evaluated in this report was chosen solely by TransCanada Keystone Pipeline, LP (Keystone). NDEQ's evaluation of the route considers major features of the pipeline as well as the existing conditions of the environment surrounding that route. NDEQ's evaluation also identifies and evaluates the potential effects of building and operating the pipeline, which would carry crude oil produced from the oil sands in central Alberta. The pipeline may also carry conventional light crude oil produced from the Bakken Formation in Montana and North Dakota. The evaluation identifies specific measures that are intended to mitigate those effects. Finally, the report describes the steps that would be taken to prevent an oil release to the environment and the responsibilities of various State and federal agencies as well as those of Keystone.

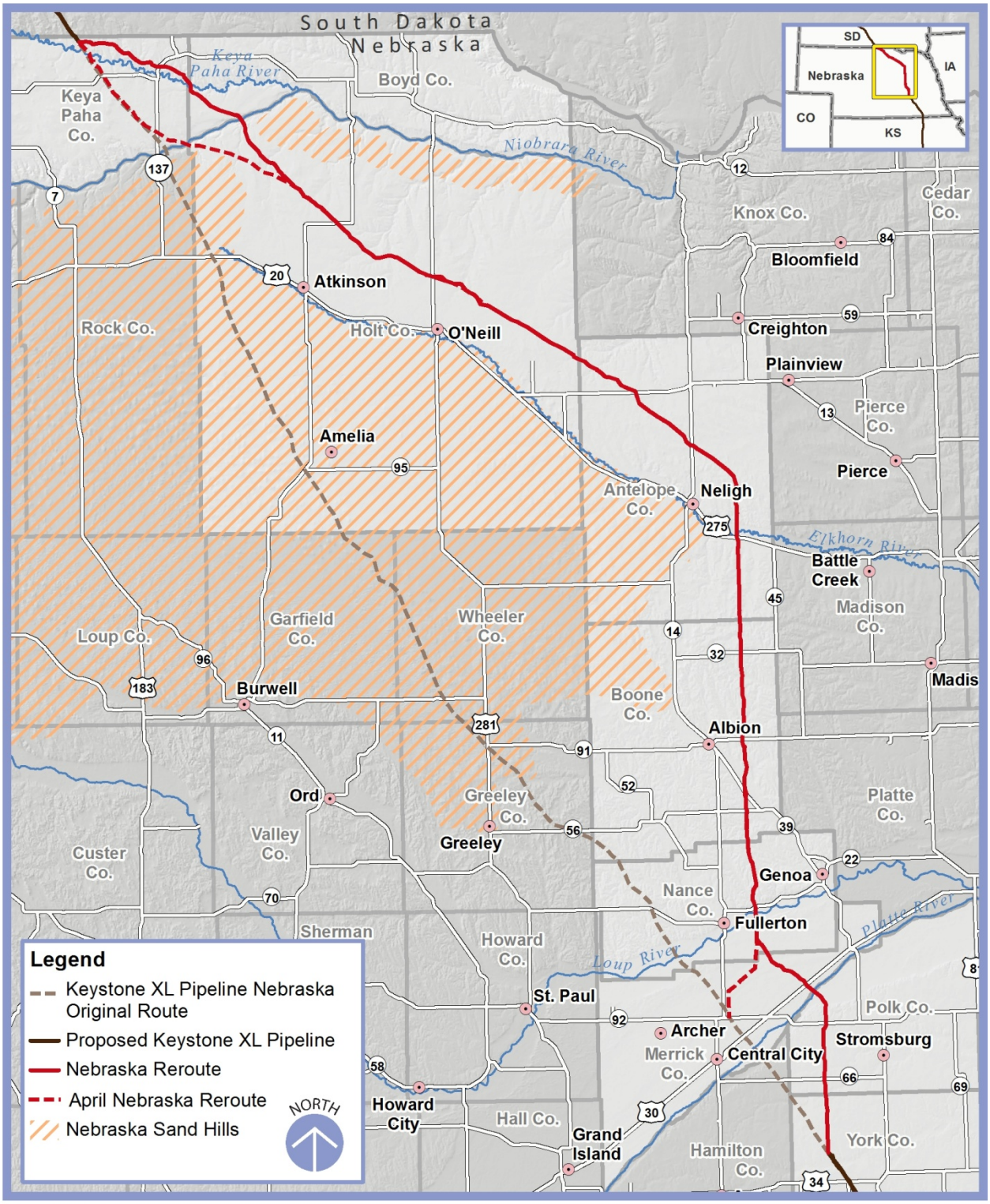
This report presents the results of NDEQ's evaluation. NDEQ asks that the public review this report and provide comments regarding the potential effects and mitigation measures. NDEQ will conduct a hearing in early December 2012 to obtain further testimony from the public. After this hearing, NDEQ will prepare a Final Evaluation Report that will be submitted to the Governor. Within 30 days after receipt of the Final Evaluation Report, the Governor shall indicate whether he approves of the route reviewed in the report.

1.1 INTRODUCTION

Keystone proposes to construct, operate, and maintain a crude oil pipeline and ancillary facilities from Hardisty, Alberta, Canada, to Steele City, Nebraska, referred to as the Keystone XL Pipeline project (see Figure 1.1-1). The original Keystone XL Pipeline would have traversed the northeastern portion of the Sand Hills, an environmentally sensitive region in northcentral Nebraska. The U.S. Department of State (DOS) evaluated the original Keystone XL Pipeline alignment and presented its analysis in an environmental impact statement (EIS) that was published on August 26, 2011 (DOS, 2011a). Based on concerns expressed by Nebraska's citizens, its Legislature, and its Governor, Keystone indicated that it would develop a new alignment in Nebraska that would avoid the Sand Hills.

The Nebraska Legislature directed NDEQ to evaluate any route for an oil pipeline across the state of Nebraska.

Figure 1.1-1. Keystone XL Pipeline



Source: NDEQ 2012

On April 18, 2012, Keystone submitted a report, *Initial Report Identifying Alternative and Preferred Corridors for Nebraska Reroute* (Reroute Report) (Keystone, 2012a), to NDEQ. The preferred corridor described in this report was approximately 174 miles long and passed through Keya Paha, Rock, Holt, Antelope, Boone, Nance, and Merrick Counties. NDEQ invited public comments on the Reroute Report and held a series of public workshops. NDEQ evaluated all public comments and published *Nebraska's Keystone XL Pipeline Evaluation Feedback Report* (NDEQ, 2012a). As part of identifying a proposed route, Keystone considered all of the comments in NDEQ's Feedback Report, conducted field surveys along the Reroute alignment, and evaluated the data collected from the surveys along with other environmental and engineering considerations.

Keystone identified its revised preferred route in its *TransCanada Keystone XL Pipeline Project Supplemental Environmental Report for the Nebraska Reroute* (SER) (Keystone, 2012b), which was submitted to NDEQ on September 5, 2012. The Nebraska Reroute (see Figure 1.2-1) would start about a mile south of the Nebraska-South Dakota border in Keya Paha County and would terminate about 5 miles northwest of York in York County where it would join the route proposed in the DOS Final EIS. The proposed route is about 195 miles long and passes through Keya Paha, Boyd, Holt, Antelope, Boone, Nance, Merrick, Polk, and York Counties (see Chapter 2, Project Description, for a detailed project description).

The Nebraska Reroute is Keystone's direct response to Nebraskans' concerns and includes three significant changes to the alignment that would further reduce environmental impacts. Two of those changes were along the Reroute alignment that Keystone had proposed in April 2012. The third change, a small adjustment to the alignment around the town of Western, was made to avoid a wellhead protection area (WHPA). These changes are discussed in detail in Chapter 2, Project Description.

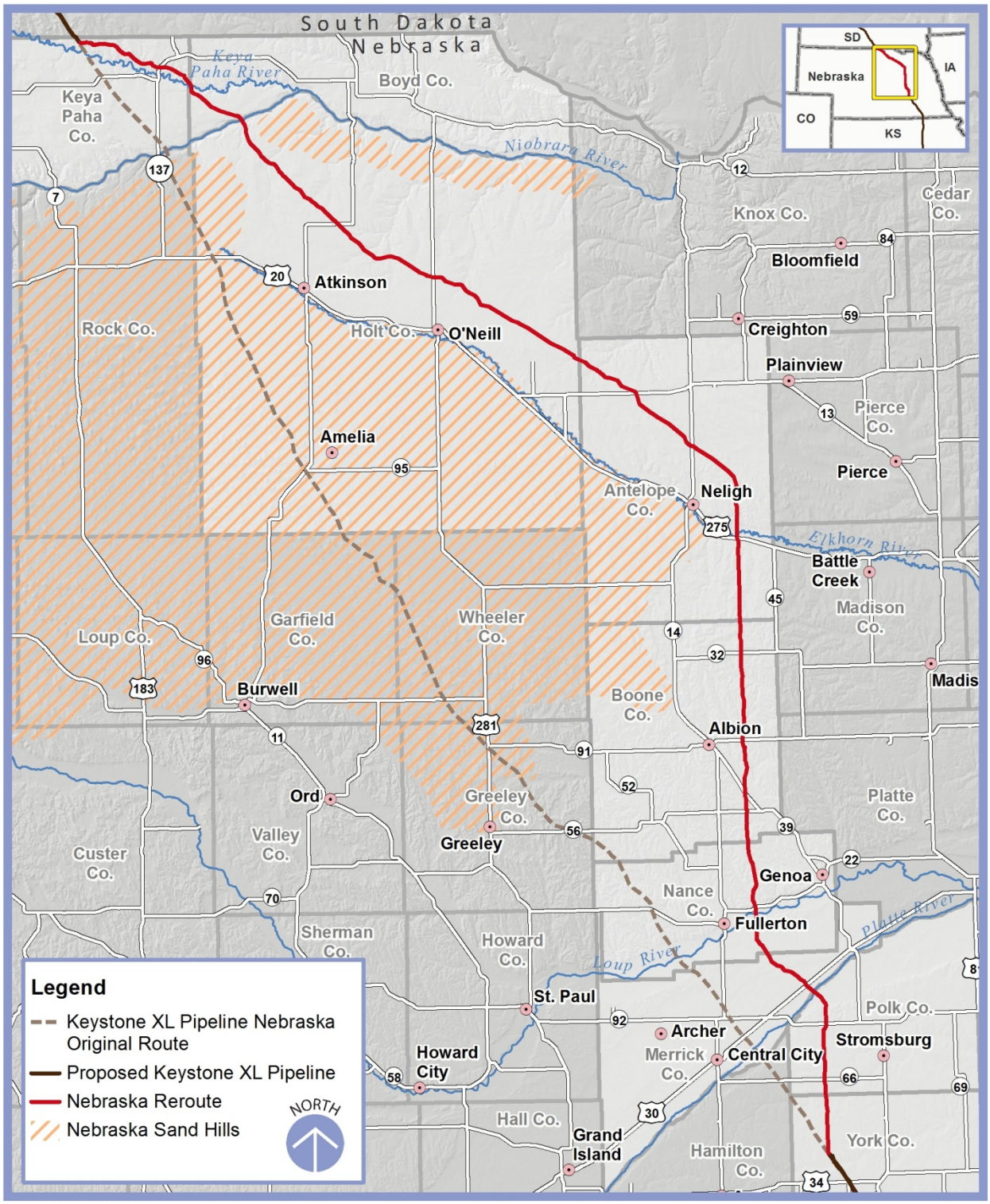
1.2 PROJECT BACKGROUND

The purpose of the proposed Nebraska Reroute (the subject of this report) is to avoid the Sand Hills of Nebraska as defined by the inter-agency–produced figure "Ecoregions of Nebraska and Kansas" (Chapman et al., 2001). The purposes of this Draft Evaluation Report are:

- To determine if Keystone's rerouted alignment avoids the Sand Hills as defined by NDEQ in its press release of December 29, 2011
- To evaluate the environmental, economic, social, and other impacts of the proposed pipeline
- To provide an opportunity for the public to review and comment on the proposed pipeline

In September 2008, Keystone applied to DOS for a Presidential Permit to cross the United States-Canada border with a crude oil pipeline. DOS evaluated the original Keystone XL Pipeline alignment in an EIS published on August 26, 2011. As originally proposed by Keystone, the Keystone XL Pipeline would have crossed a significant portion of the Nebraska Sand Hills. Many Nebraskans were concerned about the environmental impact of constructing and operating a large pipeline through the Sand Hills. The Sand Hills region comprises fragile soils that, when disturbed, are highly erodible and very difficult to restore. The region also overlies a portion of the Ogallala Aquifer, an important water supply for much of the Midwest.

Figure 1.2-1. Nebraska Reroute



Source: NDEQ 2012

In response to public concerns, the Nebraska Legislature passed bills in a special session held in the fall of 2011 and again in a regular session in the spring of 2012. These bills authorized NDEQ to collaborate with federal agencies in environmental reviews for pipeline projects. Legislative Bill (LB) 4 and LB 1161 directed NDEQ to analyze the environmental, economic, social, and other impacts of an oil pipeline in Nebraska—what is, in this case, the Nebraska Reroute (see Appendix A for the full legislation). The results of that analysis are presented in this report.

1.2.1 TransCanada Keystone Pipeline, LP

Keystone is a limited partnership organized under the laws of the State of Delaware. Keystone is an oil transportation company that transports crude oil from Canada to the United States and operates as a common carrier,[1] transporting the crude oil of several different shippers. Eminent domain for pipeline common carriers is governed by State law.

1.2.2 Presidential Permit Application and Environmental Review

On September 19, 2008, Keystone filed an initial Presidential Permit application with DOS to construct and operate a new facility, the Keystone XL Pipeline, to connect Canada to the Texas Gulf Coast. All facilities that cross the international borders of the United States require a Presidential Permit. DOS is the federal agency that receives and considers applications for Presidential Permits pursuant to Presidential authority under Executive Order 13337 of April 30, 2004 (69 Federal Register 25299), as amended. To issue a Presidential Permit, DOS must find that a proposed project or action would serve the national interest. DOS consults with other federal and State agencies and invites public comment prior to arriving at its determination.

The Presidential Permit requested in 2008 would have authorized construction and operation of the proposed Keystone XL Pipeline at the United States-Canada border crossing in Montana. At that time, the proposed project consisted of a 2,232-mile-long, 36-inch-diameter pipeline and appurtenant facilities to transport crude oil from Hardisty, Alberta, Canada, to Nederland/Port Arthur, Texas. Upon receipt of Keystone's application, DOS led a comprehensive environmental review of the proposed Keystone XL Pipeline. DOS's environmental review culminated in the publication of its Final EIS for the project on August 26, 2011.

Nebraska citizens, the Nebraska Legislature, and the Nebraska Governor expressed concerns with the proposed project's potential impact on the environmentally sensitive Sand Hills. On November 10, 2011, DOS announced it was delaying its decision on the Presidential Permit application to allow additional time to gather information regarding potential alternative routing in Nebraska. In a special session, the Legislature passed LB 4, which authorized NDEQ to review the Nebraska portion of the pipeline (see Section 1.2.3 below). LB 4 was approved by the Governor on November 22, 2011.

A provision of the Temporary Payroll Tax Cut Continuation Act of 2011 required the President to decide on Keystone's Presidential Permit within 60 days. On January 18, 2012, President Barack Obama denied the Presidential Permit without prejudice, stating that 60 days was an insufficient period to obtain and assess the necessary information and that the Keystone XL

[1] A common carrier is an individual or business that advertises to the public that it is available for hire to transport people or property (in this case, crude oil) in exchange for a fee. Keystone would not own the crude oil that is transported in the pipeline.

Pipeline as presented and analyzed at that time would not serve the national interest (77 Federal Register 5614). Following the Presidential Permit denial, NDEQ halted active review of the pipeline.

1.2.3 State Legislation and Proposed Nebraska Reroute

The original Keystone XL Pipeline traversed the state of Nebraska through the northeastern corner of the Sand Hills, an environmentally sensitive region. During public review, concerns were raised regarding the pipeline's potential effects on the Sand Hills. Based on concerns about the pipeline passing through the Sand Hills in Nebraska, the Nebraska Legislature passed LB 4, which was enacted on November 22, 2011. The bill directed NDEQ to evaluate the Keystone XL Pipeline within the state of Nebraska and to "ensure adequate information gathering, full and careful agency and public review, objective preparation of a supplemental environmental impact statement, adherence to a defined schedule, and an appropriate role for a pipeline carrier which avoids the appearance of conflicts of interests." Based on this review, the Governor will indicate "whether he or she approves any of the routes reviewed in the supplemental environmental impact statement" [LB 4, Sec. 3. (4)].

Keystone agreed to reroute the Nebraska portion of the Keystone XL Pipeline to avoid the Sand Hills and requested that Nebraska define the limits of the Sand Hills for that purpose. On December 29, 2011, NDEQ provided Keystone with a Sand Hills definition based on the map "Ecoregions of Nebraska and Kansas" (Chapman et al., 2001). This map was completed in 2001 as a 7-year collaboration of multiple State and federal agencies (see Figure 1.2-2).

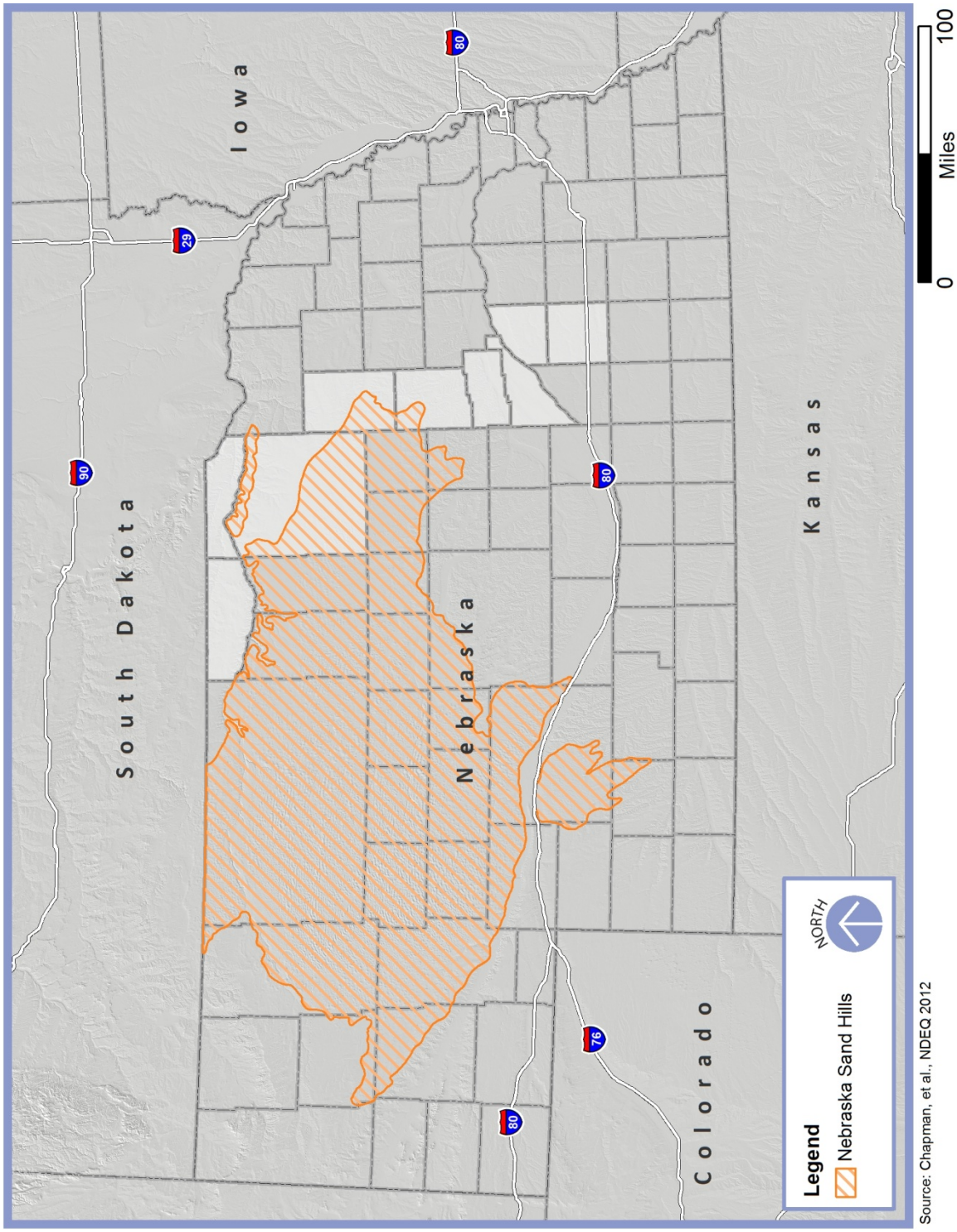
To reaffirm the Legislature's intention to have NDEQ continue its evaluation of major oil pipeline projects, in April 2012 the Nebraska Legislature passed LB 1161, which the Governor signed on April 17, 2012. LB 1161 modified LB 4 and directed NDEQ to evaluate Keystone's proposed reroute of the Keystone XL Pipeline in Nebraska, to provide "an analysis of the environmental, economic, social and other impacts," and to "collaborate with a federal agency or agencies and set forth the responsibilities and schedules that will lead to an effective and timely evaluation."

The day after the Governor signed LB 1161 into law, Keystone submitted to NDEQ the Reroute Report (Keystone, 2012a), which presented an analysis of eight alternative pipeline corridors that would avoid the Sand Hills Ecoregion. The Reroute Report identified a then-preferred corridor that was 174 miles long, 2,000 feet wide, and passed through Keya Paha, Rock, Holt, Antelope, Boone, Nance, and Merrick Counties. Keystone noted in the Reroute Report that it would select a specific pipeline route from within or near the preferred 2,000-foot-wide corridor based on the results of field surveys and engineering analyses conducted during the spring and summer of 2012.

On May 4, 2012, Keystone filed a new application with DOS for a Presidential Permit for the Keystone XL Pipeline project, reconfigured as the portion of the original project extending from the United States-Canada border east of Morgan, Montana, to an existing tank farm near Steele City, Nebraska (see Section 1.2.4 below).[2] In June 2012, DOS announced that it would prepare a Supplemental EIS on this new application. DOS anticipates publication of this document in the last quarter of 2012.

[2] On January 31, 2012, Keystone informed DOS that the portion of the Keystone XL Pipeline from Cushing, Oklahoma, to the Gulf Coast would be developed as the stand-alone "Gulf Coast project."

Figure 1.2-2. The Nebraska Sand Hills



Source: Chapman, et al., NDEQ 2012

On September 5, 2012, Keystone submitted to NDEQ its SER. That report describes Keystone's revised preferred route through Nebraska, which is the subject of this Draft Evaluation Report. The preferred route that Keystone selected is slightly different than the corridor presented in its Reroute Report (see Figure 1.1-1). The differences reflect changes to the alignment that were made to address issues identified during the initial phases of NDEQ's evaluation process. This alignment is known as the Nebraska Reroute.

1.2.4 Reconfigured Keystone XL Pipeline

The currently proposed Keystone XL Pipeline would transport crude oil from Hardisty, Alberta, Canada, to Steele City, Nebraska. In Steele City, the project would connect with the Keystone Pipeline Cushing Extension. At the terminus of the Cushing Extension, the oil would be delivered into a new 36-inch-diameter pipeline currently under construction as the "Gulf Coast project" for transportation to refinery markets along the Gulf Coast.[3] The Keystone XL Pipeline would have an initial nominal throughput capacity of 700,000 barrels per day and could be expanded to an ultimate nominal capacity of 830,000 barrels per day through the installation of additional pumping capacity.

The proposed Keystone XL Pipeline would transport crude oil derived from the Athabasca oil sands[4] areas in Alberta, Canada, and may also transport crude oil from the Bakken Formation in the Williston Basin in Montana and North Dakota. The types of oil sands–derived Canadian crude oil to be transported by the proposed Keystone XL Pipeline would consist of diluted bitumen (dilbit), synthetic crude oil, synbit, and dilsynbit. Dilbit consists of bitumen mixed with a light hydrocarbon liquid such as natural gas condensate or refinery naphtha. The bitumen is diluted to improve its viscosity,[5] making it a more liquid form that can be transported by pipeline. According to Keystone, the dilbit is not heated prior to transportation through the pipeline.[6]

The physical and chemical properties of synthetic crude oil and Bakken crude oil are similar to those of other light crude oils commonly transported by pipeline. The properties of dilbit, synbit, and dilsynbit are similar in many respects to other heavy sour crude oils. See Chapter 6, Pipeline Safety and Potential Spills, for a discussion of the various characteristics of crude oil. However, concerns were raised by the public that some of the characteristics of dilbit and other oil sands–derived products could make the pipe more likely to leak or make the transported oil more dangerous or difficult to clean up in the event of a spill. Because of these concerns, Congress directed the U.S. Secretary of Transportation to conduct a study to determine whether transporting dilbit products by pipeline increases the risk of a release. The Pipeline and Hazardous Materials Safety Administration (PHMSA) has contracted with the National Academy of Sciences, which has formed a committee to perform an independent study.

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3 The Gulf Coast project is an approximately 485-mile-long, 36-inch-diameter crude oil pipeline beginning in Cushing, Oklahoma, and extending south to Nederland, Texas. On July 27, 2012, Keystone announced that the U.S. Army Corps of Engineers (Fort Worth, Galveston, and Tulsa Districts) granted the necessary permits for construction of the Gulf Coast project. Construction began on August 6, 2012.

4 Oil sands (also referred to as tar sands) are a combination of clay, sand, water, and bitumen, which is a material similar to soft asphalt. Only the crude oil derived from the oil sands would be transported.

5 Viscosity is a fluid's resistance to flow. A viscous fluid, such as crude oil, is thick and syrupy.

6 The normal operating temperature of the pipeline is between 120 degrees Fahrenheit (°F) and 150°F. As the oil moves through the pipeline, friction occurs, which generates heat. The effects of temperature are discussed further in Chapter 4, Affected Environment and Environmental Consequences, of this report.

The Nebraska Reroute is a part of the Keystone XL Pipeline. Details of the proposed Nebraska Reroute portion of the proposed Keystone XL Pipeline are provided in Chapter 2, Project Description. These details are based on information in Keystone's Reroute Report (Keystone, 2012a), the Keystone XL Pipeline project Final EIS (DOS, 2011a), and Keystone's SER (Keystone, 2012b).

After DOS published the Final EIS in August 2011, a new WHPA was established for the town of Western; this WHPA combines two existing WHPAs into one larger protected area. The new WHPA overlaps the Final EIS route. Keystone has proposed adjusting the route to the west and out of the WHPA. This adjustment, which is about 14 miles long in Saline and Jefferson Counties, is briefly discussed in Chapter 2, Project Description, and Chapter 4, Affected Environment and Environmental Consequences, of this Draft Evaluation Report.

1.2.5 Relationship with U.S. Department of State

On June 15, 2012, DOS published in the Federal Register a notice of intent to prepare a Supplemental EIS evaluation of the reconfigured Keystone XL Pipeline consistent with the National Environmental Policy Act (NEPA), the National Historic Preservation Act (NHPA), and other relevant statutes.

LB 4 and LB 1161 authorized NDEQ to collaborate with DOS on the Nebraska Reroute and to enter into a Memorandum of Understanding (MOU) with DOS that sets forth the responsibilities and schedules that will lead to an effective and timely review of the environmental document under NEPA. NDEQ and DOS finalized an MOU on May 24, 2012 (see Appendix A). The MOU established NDEQ as a cooperating agency in the DOS environmental review process and established DOS's commitment to fully consider the views of the State of Nebraska in conducting its environmental review, consistent with NEPA.

Since executing the MOU, NDEQ has worked closely with DOS to conduct a coordinated environmental analysis. DOS's activities have focused largely on actions in Montana and South Dakota. DOS will incorporate NDEQ's Draft Evaluation Report into its Supplemental EIS. In Nebraska, DOS has taken the lead in consulting with the U.S. Department of the Interior, U.S. Fish and Wildlife Service (USFWS) pursuant to Section 7 of the Endangered Species Act (ESA) and other federal statutes.

1.3 OVERVIEW OF THE ENVIRONMENTAL REVIEW PROCESS

1.3.1 Nebraska's Lead Agency

NDEQ is the State's lead agency for the process set forth in LB 4 and LB 1161. NDEQ has the authority and general jurisdiction for the administration and enforcement of environmental laws in Nebraska pursuant to Nebraska Revised Statutes § 81-1504. NDEQ has reviewed Keystone's SER as submitted on September 5, 2012, and, through subsequent Requests for Information, has conducted an independent evaluation of the proposed Nebraska Reroute.

This Draft Evaluation Report documents the environmental, economic, social, and other impacts of the Nebraska Reroute as required by LB 4 and LB 1161. This report also addresses issues identified by the public during public information meetings held in May 2012 and issues expressed by other State and local agencies.

As described below in Section 1.4, NDEQ will conduct a public information session and public hearing to solicit formal testimony regarding the Nebraska Reroute. All comments received on this Draft Evaluation Report will be considered in NDEQ's Final Evaluation Report.

The Final Evaluation Report will be submitted to Nebraska's Governor. In accordance with the process directed in LB 1161, the Governor will indicate to DOS "whether he or she approves any of the routes reviewed in the supplemental environmental impact statement" [LB 1161, Sec. 3. (4)] regarding the Nebraska Reroute.

1.3.2 Key Resource Agencies

DOS is jointly collaborating with NDEQ in this Draft Evaluation Report, as described above in Section 1.2.5. DOS will use the Evaluation Report as one of its resources in preparing its environmental documentation and will consider the Governor's views in the federal decision to issue or deny Keystone's application for a Presidential Permit. Other key federal and State resource agencies are:

- Nebraska Association of Resources Districts
- Nebraska Department of Health and Human Services
- Nebraska Department of Natural Resources (NDNR)
- Nebraska Department of Roads
- Nebraska Game and Parks Commission (NGPC)
- Natural Resources Districts (NRDs): Central Platte, Little Blue, Lower Big Blue, Lower Loup, Lower Niobrara, Lower Platte North, Lower Platte South, Upper Big Blue, Upper Elkhorn
- Nebraska State Historic Preservation Office (SHPO)
- U.S. Army Corps of Engineers (USACE), Omaha District
- U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), Central Region
- U.S. Environmental Protection Agency (EPA), Region VII
- USFWS, Nebraska Field Office

1.4 PUBLIC INVOLVEMENT

Both Nebraska Legislative actions, LB 4 and LB 1161, required NDEQ to provide opportunities for public input to the pipeline evaluation process. Chapter 7, Outreach and Agency Coordination, provides a full summary of all of the outreach and coordination efforts undertaken by NDEQ. Several avenues of participation were made available for the public to be a part of this process, including:

- Public information meetings: in-person open house forums conducted to educate the public and solicit public input.
- Online meeting: self-guided online meeting tool established to provide an online version of the in-person public information meetings and an opportunity to submit comments.
- Project website: established to provide information regarding NDEQ's role, the evaluation process, and the multiple opportunities to submit comments.
- Project information line: toll-free telephone line to provide project information and opportunity to submit comments orally (currently informational only).

NDEQ held four public information meetings over the course of 2 weeks during May 2012 in O'Neill, Neligh, Albion, and Central City, Nebraska. Mapbooks were placed in six local libraries along the proposed pipeline corridor in Springview, O'Neill, Neligh, Albion, Fullerton, and Central City, Nebraska. Since Keystone submitted its SER in September 2012, mapbooks have also been placed in libraries in Stromsburg, York, Fairbury, and Western.

Access to the online public meeting is through NDEQ's Nebraska Reroute website, <https://ecmp.nebraska.gov/deq-seis>. NDEQ held additional meetings that included property owners, agencies, interest groups, and stakeholders. Agency coordination letters were also sent.

Comments submitted by the public and agencies are summarized in Table 1.4-1. NDEQ identified 67 unique issues within 19 general categories. These were used to help define NDEQ's analyses for the Nebraska Reroute. Table 1.4-1 also indicates the location in the Draft Evaluation Report where the concerns are addressed.

Table 1.4-1. Issues Identified by Nebraskans

Category	Issue	Addressed in Section No.
Economic benefits and concerns	▪ How many short- and long-term jobs will the Nebraska Reroute create?	4.13
	▪ Will farmers be compensated for loss of income that may occur as a result of a leak?	4.10
	▪ What tax benefits will accrue to County and local governments? Will loss of income to area landowners during construction result in tax hardships?	4.13
	▪ What are the rights of the landowners if Keystone transfers pipeline ownership to another company?	4.13
	▪ If Keystone defaults on construction loans or sells the pipeline to others, what instruments would be in place to hold the landowners and State of Nebraska harmless from any financial obligations resulting from such default?	4.13
Alternative corridors	▪ Why can't the Keystone XL Pipeline be located parallel to the existing Keystone Oil Pipeline or other existing utility corridors instead of on a new alignment?	2.1
	▪ Are there other alternatives to crossing the Ogallala Aquifer, such as through Boyd County, where the soils have a greater percentage of clay?	2.1
Sand Hills	▪ What process did the Nebraska Department of Environmental Quality (NDEQ) use to define the Sand Hills?	1.2
	▪ How will Keystone ensure that sandy soils are stabilized and restored to a condition that will enable vegetation to quickly reestablish?	2.3
	▪ How will Keystone deal with wetlands, wet meadows, and subirrigated meadows?	2.3

Category	Issue	Addressed in Section No.
Ogallala Aquifer and water quality	▪ Will portions of the pipeline that are constructed in the Ogallala Aquifer receive special protection, such as a double wall or a heavy-thickness pipe, to protect this "precious resource" against leaks and potential groundwater contamination?	2.1
	▪ If a leak occurs into the Ogallala Aquifer, how will it be cleaned up? Can it be fully cleaned up? Who will pay for the cleanup? Will farmers be compensated for long-term damages if the leak results in loss of crops?	6.6
	▪ Will Keystone monitor the water quality of wells that are in the Ogallala Aquifer and within the project corridor? How long will Keystone monitor water quality? If Keystone does not propose to monitor water quality, will NDEQ conduct this monitoring?	5.5
	▪ Keystone has stated that it will avoid wellhead protection areas. Is there a minimum horizontal distance that will separate the pipeline from domestic or irrigation wells? Is there a distance that will separate the pipeline from municipal well fields?	4.3
	▪ In the areas where the pipeline intersects groundwater, will the pipeline and associated trench alter groundwater flow? How will the pipeline and trench intersecting groundwater-fed springs affect their flow? If groundwater flow is affected, how will that be mitigated?	4.3
Pipeline construction, operation, and maintenance	▪ How will the pipeline be constructed through areas of hilly terrain, wetlands, and shallow water tables?	2.3
	▪ How much water will be needed during construction to ensure proper compaction? What will be the source of that water?	2.3
	▪ How will construction materials be delivered to the construction site? How will yard sites for materials storage be identified? Will landowners be compensated for allowing materials storage? Will these areas be restored to their previous use following construction?	2.2
	▪ How many pumping stations will be needed, and where will they be located? What security measures will be taken to prevent vandalism at these stations? What measures will Keystone take to ensure that stream channel degradation does not result in exposure of or damage to the pipe?	2.1
	▪ How much water will be needed at pumping stations?	2.1
	▪ How much noise would occur from pumping station operation, and will this noise be mitigated?	4.17

Category	Issue	Addressed in Section No.
Waterbodies	▪ How will Keystone cross important rivers such as the Niobrara, Elkhorn, Loup, and Platte? How will river, stream, and other waterbody crossings be restored after construction? Will Keystone monitor this restoration for long-term success?	2.1
	▪ In streams where Keystone proposes to cross using an open cut, what measures will be taken to prevent damage from flash flooding? What measures will be taken to restore streambed and banks?	2.3
	▪ At waterbody crossings where Keystone proposes to use horizontal directional drilling techniques, how much water will be needed, and what will be the source of that water?	2.3
Corrosion	▪ How will Keystone prevent corrosion of a steel pipe when it is immersed in water?	6.3
	▪ Farmers will use chemicals extensively during the growing season. Will these chemicals accelerate corrosion? Will runoff or seepage from feedlots accelerate corrosion?	6.3
Spills, contamination, and cleanup	▪ Who will conduct and pay for emergency responder training? Will Keystone provide the necessary equipment to emergency responders and to nearby hospitals who may have to treat victims of exposure to product spills?	6.6
	▪ How will spills be cleaned up? Who will pay for cleanup and the damages that may result? Will the landowner bear any liability or responsibility for cleanup?	6.6
	▪ What provisions are included to prevent pipeline rupture in the event of a sudden, unexpected valve closure?	2.1
	▪ What methods does the industry use to ensure incorporation of lessons learned? For example, the spills into the Kalamazoo and Yellowstone Rivers made national headlines. What lessons did Keystone take from these accidents, and how are they incorporated into the proposed design of the pipeline and in its Spill Prevention, Control, and Countermeasure Plan?	6.2
Leak detection	▪ How quickly can leaks be detected? How much product might be lost during the time between breach and response? How quickly and to what extent would such a leak contaminate an aquifer or waterbody, given the site conditions in the proposed corridor?	6.5
	▪ What safeguards are present to detect and prevent leaks? What is the history of the effectiveness of these safeguards? How often have these safeguards failed?	6.5
	▪ What was the response time for leaks that occurred on the Keystone Oil Pipeline? Do any cleanup or remediation activities remain to be completed?	6.6

Category	Issue	Addressed in Section No.
Product characteristics and health effects	▪ What are the characteristics of the products being transported? What chemicals will be added to facilitate movement through the pipeline?	6.3
	▪ How toxic are the products being moved through the pipeline? What are the health risks from exposure? Will emergency responders receive specific training to diagnose and treat exposures to diluents and other chemicals in the oil?	6.3
	▪ Are any of the diluents that are added to the crude oil water-soluble? How would these chemicals be removed from groundwater in the event of a spill or leak?	6.3
	▪ Will Keystone or NDEQ regularly monitor rural water wells for the chemicals that may enter the water supply as a result of an undetected leak?	5.5, 6.6
Temperature	▪ What will the temperature of the product be? Will a higher temperature affect the freeze-thaw cycle?	4.10
	▪ How will a higher temperature affect seed germination, crop growth, and water evaporation?	4.10
	▪ Will the higher temperature of the ground surrounding the pipeline translate to increased temperatures of streams and other waterbodies? If yes, could these temperatures result in degraded fisheries?	4.10
Soils and erosion	▪ How will the pipeline be constructed through loose and sandy soils? How will trench cave-ins be avoided? How will construction be accomplished when these soil conditions occur in areas of shallow water table (that is, 2 feet or less)?	2.3
	▪ How will construction affect shelterbelts and the effectiveness of these areas in reducing wind erosion?	2.3
	▪ How will Keystone ensure the success of soil stabilization and vegetation reclamation following construction?	2.5
	▪ Will Keystone monitor the postconstruction area for obvious signs of wind and water erosion? If so, for how long? What remedies will be available to the landowner where erosion has occurred outside of the right-of-way but is nevertheless a direct result of the pipeline construction?	2.5
	▪ If an area has to be fenced off to allow for revegetation, how will erosion due to increased cattle movement along the fence line be addressed?	2.2
Geology	▪ How could earthquakes affect pipeline integrity? The area north of the Niobrara River has experienced earthquakes in recent memory. What special measures will be taken to prevent earthquakes from damaging the pipeline?	4.1
	▪ Will the pipeline be constructed in areas of karst topography? If yes, what measures will be taken to ensure safe construction and operation?	4.1

Category	Issue	Addressed in Section No.
Property values	▪ What is the pipeline's effect on property values? Will diminished property values make future generations reluctant to invest in farming in the area?	4.13
Easements	▪ Who is responsible for maintaining the easement? For example, who would remove trees?	2.5
	▪ Can the landowner irrigate over the pipeline construction area?	2.5
	▪ What are the width and depth of the easement? Does the landowner relinquish his or her mineral rights?	2.2
	▪ Is it appropriate to give the power of eminent domain to a foreign company?	1.2, 2.2
Farm or ranch operations and associated infrastructure	▪ Where the pipeline crosses existing farmland, how will Keystone work with landowners during the growing season? How will Keystone avoid affecting irrigation systems, particularly pivot and gravity-fed systems and their supporting infrastructure?	2.3
	▪ How will construction be performed to avoid or minimize impacts on existing irrigation infrastructure such as electrical power?	2.3
	▪ Will Keystone compensate farmers for loss of income when their fields cannot be farmed such as during construction?	2.2
	▪ Will a permanent access road be needed? If so, who will maintain that road and who will pay for the maintenance?	2.2
	▪ How will construction affect drain tiles? Will Keystone restore the drainage where it is affected?	2.3
	▪ What provisions will be taken to prevent impacts on livestock during construction? For example, will Keystone ensure that construction crews close gates or that damaged fences are repaired or that activities are done at times that would avoid sudden or disturbing noises?	2.3
	▪ What measures will Keystone take to ensure that topsoil that is removed for trench construction is replaced in the correct order? How will Keystone ensure the success of soil stabilization following construction and that the construction site is restored to a condition that will enable pasture or crops to quickly reestablish?	2.3
Public service	▪ Will roads be improved prior to construction? How will Keystone compensate local governments for damages done to roads during construction?	2.2
	▪ What special measures will Keystone use to avoid underground electrical cables, telephone lines, and fiber-optic cables?	2.3

Category	Issue	Addressed in Section No.
Special land designations	▪ Will lands that are currently registered with the U.S. Department of Agriculture Natural Resources Conservation Service under the Conservation Reserve Program, the Wetlands Reserve Program, or the Grassland Reserve Program be avoided? Will lands under similar programs with the Nebraska Game and Parks Commission be avoided? If not, how will the landowners be compensated for the loss of revenue from these programs?	4.10
	▪ Will the landowners also be compensated for any penalties for leaving these programs?	4.10
	▪ Will lands that are held in permanent easement for other uses, such as wetland mitigation, be avoided? If not, what provisions will be taken to compensate for the loss of use?	4.10
	▪ Will lands administered by the Nebraska Land Trust be avoided?	4.10
Native American and cultural resources	▪ Will the pipeline avoid areas of Native American burials, traditional cultural properties, and other archaeological sites?	4.15
	▪ How will accidental discoveries of paleontological or archaeological sites during construction be handled? What procedures or mitigation measures will be in place to ensure the integrity of such discoveries?	4.15

Source: NDEQ, 2012a

1.5 EVALUATION REPORT ORGANIZATION

This Draft Evaluation Report complies with the requirements of LB 4 and LB 1161. It describes the proposed alignment for the Nebraska Reroute, existing environmental conditions, potential environmental impacts that may result as a consequence of the pipeline, and proposed mitigation measures for addressing impacts. The Draft Evaluation Report contains:

- **Executive Summary** – Provides a brief synopsis of the Keystone XL Pipeline project and the Nebraska Reroute, including a description of the proposed Nebraska Reroute, potential impacts, and mitigation measures. The Executive Summary also briefly describes the public involvement efforts and the process NDEQ has followed to develop the Draft Evaluation Report.
- **Front Matter** – Provides background information for the reader regarding the document, including a "Dear Reader" letter, which will provide an introduction to the Nebraska Reroute and an invitation to the public to comment on the Draft Evaluation Report; a glossary; and a list of abbreviations and acronyms.
- **Chapter 1, Introduction and Background** – Specifies the background and chronology of previous Keystone XL Pipeline project work, the State legislation governing the evaluation of the proposed Nebraska Reroute, an overview of the environmental review process, and issues of concern identified by the public and resource agencies.

- **Chapter 2, Project Description** – Presents the conceptual details of the pipeline and ancillary features in Nebraska. Chapter 2 discusses the plans for facility construction, environmental compliance, operation and maintenance, future plans, and ultimate project decommissioning.
- **Chapter 3, Project Regulatory Requirements** – Describes the permits and approvals needed from federal, State, and local agencies if the Nebraska Reroute were to be approved for construction and operation.
- **Chapter 4, Affected Environment and Environmental Consequences** – Describes the known existing condition of each of the specific potentially affected environmental resources, including natural and built resources. Documentation of existing features is based on available data. Chapter 4 also analyzes the potential effects of the Nebraska Reroute on the existing environment.
- **Chapter 5, Mitigation** – Summarizes commitments made by Keystone that would reduce impacts of the construction and operation of the proposed Nebraska Reroute and provides additional suggestions by NDEQ that would further reduce impacts.
- **Chapter 6, Pipeline Safety and Potential Spills** – Discusses information pertinent to accidental oil releases, including applicable standards and regulations, recent spill incident history, characteristics of oil that would be transported in the Keystone XL Pipeline, potential consequences of a spill, and the specific spill response and plans proposed by NDEQ and Keystone for the Nebraska Reroute.
- **Chapter 7, Outreach and Agency Coordination** – Describes the role of NDEQ in the public involvement process, the specific public and agency coordination efforts undertaken as part of the proposed Nebraska Reroute, the issues identified as part of the process, and the opportunities available to the public to comment on the document.
- **Back Matter** – Provides document-specific information, including the list of preparers, references cited, and an index of frequently used terms.
- **Appendices** – Includes eight appendices that provide supplemental technical data for the various report chapters.

1.6 REQUEST FOR COMMENTS ON THE DRAFT EVALUATION REPORT

NDEQ encourages all interested parties to submit written comments on any aspect of this Draft Evaluation Report. NDEQ will consider all comments in preparing the Final Evaluation Report, which will include responses to all relevant comments.

1.6.1 Instructions for Submitting Comments

The deadline for submitting comments on the Draft Evaluation Report is December 4, 2012. When submitting comments, please be as specific as possible and substantiate your concerns and recommendations.

Written comments should be mailed to:

Nebraska Pipeline Review Project
1200 N Street, Suite 400
PO Box 98922
Lincoln, NE 68509-8922

Comments can also be submitted on NDEQ's website at <https://ecmp.nebraska.gov/deq-seis> or by emailing <NDEQ.SEISpubliccomment@nebraska.gov>.

See Chapter 7, Outreach and Agency Coordination, for further details of the comment process for this Draft Evaluation Report.

1.6.2 Public Meetings

NDEQ will host an Information Session and Public Hearing on this Draft Evaluation Report in Albion on December 4, 2012, as announced in the Dear Reader letter attached to the Draft Evaluation Report.

CHAPTER 2

PROJECT DESCRIPTION

First proposed in 2008, the Keystone XL Pipeline would transport crude oil from Hardisty, Alberta, Canada, to Steele City, Nebraska. This would allow for delivery of that crude oil to existing refinery markets on the Texas Gulf Coast. Because the project would cross the United States' border with Canada, a Presidential Permit issued by DOS would be required. As part of the permitting process, DOS is conducting an environmental analysis consistent with NEPA.

Since it was proposed, the Keystone XL Pipeline has undergone extensive environmental review.[1] In the Final EIS issued in 2011, DOS analyzed alternatives for the Keystone XL Pipeline as the project was initially proposed. Several categories of alternatives were considered, including no-action, system alternatives (that is, the use of other pipeline systems or other methods of providing heavy crude oil to the target markets), major route alternatives and route variations, alternative pipeline designs, and alternative sites for aboveground facilities. The route selected and evaluated in that Final EIS included a segment that crossed the Nebraska Sand Hills. Ultimately, that route was rejected because of environmental concerns over the segment that crossed the Sand Hills.

As described in Chapter 1, Keystone agreed to reroute the Nebraska portion of the Keystone XL Pipeline project to avoid the Sand Hills and requested that Nebraska define the limits of the Sand Hills for that purpose. On December 29, 2011, NDEQ provided Keystone with a Sand Hills definition based on the map "Ecoregions of Nebraska and Kansas" (Chapman et al., 2001). Using this information, in April 2012 Keystone submitted a revised alignment that would avoid the Sand Hills Ecoregion previously identified by NDEQ. Keystone referred to this new alignment as the "Nebraska Reroute" (Keystone, 2012a). NDEQ solicited public comments on Keystone's new alignment, and provided a *Feedback Report* to Keystone in July 2012 that identified a number of additional concerns about the rerouted portion of the alignment (NDEQ, 2012a). Keystone considered this information and further refined the Nebraska Reroute in response to those concerns. The revised alignment was submitted to NDEQ for evaluation in Keystone's SER (Keystone, 2012b).

The proposed Keystone XL Pipeline project would consist of an approximately 875-mile-long, 36-inch-diameter pipeline to transport crude oil from Hardisty, Alberta, Canada, to Steele City, Nebraska. At Steele City, the project would connect with the existing Keystone Pipeline Cushing Extension. At the terminus of the Cushing Extension, the oil would be delivered into a new 36-inch-diameter pipeline being constructed as the Gulf Coast Project. The Gulf Coast Project will transport oil to refinery markets on the Gulf Coast. The Keystone XL Pipeline would have a throughput capacity of 830,000 barrels per day.

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[1] That environmental review process is ongoing. Keystone submitted a new Presidential Permit Application in May 2012. On June 15, 2012, DOS published a Notice of Intent to Prepare a Supplemental Environmental Impact Statement (SEIS) for the Proposed TransCanada Keystone XL Pipeline Proposed to Extend from Phillips, MT (the Border Crossing) to Steele City, NE. (Public Notice 7924, Federal Register, Volume 77, No. 116, June 15, 2012.

In the SER, Keystone proposed three further refinements to its pipeline route in Nebraska to address environmental concerns raised by the public and NDEQ. Two of these refinements are along the Nebraska Reroute and are referred to in the SER as the Northern Alternative and the Clarks Alternative. The Northern Alternative was developed to avoid areas that are not a part of the designated Sand Hills but share some of the characteristics of the Sand Hills region (such as the presence of fragile soils). The Northern Alternative would pass through Keya Paha and Boyd Counties, crossing the Niobrara River southwest of Naper. The Clarks Alternative was developed to address NDEQ's concerns regarding the location of Keystone's preferred reroute corridor in an area where the aquifer is very thin, wells are shallow, and bedrock is close to the surface. This area was upgradient (west) of the boundary of the Clarks WHPA. The Clarks Alternative would route the proposed pipeline downgradient (east) of the WHPA.

The third refinement is referred to in the SER as the Western Alternative. The Western Alternative would be located south of the Nebraska Reroute and in Saline and Jefferson Counties. This route variation from the Final EIS alignment was developed to avoid crossing the expanded WHPA for the nearby town of Western. Although the Western Alternative is not included as part of the Nebraska Reroute in this NDEQ report, impacts to certain relevant resources are briefly addressed in Chapter 4, Affected Environment and Environmental Consequences.

The three route modifications described above illustrate an important component of the environmental review process adopted by NDEQ that allows for public and agency input and subsequent response of the applicant. In general, this process results in decisions that produce projects with greater consideration of environmental resources, fewer impacts, and a more informed public review.

This chapter describes the physical characteristics of the pipeline and its associated facilities (such as pump stations and valves) and provides detailed information about the construction process.

2.1 PROPOSED PROJECT

2.1.1 Pipeline Facilities

The Nebraska Reroute would start about 1 mile south of the Nebraska-South Dakota border in Keya Paha County, Nebraska, at milepost 601.8 of the Keystone XL Pipeline. The proposed pipeline route would run southeastward across the southwestern corner of Boyd County where it would cross the Keya Paha River, and then enter Holt County as it crosses the Niobrara River. The route would continue southeastward and turn to the south in Antelope County, where it would cross the Elkhorn River, and then pass through Boone County and into Nance County. In Nance County, the route would cross the Loup River and then turn southeast across the northeastern corner of Merrick County. After crossing the Platte River and entering Polk County, the route would turn south. The Nebraska Reroute would terminate in the northwestern corner of York County, Nebraska, at milepost 796.3 (see Figure 1.1-1 in Chapter 1, Introduction and Background). The Nebraska Reroute would be approximately 194.5 miles long. Detailed maps of the proposed pipeline route are provided in Appendix B. Table 2.1-1 summarizes the pipeline facilities by county.

Table 2.1-1. County-by-County List of Pipeline Lengths

County	Approximate Mileposts[a]		Length (miles)
	Begin	End	
Keya Paha	601.8	617.7	15.9
Boyd	617.7	626.1	8.4
Holt	626.1	680.8	54.7
Antelope	680.8	724.1	43.3
Boone	724.1	752.4	28.3
Nance	752.4	767.2	14.7
Merrick	767.2	775.1	7.9
Polk	775.1	789.0	13.9
York	789.0	796.3	7.4
		Total	**194.5**

[a] *Mileposts in this table and elsewhere in this report are based on geographic information system data provided by TransCanada Keystone Pipeline, LP.*

The 36-inch-diameter pipeline would be made of high-strength steel pipe that would be tested to American Petroleum Institute (API) specifications. The standard pipe wall thickness would be 0.465 inch; the pipe wall would be thicker (from 0.515 to 0.748 inch) in high consequence areas (HCAs) as defined in 49 Code of Federal Regulations (CFR) § 195.450, at areas of lower elevation downstream of pump stations, at horizontal directional drilling (HDD) crossings, and at road and railway crossings. Chapter 6, Pipeline Safety and Potential Spills, explains HCAs in more detail. The pipeline would be protected against corrosion by a cathodic protection system and an external coating of fusion-bonded epoxy (FBE). An abrasion-resistant overcoat would also be applied to the pipe joints used at HDD and conventional bored crossings.

2.1.2 Aboveground and Ancillary Facilities

Additional components of the proposed Nebraska Reroute would include pump stations, permanent access roads, mainline valves (MLVs), pigging facilities, and various temporary facilities, including temporary access roads, a construction camp, pipe storage sites, contractor yards, and railroad sidings. These facilities, their locations, and land needs are summarized in Table 2.1-2 and further described below.

Table 2.1-2. Aboveground Facilities

Description	Approximate Milepost	County	Land Needed (acres) or Collocated Facility[a]
Mainline valves	—[b]	Multiple	Permanent pipeline right-of-way or pump station
Pump stations			
Pump station 22	654.2	Holt	5–15
Pump station 23	707.5	Antelope	5–15
Pump station 24	764.9	Nance	5–15
Electrical substations[c]	Same as pump stations	Same as pump stations	Pump stations
Pig launchers/receivers	Same as pump stations	Same as pump stations	Pump stations

[a] *Mainline valves and pigging facilities would be within the pipeline right-of-way or pump station sites and would not require any additional land for construction or operation.*
[b] *Mainline valve locations have not yet been determined.*
[c] *Power lines to the substations would be constructed by the power providers.*

Pump Stations

Three pump stations would be placed along the Nebraska Reroute. These facilities would be located in Holt, Antelope, and Nance Counties. Although Keystone has not yet determined the exact locations of the pump stations, the approximate locations are shown on the maps in Appendix B. Each pump station would occupy between 5 and 15 acres. For the purpose of analyzing impacts for this report, NDEQ assumes each pump station would be 15 acres. A typical pump station layout without pigging facilities is shown in Figure 2.1-1. In addition to the three pump stations along the Nebraska Reroute, Keystone would construct a pump station in Fillmore County and at Steele City, for a total of five pump stations in Nebraska.

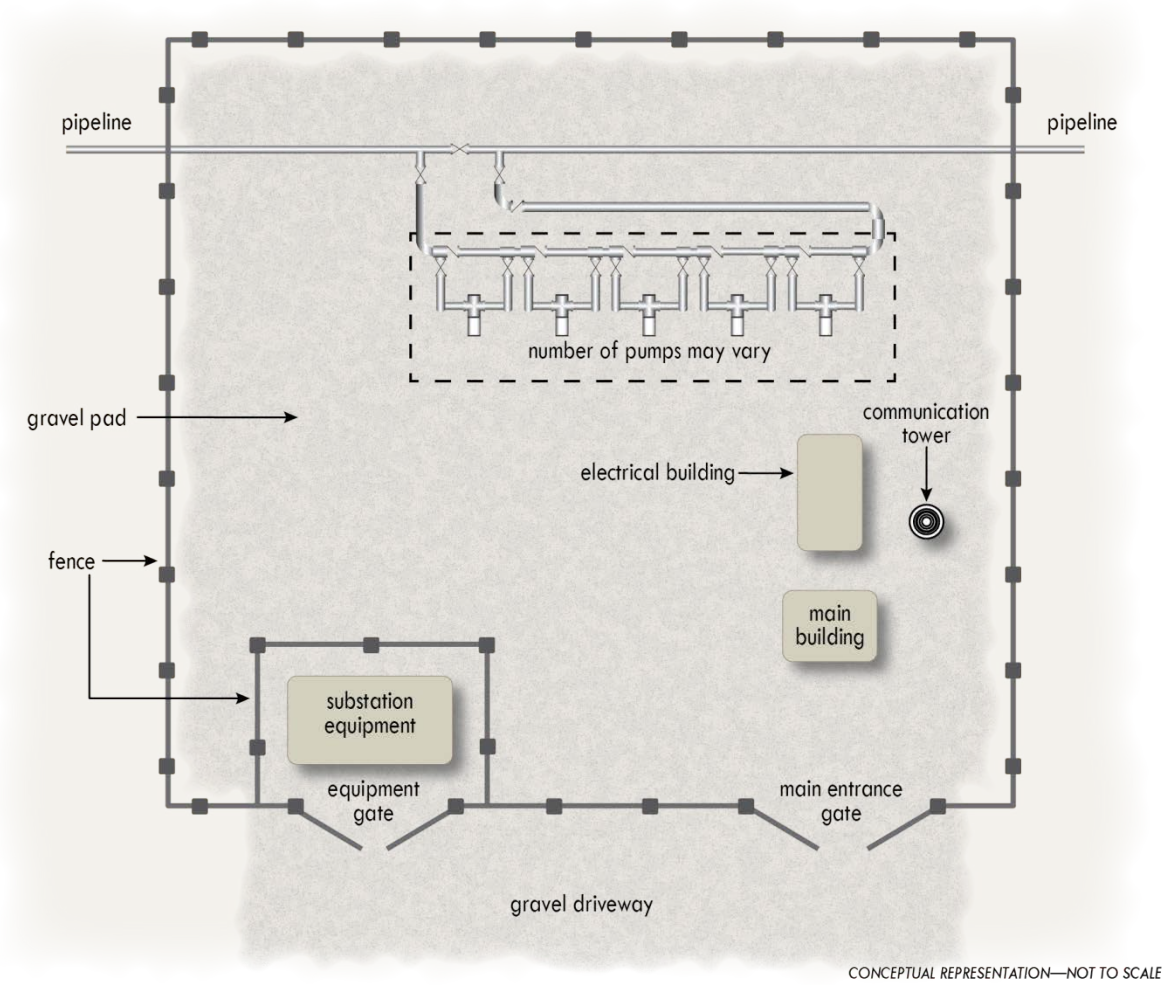
Each pump station would have three to five pumps driven by electric motors, an electrical equipment shelter, a variable frequency drive equipment shelter, a sump tank, a communication tower, a small maintenance and office building, a parking area for maintenance personnel, and a security fence along the perimeter. The communication tower would be about 33 feet tall, but the antenna height at some stations could be higher (but no greater than 190 feet) based on final engineering studies. The electrical shelter would house the electrical systems and the communication and control equipment. Each pump station would need an electrical substation and power line with voltage of 69 kilovolts (kV) or 115 kV (see *Power Lines and Substations*, below).

The pipeline would enter and exit the pump station site below grade. One MLV would be located at the entrance and one MLV would be located at the exit to allow isolation of the pump station facility in the event of an emergency. The manifold connecting the pipeline to the equipment would be aboveground.

The pump stations would be fully automated and would be occupied only as needed for maintenance and inspection. In the event of an electrical power outage, batteries would maintain power to all communication and specific control equipment. Backup generators would not be

installed at the pump stations to power the pumps; however, generators would be installed to provide backup power to operate control equipment and MLVs at the pump stations.

Figure 2.1-1. Conceptual Pump Station Layout



Power Lines and Substations

Each of the three proposed pump stations along the Nebraska Reroute would operate using electrical power supplied by a regional power provider. Power lines to the pump stations would be constructed and operated by the power provider and would not be Keystone's responsibility. Substations would be incorporated into the pump station layouts during the final project design. Each substation would occupy about 1.0 to 1.5 acre within the pump station site. Most of the proposed new electrical distribution lines to service pump stations would be 115 kV lines strung along single poles and/or H-frame wood poles. The poles would typically be about 60 to 80 feet high with 250- to 400-foot-long wire span distances.

Keystone would power MLVs using service drops from adjacent distribution power lines with voltage below 69 kV. Each distribution service drop would typically be less than 200 feet long

and would need installation of one or two poles and a transformer. The electric utility would typically install a pole-mounted transformer within 200 feet of the valve site location. However, in some cases, the electric utility would install the transformer on an existing pole that could be more than 200 feet from the valve site. Upon completion of the new service drops, the electrical power providers would restore the work area in accordance with local permits.

Mainline Valves

Keystone would install MLVs a minimum of every 20 miles, at pump stations, at major river crossings, upstream of sensitive waterbodies, and at other locations as needed to comply with Special Condition 32 of the PHMSA 57 Special Conditions presented in the Final EIS (DOS, 2011a) (see Chapter 5, Mitigation Measures, for more information on mitigation conditions). PHMSA Special Condition 32 states:

> Keystone must design and install mainline block valves and check valves on the Keystone XL system based on the worst case discharge as calculated by 49 CFR § 194.105. Keystone shall locate valves in accordance with 49 CFR § 195.260 and by taking into consideration elevation, population, and environmentally sensitive locations, to minimize the consequences of a release from the pipeline. Mainline valves must be placed based on the analysis above or no more than twenty (20) miles apart, whichever is smaller.

To isolate a section of pipeline and limit the volume in the event of an oil leak, MLVs can, when a leak is detected, be either manually or remotely closed. Valves would be operated to avoid excessive pressures that could rupture the pipeline. Special Condition 32 also requires that the remotely operated valves have remote power backup to ensure communications are maintained during severe weather. Each motor-operated valve station would include a diesel-fired emergency generator and a diesel fuel tank with secondary containment. Each MLV not associated with a pump station (referred to by Keystone as an “intermediate MLV”) would occupy a fenced site approximately 40 by 50 feet in size located within the 50-foot-wide permanent right-of-way (ROW). Keystone has not yet determined the exact numbers and locations of the intermediate MLVs for the Nebraska Reroute. In the Final EIS, DOS stipulated that an independent engineering analysis review the MLV locations to assess whether additional valves or external leak detection systems would be needed in areas with particularly sensitive environmental resources.

Pig Launchers and Receivers

Some of the pump stations would include launchers and receivers for the in-line inspection tools (commonly referred to as “pigs”) used for pipeline evaluation and maintenance operations. Pigs would be used to clean the pipeline and can measure pipe thickness and corrosion. All of the pig-launching and -receiving facilities would be located within the pump station boundaries.

Access Roads

Keystone would use existing public and private roads to gain access to most of the construction ROW. Keystone would construct new access roads in areas where existing roads do not exist or are unavailable for use. The typical access road would be 30 feet wide. In its SER, Keystone identified 32 existing private roads along the proposed Nebraska Reroute that would be used for temporary access during construction. These access roads are shown on the pipeline route maps

in Appendix B and are summarized in Table 2.1-3. Based on Keystone's September 14, 2012, response to NDEQ's data request (see Appendix H), up to 20 additional access roads (either new or existing) would be needed for the Nebraska Reroute. Locations for these additional access roads have not yet been determined.

Table 2.1-3. Proposed Temporary Access Roads

Access Road Number	Milepost	Length (feet)	Acreage
CAR-304	608.9	10,786	7.4
CAR-305	610.7	1,068	0.7
CAR-306	617.7	19,729	13.6
CAR-307	618.2	1,176	0.8
CAR-308	618.6	706	0.5
CAR-309	627.2	1,594	1.1
CAR-310	629.1	525	0.3
CAR-311	635.8	7,111	4.9
CAR-293	658.5	1,346	0.9
CAR-246	664.3	3,086	2.1
CAR-294	666.5	617	0.4
CAR-295	667.5	1,439	1.0
CAR-296	680.7	429	0.3
CAR-248	689.7	4,216	2.9
CAR-249	690.3	3,215	2.2
CAR-297	693.5	176	0.1
CAR-298	705.2	1,611	1.1
CAR-250	707.1	2,715	1.8
CAR-251	710.1	2,527	1.7
CAR-252	711.1	2,368	1.6
CAR-253	713.2	2,234	1.5
CAR-286	713.2	2,493	1.7
CAR-254	713.5	1,052	0.7
CAR-255	714.2	1,652	1.1
CAR-256	715.6	1,364	0.9
CAR-257	720.1	2,570	1.8
CAR-258	743.5	2,013	1.4
CAR-259	745.4	2,289	1.6
CAR-260	757.7	90	0.1
CAR-261	758.2	517	0.4
CAR-264	761.4	1,298	0.9
CAR-268	762.3	2,810	1.9
		Total	**59.6**

Keystone would construct short permanent gravel access roads to the pump stations and MLVs. These permanent access roads have not yet been defined. Keystone would be responsible for maintenance of the new access roads.

Pipe Storage Sites, Contractor Yards, and Railroad Sidings

Keystone has not yet determined the exact numbers and locations of pipe storage sites, contractor yards, and railroad sidings that would be needed for the proposed Nebraska Reroute. Keystone's September 14, 2012, response to NDEQ's data request indicated that approximately ten pipe storage sites, nine contractor yards, and six railroad sidings would be needed for construction of the Keystone XL Pipeline within Nebraska. Based on this information, NDEQ estimates seven pipe storage sites, seven contractor yards, and five railroad sidings would be needed for the Nebraska Reroute. Each of these facilities would occupy approximately 40, 30, and 10 acres, respectively. Although specific locations have not yet been determined for these facilities, Keystone would, wherever practicable, use existing commercial or industrial sites or sites that were used for previous construction projects.

At pipe storage sites and contractor yards, a 2- to 3-day supply of fuel could be stored for the construction equipment. Fuel would be transported daily by fuel trucks from the storage areas to the construction area for equipment fueling. Each fuel storage system would include temporary, aboveground, 10,000- to 20,000-gallon, skid-mounted tanks and/or 9,500-gallon fuel trailers; rigid steel piping; and dispensing pumps. The fuel storage system would have a secondary containment structure capable of holding 110 percent of the volume of the fuel storage tanks or fuel trailers. Containment structures would consist of sandbags or earthen berms with a chemically resistant membrane liner. The total volume of fuel stored at a given facility would vary depending on the location, but would not exceed 30,000 gallons.

Contractor yards typically house office trailers and other trailers to store supplies and equipment such as seed, pumps, hardware, spare parts, rope, hoses, and spill kits. Some hazardous materials such as paints, solvents, cleansers, starting fluid, and adhesives would typically be stored there as well. The contractor yards would also be used for vehicle and equipment maintenance that is not performed on the ROW or at existing maintenance and repair facilities.

Construction Camp

Because of the remoteness of the proposed project route from larger population centers, Keystone has indicated that a temporary construction camp might be needed in the northern part of the Nebraska Reroute corridor to house construction workers until completion of the project. For the purpose of its evaluation, NDEQ conservatively assumes that this camp would be built. Keystone indicated that the construction camp could be built in northern Holt County. Factors that Keystone would consider when siting the camp include:

- Availability of existing municipal water and wastewater systems and power supplies
- Opportunity to minimize impacts on traffic for nearby towns, communities, and residences
- Opportunity to avoid impacts on threatened and endangered species or other species of concern

The camp would be sited, permitted, constructed, and operated to comply with applicable county, State, and federal regulations (see Chapter 3, Project Regulatory Requirements). Keystone would minimize the use of artificial lighting.

The SER indicated that the size of the construction camp in Nebraska could be as large as 100 acres, including a contractor yard (typically 30 acres). The camp would consist of modular

housing units and include a convenience store, recreational and fitness facilities, entertainment rooms and facilities, telecommunications/media rooms, kitchen/dining facilities, laundry facilities, and security units. Each camp would also have a medical infirmary to provide first aid and other routine minor medical services for workers and staff.

Housing facilities would consist of dormitory-like units, with about 28 occupants per unit. The units would employ heating and air conditioning systems. The camp would be able to accommodate approximately 600 people and provide space and utility hook-ups for about 300 recreational vehicles, for a total capacity of 900 workers.[2]

Potable water for the construction camp would be provided by municipal sources, if available, or by drilling a well. If a licensed and permitted publicly owned treatment works for wastewater is available nearby, Keystone would either pipe or truck wastewater to the treatment facility. If it is not practicable to use a publicly owned treatment works for wastewater, a self-contained wastewater treatment facility would be included with the construction camp in compliance with Nebraska Department of Health and Human Services requirements, as applicable. Wastewater treated onsite would undergo primary, secondary, and tertiary treatment consisting of solids removal, bioreactor treatment, membrane filtration, and ultraviolet exposure. The effluent discharge would comply with all applicable regulatory requirements.

Electricity for the camp would either be provided by local utilities from an interconnection to their distribution system or generated onsite through diesel-fired generators. A contracted camp supplier would provide continuous security. Keystone would work with the camp supplier to ensure that as many local employees are hired as possible to staff the camp.

Most of the workers in the construction camps would be transported to and from the ROW each day by buses. Some individual crews and workers would be transported to and from job sites in separate vehicles.

2.2 LAND NEEDS

2.2.1 Right-of way Acquisition Process

To construct, operate, and maintain the proposed Nebraska Reroute, Keystone would negotiate easement agreements with landowners along the route. The easement agreements would list the conditions to which the landowners and Keystone both agree, including financial compensation to the landowners in return for granting easements. Compensation would also be made for loss of use during construction, crop loss, loss of nonrenewable or other resources, restrictions on future use of the land, and restoration of any unavoidable damage to personal property during construction. Easement negotiations and final agreements are private business concerns between the landowners and Keystone, and neither DOS nor NDEQ has legal authority or ability to intervene in the proceedings or enforce the conditions of an easement agreement. In most cases, agreements would allow the agricultural uses currently in place to continue within the permanent ROW after pipeline installation.

[2] Many construction workers would bring their personal recreational vehicles as their temporary housing.

Mineral rights would not be acquired by Keystone, but any extraction operations associated with the exercise of mineral rights would be conducted to avoid jeopardizing the integrity of the pipeline.

If Keystone were unable to reach an easement agreement with a property owner, Keystone would use Nebraska eminent domain laws to obtain easements needed for pipeline construction, maintenance, and operation. Under this process, the level of compensation would be determined by a court according to applicable State law. Nebraska's eminent domain statutes are in Nebraska Revised Statutes Chapter 76, §§ 76-704 to 76-725.

2.2.2 Temporary Land Needs

Table 2.2-1 summarizes the land needs for the facilities associated with the Nebraska Reroute. NDEQ estimates that the total land affected by construction of the Nebraska Reroute would be about 3,426 acres. Included within this number is the land needed for permanent operation, such as the 50-foot-wide permanent ROW and pump station sites. In determining the affected acreages, all existing privately owned access roads were conservatively estimated to need upgrades and maintenance during construction.

Table 2.2-1. Estimated Land Needs Associated with Construction and Operation

Facility	Land Affected During Construction (acres)[a]	Land Affected During Operation (acres)[b]
Pipeline right-of-way	2,575	1,179
Additional temporary workspace	127	0
Aboveground facilities[c]	45	45
Construction camp, pipe storage sites, contractor yards, and railroad sidings[d]	610	0
Access roads[e]	59	undetermined
Total	**3,415**	**1,224**

[a] *Based on a 110-foot-wide construction right-of-way, except in wetlands, where an 85-foot-wide construction right-of-way would be used. These numbers include land affected during operation.*

[b] *Operation acreage is based on a 50-foot-wide permanent right-of-way.*

[c] *Includes acreage for aboveground facilities not included within the permanent right-of-way. Assumes each pump station would occupy 15 acres.*

[d] *Assumes 70 acres for construction camp (not including a collocated contractor yard), 280 for pipe storage, 50 for railroad sidings, and 210 for contractor yards. See Section 2.1.2 for further information.*

[e] *Conservatively assumes all identified access roads would need modification. Additional temporary and permanent access roads have yet to be identified.*

The construction ROW would be 110 feet wide in most areas. In certain sensitive areas, such as wetlands, cultural or historic sites, shelterbelts, residential areas, or commercial/industrial areas, the construction ROW may be reduced to 85 feet. Additional temporary workspace would be needed for some construction staging areas and for situations where special construction techniques would be used such as at waterbody crossings. The typical sizes for these areas are provided in Table 2.2-2.

Table 2.2-2. Typical Additional Temporary Workspace Areas

Feature	Dimensions (feet)	Size (acres)[a]
Horizontal direction drilling	250 × 150 on entrance side and 150 × 150 on exit side plus area for pipe string	1.4 plus area for pipe string
Waterbodies 50 feet wide or greater	300 × 100[b]	1.4
Waterbodies less than 50 feet wide	150 × 25 on working and spoil sides of right-of-way or 150 × 50 on working side only[b]	0.3
Bored highways and railroads	175 × 25 on working and spoil sides of right-of-way or 175 × 50 on working side only[b]	0.4
Open-cut or bored roads	125 × 25 on working and spoil sides of right-of-way or 125 × 50 on working side only[b]	0.3
Foreign pipelines, utilities, or other buried features	125 × 50[b]	0.3
Push-pull wetland crossings	50 × length of wetland	Depends on wetland length
Construction spread mobilization and demobilization	470 × 470	5.1
Stringing truck turnaround	200 × 80	0.4

[a] *Total for each feature.*
[b] *At each end of crossing.*

2.2.3 Permanent Land Needs

As shown in Table 2.2-1, NDEQ estimates the total land needed for project operation would be about 1,224 acres. This includes the permanent pipeline ROW and the pump station sites. This number does not include permanent access roads that would be constructed for the project, because that information is not yet available.

2.3 CONSTRUCTION PROCEDURES

2.3.1 General Pipeline Construction Techniques

Keystone would construct the Nebraska Reroute consistent with the PHMSA requirements in 49 CFR § 195 (Transportation of Hazardous Liquids by Pipeline), as well as relevant industry standards and applicable State standards. These regulations specify pipeline material and qualification standards, minimum design requirements, and required measures to protect the pipeline from internal, external, and atmospheric corrosion.

Construction of the proposed pipeline would primarily involve standard cross-country pipeline construction techniques. Keystone proposes to divide the proposed pipeline in Nebraska into three manageable segments, called “spreads,” on which three separate crews can work simultaneously. These spreads are shown in Table 2.3-1 and on Figure 2.3-1. The Nebraska

Reroute would encompass all but 1 mile of Spread 8, all of Spread 9, and only about 20 of the 100 miles of Spread 10.

Table 2.3-1. Construction Spreads

Description	Total Length (miles)	Counties within Each Nebraska Reroute Spread	Nebraska Reroute Mileposts[a]	Length within Nebraska Reroute (miles)
Spread 8	90.9	Keya Paha, Boyd, Holt, Antelope	601.8 to 691.8	90.0
Spread 9	83.9	Antelope, Boone, Nance, Merrick, Polk	691.8 to 775.7	83.9
Spread 10	99.7	Polk, York	775.7 to 796.3	20.6

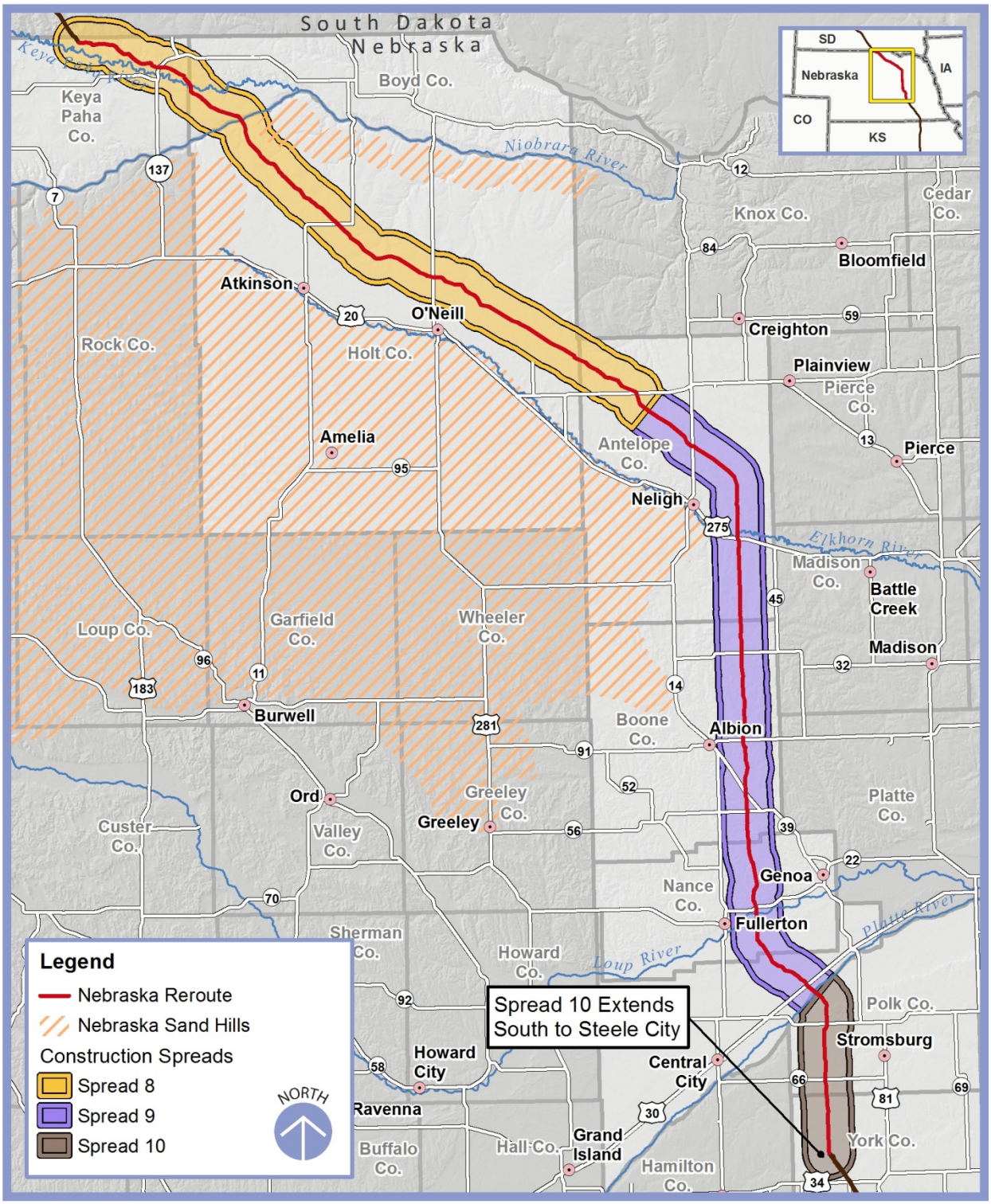
[a] *Mileposts are for the Nebraska Reroute portion of the construction spreads.*

Pipeline construction would generally proceed as a moving assembly line, comprising:

- Surveying and staking the construction ROW
- Clearing and grading
- Trenching
- Pipe stringing
- Bending
- Welding
- Installing
- Backfilling
- Testing
- Cleaning up and restoring

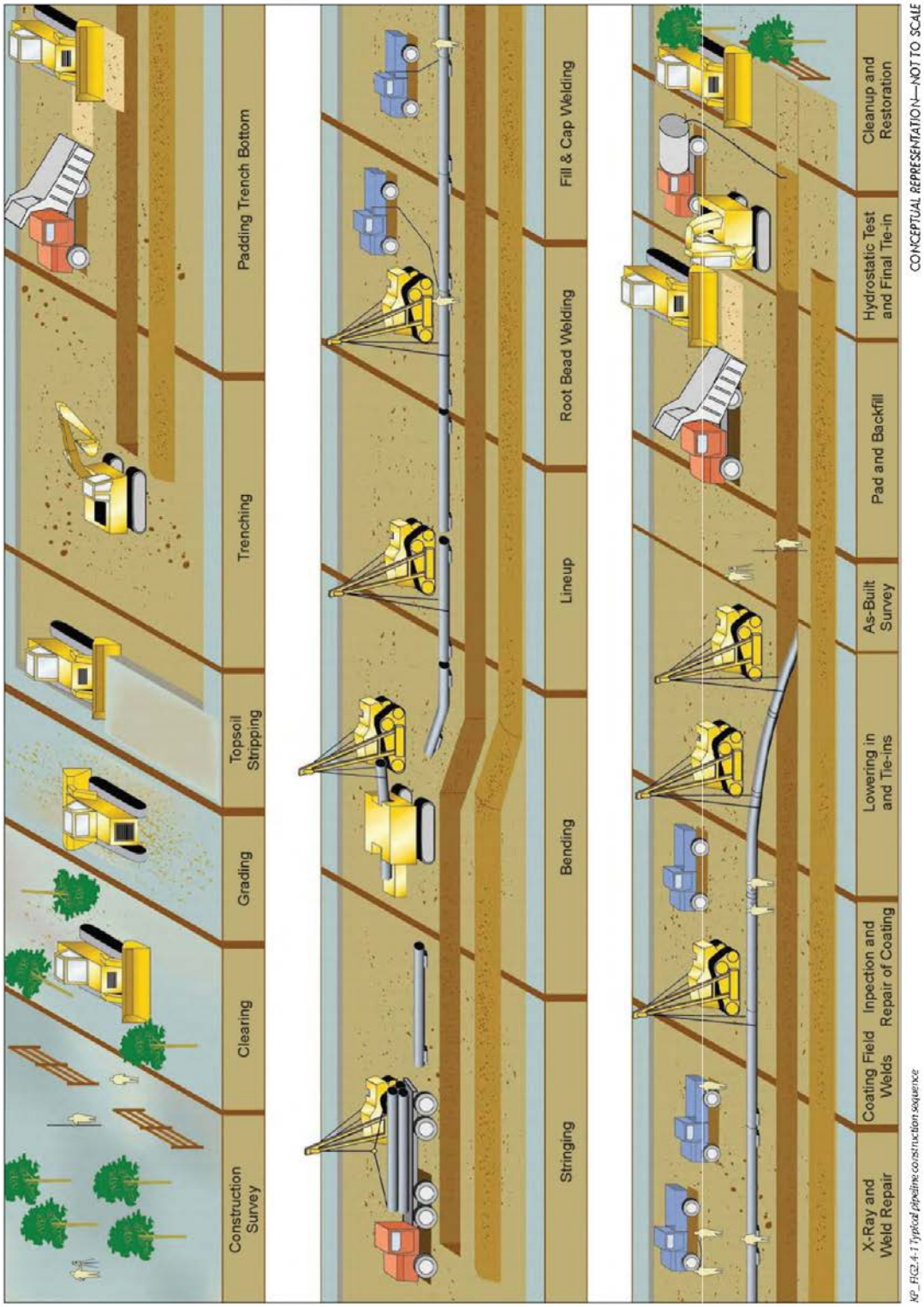
The typical construction sequence is shown in Figure 2.3-2. Most construction activities would be carried out during daylight hours. Some work, such as HDD crossings or critical tie-ins, might need to be conducted after daylight hours because of weather conditions, safety requirements, or other project needs.

Figure 2.3-1 Construction Spreads



Source: NDEQ 2012

Figure 2.3-2. Typical Pipeline Construction Sequence



Source: DOS, 2011a

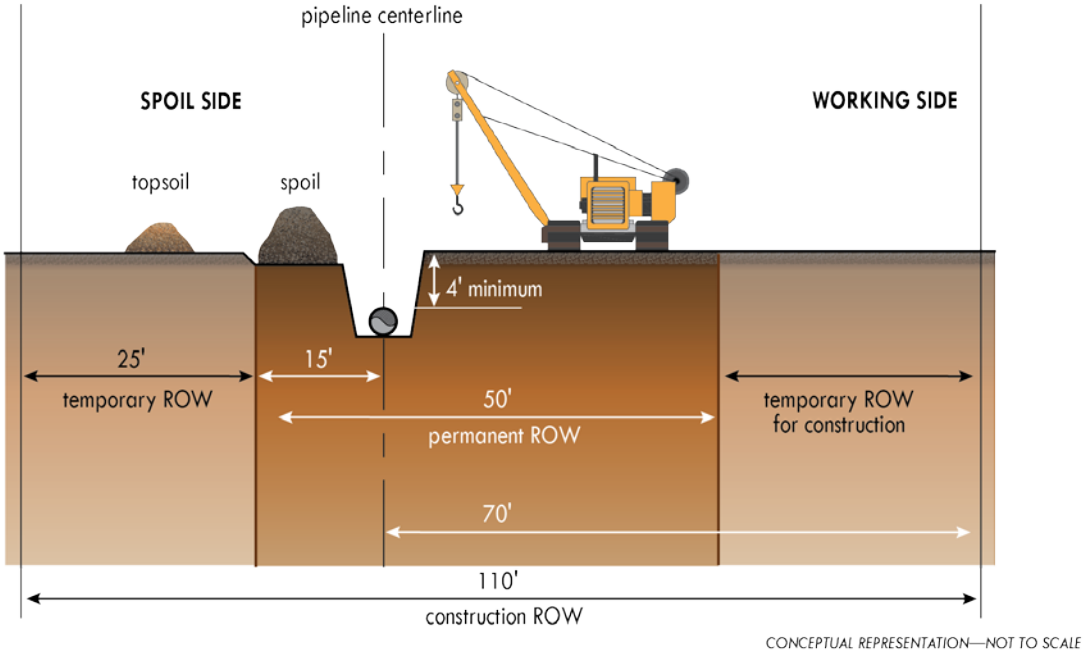
Survey and Staking

Prior to beginning construction, Keystone would survey and stake the centerline of the pipeline and the perimeter of the construction ROW, including additional temporary workspace. Features such as existing utilities, wells, approved access roads, and wetlands or other environmentally sensitive areas would be marked. Existing fences would be braced and cut and temporary construction fencing would be installed, as needed, to control access by humans or livestock.

Clearing and Grading

Keystone would begin pipeline construction by clearing the approved construction workspace, which would include the temporary and permanent ROW, additional temporary workspaces, and new access roads. Figure 2.3-3 depicts a typical pipeline construction ROW. The construction ROW would be graded, if needed, to provide a relatively level workspace. Where grading occurs, topsoil would first be removed to a maximum depth of 12 inches, then stored separately from the subsoil. Where grading is not needed, rootstock would be left in the ground and topsoil stripping would occur only over the trenchline. Temporary erosion control measures, such as silt fencing or straw bales, would be installed prior to or immediately after vegetation removal along slopes leading to wetlands and riparian areas.

Figure 2.3-3. Typical Right-of-way Cross Section



Trenching

Trenching for the pipeline would be accomplished with a trenching machine or backhoe-type equipment. In areas of shallow consolidated bedrock, tractor-mounted mechanical rippers or rock trenchers would be used. Keystone does not anticipate that blasting would be needed.

Trench spoils would be stored adjacent to the trench within the construction work areas (except near stream channels). In general, the trench would be excavated to a depth of 7 to 8 feet to allow for a minimum of 4 feet of cover after construction. In stable soils, the trench would be about 4 to 5 feet wide. During trenching, all topsoil (up to 12 inches) would be segregated and stockpiled for subsequent reclamation, except in inundated wetlands where topsoil segregation would not be feasible. Based on site-specific circumstances, topsoil would be segregated over the trench only, over the trench and spoil side, or over the full width of the construction ROW. Topsoil would be stored so that it would not mix with the stockpiled subsoil.

Stringing and Bending

This step typically would occur after trenching but could also be completed prior to excavation of the trench. Using conventional laydown methods, Keystone would string and distribute new, FBE-coated pipe (in approximately 80-foot-long joints) along the construction ROW parallel to the trench. Bends would be fabricated in the pipeline by a track-mounted, hydraulic bending machine to accommodate both surface topography and turns in the route. Fabricated bends might be used for larger bend angles. Gaps would be left in the pipeline string to allow wildlife to pass from one side of the ROW to the other.

Welding and Coating

The pipeline joints would be welded together in accordance with PHMSA safety regulations. Completed welds would be visually and radiographically or ultrasonically inspected for integrity. Welds that would not meet established specifications would either be repaired or removed and replaced. The welded joints that passed inspection would be sandblasted, heated, and coated with epoxy. The entire pipeline would be inspected for defects in the coating, such as pinholes and nicks, using special equipment (for details, see Chapter 6, Pipeline Safety and Potential Spills). The coating would be repaired, as needed, prior to the pipeline being lowered into the trench.

Lowering-in and Backfilling

Prior to pipeline installation, any water would be pumped out of the trench, cave-ins would be removed, and the trench would be cleared of rocks and debris that might damage the pipe or the pipe coating. In areas of rocky soils or bedrock, the bottom of the trench would be padded with sand or gravel. Where rock occurs within the trench perimeter, rock-free soil padding would be used to protect the pipe. In special situations, abrasion-resistant coatings or rock shields could be used to protect the pipe prior to installation.

Keystone would use sideboom tractors or backhoe-type equipment to lower the welded pipeline into the trench. Keystone would pad the pipeline with suitable soil, as needed, and backfill the trench with previously excavated material determined suitable for backfill. Keystone would spread the segregated topsoil over stripped areas of the permanent ROW to bring surfaces up to finish grade.

The pipeline would have the following minimum cover:

- 5 feet at waterbodies and drainage ditches adjacent to roadways
- 3 feet in areas of consolidated bedrock (4 feet at drainage ditches adjacent to public roads and railroads)
- 4 feet of cover in other areas.

In cultivated areas where conditions do not allow a minimum of 4 feet of cover over the pipeline, Keystone would place warning tape and additional pipeline markers. If chisel plowing or other activities could damage the pipeline in these areas, the top of the pipeline would be placed at least 1 foot below the deepest penetration, and at least 3.5 feet of cover would be maintained. In areas where the pipeline would be installed by HDD, the cover would be much greater (see Section 2.3.2).

Hydrostatic Testing

After construction of each pipeline segment and before the pipeline would be placed in service, the entire length would be filled with water and hydrostatically tested for structural integrity. This testing would ensure there are no leaks, verify the strength of the pipeline, and provide the required margin of safety for operation at the anticipated pressures. Keystone would conduct testing in accordance with 49 CFR § 195, Subpart E (Pressure Testing), and with stipulations in the 57 Special Conditions, Special Conditions 5, 20, 22, and 23, as described in the Final EIS (DOS, 2011a).

To perform the hydrostatic testing, a manifold would be welded onto each end of the 30- to 50-mile-long test section, and the section would be filled with water and pressurized for a period of 8 hours. The sources of water for the hydrostatic testing have not yet been determined by Keystone, but would generally be either surface water or municipal supply. Keystone has indicated that the hydrostatic test water in Nebraska could be drawn from the Keya Paha, Niobrara, Elkhorn, Loup, and Platte Rivers. NDEQ estimates that about 8.4 million gallons of water would be required to test a 30-mile-long segment of pipeline and about 14 million gallons would be required to test a 50–mile-long segment of pipeline.

After completion of hydrostatic testing, the test water would be discharged to an upland area or to surface waters in the same basin as the source water under a temporary National Pollutant Discharge Elimination System (NPDES) discharge permit issued by NDEQ. If hydrostatic test water were discharged to an upland area, a straw bale structure or other dissipation device would be built to dissipate energy, reduce velocity, and spread water to avoid erosion and promote ground infiltration.

Upon completion of all hydrostatic testing, test manifolds would be removed and the test sections would be welded together. The continuous pipeline would be inspected for dents or other deformations using an electronic caliper pig and, where appropriate, pipe sections would be replaced with pretested pipe.

Cleanup and Restoration

After construction, the temporary ROW would be restored consistent with applicable federal and State regulations and permits, the easement agreements negotiated between Keystone and individual landowners, and Keystone's Construction, Mitigation, and Reclamation Plan (CMRP) (see Appendix C). The disturbed areas would be graded as closely as is practicable to preconstruction contours. During cleanup, trash and construction debris in the ROW would be removed and disposed of in approved areas in accordance with applicable regulations. After backfilling, Keystone would attempt to complete final cleanup and grading within 10 days in residential areas and 20 days in other areas, weather permitting.

To stabilize soil, Keystone would reseed the construction ROW as soon as possible after completion of cleanup. Seeding procedures would depend on weather and soil conditions and would follow recommended rates and seed mixes provided by the landowner, the land management agency, or NRCS.

Upon completion of construction activities, all existing fencing and grazing structures, such as fences, gates, irrigation ditches, cattle guards, and reservoirs, would be repaired to preconstruction conditions or better. If requested by the landowner, gates, boulders, or other barriers would be installed to limit unauthorized access to the permanent ROW. In addition, to the extent permitted by landowners, Keystone would make reasonable efforts to restrict access to the pipeline corridor via access roads after construction to minimize alteration of human activity patterns in formerly inaccessible areas.

Keystone would inspect the ROW after the first growing season to determine the success of revegetation and noxious weed control. Eroded areas would be repaired and areas where revegetation was not successful would be reseeded by Keystone or Keystone would compensate the landowner for reseeding. Keystone would control noxious weeds in accordance with the CMRP.

Pipeline Marking

Keystone would place pipeline markers along the permanent ROW for safety purposes in accordance with the requirements of 49 CFR § 195.410 (Line Markers) and PHMSA Special Condition 40 (see Chapter 5, Mitigation Measures, for more information on mitigation conditions). The pipeline markers would be made from industrial strength materials to withstand abrasion from wind and damage from cattle, and would identify the owner of the pipeline, and convey emergency contact information. At a minimum, markers would be installed:

- On both sides of all highways, roads, road ROWs, railroads, and waterbody crossings and in areas where the pipeline would be buried less than 48 inches deep.
- At all fences.
- Along the ROW to provide line-of-sight marking of the pipeline, if practicable and consistent with the type of land use, such that it would not hinder the use of the property by the landowner. Pipeline markers would be installed at all angle points, and at intermediate points, where practicable, so that from any marker, the adjacent marker would be visible in either direction.

In addition to the above, aerial markers showing identifying numbers would be installed at approximately 5-mile intervals. At each MLV site and pump station, signs would be installed and maintained on the perimeter fence where the pipeline would enter and exit the fenced area. All markers and signs would be maintained throughout the operational life of the pipeline.

2.3.2 Special Pipeline Construction Techniques

Special techniques would be used when constructing the pipeline across wetlands; waterbodies; roads and railroads; utilities; agricultural, residential, and commercial areas; and steep terrain. Although the pipeline was rerouted to avoid the designated Sand Hills region, the pipeline would cross some areas with fragile soils. Special procedures would be used in those locations as well.

Wetlands

The construction ROW in wetland areas would be 85 feet wide (rather than the typical construction ROW width of 110 feet in other areas). Over most of the construction ROW, clearing of vegetation would be limited to flush-cutting trees and shrubs and their subsequent removal. Stump removal, grading, topsoil segregation, and excavation would be limited to the area immediately over the trench line.

In wetland areas with unsaturated soils that are able to support construction equipment without equipment mats, construction would occur in a manner similar to conventional upland cross-country construction. Topsoil would be segregated only from over the ditch.

Where wetland soils are saturated or inundated and the soils cannot support conventional pipe-laying equipment, Keystone could install the pipeline using the push-pull technique. This technique would involve stringing and welding the pipeline outside of the wetland, and excavating and backfilling the trench using a backhoe supported by equipment mats or timber riprap. Topsoil would not be segregated. The pipeline segment would be installed in the wetland by equipping it with floats and pushing or pulling it across the water-filled trench. After the pipeline is floated into place, the floats would be removed and the pipeline would sink into place. Most pipes installed in wetlands would be coated with concrete or installed with set-on weights to counteract buoyancy. Trench breakers would be installed prior to backfilling, where necessary, to prevent wetland waters from draining through the trench backfill. Contours would be restored during backfilling, because little or no grading would occur in wetlands.

Additional temporary workspace areas would be needed on both sides of wide, saturated wetlands to stage construction, weld the pipeline, and store materials. These additional temporary workspace areas would be located in upland areas a minimum of 10 feet from the wetland edge.

Material not needed to allow access along the travel lane would be removed from wetlands after backfilling. The materials in the travel lane would be removed at the completion of construction. To eliminate mounding over the pipeline trench, excess excavated material would be removed from the wetland and spread along upland ROW, placed in an approved off-ROW location as requested by a landowner, or disposed of at an existing authorized landfill.

In wetlands where no standing water is present, the construction ROW would be seeded in accordance with the recommendations of the local soil conservation authorities or land management agency.

Waterbody Crossings

A total of 163 waterbodies would be crossed by the proposed Nebraska Reroute. Intermittent waterbodies that are dry or have nonmoving water at the time of construction would be crossed using conventional upland construction methods. In general, major waterbodies and environmentally sensitive waterbodies would be crossed using HDD or dry open-cut methods (flume, or dam and pump). The remaining waterbodies would be crossed using the wet open-cut method. With the exception of HDD crossings, Keystone has not yet identified the specific method to be used for crossing each waterbody.

The pipeline would have a minimum of 5 feet of cover at waterbodies, ditches, and drainages except in areas of consolidated bedrock where the minimum cover would be 3 feet. Where the HDD method is used, the pipeline would be at least 25 feet beneath the bottom of the waterbody.

The pipeline would be weighted to counteract buoyancy. Additional temporary workspace areas would be needed on both sides of waterbodies to stage construction, fabricate the pipeline, and store materials.

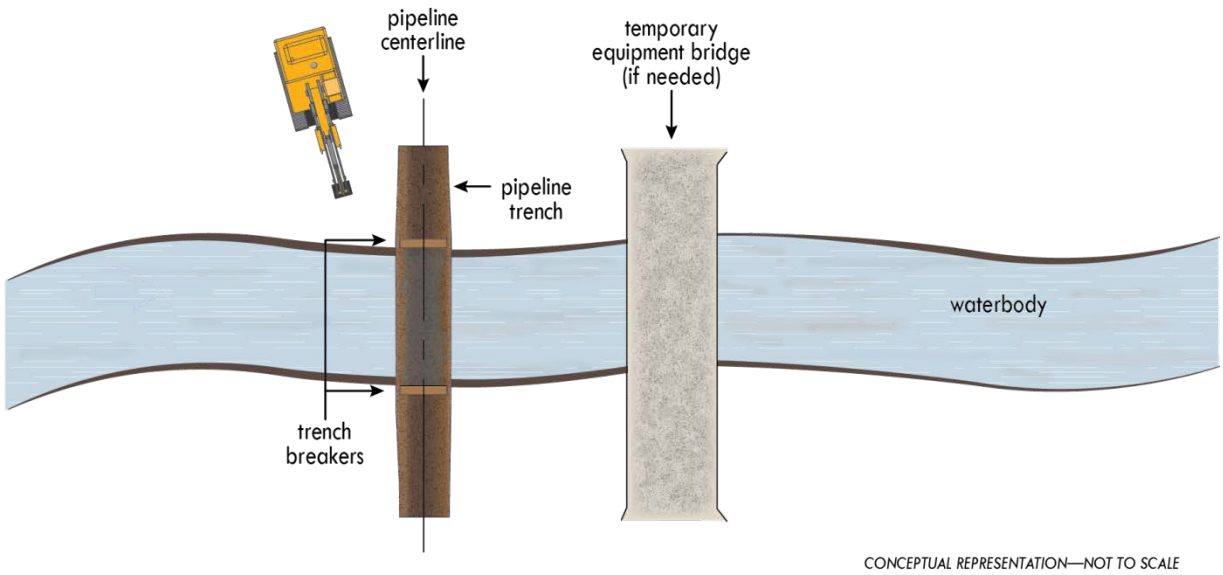
Keystone would minimize the time of in-stream construction to reduce construction impacts. For minor waterbodies (less than 10 feet wide at the water's edge), trenching and backfilling would typically need no more than 24 hours; intermediate waterbodies (10 to 100 feet wide) would typically need no more than 48 hours. Major waterbodies (greater than 100 feet wide) would be crossed as quickly as possible. Erosion and sediment control measures would be installed across portions of the construction ROW to reduce sediment transport into the waterbody.

In addition to the proposed pipeline crossings, temporary equipment bridges would be installed across many waterbodies, including all perennial waterbodies. These temporary equipment bridges could consist of subsoil fill over culverts, timber mats supported by flumes, railcar flatbeds, or flexi-float apparatus. At the waterbodies where temporary equipment bridges would be constructed, clearing crews would be allowed only one pass through the waterbodies prior to the bridge construction. All other construction equipment would be required to use the bridges. The equipment bridges would be removed after completion of construction and restoration.

Wet Open-cut

Under the wet open-cut method, the trench would be excavated through flowing water (see Figure 2.3-4). The pipe section would be welded adjacent to the stream or in a staging area. If the waterbody is narrow enough, backhoes would excavate the trench across the streambed from one or both banks. For wider waterbodies, the equipment would need to operate from within the waterbody. Spoil would be stored at least 10 feet from the water's edge unless the waterbody width exceeds the reach of the excavation equipment. Keystone would install sediment barriers to prevent excavated spoil from entering the water and would use temporary trench plugs to prevent water from flowing into the upland portions of the trench. The trench plugs would be removed to allow pipeline installation. The pipeline segment would be carried, pushed, or pulled across the waterbody and positioned in the trench. Permanent trench breakers would then be installed at the edges of the stream as outlined in Keystone's CMRP to keep water from flowing through the trench backfill. After trench backfilling, the banks would be restored and permanent erosion controls would be installed.

Figure 2.3-4. Conceptual Wet Open-cut Waterbody Crossing



Dry Open-cut

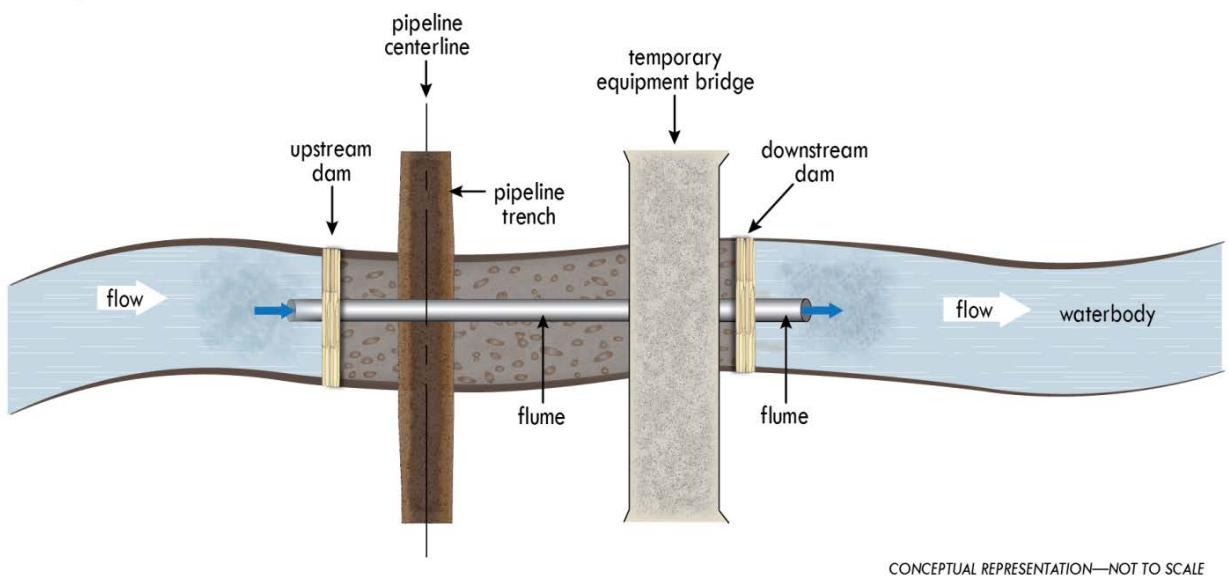
In its September 14, 2012, response to the NDEQ's data request, Keystone stated it would use flume or dam and pump methods "where technically feasible on environmentally sensitive waterbodies as warranted by resource-specific sensitivities (e.g., less than 30 feet wide and containing endangered/threatened species or high quality coldwater fisheries)." The flume method (Figure 2.3-5) is a standard dry waterbody crossing construction method that involves diverting the flow of water across the trenching area through one or more flume pipes placed in the waterbody. This method allows for trenching activities to occur within a relatively dry stream or river bed (that is, beneath the flume pipes containing the water flow), thereby minimizing the introduction of sediment and turbidity into the waterbody. This method usually reduces the volume of spoil that must be excavated and allows visual inspection of the trench bottom prior to pipeline installation. The flume method is used for sensitive, relatively narrow waterbodies free of large rocks and bedrock at the trenchline and with a relatively straight channel across the construction ROW. Keystone indicates that it would use the flume method on selected environmentally sensitive waterbodies where technically feasible.

For this crossing method, flumes—typically 40 to 60 feet long—would be installed through the trench construction area in the size and number necessary to more than accommodate the highest anticipated flow during construction. The upstream and downstream ends of the flume pipes would be incorporated into dams made of sand bags and plastic sheeting (or equivalent material). The dams would divert the water flow through the flume pipes, thereby isolating the water flow from the construction area. Prior to trenching, the area between the dams typically would be dewatered using pumps. The pumps might be operated if needed during construction to remove water that leaks in. Pumped water would be discharged into a straw bale structure or similar dewatering device.

Backhoes located on both banks of the waterbody would excavate a trench under the flume pipe in the dewatered streambed. After trench excavation, the prefabricated segment of pipe would be installed beneath the flume pipes. The trench would then be backfilled with native spoil from the

streambed unless otherwise specified in stream crossing permits. Prior to removing the dams and flume pipes, accumulated water in the construction area would be removed and the bottom contours of the streambed and the streambanks would be restored as closely as practicable to preconstruction contours. Streamflow would be restored by slowly removing the sand bags to gradually flood the workspace.

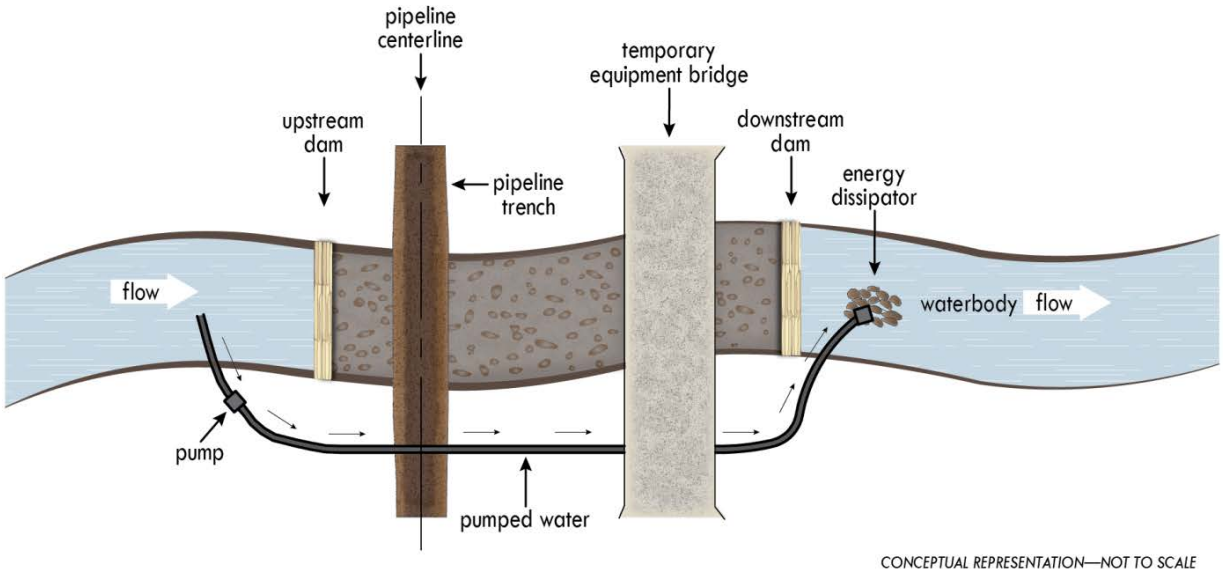
Figure 2.3-5. Conceptual Flume Waterbody Crossing



The dam and pump method is similar to the flume method except that pumps and hoses would be used instead of flume pipes to isolate and transport the streamflow around the construction work area (see Figure 2.3-6). Similar to the flume, the objective is to create a relatively dry work area to avoid or minimize sediment transport and turbidity downstream of the crossing during in-stream work.

As the first step in the dam and pump crossing method, one or more pumps and hoses of sufficient size to transport anticipated flows around the construction work area would be installed. Additional backup pumps would be needed onsite at all times in case of pump failure. After placement of the pumps, the waterbody upstream and downstream of the construction area would be dammed as described above for the dam and pump method. The pumps would be started during dam installation to maintain continuous flow to the waterbody below the crossing. Where necessary to prevent scouring of the waterbody bed or adjacent banks, the downstream discharge would be directed into an energy-dissipation device or concrete weight. The pumps would run continuously during pipeline installation, dam removal, and streambed and bank restoration.

Figure 2.3-6. Conceptual Dam and Pump Waterbody Crossing



Horizontal Directional Drilling

Waterbodies that Keystone has considered for HDD include those that are commercially navigable; wider than 100 feet; have terrain features that prohibit open crossing methods; and are adjacent to features such as roads, railroads, and environmentally sensitive resource areas. The following waterbodies along the proposed Nebraska Reroute would be crossed using HDD: the Keya Paha, Niobrara, Elkhorn, Loup, and Platte Rivers. Additional HDD crossings could be added as a result of agency or landowner concerns, or because of construction-related issues. Prior to construction, geotechnical assessments of the crossing locations would be conducted to confirm that HDD would be feasible and to provide information needed for detailed design of the HDD crossing. Keystone would create site-specific waterbody crossing plans that describe the procedures to be used at each waterbody crossed using the HDD method. The depth of the installed pipeline beneath the waterbody would depend on site-specific conditions such as topography, geology, and size of the waterbody. Depths would generally be at least 25 feet and could be greater than 50 feet for larger waterbodies. The sources of water needed for the HDD drilling process have not yet been identified, but would generally be from surface water.

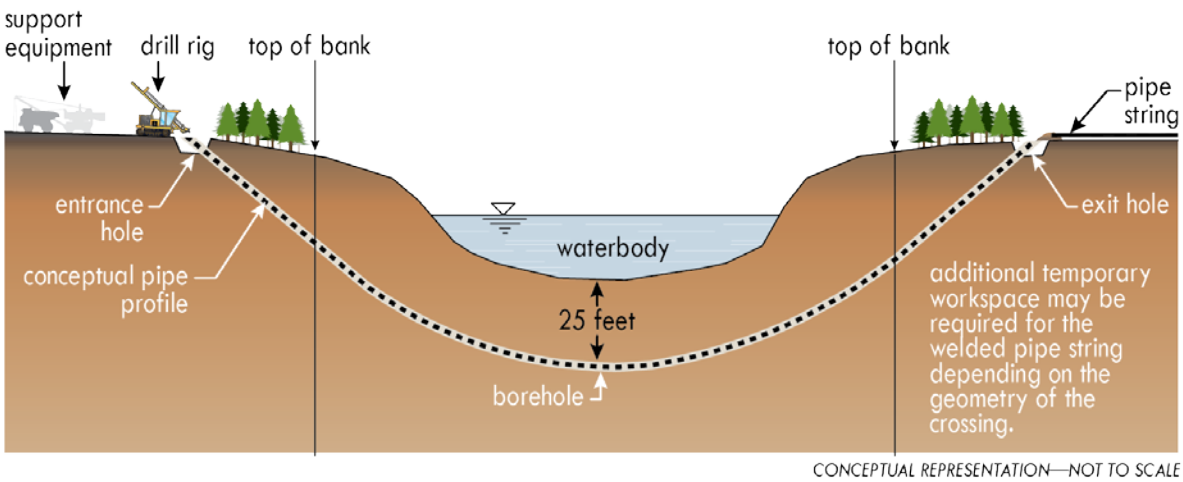
The HDD technique involves drilling a pilot hole under the feature to be crossed, then enlarging that hole through successive reamings until the hole is large enough to accommodate the pipeline (such as a 50-inch-diameter hole for the proposed 36-inch-diameter pipe). Throughout the process of drilling and enlarging the hole, a slurry made of naturally occurring materials, such as bentonite clay and water, would be circulated through the drilling tools to lubricate the drill bit, remove drill cuttings, and hold the hole open. This slurry is referred to as drilling mud.

Pipe sections long enough to span the entire crossing would be staged and welded along the construction work area on the opposite side of the HDD crossing from the HDD equipment, hydrostatically tested, and then pulled back through the drilled hole. Keystone would use industry-standard procedures to ensure that pipe and coating integrity would be maintained during HDD installations. This would include application of an abrasion-resistant overcoat to the FBE coating on the pipe joints designated for HDDs. This overcoat would prevent damage

to the corrosion-resistant FBE coating as the pipe is pulled through the bored hole. Figure 2.3-7 shows a conceptual HDD waterbody crossing.

The HDD method usually avoids direct impacts on waterbodies, but HDD operations could pose a risk to wetlands and waterbodies through "frac-outs." A frac-out occurs when the drilling fluid is released through fractured bedrock and sands. The drilling fluid could then enter a wetland or waterbody. DOS's Final EIS (DOS, 2011a: Section 3.3.2.2) indicated that an HDD Frac-out Plan would be developed in consultation with regulatory agencies to address "appropriate response and crossing implementation." Frac-out contingency plans typically contain preventive and mitigative measures to address potential frac-outs.

Figure 2.3-7. Conceptual HDD Waterbody Crossing

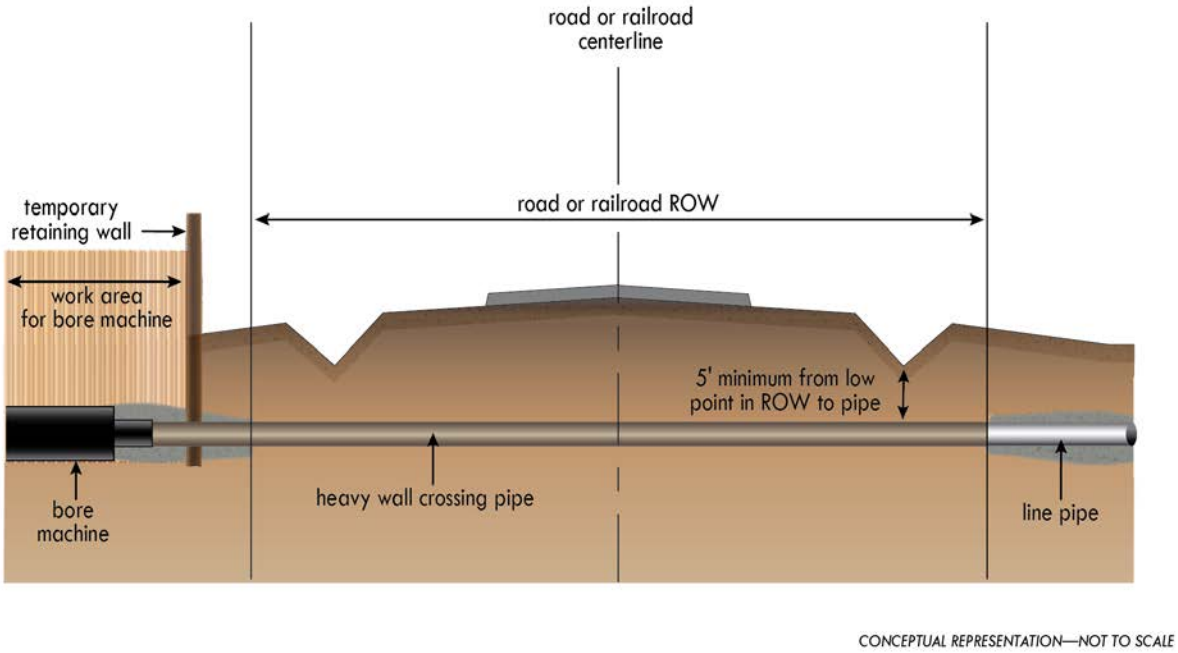


Road, Railway, and Utility Crossings

Construction across paved roads, highways, and railroads would be completed in accordance with the requirements of Keystone's road and railroad crossing permits and approvals. In general, Keystone would cross all major paved roads, all primary gravel roads, all highways, and all railroads by using conventional boring methods to avoid or minimize traffic disruption. Each bore would take 1 to 2 days for most roads and railroads, and 10 days for long crossings such as Interstates or other four-lane highways.

For a conventional bore, a pit would be excavated on each side of the feature to be crossed. The boring equipment would be placed in one of the pits and a hole large enough to accommodate the pipeline diameter would be bored under the road or railroad. A prefabricated pipe section with an abrasion-resistant coating would then be pulled through the borehole. For long crossings, sections would be welded onto the pipe string before being pulled through the borehole. Figure 2.3-8 depicts a road/railroad crossing bore.

Figure 2.3-8. Typical Road/Railroad Bore Cross Section



If permitted by local regulators and landowners, driveways and smaller unpaved roads would likely be crossed using the open-cut method, which would typically take between 1 and 2 days to complete. This method would need temporary road closures and the establishment of detours for traffic. If no reasonable detour were feasible, at least one lane of traffic would be kept open in most cases. Keystone would post signs at these open-cut crossings and control traffic to reduce travel disturbance and protect public safety. Backfill material at these crossings must be suitable mineral soil and be consistent with engineering specifications required by the municipality or relevant political jurisdiction, and be compacted in lifts, as required.

Where the pipeline would cross existing utilities such as power lines or other pipelines, Keystone would coordinate with the owner to ensure that the pipeline construction would not damage the existing utility and that adequate separation would be maintained. Keystone would comply with U.S. Department of Transportation regulations, utility agreements, and industry best management practices (BMPs) with respect to utility crossing and separation specifications. One-call notifications would be made prior to the start of construction to identify public utilities. Similarly, private landowners would be notified of planned construction activities so that buried features (such as irrigation systems and other water lines) would be identified. These private utilities would be avoided or replaced.

Unless otherwise specified in a crossing agreement or by statute, the proposed pipeline would cross existing utilities with a minimum vertical clearance of 12 inches. The clearance distance would be filled with sandbags or suitable fill material to maintain the separation. Trench backfill at the crossing would be compacted in lifts to ensure continuous support of the existing utility.

Agricultural Areas

Keystone's construction methods applicable to agricultural areas are:

- Construction traffic would be restricted to approved workspace areas, existing public roads, and approved private roads. Construction workspace boundaries (including preapproved temporary workspace) would be clearly staked to prevent disturbance to unauthorized areas.
- Where feasible, Keystone would work with landowners to implement measures that would allow an irrigation system to continue to operate during pipeline construction. If construction areas were to intercept an irrigation system, Keystone would establish with the landowner a mutually acceptable amount of time that the irrigation system may be out of service. If an irrigation system interruption were to result in crop damages, either on or off the construction ROW, the landowner would be compensated. Disruptions to active irrigation ditches would last for only the time necessary to install the pipeline beneath the ditch, typically 1 day or less.
- Fences within the construction ROW would be braced and secured before cutting to prevent the fence from weakening or slacking. To contain livestock, openings created in the fences would be temporarily closed when construction crews leave the area. In addition, gaps through natural livestock barriers would be fenced according to landowners' or land managers' requirements. Temporary gates and fences would be installed to control livestock, if needed.
- Crops would be cleared by Keystone using standard agricultural equipment unless the landowner has agreed to remove the crops.
- When crossing shelterbelts, the construction ROW would be reduced to the minimum width necessary (but no greater than 85 feet) to construct the pipeline so that tree removal would be minimized.
- Topsoil would be removed and segregated from excavated subsoil in separate, distinct rows with a separation that would limit any mixing of topsoil and subsoil during handling. The topsoil would be restored upon completion of pipeline construction.
- Shavings produced during the pipe welding process would be removed immediately following this operation to ensure that livestock do not ingest this material. When welding operations would create a continuous line of pipe that might be left in the ROW for an extended period of time because of construction or weather constraints, a gap would be provided in the welded pipe to allow for access at farm road crossings and for passage of livestock. In addition, plugs would be left or placed in the trench to allow passage of livestock or wildlife.
- Soils compacted during the construction process would be decompacted. Compacted cropland would be ripped a minimum of three passes at least 18 inches deep, and all pasture would be ripped or chiseled a minimum of three passes at least 12 inches deep before replacing topsoil.
- On agricultural land, rocks exposed on the surface by construction activity would be removed from the construction ROW prior to and after topsoil replacement. Rocks would also be removed in areas of rangeland to maintain the productive capability of the land. Rock clearing would be carried out either manually or with a mechanical rock

picker. Rocks that are similar in size to those occurring in the undisturbed landscape would be left in place to the extent practicable. Rock removed from the ROW would be either hauled away for disposal at appropriate facilities or placed in a location acceptable to the landowner.

- If site-specific conditions would warrant and if agreed to by the landowner, Keystone would apply amendments (fertilizer and soil pH-modifier materials and formulations) commonly used for agricultural soils in the area and in accordance with written recommendations from the local soil conservation authority, land management agencies, or landowner. Soil amendments would be incorporated into the normal plow layer as soon as possible after application.
- Temporary erosion and sediment controls would be installed immediately after initial soil disturbance and maintained throughout construction until completion of restoration. Permanent erosion control structures would be installed, where needed.
- Keystone will work with the landowner regarding the type of vegetation that would be re-established.

Keystone would compensate landowners for financial impacts associated with crop damage or losses resulting from construction of the Nebraska Reroute. In addition, structures related to agricultural lands, such as fences, drainage tiles, and irrigation systems, would be repaired or replaced if damaged by construction of the proposed Nebraska Reroute.

Steep Terrain

Steep and rugged terrain occurs in some areas of the Nebraska Reroute, and is generally associated with waterbodies. These areas could have high potential for landslides, erosion, and mass wasting, and might need additional grading to accommodate pipe bending limitations. The original contours would be restored after pipeline installation. Construction in these areas could need additional temporary workspace areas.

Generally, an effort is made to route pipelines so they go straight up or down steep slopes. In areas where a pipeline must laterally cross a slope, cut-and-fill grading is used to obtain a safe, flat, work terrace. Cut-and-fill grading would consist of excavating soil from the high side of the ROW and moving it to the low side of the ROW (see Figure 2.3-9). After pipeline installation, soil from the low side of the ROW would be returned to the high side, and the slope would be brought to a stable angle of repose.

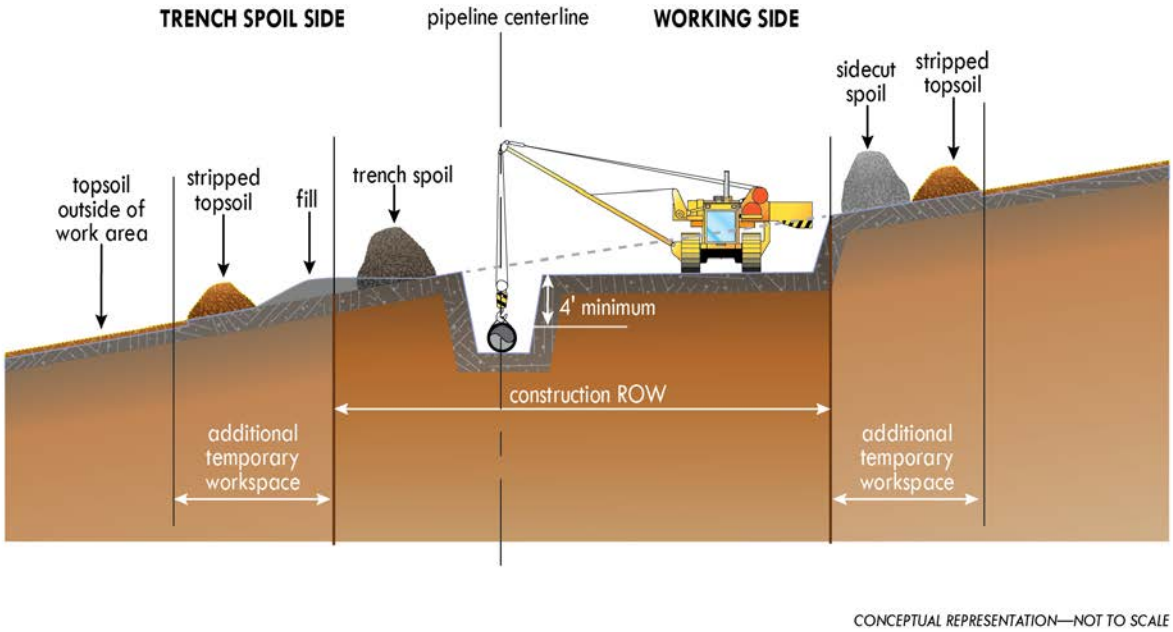
Temporary sediment barriers such as silt fences and straw bales would be installed during clearing to prevent the movement of disturbed soil off the ROW. Temporary slope breakers consisting of mounded and compacted soil would be installed across the ROW during initial grading, and permanent slope breakers would be installed after completion of the pipeline installation.

Areas of Fragile Soils

Although the Nebraska Reroute would not be located in the Sand Hills, areas of fragile, sandy soils that have surface features very similar to the Sand Hills are present. Fragile soils present in the Nebraska Reroute are especially prone to wind and water erosion during construction. In these areas, Keystone would implement special construction and reclamation measures, which are detailed in Section 4.5 of its CMRP (see Appendix C). Keystone would monitor these areas

for several years, would repair areas of erosion, and would reseed poorly vegetated areas, as necessary.

Figure 2.3-9. Cut-and-fill Grading on Steep Slopes



2.3.3 Aboveground and Ancillary Facility Construction

Pump Stations

At the proposed pump station sites, construction activities and the storage of construction materials would be confined to within the footprint of the permanent facility. Keystone would begin construction at each new pump station by clearing vegetation and removing topsoil. The site would be graded, as necessary, to create a level working surface. Building foundations would be installed for the electrical equipment shelter and the pump equipment shelter. The structures to support the pumps, manifolds, pig-receiving and -launching equipment, and associated facilities would then be built. Pig launchers and receivers would be constructed within the boundaries of each pump station site.

Piping, both above- and belowground, would be installed and hydrostatically tested using the methods employed for the main pipeline. After successful testing, the pump station piping would be tied into the main pipeline. Pumps, controls, and safety devices would be checked and tested to ensure proper system operation and activation of safety mechanisms before being put into service. After completion of testing, the site would be graded and surfaced with gravel, and a perimeter security fence would be installed.

Mainline Valves

MLVs would be constructed during pipeline installation. The construction sequence for MLVs would consist of clearing and grading, followed by trenching, foundation and valve installation, placement of gravel, fence installation, cleanup, and site restoration. If necessary, new access roads would be constructed to the fenced MLV sites.

Access Roads

Prior to construction, Keystone would evaluate all existing roads that it proposes to use for access to be certain that any associated bridges could adequately and safely accommodate construction equipment traffic. If bridge capacity or clearance could not accommodate equipment weight or dimensions, an alternate route would be found. Some of the existing unpaved roads that Keystone would use for access might need improvements such as blading and filling, or in some cases widening, prior to use for the Nebraska Reroute. Information regarding specific access road improvements is not yet available. Unpaved roads might also need maintenance during construction of the Nebraska Reroute. At locations where existing roads would not be available for provision of access to the construction ROW, Keystone would construct new temporary access roads. A permanent access road would be needed for each pump station and MLV site. Both the temporary and permanent roads that Keystone would construct would be 30 feet wide and graveled. Keystone has indicated that it would obtain necessary approvals and permits prior to modifying existing roads or constructing new access roads.

2.4 CONSTRUCTION SCHEDULE

Keystone has indicated that it would begin construction of the proposed Nebraska Reroute after obtaining all necessary permits and approvals. Each spread, constructed concurrently, would take 6 to 8 months to complete. If dictated by schedule constraints, Keystone might revise the construction spreads to create a greater number of shorter spreads. Construction of the new pump stations would need 18 to 24 months. Keystone could start one or more spreads in 2013, with the remainder built in 2014. The scheduling would depend on a number of factors such as land acquisition, permit receipt, and weather. The targeted in-service date for the pipeline is 2015.

2.5 OPERATION AND MAINTENANCE

The proposed pipeline would be operated, maintained, monitored, and inspected in accordance with 49 CFR §§ 194 and 195 and other applicable federal and State regulations. Keystone would also comply with the 57 Special Conditions (see Chapter 5, Mitigation Measures) developed by PHMSA that were presented in Appendix U of the Final EIS (DOS, 2011a).

2.5.1 Right-of-way Maintenance and Monitoring

A 50-foot-wide permanent ROW would be maintained along the Nebraska Reroute during operation of the pipeline. Woody vegetation along the permanent easement would be cleared periodically to maintain access for pipeline integrity surveys. Mechanical mowing or cutting would be conducted, as needed, along the permanent easement. Most agricultural crops could be grown within this permanent ROW; however, structures and deep-rooted vegetation such as trees

would not be allowed. In areas where the pipeline would be installed using HDD, the pipeline would be situated deeper and trees could remain in the ROW.

Keystone would monitor permanent erosion control devices to identify areas in need of repair. The remainder of the ROW would be monitored to identify areas where additional erosion control devices would be necessary to prevent future degradation. The ROW would also be monitored to identify areas that would need additional reclamation to maintain the integrity of the pipeline.

During operation, Keystone would use standard agricultural herbicides to control the growth of vegetative species on all aboveground sites.

2.5.2 Operating Conditions

The pipeline would be operated at a maximum pressure of 1,308 pounds per square inch gauge.[3] The normal operating temperature of the pipeline would be between 120 degrees Fahrenheit (°F) and 150°F. As oil would move through the pipeline, friction-generated heat would occur. According to the Final EIS (DOS, 2011a: Section 3.2.2.3), pipeline operation would result in a 4°F to 8°F increase in soil temperature at the surface, primarily from November to May. Heat from the pipeline would increase the soil temperature 10°F to 15°F at 6 inches below the surface, with the largest increases occurring during March and April. Soil temperature close to the pipeline could be as much as 40 degrees warmer than ambient soil temperature.

2.5.3 Corrosion Protection

To protect the pipeline and other belowground facilities against corrosion, Keystone would follow the requirements of 49 CFR § 195 Subpart H (Corrosion Control) and PHMSA's 57 Special Conditions. An external coating of FBE would be applied to the pipeline and all buried facilities. Cathodic protection, which uses a low-voltage electric current to prevent corrosion of the metal pipeline, would also be installed. The cathodic protection systems would consist of rectifiers (devices that convert alternating current to direct current) coupled to semi-deep vertical anode beds at each pump station, as well as rectifiers coupled to deep-well anode beds at selected MLV sites. The semi-deep anode beds would consist of 12-inch-diameter vertical holes spaced 15 feet apart, with a depth of approximately 45 feet. The deep well anode bed would be a single, 12-inch-diameter vertical hole with a depth of approximately 300 feet.

2.5.4 Pipeline Integrity and Leak Detection Monitoring

Periodic inline inspections and aerial and ground surveillance would be conducted to monitor pipeline conditions and integrity. Pigs would be used periodically for internal cleaning and high-resolution inline inspection. Keystone would be able to conduct full pigging of the entire pipeline with minimal service interruption.

The pipeline ROW would be inspected through use of aerial and ground surveillance to provide prompt identification of possible encroachments or nearby construction activities, erosion, exposed pipe, or any other conditions that could result in damage to the pipeline. The aerial surveillance of the pipeline ROW would be carried out at least 26 times per year, at intervals not

[3] A unit of pressure relative to atmospheric pressure at sea level—the pressure of a system measured by a gauge above atmospheric pressure.

to exceed 3 weeks, as required by 49 CFR § 195.412. Pump stations and MLVs would be inspected at intervals not to exceed 7.5 months, but at least twice per calendar year.

Keystone would develop and implement an annual Pipeline Maintenance Program to ensure the integrity of the pipeline. The Pipeline Maintenance Program would include valve maintenance, periodic inline inspections, and cathodic protection readings to ensure facilities remain reliable and in service. Data collected in each year of the program would be fed back into the decision-making process for the development of the following year's Pipeline Maintenance Program.

The proposed pipeline would be monitored from Keystone's Operations Control Center in Calgary, Canada. The center would be staffed continuously. Keystone also has a fully redundant backup control center that would be used, if needed. A supervisory control and data acquisition (SCADA) system would be used to remotely control and monitor the pipeline system. A leak detection system would be capable of identifying abnormal conditions and initiating visual and audible alarms. If a valve were to start to shut, automatic shutdown systems would be initiated and all pumps upstream would turn off automatically.

Chapter 6, Pipeline Safety and Potential Spills, describes pipeline integrity and leak detection monitoring in greater detail.

2.5.5 Emergency Response Procedures

PHMSA regulations (49 CFR § 194) require pipeline operators to prepare and implement a pipeline Facility Response Plan. Such plans include emergency response action plans, facility information, worst-case spill scenarios, and response training records.

Additional details regarding emergency response are provided in Chapter 6, Pipeline Safety and Potential Spills.

2.6 FUTURE PLANS AND DECOMMISSIONING

Keystone expects to operate the Keystone XL Pipeline for approximately 50 years. It typically does not abandon large-diameter pipelines but generally idles or deactivates pipe as market conditions dictate. This allows a dormant pipeline to be reactivated or converted to another purpose in the future. When a pipeline or a segment of a pipeline is idled or deactivated, the pipe generally is purged of its contents, filled with an inert gas, and left in place and intact with appropriate warning signs. Cathodic protection would likely remain functional as would other integrity measures such as periodic inspections under the integrity management plan.

Decommissioning activities would need to be conducted in compliance with all applicable regulatory requirements that are in place at the time of decommissioning, as well as ROW agreements with affected landowners. Nebraska does not currently have regulations applicable to pipeline decommissioning. PHMSA has requirements that apply to the decommissioning of crude oil pipelines in 49 CFR § 195.402(c)(10) and in 49 CFR §§ 195.59 and 195.402. These regulations require that procedural manuals for hazardous liquid pipelines include procedures for abandonment. Such procedures would include safe disconnection from an operating pipeline system, purging of combustibles, and sealing abandoned facilities left in place to minimize safety issues and environmental hazards (49 CFR § 195.402). Further, these regulations require that for each abandoned onshore pipeline facility that crosses over, under, or through a commercially navigable waterway, the last operator of that facility must file a report upon abandonment of that

facility. The report must include certification that the facility has been abandoned in accordance with all applicable laws.

Prior to decommissioning the Nebraska Reroute, Keystone would identify the decommissioning procedures it would use along each portion of the route, identify the regulations it would be required to comply with, and submit applications for the appropriate environmental permits.

CHAPTER 3

PROJECT REGULATORY REQUIREMENTS

DOS is the lead federal agency for the Presidential Permit decision for the Keystone XL Pipeline. As the lead federal agency, DOS is responsible for review consistent with NEPA and has an overall coordination responsibility for compliance determinations for all federal laws. Determinations of compliance with tribal, State, and local laws are also integral to the federal decision. NDEQ and DOS signed an MOU dated May 24, 2012 (see Appendix A). The MOU defines the roles and responsibilities of DOS and NDEQ in the coordination of reviews and determinations of compliance with Nebraska laws for the project located within the state of Nebraska.

DOS presented a list of major federal permits, licenses, approvals, authorizations, and consultation requirements for the Keystone XL Pipeline project in its Final EIS (DOS, 2011a) and will likely present similar information in its Supplemental EIS of the reconfigured Keystone XL Pipeline (in progress). As a part of its evaluation, NDEQ prepared a similar list of major regulatory requirements for the proposed Nebraska Reroute (see Table 3.1-1).

Keystone would be required to obtain all necessary permits prior to construction if the Presidential Permit were to be approved (see Chapter 1, Introduction and Background). NDEQ is the State of Nebraska's lead agency for the process set forth in LB 4 and LB 1161 (discussed previously in Chapter 1). NDEQ has the authority and general jurisdiction for the administration and enforcement of environmental laws in the state pursuant to Nebraska Revised Statutes § 81-1504. LB 845 sets forth that the pipeline carrier who owns, constructs, operates, or manages a pipeline through Nebraska is financially responsible for reclamation costs relating to the construction, operation, and management of the pipeline in Nebraska. LB 845 requires "proper reclamation," including restoration of the "condition, contour, and vegetation that existed prior to construction, including stabilizing disturbed areas, establishing a diverse plant environment of native grasses and forbs to create a safe and stable landscape, restoring active cropland to its previous productive capability, mitigating noxious weeds, and managing invasive plants …" (see Appendix A for LB 4, LB 1161, and LB 845).

In addition to regulatory requirements for the pipeline, Keystone has adopted several mitigative avoidance, minimization, and compensatory measures and commitments, which are outlined in Chapter 5, Mitigation Measures, of this report. Keystone has also entered into landowner agreements with conditions and has committed to several other measures to mitigate impacts related to construction and operation of the proposed Nebraska Reroute (see Chapter 5). All of these mitigative measures must comply with federal, State, and local permits. NDEQ recognizes that pipeline safety is regulated by the federal government. See Chapter 6, Pipeline Safety and Potential Spills, for a description of the relevant regulations. Table 3.1-1 lists the major federal, State, and local agencies' permits, licenses, approvals, authorizations, and consultation required before implementation of the proposed Nebraska Reroute could begin.

Table 3.1-1. Major Permits, Licenses, Approvals, and Consultation Requirements for the Proposed Nebraska Reroute[a]

Agency	Permit or Consultation/Authority	Agency Action	Outcome
Federal			
U.S. Department of State	Presidential Permit, Executive Order 13337 of April 30, 2004 (69 Federal Register 25299, et seq.)	Considers approval of cross-border facilities	Decision by the President to allow construction of pipeline across international border
	Lead federal agency for compliance with the National Environmental Policy Act	Leads environmental review of major projects considered for Presidential Permits requiring environmental impact statements	Identifies alternatives, requires full disclosure of environmental impacts, and requires public notification and input to the final decision
	Lead federal agency for compliance with Section 106 of the National Historic Preservation Act	Requires federal agencies to take into account the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings; federal agencies usually accomplish this by complying with 36 Code of Federal Regulations § 800	Avoids, minimizes, and/or treats impacts on cultural resources
	Section 7 of the Endangered Species Act (ESA)	Leads coordination of the U.S. Department of the Interior, U.S. Fish and Wildlife Service (USFWS) determination of compliance with Section 7 of the ESA	Determination by USFWS that the project will not jeopardize the continued existence of species provided protection under the ESA or the critical habitats on which the species depend
	Various tribal responsibilities, including Native American Graves Protection and Repatriation Act (25 United States Code § 3001, et seq.)	Leads government-to-government consultation with federally recognized tribes; responsible for all pertinent Executive Orders and laws related to Federal Trust responsibilities to federally recognized Native American tribes	Ensures compliance with all Executive Orders and laws pertinent to federally recognized Native American tribes and fulfills federal government-to-government consultation requirements with Native American tribes
U.S. Department of Agriculture, Farm Service Agency	Notification for Conservation Reserve Program, Conservation Reserve Enhancement Program, and Grassland Reserve Program	Notifies local Farm Service Agency office that conservation lands will be disturbed by pipeline construction[b]	Allows crossing of conservation lands

Agency	Permit or Consultation/Authority	Agency Action	Outcome
U.S. Department of Agriculture, Natural Resources Conservation Service	Notification for Wetland Reserve Program	Notifies local Natural Resources Conservation Service office that Wetland Reserve Program land will be disturbed by pipeline construction	Allows crossing of conservation lands
U.S. Army Corps of Engineers – Omaha District	Implements Section 404 of the Clean Water Act	Considers issuance of Section 404 permits for the placement of dredge or fill material in waters of the United States, including wetlands	Determines whether the discharge of dredge or fill material will significantly affect waters of the United States; may issue a permit/ authorization that includes conditions to avoid, minimize, or compensate for impacts
U.S. Environmental Protection Agency	Clean Water Act	Provides oversight of the Clean Water Act	Protects water quality
	Oil Pollution Act of 1990	Response in case of a spill	Spill cleanup
	National Environmental Policy Act; Section 309 of the Clean Air Act	Reviews environmental impact statements filed by other federal agencies	Rates project as: ▪ Lack of Objections ▪ Environmental Concerns ▪ Environmental Objections ▪ Environmentally Unsatisfactory Rates environmental impact statement as: ▪ Adequate ▪ Insufficient Information ▪ Inadequate
U.S. Fish and Wildlife Service	Section 7 of the ESA Informal Consultation	Determines what effect the action may have on listed species or critical habitats; explores ways to reduce or remove adverse effects; determines the need to enter into formal consultation	Provides a determination of effect: ▪ No effect ▪ May affect but not likely to adversely affect ▪ Nonconcurrence ▪ May affect and is likely to adversely affect ▪ May affect and is likely to jeopardize proposed species/adversely modify proposed critical habitat

Agency	Permit or Consultation/Authority	Agency Action	Outcome
	Section 7 of the ESA Formal Consultation (only by written request to USFWS following informal consultation)	Evaluates the initiation package; develops a biological opinion and an incidental take permit; makes conservation recommendations	Provides a jeopardy/no jeopardy and/or adverse modification/no adverse modification opinion; may include Reasonable and Prudent Alternatives and conservation measures and provisions for "take" of species
	Migratory Bird Treaty Act of 1918	Protects migratory birds from "hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any … bird, or any part, nest or egg"	Provides protection for migratory birds, including bald eagles; may require avoidance, minimization, or compensation for impacts for a compliance determination
	Bald and Golden Eagle Protection Act (16 United States Code §§ 668–668c)	Prohibits anyone without a permit issued by the Secretary of the Interior from "taking" bald eagles, including their parts, nests, or eggs	Provides protection for bald and golden eagles; may require avoidance, minimization, or compensation for impacts
	Fish and Wildlife Coordination Act (16 United States Code §§ 661–667e)	Requires federal agencies that construct, license, or permit water resource development projects to first consult with USFWS and the State fish and wildlife agency regarding impacts on fish and wildlife resources and measures to mitigate these impacts	May require avoidance, minimization, or compensation for impacts
U.S. Department of the Interior, National Park Service	National Trails System Act	Promotes the recreation and preservation of, public access to, travel within, and enjoyment and appreciation of the open-air, outdoor areas and historic resources of the nation's trails; conducts consultation with other federal, State, and local governmental agencies, public and private organizations, and landowners and land users	Determines compliance with the National Trails System Act, which manages the use, protection, development, and administration of trails within the National Trail system, including avoidance
U.S. Department of Justice, Bureau of Alcohol, Tobacco, Firearms and Explosives	Treasury Department Order No. 120-1, effective July 1, 1972	Considers issuance of permits to purchase, store, and use explosives, should blasting be required	Sets the standard for blasting; may issue a permit for blasting and related activities

Agency	Permit or Consultation/Authority	Agency Action	Outcome
U.S. Department of Transportation, Federal Highway Administration	Crossing Permit	Considers issuance of permits for crossing of federally funded highways	Allows pipeline projects to cross roadways
U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration	49 Code of Federal Regulations § 195, Transportation of Hazardous Liquids by Pipeline	Reviews design, construction, operation, maintenance, and emergency operation plan Inspects pipeline projects, including Integrity Management Programs, and identifies high consequence areas prior to installation	Prescribes safety standards and reporting requirements
	49 Code of Federal Regulations § 194, Response Plans for Onshore Pipelines	Requires a facility response plan that includes emergency response action plans, facility information, worst-case spill scenarios, and response training records	Establishes a facility response plan
	49 Code of Federal Regulations § 190, Pipeline Safety Programs and Rulemaking Procedures; 198, Regulations for Grants to Aid State Pipeline Safety Programs; 199, Drug and Alcohol Testing	Clarifies the procedures PHMSA follows in rule making and enforcement; describes regulations for grants to aid States that implement pipeline safety compliance programs; requires operators of pipeline facilities to establish programs for preventing alcohol misuse and to test employees for the presence of alcohol and prohibited drugs	Prescribes procedures, regulations and requirements for pipeline safety
State			
Nebraska Department of Environmental Quality[c]	Environmental Evaluation under Legislative Bill 4 and Legislative Bill 1161	Analyzes the environmental, economic, social, and other impacts associated with the Nebraska Reroute	Identifies environmental impacts and requires public involvement
	Nebraska Administrative Code, Title 126, Chapter 18 – Releases of Oil or Hazardous Substances	Oversight of spill response and remedial activities	Requires spill reporting, containment, and remediation
	Section 401 of the Clean Water Act Water Quality Certification	Considers issuance of the permit for stream and wetland crossings; required for Section 404 authorization	Protects water quality

Agency	Permit or Consultation/Authority	Agency Action	Outcome
	Nebraska Administrative Code, Title 117 – Nebraska Surface Water Quality Standards	Applies water quality criteria to protect downstream beneficial uses	Applies standards at all times to all surface waters of the state
	Section 402 of the Clean Water Act (National Pollutant Discharge Elimination System [NPDES])		
	▪ NPDES Construction Stormwater Permit NER110000	Considers issuance of a permit for projects that disturb more than 1 acre of land	Prevents or minimizes stormwater runoff during construction
	▪ NPDES Hydrostatic Testing Permit NEG672000 and Excavation Dewatering Permit NEG671000	Considers issuance of permits that regulate hydrostatic test water discharge and construction dewatering discharge to waters of the state	Controls pollutant discharges
	▪ NPDES Pesticide General Permit NEP100000	Considers issuance of permit for application of pesticides	Prevents pesticides from entering surface waters
	On-site Wastewater Permit or Wastewater Construction Permit (Title 124 if lagoon is under 1,000 gallons of wastewater per day; Title 123 if greater than 1,000 gallons per day)	Considers issuance of permit for a new wastewater treatment system	Allows construction of a wastewater treatment system at a construction camp
	Agricultural Chemical Secondary Containment Program (Nebraska Administrative Code, Title 198)	Requires that a Professional Engineer registered in Nebraska certify that facilities comply with Title 198	Necessary if fertilizer is stored in large containers in areas of remediation
	Solid or Hazardous Waste (Nebraska Administrative Code, Title 128 and Title 132)	Considers disclosure of waste products, containerization, and transportation to an appropriate disposal facility	Allows appropriate disposal of waste generated during construction
	Nebraska Administrative Code, Title 118 – Ground Water Quality Standards and Use Classifications	Regulates groundwater quality in Nebraska	Applies standards at all times to all groundwater of the state
	Nebraska Administrative Code, Title 118 – Ground Water Quality Standards and Use Classifications, Appendix B	Determines needed action for point-source pollution resulting from petroleum releases	Eliminates threats to public health and welfare

Agency	Permit or Consultation/Authority	Agency Action	Outcome
	Safe Drinking Water Act	Implemented by the Nebraska Department of Environmental Quality at the State level; provides drinking water standards	Applies standards at all times to all drinking water for the state, localities, and water suppliers
Nebraska Department of Agriculture	Food Safety and Consumer Protection Permit	Considers issuing a permit to operate a food establishment	Allows a food license at a construction camp
Nebraska Department of Health and Human Services	Permit to Operate Public Water System	Determines compliance with State regulations for public water systems	Permits operation of public water supply for a construction camp
	Public Water Systems (Nebraska Administrative Code, Title 179, Chapter 7)	Sets minimum vertical crossing requirements and separation distances for pipelines and any source of pollution, including fuel storage tanks	Avoids or minimizes contamination of drinking water by existing sources of pollution
Nebraska Department of Natural Resources[d]	Permit to Appropriate Surface Water	Considers issuance of permit to use surface water (for hydrostatic test water or dust control)	Permits water use during construction
	Interbasin Transfer of Surface Water	Considers issuance of permit for diversion of water from one river basin and the transportation of such water to another river basin for storage or for a beneficial use	Permits transfer of water if waters for hydrostatic testing are not released in the source basin
	Interbasin Transfer of Water Addendum to Application for a Permit to Appropriate Water	Considers adverse impacts and beneficial uses of the proposed interbasin transfers	Files an addendum along with an application for an appropriation of water that proposes transfer of water from one basin to another
	Petition for Leave to File an Application to Appropriate Water within a Moratorium or Stay Area (Variance Petition)	Considers issuance of permit to use surface waters where no new surface waters are being appropriated	Permits a variance from moratorium
Nebraska Department of Roads	Permit to Occupy Right-of-Way	Considers issuance of permits for crossing of State highways and State rights-of-way	Allows crossing of State highways, rights-of-way, and the Outlaw Trail Scenic Byway
Nebraska Game and Parks Commission	Consultation	Consults regarding impacts on State-listed threatened or endangered species, natural resources	Avoids, minimizes, or compensates for impacts on protected species

Agency	Permit or Consultation/Authority	Agency Action	Outcome
	Crossing Permit	Considers issuance of a permit to cross State-owned lands, such as the Cowboy Recreation and Nature Trail	Allows crossing of State-owned property managed by Nebraska Game and Parks Commission
Nebraska State Fire Marshall	Nebraska State Fire Code Regulations (Title 153)	Assesses compatibility with fire code regulations	Ensures compliance with State fire code regulations for a construction camp
Nebraska State Historic Preservation Office	Nebraska State Historical Society (Nebraska Revised Statutes §§ 82-101 to 82-132), Nebraska Archaeological Resources Preservation Act (Nebraska Revised Statutes §§ 82-501 to 82-510), Unmarked Human Burial Sites and Skeletal Remains Act (Nebraska Revised Statutes §§ 12-1201 to 12-1212), and consultation under Section 106 of the National Historic Preservation Act, including National Historic Trails	Reflects the interests of the State of Nebraska and the state's citizens in the preservation of their cultural heritage and advises and assists federal agencies in carrying out their Section 106 responsibilities	Allows the consideration of historic properties at all levels of planning and assists in the development of strategies to avoid, minimize, and/or treat impacts on cultural resources
State of Nebraska Board of Educational Lands and Funds	Notification and easement	Notifies Board of Educational Lands and Funds that State-owned lands will be crossed	Allows crossing of State-owned lands managed by Board of Educational Lands and Funds

Agency	Permit or Consultation/Authority	Agency Action	Outcome
Natural Resources District (NRD)			
Central Platte NRD	Request for Variance[e]	Considers issuance of permit to use groundwater where water rights are fully appropriated	Permits use of groundwater for construction
Lower Loup NRD	Well Construction Permit	Considers issuance of a permit for a well that pumps more than 50 gallons of water per minute	Permits use of groundwater for construction
Lower Niobrara NRD	Ground Water Well Permit	Considers issuance of a permit for a well that pumps more than 50 gallons of water per minute	Permits use of groundwater for construction
Lower Platte North NRD	Ground Water Well Permit	Considers issuance of a permit for a well that pumps more than 50 gallons of water per minute	Permits use of groundwater for construction
Upper Big Blue NRD	Authorization to Transfer Ground Water	Considers issuance of authorization to use groundwater	Permits use of groundwater for construction
Upper Elkhorn NRD	Ground Water Well Permit	Considers issuance of a permit for a well that pumps more than 50 gallons of water per minute	Permits use of groundwater for construction
	Request for Variance	Considers issuance of permit to use groundwater where water rights are limited for new development	Permits use of groundwater for construction
County			
Keya Paha County	Conditional Use Permit[f]	Considers issuance of permits for conditional use of land	Allows land use other than that designated by County, in this case a pipe storage yard or a pump station
	Building Permit	Considers issuance of permits for structures	Allows construction of buildings such as pump stations
Boyd County	Special Use Permit/ Conditional Use Permit	Considers issuance of permits for conditional use of land	Allows land use other than that designated by County
Holt County	Pipeline Construction Permit	Considers construction of a pipeline	Allows construction of an aboveground or belowground pipeline and requires a mitigation and reclamation plan

Agency	Permit or Consultation/Authority	Agency Action	Outcome
Antelope County	Building Permit	Considers issuance of permits for structures	Allows construction of buildings such as pump stations
	Floodplain Development Permit	Considers issuance of permits for development within a Federal Emergency Management Agency-designated floodplain	Allows construction of the pipeline within a designated floodplain, adjacent to the Elkhorn River
Boone County	None required[g]		
Nance County[h]	Conditional Use Permit	Considers issuance of permits for conditional use of land	Allows land use other than that designated by County
	Floodplain Development Permit	Considers issuance of permit for development or construction in a Federal Emergency Management Agency-designated floodplain	Prevents or minimizes changes to floodplain
	Building Permit	Considers issuance of permits for structures	Allows construction of buildings such as pump stations
	Request for Variance	Considers granting of a variance from Nance County zoning regulations	Allows construction not usually allowed under Nance County zoning regulations
	Soil Extraction Permit	Considers allowing soil extraction for commercial purposes	Allows soil removal
	Easement Filing	Accepts easement ownership changes	Files easement ownerships within the county
Merrick County	Conditional Use Permit[i]	Considers issuance of permits for conditional use of land	Allows land use other than that designated by County
	Zoning Permit	Considers issuance of a permit to allow zoning changes	Allows regulation of setbacks for buildings such as pump stations
	Floodplain Development Permit	Considers issuance of a permit for development or construction in a Federal Emergency Management Agency-designated floodplain	Prevents or minimizes changes to floodplain

Agency	Permit or Consultation/Authority	Agency Action	Outcome
Polk County	Zoning Permit	Considers issuance of a permit to allow zoning changes	Allows regulation of setbacks for buildings such as pump stations
	Floodplain Development Permit	Considers issuance of a permit for development or construction in a Federal Emergency Management Agency-designated floodplain	Prevents or minimizes changes to floodplain

[a] *Table 3-1 is not an all-inclusive list for the entire Keystone XL Pipeline from its entry into the United States to Steele City, Nebraska. It is a list of major licenses, approvals, and consultation requirements for the Nebraska Reroute only.*

[b] *The local Farm Service Agency offices are located in the following Nebraska communities: Ainsworth (Keya Paha and Rock Counties), O'Neill (Holt County), Neligh (Antelope County), Albion (Boone County), Fullerton (Nance County), and Central City (Merrick County).*

[c] *TransCanada Keystone Pipeline, LP (Keystone), provided notification to the Nebraska Department of Environmental Quality that the 20 emergency generators that would be constructed and operated at pump stations and mainline valve stations in Nebraska are exempt from air quality permits because their intended purpose is as emergency equipment to be used only under instances of power loss (see Appendix M of the Supplemental Environmental Report [Keystone, 2012b]).*

[d] *The Nebraska Department of Natural Resources had approved several applications by Keystone in 2009 for the original Keystone XL Pipeline project. They have all been cancelled (personal communication, C. Southwick, August 10, 2012).*

[e] *Portions of Nance and Merrick Counties have moratoriums on surface water appropriations.*

[f] *Keya Paha County issued a conditional use permit for a pipe storage yard in March 2010, valid for 3 years. Keystone would then need to apply for an extension (personal communication, D. Kienke, August 1, 2012).*

[g] *Boone County does not have regulations for pipelines (personal communication, K. Benson, August 1, 2012).*

[h] *Nance County is revising its planning and zoning regulations. Keystone should contact the County prior to obtaining permits to determine what the updated regulations would require (personal communication, N. Sharman, August 2, 2012)*

[i] *Merrick County approved a conditional use permit for a pump station on July 13, 2010 (personal communication, J. Myers, August 2, 2012).*

Keystone is responsible for obtaining all necessary permits, licenses, approvals, and consultations prior to construction. Keystone must coordinate with all affected federal, State, local, and regional agencies because requirements may change at any time.

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CHAPTER 4

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

The Nebraska Legislature's directive to NDEQ states, "Evaluate any route for an oil pipeline within … the state … for the stated purposes of being included in a federal agency's or agencies' National Environmental Policy Act review process. Any such evaluation shall include … an analysis of the environmental, economic, social, and other impacts associated with the proposed route." This chapter presents the results of NDEQ's evaluation.

The Nebraska Reroute would pass through nine Nebraska counties and would cross a wide variety of environmental conditions. In the northern portion, soils are fragile and susceptible to erosion. Through the middle portion of the pipeline alignment, the environment consists of rich, irrigated farmlands typified by thousands of acres of corn and soybeans. Through the Platte River valley, the land is still heavily used for agricultural purposes although water tables are high (only a few feet below ground surface). Then the land transitions back to rich farmland and deep water tables in Polk and York Counties. In this chapter, NDEQ describes the environment crossed by the Nebraska Reroute—its soils and geology, its water and economy, and other resources in Nebraska. NDEQ also describes how the Nebraska Reroute could affect those resources, from short-term effects during construction to long-term effects associated with reclamation and restoration after construction.

The scope of the analysis has been defined to concentrate on issues that are most relevant to the citizens of Nebraska. To meet this objective, a number of sources were used, including written agency and public comments, comments received at public meetings as documented in the *Feedback Report* (NDEQ, 2012a), and additional information provided in the August 2011 Final EIS (DOS, 2011a) and the September 2012 SER (Keystone, 2012b). The SER identified Keystone's preferred corridor and is the subject of this analysis.

Planning and environmental studies for this project have been ongoing since 2008. Since then, Keystone has made a broad range of commitments to DOS to take steps during construction and operation that will help reduce or avoid short- and long-term impacts. Many of these commitments are contained in Keystone's CMRP, which was included with the SER (Keystone, 2012b). Still others are enumerated in the DOS Final EIS (2011a) or in Keystone's Presidential Permit Application (Keystone, 2012c).

Keystone has committed to NDEQ that the previous agreements with DOS would be honored. NDEQ has agreed and considers those commitments as part of the Nebraska Reroute project. In discussing impacts on the many resources considered in this chapter, NDEQ first identifies the potential impact of the Nebraska Reroute and then describes the measures Keystone would implement to avoid, minimize, or compensate for the impact.

Information on the existing condition of each resource was compiled from the most recent data available—published and unpublished reports, land use plans, maps, and agency databases. Field reconnaissance was conducted where possible to review baseline resource conditions within the study corridor, as needed, and to verify land use and visual resources data. Following

the initial inventory effort, federal, State, and local resource management agencies were contacted to refine and verify or supplement information. Resource inventories were developed in sufficient detail for NDEQ to assess potential impacts that could result from project implementation. While the impact analyses specifically address impacts on the existing environment within the reroute alignment, resource data have also been collected outside of the corridor to provide regional context. The ROW width for the Nebraska Reroute—and the focal point of the study—is generally 110 feet (corresponding to the width of the temporary easement), which incorporates the typical 50-foot-wide permanent easement. There may, however, be variation in each of the resource disciplines, depending on the potential impact area. Variation in the study areas is identified, where applicable, in each resource section of this chapter. Additional temporary work areas are also needed at wetland and stream crossings, roads, and at three new pump stations along the route.

In its SER, Keystone proposed a minor adjustment to the Keystone XL Pipeline alignment near the town of Western, Nebraska, in Saline and Jefferson Counties. This adjustment was made to move the pipeline away from the new WHPA for Western. The resources impacts of this adjustment are very similar to those described in the Final EIS, and are not repeated in NDEQ's Draft Evaluation Report. However, the impacts of this adjustment are discussed in the Groundwater Section (4.3) because the impacts of the new alignment are reduced from those described in the Final EIS.

4.1 GEOLOGY

Geology is an important factor in considering the potential for the proposed Nebraska Reroute to affect the environment. Geological conditions determine the depth at which the pipeline would be placed, the location of groundwater, and the migration pathways that spilled substances would follow if pipeline leaks were to occur. Furthermore, geological hazards and the locations of mineral and paleontological resources are important considerations in routing the pipeline and protecting it from natural hazards.

This section provides an overview of the relevant geologic conditions and describes the potential environmental impacts of constructing, operating, and maintaining the proposed Nebraska Reroute. For a detailed discussion of the geologic conditions along the Nebraska Reroute, see Appendix E.1.

4.1.1 Existing Conditions

The proposed Nebraska Reroute would pass through the eastern third of Nebraska. Nebraska is located in the High Plains portion of the Great Plains physiographic province, an area that extends from southern South Dakota to northwestern Texas. The landscape of this region is described as a large, eastwardly tilted surface formed by weathered material from the Rocky Mountains and deposits of volcanic debris from the west. The High Plains Aquifer is, in large part, a product of these erosion and depositional processes over the Cenozoic Era,[1] which began 33.9 million years ago.

[1] Geologic time is divided and subdivided into various categories. Eras are divided into periods and epochs. Presently, Earth is considered to be in the Quaternary Period of the Cenozoic Era (Recent Epoch).

During this period, large quantities of sediment were eroded from the mountains and the plains. Expansive, braided streams transported large quantities of silt, sand, and gravel and deposited these sediments in stream valleys and terraces. Winds also transported sand and silt from the stream valleys and deposited them as dune sand and loess over large parts of the High Plains. Nebraska is almost entirely covered by sand and gravel, silt, and clay of the Quaternary Period. Rocks underlying the surface material are sedimentary, originating in the earlier Cretaceous and Tertiary Periods (see Appendix E.1).

Surface and Bedrock Geology along the Proposed Nebraska Reroute

Major surface deposits along the proposed Nebraska Reroute are alluvium (material deposited by a stream or body of moving water), loess (windblown silts), eolian deposits (windblown sands), and colluvium (material deposited or built up at the bottom of a low-gradient slope) (U.S. Department of the Interior, U.S. Geological Survey [USGS], 2012a). The central and southern sections of the proposed Nebraska Reroute are largely overlain by loess. Sandy soils are found along the northern portion of the route. The underlying bedrock consists of the Cretaceous-age sedimentary Carlile Shale, Niobrara Formation, and Pierre Shale and the Tertiary-age White River, Arikaree, and Ogallala Groups.

Mineralogical Resources

The major mineral resource along the proposed Nebraska Reroute is aggregate (sand and gravel) used for road construction, concrete, and other building applications. There is no current oil, natural gas, coal, or other mineral mining activity along the Nebraska Reroute (Nebraska Oil and Gas Conservation Commission, 2008; USGS, 2008a).

Paleontological Resources

Paleontological resources are physical remains of plant and animal species that have mineralized into or left impressions in solid rock. During the public information meetings held by NDEQ, Nebraska residents expressed concerns about these resources. The surface geologic deposits could have identifiable fossils, as could the bedrock along the proposed Nebraska Reroute.

Surface deposits could be found within the Quaternary-age deposits (Keystone, 2012b). Fossils that could be found in the alluvial deposits include ostracod carapaces, clams, and aquatic and terrestrial snails. Fossilized evidence of horses, camels, and mammoths could be found in the loess deposits (Diffendal et al., 1996).

Nebraska's bedrock is all sedimentary in origin and therefore potentially fossil-bearing. Nebraska's fossil-bearing beds are very diverse and contain mammals such as four-tuskers and mastodons of Tertiary age; clams, oysters, saltwater fish such as sharks and marine reptiles such as plesiosaurs of Cretaceous age; and marine invertebrate fossils, including corals, sea lilies and lamp shells of Pennsylvania-age (Voorhies, 1994).

Northern Antelope County has a significant paleontological resource. Numerous vertebrates—including three-toed horses, rhinos, camels, and other animals—are preserved at the Ashfall Fossil Beds State Historical Park, which is about 7 miles northeast of the proposed Nebraska Reroute. Nearly 12 million years ago (Miocene Epoch), these vertebrates were buried by volcanic ash, which preserved the skeletons until they were discovered in the 1970s. Fossils in this area may be found in the Upper Cretaceous bedrocks (Niobrara Formation, Pierre Shale, and

Carlile Shale). Fossils found in these formations could include ammonites, gastropods, fish, mosasaurs, bivalves, sea turtles, and sharks. Tertiary bedrock (Ogallala Group) could contain fossils of horses, rhinoceroses, proboscideans, mammoths, and other ruminants.

Geologic Hazards[2]

Seismic Hazards

Seismic hazards include faults, seismicity, and ground motion hazards. Collectively, these three phenomena are associated with seismic hazard risk. Faults are defined as a fracture along which blocks of earth materials on either side of the fault have moved relative to each other. An active fault is one with demonstrable evidence of having moved within the last 10,000 years (USGS, 2008b). Seismicity refers to the intensity and the geographic and historical distribution of earthquakes. Ground motion hazards are defined as movement of the earth's surface as a result of earthquakes (USGS, 2008b).

Seismically, Nebraska is in a relatively quiet and stable part of the continent. Eastern Nebraska historically has had minimal earthquake activity (USGS, 2008b). Earthquakes in Nebraska have ranged in magnitude from 2.8 to 4.3, as measured on the Richter magnitude scale. The ancient Nemaha Uplift, the Humboldt Fault Zone, and deep-sealed faults in the Salina Basin are thought to be related to the few minor earthquakes that have occurred. There are no active faults along the proposed Nebraska Reroute (Crone and Wheeler, 2000; USGS and Montana Bureau of Mines and Geology, 2006). USGS ground motion hazard mapping indicates that the potential ground motion hazard along the proposed Nebraska Reroute is low.

Landslides

Landslide is a term used to identify various processes involving the movement of earth material down slopes (USGS, 2004). Landslides can occur in a number of different ways in different geological settings. Large masses of earth can become unstable and can be pulled downhill by the force of gravity. Instability can be caused by a combination of steep slopes, periods of high precipitation, undermined support by natural processes (stream erosion), or unintentional undercutting or undermining the strength of unstable materials during the construction of roads and structures (USGS, 2004).

Landslide potential is greater on steeper slopes. The Cretaceous Pierre Shale (such as is found in Keya Paha, Boyd, and Holt Counties along the proposed Nebraska Reroute) is especially susceptible to landslides. The Pierre Shale contains some layers rich in volcanic ash, which weaken the rock and make it even more susceptible to movement. The Pierre Shale can also contain appreciable amounts of bentonite (clay), which can expand dramatically when exposed to moisture and can cause soil and/or geologic formations to become unstable (University of Nebraska–Lincoln [UNL], 2012a).

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[2] Flooding, also considered a geologic hazard, is discussed in Section 4.4.

Subsidence

Land-surface subsidence can result from the following causes:

- Mining of groundwater that causes aquifers to compact
- Drainage of organic soils
- Collapse of subsurface cavities (Galloway et al., 2000)

Along the proposed Nebraska Reroute, the ground surface is not susceptible to subsidence because of the lack of historical declines in groundwater levels that would have caused aquifers to compact. There is also a very limited extent of organic soils and relatively shallow bedrock with cavernous features.

Subsidence can also occur in areas of karst, but no known karst features are present along the proposed Nebraska Reroute.

4.1.2 Potential Impacts

The proposed Nebraska Reroute would be constructed approximately 7 feet below the ground surface, except where crossings using HDD or conventional boring methods (such as under a highway or railroad track) would be used. In this section, impacts are assessed on the geological, mineralogical, and paleontological resources that would be found within this near-surface layer. The potential for geological conditions along the route that would add to the vulnerability of the pipeline are also assessed.

The potential impacts on geology in the proposed Nebraska Reroute corridor could occur during both the construction and operational phases. The following impacts have been identified:

- Disturbance of topography
- Loss of access to underlying mineral resources
- Disturbance of paleontological resources
- Potential damage to the pipeline attributable to geological hazards

Topography

Construction

Construction impacts would include disturbances to the topography along the Nebraska Reroute resulting from grading and trenching. Most of the Nebraska Reroute would be within areas where bedrock is buried by unconsolidated sediments consisting of alluvium, loess, and/or eolian deposits.

Keystone has stated that "there appears to be some shallow bedrock, but [it] is very limited in length along the preferred alternative route … which could necessitate ripping or blasting" (Keystone, 2012b) In shallow bedrock areas, impacts to bedrock are expected to be minimal and limited to areas where bedrock is within 8 feet of the surface. Trench excavation would typically be to depths of between 7 and 8 feet (DOS, 2011a).

Operation

Routine pipeline operation and maintenance are not expected to affect topography or bedrock geology.

Mineralogical Resources

Construction

Gravel and other borrow materials might be needed for trench excavations and temporary sites. Trenches excavated for placement of the pipeline are expected to be between 7 and 8 feet deep. The pipeline trench would typically be backfilled with materials derived from trench excavation, but it might be necessary to obtain construction sand and gravel from local commercial sources for use as pipe bedding in certain sections, as road base, or for graveling of aboveground facilities such as the pump stations or valve sites or temporary sites (construction camp, storage, contractor yards, and temporary access roads). Construction materials might also be needed to stabilize the land for permanent facilities, including pump stations, MLVs, and permanent access roads.

Keystone expects that borrow materials would be obtained from an existing, previously permitted commercial source located as close to the pipeline or contractor yard as possible. These short-term demands for sand and gravel would not substantially affect the long-term availability of construction materials in the area.

Operation

Operation of the proposed Nebraska Reroute would limit future access to sand, gravel, clay, and stone resources that would be within and adjacent to the permanent pipeline easement.

Paleontological Resources

Construction

Potential impacts on paleontological resources during construction include damage or destruction of fossils by excavation activities, erosion of fossil beds by grading, and unauthorized collection of fossils. Fossils or other paleontological resources found on private land would be recovered only with approval of the landowner, and, for this reason, they might be unavailable for scientific study.

Operation

Routine pipeline operation and maintenance are not expected to affect paleontological resources. No additional disturbance or loss of unique geologic features or scientifically important fossils would occur.

Geologic Hazards

Construction

Seismic

Seismic activity, if any, would be unlikely to affect construction activities or vice versa because the proposed Nebraska Reroute would not cross any known active faults.

Landslides

The main hazard of concern during pipeline construction would be unintentional undercutting of slopes or construction on steep slopes, thereby causing or contributing to instability that could lead to landslides. Other hazards might result from construction on the Cretaceous Pierre Shales that contain bentonite beds. The high swelling hazard might cause slope instability during periods of precipitation.

Along the proposed Nebraska Reroute, potentially unstable soils or geologic formations are present at crossings of the Keya Paha and Niobrara Rivers. The Pierre Shale is exposed in the northern part of Nebraska where the Keya Paha and Niobrara Rivers eroded overlying deposits. The Pierre Shale is susceptible to slumps and slides and cannot support slopes greater than 10 percent. Layers rich in volcanic ash are particularly unstable (Maher et al., 2003).

During construction activities, vegetation clearing and alteration of surface drainage patterns could also increase landslide risk.

Subsidence

Construction of the pipeline is not expected to cause land subsidence because no known karst or other subsidence-prone geologic features are present along the proposed Nebraska Reroute.

Operation

Seismic

Based on evaluation of potential seismic hazards along the proposed Nebraska Reroute, the risk of potential impact to the pipeline from earthquake ground motion is considered minimal. The Nebraska Reroute would not cross any known active faults and would be located outside of known zones of high seismic hazard.

Landslides

Routine pipeline operation and maintenance are not expected to cause landslides.

Subsidence

Routine pipeline operation and maintenance are not expected to cause subsidence.

4.1.3 Commitments to Reduce or Avoid Impacts

Keystone has committed to avoid or reduce impacts by implementing a CMRP (see Appendix C). The CMRP prescribes construction, operation, and maintenance procedures that are designed to reduce the likelihood and severity of impacts along the proposed Nebraska Reroute. Keystone has committed to implementing construction, mitigation, and reclamation actions in the CMRP to the extent that they do not conflict with the requirements of any applicable federal, State, or local rules and regulations, or other permits and approvals applicable to the project. The CMRP includes the following commitments by Keystone:

- Keystone has committed to reasonably compensate landowners for damages to private property caused by construction and operation of the Nebraska Reroute and caused by future activities associated with maintenance and repairs to the pipeline.
- Keystone has committed to consult with the appropriate Nebraska regulatory agency on the applicability and requirements for Paleontological Resource Protection Plans and will prepare and file plans addressing vertebrate fossils, as required.
- Keystone has committed to incorporate the 57 Special Conditions recommended by PHMSA (see Appendix F.2). Several of these conditions address design and manufacturing considerations that would minimize the likelihood of pipeline accidents caused by seismic activity.
- Keystone has committed to adopt local route variations to avoid areas with high landslide potential, particularly areas with slopes greater than 15 percent and with unstable soil or rock conditions. If rerouting the pipeline were not practicable, Keystone has committed to implement measures that would decrease landslide risks.

4.2 SOILS AND SEDIMENT

Soil is a natural body made up of solids (minerals and organic matter), liquid, and gases and that occurs on the land surface and occupies space. Soil is characterized by its horizon development (layering) and by its ability to support rooted plants.

This section provides an overview of relevant soils and sediment conditions and describes the potential environmental impact associated with construction, operation, and maintenance of the proposed Nebraska Reroute. For a detailed discussion of native soils along the Nebraska Reroute, refer to Appendix E.2.

4.2.1 Existing Conditions

Soils are formed during naturally occurring, external processes constantly taking place on the Earth's surface (NRCS, 2012a), as follows:

- **Addition** – placement or reaction of materials in soil
- **Loss** – removal of material physically by water or wind from its original position
- **Transfer** – movement of material downward in the soil by water and wind
- **Transformation** – alteration of rock or soil by physical, chemical, or biological processes

The five natural factors that influence soil formation are (NRCS, 2012a):

- **Climate** – Precipitation and temperature variations are the most important climatic elements that affect soil formation. These factors cause different patterns of weathering and leaching (Gutentag et al., 1984).
- **Slope/Topography** – The degree, or relative steepness, of a slope affects the rate at which water seeps into soil, the rate of surface runoff and its associated soil erosion, and also the distribution of vegetation (Krzic et al., 2004). The proposed Nebraska Reroute would be located within two Land Resource Regions associated with soil resources (DOS, 2011a; NRCS, 2006). From north to south, these are Western Great Plains Range and Irrigated Region and the Central Great Plains Winter Wheat and Range Region.
- **Parent material** – Parent material is the original material from which a soil forms. In Nebraska, most bedrock (limestone, sandstone, and shale bedrock formations) is covered by more recent geologic materials that include glacial deposits, windblown minerals, or materials moved by water (UNL, 1999).
- **Biological factors** – Soil development is affected by both the type and number of organisms that live within the soil and on the surface. Vegetation and microorganisms are the most abundant living organisms in the soil and influence the kind of soil developed. Grassland soils tend to be darker, particularly to greater depths, and have a more stable structure than forest soils. Most Nebraska soils were formed beneath grasses (UNL, 1999).
- **Time** – The interaction of all the factors that affect soil formation over time.

Soil Associations

NRCS soil survey geographic databases (NRCS 2012b, 2012c, 2012d, 2012e, 2012f, 2012g, 2012h, 2012i, 2012j) were used to create a soil association inventory map for the proposed Nebraska Reroute. A soil association is a landscape that has a distinctive pattern of soils. An association normally consists of one or more major soils (from which it is named) and at least one minor soil. Figure 4.2-1 shows soils located in the nine counties that would be crossed by the proposed Nebraska Reroute. Seventeen individual soils associations would be crossed by the Nebraska Reroute (see Table 4.2-1). A soil key is provided to relate colors on the figure to soil associations crossed by the Nebraska Reroute (see Figure 4.2-1).

The major soil associations that would be crossed by the Nebraska Reroute are discussed in the following section (see Figure 4.2-1). Detailed soil tables for each county can be found in Appendix E.2.

Although the proposed Nebraska Reroute would be located outside of the Sand Hills, areas of fragile, sandy soils with surface features very similar to soils found in the Sand Hills (such as the Valentine Association) are present within the corridor (see Figure 1.1-3). Valentine soils consist mainly of eolian, well-sorted sands and sandy alluvium, with a smaller amount of loess and glacial outwash. Topsoil is typically sand mixed with organic matter, and the top 6 inches contains vegetative root systems and the native plant seed bank. Soils in the Valentine Association are generally very deep, excessively drained to somewhat poorly drained with intermittent wetland depressions. Rolling-to-hilly sand dunes, common in this area, have been stabilized by vegetative cover, where such cover exists (DOS, 2011a). Segments of the proposed Nebraska Reroute crossing Valentine soils can be found in Boyd, Holt, Antelope, and Nance Counties.

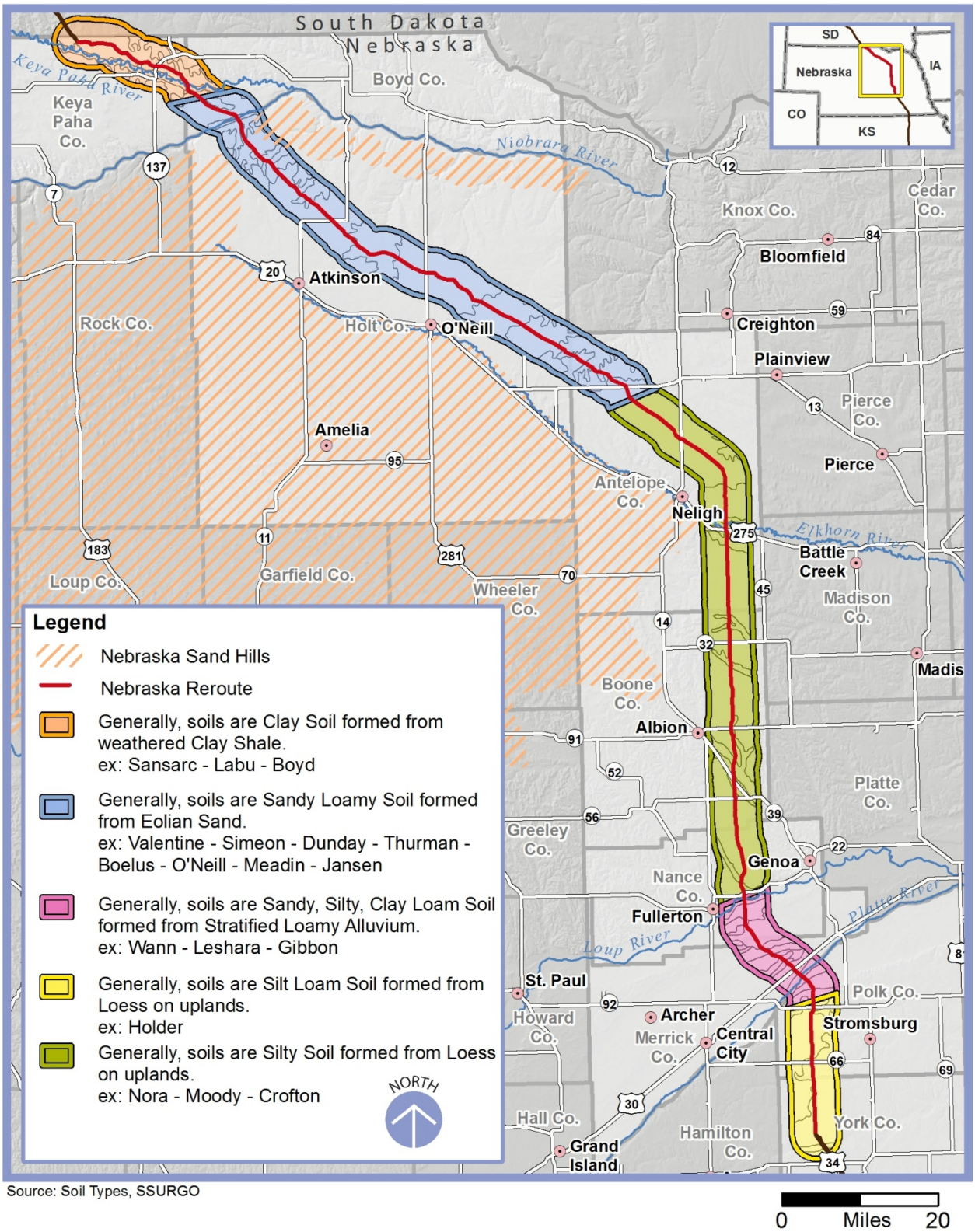
In the southern portion of the proposed Nebraska Reroute (Polk and York Counties), soils are characterized by deep loess deposits. These soils are well-drained and are mostly silty.

Table 4.2-1. Soil Associations within the Proposed Nebraska Reroute Corridor

Soil Association	Soil Type	Acreage[a]	Linear Miles[b]
Reliance	Silty Clay Loam	8.8	0.7
Sansarc	Clay	240.6	18.2
Loup	Sandy	58.2	5.0
Valentine	Sandy	526.9	39.5
O'Neill	Sandy	368.1	27.7
Simeon	Sandy	132.9	10.0
Thurman	Sandy	130.3	9.8
Wewela	Sandy Loam	38.0	2.9
Nora	Silty	535.9	40.3
Hord	Silt Loam	166.5	12.7
Wann	Sandy Loam	87.2	6.7
Platte	Sandy	13.5	1.6
Wood River	Silt Loam	15.4	1.2
Hastings-Fillmore	Silt Loam	125.5	9.4
Holder	Silt Loam	106.4	8.0
Uly-Coly	Silt Loam	19.7	1.5
Water	Not applicable	1.0	1.0

[a] *Determined by using maps and digital measuring tools, using a study corridor 110 feet in width. An additional 230 acres will be crossed within the temporary work space and pump station areas.*
[b] *Determined by using maps and digital measuring tools.*

Figure 4.2-1. Soil Associations along the Proposed Nebraska Reroute



Source: Soil Types, SSURGO

A baseline evaluation using the NRCS soil survey geographic database (NRCS, 2012b, 2012c, 2012d, 2012e, 2012f, 2012g, 2012h, 2012i, 2012j) was completed to identify existing soil conditions that could be adversely affected during construction and operation of the proposed Nebraska Reroute. The soil conditions identified include erodibility, hydric nature, compactibility, stone/rock/gravel content (see Appendix E.2 for a definition), drought-prone nature, and revegetation potential.

Highly Erodible Soils

If stabilizing vegetation is removed or damaged, highly erodible soils are prone to high rates of erosion when exposed to wind or water. The wind erodibility group and soil water erodibility factor were evaluated for the proposed Nebraska Reroute.

The wind erodibility group is a grouping of soils with similar properties that affect their susceptibility to being blown in cultivated areas (NRCS, 2012a). Soils with a wind erodibility group 1 or 2 are considered highly wind erodible. Soils that are highly susceptible to erosion by wind were identified in Keya Paha, Holt, Antelope, and Merrick Counties (see Figure 4.2-3). The primary soil in these counties is fine-grained sand.

Soil water erodibility factor is used to quantify the susceptibility of soil to being detached and moved by water. Soils with a water erodibility factor greater than 0.24 are considered highly water erodible (Keystone, 2012b).

Soils that are highly susceptible to erosion by water were identified in the central portion of Holt County, the southeastern portion of Antelope County, and across Boone, Nance, Polk, and York Counties (see Figure 4.2-2). These soils are sandy soils in Holt County and loess soils in the other identified counties.

Hydric Soils

Under normal conditions (average yearly temperature and precipitation), hydric soils are saturated for a sufficient period of time during the growing season to support the growth of plants that thrive in wet conditions (hydrophytic vegetation). Hydric soils were identified primarily in Boyd, Holt, Polk, and York Counties (see Figure 4.2-4).

Drought-prone Soils

Drought-prone soils are defined by texture designations that affect the soil moisture-holding capacity and generally are relatively coarse-grained soils that lack silt and clay needed to hold moisture, or soils that have an extremely high clay content.

Drought-prone soils were identified in Keya Paha, Boyd, Holt, Antelope, and Merrick Counties (see Figure 4.2-5). Drought-prone soils are concentrated along the southern border of Keya Paha and Boyd Counties, across the northern half of Holt County, in the northwestern corner of Antelope County, and across Merrick County.

Stony/Rocky/Gravelly Soils

Stony/rocky/gravelly soils were identified in Keya Paha, Boyd, Holt, Antelope, and Merrick Counties (see Figure 4.2-6). Along the proposed Nebraska Reroute, only gravelly soils are found.

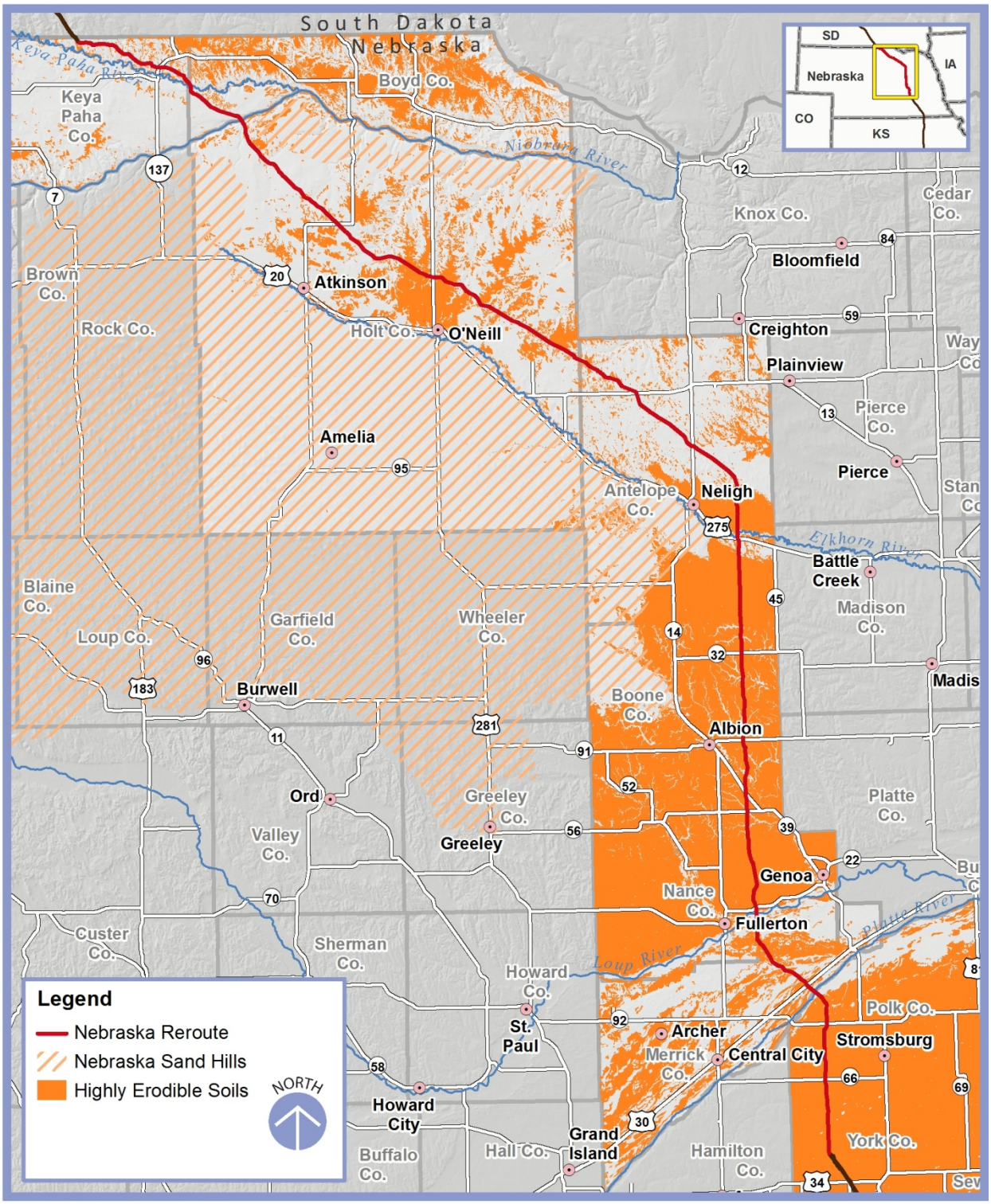
Compaction-prone Soils

The degree of compaction depends on the moisture content and texture of the soil. Soils identified as compaction-prone are subject to rutting and displacement (DOS, 2011a). Compaction-prone soils were identified along the entire Nebraska Reroute, but are concentrated in Antelope, Boone, Nance, Polk, and York Counties (see Figure 4.2-7).

Low Revegetation Potential

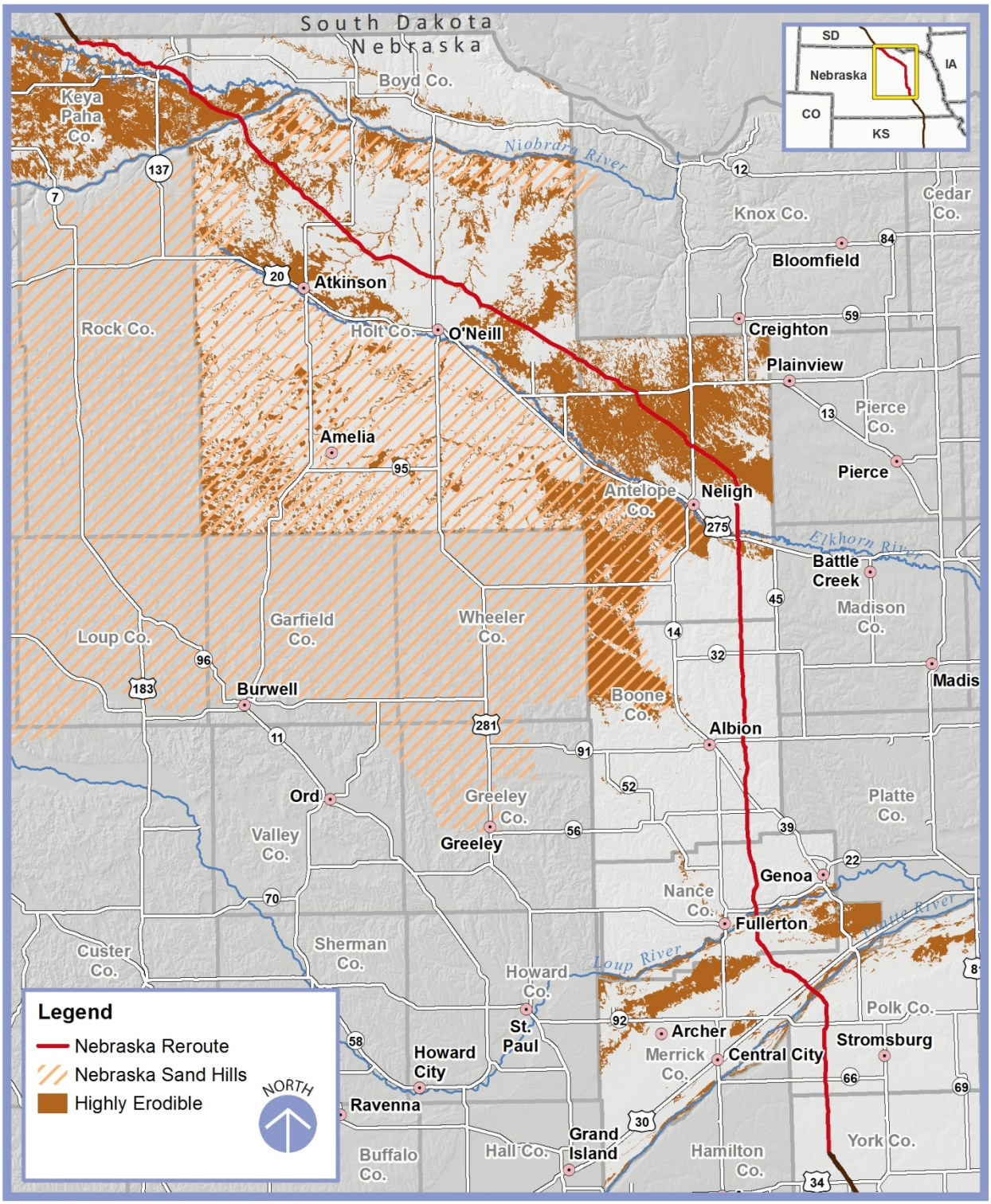
Low-revegetation potential soils contain suitable growing conditions in the topsoil horizon and upper subsoil horizons (layers immediately underlying the topsoil), but contain undesirable soil conditions at greater depths that could degrade agricultural capability if not managed properly (DOS, 2011a). These soils were identified in Nance, Merrick, Polk, and York Counties (see Figure 4.2-8).

Figure 4.2-2. Highly Erodible Soils (by Water) along the Proposed Nebraska Reroute



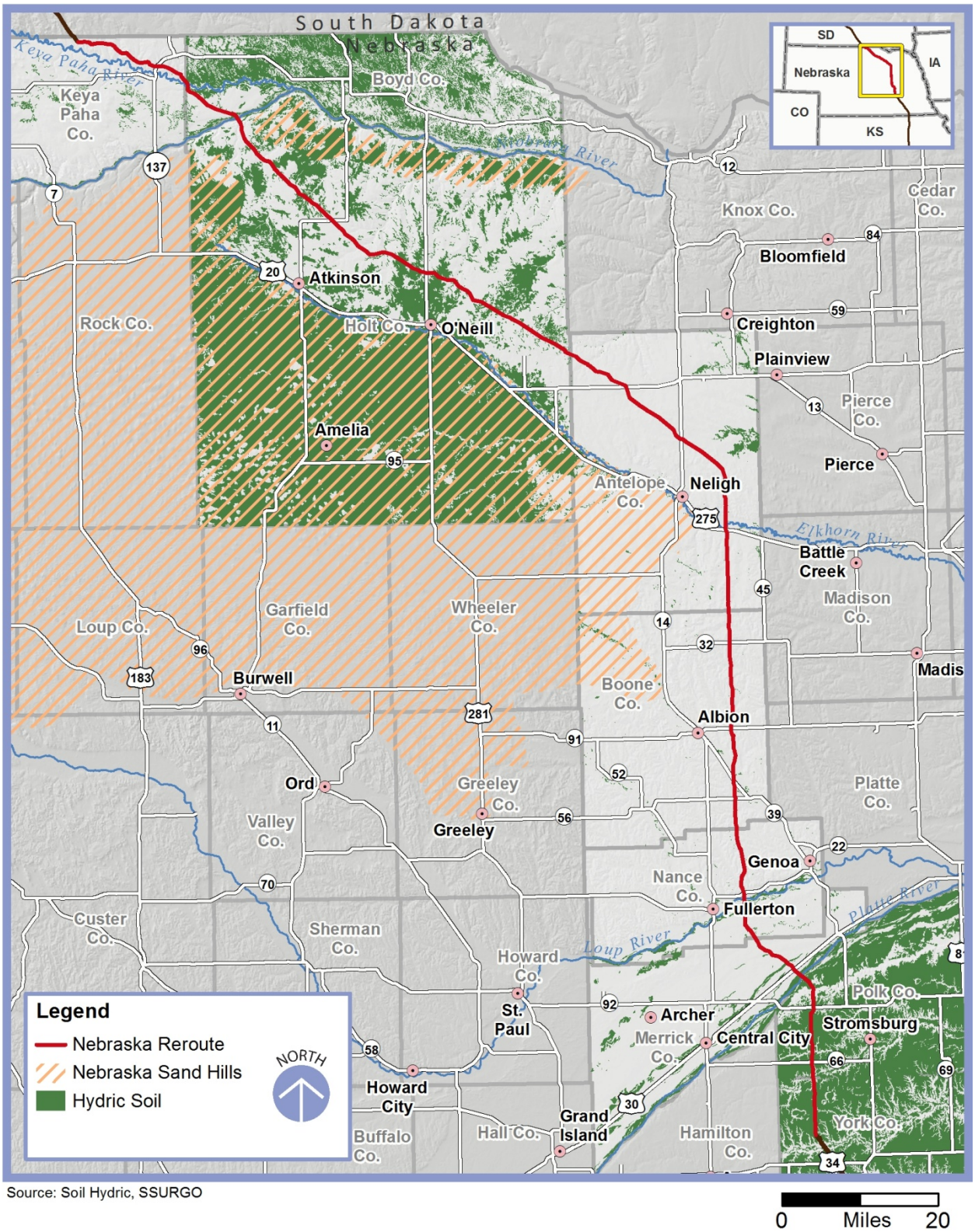
Source: Soil KwFactor, SSURGO

Figure 4.2-3. Highly Erodible Soils (by Wind) along the Proposed Nebraska Reroute



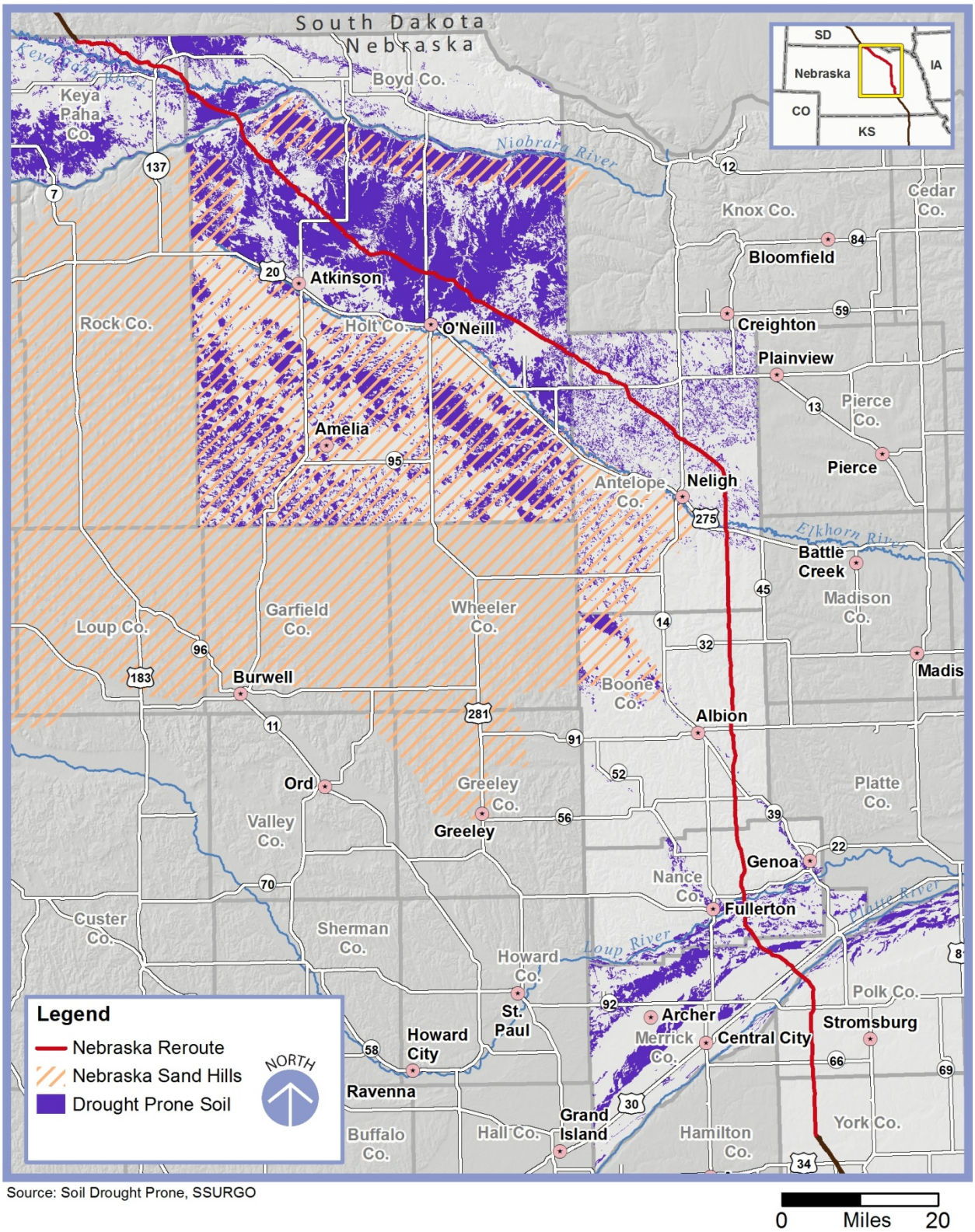
Source: Soil Wind Erodability Group, SSURGO

Figure 4.2-4. Hydric Soils along the Proposed Nebraska Reroute



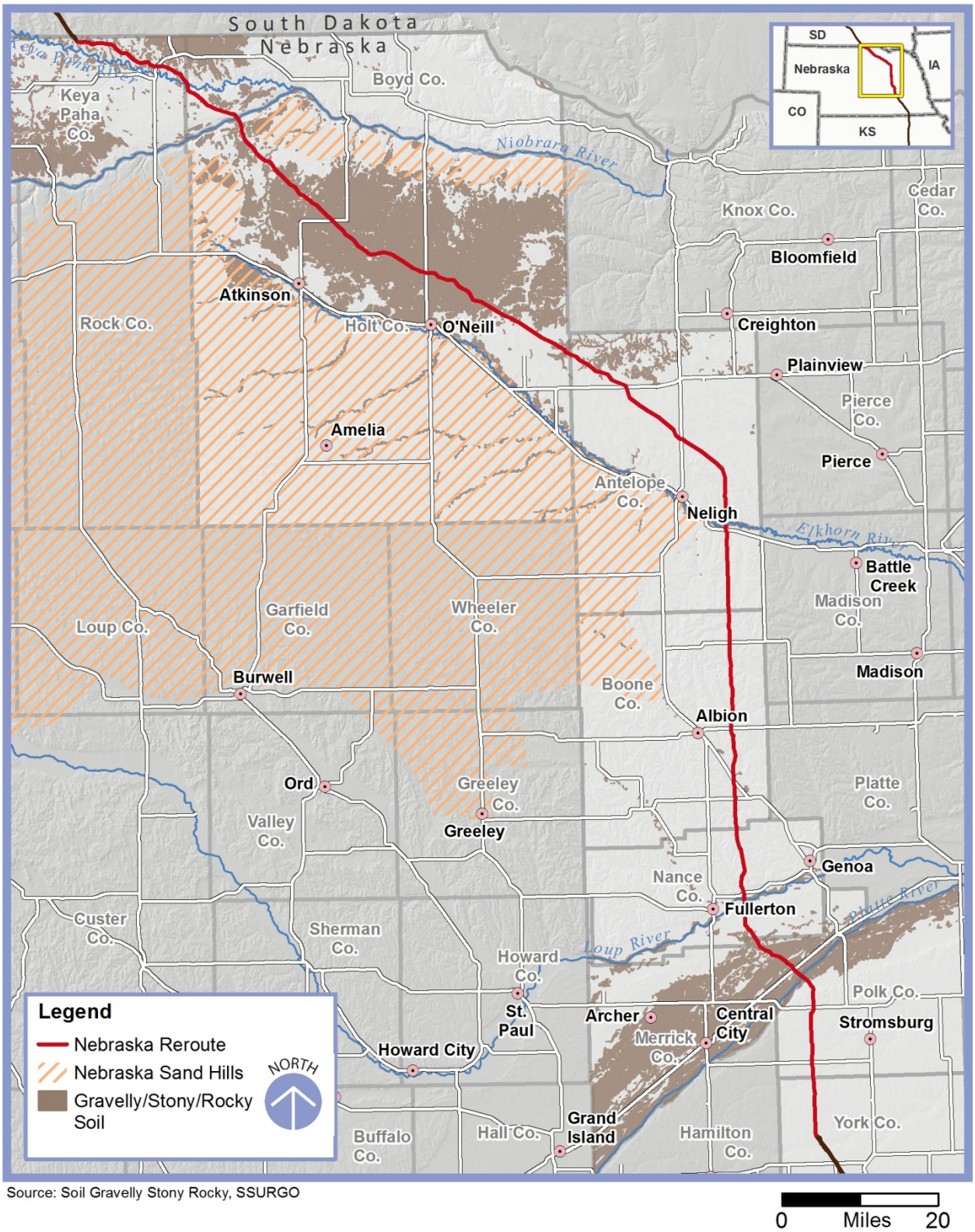
Source: Soil Hydric, SSURGO

Figure 4.2-5. Drought-prone Soils along the Proposed Nebraska Reroute



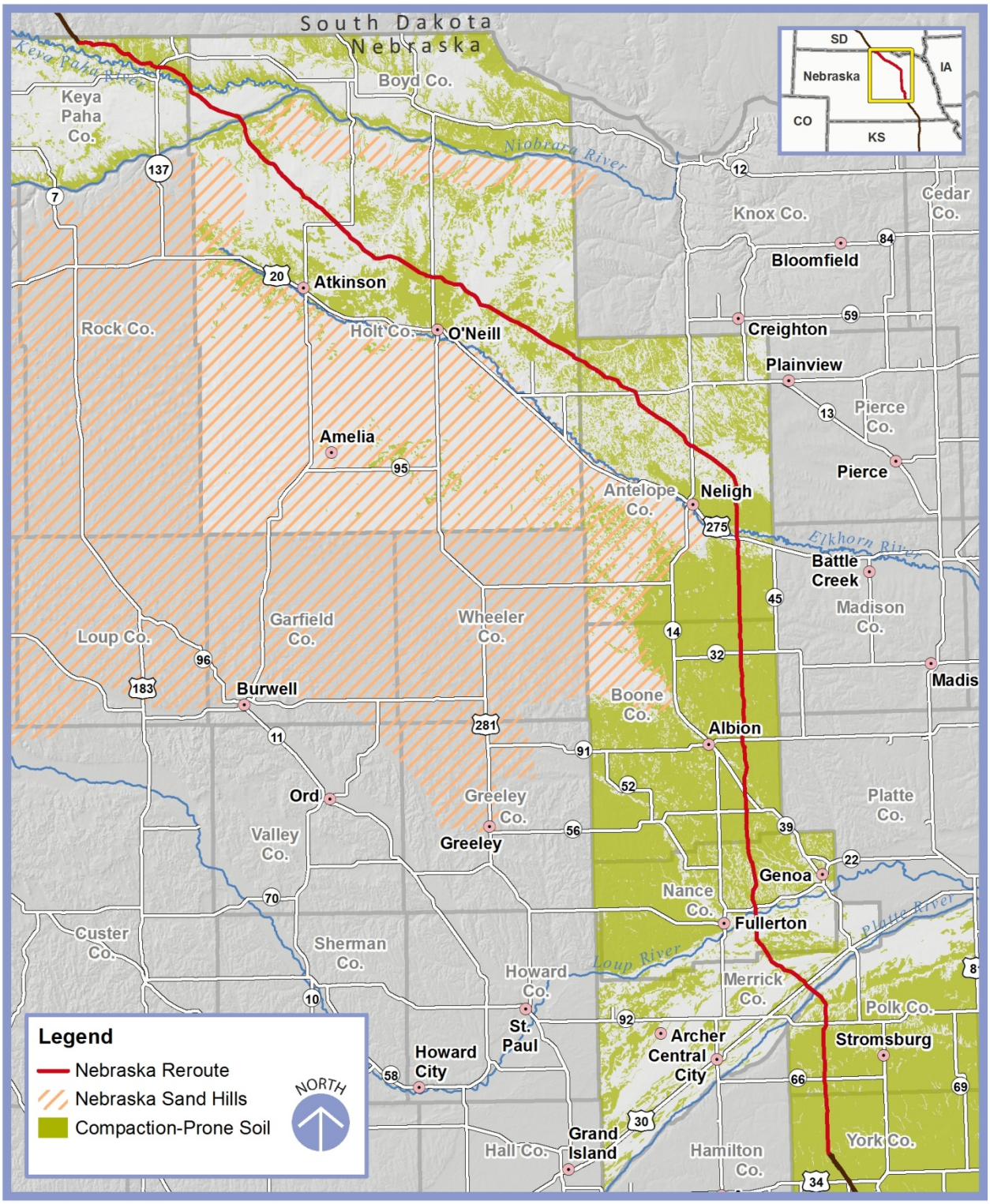
Source: Soil Drought Prone, SSURGO

Figure 4.2-6. Gravelly/Stony/Rocky Soils along the Proposed Nebraska Reroute



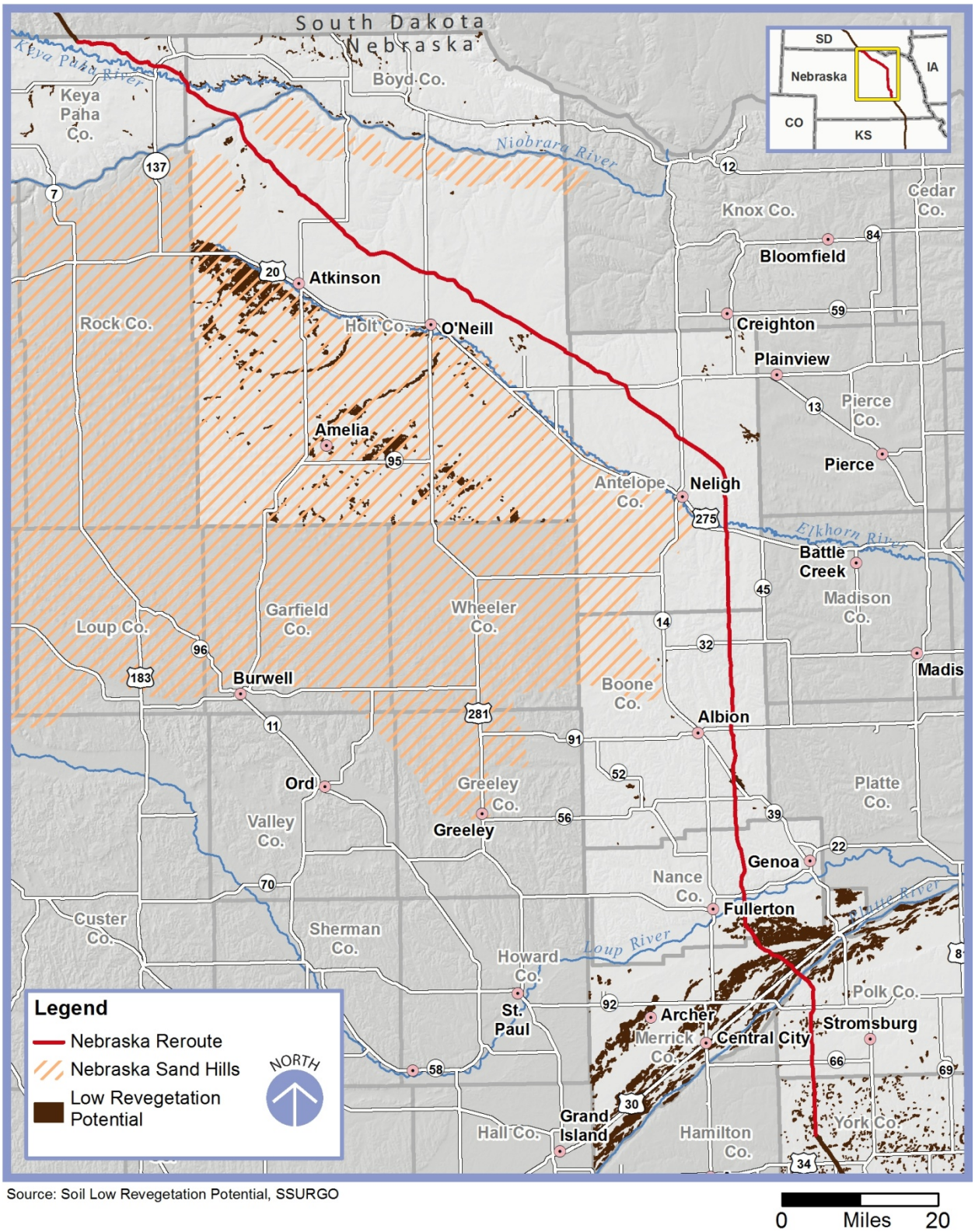
Source: Soil Gravelly Stony Rocky, SSURGO

Figure 4.2-7. Compaction-prone Soils along the Proposed Nebraska Reroute



Source: Soil Compaction Prone, SSURGO

Figure 4.2-8. Low-revegetation Potential Soils along the Proposed Nebraska Reroute



Source: Soil Low Revegetation Potential, SSURGO

Soil Temperatures

Farm and ranch operators along the proposed Nebraska Reroute expressed concern about the possible effects the proposed pipeline would have on soil temperatures. Soil temperatures are measured daily by the NRCS at a network of hydrometeorological stations across the United States. These measurements are recorded for depths of 2, 4, 8, 20, and 40 inches below ground surface (bgs). The nearest NRCS stations where soil temperatures are measured are located near Lincoln, Nebraska (approximately 60 miles east of the proposed Nebraska Reroute); Sioux City, Iowa (approximately 80 miles east of the proposed Nebraska Reroute); and Sioux Falls, South Dakota (approximately 145 miles northeast of the proposed Nebraska Reroute). Soil temperatures at these stations are:

- At Lincoln, soil temperatures at 2 inches bgs average approximately 30°F in January, 42°F in March, 60°F in May, 80°F in July, and 55°F in October. At a depth of 40 inches bgs, soil temperatures average approximately 40°F in January, 39°F in March, 50°F in May, 64°F in July, and 60°F in October.
- At Sioux City, soil temperatures at 2 inches bgs average approximately 30°F in January, 36°F in March, 56°F in May, 73°F in July, and 53°F in October. At a depth of 40 inches bgs, soil temperatures average approximately 40°F in January, 38°F in March, 49°F in May, 63°F in July, and 57°F in October.
- At Sioux Falls, soil temperatures at 2 inches bgs average approximately 24°F in January, 30°F in March, 53°F in May, 78°F in July, and 52°F in October. At a depth of 40 inches bgs, soil temperatures average approximately 37°F in January, 35°F in March, 46°F in May, 63°F in July, and 55°F in October (NRCS, n.d.).

The average depth to frost is approximately 5 feet bgs in the northern portion of the proposed Nebraska Reroute and 4 feet bgs in the southern portion (National Oceanic and Atmospheric Administration, 1978).

Minimum soil temperatures for corn seed germination are 55°F; soybean seed germination requires a minimum of 59°F. Soil temperatures of 55°F are typically reached in early May in the counties along the proposed Nebraska Reroute, while soil temperatures of 60°F are typically reached in mid-May (UNL, 1998).

4.2.2 Potential Impacts

Potential impacts on soil and sediment that could occur during construction, operation, and maintenance of the proposed Nebraska Reroute are described in this section.

Construction

Construction activities associated with the proposed Nebraska Reroute include clearing, grading, trench excavation, backfilling, equipment traffic, and restoration along the corridor. Similar activities would also occur during construction of pump stations, access roads, and a construction camp. These construction activities could adversely affect soil resources. Potential impacts include:

- Construction camp (infrastructure and soil disturbance)
- Soil erosion
- Sandy soil loss attributable to cave-ins
- Topsoil loss or degradation
- Soil compaction
- Increased rock content in near-surface soil
- Drainage system damage
- Soil contamination attributable to spills and leaks

Construction Camp

Rural Nebraska may not have sufficient temporary housing near the proposed Nebraska Reroute to house all construction personnel working in those areas. In the remote area on the northern portion of the Nebraska Reroute, Keystone would construct a temporary work camp to meet the housing needs of the construction workforce. The construction camp site might be established on a site up to 100 acres in size, which would cause soil disturbance. About 30 acres of that area might be used as a contractor yard, although the majority would be used for housing and administration facilities. The camp would need infrastructure, including parking, for up to 900 workers.

Soil Erosion

Clearing for the proposed Nebraska Reroute would remove protective vegetative cover, which would increase soil erosion. Soil erosion could also occur during open-cut trenching and during temporary spoil storage.

Highly erodible soils present along the proposed Nebraska Reroute are especially prone to wind and water erosion during construction. These soils would need additional measures to control erosion during construction. Approximately 77 percent of the proposed Nebraska Reroute would be constructed where the soils are characterized as highly erodible by either wind or water. Wind and/or water erosion could result in a loss of valuable topsoil. Although the Nebraska Reroute would not be located in the Sand Hills, areas of fragile (highly erodible – wind erodibility groups 1 and 2), sandy soils that have surface features very similar to the Sand Hills are present. Removal of the vegetative cover without effective, durable restoration could cause severe wind erosion. Severe wind erosion could create steep-sided, irregular, or conical

depressions referred to as "blowouts." If severe erosion were to occur during construction, stabilization and revegetation would be more difficult following construction.

All soil types are susceptible to erosion by precipitation, particularly during intense storms or less intense storms that occur over a long duration. Soils identified as compaction-prone are especially subject to rutting and displacement when construction vehicles are operated during wet weather conditions. Compaction and rutting may reduce water infiltration and cause surface water pooling or surface water diversion, which could lead to increased localized soil erosion and sedimentation. Stockpiled topsoil and trench spoils could cause water to pond during storms with precipitation.

Sandy Soil Loss Attributable to Cave-ins

Where the proposed Nebraska Reroute would be constructed in loose, sandy soils, cave-ins could occur during trench excavation, and unstripped topsoil along the edges of the trench could consequently be lost. Using a wider excavation trench would allow for a greater angle of repose (more gently sloping sides), which would reduce the risk of cave-ins in sandy soils. However, a wider excavation trench would generate more spoil, which would increase the amount of material susceptible to wind and water erosion and to sediment transport.

Topsoil Loss or Degradation

During grading and excavation activities, the topsoil (to a depth of up to 12 inches) would be removed and segregated. Improper segregation of the topsoil could lead to mixing with subsoil. Soil mixing could cause reduced capability of the topsoil through mixing with less fertile soils that are in poorer condition. Valuable topsoil might also be lost from its original location through wind and/or water erosion. In addition, wind erosion could cause fugitive dust problems, which could lead to deposition of subsoil on topsoil in areas outside the proposed Nebraska Reroute.

Soil Compaction

Soils with high clay and/or silt content could become compacted during construction from the use of construction vehicles and equipment within the permanent pipeline easement, temporary workspace areas, temporary access roads, and construction yards. The degree of compaction would depend on the texture and moisture content of the soil, the frequency and duration of construction activities, the types of equipment or vehicles used, and the use of pressure-diffusing devices (such as construction mats). Compaction would be greatest where equipment would operate on moist-to-wet soils with high clay content. Compaction could also occur in areas where multiple passes would be made by construction equipment, for instance, along temporary access roads and along the working side of the construction ROW.

Increased Rock Content in Near-surface Soil

In areas where rocky soil or shallow bedrock is present, pipeline backfill activities could result in a concentration of large clasts (coarse gravel-, cobble-, or boulder-size material) near the surface. Large clasts concentrated near the surface could result in less productive soils and damage to farming equipment.

Soils Drained by Drainage Tile Systems

Construction of the proposed Nebraska Reroute could cause temporary disruption of existing drainage tile systems in active agricultural land within the Nebraska Reroute ROW. Where this occurs, existing soils could become saturated during wet weather conditions. Improper dewatering techniques or failure to implement dewatering where necessary could also cause sediment to enter drain tile systems, possibly diminishing their effectiveness.

Operation and Maintenance

Potential impacts during operation and maintenance of the proposed pipeline could include:

- Soil erosion
- Compaction
- Temperature effects
- Contamination

Erosion

Accelerated soil erosion could occur as a result of surface disturbance from pipeline maintenance activity and incidental repairs (which may include excavation of the pipeline). Excavation for pipeline repairs would generate spoil, which would increase the amount of material susceptible to wind and water erosion and sediment transport.

Maintenance and incidental repairs in areas with highly erodible soils could also adversely affect reclamation activities, such as erosion control and revegetation procedures.

Compaction

Vehicular traffic could lead to localized soil compaction during maintenance activities and incidental repairs, particularly if the soil were wet.

Soil Temperature Impacts

NDEQ reviewed the DOS' study of the pipeline's effects on the surrounding soil temperatures. According to data presented in Appendix L to the Final EIS (DOS, 2011a), pipeline temperatures for the proposed Nebraska Reroute would range from 85°F to 100°F in the winter to 120°F to 130°F in the summer. Soil temperatures closer to the buried pipeline may be as much as 40°F warmer than the ambient surrounding soil temperatures. DOS modeled soil temperature profiles for January, March, May, July and October. In Nebraska, the January and March profiles showed warming adjacent to the pipeline that decreased the frost depth. The May profile showed earlier frost-out above and adjacent to the pipeline. The July profile showed warmer temperatures surrounding the pipeline, with temperatures of up to 130°F at the pipeline casing. The October profile showed a gradual cooling at the soil surface, consistent with ambient air temperatures (DOS, 2011a).

The relatively high temperature of the crude oil in the pipeline would cause a localized increase in soil temperature and a decrease in soil moisture immediately above the pipeline. The true measure of these effects would be its impact on agricultural productivity. Additional discussion regarding potential impacts on agricultural crops can be found later in this chapter in Section 4.10, Agricultural and Land Use.

4.2.3 Commitments to Reduce or Avoid Impacts

As part of its activities associated with the proposed Nebraska Reroute, Keystone has committed to implement procedures that are designed to reduce the likelihood and severity of impacts along the Nebraska Reroute. Keystone presented these procedures in its CMRP (Keystone, 2012b), which is attached with this Draft Evaluation Report as Appendix C. These measures would be implemented to the extent that they would not conflict with the requirements of any applicable federal, State, or local rules and regulations, or other permits and approvals applicable to the project. Highlights from the CMRP and Final EIS are presented below.

Soil Erosion

Localized soil erosion would be reduced using BMPs. BMPs for sediment and water erosion might include installation of sediment barriers (such as silt fencing, straw or hay bales, compost socks, or sand bags), trench plugs, temporary slope breakers, and drainage channels or ditches. BMPs for wind erosion might include applying water, matting, mulch, or tackifier. Straw or native prairie hay may be used as mulch and crimped into the soil to prevent wind erosion. Photodegradable matting might also be used on steep slopes or areas prone to extreme wind exposure, such as north- or west-facing slopes and ridge tops. These erosion control measures would be implemented in areas where soil is exposed, steep slopes are present, or other areas where the erosion potential is high.

Precipitation might cause unavoidable soil erosion by water. In addition to the mitigation measures mentioned above, the potential for these impacts would be reduced by scheduling construction in sloped areas during drier months of the year and outside of the snowmelt season.

Mitigation measures would include stockpiling stripped topsoil along the edge of the construction workspace and any areas where topsoil removal would be needed. To minimize mixing of topsoil and subsoil, care should be taken during removal and stockpiling and in redistribution of topsoil during backfilling.

Monitoring

Once construction was complete, Keystone would monitor areas highly susceptible to erosion to ensure successful reclamation and revegetation. Any areas adversely affected by construction would be regularly inspected to identify areas of erosion, settling, or poor seed germination. Erosion and settling would be monitored by aerial patrols and landowner reporting. Areas where initial reclamation and revegetation were unsuccessful would be revegetated promptly and monitored.

Sandy Soil Loss

Minor route realignments would be incorporated through highly erodible soils to avoid particularly erosion-prone locations such as ridgetops and existing blowouts as much as practicable. Where construction in loose, sandy soils would be necessary, Keystone would include intensive monitoring and the prompt use of effective BMPs to reduce and control erosion. Specific construction, reclamation, and postconstruction procedures have been developed to prevent erosion of sandy soils and loss of sandy soils to cave-ins during trenching activities.

Topsoil Loss or Degradation

Keystone would implement construction procedures to prevent soil mixing and to minimize the loss and degradation of topsoil from erosion. Specific construction methods would be implemented to ensure that disturbed areas would be returned to preconstruction conditions. Mitigation measures would include conserving topsoil (through segregation and stockpiling) for postconstruction replacement and reclamation.

In areas with identified low-revegetation potential soils, the recommended topsoil salvage depths would be designed to conserve the high-organic content soils that do not contain physical or chemical conditions that could inhibit soil capability.

Soil Compaction

Keystone would prevent or minimize soil compaction during construction. Measures would include ripping to relieve compaction in adversely affected areas (for example, subsoils that have experienced substantial construction traffic) prior to replacing and respreading topsoil.

Increased Rock Content in Near-surface Soil

Keystone would screen soils prior to backfilling and remove all excess rocks exposed during construction activity. The size and concentration threshold for rock removal would be consistent with the quantity, size, and distribution of rocks found in adjacent undisturbed areas (outside of the construction workspace).

Drainage System Damage

Drainage tile systems would be identified prior to construction and avoided, where possible. Any drainage systems damaged during construction would be repaired or replaced.

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4.3 GROUNDWATER RESOURCES

Groundwater provides approximately 85 percent of the water used for human consumption in Nebraska (UNL, 2012a).

Within the alignment of the proposed Nebraska Reroute, groundwater aquifers are the principal supply for drinking water and agriculture. The rerouted portion of the Keystone XL pipeline could adversely affect groundwater resources in a number of ways. The proposed Nebraska Reroute would increase demand for groundwater resources during the construction phase because it would use those resources to supply construction-related activities. During the operational phase of the proposed pipeline, there would be areas where the pipeline would be embedded within geologic deposits that overlie the Ogallala Group, the principal geologic unit in the High Plains Aquifer. There would also be a few areas where the pipeline would be embedded within the Ogallala Group. Groundwater is both an important resource in Nebraska and an important issue to the citizens of Nebraska.

This section:

- Provides an overview of existing groundwater conditions along the proposed Nebraska Reroute
- Identifies resources, including shallow aquifers and registered groundwater wells, that could be vulnerable to spills or leaks (also see Chapter 6, Pipeline Safety and Potential Spills)
- Evaluates the effect of the proposed pipeline's additional demands on groundwater resources
- Describes potential impacts from construction, operation, and maintenance of the pipeline
- Identifies measures to which Keystone has committed that would avoid or reduce these potential impacts on groundwater resources

For a detailed discussion of the groundwater resources along the proposed Nebraska Reroute, see Appendix E.3.

4.3.1 Existing Conditions

The term *groundwater* refers to water that is below the land surface and in the saturated zone. The saturated zone is the zone in which all of the cracks in the rock and all of the pore spaces between the grains of rock or within the soil are filled with water. The upper limit of the saturated zone is called the water table (UNL, 2012a).

In Nebraska, usable groundwater is present in voids or pore spaces in various layers of geologic material such as sand, gravel, silt, sandstone, and limestone. Where such geologic units yield enough water for human use, these layers are referred to as aquifers. In parts of Nebraska, groundwater is encountered just a few feet below the surface, while in other areas it is encountered a few hundred feet underground. Water that can be withdrawn from a given aquifer can range from a few gallons per minute (which is just enough to supply a typical household) to many hundreds or even thousands of gallons per minute (which is the yield of large irrigation, industrial, or public water supply wells) (NDEQ, 2011).

Regional Hydrogeology

In Nebraska, the principal aquifer underlying the proposed Nebraska Reroute corridor is the High Plains Aquifer (Gutentag et al., 1984; Weeks et al., 1988). The High Plains Aquifer is a regional water-table aquifer extending from southcentral South Dakota to the southern part of the Texas Panhandle. The geologic units that make up the High Plains Aquifer are of late Tertiary or Quaternary age and could be hydraulically interconnected. This interconnection could support a continuous water table throughout most of the region (see Appendix E.3). The Upper Tertiary rocks include parts of the Brule Formation, Arikaree Group, and Ogallala Group. The Quaternary deposits in the aquifer consist of alluvial, dune-sand, and valley-fill deposits (Gutentag et al., 1984).

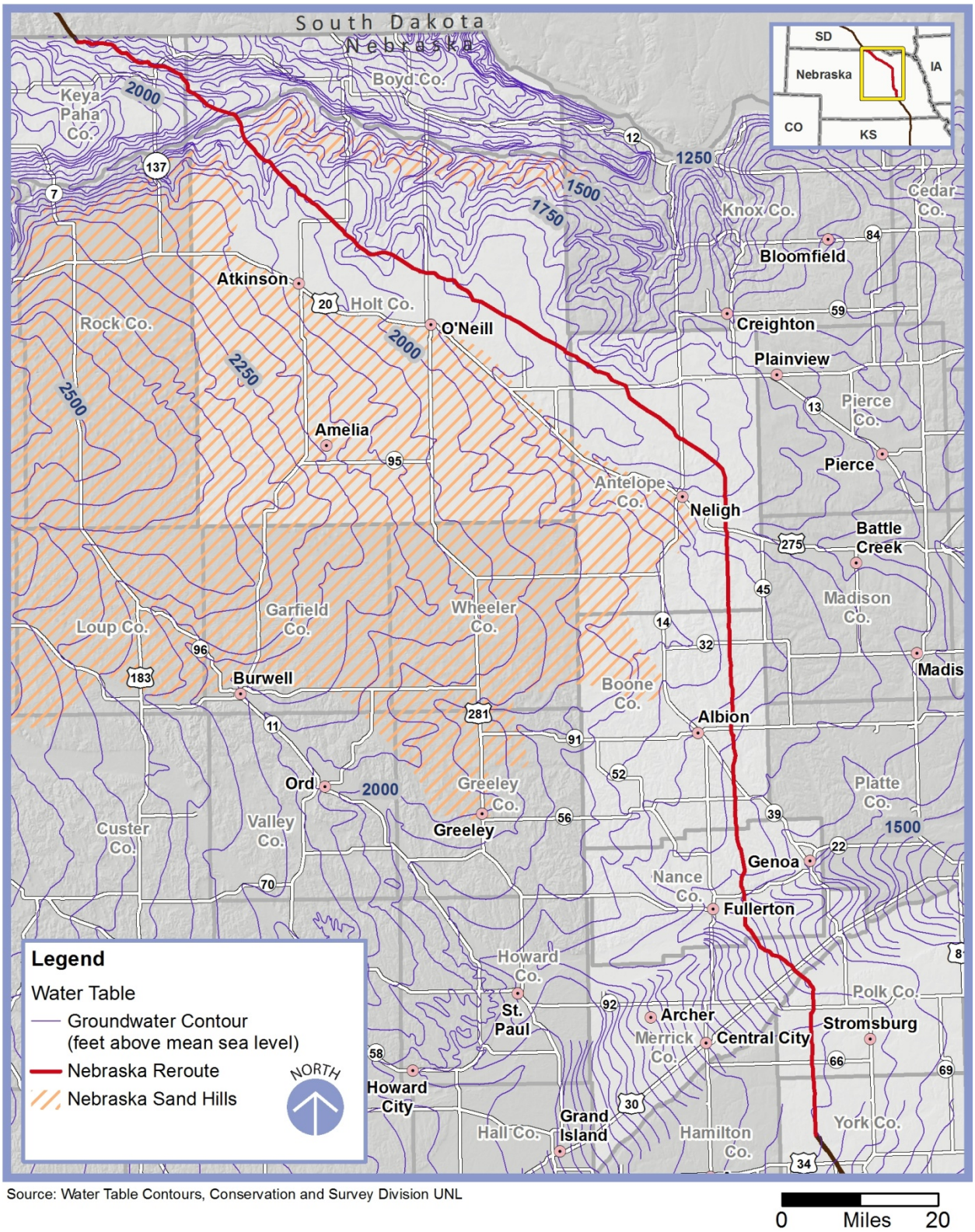
Figure 4.3-1 shows regional groundwater table elevations.

The High Plains Aquifer contains about 3.25 billion acre-feet of water in storage. Approximately 66 percent of the water stored in the High Plains Aquifer is located in Nebraska (Gutentag et al., 1984). Most of this water is in the Sand Hills. The maximum saturated thickness of the aquifer is about 1,000 feet and averages 200 feet. Across Nebraska, groundwater generally flows from northwest to southeast.

The Ogallala Group is the principal geologic unit in the High Plains Aquifer. Other important geologic deposits in this aquifer are Quaternary-age, wind-deposited loess and fine-grained sand, alluvial silt, sand, and gravel, along with Tertiary-age silt, sand, and gravels (Condra and Reed, 1943; Korus and Joeckel, 2011). The Ogallala Group consists of a heterogeneous sequence of clay, silt, siltstone, sand, sandstone, and gravel deposited by streams that flowed eastward from the Rocky Mountains. The saturated thickness of the Ogallala Group ranges from 10 to 200 feet in the northern part of Nebraska to more than 800 feet in central Nebraska beneath the Sand Hills (Bleed and Flowerday, 1998).

The median depth to water in the Ogallala Group is greater than 100 feet bgs, while the median depth to groundwater in the Platte River Valley is generally less than 20 feet bgs (UNL, 1998).

Figure 4.3-1. Regional Groundwater along the Proposed Nebraska Reroute



Source: Water Table Contours, Conservation and Survey Division UNL

Hydrogeologic Units

The High Plains Aquifer consists of all or parts of several geologic units of Quaternary and Tertiary age. Table 4.3-1 shows the stratigraphic column of the aquifer, including the formation name, generalized rock type, and age of the geologic units that make up the aquifer.

Table 4.3-1. Stratigraphic Column of the High Plains Aquifer

Era	Period	Epoch	Geologic Unit		Lithology	Hydrogeologic Unit
Cenozoic	Quaternary	Holocene	DeForest Formation		Dune sands, alluvium	High Plains Aquifer
		Pleistocene	Multiple loesses and alluvial units		Sand, gravel, silt and clay	
	Tertiary	Pliocene	Broadwater Formation		Sand and gravel	
		Miocene	Ogallala Group		Sandstone and siltstone	
		Oligocene	Arikaree Group		Sandstone and siltstone	
			White River Group	Brule Formation	Siltstone, sandstone and claystone	
		Eocene				

Source: Modified from Korus and Joeckel, 2011.

Brule Formation

The Brule Formation of Oligocene age is the oldest geologic unit in the aquifer. Groundwater wells in the Brule Formation can yield up to 1,500 gallons per minute (gal/min), but wells in this formation typically yield less than 300 gal/min (Gutentag et al., 1984). Very few wells within the proposed Nebraska Reroute are in the Brule Formation, and, because of its consolidated nature, this unit is not a major source of groundwater (Gutentag et al., 1984).

Arikaree Group

The Arikaree Group comprises the late Tertiary deposits between the underlying Brule Formation and the overlying Ogallala Group. Wells completed in the Arikaree Group generally do not yield large amounts of water. Well yields of about 350 gal/min can be expected from about 200 feet of saturated thickness (Gutentag et al., 1984).

Ogallala Group

The Ogallala Group comprises Miocene rocks younger than the Arikaree Group. The Ogallala Group is the principal geologic unit in the High Plains Aquifer. The Ogallala Group consists of consolidated and unconsolidated gravel, sand, silt, and clay. In some areas, irrigation wells that yield about 1,000 gal/min can be developed at a depth of about 100 feet in saturated sand and gravel, while in other areas wells that yield 100 gal/min can be developed at a depth of as little as 20 feet in saturated sand and gravel (Gutentag et al., 1984).

Broadwater Formation

The Broadwater Formation consists of Pliocene rocks. Mainly sand and gravel make up the Broadwater Formation.

Surface Deposits (Alluvial and Valley Fill Deposits)

Unconsolidated deposits of Quaternary age overlie the Ogallala Group. These Quaternary-age deposits consist of gravel, sand, silt, and clay, much of which is reworked material that was derived from the Ogallala Group. Deposits of loess overlie the Ogallala Group or the unconsolidated Quaternary sediments in some locations. The loess was deposited as windblown material and consists mostly of silt with small quantities of very fine-grained sand and clay (Gutentag et al., 1984).

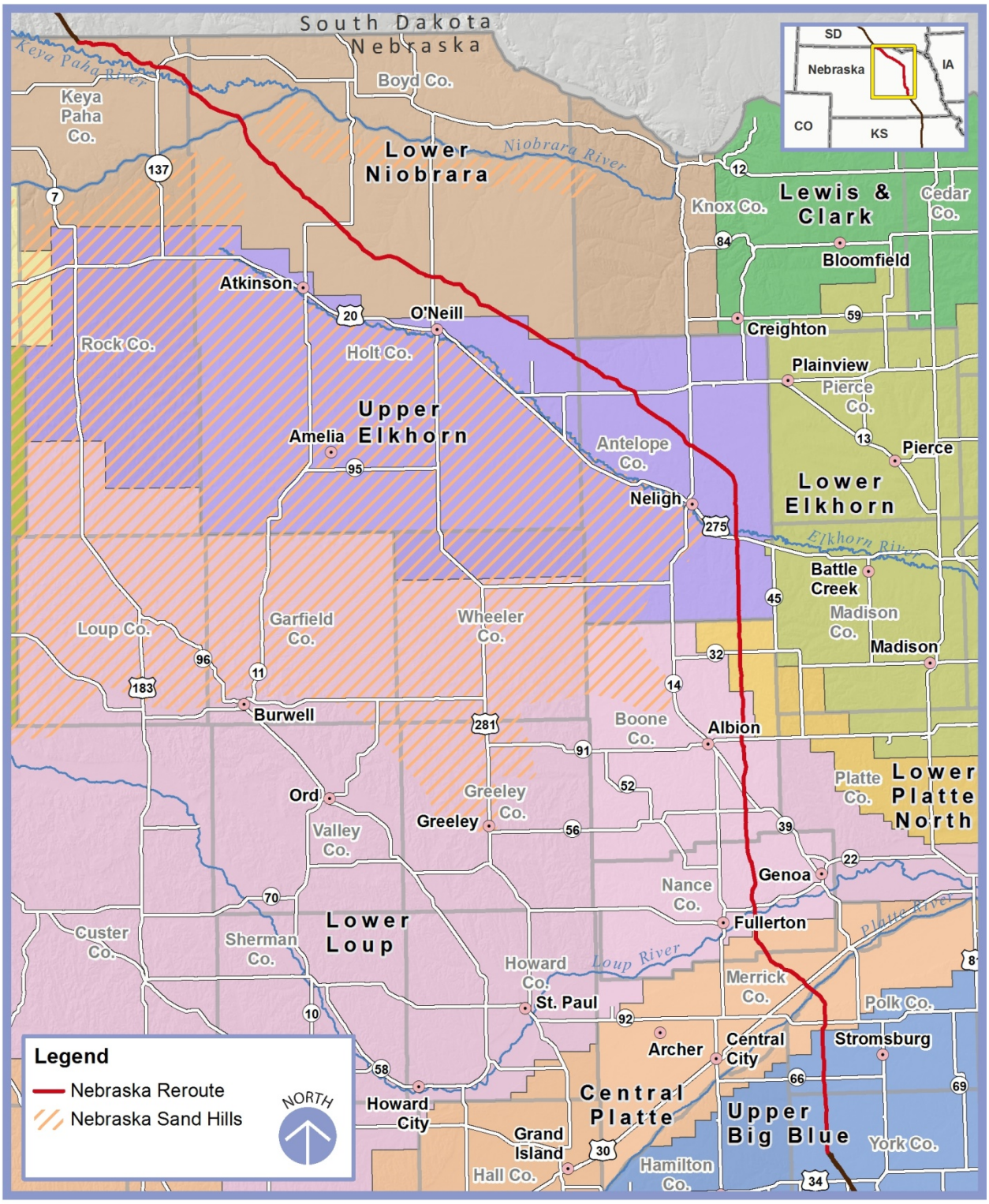
Sand sheets of Quaternary age make up part of the aquifer where they are saturated. The sand sheets are most extensive in northcentral Nebraska, where they have a thickness of about 100 feet. The sand sheets are highly porous and permeable and, therefore, quickly absorb rainfall that recharges the High Plains Aquifer (Bleed and Flowerday, 1998). Valley-fill deposits along the channels of streams such as the Platte River also are considered to be part of the aquifer where they are hydraulically connected. In such places, the valley-fill deposits directly link the streams to the High Plains Aquifer and allow water to move freely between the aquifer and surface streams.

Groundwater Basins

The proposed Nebraska Reroute would pass through six NRDs (see Figure 4.3-2), which regulate groundwater in Nebraska. These six NRDs are:

- Lower Niobrara
- Upper Elkhorn
- Lower Loup
- Lower Platte North
- Central Platte
- Upper Big Blue

Figure 4.3-2. Natural Resources Districts along the Proposed Nebraska Reroute



Source: Natural Resource Districts, 2010 U.S. Census Data

Table 4.3-2 summarizes the hydrogeology of the Lower Niobrara, Upper Elkhorn, Lower Platte North, Lower Loup, and Upper Big Blue NRDs along the proposed Nebraska Reroute. The NRDs are further discussed in the sections below.

Table 4.3-2. Hydrogeology of Natural Resources Districts along the Proposed Nebraska Reroute

Natural Resources District	Saturated Thickness (feet)	Depth to Groundwater (feet below ground surface)	Transmissivity (gallons/day/foot)	Specific Yield (%)
Lower Niobrara	0–900	0–200	20,000–150,000	5–20
Upper Elkhorn	0–800	0–200	20,000–250,000	5–20
Lower Platte North	0–500	0–200	20,000–300,000	<5–20
Lower Loup	0–1,100	0–200	20,000–250,000	5–20
Central Platte	0 –200	0–200	20,000–250,000	10–20
Upper Big Blue	0–400	0–200	20,000–200,000	5–25

Lower Niobrara NRD

The proposed Nebraska Reroute would enter Nebraska in Keya Paha County, which is part of the Lower Niobrara NRD. This NRD includes Keya Paha and Boyd Counties and part of Holt County.

The general hydrogeology of this NRD is typical for an area dominated by sediments of recent origin (Quaternary-age sand, gravel, and silt). Refer to Appendix E.3 for figures for this NRD (saturated thickness and depth to water).

The principal aquifer is generally unconfined and is hydrologically connected to streams in the NRD (NDNR, 2005). The groundwater table reflects a pattern of groundwater movement toward the Niobrara River and its tributaries. Groundwater tends to move from the uplands to streams (NDNR, 2005). Groundwater is used for a variety of purposes, including domestic, industrial, livestock, and irrigation uses. The main use of groundwater is for irrigation.

Construction in the Lower Niobrara NRD requires a Ground Water Well Permit for a well that would pump over 50 gal/min. This allows groundwater to be pumped for an approved beneficial use.

Upper Elkhorn NRD

The Upper Elkhorn NRD includes parts of Holt and Antelope Counties. The Nebraska Reroute would continue through an area underlain by the Ogallala Group in Holt County. The general hydrogeology of this NRD is complex because of the wide range of depositional environments—from eolian in the west to glacial in the east. Refer to Appendix E.3 for figures for this NRD (saturated thickness and depth to water).

The western and central parts of this NRD are hydrologically connected to surface water streams and are unconfined (NDNR, 2005). Groundwater is used for a variety of purposes, including domestic, irrigation, industrial, and livestock uses. The main use of groundwater is for irrigation.

Construction in the Upper Elkhorn NRD requires a Ground Water Well Permit and a Request for Variance. The Ground Water Well Permit allows a well that pumps over 50 gal/min. The Request for Variance would allow groundwater to be used where water rights are limited for new development. These permits would allow groundwater to be pumped for an approved beneficial use.

Lower Platte North NRD

The Lower Platte North NRD encompasses parts of seven counties in eastcentral Nebraska. The Lower Platte North NRD Groundwater Management Plan subdivides the district into four regions with distinct hydrogeology. The Nebraska Reroute passes through the Shell Creek Region, which extends from the Sand Hills to the Platte River. In the upper reaches of the Shell Creek Region, the principal source of groundwater is from the Ogallala Group.

The north extent of the Shell Creek Region is designated as the Upper Newman Grove. The Upper Newman Grove has a saturated thickness of 50–150 feet. Over most of the Shell Creek Region groundwater is very deep and is not directly connected to surface water (Lower Platte North NRD, 2009).

The Lower Platte North NRD has established a groundwater management area for quality purposes. As part of the groundwater management area, permits are required prior to the construction of wells pumping greater than 50 gal/min (NDNR, 2005).

Lower Loup NRD

The Lower Loup NRD includes parts of Boone and Nance Counties. Nance County borders the Platte River Valley and the Loup River Valley aquifers. The depth to water is 50 to 100 feet bgs in the highland areas and less than 50 feet bgs in the lowland areas (Miller and Appel, 1997).

The general hydrogeology of this NRD reflects the nature of the eolian and fluvial origin of the recent sediments. Refer to Appendix E.3 for figures illustrating this NRD (saturated thickness and depth to water). The principal aquifer is generally unconfined and is hydrologically connected to surface streams (NDNR, 2005).

Groundwater is used for a variety of purposes including domestic, irrigation, industrial, and livestock. The main use of groundwater is for irrigation (NDNR, 2005).

Construction in the Lower Loup NRD would require a Well Construction Permit for a well that would pump over 50 gal/min. This permit would allow groundwater to be pumped for an approved beneficial use.

Central Platte NRD

The Central Platte NRD includes most of Merrick County. This NRD is part of the Cooperative Hydrology Study, which is a geohydrologic study of surface and groundwater resources of the Platte River Basin upstream from Columbus, Nebraska. The Cooperative Hydrology Study divides the High Plains Aquifer into eight hydrostatic units (see Appendix E.3). Wells in this groundwater basin can yield large amounts of water (Peterson, 2007). Groundwater is used for a

variety of purposes, including domestic, irrigation, industrial, and livestock uses. The main use of groundwater is for irrigation.

Construction in the Central Platte NRD would require a Request for Variance, which would allow groundwater to be used where rights are fully appropriated. This Request for Variance would allow groundwater to be pumped for an approved beneficial use.

Upper Big Blue NRD

The Upper Big Blue NRD includes Polk and York Counties. Groundwater originates mainly as infiltration from precipitation. The basin hydrogeology is complex because of the glacially influenced origin of the sediments. Refer to Appendix E.3 for figures illustrating this NRD (saturated thickness and depth to water).

Groundwater is used for a variety of purposes, including domestic, irrigation, industrial, and livestock uses. The main use of groundwater is for irrigation (NDNR, 2005).

Construction in the Upper Big Blue NRD would require a permit to construct a water well and an authorization to transfer groundwater. Water use in the Upper Big Blue NRD is also subject to the Kansas-Nebraska Big Blue River Compact.

Water Quality Standards

Protection of drinking water sources is important to provide safe drinking water to the public. Congress passed the Safe Drinking Water Act to protect Americans' health by regulating the nation's public drinking water supply. It applies to every public water system that has at least 15 service connections or serves at least 25 people per day for 60 days of the year. WHPAs in Nebraska are subject to the Safe Drinking Water Act.

The Safe Drinking Water Act authorizes EPA to set national health-based standards for drinking water. Federal standards include the National Primary Drinking Water Regulations and the Secondary Drinking Water Regulations. The Safe Drinking Water Act is implemented by the states.

- National Primary Drinking Water Regulations (primary standards) are legally enforceable standards that apply to public water systems. Primary standards protect public health by limiting the levels of contaminants in drinking water (EPA, 2012a).
- National Secondary Drinking Water Regulations (secondary standards) are guidelines regulating contaminants that can cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards for water systems, but these standards are not enforceable. However, states may choose to adopt them as enforceable standards (EPA, 2012a).

Groundwater quality in Nebraska is regulated by NDEQ Title 118 – Ground Water Quality Standards and Use Classification (Standards). The groundwater standards and groundwater classifications apply to all groundwater of the state, with the exception of an aquifer or part of an aquifer that has been exempted through the Rules and Regulations of the Nebraska Oil and Gas Conservation Commission or through NDEQ Title 122 – Rules and Regulations for Underground Injection and Mineral Productions Wells.

Numerical standards (maximum contaminant levels) apply to groundwater in Nebraska. The numerical standards are intended to protect the beneficial uses of groundwater. The standards apply if the beneficial uses of groundwater would be impaired, if public health and welfare would be threatened, or if the beneficial use of hydrologically connected groundwaters would be impaired. Any substance introduced directly or indirectly by human activity is not allowed to enter groundwater if one or more of the numerical standards would be exceeded or if it degrades the present groundwater quality. Any pollutant introduced directly or indirectly by human activity that would impair the beneficial uses of groundwater because of unacceptable color, corrosivity, odor, or any other aesthetic characteristic is also not allowed.

Shallow Aquifers

Shallow aquifers are areas where the groundwater is less than 50 feet bgs. Shallow aquifers were identified using digital data provided by NDNR. Figure 4.3-3 shows the average groundwater depth below the surface. NDEQ's review of the average groundwater depth indicated that shallow aquifers are present in Keya Paha, Holt, and Merrick Counties.

Groundwater Use and Registered Well Survey

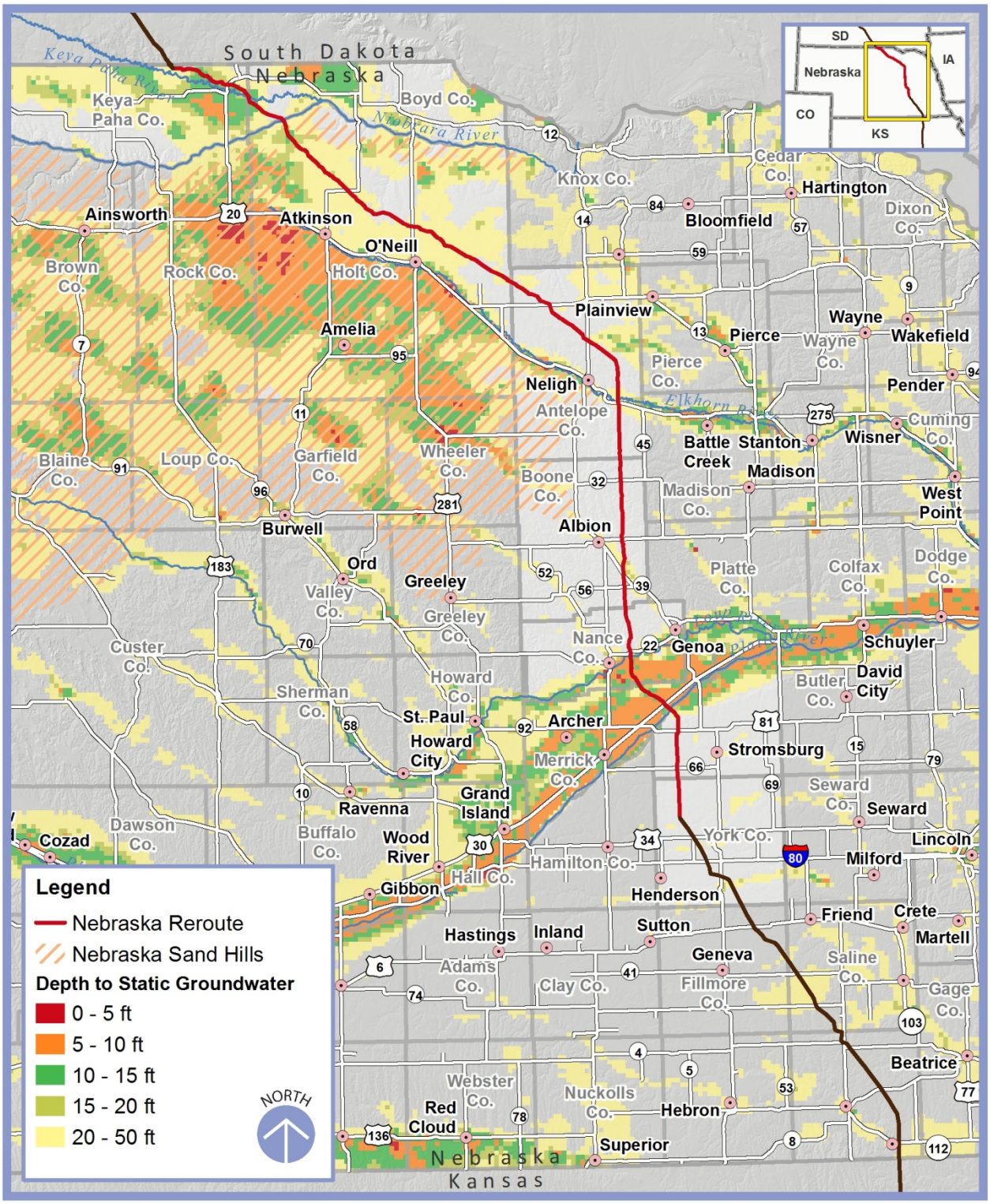
A database analysis was conducted to determine the presence of water wells within the temporary construction easement. The database used is a publicly available and searchable database maintained by NDNR. It was queried for data about domestic, irrigation, and public water supply wells.

Table 4.3-3 lists the five registered groundwater wells located within the temporary construction easement as of the date of the search (see Figure 4.3-4) (NDNR, 2012). Not all wells are registered in the NDNR database. In particular, livestock and domestic wells drilled before 1993 were not required to be registered. Certain dewatering and other temporary wells are also not required to be registered.

Table 4.3-3. Registered Groundwater Wells along the Proposed Nebraska Reroute

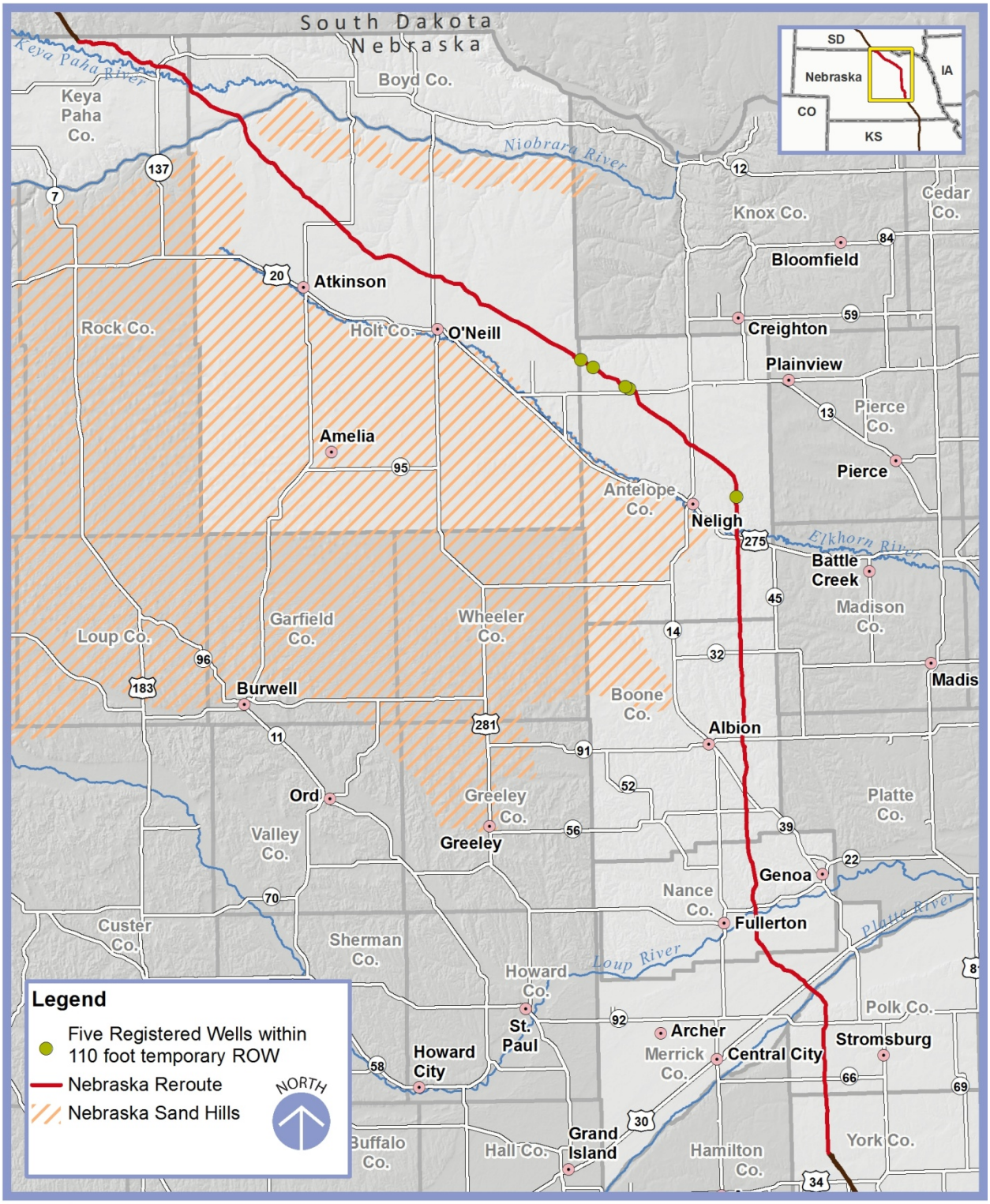
Well Registration Number	County	Latitude	Longitude	Total Depth (feet)	Static Water Level (feet)	Use	Pumping Rate (gallons/ minute)
G-108715	Antelope	42.34230	–98.1791	360	78	Irrigation	900
G-131786	Antelope	42.34589	–98.1890	347	84	Irrigation	800
G-044998	Antelope	42.38246	–98.2671	272	30	Irrigation	550
G-056118	Antelope	42.39700	–98.2962	314	40	Irrigation	700
G-070906	Antelope	42.14049	–97.9221	340	127	Irrigation	800

Figure 4.3-3. Static Groundwater Levels along the Proposed Nebraska Reroute



Source: Static Groundwater Levels, Nebraska DNR Wells

Figure 4.3-4. Registered Groundwater Wells within the Temporary Construction Easement for the Proposed Nebraska Reroute



Source: Wells, Nebraska DNR

Wellhead Protection Areas

In Nebraska, WHPAs and protection activities (including Wellhead Protection Area Plans) are established on a voluntary basis by the State and local communities to protect municipal groundwater resources. WHPAs are generally defined as surface and subsurface areas that surround a water well or well field supplying a public water system and through which contaminants are reasonably likely to move toward and reach the water well or well field (NDEQ, 2001). The Nebraska Source Wellhead Protection Program generally includes a 20-year time-of-travel area in WHPAs for community wells. This time-of-travel area is determined based on computer modeling that accounts for geologic information and the amount of groundwater pumped annually from the specific well or wells in the system (Keystone, 2012b; NDEQ, 2001).

WHPAs within 1 mile of the proposed Nebraska Reroute corridor were evaluated. The Nebraska Reroute would not pass through any mapped WHPAs, but the Nebraska Reroute would pass within 1 mile of the WPHAs for St. Edward (Boone County) and Bradshaw (York County) WHPAs. The proposed Nebraska Reroute would be within a half mile upgradient of the St. Edward WHPA boundary and approximately a half mile downgradient of the Bradshaw WHPA boundary (see Figure 4.3-5). Although not part of the Nebraska Reroute, the alignment in the Final EIS would pass through the WHPA at Steele City.

4.3.2 Potential Impacts

Potentially affected groundwater resources within the proposed Nebraska Reroute corridor include shallow aquifers, WHPAs, and groundwater wells. Potential impacts on groundwater resources from construction, operation, and maintenance of the pipeline were evaluated.

Construction

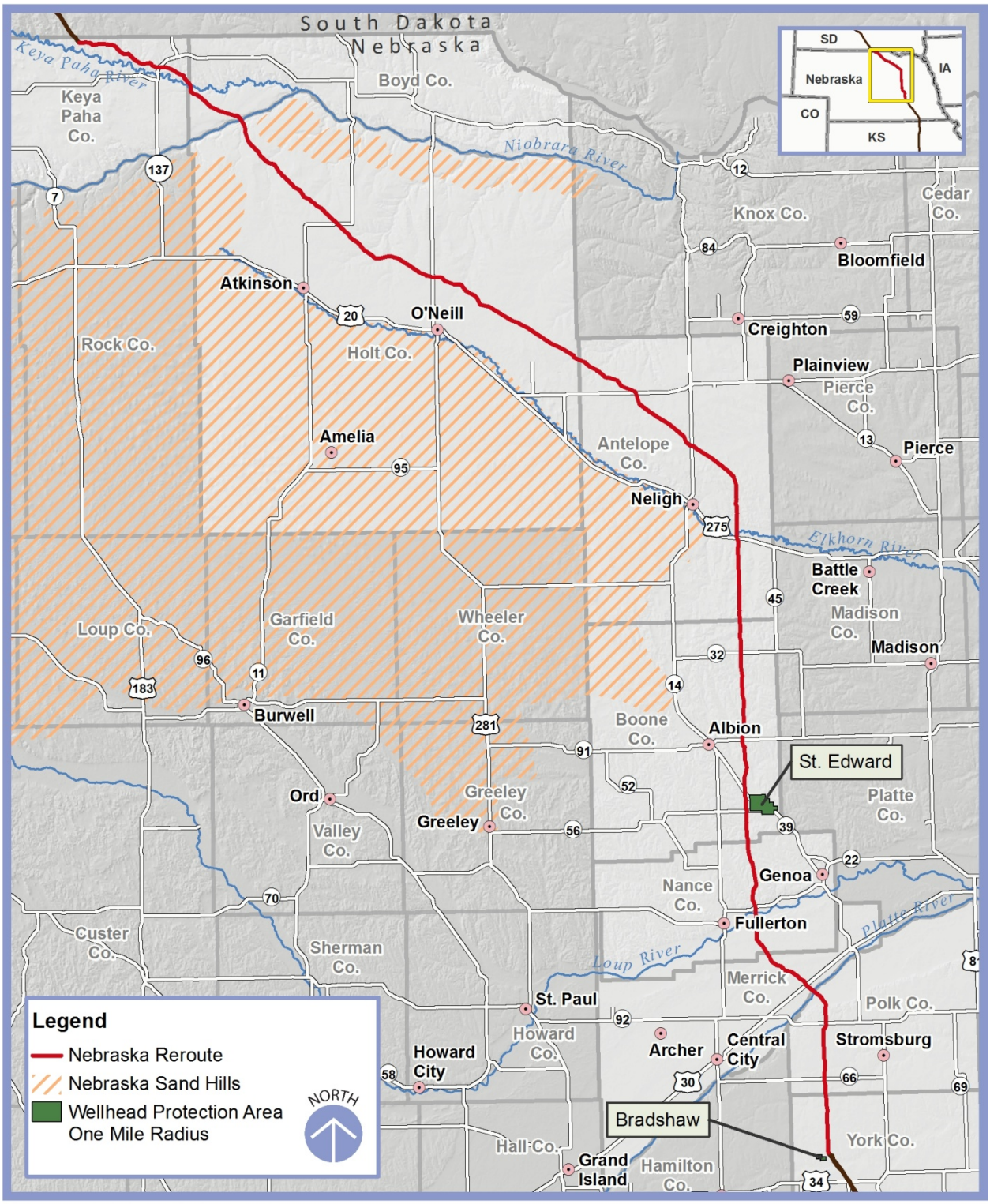
As described below, potential impacts on groundwater would include:

- Aquifer impacts attributable to increased water demand during construction
- Contamination of shallow aquifers from releases of fuel or other chemical contamination from construction-related equipment

Water for Construction

Water would be used during pipeline construction to control dust, perform hydrostatic testing of the pipeline and facility piping (described further below), and conduct activities associated with HDD. Other potential uses of water during construction include washing equipment, providing water when placing backfill or embankment, and hydromulching. Potable water might also need to be supplied from groundwater sources for a potential construction camp. Groundwater resources along the proposed Nebraska Reroute might be used for these activities. Groundwater recharge and production in domestic and irrigation wells could decrease locally because of the increased demand on groundwater supplies.

Figure 4.3-5. Wellhead Protection Areas along the Proposed Nebraska Reroute



Source: Wellhead Protection Areas, NDEQ

Hydrostatic Testing

Groundwater might need to be withdrawn for hydrostatic testing where surface water or municipal sources are not available or cannot be used. The discharge of hydrostatic test water would need to comply with the requirements of an NPDES Permit (NEG672000) that authorizes the discharge of water used for hydrostatic testing to upland areas or into surface waters. NDEQ administers this permit to control pollutant discharges from hydrostatic testing.

Construction Camp

Rural Nebraska might not have enough temporary housing near the proposed Nebraska Reroute to house all the construction personnel working in those areas. In those remote and rural areas, a temporary work camp might be constructed to meet the housing needs of the construction workforce. The site of the construction camp (and associated contractor yard) could be up to 100 acres in size, and would be located in reasonable proximity to the work areas. The camp would need systems and infrastructure, including parking, for up to 900 workers (Keystone, 2012b). Potable water would be provided by drilling a well, where feasible.

Spills and Leaks

Construction activities could affect groundwater quality through inadvertent releases during refueling and maintenance of construction equipment, leaks from equipment hoses and seals, and the storage, transportation, and use of petroleum and hazardous materials. Groundwater contamination from construction spills and leaks could be especially detrimental to shallow groundwater aquifers, WHPAs, and groundwater wells.

Shallow groundwater is at a higher risk of being adversely affected by construction activities. Surface spills would potentially reach and affect shallow groundwater in less time than deeper groundwater.

It might also be necessary to dewater trenches while lowering in and backfilling areas having shallow groundwater. Where the water table would be disturbed during trenching and excavation activities, concentrations of total suspended solids could temporarily increase.

WHPAs downgradient of the Nebraska Reroute would be at risk of contamination. A WHPA might be the only source of drinking water for local residents and livestock.

Groundwater wells in Nebraska are a water source for domestic use, livestock watering, and irrigation. Spills and leaks from construction activities could reduce the water quality of these wells.

Operation

Operation of the proposed pipeline would have no effect on groundwater quality or use. Impacts could result from a leak or accidental discharge of crude oil from the pipeline. These impacts are discussed in Chapter 6, Pipeline Safety and Potential Spills.

4.3.3 Commitments to Reduce or Avoid Impacts

Keystone has committed to implement the procedures in its CMRP (Keystone, 2012b). This plan provides several measures that would reduce or avoid the impacts described above. A brief summary of the commitments relative to groundwater is presented below.

The potential for contamination of water supplies is a major concern for Nebraskans. The impacts of a spill are discussed in detail in Chapter 6, Pipeline Safety and Potential Spills. Upon the request of individual landowners who provide the necessary access to perform the testing, Keystone has also committed to conducting baseline water quality testing for domestic and livestock wells within 300 feet of the final centerline of the approved route. These baseline samples would be collected prior to placing the pipeline in service. Subsequently, in the event of a significant spill in the area, Keystone would conduct water well testing as required by NDEQ pursuant to Title 118, Nebraska Administrative Code. Keystone would also provide an alternative water supply for any well where water quality was found to be compromised by the spill.

Keystone has also committed to ensuring the safe operation of its pipeline to prevent any incidents from occurring. Should a release occur from the Keystone XL Pipeline, Keystone is committed to clean up any releases that might occur. Keystone is also legally required to clean up spills under Title 118 and OPA 90. In addition to all of the above, and in response to public concerns, Keystone would commit to file with the NDEQ, by May 1 of each year:

(a) A certificate of insurance as evidence that it is carrying a minimum of $200 million in third party liability insurance adjusted by calculating the GDP-IPD from the date of a Presidential Permit is issued for the project and adjusting the amount of third party liability insurance policy by this percentage. The third party liability insurance shall cover sudden and accidental pollution incidents from Keystone XL Pipeline

(b) A copy of Keystone's SEC Form 10-K and Annual Report.

Keystone has also committed to keeping abreast of the latest developments in external leak detection technologies (above and beyond those already proposed to be implemented on the project, as described in the Final EIS [DOS, 2011a]), that could be installed along the pipeline at sensitive locations. Keystone would report to, and discuss with NDEQ the status of innovation in such pipeline leak detection equipment and methods on or before January 1, 2014, and at such times thereafter until 2024 as the NDEQ shall specifically request, but in no case more frequently than once in every 3 years.

Once a final project route were determined, Keystone would conduct a detailed spill risk assessment for the section of the Keystone XL Pipeline. Using that assessment, Keystone would determine the optimal location of spill response equipment and resources, taking into account response times to sensitive areas and receptors. There spill response locations would be reflected in the Emergency Response Plan (ERP) that Keystone would submit to PHMSA for review and approval.

Water for Construction

Water use for construction would comply with all water-use and water-rights regulations.

Hydrostatic Testing

Hydrostatic test water would be tested and discharged in accordance with State and federal permits. All applicable water withdrawal and discharge permits would be acquired prior to hydrostatic testing. Hydrostatic testing is not anticipated to cause long-term effects on groundwater levels. Hydrostatic testing would be a one-time event and would not entail a prolonged used of water resources.

Wellhead Protection Areas

Route variations have been made to avoid WHPAs, and additional specific construction procedures would be used to reduce the likelihood and severity of potential groundwater impacts along the proposed Nebraska Reroute.

Shallow Aquifers

Groundwater contamination in shallow aquifers from pipeline leaks and potential spills from construction activities would be addressed by the procedures in Keystone's Spill Prevention, Containment, and Countermeasure (SPCC) Plan, which would be prepared specifically for the Nebraska Reroute. An outline of this plan is provided in Section 3.0 of the CMRP, which is shown in Appendix C of this Draft Evaluation Report. As identified in Chapter 3, Keystone would also adhere to all federal, State, and local regulations in the event of a spill during construction and operation.

The SPCC would provide detailed requirements for preventing spills and would include such issues as managing hazardous materials during construction in staging areas and in the construction ROW. The SPCC requires developing emergency response procedures for all incidents involving hazardous materials that could pose a threat to human health or the environment. The SPCC also prescribes requirements for emergency response equipment (such as first aid supplies, radios, hand-held fire equipment, and so forth) in all areas where hazardous materials are handled or stored.

The SPCC would also establish emergency notification procedures. These procedures would identify the individuals and agencies to be contacted in the event of a spill that would meet government reporting requirements.

Finally, the SPCC would prescribe the procedures to be followed in the event of a spill. For example, when notified of a spill, Keystone would immediately ensure that:

- Action is taken to control danger to the public and personnel at the site.
- Spill contingency plans are implemented and necessary equipment and personnel are mobilized.
- Measures are taken to isolate or shut down the source of the spill.
- All resources necessary to contain, recover, and clean up the spill are available.
- Any resources requested by the contractor from Keystone are provided.
- The appropriate agencies are notified. For spills on public land, into surface water, or into sensitive areas, the appropriate federal or State managing office would also be notified and involved in the incident.

4.3.4 Western Alternative

The Western Alternative was developed to avoid the WHPA near the town of Western. The Final EIS alignment is now located upgradient of the WHPA near Western.

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4.4 SURFACE WATER

The proposed Nebraska Reroute would cross 163[3] waterbodies within six major watersheds (also known as river basins). In addition to the rivers and streams, nearby surface drinking water supplies and ecological resources have been identified.

This section assesses the existing environmental conditions of these resources and evaluates how the proposed Nebraska Reroute would affect the resources, both during and after construction. In addition, the available measures to prevent significant environmental impacts are identified. Of principal concern are the construction techniques that would be used at each river crossing and the erosion control measures that would be used. Also addressed are the potential demands on local water supplies to support a construction camp.

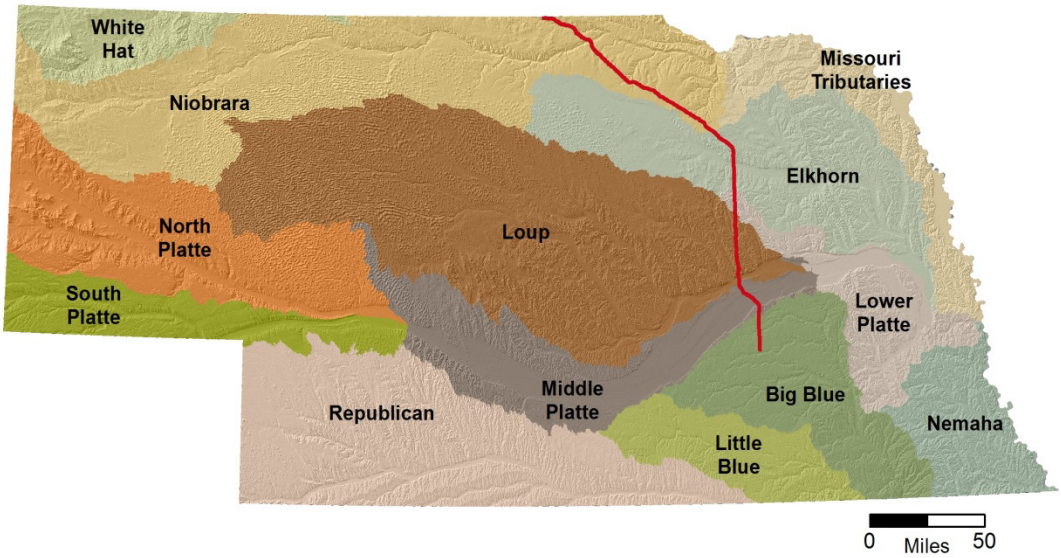
4.4.1 Existing Conditions

The proposed Nebraska Reroute would cross six major watersheds (listed from north to south):

- Niobrara
- Elkhorn
- Lower Platte
- Loup
- Middle Platte
- Big Blue

A watershed is the area that drains to a river or other surface water. Figure 4.4-1 shows Nebraska's major watersheds (NDEQ, 2012b).

Figure 4.4-1. Nebraska's Major Watersheds



Note: The red line shows the Nebraska Reroute.

[3] Based on evaluation of data taken National Hydrologic Database (USGS, 2011).

Surface waters in Nebraska include "all streams, lakes, ponds, impounding reservoirs, marshes, wetlands, watercourses, waterways, springs, canal systems, drainage systems, and all other bodies or accumulations of water, natural or artificial, public or private, situated wholly or partly within or bordering upon the state. Impounded waters in this definition do not include areas designated by NDEQ as wastewater treatment or wastewater retention facilities or irrigation reuse pits" in Nebraska Administrative Code, Title 117, Chapter 1. Streams not listed in Title 117 flow only intermittently.

Appendix E.4, Attachment B, contains figures showing surface waters and floodplains that would be crossed by the Nebraska Reroute. Appendix E.4, Attachment A, also contains tables listing surface waters crossed by the proposed Nebraska Reroute and their classifications.

NDEQ Title 117 assigns beneficial uses to stream segments based on various characteristics. A beneficial use is "[a]ny productive use of surface waters for which water quality is protected. Beneficial uses include but are not limited to agricultural, industrial, and public water supplies; support and propagation of fish, and other aquatic life; recreation in and on the water; and aesthetics" (Nebraska Administrative Code Title 117, Chapter 1). More details on stream segment categorizations as well as tables listing crossed segments can be found in Appendix E.4, Attachment A.

NDEQ identified 163 waterbodies that would be crossed by the proposed Nebraska Reroute, using the National Hydrologic Database (USGS, 2011) and data from Title 117 (see Appendix E.4). Keystone, however, states in its SER that the route crosses 140 streams in its SER. In preparing that list, Keystone used a database produced by EPA. The small, nonsubstantive difference in the waterbody crossing numbers is due to the use of two different databases and to differing interpretations in the number of small intermittent drainages that would be crossed by the proposed pipeline. These types of drainages have been affected by past and current agricultural practices that manipulated the topography, diverted water from its original course, or obliterated the original stream only to move it to a different location.

Sensitive Areas

The Nebraska Land Trust (NLT) holds a conservation easement near St. Edward in Boone County that is referred to as the Hosford Easement.[4] The northern two parcels of the easement are not in the proposed Nebraska Reroute corridor, but they are bisected by Beaver Creek, which is downstream of the confluence of an unnamed tributary that would be crossed by the Nebraska Reroute. The southeastern corner of the southern parcel would be near but not crossed by the proposed Nebraska Reroute at the Beaver Creek crossing.

Prior to operation, Keystone would need to identify along the Nebraska Reroute both HCAs and unusually sensitive areas, as defined by PHMSA. PHMSA regulations specify required measures to prevent and mitigate the consequences of a pipeline failure that could affect an HCA (see Chapter 6, Pipeline Safety and Potential Spills).

[4] The Hosford Easement encompasses approximately 546 acres in two parcels in Section 31 (Township 20 North, Range 5 West) and one parcel in Section 8 (Township 19 North, Range 5 West) near St. Edward. The proposed Nebraska Reroute corridor includes the watershed of an unnamed tributary to Beaver Creek that crosses the Hosford Easement in the extreme southeastern corner of Section 31.

A 76-mile segment of the Niobrara River between Borman Bridge and the State Highway 137 bridge was designated as part of the Wild and Scenic River System in 1991 (U.S. Department of the Interior, National Park Service, 2012a). The Nebraska Reroute would not cross the Niobrara River within the designated reach, but it would cross the river at a point approximately 12 miles downstream of State Highway 137.

Canyon Crossings and Steep Terrain

The Nebraska Reroute would cross ground with slopes ranging from 20 to 40 percent and four locations with slopes greater than 40 percent (that is, a vertical change of 40 feet over a horizontal distance of 100 feet). Three of the steepest locations are at stream crossings: Dry Creek in Keya Paha County, and Beaver Creek and Big Sandy Creek in Holt County. The fourth is located near the South Dakota-Nebraska border in Keya Paha County. The majority of locations with steep terrain are located in the Niobrara watershed. No ground surface along the proposed Nebraska Reroute would have slopes greater than 80 percent.

Floodplains

All streams have a floodplain, which is the adjacent land beyond the stream banks that has the potential to become flooded. NDNR estimates the limits of the 100-year floodplain[5] for some streams along the proposed Nebraska Reroute. Through its Large Area Mapping Initiative, NDNR used a geographic information system to map the 100-year floodplains for streams in large, rural, unmapped areas in Nebraska. Together, the Large Area Mapping Initiative process and the Cooperating Technical Partners program (a Federal Emergency Management Agency program) have mapped the floodplains in many of the counties in Nebraska.

The proposed Nebraska Reroute would cross 48 streams with delineated floodplains. Of these floodplains, the four widest are in the southern portion of the route. The numbers in parentheses are the approximate floodplain width for each stream within the proposed Nebraska Reroute corridor:

- Loup River (1.2 mile)
- Prairie Creek (3.3 miles)
- Silver Creek (3.8 miles)
- Platte River (1.1 mile)

Although York County participates in the National Flood Insurance Program, none of the streams in the county have regulatory floodplains.

Surface Water Use

NDEQ designated the beneficial uses of designated streams as:

- Primary contact recreation
- Aquatic life – coldwater Classes A and B, warmwater Classes A and B
- Water supply – public drinking water, agricultural, and industrial
- Aesthetics

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[5] A 100-year flood is a level of flood water that has a 1 percent chance of occurring in a given location in any given year.

The Nebraska Reroute would cross 30 designated streams and 133 undesignated streams. The numbers of designated stream segments with certain types of beneficial uses are listed below:

- 10 stream segments categorized with primary contact recreation beneficial uses
- 15 stream segments categorized with aquatic life coldwater Class B beneficial uses
- 6 stream segments categorized with aquatic life warmwater Class A beneficial uses
- 9 stream segments categorized with aquatic life warmwater Class B beneficial uses
- 30 stream segments categorized with agricultural water supply beneficial uses
- 30 stream segments categorized with aesthetics beneficial uses

4.4.2 Potential Impacts

Potential impacts on surface water resources during construction activities would include:

- Temporary increases in total suspended solids concentrations and increased sedimentation during stream crossings
- Short-term degradation of aquatic habitat from in-stream construction activities
- Potential changes in channel morphology and stability caused by channel and bank modifications
- Temporary-to-long–term decrease in bank stability and resultant increase in concentrations of total suspended solids resulting from bank erosion while vegetation removed from banks during construction were reestablishing (Keystone, 2012b).

The two most common causes of impacts to surface water during construction would be trenching through waterbodies and erosion from uncontrolled runoff. This section first discusses the potential impacts from direct changes to waterbodies during construction and the potential impacts caused by actions in upland locations that could affect surface waters indirectly. Lastly, the potential impacts from operation of the pipeline are discussed.

Construction

Waterbody Crossings

Streams that are dry or have nonmoving water at the time of construction would be crossed using conventional upland construction methods (trenching). In general, major waterbodies would be crossed using HDD methods. The remaining waterbodies would be crossed using the wet or dry open-cut methods.

With the exception of HDD crossings, the actual crossing method that would be used at a given waterbody crossing would depend on the conditions in the USACE's potential authorization under Section 404 of the CWA and conditions of the Section 401 Water Quality Certification issued by NDEQ and the requirements of the NPDES permits (see Chapter 3, Project Regulatory Requirements).

The longer a trench is kept open at a waterbody crossing, the more likely it is that sediment would reduce the water quality. Trenches through waterbodies that are dry or contain nonmoving water at the time of crossing would not be left open more than 24 hours (Keystone, 2012b). Keystone has committed to install erosion and sediment control measures across

portions of the construction ROW to reduce the amount of sediment transported into the waterbody.

An open-cut method would be used to cross the waterbodies listed in Table 4.4-1 along with any key species[6] present. Keystone would use construction techniques that would protect water quality to comply with NDEQ's general NPDES (see Chapter 3, Project Regulatory Requirements). USACE would also require Keystone to obtain Section 404 authorizations.

Table 4.4-1. Waterbodies More than 50 Feet Wide That Would Be Crossed by the Proposed Nebraska Reroute

Crossing Width (feet)	River	Approximate Milepost	Key Species Present[a]
50–100	Beaver Creek (Holt County)	626.8	Grass pickerel, largemouth bass
>100	Brush Creek	642.5	Blacknose dace, largemouth bass
50–100	Unnamed creek	705.4	None listed
50–100	Shell Creek	731.1	None listed
>100	Vorhees Creek	737.3	None listed
50–100	Beaver Creek (Boone County)	743.7	Channel catfish, flathead catfish
50–100	Unnamed tributary to Bogus Creek	749.6	None listed
50–100	Unnamed tributary to Bogus Creek	749.7	None listed
50–100	Unnamed tributary to Loup River	763.6	None listed
50–100	Prairie Creek	766.6	Channel catfish, largemouth bass

[a] *Data compiled from Nebraska Administrative Code, Title 117, Chapter 5.*

Construction activities could temporarily interrupt downstream water flow, and this interruption might interfere with existing water rights. NDEQ suggests that Keystone should identify water rights that could be affected by temporary interruptions of water flow. NDEQ also suggests that Keystone should demonstrate that temporary interruptions of surface water flows would not adversely affect or impair any prior water rights.

Driving equipment through waterbodies can cause impacts to water quality downstream from the construction site due to siltation, bank erosion, and streambed disruption. Using temporary equipment bridges would greatly reduce these direct impacts. In its CMRP, Keystone has specified that temporary equipment bridges would be installed across many waterbodies, including all perennial streams. At the waterbodies where temporary equipment bridges would be constructed, clearing crews would be allowed only one pass through the waterbodies before the bridge construction. All other construction equipment would be required to use the bridges. The equipment bridges would be removed after construction and restoration were completed.

[6] Key species, as defined by NDEQ, are identified as endangered, threatened, sensitive, or recreationally important aquatic species.

All surface waters are considered to be waters of the State, and construction activities associated with the Nebraska Reroute must not adversely affect these waters' assigned beneficial uses. BMPs applicable to crossing methods would be included in the Stormwater Pollution Prevention Plan submitted with NDEQ's NPDES permit. Additional information regarding stream crossings and associated permitting can be found in Appendix E.4.

Construction activities in the beds and banks of flowing streams would disturb the bed and bank soil, creating suspended sediment. Any release of sediment-laden, trench-dewatering discharges could affect the waterbody and would need an NPDES permit from NDEQ. This permit will require Keystone to identify discharges to streams from sources other that stormwater, and to eliminate or reduce those discharges to the extent feasible.

Streambed and Bank Stability

Trenching across a waterbody's bed and banks with open-cut techniques would disturb the alluvial deposits or introduce upland soil that could reduce stream stability. Increased sediment would increase turbidity, which could adversely affect the stream's water quality. Construction techniques using appropriate BMPs, such as dam and pump or flume method of isolating a stretch of stream bed, allow for trenching without adding sediment to the water. USACE permit conditions and the SWPPP would include measures for preventing adverse effects.

After the pipeline would be installed beneath a waterbody, restoration would begin. The waterbody's banks would be restored to preconstruction contours or to a stable configuration. Appropriate erosion control measures such as rock riprap, gabions (rock enclosed in wire baskets), log walls, vegetated geogrids, or willow cuttings would be installed as necessary on steep banks in accordance with permit requirements. More-stable banks would be seeded with native grasses and mulched or covered with erosion control fabric. Waterbody banks would be temporarily stabilized within 24 hours of completing in-stream construction. Sediment barriers, such as silt fences, straw bales, or drivable berms, would be maintained across the ROW at all waterbody approaches until permanent vegetation were established (Keystone, 2012b).

Horizontal Directional Drilling

HDD is a trenchless construction technique employing guided drilling and is used for long distances such as under rivers.

Keystone has committed to using this technique to cross five major rivers along the proposed Nebraska Reroute (Keystone, 2012b). These crossings are listed in Table 4.4-2. These rivers have key species[7] as defined by NDEQ which are also listed in the table.

Although use of HDD techniques would avoid the direct disturbances of the stream bed and bank associated with open-cut techniques, there is a potential for an accidental release of drilling fluids, called a "frac-out." Release of drilling fluid in waterbodies might cause turbidity issues but not toxicity, based on this excerpt from the CMRP (see Appendix C): "[d]rilling fluids and additives utilized during implementation of a directional drill [referred to as HDD in this report] shall be non-toxic to the aquatic environment" (Keystone, 2012b).

[7] Key species are identified as endangered, threatened, sensitive, or recreationally important aquatic species.

Table 4.4-2. Rivers Crossed by Horizontal Directional Drilling along the Proposed Nebraska Reroute

River	Key Species Present[a]
Keya Paha River	Channel catfish, largemouth bass
Niobrara River	Channel catfish, largemouth bass, rock bass, bluegill
Elkhorn River	Channel catfish, largemouth bass, northern pike, flathead catfish
Loup River	Channel catfish, largemouth bass
Platte River	Channel catfish, flathead catfish

[a] *Data compiled from Nebraska Administrative Code, Title 117, Chapter 5.*

Keystone has committed to develop a contingency plan to address a frac-out during an HDD operation. The plan would include instructions for monitoring during the directional drilling and mitigation in the event of a release of drilling fluids. Additionally, the waterbody would be monitored downstream by the contractor for any signs of drilling fluid. Clearing would be necessary at crossings to provide a path on each edge of the ROW to place the telemetry wires that would be used to monitor the location of the drill head used to bore the pilot hole for HDD. Any clearing of vegetation adjacent to the river's edge would be done manually (Keystone, 2012b).

Canyon Crossings and Steep Terrain

Building the proposed Nebraska Reroute in steep terrain would necessitate the use of special construction techniques to create a work platform that would facilitate excavating the trench, staging pipe material, welding pipe, lowering pipe into the trench, and backfilling the trench. DOS's Final EIS describes the special construction techniques proposed for steep terrain (2011a: Section 2.3.3.3); these are also described in Chapter 2, Project Description, of this Draft Evaluation Report.

Construction of the proposed Nebraska Reroute on steep valley slopes would necessitate site-specific erosion and sediment control measures to address stormwater discharge and revegetation on steep slopes. Use of techniques appropriate for construction activities on steep slopes and restoration of slopes that are stable and conform to the adjacent undisturbed steep terrain as nearly as practical would be implemented to avoid creating discontinuities. The CMRP, Appendix C, contains commitments Keystone has made to minimize sediment runoff and encourage revegetation.

Floodplains

Floodplains would be unavoidable during construction. Elements such as staging areas, stream spoil stockpiles, temporary stream flow pumping facilities, temporary travel crossing flumes, temporary travel crossing bridges, and HDD entry and exit sites would be subject to flooding from sudden precipitation if located within a floodplain. No permanent aboveground pipeline structures would be located in floodplains.

Floodplain Development Permits would be needed to construct the pipeline and any ancillary facilities within regulatory floodplains. Floodplain Development Permit applications are made to

the local government agency. Counties with regulatory floodplains for the stream segments are identified in Appendix E.4.

Upland Actions

The primary impacts to surface waters from construction activities in upland areas would be due to runoff. Any disturbed soil can result in runoff of sediment. Minimizing the construction footprint and implementing erosion-control methods are effective ways of reducing these impacts.

Access Roads

Construction of access roads can affect surface water by causing siltation and turbidity due to erosion runoff. Keystone has committed to construction procedures that would minimize erosion runoff. In addition, Keystone would include access roads as part of its NPDES Construction Stormwater permit. Access roads that cross streams would use either existing bridges or temporary bridges that would be removed after restoration.

Construction Camp

If Keystone were to determine that a work camp would be necessary, potential arrangements would be discussed with the landowner(s) and potential local water/wastewater providers. Permits would be obtained as necessary, based on local jurisdiction/authority. Potential water-related permits necessary for the work camp—and authorizing agencies—are:

- Water supply – Nebraska Department of Health and Human Services permit
- Wastewater treatment facility – NDEQ's NPDES permit for discharge of domestic wastewater
- Stormwater – NDEQ's NPDES Construction Stormwater permit

Water Use

Constructing the proposed Nebraska Reroute would use large amounts of water. Uses would include water for controlling dust, hydrostatic testing of the pipeline, and preparation of drilling mud for HDD operations. Potential additional water uses include applying water when placing backfill or embankment and using water for hydromulching operations. Restoration operations could require use of water to maintain or reestablish vegetation and might extend over several years.

Keystone would need to obtain water for construction from sources along the pipeline alignment. Potential sources include surface waters, groundwater, and municipal water. Use of Nebraska's surface water resources would necessitate (in most cases) a surface water right from NDNR. The permit or water right would be approved for a specific location, purpose, and quantity. Several river basins or segments of river basins in Nebraska have been identified by NDNR as either fully appropriated or over-appropriated. For those portions of the Nebraska Reroute in a fully appropriated or over-appropriated basin, Keystone would need to comply with the plan implemented to protect existing water uses in the affected basin.

Dust Control

Airborne dust levels should be controlled at all times during construction. Methods include water truck applications, water sprinklers, or calcium chloride application. Use of calcium chloride application is generally limited to roadways. Sources of water used for dust control might include surface water or groundwater sources and existing municipal or industrial supplies along the proposed Nebraska Reroute corridor.

Hydrostatic Testing

Hydrostatic testing involves filling a segment of pipe (often 10 to 20 miles in length) with water and pressurizing the pipe to a prescribed value. Hydrostatic testing would need to comply with requirements of the NPDES permit (NEG672000) authorizing hydrostatic testing discharges to land application or to surface waters.

Because of the pipeline's linear nature, hydrostatic testing of the pipeline might involve filling a pipe segment for testing with water from a source in one river basin and reusing the water to test consecutive pipe segments. Through this process, water would be emptied many miles from the original source. This could transfer water from one river basin to another river basin and would necessitate obtaining a permit for transfer of water from NDNR. Additional details can be found in Appendix E.4.

The States of Nebraska and Kansas have entered into an agreement to maintain minimum flows in the Big Blue River at the state line. The Big Blue River Basin Compact requires minimum mean daily flows during the period of May 1 through September 30. Any water appropriation for construction activities associated with the proposed Nebraska Reroute would be considered junior, so it must comply with the Big Blue River Basin Compact. The southern end of the proposed Nebraska Reroute in Polk and York Counties passes through the Upper Big Blue NRD.

Horizontal Directional Drilling

Water is needed to prepare drilling mud used in the HDD technique. Drilling mud would be disposed of at an upland site or an approved landfill following completion of the crossing operation. Entry and exit sites for HDD are often some distance from the surface water being crossed, and, if that is the source of water, paths would be needed to provide access for water collection.

The permit application for Appropriation of Water must include an estimate of the amount of water that would be used for pretesting the HDD pipe string and mixing drilling mud.

Operation

Keystone is required by PHMSA regulations to prepare manuals and written procedures for conducting operation, maintenance, inspection, and monitoring activities. As stated in Chapter 2, Project Description, the pipeline ROW would be inspected through aerial and ground surveillance to provide prompt identification of possible encroachments or nearby construction activities, ROW erosion, exposed pipe, and other conditions that could damage the pipeline or adversely affect surface waters. Aerial surveillance of the pipeline ROW would be carried out at least 26 times per year. Permanent ROW would provide access for the life of the proposed Nebraska Reroute to support surface and aerial inspections and necessary repairs or maintenance.

Watersheds

NDEQ's NPDES Construction Stormwater permit requires restoration of vegetation when more than 1 acre is disturbed. Vegetation disturbed by maintenance activities would be restored immediately following completion of the maintenance activity.

Streambed Stability

The effects of short-term degradation include migration of existing up- or downstream headcuts (also known as "nick points"), local scour during high flows, and long-term streambed degradation. The potential for development of short- and long-term stream degradation should be addressed at each stream crossing to determine whether the proposed 5-foot depth of cover for open-cut stream crossing locations would be sufficient to protect the pipeline from exposure or damage.

Potential extents of lateral channel migration should be evaluated to determine the starting and ending points of greater depth of cover at stream crossings.

Stream meanders can also lead to bank undercutting and sloughing, which can be a problem if the pipeline is buried in the bank.

Floodplains

Aboveground and ancillary facilities would not be located within floodplains within the proposed Nebraska Reroute corridor. These facilities might not be susceptible to damage from floating debris or submergence but might be inaccessible for operation, maintenance, or monitoring during a flood. NDEQ suggests that aboveground and ancillary facilities should be located where they would not be damaged by flooding and should be accessible if they might need to be operated, maintained, or monitored during a flood. Specifically, in the case of flooding, an access plan should be developed for Pump Station 24, which would be south of the Loup River.

4.4.3 Commitments to Reduce or Avoid Impacts

Keystone's CMRP and other commitments described above and in Appendix C would avoid or reduce many impacts on surface waters that would occur on the proposed Nebraska Reroute.

Further, as outlined in Keystone's CMRP, trenches through water bodies that are dry or contain nonmoving water at the time of crossing would not be left open for more than 24 hours, except in extenuating circumstances, to reduce chances of sediment discharge from a sudden storm resulting in runoff. This commitment would not apply where excavation of rock by blasting or mechanical means might be needed in a waterbody.

Keystone would also:

- Abide by mitigation measures outlined in applicable water withdrawal and discharge permits to protect sensitive receptors, such as fisheries.
- As a standard procedure and as part of its withdrawal and discharge permits, identify water rights that could be affected by temporary interruptions of water flow.
- As the location and design for Pump Station 24 would be finalized, Keystone would develop an access plan for this pump station. Because of the station's location near the Loup River, access during flood conditions would be an important consideration.

4.5 WETLANDS

Wetlands are areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of wetland vegetation typically adapted for life in saturated soil conditions. Wetlands are essential breeding, rearing, and feeding grounds for many species of fish and wildlife. They also perform flood protection and pollution control functions (Cowardin et al., 1979).

Wetlands along the proposed Nebraska Reroute corridor fall under the jurisdictions of the USACE Omaha District, EPA, and NDEQ. Under Section 404 of the Clean Water Act (CWA), permits are required for the discharge of fill material into waters of the United States. Waters of the United States protected by the CWA include surface waters such as streams, lakes, impoundments, and wetlands. Waters of the United States include the area below the ordinary high water mark of stream channels and lakes or ponds connected to the tributary system and wetlands adjacent to these waters. Although not regulated under federal law, isolated wetlands would be adversely affected by the proposed Nebraska Reroute as well. Nonwetland surface water features are addressed in Section 4.4 and Appendix E.4 of this Draft Evaluation Report.

As part of federal regulatory requirements under the CWA, inventories of wetlands and other waters of the United States are required along the proposed pipeline ROW and other associated areas of disturbance related to the Nebraska Reroute. Information gathered during these inventories, including field surveys, would be used to evaluate the potential for adverse effects on waters of the United States and to complete notification and permitting requirements of both NDEQ and USACE under Sections 401 and 404 of the CWA.

In addition to the USACE regulations, the State regulates impacts on wetlands in accordance with the CWA and the Nebraska Environmental Protection Act (Nebraska Revised Statutes §§ 81-1501 to 81-1533). NDEQ conducts the required review under Section 401 of the CWA and the aforementioned State laws. NDEQ applies an antidegradation policy to all wetlands and has adopted regulations for the administration of Section 401 (Title 120) and water quality standards (Title 117) for all waters of the State, both surface waters and natural wetlands, regardless of whether they are waters of the United States or not. For Section 401 water quality certification, NDEQ requires avoidance, minimization, and compensatory mitigation for wetland impacts through creation of new wetlands or through restoration or enhancement of existing wetlands.

4.5.1 Existing Conditions

The designated Study Area for reviewing wetland impacts for the proposed Nebraska Reroute consists of a 300- to 500-foot-wide corridor centered on the route. In addition, the Study Area includes proposed ancillary facilities (access roads, pump stations, pipe yards, and contractor yards outside the pipeline construction ROW) locations. The Wetlands Map Book (see Appendix E.5) depicts wetlands within the Study Area. The functions and corresponding values commonly attributed to wetlands are summarized in Appendix E.5.

According to data provided by Keystone on September 20, 2012; USFWS National Wetland Inventory (NWI) maps; National Land Cover Dataset (NLCD); and the USGS National Gap Analysis Program (GAP), wetlands within the Study Area include freshwater emergent (palustrine emergent wetland), freshwater forested/shrub (palustrine forested and palustrine

scrub/shrub wetlands), riverine (perennial, intermittent, and ephemeral waterways), freshwater pond (open waterbody), and other types (human-made waterbody and ditch) (Keystone, 2012b; USFWS, 2012a; Fry et al., 2011; USGS, 2012b) (see Appendix E.5).

Section 4.6 discusses biologically unique landscapes crossed by the Study Area. Some wetlands found within these biologically unique landscapes are considered sensitive wetland habitats by NGPC. A discussion of these sensitive wetland habitats is included in Section 4.6.4.

To identify the types and acreage of wetlands that would be crossed by the Nebraska Reroute, Keystone conducted field delineations and aerial photography interpretations in the spring and summer of 2012. These data were used to calculate potential impacts to wetland resources in these analyses in combination with USFWS NWI, NLCD, and USGS GAP data (USFWS, 2012a; Fry et al., 2011; USGS, 2012b). NDEQ monitored Keystone's field delineations and verified the wetland mapping

Freshwater Emergent Wetlands

Emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes (nonwoody herbs that thrive in wet environments), excluding mosses and lichens. Hydrophytic vegetation is present for most of the growing season in most years and contains predominantly perennial plants. In areas such as the prairies of central Nebraska, substantial seasonal and annual climatic fluctuations can result in a range of conditions in the same wetland, such as vegetated-to-open water ponded habitats. Freshwater emergent wetlands within the Study Area are shown in Appendix E.5.

Freshwater Forested/Shrub Wetlands

Forested wetlands are characterized by woody vegetation with a height above 6 meters. Forested wetlands are most common in areas of Nebraska where moisture is relatively abundant, particularly along rivers. Forested wetlands normally have an overstory of trees, an understory of young trees or shrubs, and an herbaceous layer (Cowardin et al., 1979). Shrub wetlands include areas dominated by woody vegetation less than 6 meters tall. Vegetation forms found in this type of wetland include shrubs, young trees, and trees or shrubs that are small or have experienced stunted growth because of environmental conditions. Shrub wetlands may represent a successional stage leading to a forested wetland or could be relatively stable communities (Cowardin et al., 1979). Freshwater forested/shrub wetlands within the Study Area are shown in Appendix E.5.

Riverine Wetlands

Riverine wetlands are closely associated with the riparian zones and floodplains of all of Nebraska's rivers and streams. These riparian areas are complex systems with numerous interrelated wetland and nonwetland components (wetlands, organic matter, sandbars, tree falls, side channels, etc.). Wetlands are an important component of this system because of production of invertebrates and other organic matter that provide nutrients to the streams and rivers. Additionally, riverine wetlands provide spawning and nursery areas for many different types of fish, amphibians, and reptiles, and a home for numerous wildlife species. Based on NGPC maps, the Study Area crosses the riverine wetland complex area in Antelope County at the Elkhorn River. Riverine wetlands within the Study Area are shown in Appendix E.5.

Freshwater Pond Wetlands

Freshwater ponds included as wetlands in the NWI dataset are often shallow-to-deep depressions with open water surrounded by a wetland fringe. During dry seasons or years the water can recede, leaving mud flats. Freshwater pond wetlands within the Study Area are shown in Appendix E.5.

Other Wetlands

Wetlands included as "other" in the NWI dataset are areas that likely support wetland vegetation, soils, and hydrology but do not occur along a stream, river, lake, or pond. They may occur in irrigated crop land or along other man-made water features such as ditches. Other wetlands within the Study Area are shown in Appendix E.5.

Additional information about plant communities associated with each wetland type is included in Section 4.6, Terrestrial Vegetation, of this Draft Evaluation Report.

4.5.2 Potential Impacts

Potential impacts on wetlands within the Study Area were calculated using the data provided by Keystone on September 20, 2012; USFWS NWI maps; NLCD; and the USGS GAP data (USFWS, 2012a; Fry et al., 2011; USGS, 2012b). The proposed construction width within wetlands is 85 feet. Additional temporary workspace would be needed on both sides of wide, saturated wetlands to stage construction, weld the pipeline, and store materials. These additional temporary workspace areas would be located in upland areas a minimum of 10 feet from the wetland edge. Ancillary facilities outside of the pipeline ROW may also affect wetlands. The temporary construction camp, if needed, should be located to avoid impacts on wetlands. Preliminary estimates of the surface area of emergent and forested/shrub wetlands affected by construction and operation of the ROW as well as ancillary facilities are summarized in Appendix E.5.

The proposed Nebraska Reroute crosses five types of NWI wetlands (freshwater emergent, freshwater forested/shrub, riverine, freshwater pond, and other). Each type of wetland supports a unique flora, fauna, and hydrology; consequently, impacts from construction and operation could affect each wetland type differently.

Construction of the pipeline would affect wetlands and their functionality primarily during and immediately following construction activities. However, wetland recovery may take 3 to 5 years, and permanent changes are also possible (Federal Energy Regulatory Commission [FERC], 2004). Potential construction- and operation-related impacts to wetlands could result from backfilling or draining, modifying surface and subsurface flow patterns that could affect wetland productivity, and altering wetland vegetation composition and structure through clearing and operational maintenance.

Noxious and invasive weeds could be spread to wetlands along the proposed Nebraska Reroute corridor during construction and operational maintenance. Invasive noxious weeds could hinder the return of native and preconstruction vegetation. The federal, State, and county lists of noxious weeds that could occur along the proposed Nebraska Reroute—and information about efforts to control the spread of noxious weeds within the Nebraska Reroute—are presented in Appendix E.6. Within the portion of the proposed Nebraska Reroute that has been surveyed, musk thistle (*Carduus nutans*) and Canada thistle (*Cirsium arvense*) were the two noxious

species identified. The remainder of the Nebraska Reroute would be surveyed prior to construction to prepare noxious weed plans (Keystone, 2012b).

Wetland soils, hydrology, and vegetation would also be affected within the proposed Nebraska Reroute through increased soil temperatures near the pipeline. According to the Final EIS, operation of the proposed pipeline would increase soil temperatures above ambient surrounding soil temperatures as follows:

- At the soil surface – by 4°F to 8°F
- At 6 inches below the soil surface – by 10°F to 15°F
- At pipeline burial depth – by as much as 40°F

The largest increases are anticipated to occur from January to May within the proposed Nebraska Reroute (DOS, 2011a). Native prairie grasses, trees, and shrubs have root systems penetrating below 6 inches and would be affected by the increased soil temperature. Operation of the proposed pipeline could also cause slight increases in water temperatures because the pipeline would be buried 4 to 5 feet below the bottom of the wetland or waterbody. Small ponds and wetlands may remain unfrozen later and may thaw sooner than surrounding wetlands. Increased soil and water temperatures during early spring could cause early germination and increased productivity in wetland plant species. Early and late migrant waterfowl might be attracted to and concentrated within these areas during spring and fall migrations (DOS, 2011a).

Freshwater Emergent Wetlands

According to Keystone data, USFWS NWI maps, NLCD, and the USGS GAP data, approximately 33 acres of emergent wetlands would be temporarily adversely affected during construction by the removal of vegetation, loss and degradation of topsoil, soil compaction and rutting from construction equipment, introduction and dispersal of invasive weeds, and alteration of ground elevation and water flow (USFWS, 2012a; Fry et al., 2011; USGS, 2012b). Freshwater emergent wetlands within the Study Area are shown in Appendix E.5. Generally, following construction, wetland communities eventually undergo a transition back into a community that is functionally similar to preconstruction conditions, provided conditions such as elevation, grade, and soil structure are successfully restored (FERC, 2004). Herbaceous species within emergent wetlands typically regenerate within 3 to 5 years (FERC, 2004). If mitigation measures discussed in Section 4.5.3 were to be followed, it would be unlikely that the Nebraska Reroute would result in long-term impacts on emergent wetlands.

Freshwater Forested/Shrub Wetlands

According to Keystone data, USFWS NWI maps, NLCD, and the USGS GAP data, approximately 16 acres of forested/shrub wetlands would be temporarily affected during construction activities (Keystone, 2012b; USFWS, 2012a; Fry et al., 2011; USGS, 2012b). Freshwater forested wetlands within the Study Area are shown in Appendix E.5. Given the length of time needed for the trees and understory to mature and return to preconstruction conditions, clearing trees within riparian forest communities would result in long-term, adverse impacts on these vegetation communities. Permanent impacts on forested/shrub wetlands would occur within the permanent easement centered on the pipeline by conversion of forested wetland to emergent wetland. In this area, trees would be removed during construction and would be prevented from reestablishing because of periodic mowing and brush clearing during pipeline

operation. It is likely that herbaceous emergent wetland vegetation would grow within the permanent ROW in previously forested/shrub wetlands.

Riverine Wetlands

According to Keystone data, USFWS NWI maps, NLCD, and the USGS GAP data, approximately 12 acres of riverine wetlands would be affected during construction activities (Keystone, 2012b; USFWS, 2012a; Fry et al., 2011; USGS, 2012b). Riverine wetlands within the Study Area are shown in Appendix E.5. The two most common causes of impacts to surface water during construction would be trenching through waterbodies and erosion from uncontrolled runoff. Additional information about potential impacts to rivers and streams in the Study Area are discussed in Section 4.4.2.

Freshwater Pond Wetlands

According to Keystone data, USFWS NWI maps, NLCD, and the USGS GAP data, approximately 1 acre of freshwater pond wetlands would be affected during construction activities (Keystone, 2012b; USFWS, 2012a; Fry et al., 2011; USGS, 2012b). Freshwater pond wetlands within the Study Area are shown in Appendix E.5. The two most common causes of impacts to surface water during construction would be trenching through waterbodies and erosion from uncontrolled runoff. Additional information about potential impacts on freshwater ponds in the Study Area is discussed in Section 4.4.2.

Other Wetlands

According to Keystone data, USFWS NWI maps, NLCD, and the USGS GAP data, less than an acre of other wetlands would be affected during construction activities (Keystone, 2012b; USFWS, 2012a; Fry et al., 2011; USGS, 2012b). Other wetlands within the Study Area are shown in Appendix E.5. The two most common causes of impacts to surface water during construction would be trenching through waterbodies and erosion from uncontrolled runoff. Generally, following construction, wetland communities eventually undergo a transition back into a community that is functionally similar to preconstruction conditions, provided conditions such as elevation, grade, and soil structure would be successfully restored (FERC, 2004).

4.5.3 Commitments to Reduce or Avoid Impacts

Keystone would implement actions in accordance with its CMRP (see Appendix C), except where those actions would conflict with federal, State, or local rules and regulations or other permits or approvals.

Wetland impacts would be avoided or minimized along the proposed Nebraska Reroute to the extent practicable. As described in the CMRP (Appendix C), if equipment must operate within a wetland or sensitive area containing standing water or saturated soils, Keystone would use timber mats, timber riprap, or other methods to stabilize surface conditions and reduce impacts during construction. Keystone would reduce impacts on forest/shrub wetlands by limiting the removal of tree stumps and restricting grading activities to the area directly over the trench line. Other methods used to avoid and/or minimize permanent impacts to wetlands include:

- Reducing the construction corridor width to 85 feet in wetlands
- Crossing riparian wetland features perpendicularly wherever possible to minimize the crossing distance
- Selecting route variations to reduce the total length of wetland crossings
- Cleaning all construction equipment to limit the potential for the spread of noxious species
- Controlling sedimentation with BMPs
- Locating additional temporary workspace outside of wetlands
- Limiting the duration of construction in wetlands
- Limiting construction equipment crossings of wetlands
- Avoiding placing ancillary facilities (including temporary roads) in wetlands

As discussed in Appendix C, Noxious Weed Management Plan, the spread of noxious and invasive weeds into wetlands would be minimized and avoided. Erosion control measures would be used when constructing on slopes or where the potential for erosion or sedimentation would be high.

Keystone further committed[8] to develop compensation through the USACE CWA Sections 404 and 401 permitting program for impacts on forested wetlands adversely affected by the construction ROW (Keystone, 2012d).

In the same letter, Keystone committed to consult with USACE to ensure its compliance with CWA Section 404 permitting (Keystone, 2012d).

[8] In an October 18, 2012, letter to NDEQ

4.6 TERRESTRIAL VEGETATION

This section describes the terrestrial vegetation in the proposed Nebraska Reroute corridor and how the Nebraska Reroute could affect these resources in terms of both short-term effects during construction and long-term effects from reclaiming and restoring the ROW after construction. Also provided are possible measures to reduce the impacts of the proposed Nebraska Reroute on terrestrial vegetation.

The proposed Nebraska Reroute would cross both undeveloped and agricultural land in central and eastern Nebraska. The terrestrial vegetation is dominated by agricultural land, grassland, and rangeland.

4.6.1 Existing Conditions

The designated Study Area for reviewing impacts on terrestrial vegetation from the proposed Nebraska Reroute consists of a 300- to 500-foot-wide Study Area (centered on the Nebraska Reroute alignment) that extends from about 1 mile south of the South Dakota-Nebraska border in Keya Paha County to the northwest corner of York County. The vegetation types in the Study Area were identified and delineated based on interpretation of aerial photographs, and general observations made during field surveys on properties where access was successfully obtained.

To identify potential impacts on terrestrial vegetation in these ecoregions,[9] field surveys and interpretation of aerial photographs were used to identify Biologically Unique Landscapes[10] and to identify and categorize wetlands. Seven basic habitat classification types were documented based on field reconnaissance: agricultural, grassland/herbaceous, nonforested wetlands, forested wetlands, developed, forest, and open water.

The proposed Nebraska Reroute would cross several different ecoregions (see Appendix E.6). Some native vegetation of the various ecoregions is found in the Study Area; however, much of the land in the Study Area has been converted for farming and ranching. Within the ecoregions are Biologically Unique Landscapes (see Appendix E.6). The Study Area also crosses five types of wetlands, according to the NWI conducted by USFWS and discussed in Section 4.5.

4.6.2 Potential Impacts

Vegetation would be temporarily and adversely affected in the areas needed for construction and within possible construction camp areas. Vegetation cover in the Nebraska Reroute construction corridor would be removed during the initial phases of construction and restored after construction (after the possible work camp would have been dismantled). In some areas, vegetation would be permanently displaced after construction because of ROW maintenance and new ancillary facilities, such as roads, MLVs, and pump stations. Vegetation could also be temporarily or permanently adversely affected in the event of a spill or release from the pipeline (see Chapter 6, Pipeline Safety and Potential Spills). Although vegetation cover would be

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[9] An ecoregion of the United States is "an area within which ecosystems (and the type, quality, and quantity of environmental resources) are generally similar" (EPA, 2012b).

[10] NGPC identified the Biologically Unique Landscapes as part of the Nebraska Natural Legacy Project to reverse the decline of at-risk species, recover currently listed species (delisting), keep native species common, and conserve natural communities (NGPC, 2011b).

retained within the ROW, pipeline maintenance activities and access requirements could alter the type of vegetation in this corridor.

Clearing for construction and periodic maintenance activities could temporarily or permanently alter the composition or structure of vegetative communities along the Reroute. This potential impact would be small because 95 percent of the land within the 110-foot-wide corridor is currently in agricultural production (cropland and rangeland) (see Section 4.10). Impacts on vegetation could also affect other resources such as soil because of the increased risk of soil erosion from the lack of vegetative cover. The degree of impact would depend on the type and amount of vegetation, the affected plants' regeneration rates, and the frequency of disruption. Table 4.6-1 summarizes the estimated impacts on vegetation communities from the Nebraska Reroute, based on the NLCD (Fry et al., 2011).

Table 4.6-1. Estimated Impacts of the Proposed Nebraska Reroute on Vegetation Communities

Vegetation Community Classification	Length of Community Crossed (miles)	Temporary Vegetation Impacts during Construction (acres)[a]	Permanent Vegetation Impacts during Operation (acres)[b]
Agricultural	116	1,644	30
Grassland/herbaceous	68	996	0
Nonforested wetlands	<1	15	4
Forested wetlands	2	16	11
Developed	7	121	<1
Forest	<1	13	5
Total	**195**	**2,805**	**65**

Source: Fry et al., 2011

[a] *Includes acres disturbed on a temporary basis (permanent right-of-way width plus temporary workspace) during construction. Acreage does not include disturbance associated with tank farms, pipe stockpile sites, rail sidings, contractor yards, or construction camps.*

[b] *Includes acres disturbed (maintained) on a permanent basis during operation of the proposed pipeline. Acreage does not include disturbance associated with tank farms, pipe stockpile sites, rail sidings, contractor yards, or construction camps.*

Agricultural Habitat Impacts

During field surveys, agricultural habitat was found within much of the Study Area in each ecoregion and Biologically Unique Landscape. Approximately 116 miles of the Study Area cross agricultural vegetation types (Fry et al., 2011).

Within the Study Area, impacts on agricultural land such as annually tilled cropland would be short-term and potentially limited to the current growing season if topsoil were segregated and soils were chisel-plowed after construction to reduce compaction of the soil caused by construction activities. Impacts on other types of agricultural land such as pastures and open grassland generally would be short- to long-term, with vegetation potentially reestablishing

within 5 years after construction. However, invasion of noxious weeds and nonnative plants introduced during construction could prevent short-term recovery of prairie grasslands.

Grassland/Herbaceous Habitat Impacts

According to field surveys and interpretation of aerial photographs, grasslands and herbaceous habitats are found throughout the Study Area in all of the ecoregions and Biologically Unique Landscapes. According to NLCD, approximately 68 miles of the Study Area cross grassland/herbaceous vegetation types (Fry et al., 2011). Approximately 491 acres would be within the construction ROW, and 412 acres would be within the permanent ROW. Impacts on grasslands and herbaceous prairies could be long-term, because sod destroyed during construction would not regenerate quickly.

Shortgrass- and mixed-grass prairie areas could take approximately 10 years to reestablish because of poor soil conditions and low moisture levels (DOS, 2011a). Heat dissipated from the pipeline could lead to early germination and increased growth of native prairie grasses, but it could also lead to decreased soil water that could be detrimental to native prairie plants. In addition, invasion of noxious weeds and nonnative plants introduced during construction could prevent the recovery of prairie grasslands.

Nonforested Wetland Habitat Impacts

Jurisdictional nonforested wetlands are regulated under a Section 404 permit from USACE. Nonforested wetland habitats were identified by Keystone (see Section 4.5, Wetlands). Potential construction- and operation-related impacts on wetlands could occur because of backfilling or draining; modifying surface and subsurface flow patterns, which could reduce wetland productivity; and altering the composition and structure of wetland vegetation communities as a result of clearing during construction and maintenance during operation.

Once the ROW were restored and revegetated, it would be unlikely that emergent wetland vegetation would be permanently adversely affected, because these areas naturally consist of quick-growing herbaceous plants (FERC, 2004). However, plant species composition might naturally change to species more adapted to disturbed soils.

Forested Wetland Habitat Impacts

Forested wetlands are regulated under a Section 404 permit from USACE. The majority of wetland forested habitat in the Study Area is along the major rivers crossed by the Study Area in the Biologically Unique Landscapes. Pockets of upland forested habitat were also found along the proposed Nebraska Reroute. According to NLCD, approximately 2 miles of the Study Area cross forested wetland vegetation types. Clearing trees in forested wetland communities during construction would cause long-term impacts on these vegetation communities, because of the length of time needed for the trees and understory to mature to preconstruction conditions.

Permanent impacts would occur within the 50-foot-wide permanent easement centered on the pipeline. In this 50-foot-wide area, trees and stumps would be removed during construction and would not be allowed to reestablish because vegetation would be periodically mowed and brush would be periodically cleared during operation of the pipeline. However, these effects would be lessened if HDD were used as clearing and grading would be needed only to facilitate driller access and placement of telemetry wires.

Developed Habitat Impacts

Developed areas include farmsteads and agribusinesses in the Study Area in all ecoregions. Approximately 7 miles of the Study Area cross developed vegetation types. After construction, the vegetation in the developed areas would be returned to preconstruction conditions to the extent practicable. Additional information on the potential impacts on developed areas is provided in Section 4.10.2.

After the vegetative cover were removed and the soil disturbed, noxious weeds and invasive plants could prevent or delay the reestablishment of vegetation communities. Coordination through the Nebraska Department of Agriculture's Noxious Weed Program, in accordance with the Noxious Weed Control Act of Nebraska, would be required to reduce effects of noxious weeds in the Study Area. Appendix C includes the federal, State, and county lists of noxious weeds that could be present in the Study Area and information about efforts to control the spread of noxious weeds.

Forested Habitat Impacts

Less than 1 mile of the Study Area crosses upland forested vegetation. Clearing trees in upland forest communities during construction would cause long-term impacts on these vegetation communities. Permanent impacts would occur within the 50-foot-wide permanent easement centered on the pipeline. In this 50-foot-wide area, trees would be removed during construction and would be prevented from reestablishing because vegetation would be periodically mowed and brush would be periodically cleared during operation of the pipeline. Vegetation control as part of routine maintenance could occur every 1 to 3 years in upland forested areas.

Open Water Habitat Impacts

Open water habitats are found within all of the ecoregions and Biologically Unique Landscapes crossed by the Study Area. Less than 1 mile of the Study Area crosses open water. Potential impacts on open water habitats are discussed further in Section 4.3, Surface Water.

4.6.3 Commitment to Reduce or Avoid Impacts

Keystone has committed to avoid or reduce impacts by implementing its CMRP (see Appendix C). The CMRP prescribes construction, operation, and maintenance procedures that are designed to reduce the likelihood and severity of impacts along the proposed Nebraska Reroute.

As described in the CMRP, after the ROW were cleaned up and topsoil is replaced, Keystone has committed to reseed the construction ROW using seed mixes based on input from the local NRCS office and specific seeding requests from landowners and land managers. In the first year after construction, the ROW would be inspected to identify areas of erosion or settling and would be monitored periodically thereafter.

Keystone has committed to implementing several measures to control the introduction and spread of noxious weeds, such as cleaning all construction equipment before moving it to the job site, marking all areas of the ROW that are infested with noxious weeds, stripping and storing topsoil contaminated with weeds separately from clean topsoil and subsoil, and limiting the potential for spread of weeds by contracting with a State-licensed pesticide applicator to apply pesticides at valve sites, metering stations, and pump stations (see Appendix C). Keystone has

committed to work with landowners and the NRCS to determine appropriate seed mixes. Further, prior to construction, Keystone would mark all areas of the ROW which contain infestations of noxious, invasive species or soil-borne pests and implement BMPs for conducting vegetation control where necessary before and after construction. Agricultural herbicides used would be developed in consultation with county or State regulatory agencies, and all herbicides applied prior to or during construction will be nonresidual. Herbicides would not be used in or within 100 feet of a wetland or waterbody. Where necessary, Keystone has committed to retain a local rangeland expert.

Keystone has committed to implementing the measures in the CMRP to the extent that they do not conflict with the requirements of any applicable federal, State, or local rules and regulations, or other permits and approvals applicable to this project.

In addition to the measures prescribed in the CMRP, Keystone has also agreed to implement various measures in the Final EIS that would reduce impacts on terrestrial vegetation and increase the likelihood that disturbed areas would be successfully restored (DOS, 2011a).

As discussed in the Final EIS, Keystone has agreed to limit construction traffic to approved workspace areas, contractor and pipe yards, pump stations, existing roads, authorized newly constructed roads, and approved private roads, all of which would be clearly staked by Keystone to prevent unauthorized areas from being disturbed. Appropriate construction and clearing techniques would be used in different vegetation types, such as mowing in cropland and reducing the construction width in wetlands and shelterbelts to reduce construction impacts (DOS, 2011a).

To promote revegetation after construction, the existing topsoil would be preserved everywhere to a maximum depth of 12 inches and would be stockpiled to minimize the potential for subsoil and topsoil mixing. Postconstruction drainage and slopes would be restored to preconstruction conditions. In wetlands and other sensitive areas, Keystone has agreed to use timber mats, timber riprap, or other methods to stabilize surface conditions and reduce impacts (DOS, 2011a).

Keystone would be required to consult with the staff from NDEQ to develop mitigation for impacts on emergent wetlands in the Nebraska Reroute corridor to comply with State Water Quality Certification Program and with Section 404 guidelines under the jurisdiction of USACE.

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4.7 WILDLIFE

Constructing the proposed Nebraska Reroute would affect approximately 1,500 acres of primarily rangeland and cropland vegetation habitats. Although much of this area would be revegetated after the pipeline were installed, periodic maintenance activities could alter or fragment the existing habitat. In addition, ancillary above-grade facilities could harm birds during migration.

This section provides an overview of the existing wildlife and habitat conditions along the Nebraska Reroute alignment and identifies the foreseeable impacts of the Reroute. In addition, available ways to reduce the impacts to wildlife are identified.

The designated Study Area for reviewing impacts on wildlife from the proposed Nebraska Reroute consists of a 110-foot-wide corridor centered on the alignment.

4.7.1 Existing Conditions

The designated Study Area for reviewing wildlife habitat impacts for the proposed Nebraska Reroute consists of a 300- to 500-foot-wide corridor centered on the route. The proposed Nebraska Reroute passes through terrestrial wildlife habitats dominated by prairies, agricultural land, riparian corridors, and wetlands that support various wildlife species. A discussion of federal and/or State-protected species is included in Section 4.9.

Annual surveys for bald eagle and golden eagle and for other raptor nests and rookeries were conducted for the route identified in the Final EIS (DOS, 2011a). However, nest and rookery surveys have not been conducted for the proposed Nebraska Reroute because of the timing of the route selection. Raptor nest surveys and rookery searches would be conducted before refoliation in spring 2013.

The following baseline information was obtained from the Final EIS, publicly available information from federal and State government wildlife agencies, and published scientific information regarding the distribution and ecology of the wildlife species discussed.

Wildlife Habitat Types Crossed by the Nebraska Reroute

Several basic habitat types provide forage, cover, and breeding habitats for wildlife. These habitat types are described in more detail in Section 4.6, Terrestrial Vegetation.

- Agricultural, including cultivated crops and hay/pastureland
- Grassland/herbaceous
- Forest
- Forested and nonforested wetlands
- Open water (Fry et al., 2011)

Comprising almost 95 percent of the total alignment, agricultural, grassland, and rangeland are the dominant habitat types crossed by the proposed Nebraska Reroute.

Representative Wildlife in the Study Area

Big-game and small-game animals, furbearers, waterfowl, and game birds use habitats in and around the Study Area. Nongame wildlife species, such as small mammals, coyotes, foxes, weasels, bats, raptors, songbirds, lizards, toads, and snakes, are also common in the Study Area. Many different types of invertebrates are present in the Study Area including bees, beetles, butterflies, cicadas, earthworms, grasshoppers, hornets, moths, and spiders, many of which provide food for birds, amphibians, reptiles, and small mammals (DOS, 2011a). Appendix E.7 provides a comprehensive list of species found in the Study Area.

Central Flyway and Bird Conservation Areas

The Study Area crosses a segment of the Central Flyway avian migration corridor. Most of the Study Area is within the Central Mixed-grass Prairie Bird Conservation Region and follows the boundaries of the Eastern Tall-grass Prairie Bird Conservation Region and the Prairie Potholes Bird Conservation Region. The Prairie and Badland Bird Conservation Regions cover a small portion of the northern end of the Study Area (USFWS, 2008). Appendix E.7 lists the birds of conservation concern that are listed as breeding and might be present in the Study Area given the current range of the species.

Biologically Unique Landscapes and Tier I and II Species

The proposed Nebraska Reroute crosses four areas identified as Biologically Unique Landscapes (NGPC, 2011b): the Keya Paha, Lower Niobrara, the Verdigris-Bazile, and Lower Loup (see Section 4.6.1 for additional discussion of Biologically Unique Landscapes). These landscapes might provide important habitat for some species considered to be at-risk in the region. The State, through the Nebraska Natural Legacy Project, divides at-risk species into two classifications. Tier I species generally have statutory protection through the ESA. Some Tier I species and all Tier II species currently have no statutory protection. Conserving their habitats in these Biologically Unique Landscapes is an important component of protecting these species. Appendix E.7 lists the Tier I species that could be present in each Biologically Unique Landscape crossed by the Study Area.

The Nebraska Natural Legacy Project State Wildlife Action Plan does not provide data regarding the distribution of Tier II species in Biologically Unique Landscapes. The list of Tier II at-risk wildlife in Nebraska is included in Appendix E.7.

4.7.2 Potential Impacts

The proposed Nebraska Reroute would cross habitats used by wildlife and could affect wildlife resources in several ways:

- Habitat loss, alteration, and fragmentation
- Wildlife deaths during construction and operation of the pipeline
- Impacts from movement barriers, stress, displacement, or exposure to construction and operation noise and activity; low-level helicopter or airplane monitoring overflights; and increased human activity. These impacts could include:
  - Reduced mating and/or reproductive success
  - Reduced survival (DOS, 2011a)

Impacts from construction and operation of the pipeline would be small on a landscape level because the permanent corridor would be narrow, disturbed habitats would be reclaimed, and the majority of the affected habitats would be range- and cropland (see Appendix E.7). Although the Study Area has a substantial amount of intensively farmed agricultural land that has been fragmented, the Nebraska Reroute would cross low-intensity agricultural areas (such as rangeland used for grazing) and Biologically Unique Landscapes that still have some large patches of rangeland/grassland (prairie), forested areas (generally riparian), and wetland habitats.

Fragmentation effects are generally more pronounced in wooded and shrubland habitats because of the difference in habitat features and characteristics between a wooded habitat and the altered vegetative cover of the maintained ROW. Fragmentation effects would likely be short-term in grasslands/cropland where the habitat structure could recover relatively quickly. Habitat could be altered by the disruption of native vegetation communities and the introduction or colonization of nonnative, noxious, or invasive species.

Fragmentation reduces the size of available contiguous habitat for wildlife, increases the amount of edge habitat, provides conditions more suitable for the establishment of invasive species, and alters the accessibility of formerly inaccessible habitat for human use (DOS, 2011a).

Affected areas within the ROW would be reclaimed quickly to prevent erosion and colonization by nonnative noxious or invasive species. In addition, the ROW could be a barrier to wildlife movement to and from foraging, resting, or cover areas or breeding habitat. Any barriers to movement due to construction would be temporary and would not have long-term impacts on populations.

Permanent adverse impacts would include a minor loss of forested habitat within the permanent pipeline corridor; fragmentation of wooded habitats and habitats in Biologically Unique Landscapes; increased human activity within the ROW; and access roads that could increase direct wildlife deaths from vehicle-animal collisions, destruction of underground nests and burrows, abandonment of burrows and loss of young, and legal and illegal killing of wildlife (Madson, 2006). In addition, migratory waterfowl could be attracted to the pipeline corridor during the early spring if it were to become free of snow earlier than the surrounding habitat (DOS, 2011a).

4.7.3 Commitments to Reduce or Avoid Impacts

The proposed Nebraska Reroute would be constructed and operated in accordance with all applicable laws and permits. In addition, Keystone has committed to avoid or reduce impacts on habitat loss, alteration, and fragmentation by implementing a CMRP (Appendix C). These commitments are described below, as well as additional commitments made by Keystone

Habitat Loss

- Clear vegetation within the construction corridor only if absolutely necessary.
- Use corridor-narrowing strategies across riparian and waterbody areas where standard pipeline construction methods will be used to minimize impacts (that is, areas where HDD will not be used).
- Develop construction timing restrictions with regulatory agencies to minimize direct deaths of wildlife during the nesting, calving, and migration seasons.

- Conduct preconstruction nest surveys to avoid and/or mitigate the loss of raptor, waterfowl, wading bird, and songbird nests.
- Clear vegetation outside of the bat and migratory bird nesting seasons.
- In coordination with USFWS, develop a Migratory Bird Conservation Plan to comply with the Migratory Bird Treaty Act (DOS, 2011a).
- Minimize clearing or grading areas where the pipeline is installed by HDD.
- In coordination with landowners, use fences to exclude livestock in reclaimed habitat to increase the probability that native trees and shrubs become successfully established.
- Minimize disturbance of vegetation within the permanent pipeline corridor.
- Conduct maintenance activities outside of restriction periods to minimize direct deaths of wildlife during the nesting, calving, and migration seasons.
- In the area where access is through the gate, secure/lock temporary gates when construction activities are not occurring.
- Make reasonable efforts to restrict access to the pipeline corridor through access roads after construction to minimize alteration of human activities in formerly inaccessible areas.

Habitat Alteration

- Use native seed mixes containing species locally adapted to environmental conditions.
- Use erosion-control materials that are certified free of invasive and noxious species.
- For all agricultural soil disturbed, collect and stockpile topsoil to preserve the native seed bank and minimize colonization of invasive species.
- Thoroughly clean equipment before and during construction to prevent the introduction and spread of invasive organisms and diseases.
- Frequently monitor the control of erosion and the success of reclamation and promptly repair eroded areas, areas of poor germination, and areas where nonnative, invasive, or noxious species have dominated the reestablishment of vegetative cover.
- Use soil additives such as fertilizers and pH modifiers in native rangelands to minimize the potential spread of nonnative and invasive species; discuss with agricultural extension agents/rangeland experts as needed to assess suitability
- Where forested areas would be reclaimed, Keystone would request that landowners discourage intensive grazing in the construction ROW during the first five growing seasons.

Habitat Fragmentation

- Avoid large patches of wooded or shrubland habitats, because they need substantially longer periods of time to recover and would not recover within the permanent ROW if the ROW were maintained free of woody vegetation.
- Use HDD to avoid impacts to forested habitats in large riparian corridors. Minimize clearing or grading the HDD path.

Keystone further committed to prevent unauthorized access, and, to the extent possible by landowners, Keystone would secure/lock temporary gates when construction activities were not occurring in the area where access would be through that gate. Also to the extent permitted by landowners, Keystone would make reasonable efforts to restrict access to the pipeline corridor through access roads after construction to minimize alteration of human activity patterns in formerly inaccessible areas (Keystone, 2012d).

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4.8 FISHERIES

The proposed Nebraska Reroute could affect fisheries in the streams it would cross—both during construction, depending on the construction method, and during operation, as a result of maintenance practices and potential leaks. This section provides an overview of fisheries in the six river basins crossed by the Nebraska Reroute. It also assesses the impacts associated with the five crossing techniques that could be used. Measures that Keystone has agreed to implement to reduce potential impacts are also identified. Section 4.9 discusses special-status fish species including federal and State-listed threatened and endangered species and species of concern.

4.8.1 Existing Conditions

The proposed Nebraska Reroute would cross the Niobrara, Elkhorn, Lower Platte, Loup, Middle Platte, and Big Blue river basins, as discussed in Section 4.4, Surface Water. Nebraska Surface Water Standards (Title 117) assign beneficial uses to all designated surface waterbodies within or bordering the state. One of the specific uses for waterbodies is to support aquatic life. Waters designated as having a coldwater aquatic use are waters "which provide, or could provide, a habitat consisting of sufficient water volume or flow, water quality, and other characteristics such as substrate composition, which are capable of maintaining year-round populations of coldwater biota."[11] Waters designated as having a warmwater aquatic use are waters "which provide, or could provide, a habitat consisting of sufficient water volume or flow, water quality, and other characteristics, such as substrate composition, which are capable of maintaining year-round populations of warmwater biota."[12]

In 1976, NGPC, in collaboration with USFWS, performed a stream evaluation of fisheries in Nebraska and established fishery values. The proposed Nebraska Reroute would cross 20 streams in which fisheries were identified. Table E.8-2 in Appendix E.8 identifies these streams and their value classifications, from highest-value fishery (Class I) to limited fishery resource (Class IV). Table E.8-3 in Appendix E.8 lists the fish species that are present in the river basins the Nebraska Reroute would cross.

4.8.2 Potential Impacts

The proposed Nebraska Reroute could affect fisheries in creeks, streams, and rivers that it crosses. The impacts on fisheries would depend on the construction method used to cross the waterbody and the quality of the habitat that is present. Waterbodies along the Nebraska Reroute would be crossed using one of the following methods:

- HDD method
- Open-cut methods
  - Nonflowing, dry open-cut method
  - Flowing open-cut method
  - Dry-flume open-cut method
  - Dry dam-and-pump open-cut method

[11] Coldwater biota are life forms in waters where temperatures seldom exceed 25°C (77°F).

[12] Warmwater biota are life forms in waters where temperatures frequently exceed 25°C (77°F).

Table 4.8-1 lists the streams that would be crossed using the HDD method and the key fish species present at each of these crossings. HDD crossings would not disturb the stream beds, but fisheries could be affected if drilling fluids (frac-out) were unintentionally released during the HDD operation. Although drilling mud is nontoxic, fisheries and aquatic invertebrates could suffocate as a result of fouled gills while the drilling fluid were suspended or larval fish could be buried by the drilling mud once it were to settle out (Forkert Engineering & Surveying, Inc., and Chambers Group, Inc., 2008).

Table 4.8-1. Stream Segments to be Crossed Using HDD Method along the Proposed Nebraska Reroute

Stream Segment	Perennial?	Key Species
Keya Paha River	Yes	Channel catfish, largemouth bass
Niobrara River	Yes	Channel catfish, rock bass, largemouth bass, bluegill
Elkhorn River	Yes	Northern pike, channel catfish, flathead catfish, largemouth bass
Loup River	Yes	Channel catfish, flathead catfish
Platte River	Yes	Channel catfish, flathead catfish

In addition to the pipeline crossings, construction of access roads across water bodies with fisheries or fishery habitat could be temporary adversely affected. This would be due to a temporary increase in total suspended solids concentrations and increased sedimentation during installation and removal of drainage structures needed to maintain stream flow while the temporary crossing were in place.

All other waterbody construction methods, including temporary construction access, could adversely affect fisheries in the following ways:

- Disturb subsurface macroinvertebrates
- Alter the waterbody substrates, stream bed, and bank structure
- Reduce the amount and quality of riparian habitat
- Release sediment and degrade downstream habitats
- Increase water temperature due to increased turbidity

If sediment were to be released during construction, it could adversely affect fish and habitat by exposing fish to suspended sediments, depositing sediment downstream (Berry et al., 2003), and degrading downstream habitat. When sediment is deposited downstream, it can cover demersal[13] eggs and prey organisms for benthic (bottom) feeders, and it can also trap young fish. Sediment deposition can also adversely affect habitat by reducing sediment porosity, pool depth, and riffle areas (Cordone and Kelly, 1961; Canadian Association of Petroleum Producers [CAPP] et al., 2005).

[13] Fish or other organisms dwelling at or near the bottom of a body of water.

These impacts could reduce the amount of overwintering, spawning, foraging, and nursery habitat as well as the amount of interstitial (spaces between objects) habitat for invertebrates, leading to reduced diversity of benthic invertebrates and a loss of prey (CAPP et al., 2005; Berry et al., 2003). The amount of sedimentation that would be caused by construction depends on the material of the stream bed, the flow in the stream during construction, the distance of the stream crossing, and the duration of the in-stream disturbance.

Construction methods that divert the flow from the stream bed could strand fish in the dewatered area, impinge or entrain fish at the intake pump, disrupt fish movement, and release sediment once stream flows resume (Department of Fisheries and Oceans Canada, 2009; CAPP et al., 2005).

During operation of the proposed pipeline, riparian areas within the permanent ROW would need to remain clear of trees. The effects of this loss of riparian habitat, such as loss of shade and potential instability or erosion of stream banks, would continue to occur, though on a smaller scale than during construction.

The equipment used to install the pipeline would contain fuel, hydraulic fluid, and other potentially hazardous fluids. Additionally, there is a potential for leaks and spills during operation of the pipeline. Chapter 6, Pipeline Safety and Potential Spills, discusses mitigation for fisheries affected by a potential spill.

Other Construction Phase Impacts

Water used for hydrostatic testing of the pipeline and small amounts of water for HDD operations and for controlling dust on roads and the construction site would be obtained from surface water resources (DOS, 2011a). All surface water withdrawals would comply with permit regulations and would not exceed the volumes or rates specified in the permits.

The effects of withdrawing water could include reduced stream flow, the entrainment of fish eggs and larvae, and the impingement of fish (CAPP, 1996). However, withdrawing water for hydrostatic testing would be a one-time use and would occur in streams with enough flow to support the withdrawal. Withdrawal pumps would be equipped with 500-mesh (0.001-inch) screens that would prevent fish and macroinvertebrates from entering the pump (DOS, 2011a). However, this would not prevent the early larval stages of microinvertebrates, viruses, bacteria, or parasitic pathogens from entering the pump.

Adverse effects of discharging hydrostatic test waters could include increased stream flow, scouring at the discharge site, increased downstream sedimentation, and transfer of pathogens or invasive species (CAPP et al., 2005). High rates and volumes of discharge water could dislodge sediment from streambeds and/or banks or could increase streambank and substrate scour, thereby increasing the amount of suspended sediment in the stream. To reduce impacts, dissipation devices and dewatering structures would be used to dissipate and remove sediment from hydrostatic testing waters (DOS, 2011a). In addition, the increased volume in the stream due to the discharged test waters could temporarily increase the water temperature in the stream or reduce the dissolved oxygen levels (CAPP et al., 2005).

The effects of scouring and disturbances on fish habitat are expected to be similar for each of the four waterbody construction methods listed above, although the duration of time that water would be discharged would be shorter. The introduction of invasive species such as Eurasian milfoil (*Myriophyllum spicatum),* zebra mussels (*Dreissena polymorpha*), and the parasite that causes whirling disease (*Myxobolus cerebralis)* could also adversely affect fish habitat (Nebraska

Aquatic Nuisance Species Planning Committee, 2010). Currently, the distribution of these invasive species in Nebraska is limited. If hydrostatic test water were to be withdrawn from one basin and discharged into another, this could spread invasive species. Additionally, some invasive organisms can live in dry equipment for several days.

4.8.3 Commitments to Avoid or Reduce Impacts

As described in the Final EIS (DOS, 2011a), and to avoid or reduce impacts, Keystone has agreed to implement the following:

- Use typical BMPs associated with the dam-and-pump method, which include a pump that maintains 1.5 times the ambient flow rate at the time of construction and screened intake hoses with openings with sufficient surface area to prevent fish entrainment and impingement. Crossings of less than 100 feet would be completed in less than 48 hours, which would minimize the period of time that fish movements would be impeded (DOS, 2011a, p. 3.7-24).[14]
- Minimize clearing and grubbing of waterbody banks.
- Use HDD for crossing the five streams listed in Table E.8-4.
- Consult with agencies before using open-cut methods to define fish-spawning periods and construction schedules to avoid, where practicable, in-stream activities during sensitive periods.
- Restrict herbicide use within 100 feet of a waterbody.
- Conduct routine aerial and ground surveillance inspections.
- Develop and implement a Frac-out Contingency Plan.
- Thoroughly clean all equipment used during the withdrawal and discharge of water after each use and before use at other locations.

Chapter 6, Pipeline Safety and Potential Spills, discusses mitigation for fisheries that would be affected by a potential spill.

[14] Final EIS (DOS, 2011a: 3.7-24)

4.9 THREATENED AND ENDANGERED SPECIES AND SPECIES OF CONSERVATION CONCERN

The proposed Nebraska Reroute would cross habitat that might be used by threatened and endangered species protected by the federal government and Nebraska. This section identifies species of concern along the alignment as well as how their lifecycles might rely on property within or near the proposed Nebraska Reroute. Although a detailed survey of each species is not complete, the section identifies project activities that could adversely affect each of these species. If future surveys confirm the presence of a given species along the alignment, mitigation measures would be developed in consultation with USFWS and NGPC to avoid impacts on the species.

DOS is the lead agency in consultation with USFWS under Section 7 of the ESA. Federally listed species require coordination under Section 7 of the ESA for actions that require a federal permit or approval. Similarly, State-listed species require coordination under the Nebraska Nongame and Endangered Species Conservation Act for any State permit or approval. In addition, the Nebraska Nongame and Endangered Species Conservation Act [Neb. Rev. Stat. § 37-806(11)], requires impacts to federally listed species that may be impacted to result in a net benefit for the species. This would apply to the American burying beetle, western prairie fringed orchid, and the small white lady's slipper. In these instances, mitigation might exceed actual resources adversely affected to ensure a species net benefit would occur.

4.9.1 Existing Conditions

Numerous federal or State-listed threatened or endangered species are found in the counties crossed by the proposed Nebraska Reroute.

Based on information from USFWS, six federally listed threatened or endangered species might be present in the Study Area (USFWS, 2012b).

The Sprague's pipit has undergone a review by USFWS for its conservation status. USFWS determined listing the Sprague's pipit as threatened or endangered is warranted; however, implementing this action is precluded at this time by higher priority listing actions (USFWS, 2010a). Therefore, a discussion of this species is included in this section.

In addition, the northern long-eared bat (*Myotis septentriaonalis*) is currently undergoing a review by USFWS to determine its conservation status. Although its status has not yet been determined, a discussion of this species is included because it could be warranted for protection under the ESA.

Because the proposed Nebraska Reroute would avoid the current range of the blowout penstemon, that species was not evaluated.

A 12-month review was completed by USFWS regarding the conservation status of the Platte River caddisfly (*Ironoquia plattensis*). USFWS determined that there are sufficient scientific and commercial data to demonstrate that the Platte River caddisfly is secure throughout its range (USFWS, 2012b).

The Study Area for threatened and endangered species and species of conservation concern varies for each species.

- For the western prairie fringed orchid and small white lady's slipper, the Study Area is a 300- to 500-foot-wide corridor centered on the proposed Nebraska Reroute alignment.
- For the interior least tern, piping plover, whooping crane, Sprague's pipit, northern long-eared bat, bald eagle, and American burying beetle, the Study Area is a 2,000-foot-wide corridor centered on the proposed alignment.
- For the northern river otter, pallid sturgeon, blacknose shiner, finescale dace, and northern redbelly dace, the Study Area is the streams and rivers that would be crossed by the proposed pipeline.

According to NGPC, 11 State-listed threatened or endangered species (and two candidate species) are known to be present near the Study Area (NGPC, 2012) (see Appendix E.9). Bald eagles (*Haliaeetus leucocephalus*) have been removed from the USFWS federally threatened or endangered species list and from the State of Nebraska threatened or endangered species list. However, bald eagles are protected under the Bald and Gold Eagle Protection Act and the Migratory Bird Treaty Act and are discussed further in this section.

Appendix E.9, Threatened and Endangered Species and Species of Conservation Concern Technical Memorandum, provides detailed information about each protected species that might be present in the Study Area. In addition, Appendix E.9 lists their status, typical habitat, and occurrence, which were reviewed from current or recent research reports, management and recovery plans, and conservation assessments. All federally listed species automatically become State-listed species. The Nebraska Reroute would not cross critical habitat for any listed species.

4.9.2 Potential Impacts

Surveys for interior least tern, piping plovers, American burying beetle, western prairie fringed orchid, and northern river otter were performed in the spring and summer of 2012. Surveys for blacknose shiner, finescale dace, and northern redbelly dace will be performed in the fall of 2012. Preconstruction surveys will be performed for interior least terns, piping plovers, western prairie fringed orchid, small white lady's slipper, northern river otter, blacknose shiner, finescale dace, and northern redbelly dace.

Interior Least Tern and Piping Plover

Potential direct impacts on interior least tern and piping plover habitat might occur because of project construction and operation. The proposed crossings of the Niobrara, Elkhorn, and Loup Rivers have associated habitat for interior least terns. Each of these locations would be crossed using the HDD method; however, the effects of construction, such as noise and dust, near these locations could influence the selection of nest sites and/or nesting success if construction were to occur during the nesting and breeding season (mid-April for piping plovers and early May for least terns to mid-August). In addition, if there were an unintended release of drilling fluids (frac-out) during the HDD operation and the impacts from frac-out clean-up response, the selection of nest sites or nesting in areas downstream of the release could be affected.

Short-term indirect impacts on these species might occur during hydrostatic testing of the pipeline because of potential reduced flows in the Niobrara River and the Platte River basins,

including the Elkhorn River and Loup River basins. A reduction in potential forage habitat and increased access to in-river nesting sites from predators might occur. The amount of water needed from these two river systems for hydrostatic testing has not yet been determined. However, Keystone would be required to obtain a permit for withdrawal of water supplies for hydrostatic testing. This issue would be addressed during consultation between DOS and USFWS, as required by Section 7 of the ESA.

Activities involved with maintenance or spill cleanup may impact interior least terns and piping plovers if activities were to take place in or near habitat or nest sites.

Whooping Crane

Migrating whooping cranes roost and feed within the Study Area. Appendix E.9 shows the whooping crane migration corridor in Nebraska. The percentages represent the geographic area in which all whooping crane sightings have been reported. For example, the 75 percent corridor represents 75 percent of the sightings in this geographic area.

Construction activities could cause direct impacts on whooping cranes as a result of the potential disturbance to roosting and feeding habitats during migration; however, these impacts would be temporary and would cease once construction activities stop. If a whooping crane were present or would arrive during construction, construction would cease. Roosting habitats would most likely be located at major river crossings, such as the Platte, Loup, Elkhorn, and Niobrara Rivers. Feeding habitats would include wetland areas as well as areas of shallow water in stream corridors. Therefore, the Nebraska Reroute may impact migrating whooping cranes in the Study Area. Section 4.9.4 discusses conservation measures.

Hydrostatic testing of the pipeline could cause short-term indirect impacts on this species. Reduced flows in rivers and streams could lower shallow water areas used for roosting and feeding. Permits are required for this water use, and the terms and conditions of those permits will protect the species. This issue would be addressed during the ESA Section 7 consultation between DOS and USFWS.

Activities involved with maintenance or spill cleanup might harm interior whooping cranes if activities were to take place in or near their roosting or foraging habitat.

Sprague's Pipit

The proposed Nebraska Reroute avoids the Sprague's pipit current breeding range, beginning in northern South Dakota, and large, native grasslands do not exist in the Study Area. The Sprague's pipit could stopover in the Study Area during the spring and fall migrations. Direct impacts to the Sprague's pipit might result from the potential disturbance of foraging habits during migration because of construction activities; however, these impacts would be temporary and would cease once construction activities stop. Construction would decrease the amount of available foraging habitat; however, this would be small in comparison with adjacent foraging areas. Additionally, pipeline construction, and associated infrastructure, could fragment suitable habitat. As a result of the lack of breeding habitat and availability of adjacent foraging habitat during migration, it is not anticipated the project will impact the Sprague's pipit.

Pallid Sturgeon

Because the proposed Nebraska Reroute would not cross any waterbodies containing pallid sturgeon, no direct impacts on this species are anticipated. Hydrostatic testing of the pipeline could cause short-term indirect impacts on this species. Decreased flows could limit individual sturgeon's ability to seek and find still-accessible deeper water or alternative tributaries, streams, or rivers, potentially stranding fish or harming spawning locations. Permits will be required for this water use, and the terms and conditions of those permits will protect the species. This issue would be addressed during the ESA Section 7 consultation between DOS and USFWS. In addition, if the Platte River downstream of the Loup River confluence were used as a water source for hydrostatic testing, there would be a potential for larval pallid sturgeons to be entrained.

American Burying Beetle

Land use in Boone, Nance, Merrick, Polk, York, Fillmore, Saline, and Jefferson Counties is largely row crops that do not have suitable habitat for ABBs. The Nebraska Reroute would have a reduced impact on ABB by avoiding prime ABB habitat in Holt County and crossing Boyd County, where no ABBs were found during surveys. As a result of rerouting the pipeline east of the Sand Hills, the amount of ABB habitat is reduced. Antelope County, which would be traversed by the proposed Nebraska Reroute, has had a historic ABB occurrence, but 2012 sampling efforts found no ABBs. Antelope County is largely row crops with only islands of suitable ABB habitat, and no ABBs are expected to occur (Keystone 2012a).

Construction of the proposed Nebraska Reroute may impact beetles during vegetation clearing, site grading, and excavation activities. Work within the ROW, specifically removing topsoil and grading, might reduce soil moisture. Soil would be compacted during construction and reclamation activities, which might temporarily reduce the amount of habitat; alter suitable habitat; fragment habitat; and potentially kill eggs, larvae, and adults.

During operation, the pipeline might increase the soil temperature locally by as much as 15°F at 6 inches below the surface. Higher soil temperatures could increase the number of deaths because beetles could emerge from the soil too early in the spring when food sources are scarce and air temperatures are too cold. In addition, higher soil temperatures could increase metabolic rates such that overwintering beetles could starve before they emerge or drying soils could cause beetles to lose water and desiccate (Bedick et al., 1999).

Western Prairie Fringed Orchid

Within the Study Area, western prairie fringed orchids are found in Rock, Holt, Antelope, and Boone Counties where there is suitable habitat. Construction of the proposed Nebraska Reroute may impact western prairie fringed orchids and their habitat. Construction-related impacts include changing wetland hydrology and consequently disturbing existing habitat and the potential to introduce or spread competing exotic invasive plants as a result of revegetation. Permanent project-related facilities (for example, pump stations and access roads) could permanently displace populations of western prairie fringed orchids and their habitat.

Northern Long-eared Bat

The proposed Nebraska Reroute occurs at the cusp of the northern long-eared bat's range; however, much information is lacking for this species. Old-growth forests, caves, and quarry tunnels have not been identified in the Study Area. If northern long-eared bat were present in patches of oak woodland, direct impacts could result from the clearing of these trees for the pipeline and associated infrastructure. The removal of any structures where bats might be roosting would also directly adversely affect the species. This species actively forages at night; therefore, daytime construction would not adversely affect feeding behavior. If the species were observed in the Study Area during surveys, their roosting site could be avoided by construction or individuals could be relocated as a conservation measure. As a result of the lack of habitat and the implementation of conservation measures if bats were present, it is not anticipated the project will impact the northern long-eared bat.

Blacknose Shiner, Finescale Dace, and Northern Redbelly Dace

In 2009, potential habitat for blacknose shiners was identified at five waterbody crossings. However, no finescale dace, northern redbelly dace, or habitat for these species was found. In 2012, surveys were performed along the proposed Nebraska Reroute corridor, and these surveys will be reviewed in consultation with NGPC. If these species were present in streams being crossed by the proposed Nebraska Reroute, NGPC recommends the use of HDD stream-crossing methods to reduce the impacts on these species and their habitat (DOS, 2011a). Impacts of the Nebraska Reroute on fisheries are described in Section 4.8.2.

Northern River Otter

Northern river otter habitat is most likely to be present in the Niobrara, Elkhorn, and Loup Rivers, which the Nebraska Reroute would cross using HDD. The use of HDD will minimize clearing and grubbing adjacent to river otter habitat. Construction-related noise could disturb otter dens; however, the impacts are anticipated to be temporary and would cease once construction activities stop.

Small White Lady's Slipper

Construction-related impacts include changing wetland hydrology and consequently disturbing the wetland, and the potential to introduce or spread competing exotic invasive plant species as a result of revegetation. Construction of the proposed Nebraska Reroute may impact small white lady's slipper species and habitat. Permanent project-related facilities (for example, pump stations and access roads) could permanently displace habitat for and populations of small white lady's slipper.

Bald Eagle

The crossings at the Niobrara, Elkhorn, Loup, and Keya Paha Rivers and at Beaver and Shell Creeks would be attractive areas for migrating bald eagles because of the crossings' large trees. The likelihood of bald eagles wintering in these areas depends on seasonal weather conditions and the presence of open water on river systems that would allow adequate food. Because potential bald eagle habitat in the Study Area would include riparian areas surrounding the Niobrara, Elkhorn, and Loup Rivers, nesting pairs might be temporarily disturbed if construction were to occur near these areas. Although the river crossings of the most likely wintering or

nesting habitat would be at locations where HDD would be used, construction activities on the banks would disturb roosting or nesting bald eagles in the short term. Long-term impacts from HDD are not anticipated because there is ample nesting and roosting habitat available along these river crossings.

No disturbances from operation of the pipeline at major river crossings are anticipated. If activities associated with maintenance or spill cleanup were to occur in the location of bald eagle habitat, disturbances to roosting or nesting bald eagles could occur. Once pump stations have been established, noise and human activity at these areas would become a common part of the environment.

4.9.3 Commitments to Reduce or Avoid Impacts

Keystone (2012b) has agreed to the following conservation measures to avoid or minimize potential impacts on interior least terns, piping plovers, whooping cranes, American burying beetles, and western prairie fringed orchids. In addition, conservation measures have been proposed based on discussion of the proposed Nebraska Reroute with NGPC. These conservation measures are summarized below and discussed in more detail in Chapter 5.

No conservation measures have been proposed for pallid sturgeon because this species is not known to be present in the Study Area.

Interior Least Tern and Piping Plover

- Conduct preconstruction surveys within 0.25 mile of suitable breeding habitat.
- Conduct no construction activities within 0.25 mile of an active nest until fledglings have left the nest.
- NGPC recommends downshield lighting during construction during the nesting season until fledglings have left the nest.
- NGPC recommends coordination with NGPC if nesting is initiated within 0.25 mile of construction after construction has already commenced.
- Cease construction if a tern or a plover nest at a construction site and initiate coordination with the appropriate agencies.

Whooping Crane

- Conduct surveys for whooping cranes during migration season.
- NGPC recommends the Whooping Crane Survey Protocol be followed (USFWS, 2012b).
- Cease construction if a whooping crane were to land at a construction site; initiate coordination with the appropriate agencies.

Sprague's Pipit

- Perform surveys for Sprague's pipit during migration season.

American Burying Beetle

- Trap and relocate beetles before construction.
- Remove animal carcasses during construction.
- Train workers in identification and avoidance of beetles.
- Downshield lighting at ancillary facilities.
- Compensate for temporary and permanent operation impacts through establishment of a conservation trust.
- Monitor for compliance on reclaimed areas.
- Implement NGPC- and USFWS (Nebraska Field Office)-specific measures for capturing and relocating beetles and for maintaining clear areas.
- Implement a reclamation performance bond to insure that funds would be available if reclamation following construction were to fail.

Western Prairie Fringed Orchid

- Conduct presence/absence surveys.
- Reduce construction width in sensitive areas.
- Salvage topsoil.
- Restore habitat using methods approved by NRCS.
- Monitor selected wetland areas.
- NGPC recommends the establishment of a conservation trust to compensate for temporary and permanent operation impacts.

Northern Long-eared Bat

- Perform surveys for northern long-eared bat in suitable habitat.
- Avoid roosting sites and relocate individuals if an individual were observed during construction.

Blacknose Shiner, Finescale Dace, Northern Redbelly Dace

- Perform surveys prior to construction. If these species were found, coordinate with NGPC to develop appropriate measures to avoid or minimize impacts to the species.

Northern River Otter

- Conduct surveys before construction.
- Restrict construction within 0.25 mile of active dens.
- Use the HDD construction method on all rivers potentially supporting this species.

Small White Lady's Slipper

- Conduct presence/absence surveys in selected locations.
- Establish a conservation trust to compensate for temporary and permanent operational impacts (NGPC recommendation).

Bald Eagle

- Conduct nest/roost surveys within 1 mile of the ROW if construction were to occur during the nesting/roosting period.
- Consult with USFWS for buffers and construction activities.

4.10 AGRICULTURE AND OTHER LAND USES

The land use within the temporary construction easement for the proposed Nebraska Reroute is primarily agricultural: 95 percent of the land is used for crop cultivation or pasture, and the balance is used primarily for rangeland. Much of the agricultural land can be classified as having prime agricultural soils. Other land uses within or adjacent to the ROW include residential, power generation, and uses supporting agricultural activities.

> Landowners would be compensated for any construction-related crop loss.
>
> If NRCS or FSA conservation program participants were required to leave the program because of the proposed Nebraska Reroute, they would be compensated for any lost payments, including retroactive forfeit payments.

Keystone expects that agricultural land use along the pipeline alignment, and land temporarily used for staging areas, contractor yards, worker camps, and temporary access roads, would be fully restored and returned to agricultural production. Constructing the proposed Nebraska Reroute would permanently convert property required for ancillary facilities (such as pump stations) from agricultural to a nonagricultural use.

This section provides an estimate of the affected acreage by land use type along the proposed Nebraska Reroute and the measures—including compensation for temporary loss of use—that could be implemented to reduce the potential impacts.

4.10.1 Existing Conditions

This section describes the existing agricultural and land-use conditions along the Nebraska Reroute corridor. Data for some topics, such as crop statistics (for example, acres planted and harvested, yields, and production) and some types of conservation easements are available only at the county level. Consequently, a description of these resources is provided at this level. Other data, such as land cover and the locations of structures, are available at a more detailed resolution. Thus, some resources are discussed at a more local level. Consistent with the Final EIS (DOS, 2011a) and the SER (Keystone, 2012b), the locations of structures within 500 feet of the pipeline route centerline were identified.

Agriculture

Agriculture includes cropland and pastures, orchards, nut farms, prime farmland, conservation programs, and organic farms.

Cropland and Pasture Land

The proposed Nebraska Reroute passes through nine rural Nebraska counties: Keya Paha, Boyd, Holt, Antelope, Boone, Nance, Merrick, Polk, and York. The percentage of land in farms accounts for 92 percent of the land area in these nine counties. Generally, the more northern counties have a higher percentage of pasture and less cropland than the southern counties, and the percentage of irrigated cropland is higher in the southern counties (see Table 4.10-1).

Table 4.10-1. Agriculture Land Use along the Proposed Nebraska Reroute (2007)[a]

County	Land in Farms (acres)[b]	Percentage of County in Farms	Cropland (acres)	Percentage Cropland	Pasture (acres)[c]	Percentage Pasture	Percentage of Cropland Irrigated
Keya Paha	483,500	98	101,400	21	352,300	73	15
Boyd	251,700	72	90,300	36	151,700	60	5
Holt	1,532,600	99	667,600	44	809,300	53	58
Antelope	516,500	94	369,000	72	124,400	24	76
Boone	405,300	92	282,700	70	108,500	27	64
Nance	226,300	79	138,200	61	76,800	34	55
Merrick	247,900	78	199,600	80	39,500	16	87
Polk	269,200	95	228,600	85	32,400	12	74
York	346,100	94	314,700	91	22,600	6	83
Total	**4,279,100**	**—**	**2,392,100**	**56**	**1,717,500**	**40**	**65**

Sources: USDA, 2012a, 2012b

[a] *2007 is the latest year for which data are available.*

[b] *Land in farms includes cropland, pasture, and other uses (such as farmsteads and shelterbelts). The acreage of other uses is not listed in Table 4.10-1 but would make up the balance of the area of land in farms. For example, 6.1 percent of the land in farms in Keya Paha is "other uses" (including woodlands).*

[c] *Pasture includes both planted grasses and rangelands for grazing.*

Corn, hay, and soybeans are the primary crops grown in the proposed Nebraska Reroute counties. Hay is more prevalent in the northern counties, while corn and soybeans are more prevalent in the southern counties. Winter wheat and oats are grown on less than 1 percent of cropland. Table 4.10-2 lists the harvested acreage of the principal crops grown in the proposed Nebraska Reroute counties.

Table 4.10-2. Crops Harvested along the Proposed Nebraska Reroute (2011)

County	Corn Acreage[a]	Hay Acreage	Oats Acreage	Soybeans Acreage	Winter Wheat Acreage	Total Harvested Acreage
Keya Paha	16,800	44,000	0	4,200	0	65,000
Boyd	37,600	19,500	0	21,900	3,400	82,400
Holt	191,100	260,000	1,200	72,900	4,500	529,700
Antelope	211,900	11,500	100	116,400	600	340,500
Boone	165,900	8,000	0	101,100	800	275,800
Nance	85,400	4,100	0	49,700	1,300	140,500
Merrick	125,900	6,800	0	64,300	2,400	199,400
Polk	128,900	4,100	0	81,800	0	215,400
York	205,200	2,200	0	100,200	600	308,200
Total	**1,168,700**	**360,200**	**1,300**	**612,500**	**13,600**	**2,156,900**

Source: USDA, 2012c

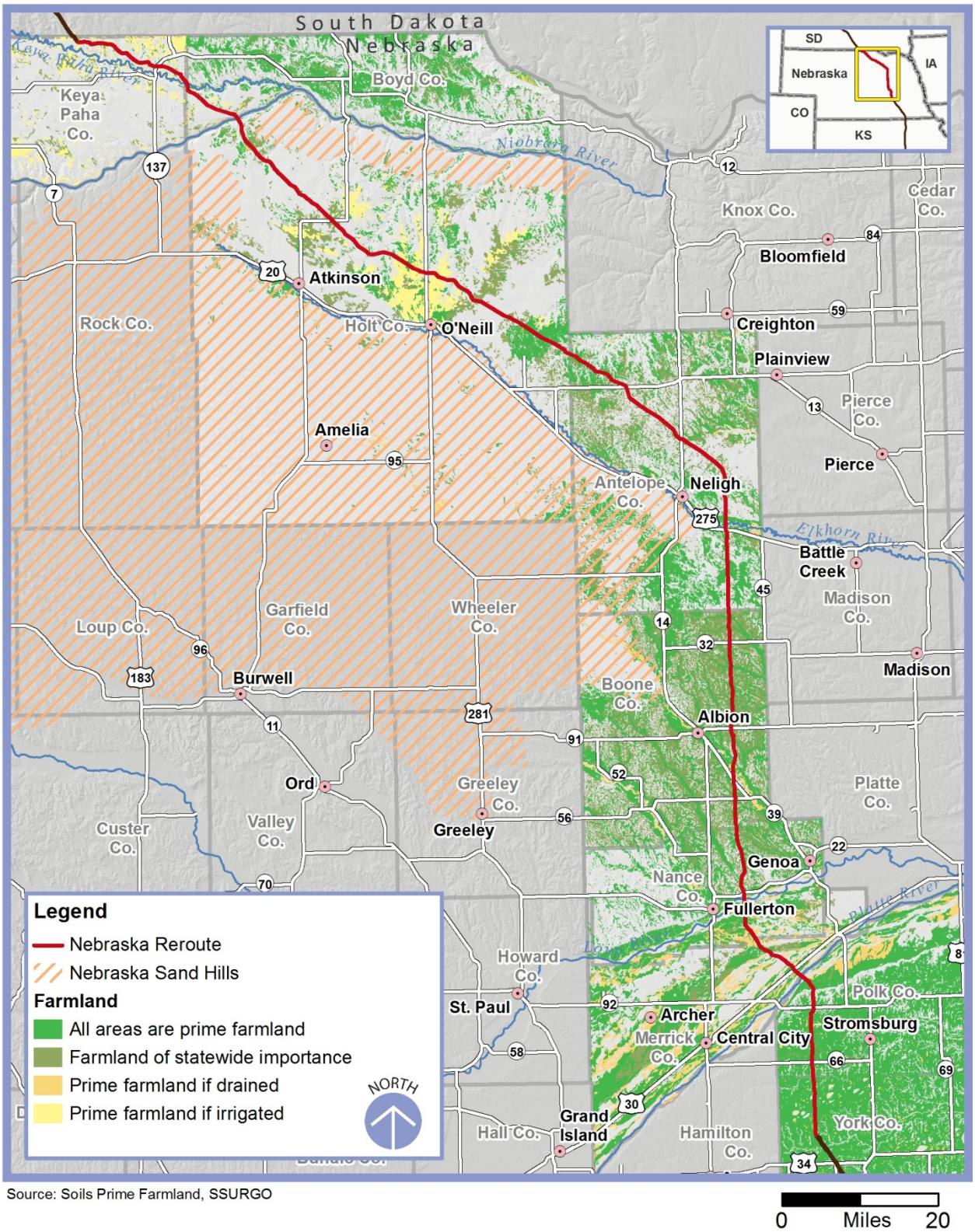
[a] *Acres harvested for grain (does not include acreage of silage)*

The latest available data (from the 2007 U.S. Census of Agriculture) identify two nut tree operations in Antelope County and one in Merrick County. The 2007 U.S. Census of Agriculture identified orchards in seven of the nine Nebraska Reroute counties. The two counties without identified orchards are Keya Paha and Boyd.

Prime Farmland

Prime farmland is land that has the best combination of soil properties, temperature, growing season, and moisture needed to produce sustained high yields of food, feed, forage, fiber, and oilseed crops when managed properly (according to acceptable farming methods) (NRCS, 2012k). Approximately 25 percent of the soil acreage in the Nebraska Reroute counties is identified by NRCS as prime farmland. Figure 4.10-1 shows the extent of prime farmland in the Nebraska Reroute counties.

Figure 4.10-1. Prime Farmland along the Proposed Nebraska Reroute



Source: Soils Prime Farmland, SSURGO

Agricultural Infrastructure

The agricultural infrastructure that could be affected by construction of the pipeline and associated infrastructure includes irrigation systems, stock-watering systems, drainage tile systems, terraces, grass-lined spillways, and springs that feed ponds to water livestock.

Approximately 65 percent of the cropland in the nine counties along the Nebraska Reroute corridor is irrigated. Irrigation is primarily accomplished with center-pivot irrigation systems that pump water from wells generally using electricity. Stock-watering systems consist of a groundwater well and a tank to supply water to livestock, or impoundments to catch groundwater from springs.

Drainage tile systems, which consist of a series of underground perforated plastic pipes connected to 6- and 12-inch-diameter pipes, are located in wet areas to provide drainage to optimize crop production. Terraces and grass-lined spillways are located on slopes to reduce erosion.

Conservation Programs

U.S. Department of Agriculture Programs

The Farm Service Agency (FSA) and NRCS, both part of USDA, manage several types of government land-conservation programs through the acquisition of easements on farmland. FSA programs include the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program, and Farmable Wetlands Program. NRCS manages the Conservation Stewardship Program, Farm and Ranch Lands Protection Program, Grasslands Reserve Program, and Wetlands Reserve Program.

- CRP is a voluntary program available to agricultural producers to help safeguard environmentally sensitive land (especially highly erodible land). Producers enrolled in CRP plant long-term, resource-conserving covers to improve the quality of water, control soil erosion, and enhance wildlife habitat. In return, FSA provides participants with rental payments and cost-share assistance. The contract duration is between 10 and 15 years (FSA, 2012a).
- The Conservation Reserve Enhancement Program is a state and federal partnership to pay incentives for installing specific conservation practices that help protect environmentally sensitive land, decrease erosion, restore wildlife habitat, and protect ground and surface water (FSA, 2012b).
- The Farmable Wetlands Program reduces downstream flood damage, improves surface and groundwater quality, and recharges groundwater supplies by restoring wetlands. Producers plant long-term, resource-conserving covers to improve water quality, control soil erosion, and enhance wildlife habitat on land enrolled in CRP. In return, FSA provides participants with rental payments and cost-share assistance. Contract duration is between 10 and 15 years (FSA, 2009).
- The Conservation Stewardship Program encourages the use of conservation practices on farmland. NRCS provides financial and technical assistance to eligible producers to conserve and enhance soil, water, air, and related natural resources on their land (NRCS, 2012l).

- The Farm and Ranch Lands Protection Program is a partnership among federal, tribal, State, and local governments and nongovernmental organizations that provides funds for the purchase and conservation of productive farm and ranchland in agriculture uses (NRCS, 2012m).
- The Grasslands Reserve Program enhances plant and animal biodiversity and protects grassland under threat of conversion to other uses. Participants voluntarily limit future development and cropping uses of the land while conducting common grazing practices and operations related to the production of forage and seeding (NRCS, 2012n).
- The Wetlands Reserve Program protects, restores, and enhances wetlands on farmland. NRCS provides technical and financial support to help landowners with their wetland restoration efforts. The goal is to achieve optimal wetland functionality, value, and wildlife habitat (NRCS, 2012o).

In 2011, there were 2,016 participants in the Conservation Reserve Enhancement Program in Nebraska with an enrollment of 24,221 acres. Statistics were not available from FSA at the county level. Statistics for the Farmable Wetlands Program were not available from FSA. For 2011, there is one Grasslands Reserve Program site in Holt County with 1,282 acres. The 2011 enrollment in CRP, the Conservation Stewardship Program, and Farmable Wetlands Program (in acres) is listed in Table 4.10-3.

Table 4.10-3. Enrollment in Conservation Programs along the Proposed Nebraska Reroute

County[a]	Conservation Reserve Program[b]	Conservation Stewardship Program[c]	Farmable Wetlands Program[d]
Keya Paha	406	17,345	0
Boyd	1,892	16,381	0
Holt	15,756	27,056	0
Antelope	17,053	4,391	96
Boone	11,857	4,566	0
Nance	9,059	2,892	509
Merrick	984	11,422	587
Polk	614	0	115
York	280	3,650	0
Total	**57,901**	**87,701**	**1,307**

[a] *Acres of land enrolled in each proposed Nebraska Reroute county*
[b] *Source: Keystone, 2012b*
[c] *Sources: FSA, 2012a, 2009*
[d] *Source: NRCS, 2012l*

Nebraska Land Trust

NLT, a nonprofit organization, acquires conservation easements to protect private lands that are ecologically, historically, or archaeologically significant in order to preserve them in essentially their natural state. Much of this land serves as wildlife habitat, protects river corridors, or preserves scenic views and historic sites. This land can be used for agricultural use, hunting, and other activities compatible with private stewardship and conservation practices (NLT, 2012a).

On December 21, 2011, a conservation easement was approved for the Hosford Farm, located southeast of Albion in Boone County. The Boone County Board approved a Conservation and Preservation Easement for portions of Sections 30 and 31 of Township 20 North, Range 5 West and part of Section 8 of Township 19 North, Range 5 West (Boone County Board of Commissioners, 2011). The easement is held by NLT (NLT, 2012a). The easement consists of three tracts of land with areas of 274, 135, and 139 acres, respectively. There are numerous Native American sites on the property such as encampments and burial mounds. There is native prairie and high-value timber areas. The easement was secured, in part, through funding from the Laredo Ridge Wind Farm for mitigation for impacts on habitat and prairie nesting birds (especially prairie chickens) (USFWS, 2010b; NLT, 2012b). This easement resulted from a mitigation project approved by the USFWS and NGPC (NLT, 2012b). The proposed pipeline comes close to, but does not cross the Hosford Farm.

Organic Farming

Organic farms must follow strict practices to remain certified.[15] Certification generally takes 3 to 5 years of strict organic farming practices during which time no chemical pesticides or chemical fertilizers can be used. During the period of time after a farm applies for organic certification and before certification is granted (usually 3 years), the farm is considered in transition (USDA, 2012d).

Holt County has the most organic farms in operation (six) totaling approximately 7,400 acres of agricultural land, cropland harvested, and pastureland. Boone and Merrick Counties each have two organic farms, and Boyd County has one organic farm. There are two farms that are in transition in Polk County and five in transition in Antelope County. An additional seven farms in Holt County, two farms in Boyd County, one farm in Boone County, and one farm in Merrick County are currently in transition.

In addition to the certification, many of the organic farms in Nebraska are registered on Driftwatch (a project of Purdue University to identify organic farming operations). There are 33 organic farms identified on Driftwatch in the nine Nebraska Reroute counties. There are 8 organic farms in York County, 7 in Merrick County, 6 in Holt County, 6 in Antelope County, 4 in Boone County, and 2 in Nance County (Driftwatch, 2012).

Land Use

The proposed Nebraska Reroute would cross approximately 190.7 miles of private land and 3.9 miles of State of Nebraska land (owned by the State of Nebraska Board of Educational Lands and Funds). The State land is located in Keya Paha, Holt, and Antelope Counties. The Nebraska Reroute would not cross any federal land. Land cover along the Nebraska Reroute is dominated by cultivated crops and grasslands. Table 4.10-4 lists the land cover that would be crossed by the Nebraska Reroute.

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[15] Organic farm certifying agents are accredited by the USDA National Organic Program. There are 90 certifying agents in the United States, 14 of whom operate in Nebraska (USDA National Organic Program, September 25, 2012).

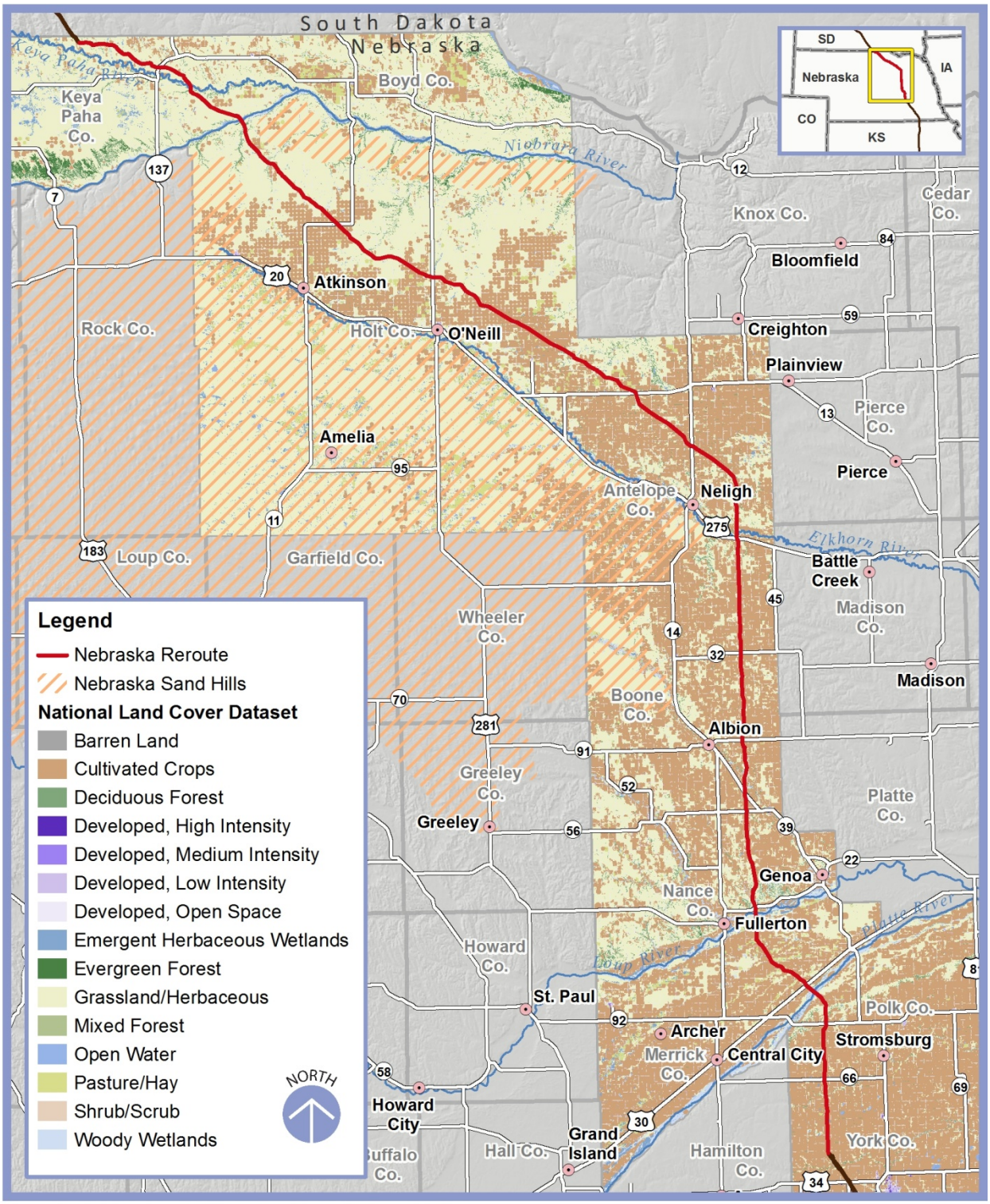
Table 4.10-4. Land Cover Crossed by the Proposed Nebraska Reroute

Land Cover[a]	Length Crossed (miles)	Length Crossed (percentage)
Developed (open space and low-intensity)	7	4
Agriculture (cultivated crops and hay/pasture)	116	59
Rangeland (grassland)	68	35
Forest (deciduous and evergreen)	1	1
Water/wetland	3	1
Total	**195**	**100**

Source: USGS and Montana Bureau of Mines and Geology, 2006

[a] *Based on existing land use in the temporary easement corridor for pipeline construction*

Figure 4.10-2. Land Cover Crossed by the Proposed Nebraska Reroute



Source: 2006 National Land Cover Database, U.S. Geological Society

Existing Development

Land use along the proposed Nebraska Reroute is rural, with farmsteads and agribusiness development (center-pivot irrigation systems, hog-confinement structures, and poultry farms) both present. Other features in the vicinity of the Nebraska Reroute include cemeteries, small dams and impoundments, power substations associated with transmission and distribution lines, levees, and railroad lines. Miscellaneous structures that are present throughout much of the corridor include fences, cattle gates, cattle guards on roads, drainage tile systems, grassed waterways, and other erosion-control structures. Zion Lutheran Cemetery in Boone County is located approximately 165 feet east of the centerline of the construction easement.

The Laredo Ridge Wind Farm is located within and adjacent to the proposed Nebraska Reroute corridor, approximately 0.4 mile north of Nebraska Highway 32 in Boone County. Approximately 40 wind turbines have been constructed at this site, and additional wind turbines are under construction (Omaha Public Power District, n.d.).

Land Use Planning

Comprehensive land use plans are available for Antelope and Nance Counties. Both of these plans describe future land-use planning to preserve agricultural use while encouraging nonagricultural uses of land around existing urban areas and transportation and utility corridors.

The Antelope County Future Land Use Plan identifies four primary land areas for the expansion or future development of various land uses. These uses include general agricultural use, prime cropland use, commercial livestock production, and nonagricultural uses (Antelope County, 2007). The proposed Nebraska Reroute would pass through areas envisioned for general agricultural use and prime cropland use. Commercial livestock production areas are avoided.

The Nance County Comprehensive Land Use Plan divides the county into the following districts: primary agriculture, secondary agriculture, transitional agriculture, commercial, and public/semipublic. The proposed Nebraska Reroute would pass through the primary agriculture district. Grain and livestock production and feeding operations are permitted in the primary agriculture district; nonfarm residential development is discouraged (Nance County, 1999).

Zoning regulations are available for Boyd, Keya Paha, Holt, Antelope, Boone, Nance, Merrick, Polk, and York Counties. Keya Paha County has two zoning districts: agricultural and agricultural within the Niobrara River corridor. The agricultural district preserves land best suited for agriculture. The agricultural district within the Niobrara River corridor protects the unique ecosystems found along the river and ensures that all activities are compatible with the current agricultural uses and the wild and scenic rivers management plan for the Niobrara River. In addition, structures along the river must meet profile and blending criteria to protect the scenic nature of the river corridor.

Zoning regulations for Boyd, Holt, Antelope, Boone, Nance, Merrick, Polk, and York Counties are similar, with agricultural, transitional-agricultural, residential, commercial, and industrial zones. Utility-distribution systems are allowed in all districts, including agricultural districts. Construction of any building or structure requires the approval of the county board.

Construction of a pipeline in Holt County requires the applicant to file a Pipeline Construction Permit Form with the Planning and Zoning Committee. Approval of the permit requires a public

hearing. The permit includes conditions regarding topsoil, impacts to property owners within 250 feet of the pipeline route, and reclamation of the route.

4.10.2 Potential Impacts

Potential impacts on agriculture and land use would occur during both the construction and operational phases of the pipeline project. Nebraska residents voiced concerns about the potential effects of the proposed Nebraska Reroute on agricultural operations and production. The comments related to farmland and irrigation ranged from compensation for farmers who lose income during construction to whether farmers would be able to irrigate over the pipeline construction area. Additional comments were related to construction effects on drainage tiles and whether Keystone would restore drainage, if it were adversely affected. Nebraska residents also expressed concerns related to impacts on livestock and concerns related to easements, financial responsibility for maintenance activities, and the potential need for a permanent access road.

Construction Impacts

Impacts could occur from constructing the pipeline and associated facilities (such as pump stations, MLVs, and temporary construction areas).

Agriculture

Cropland and Pastureland

Both crop- and pastureland would be affected by construction. Approximately 2,805 acres of temporary construction easement (including a 110-foot-wide corridor and additional easement for temporary workspace areas, pump stations, and access roads) would be acquired to construct the pipeline. This acreage includes easements needed to perform the following activities:

- Pump stations: Three pump stations would be constructed along the Nebraska Reroute.[16] Pump Station 22 would be constructed approximately 8.5 miles northwest of O'Neill, in Holt County (currently pastureland); Pump Station 23 would be constructed approximately 5 miles east-northeast of Neligh, in Antelope County (currently cropland); and Pump Station 24 would be constructed approximately 3.5 miles southeast of Fullerton, in Nance County (currently cropland). The total acreage needed for each pump station would vary, depending on the number of pump units needed for each station, the topography and shape of the site, and the space needs for an electric power substation. A maximum of 15 acres would be needed for each pump station. Final acreage and footprints would be determined after final design and through negotiations with the respective landowners (Keystone, 2012b).
- Temporary workspace areas (construction staging areas and areas where special construction techniques would be used): Approximately 95 areas would be used for construction, needing approximately 130 acres of temporary easements. Approximately 60 acres of these areas are cropland, approximately 50 acres are pastureland, approximately 17 acres are open space or low-intensity development, and approximately 3 acres are forested or wetland (Keystone, 2012b). Construction staging areas would

[16] The location of these stations is subject to change pending final design calculations.

need approximately 5 acres each. Areas where special construction techniques would be used (such as water and road crossings, steep slopes, and areas with rocky soils) would need less than 2 acres.

- Space would be needed for contractor yards (approximately 30 acres each), railroad sidings (approximately 10 acres each), and pipe stockpile sites (approximately 40 acres each). Seven contractor yards, five railroad sidings, and seven pipe stockpile sites are anticipated for the proposed Nebraska Reroute. The locations of these sites have not yet been determined; the acreage for the contractor yards, railroad sidings, and pipe stockpile sites are not included in the 2,805 acres of construction easement.
- Construction camp: This would temporarily affect up to 70 acres of land. The specific acreage for a camp in Nebraska, if constructed, has not yet been determined (Keystone, 2012b). Acreage for the construction camp is not included in the 2,805 acres needed for construction easements.
- Temporary roads: Roads would be needed to provide access for construction equipment and vehicles where existing roads do not reach. Approximately 28 temporary access roads would be necessary, which would need approximately 60 acres. Approximately 14 acres of these areas are currently cropland, 31 acres are pastureland, and the remainder is open space or low-intensity developed areas. Less than 1 acre is wetland area (Keystone, 2012b).
- Permanent roads: Permanent roads would provide access for maintaining areas where existing roads do not reach. The locations of these roads and easements would be determined through negotiations with landowners.
- The temporary easement would affect approximately 2,640 acres of agricultural land in Boyd, Keya Paha, Holt, Antelope, Boone, Nance, Merrick, Polk, and York Counties. The acreage of cropland and pastureland affected in each of these counties is shown in Table 4.10-5.

Table 4.10-5. Crop- and Pastureland Acreage Potentially Affected byTemporary Easements Acquisition along the Proposed Nebraska Reroute[a]

County	Cropland[b]	Pastureland	Total Agricultural
Keya Paha	10	206	217
Boyd	4	114	118
Holt	359	376	736
Antelope	439	157	597
Boone	313	65	378
Nance	161	47	207
Merrick	89	11	100
Polk	166	20	186
York	102	<1	102
Total	**1,644**	**996**	**2,640[c]**

Source: USGS and Montana Bureau of Mines and Geology, 2006

[a] *Based on existing land use in the temporary easement corridor for pipeline construction*

[b] *Combination of cultivated land and hay/pasture for grazing*

[c] *Total shown is agricultural land only; the remaining 165 acres within the construction easement are in forest, wetlands, and developed land.*

Construction of the proposed pipeline would temporarily disrupt agricultural activities on the affected land. Crop yields would be diminished when the land is disturbed for construction (6 to 8 months in a construction spread; approximately 3 to 4 months in any given location). Assuming that crop production from the affected land would be lost for one growing season and that it is proportional to the total production in each county, crop yields would be reduced by:

- Corn: Approximately 151,000 bushels
- Soybeans: 26,400 bushels
- Winter wheat: 400 bushels
- Hay: 300 tons
- Oats: 50 bushels

No orchards or nut farms were identified in or near (within 500 feet) the construction easement.

During construction, additional crops would be lost because of the loss of irrigation on land adjacent to the construction easement and disruption to drainage tile systems. Production of livestock would be reduced during construction because of disturbances to stock-watering systems.

Table 4.10-6 provides the total lost production during construction for all affected counties. The estimated lost production is approximately 0.1 percent of the county total for all crops in each county. Additional discussion of economic impacts from lost agricultural production is provided in Section 4.13, Employment and Fiscal Impacts.

Table 4.10-6. Estimated Effect on Cropland Production during Proposed Construction in All Affected Counties[a]

Affected Crops, All Counties	Acreage[b]	Yield, per Acre[c]	Lost Production[d]	Percentage of County Total Production[e]
Corn, grain (total)	917	165	151,000	0.1
Corn, grain (irrigated)	658	181	119,000	0.1
Corn, grain (nonirrigated)	259	124	32,200	0.2
Soybeans (total)	498	53	26,400	0.1
Soybeans, irrigated	332	57	18,800	0.1
Soybeans (nonirrigated)	166	47	7,790	0.2
Wheat (winter)	8	47	400	0.1
Hay	220	2	300	0.1
Oats	1	59	100	0.1

Sources: USGS and Montana Bureau of Mines and Geology, 2006; USDA, 2012c

[a] *Based on existing land use in the temporary easement corridor for pipeline construction*

[b] *Estimated, based on the acres of cropland from National Land Cover Database coverage, 2006, in the easement corridor in each affected county, and the acreage harvested of each crop in each affected county. The amount of crop acreage for each type of crop (such as corn or soybeans) in the easement corridor is assumed to be proportional to the total acreage in the county in 2011.*

[c] *Yield per acre is an average for all affected counties.*

[d] *Units are bushels, except hay, which is in tons. Lost production is estimated from the acreage of each crop type estimated to be in the easement multiplied by the county average yield for each crop. Lost production would be limited to one growing season.*

[e] *Agricultural production temporarily lost during pipeline construction compared with 2011 production for the nine affected counties*

Prior to construction, agricultural land (where crops are present) would be disked or mowed to ground level to provide clear, safe, and efficient access for construction. Timber shelterbelts within the construction ROW would be removed to the minimum extent practicable for pipeline construction. Additional construction impacts could include damage to irrigation and drainage systems (discussed below under agriculture infrastructure).

Disruptions to cropland activities would also include physical impacts on the soil during trenching and other construction activities (such as excavation of soil, soil compaction from construction equipment, runoff or siltation from dewatering of trenches, and disruption of irrigation systems). Dust blowing off the ROW could settle on plants, and this dust could increase opacity and reduce photosynthesis, thereby reducing crop production. Additional discussion of soil impacts is provided in Section 4.2, Soils and Sediment.

Productivity from pastureland would also be lost within the construction easement during construction and restoration. Access to pastures on either side of the pipeline route could be temporarily limited in some areas. Grazing operations might need to relocate to another pasture during construction and during soil reclamation and revegetation.

Prime Farmland

Approximately 883 acres of soils classified as prime farmland would be temporarily removed from agricultural production during construction of the proposed Nebraska Reroute. An additional 486 acres of soils that are classified as prime farmland, if drained, would also be affected. Nearly half of the acreage affected by construction within the construction easement is not prime farmland. Approximately 0.1 percent of prime farmland and soils of statewide importance within the nine proposed Nebraska Reroute counties would be temporarily affected by construction. These soils could return to agricultural production after construction and restoration.

Depending on the exact location and size, about 30 acres of prime farm land would be affected by construction of pump stations. These sites would be permanently converted from agricultural use to utility use.

As described in the Final EIS (DOS, 2011a), Keystone has agreed to compensate landowners for any maintenance- or construction-related crop loss as a result of the proposed Nebraska Reroute. Keystone has also agreed to schedule any required maintenance activity such that disruptions to crops would be avoided or minimized to the extent practicable.

Agricultural Infrastructure

The agricultural infrastructure that could be affected by construction of the proposed pipeline and associated infrastructure includes irrigation systems, stock watering systems, and drainage tile systems.

As discussed in Section 4.10.1 and shown in Table 4.10-1, approximately 65 percent of the cropland in the Nebraska Reroute counties is irrigated. Within the construction easement, approximately 69 percent of the cropland area is irrigated. There is no irrigation in the construction easement in Keya Paha County.

Irrigation systems would be affected in two ways during construction:

- The use of irrigation systems could be limited to allow for the proper soil conditions (especially moisture content) needed for construction.
- Trenching for the pipeline could disrupt underground utilities such as power distribution and water lines for irrigation wells. In some cases, power and water lines would need to be rerouted. The disruptions would generally occur for a short duration (1 or 2 days) but in some cases could last longer. The pipeline would be constructed at a greater depth than these existing power and waterlines (DOS, 2011a).

Stock-watering systems could similarly be affected by trenching for the pipeline.

Drainage tile systems could be affected by trenching for the pipeline. Drainage tile systems are located in wet areas to assist with drainage to optimize crop production. Keystone would meet with local government agencies and landowners to determine the locations of drainage tile systems prior to construction. Location data would be incorporated into the pipeline centerline survey.

Drainage tiles and associated underground pipes would be avoided during construction to the extent practicable, but some impacts would be unavoidable. Some drainage tiles would need to be cut to excavate the trench for the pipeline. Cuts to drainage tiles and pipes would allow water

to saturate subsoil in the affected area, including the excavated trench for the pipeline. However, a work crew following the pipeline trench crew would temporarily repair the drainage pipes to allow a continuous flow of water.

As described in the Final EIS (DOS, 2011a), Keystone has agreed to coordinate with landowners prior to construction to determine the locations of water lines. If existing irrigation systems, irrigation ditches, or sheet-flow irrigation would be affected by the construction of the pipeline, temporary measures would be implemented to allow continuous operation of the irrigation system, or Keystone would negotiate with the landowner an acceptable amount of time for service interruption. If an irrigation system interruption resulted in crop damages, Keystone has agreed to compensate the landowner for crop damages (DOS, 2011a).

If any drainage tiles were damaged during construction, Keystone has agreed to any temporary repairs that would maintain flow until permanent repairs could be made (DOS, 2011a).

Conservation Lands

There are no Wetlands Reserve Program lands within 3 miles of the easement (National Conservation Easement Database,[17] 2012). There is no Farm and Ranch Lands Protection Program land in the Nebraska Reroute counties. The only Grasslands Reserve Program land in the Nebraska Reroute counties is one site in Holt County; the specific location of this site is not available. Approximately 26 acres of CRP land, at ten locations, would be affected by construction of the Nebraska Reroute (Keystone, 2012b).

Although pipeline construction is permitted on CRP land, land cover cannot be disturbed during the primary bird nesting season from May 1 through July 15. For landowners participating in CRP, it is the landowner's responsibility to maintain conservation practices; therefore, the landowner would need to contact FSA prior to construction. Any disturbance to land cover must be approved by the FSA County Committee (FSA, 2012c).

Land cover on any USDA (NRCS and FSA) conservation land would need to be reestablished within 1 year. If any structures (such as terraces or grassed waterways) were affected, Keystone would rebuild them to original design standards.

The landowner would need to contact the county office prior to construction and let the office know about construction plans. If land cover and/or structures are reestablished, there would not be any impact on program participation (NRCS, 2012p). FSA has an approved seed mixture for reestablishing cover on CRP land after it is disturbed by construction (FSA, 2012c).

Wetlands in conservation areas could not be drained or filled without consulting NRCS. If a wetland area is wooded, removing the trees would constitute removing the wetlands (NRCS, 2012p).

Nebraska Land Trust Lands

The northern two parcels of the Hosford Farm conservation easement are located approximately 1,563 and 2,172 feet west, respectively, of the construction easement. The southernmost tract of the Hosford Farm conservation easement is approximately 160 feet west of the easement. Therefore, no NLT lands would be affected by the pipeline (NLT, 2012b).

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[17]< http://nced.conservationregistry.org/>

Organic Farms

Organic farms (and farms in transition to organic methods of production) are located in Boyd, Holt, Antelope, Boone, Polk, and Merrick Counties. Not all of the locations of these farms are available; however, two organic farms in Antelope County and three organic farms in Boone County registered on Driftwatch are within approximately 1 mile of the proposed Nebraska Reroute centerline (Driftwatch, 2012).

Potential impacts to organic farms from pipeline construction include potential violations of organic standards in fields because of contaminated soil on equipment, dust and drift from other fields, tobacco use by construction workers, or mixing of topsoil from nonorganic farming operations. Contamination from any of these sources would prevent organic farmers from marketing crops as organic, thereby resulting in lost income.

As described in the Final EIS, (DOS, 2011a), Keystone has agreed to compensate landowners for any maintenance- or construction-related crop loss as a result of the Nebraska Reroute. Keystone has also agreed to schedule any required maintenance activities such that disruptions to crops would be avoided or minimized to the extent practicable.

Land Use

Pipeline construction would temporarily affect land within the construction easement, temporary work areas, contractor yards, pipeline storage yards, railroad sidings, temporary access roads, and a construction camp. After construction were completed, land use in these areas would revert to its previous use, within the terms of the easement. Land use in areas needed to construct pump stations and MLVs would be permanently converted and not returned to agricultural production.

Existing Land Cover

Construction of the proposed pipeline would not affect any federal land. Approximately 54 acres of State of Nebraska land would be temporarily affected by pipeline construction (Keystone, 2012b). The remainder of the land that would be affected by the proposed Nebraska Reroute is privately owned. The land cover that would be affected by the proposed Nebraska Reroute is dominated by cultivated crops and grasslands.

The existing land cover within the construction easement (the area in which the final pipeline route would be sited) is primarily cropland and rangeland. Table 4.10-7 lists the land cover in the construction easement.

Table 4.10-7. Land Cover in the Proposed Construction Easement

Land Cover	Area in Construction Easement (acres)	Area in Construction Easement (percentage)
Developed (open space and low-intensity)	121	4
Agriculture (cultivated crops and hay/pasture)	1,644[a]	59
Rangeland (grassland)	996	36
Forest (deciduous and evergreen)	13	<1
Water/wetland	31	1
Total	**2,805**	**100**

Source: USGS and Montana Bureau of Mines and Geology, 2006
[a] *Includes 31 acres of farmed wetlands*

Existing Development

There are no farmsteads or residences within the construction easement. No relocations are planned (Keystone, 2012b); however, the following other structures are within the construction easement:

- A pole supporting a 115 kV powerline is located approximately 20 feet from the pipeline route centerline (within the permanent easement) in Boone County.
- The pipeline route crosses a levee for Vorhees Creek in Boone County.
- A pole supporting a power distribution line is located approximately 80 feet from the pipeline route centerline (within the permanent easement) in Boone County.
- The pipeline route would pass under Union Pacific Railroad tracks in Boone, Nance, Merrick, and Polk Counties and under BNSF Railway tracks in Antelope County.

Residents who live within 500 feet of the ROW could experience temporary inconveniences such as construction dust, vibration, and noise during the construction period. The following structures are located within 500 feet of the pipeline route centerline:

- Twenty-two residences
- Twenty-one locations with structures (barns and other outbuildings, grain bins, and sheds)
- A power substation approximately 120 feet from the proposed pipeline route centerline in Holt County.
- An embankment for Saltz Lake approximately 160 feet from the proposed route centerline in Holt County.
- A wind turbine associated with the Laredo Ridge Wind Farm approximately 160 feet from the pipeline route centerline in Boone County. The blades of the turbine are approximately 80 feet from the route centerline. Two other wind turbines are within 1,000 feet of the centerline. The construction easement would cut across a road and underground power line associated with the wind farm.

- A power substation approximately 110 feet from the pipeline route centerline in Boone County.
- An unnamed water impoundment approximately 110 feet from the pipeline route centerline in Boone County.

Land-Use Planning

Keya Paha, Boyd, Nance, Merrick, Polk, and York Counties would require a conditional-use permit to be approved by the zoning board in each county for constructing the pipeline and other related uses (contractor yards, railroad sidings, pipeline storage yards, and a construction camp). In Keya Paha County, any structures within the Niobrara River Scenic Overlay would be required to meet all of the established conditions for construction in this area.

In Holt County, constructing the pipeline would require a pipeline permit. Approval of the pipeline permit requires a review of the planned construction and conditions for construction in areas with structures within 250 feet of the centerline of the pipeline route. A CMRP would be required for the pipeline permit.

Operation Impacts

Operation of the pipeline would permanently affect land at pump station sites, land dedicated for permanent roads, and land at MLV locations.

Approximately 1,224 acres of permanent easement (a 50-foot-wide corridor the entire 194.6-mile length of the Nebraska Reroute, plus acreage for the pump stations) would be retained by Keystone for access to the pipeline. No structures or tall vegetation would be allowed within this easement area; however, crop cultivation and pasture uses would be allowed.

Agriculture

Cropland and Pastureland

Most of the agricultural land affected by construction of the proposed pipeline would return to crop production or grazing after construction. Land where pump stations, permanent roads, or MLVs are constructed would remain out of production. Use of land for the pump stations would reduce agricultural production in the county in which it is situated by a negligible fraction. The number of acres affected by permanent access roads, if needed, would also be minimal. One acre or less (within the 50-foot-wide permanent easement) would be required for MLVs. Agricultural production could be disrupted during maintenance activities if excavation were needed for repairs.

As described in the Final EIS (DOS, 2011a), Keystone has agreed to compensate landowners for any maintenance- or construction-related crop loss as a result of the proposed Nebraska Reroute. Keystone has also agreed to schedule any required maintenance activity such that disruptions to crops would be avoided or minimized to the extent practicable.

Soil Temperature

As oil passes through a pipeline, it is warmed by friction. No heat is added to the product to decrease its viscosity; diluents are added to serve this purpose (see Chapter 6, Pipeline Safety and Potential Spills).

According to the Final EIS (DOS, 2011a: Section 3.13), "the maximum operating temperature of the proposed Project pipeline would not exceed 150 degrees Fahrenheit." Condition 15 of the PHMSA 57 Special Conditions specifies, "Normal pump discharge temperatures should remain at or below 120° Fahrenheit (°F)," but the condition also states, "Under no circumstances may the pump station discharge temperatures exceed 150° Fahrenheit (°F) without sufficient justification that Keystone's long-term operating tests show that the pipe coating will withstand the higher operating temperature for long-term operations, and approval from the appropriate PHMSA region(s)."

The Final EIS (DOS, 2011a) concluded that the Keystone XL Pipeline's temperature effects on crop production in an 8-foot-wide corridor above and near the pipeline could include earlier germination and development of plants because of warming earlier in spring and potential depletion of soil moisture because of higher soil temperatures. Although the amount of research data directly relevant to this evaluation is limited, the NDEQ's analysis of the available data generally supports the conclusions of the EIS analysis.

According to the temperature effects study presented as Appendix L to the 2011 Final EIS (DOS, 2011a), temperature modeling indicated that pipeline temperatures for the Nebraska segment of the Keystone XL Pipeline would range from 85°F to 100°F in the winter to 120°F to 130°F in the summer. Soil temperatures closer to the buried pipeline could be as much as 40°F warmer than the ambient surrounding soil temperatures. In Appendix L, the modeling data were used to develop temperature profiles for January, March, May, July, and October. In Nebraska, the January and March profiles showed warming adjacent to the pipeline that decreased the frost depth. The May profile showed earlier frost-out above and adjacent to the pipeline. The July profile showed warmer temperatures surrounding the pipeline, with temperatures of up to 130°F at the pipeline casing. The October profile showed a gradual cooling at the soil surface consistent with ambient air temperatures (DOS, 2011a).

Based on this analysis, soil heating associated with operation of the pipeline could improve or hinder crop development and productivity depending on the local site and climatic conditions. Generally, warmer soil temperatures cause earlier frost-out in the spring and later freezing in the fall. This extension of the growing season, especially in the spring when seeds are planted, could give crops a head start, thereby allowing them to make the most efficient use of long daylight hours. Fall crops, such as winter wheat, would have a longer period to grow and develop roots to carry them through the winter months.

Spring wheat has an extensive root system; major growth can extend 3 feet or more by the time of flowering in mid-June. Mature corn roots extend to a depth of 8 feet, with the majority of the roots extending to a depth of 4 feet and lateral roots extending 4 feet out from the main plant (Weaver, 1926).[18] Soybean roots may extend 4 to 8 feet deep, with most of the roots in the upper 12 inches (McWilliams et al., 1999).[19]

The extent of increased soil temperatures, as depicted in the soil profiles, would be very limited. For May, the higher soil temperatures (at 2 feet deep) appear to be confined to a 10-foot-wide

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[18] Weaver, J. E. 1926. Root Development of Field Crops. McGraw-Hill Book Company, Inc., New York, New York.

[19] McWilliams, D. A., D. R. Berglund, and G. J. Endres. June 1999. Soybean Growth and Management, Quick Guide. <http://www.ag.ndsu.edu/pubs/plantsci/rowcrops/a1174/a1174.pdf>. Retrieved September 26, 2012.

strip centered on the pipeline. For July, the higher soil temperatures at 2 feet deep appear to be confined to an 8-foot-wide strip centered on the pipeline. Assuming an 8-foot-wide impact area, the total amount of prime farmland in Nebraska that would be affected, either positively or negatively, is 171 acres. This is 11 percent of the overall amount of 1,525 acres of prime farmland that would be affected by pipeline construction and is a small fraction of the 4.6 million acres of prime farmland in counties along the Nebraska Reroute (see the discussion of prime farmland above).

The Final EIS also stated that landowners would be compensated for yield loss attributable to the Keystone XL Pipeline.

The proposed Nebraska Reroute's effects on crop production could be slightly positive or negative and would be small compared with the total acreage that is actively farmed in Nebraska.

Prime Farmland

The site for each pump station would affect a minimal amount of prime farmland. Based on the amount of prime farmland in the affected counties, a relatively small number of acres of prime farmland would be taken out of agricultural production.

Agricultural Infrastructure

Production of crops and use of irrigation systems would resume after land were restored following construction. Areas within the 50-foot-wide permanent easement could occasionally be affected by maintenance activities. Operation and maintenance of the pipeline would not affect the use of stock-watering systems or drainage tile systems (DOS, 2011a).

Conservation Land

Land cover on conservation land would be restored after construction. Within the 50-foot-wide permanent easement, only low vegetative cover (grasses and other plants) could be reestablished. Trees and other moderate-to-large vegetation would continue to be cleared from the permanent ROW and would not be allowed to reestablish.

Nebraska Land Trust Land

Measuring from the outer edge of the construction easement, the pipeline would be constructed 160 feet or more from the Hosford Farm. Agricultural production and land cover on the Hosford Farm would not be affected by the pipeline.

Organic Farms

There are two organic farms within 1 mile of the proposed pipeline in Antelope County and three within 1 mile in Boone County. Depending on how close actual production fields would be to the pipeline (and the type of buffer between these fields and the pipeline), contamination from dust and drift of agricultural chemicals could affect these farms. If cropland and crops were contaminated from dust, mixing of topsoil from nonorganic farms, or agricultural chemicals (used for maintenance of vegetation in the permanent easement), this contamination could prevent the organic farmer from marketing the produce as organic, resulting in lost income.

As described in the Final EIS (DOS, 2011a), Keystone has agreed to compensate landowners for any maintenance- or construction-related crop loss as a result of the Keystone XL Pipeline.

Keystone has also agreed to schedule any required maintenance activity such that disruptions to crops would be avoided or minimized to the extent practicable.

Land Use

Existing Land Cover

Approximately 15 to 45 acres of existing land cover (primarily agricultural land) would be permanently affected by construction of the pump stations. A small amount of land (approximately 0.05 acre) would be permanently modified for MLVs. Keystone estimates that 12 MLV sites would be required for the Keystone XL Pipeline (DOS, 2011a). Approximately 1 acre of agricultural land would be taken out of production to construct the MLVs. Permanent access roads have not yet been determined, but the impacts on agricultural land would be minimal (Keystone, 2012e).

Existing Development

No farmsteads were identified in the 50-foot-wide permanent easement. The easement would cross a road and underground power lines associated with the Laredo Ridge Wind Farm. Operation of the pipeline would have no effect on the existing wind farm.

Land-Use Planning

No buildings or permanent structures could be located within the 50-foot-wide permanent easement. No other impacts on land use planning or future land use have been identified.

4.10.3 Commitments to Reduce or Avoid Impacts

Keystone has committed to implement a CMRP that prescribes construction, operation, and maintenance procedures that are designed to reduce the likelihood and severity of impacts along the Nebraska Reroute.

Keystone has agreed to compensate landowners for any maintenance- or construction-related crop loss as a result of the proposed Nebraska Reroute. Keystone has also agreed to schedule any required maintenance activity such that disruptions to crops would be avoided or minimized to the extent practicable.

Keystone has committed to "acquire pipeline easements and fee property from landowners and provide landowners with monetary compensation for the conveyance of those easements or fee property. Keystone will reclaim damaged or disturbed lands, repair or restore damaged property, and compensate owners for damages. Additionally, the easement area will be returned to its preconstruction use with the exception of timber/forest and areas of structures in the permanent easement" (Keystone, 2012b). Further, Keystone has committed to negotiate "with each landowner to determine fair compensation for interference with farming/ranching operations and potential reductions in crop productivity" (Keystone, 2012b).

Keystone has committed to implement weed-control measures, correct tile line or irrigation systems when damaged by the Nebraska Reroute, and monitor the yield of land affected by construction. If the yield of land affected by construction were less than the yields on unaffected land, Keystone has committed to compensate the landowner for reduced yield and implement procedures to return the land to an equivalent capability (see Appendix C).

In addition to these commitments Keystone has committed to the following measures to address potential impacts to agriculture in Nebraska (presented verbatim) (Keystone, 2012d):

- Prior to construction, Keystone would select, subject to NDEQ approval, and pay for, a public liaison officer to facilitate the exchange of information between Keystone and landowners, local communities and residents. The purpose of the public liaison officer would be to respond to questions or concerns and to resolve promptly any complaints or problems that may develop as a result of the pipeline's construction. The public liaison office would report to NDEQ or as otherwise directed by NDEQ. Keystone will consider agricultural extension agents, as well as other qualified individuals, in selecting a public liaison office.
- If construction were to adversely affect wetlands in NRCS conservation lands (such as the WRP) Keystone would follow applicable NRCS procedures in addition to other federal permit requirements.
- When agriculture (tilled) fields are disturbed, Keystone would work with the landowner regarding the type of vegetation that would be reestablished.
- Where Keystone is made aware of the presence of certified organic farms along the Project route prior to construct, keystone would work with those organic farm operations to ensure that pipeline construction does not impair the farm's organic status. Keystone would take reasonable steps to identify organic farms along the Project route.
- If the Project crosses an organic farm, Keystone will work with the landowner to take reasonable steps to avoid mixing organic soil and non-organic soil.

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4.11 RECREATION AND VISUAL RESOURCES

This section addresses the existing conditions of public recreational resources and the potential effects on these resources and areas of visual interest from construction and operation of the proposed Nebraska Reroute. Recreational areas include waterbodies, State and local parks, national historic trails, wildlife management areas, and wildlife refuges. Areas of visual interest are areas such as residences, recreational areas, rivers, and highways with landscape characteristics and sensitive viewpoints that have an aesthetic value to residents and visitors.

Areas of visual interest resources are areas such as residences, recreational areas, rivers, and highways with landscape characteristics and sensitive viewpoints that have an aesthetic value to residents and visitors.

Judgments of value, especially related to landscape views, are often considered subjective; therefore, this discussion is limited to formally recognized areas of visual interest in the Nebraska Reroute corridor such as scenic byways and areas of visual interest that the public can see along highways, from rivers and streams, or from public recreational areas.

4.11.1 Existing Conditions

The proposed Nebraska Reroute corridor crosses northcentral and eastcentral Nebraska. Although there are scenic views in this corridor, opportunities for recreation on public land are limited. Most of the land crossed by the Nebraska Reroute is privately owned, though the route crosses a public hiking and biking trail as well as rivers and streams that are used for tubing, canoeing, and kayaking. Recreational activities such as hiking, hunting, fishing, and camping would be allowed in this corridor only with the permission of the private landowner.

The Nebraska Reroute corridor travels through Nebraska's northern mixed-grass prairie and the tallgrass prairie ecoregions in eastcentral Nebraska, both of which border the eastern edge of the Sand Hills ecoregion (NGPC, 2011a). Scenic views in these various ecoregions can be found in the natural grasslands with their associated vegetation, lakes, and streams as well as in the remnants of the area's historic past and the rural agricultural landscapes. Although the Nebraska Reroute corridor does not contain any public-designated scenic overlooks, it does cross a publicly recognized scenic byway, which is discussed below in Section 4.11.2 (NGPC, 2011b).

The terrain in the tallgrass and mixed-grass prairie ecoregions allows visitors to enjoy spacious grassland views. The creeks and rivers that create deep cuts and valleys in the landscape are often associated with the many lakes and wetlands in these ecoregions (NGPC, 2011c). The areas surrounding the creeks and rivers vary greatly in color, landform, and vegetation, making them among the most scenic areas (U.S. Department of the Interior, Bureau of Land Management, 1986). Because the middle Niobrara River valley supports a diverse range of plant and animal life, it has been referred to as the biological crossroads of the Midwest. Wetlands, which are connected to both waterbodies and aquifers, support lush vegetation, visually break up the prairie landscape, and add to the overall scenic quality of the regions. Nature-based recreational activities include taking advantage of the area's waterways and bluffs through hiking, kayaking, camping, canoeing, fishing, hunting, and bird watching.

Segments of the Niobrara River have been classified under the National Wild and Scenic Rivers Act as having scenic and recreational qualities. The western portion of the river, from Borman

Bridge to its confluence with Chimney Creek and from its confluence with Rock Creek to State Highway 137, is classified as scenic (Figure 4.11-1). The eastern portion of the river, from the western boundary of Knox County to its confluence with the Missouri River, is classified as recreational (U.S. Department of the Interior, Bureau of Land Management et al., 2012).

History-based recreational and scenic opportunities (Figure 4.11-1) are available along the Nebraska Reroute corridor. One such resource is the Outlaw Trail Scenic Byway (highway), which passes through Nebraska near the South Dakota-Nebraska border. The areas along this byway were frequented by outlaws, and legends include stories of hideouts for Jesse James and his gang. The byway travels through areas of scenic beauty visible from the highway.

The Cowboy Trail is a 321-mile-long trail across northern Nebraska that follows an old railroad line. This rails-to-trails resource is used by the public for hiking and biking.

In Nance County, the Nebraska Reroute corridor crosses the Mormon Trail, which was used mainly by westward-migrating Mormons from 1864 to 1867. The California Trail, most often associated with the gold rush of 1849, is also crossed by the Nebraska Reroute corridor in Nance County. The Mormon and California trails exist as documented historic locations of the original trails, not as recreational trails (UNL, 2012b).

4.11.2 Potential Impacts

The proposed Nebraska Reroute would cross the Niobrara River between the federally designated National Recreational River (to the east) and National Scenic River (to the west). The proposed Nebraska Reroute also avoids rivers that are listed on the National Rivers Inventory, which monitors rivers having the potential to be classified as scenic or recreational in the future (U.S. Department of the Interior, National Park Service, 2012b).

No national, State, or local (county and city) parks, recreational lakes, wildlife management areas, or refuges would be crossed by the Nebraska Reroute.

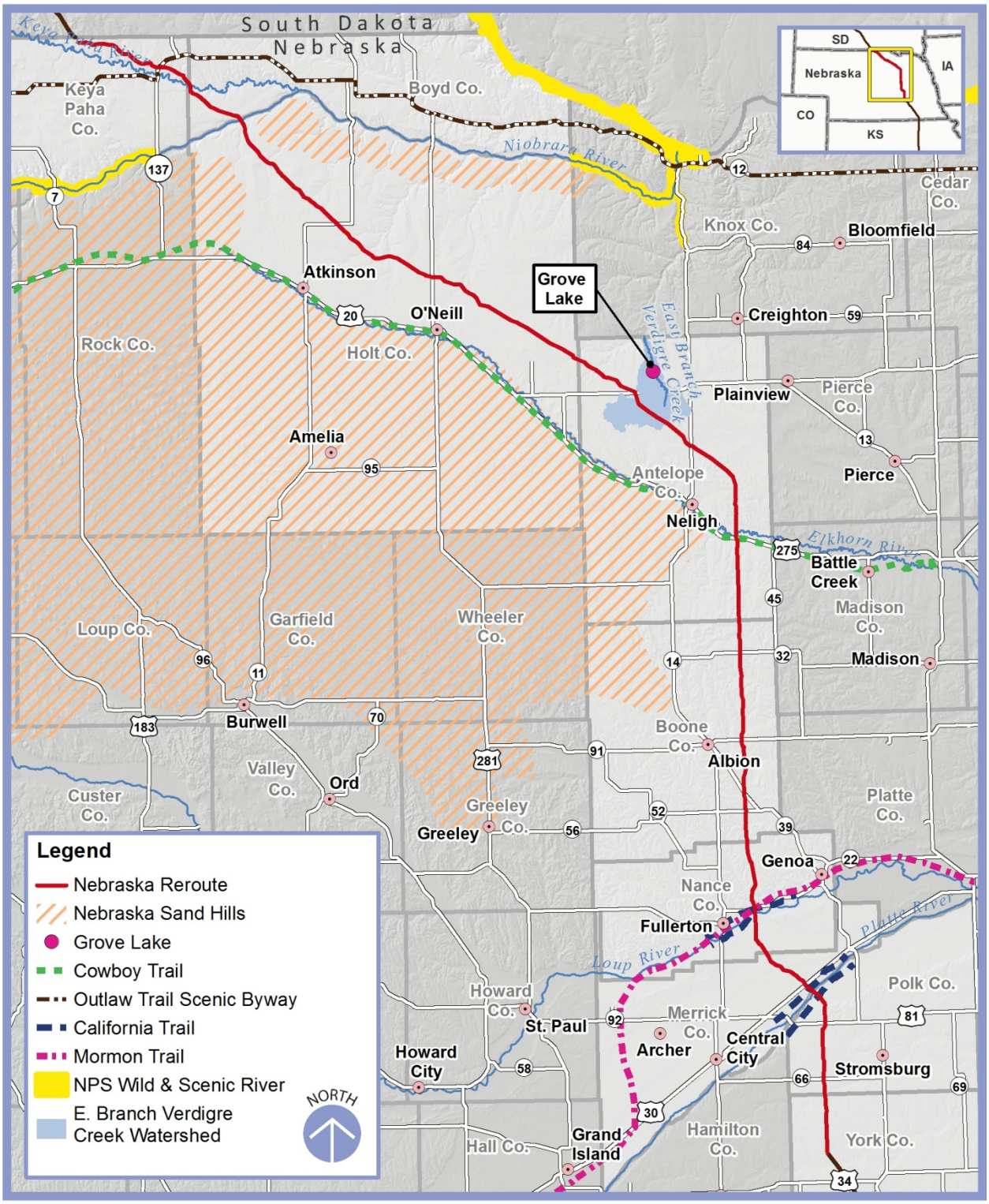
Recreational Impacts

The proposed Nebraska Reroute's crossing of the Outlaw Trail scenic byway in Keya Paha County and the Cowboy Trail in Antelope County might temporarily restrict travel during construction. The level of impact would depend on whether the crossings are trenched through or bored under. If the crossings are trenched, then short-term impacts to public recreation would occur because the trails would be temporarily closed during construction. Closure would be limited to a brief period for construction and surface repair.

The Mormon Trail and the California Trail would also be crossed by the Nebraska Reroute; however, as previously noted, these trails exist as documented historic locations of the original trails, not as recreational trails (UNL, 2012b).

Wherever practicable, recreational trails, historic or scenic trails, byways, and waterbodies used for recreational activities would be crossed using underground drilling or boring techniques to limit construction impacts to the scenic recreational use and value of these resources.

Figure 4.11-1. Scenic Byways and Recreation along the Proposed Nebraska Reroute



Source: NDEQ 2012

Construction activities could adversely affect hunting (on private land where hunting is permitted by the landowner) in the short term, depending on the timing and season. Short-term impacts on hunting activities could include the temporary disruption of access roads to private hunting grounds and wildlife disruption resulting from pipeline construction noise, increased human presence, and the temporary loss of cover. Impacts on hunting would diminish when construction-related personnel and equipment leave the area and would cease once disturbed land is revegetated along the pipeline ROW.

The proposed Nebraska Reroute would not cross federal, State, or local public recreational areas other than the Outlaw Trail scenic byway in Keya Paha County and the Cowboy Trail in Antelope County (which would experience only temporary construction impacts). Therefore, there would be no long-term effects on public recreational resources.

Visual Impacts

The proposed Nebraska Reroute could have short-term impacts on visual resources because of land disruption, construction of the pipeline, and installation of aboveground facilities, such as the power line and substation support structures (see Chapter 2, Project Description, for details). Short-term visual impacts would result from the presence of personnel and equipment in the construction areas, housing, access roads, and debris related to pipeline construction. Short-term visual impacts on forested land would be the result of clearing workspaces.

The extent of these impacts would depend on the length of time it takes to construct a particular segment of the pipeline. Cropland initially affected would be hidden after the following growing season. Visual impacts to cropped lands would be short-term because landowners would likely replant cropland disturbed by construction the first growing season following project completion. Depending on the season when construction were completed, an annual cover might be planted to hold the soil until the next growing season.

Areas of agricultural land would facilitate faster pipeline construction than areas with rocky soils, river and stream crossings, and steep terrain; therefore, construction-related effects in agricultural land might be of shorter duration than those in rocky soils and steep terrain. In steep terrain, temporary erosion control measures might be visible until vegetative cover were to become established. To reduce visual impacts from erosion, a Stormwater Pollution Prevention Plan would be developed (as required under an NPDES Construction Stormwater Permit issued by NDEQ), and site-specific erosion control measures would be devised and implemented.

Long-term visual impacts from pipeline construction would include landscape intrusions from the aboveground facilities associated with the pipeline (such as pumping stations, power lines, and substations) as well as maintenance of the associated ROW or easements. Pumping stations would be more visually intrusive if located in predominantly natural areas than if located near crop lands or areas where many human-made structures are present.

Long-term visual impacts would also result from maintenance activities along the pipeline. Because the pipeline and associated structures would be constructed away from most prominent public viewpoints, impacts would be restricted to areas either seldom seen by the public or seen only briefly in passing along travel corridors. Additionally, pump stations would be designed and painted to minimize visual impacts.

Power lines and their support structures would be constructed along existing travel corridors, wherever possible, to reduce long-term visual impacts. The Nebraska Public Power District

(NPPD) would be responsible for bringing the power from the existing 115 kV line to the new pump stations. By State law, the placement of utilities is limited to section or half-section lines, unless the landowner agrees to another route to avoid existing structures. Although the final routing for the power lines would be conducted by NPPD, there are no known high-value visual resources that would constrain their location. Power lines would need access roads, ROW, or easement maintenance that might have long-term impacts on the visual environment. Long-term visual impacts on vegetation would occur on forested areas as a result of clearing trees, shrubs, and other herbaceous cover to construct power lines.

4.11.3 Commitments to Reduce or Avoid Impacts

Keystone would implement the measures described in its CMRP to reduce or avoid impacts on recreational and visual resources. The CMRP is included in Appendix C. During construction, project-related personnel, equipment, and debris would be kept within the construction ROW, and debris would be disposed of regularly. Long-term visual impacts would be avoided by restoring the 110-foot-wide construction ROW land cover at project completion. To the extent practicable, terrain would be restored to preexisting conditions through proper grading and revegetation practices. To promote the recovery of ROW vegetation from the existing seed-bank in the soil, topsoil would be conserved and restored to preexisting contours once construction were complete. Upland areas would be restored using construction and reclamation practices specifically designed for the sensitive soils and grasslands in Nebraska.

Reclaiming pastures and prairies along the Nebraska Reroute takes longer than crop land (pasture recovery time ranges from 1 to 5 years; prairie recovery time could take up to 10 years). Therefore, these disturbed areas could be visible for longer periods than disturbed crop lands. Recovery times in forested land might take up to 20 years depending on the extent of tree removal, damage, and species affected. Recovery times for shrubs and other plant cover might take 5 to 8 years (DOS, 2011a).

Areas of pasture, rangeland, and grassland in the construction ROW would be reseeded following cleanup and topsoil would be replaced using seed mixes based on input from the local NRCS office and specific seeding needs requested by landowners and land managers.

Following construction, disturbed areas would be monitored to ensure successful reclamation. Any areas where reclamation efforts would remain unsuccessful after a period of 3 years would be reevaluated and adjusted to promote success. Efforts to restore native vegetation and fragile soils would involve experts experienced in Nebraska vegetation and soils reclamation.

Visible long-term maintenance of trees and herbaceous cover would be limited to trimming and would not involve complete removal of vegetative cover.

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4.12 POPULATION AND ENVIRONMENTAL JUSTICE

This section evaluates the potential for the proposed Nebraska Reroute to cause disproportionate impacts on vulnerable populations, including racial and ethnic minorities, low-income populations, and elderly populations. Measures that could be used to reduce the potential impacts are also identified.

The population and environmental justice analysis was conducted on a 4-mile-wide Study Area (extending 2 miles from each side of the proposed centerline of the alignment) to account for potential impacts near the Nebraska Reroute corridor. The Study Area comprises parts of nine counties: Keya Paha, Boyd, Holt, Antelope, Boone, Nance, Merrick, Polk, and York.

4.12.1 Existing Conditions

Population

This section evaluates the population (density and changes in population over time) and housing in the Study Area to determine whether construction and operation of the proposed Keystone XL Pipeline would adversely affect population trends or housing availability. The proximity of existing cities and villages to the proposed pipeline is addressed to give a context for evaluating potential construction and operational impacts.

The nine counties along the proposed Nebraska Reroute are lightly populated, with population densities ranging from approximately 1 person per square mile in Keya Paha County to approximately 24 people per square mile in York County (see Appendix E.12). Most of the cities and villages in the Nebraska Reroute counties are more than 3 miles from the centerline of the Nebraska Reroute alignment. There are five cities and villages located approximately 2 miles or less from the centerline: Orchard, Royal, Oakdale, St. Edward, and Polk. The two closest communities to the pipeline are Royal, which is 1.6 mile east of the Reroute alignment, and Polk, which is 1.6 mile west of the pipeline.

Housing

Temporary housing was evaluated for counties within 50 miles of the Nebraska Reroute corridor. The area assessed includes the nine Nebraska Reroute counties and 13 adjacent counties, which have approximately 126,300 housing units. Approximately 3,018 housing units were available for rent on April 1, 2010 (U.S. Census Bureau, 2010a, 2010b).

Potential accommodations for pipeline workers along this 50-mile-wide corridor would range from locally owned and operated lodging unique to the area to national hotel and motel chains. The availability of rooms and campgrounds would vary throughout the year.

Environmental Justice

The Nebraska Reroute would not be subject to Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, because the Nebraska Reroute would not be a federal action. However, this section analyzes the following population characteristics of the area affected by the proposed Nebraska Reroute within the framework for Executive Order 12898:

- Racial minorities (Black or African American alone, American Indian or Alaska Native alone, Asian alone, Native Hawaiian or Other Pacific Islander alone, some other race, and two or more races)
- Ethnic minorities (Hispanic or Latino origin)
- Low-income populations (persons living in poverty as defined by the U.S. Census Bureau)
- Medically underserved areas or populations

Keystone identified minority and low-income populations in accordance with EPA guidance using the following two criteria:

- The minority or low-income population in an area is 50 percent or greater of the total population.
- The minority or low-income population in an area is "meaningfully greater" than the population in the "appropriate unit of geographical analysis" (EPA, 1998).

A meaningfully greater minority or low-income population is present in the county if the percentage of the referenced population is 120 percent or more of the statewide average. Because of the low population densities in the nine counties along the proposed Nebraska Reroute, "meaningfully greater" is also defined as a geographic area with 5 percent or more of the total minority or low-income population in the nine Nebraska Reroute counties, and 10 percent or more of the total minority, low-income population in the respective county.

A meaningfully greater minority or low-income population is present in a county subdivision (precinct or township) if the percentage of that minority or low-income population is 120 percent or more of the percentage of the referenced population in the nine Nebraska Reroute counties. The population characteristics of county subdivisions were assessed using county subdivision-level Census data.

In those county subdivisions where a meaningfully greater minority population was identified, Census block data were used to analyze the proximity of these populations to the 4-mile-wide Study Area. If more than half of the minority population in the identified county subdivision was within Census blocks that are located wholly or partially within the 4-mile-wide Study Area, the county subdivision was identified as having a meaningfully greater population in the Study Area.

Census data are not available at the Census block level for low-income populations; consequently, county subdivisions with meaningfully greater low-income populations were not analyzed beyond the county subdivision level.

Racial Minorities

Data presented in Appendix E.12 show the population of the nine Nebraska Reroute counties and compares the population of the county subdivisions and nine Nebraska Reroute counties with the population of the state of Nebraska as a whole. The percentages of minorities in the nine Nebraska Reroute counties are below the statewide percentages. Within the 4-mile-wide Study Area, the percentages of racial minorities in the county subdivisions are below the percentages for the entire nine counties in the Study Area and are all below the percentages of racial minorities for the state of Nebraska as a whole. No meaningfully greater racial minority populations were identified in the Nebraska Reroute Study Area.

Ethnic Minorities

Of the nine counties along the proposed Nebraska Reroute, York and Merrick Counties have the highest and lowest numbers of ethnic minorities, respectively. At the county level, percentages of ethnic minorities (Hispanic and Latino) in the nine Nebraska Reroute counties are below the statewide percentages. There is no meaningfully greater population of Hispanic or Latino residents in the Nebraska Reroute Study Area. (See Appendix E.12 for further detail.)

Low-Income Populations

Keya Paha County has the highest percentage (22.7) of low-income populations within the nine Nebraska Reroute counties, whereas Boone County has the lowest (6.6 percent). The average share of low-income populations in the nine Nebraska Reroute counties is 8.6 percent.

Collectively, the percentage of low-income people in the nine Nebraska Reroute counties is lower than the statewide share. The percentage of low-income residents in the Nebraska Reroute Study Area is less than that for the nine counties. Within the proposed Nebraska Reroute Study Area, the low-income population is meaningfully greater in Mills Precinct in Keya Paha County and in Oakdale Township in Antelope County. (See Appendix E.12 for further detail.)

Limited-English-Proficiency Populations

Antelope County has the highest percentage (1.0) of limited-English-proficiency households within the nine counties along the proposed Nebraska Reroute. In addition, the percentage of limited-English-proficiency households in the nine Nebraska Reroute counties and in the Nebraska Reroute Study Area is lower than the percentage in the state of Nebraska as a whole. No meaningfully greater populations with limited English proficiency were identified in the Nebraska Reroute Study Area. (See Appendix E.12 for further detail.)

Medically Underserved Areas and Populations

Medically underserved areas can be a whole county or a group of contiguous counties, a group of county or civil divisions, or a group of urban census tracts in which residents have a shortage of personal health services. Medically underserved populations can include groups of persons who face economic, cultural, or linguistic barriers to health care (U.S. Department of Health and Human Services, 1995). EPA's designation of medically underserved areas is based on the ratio of primary medical professionals per 1,000 population, the infant mortality rate, the percentage of population with incomes below the poverty level, and the percentage of population 65 years of age or greater.

The medically underserved areas along the Nebraska Reroute Study Area are Keya Paha County, Boyd County, Holt County, Antelope County, Boone County, the Clarksville Service Area in Merrick County, and Polk County. EPA's designation of Boyd, Holt, Antelope, Boone, and Polk Counties and the Clarksville Service Area is based on the demographic factors mentioned above.

Health Professional Shortage Areas (HPSAs) are geographic areas designated as having a shortage of primary medical care, dental care, or mental health providers. They can be urban or rural areas, population groups, or medical or other public facilities. Within the proposed Nebraska Reroute Study Area, Keya Paha and Nance Counties are designated as primary care HPSAs. No areas within the proposed Nebraska Reroute Study Area are designated as dental care HPSAs. The entire proposed Nebraska Reroute Study Area is designated as a mental health care HPSA.

None of the 15 nursing homes and long-term care facilities and 21 assisted-living facilities in the nine Nebraska Reroute counties are within 2 miles of the centerline of the Nebraska Reroute alignment (Nebraska Department of Health and Human Services, 2012a, 2012b). (See Appendix E.12 for further detail.)

4.12.2 Potential Impacts

The potential impacts on population, housing, and minority and low-income populations would occur during construction and operation of the proposed Nebraska Reroute and would vary in duration and intensity. The impacts would accrue to the elderly, disabled, and children within the study area. No public comments were received during the public outreach related to population or environmental justice.

Population

Population impacts along the proposed Nebraska Reroute would be both short-term (during construction) and long-term (during operation of the proposed pipeline).

Construction of the proposed pipeline along the Nebraska Reroute alignment would bring a temporary influx of workers into the nine Nebraska Reroute counties. The pipeline in Nebraska would be constructed in three construction spreads (see Section 2.3.1, Project Description). Two construction spreads would encompass most of the length of the Nebraska Reroute.

Assuming that all three spreads are constructed concurrently, up to 1,500 to 1,800 workers would be involved in the construction of the Nebraska Reroute for an estimated 6 to 8 months (Keystone, 2012b). An additional 80 to 100 workers at the peak of construction (and 20 to 30 workers in the longer term) would be needed to construct each pumping station, taking 18 to 24 months (Keystone, 2012b). An estimated 10 to 15 percent of the total workforce could be hired from local communities (Keystone, 2012b). The temporary influx of construction workers would not affect long-term population trends in the Nebraska Reroute counties.

A small number of workers would be needed to maintain the pipeline over the long term (DOS, 2011a). The small number of workers would not appreciably affect long-term population trends in the Nebraska Reroute counties.

Housing

Housing impacts along the proposed Nebraska Reroute corridor would be both short-term (during construction) and long-term (during operation of the proposed pipeline).

Temporary pipeline and pump station workers would need housing for 6 to 8 months during construction of the proposed pipeline. These temporary workers would likely use housing primarily in the counties where construction would occur. NDEQ assumes that most workers hired from the local area (approximately 110 workers) would not seek temporary housing but would commute from their existing homes.

Given the limited number of rooms, the typical occupancy rate of the rooms, and the limited number of residences available for rent, temporary housing near Construction Spread 8 (in Keya Paha, Boyd, and Holt Counties) might not be adequate to support workers. The construction camp would likely be established near the middle of the spread in Holt County (Keystone, 2012b). The camp would be planned for up to 900 workers (Keystone, 2012b). Based on the number of rooms available in hotels, motels, inns, and campgrounds in the area, as well as the number of houses available for rent, temporary workers would be able to find lodging in the remaining two construction spreads for the Nebraska Reroute.

There would be an adequate number of homes to house permanent workers who would maintain and operate the pipeline.

Environmental Justice

Potential environmental justice impacts would be both short-term (during construction) and long-term (during operation of the proposed pipeline).

Emissions of air pollutants and noise levels during construction are anticipated to be minor (see Section 4.16). Additionally, Keystone would provide detours and assistance with traffic congestion during construction (DOS, 2011a). Local traffic congestion would potentially occur along specific segments of the alignment during active construction and would not be limited to any particular area; therefore, impacts would not disproportionately affect any meaningfully greater low-income population.

The infirmary planned for the construction camp would take care of many of the medical needs of the construction workers. Impacts on the availability of medical care would be minor and short-term as the construction crews would progress through the first construction spread. The shortage of health care professionals in Keya Paha County (designated as primary care HPSA) would not be affected by the medical needs of temporary construction workers.

The use of local medical facilities by Keystone workers would temporarily increase demand on medical services in an area, especially Nance County (designated as a primary care HPSA), already underserved by medical professionals. Impacts would be short-term and would not disproportionately affect any specific population.

Low-income populations would benefit from a temporary increase in economic activity in the affected area. See Section 4.13, Employment and Fiscal Impacts, for further discussions of economic impacts.

4.12.3 Commitments to Reduce or Avoid Impacts

Keystone has committed to implement a CMRP, presented in Appendix C, to reduce construction-related impacts. These measures would directly affect potential impacts to residents living along the Nebraska Reroute and in the surrounding region. Additional safety measures (as compared with many previously constructed pipelines) are being incorporated into the design and construction of the proposed pipeline because of government regulations and the conditions required by PHMSA for the design, construction, and operation of the proposed pipeline (Keystone, 2012b).

4.13 EMPLOYMENT AND FISCAL IMPACTS

Much local, state, national, and international attention has focused on potential employment opportunities that the proposed Keystone XL Pipeline could provide as well as the general economic and fiscal benefits that would accrue with its implementation. The Final EIS (DOS, 2011a) addressed these issues for the length of the entire pipeline.

Constructing and operating the proposed pipeline along the Nebraska Reroute would provide:

- Short- and long-term employment opportunities
- Short-term local economic stimulation through purchase of local goods and services for construction of the pipeline
- Economic benefits derived from multiplier effects on local, regional, and state economies through local employment and purchases
- Fiscal benefits for local and State governments from collection of expanded sales and property taxes
- Loss of agricultural production (mostly temporary) during construction of the pipeline

This section analyzes existing and recent employment trends as well as effects of projected impacts and benefits from the pipeline in a Study Area large enough to capture broad-scale economic impacts and benefits. Such effects would occur in:

- The corridor of counties along the pipeline route that would likely benefit from daily spending by construction workers
- The counties outside the construction corridor but within the state ("Rest of State")

4.13.1 Study Area Definition

The context of the economic effects of the construction and operations of the Keystone XL Pipeline is the entire state of Nebraska. Economic and fiscal effects were analyzed for the entire pipeline route through Nebraska. Three study areas were established; economic and fiscal effects were analyzed for the entire state of Nebraska, fiscal effects were analyzed for the 12-county[20] proposed pipeline route, and the economic effects were evaluated in the 12 counties along the proposed pipeline route and 7 counties that are adjacent to the route. Within the construction corridor, there is some variation in the economic characteristics of the affected counties. The northern part of the corridor is more rural than the central and southern counties, with greater distances to nearest small towns and larger urbanized areas. Furthermore, the northern pipeline construction spread would use a construction work camp because of limited available lodging for workers in the North Corridor's three counties (Keya Paha, Boyd, and Holt). Because, of significant differences in economic characteristics between the North and the Central-south Corridors, as these areas are named in this analysis,[21] the Study Area has been split into two sections to more accurately model the impact of proposed construction activities.

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[20] Elsewhere in this document only 9 counties crossed by the Nebraska Reroute are considered as the Study Area. For purposes of the economic analysis the 9 counties crossed by the Reroute, 3 counties crossed by the remainder of the route and 7 counties not crossed, but adjacent to the route. The resulting economic corridor directly affected is 19 counties.

[21] See Appendix E.13 for details of the analytical approach and county-by-county inputs and outputs.

Finally, the Central-south Corridor, while primarily rural and agricultural in nature, includes additional counties adjacent to the immediate corridor counties, ones containing clusters of nonfarm employment and nearby small towns that would attract worker spending during construction.

4.13.2 Existing Conditions

Current Employment and Income

The 3 sparsely populated North Corridor counties have only 9,500 people employed, compared with 171,300 in the 16 Central-south Corridor counties. Just 3 counties in the Central-south Corridor—Madison, Platte, and Hall—account for half of these jobs. In 2010, Study Area counties made up only about 14 percent of all jobs in the state, but 25 percent of the farming jobs. Across the Study Area, nonfarm private employment represented 78 percent of total employment in 2010. Government, manufacturing, and retail sectors have greater shares of the more populated Central-south Corridor employment than in the North Corridor. The 3 North Corridor counties accounted for only 6 percent of total Study Area employment, but 14 percent of its farming jobs.

Because of the rural and agricultural nature of the Study Area, the economic downturn that began in 2007 was experienced less severely than in other parts of the country where dependence on manufacturing and services is greater and where the collapse in the housing market caused damaging economic and fiscal repercussions. Employment in 2011 was 1.8 percent higher than in 2001, but it still lagged its 2006, prerecession level. During the decade, the highest unemployment rates (greater than 5 percent) occurred in Keya Paha and Gage counties in 2010 (5.2 and 6.3 percent, respectively), but well below the national estimate at the time (9.6 percent). Throughout the 2000s, half of the counties in the Study Area had unemployment rates below 4 percent—better than the level that economists consider full employment.

The differences in the economic and demographic composition of the Study Area, north to south, are further accented by the fact that Keya Paha County, in the North Corridor, had only 1.4 percent of the total personal income of Hall County, in the Central-south Corridor. The 3 North Corridor counties accounted for only 5.6 percent of total income in the 19-county Study Area. Across the Study Area, sources of total personal income by county generally reflect the employment patterns, with farming being the largest source of earnings (13.7 percent).

Personal income per capita, a more informative measure of economic well-being because of its controlling for population size, increased by nearly 53 percent in the Study Area from 2001 to 2010. Per capita personal income growth rates during the decade ranged from about 91 percent in Keya Paha County, in the North Corridor, to 35 percent in Saline County. Saline's slow growth rate may have also contributed to its being the lowest-ranked county in the Study Area in terms of absolute per capita personal income in 2010. Antelope County, the highest ($48,727) was 47 percent higher than that of Saline ($33,495).

Median household income, a measure of the distribution of income, supplemented the information provided in the per capita income values. Median household income ranged from $31,764 in Keya Paha County to $49,523 in Platte County in 2010. Between Census 2000 and Census 2010, Study Area median household income increased by 27.5 percent, ranging from just 16.5 percent in Pierce County to 49.9 percent in Saline County.

Current Property and Sales Tax Base

The level of services that State, county, and local governments can afford to provide constituents is constrained by fiscal revenues (tax revenues) collected. Impacts of future tax revenues, if the Nebraska Reroute were to be implemented, focus primarily on the 12 counties within which the Keystone XL Pipeline would cause direct construction and operational effects. The proposed project would likely have a long-term property tax base in these counties. In addition, construction of the pipeline would affect the sales and use tax base of the State and counties. Compensation payments to agricultural landowners for easements would also be expected to generate sales and use taxes.

In 2011, the 12 affected counties had an average effective property tax rate of 1.58 percent, resulting in $202.1 million taxes levied. In addition to county-levied property taxes, the State of Nebraska collects and distributes property taxes for public services that cross county boundaries. These public services include, among others, transmission lines, pipelines, and utilities. The 12 affected counties received $2.7 million in 2011 from these centrally assessed, State-collected taxes.

The State of Nebraska also collects sales taxes, at a rate of 5.5 percent. In 2011, the State received $1.7 billion in sales tax revenues, with the 12 affected counties accounting for $43.2 million (2.4 percent of State sales tax revenues). State-collected use taxes include lodging taxes, which are then distributed to the counties. In the North Corridor, neither Boyd County nor Keya Paha County collects a lodging tax. Although lodging tax revenues are usually small (less than 1 percent of sales and use taxes), construction of the pipeline is expected to create a short-term boost in these revenues as a result of construction personnel making daily purchases within the Study Area.

4.13.3 Potential Impacts

Impacts on Economic Activity

Construction and operation of the Keystone XL Pipeline are expected to generate economic benefits to Reroute counties through increases in economic output, employment, and income. Nebraska would benefit from Keystone's local expenditures and employment, both attributable solely to the project. This new influx of construction-related spending and labor income would generate additional cycles of economic consumption, employment, and income—"the multiplier effect."

Lost agricultural productivity would be unavoidable because of short-term impacts related to pipeline construction and long-term operational impacts related to easements that Keystone would have acquired from local land owners. Farmers would be compensated for losses with payments based on crop values, expected yields, and acres of land needed for access. To value potential net impact on agriculture production, the analysis employed a conservative approach that assumed *all* construction would occur during the growing season. Operation impacts were assumed to occur annually over the operational life of the pipeline following completion of the project.

The economic impact analysis of the Keystone XL Pipeline considered potential increases and decreases in three economic variables: output, employment, and labor income (compensation). The economic analysis considered short- and long-term impacts and used two levels of impact—

direct and secondary—to account for total impact. Direct impacts are the initial increases in economic output and employment. Secondary impacts capture the multiplier effects of the direct expenditures. The economic impact analysis was carried out using a computer simulation tool that employs input-output techniques to forecast regional impacts of proposed projects or project alternatives.[22] The model generates regional multipliers based on spending or employment of each affected sector. The size of the Study Area, the time period of the datasets being used in the model, and the level of economic activity being evaluated are affected by these multipliers. Furthermore, because construction durations may last less then a year, all impacts on jobs and incomes are presented as average annual.

The following impacts were considered for the economic impact analysis:

Short-term Impacts

- Local daily spending by construction workers in the construction corridor
- Employment of "local" workers on construction of the pipeline
- Locally sourced contractor activities
- "Local" workforce household consumption
- Construction of roads, contractor yards, and stockpile sites
- Construction and operation of the work camp
- Construction of transmission lines for powering pump stations
- Impacts on agricultural production from acquisition of construction easements

Long-term Impacts

- Impacts from operation of the pipeline

Economic Impacts from Construction Activity

Daily spending of construction corridor workers would account for approximately $31.4 million of economic activity, which would multiply through Study Area economies to generate a total of nearly $50.8 million of new economic activity attributable to constructing the pipeline (see Table 4.13-1). Direct spending by construction workers would help support or create 570 average annual jobs in the construction corridor and would lead to employment of another 150 people through cycling of the original compensation through the local economies. The total of 720 new jobs within the construction corridor would provide average annual incomes of $17,500.

[22] Input-output models create an accounting framework for a regional economy that describes flows of outputs to and from industries and institutions. In the models, economic sectors can purchase outputs of other sectors, sell to other sectors, sell outside the local economy, and buy outside the local economy. This accounting framework allows the user to project how a change in the level of economic activity would affect the local economy.

Table 4.13-1. Economic Impact from Keystone XL Pipeline Construction Activity in Nebraska

Economic Variable	Direct	Secondary	Total
Inside Construction Corridor			
Output	$31.4 million	$19.4 million	$50.8 million
Average Annual Employment	570	150	720
Employee compensation	$8.2 million	$4.4 million	$12.6 million
Rest of State			
Output	$12.2 million	$200 million	$212 million
Average Annual Employment	110	1,760	1,870
Employee compensation	$5.4 million	$78.6 million	$84million
Impacts from Connected Actions, Rest of State			
Output	$10.1 million	$7.1 million	$17.2 million
Average Annual Employment	100	50	150
Employee compensation	$3.5 million	$2.6 million	$6.1 million
Agricultural Losses, Inside Construction Corridor			
Output	$1.5 million	$0.9 million	$2.3 million
Average Annual Employment	—	—	—
Employee compensation	$0.3 million	$0.3 million	$0.6 million
Total Net Economic Impact of Construction Activity			
Output	$52.2 million	$226 million	$278 million
Average Annual Employment	780	1,960	2,740
Employee compensation	$16.8 million	$85.3 million	$102 million

Outside of the Study Area, similar economic benefits from the pipeline's construction would, in the short term, raise greater Nebraska economic and employment levels. These benefits would come from all other construction-related activities, including employment of local workers, increased local contractor activities, and increased consumption by households, as well as construction and operation of the work camps. Keystone expects to employ a total of 2,700 workers during construction of the Nebraska portion of the Keystone XL Pipeline. Keystone expects that approximately 10 percent of that labor force (270 jobs) would be sourced

from the state of Nebraska. Because of the short construction duration, these jobs would transition to average annual, resulting in 110 full time equivalents.[23]

The combined effect of the household spending from 110 average annual jobs, along with the additional actions, would support up to $212.2 million in economic output and up to 1,870 jobs. The estimated average annual employee compensation would be $44,900.

Table 4.13-1 also summarizes the economic benefits that would occur in Nebraska as a result of connected actions associated with the pipeline. Connected actions include construction of transmission lines and electricity substations to provide power to the necessary pump stations. The combined effect of these actions, as multiplied through the state economy, would support up to $17.2 million in new economic output and up to 150 new jobs. The estimated average annual employee compensation associated with these activities would be $55,300.

As indicated above, during construction, adverse economic impacts might result from reduced agricultural production in the construction corridor. Impacts on agricultural production as measured in this analysis include the direct loss of production in the Study Area. The combined effect of pipeline construction would be a loss of $1.5 million in agricultural production, with a total reduction in economic output of $2.3 million. While there would be a slight reduction in employee compensation because farm incomes would decrease, no decrease in farm employment is anticipated.

Impacts on agricultural production are, however, expected to be offset by payments to households for construction easements, rights of access, and compensated crop losses. The size of the compensatory payments is not fully known, so the extent to which these payments could offset lost crop yields was not evaluated.

The last rows in Table 4.13-1 summarize the net economic impacts from construction of the pipeline. The actions would result in $277.8 million in increased economic activity and would support up to 2,740 new or existing jobs. Average per worker annual incomes would be $37,200, for a total of $102.1 million in labor incomes.

Economic Impacts from Operational Activity

Operation of the pipeline is expected to result in a small number of employees (fewer than 10) to conduct operational and monitoring activities that would likely be shared among the states the Keystone XL pipeline would cross. These few additional new workers are not expected to have a significant impact on the Study Area's or the state's economies because they may not be fully based within Nebraska. Beside small employment gains, further benefits would derive from the local generation and sale to Keystone of electricity needed to power the pump stations. These impacts are summarized below, in Table 4.13-2. As the table shows, the $14.8 million in revenue to power providers would not result in new direct employment. However the secondary effects would support up to 50 jobs annually, with average annual incomes of $94,000.

[23] The construction periods would vary, but Keystone expects the majority of the work to be completed in a 20-week construction period.

Table 4.13-2. Economic Impact from Keystone XL Pipeline Operational Activity in Nebraska

Economic Variable	Direct	Secondary	Total
Output	$14.8 million	$4.0 million	$18.8 million
Employment	0	50	50
Employee compensation	$0	$4.8 million	$4.8 million

Fiscal Impacts

Construction and operation of the Nebraska Reroute would have impacts on fiscal resources (tax collections) of the Study Area and of Nebraska in multiple ways:

- Sales taxes from construction expenditures
- Sales taxes from indirect multiplier effects during construction
- Sales taxes from employee spending during construction
- Sales taxes from indirect multiplier effects during operation
- Sales taxes from employee spending during operation
- Property taxes from State-assessed utilities during operation

The actual level of anticipated sales tax impacts is difficult to quantify because of tax credits and levels of distributions to counties. Keystone would receive credits toward use taxes from the State of Nebraska for sales taxes paid to other states for material purchases (pipe, valves, etc.). This credit would vary depending on how much material would have already been purchased and would already be in inventory and on the amount of taxes paid. As such, effects on sale tax revenues were not quantified in the fiscal analysis.

Centrally assessed utilities in Nebraska are valued for property tax purposes based on a combination of the value of real property, tangible assets, total operating revenue, and net operating income. Because of this, estimating property tax revenue for a centrally assessed utility based solely on construction value yields inaccurate results. As such, impacts on the Study Area property tax base were evaluated using the taxable value of the recently completed Keystone 1 as a proxy value.[24] The Keystone 1 pipeline, also owned by Keystone, entered its first full year of operation in 2012,

The 2012 Keystone 1 total taxable value (real plus personal property value), by county and along with the miles of pipe, was determined from data obtained from the State of Nebraska Department of Revenue. The total taxable value was disaggregated to an average value per mile for counties with and counties without pump stations. These values were then applied to the total miles of pipe in each county for the Keystone XL Pipeline and adjusted for the larger pipe diameter size (36 inches) of the Keystone XL Pipeline, yielding an estimated valuation for the pipeline once fully operational. The effective county property tax rates were then applied to

[24] The Keystone 1 pipeline, also owned by Keystone, contains 214.5 miles of pipe in Nebraska. It crosses through Cedar, Wayne, Stanton, Platte, Colfax, Butler, Seward, Saline, Jefferson, and Gage Counties. The Keystone 1 pipeline, which is a 30-inch-diameter crude oil pipeline, entered its first full year of operation in 2012 with a total taxable value of $538.5 million.

estimate potential property tax generation of the pipeline in its first full year of operation. Subsequent years would see a decline in valuation for 15 years as the personal value component were depreciated.

Estimated property tax impacts following completion of the pipeline are shown in Table 4.13-3. The table demonstrates the property tax revenues possible following the first full year of valuation. The estimate does not include the net book value that would include the additional value from income earned as a result of material moved through the pipe during the course of operation.

Table 4.13-3. Property Tax Impacts from Keystone XL Pipeline Construction, by County

County	Estimated Taxable Value ($ million)	Year 1 Property Tax High ($ million)	Year 1 Property Tax Low ($ million)
Keya Paha	33.82	0.43	0.37
Boyd	18.92	0.32	0.27
Holt[a]	195.07	3.15	2.70
Antelope[a]	153.90	2.41	2.06
Boone	59.04	0.93	0.80
Nance[a]	54.89	0.86	0.74
Merrick	16.05	0.29	0.25
Polk	28.66	0.48	0.42
York	59.61	0.96	0.82
Fillmore[a]	53.91	0.80	0.69
Saline	30.38	0.59	0.51
Jefferson[a]	99.99	1.75	1.50
Total	**804.24**	**12.99**	**11.13**

[a] *Includes property value from transmission lines and substations necessary for the pump stations.*

4.14 PUBLIC SERVICES

This section addresses the existing conditions of public services and the potential effects on public services from implementation of the proposed Nebraska Reroute. Public services that could be adversely affected by the Nebraska Reroute include law enforcement (local police and sheriff), fire protection, medical facilities, public roads, railroads and utilities, and school busing.

4.14.1 Existing Conditions

An evaluation using information readily available online was conducted to retrieve and review public service information (defined above) along the Nebraska Reroute corridor. Four maps were used to assess existing conditions: the 2010 U.S. Census TIGER[25] data, the 2010 U.S. Census Tract reference maps, the 2007 ESRI[26] Street Map data, and the Nebraska Department of Roads Highway Network.

Field and construction reclamation crews from Keystone collected data related to public services along the proposed Nebraska Reroute corridor. NDEQ reviewed these data and conducted site visits to confirm Keystone's findings.

Law enforcement services are provided by county sheriff's departments and city police departments. Service providers can overlap in jurisdiction and are supported by the Nebraska State Patrol. In many cases, mutual-aid or cooperative agreements allow departments to support one another during emergencies. Table 4.14-1 shows information for relevant public services in the counties along the proposed Nebraska Reroute corridor.

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[25] TIGER is a U.S. Census Bureau acronym for "Topologically Integrated Geographic Encoding and Referencing."

[26] ESRI is a private company that develops digital geographic systems.

Table 4.14-1. Existing Public Services along the Proposed Nebraska Reroute Corridor, by County

Nebraska County	Law Enforcement Departments[a, b, c]	Fire Departments[a, b]	Nearest Medical Facilities[a, c, d]	School Busing[e]
Keya Paha	Keya Paha County Sheriff	Springview	Rock County Hospital (Bassett)	Springview Public School Keya Paha County HS
Boyd	Boyd County Sheriff	Butte, Bristow, Lynch, Naper, Spencer	Niobrara Valley Hospital (Lynch)	West Boyd Schools, Lynch Public School, Spencer-Naper High School
Holt	Atkinson Police Department (PD), Holt County Sheriff, O'Neill PD	Atkinson, Chambers, Ewing, O'Neill, Page, Stuart	Avera St. Anthony's Hospital (O'Neill)	Chambers Public Schools Stuart Public Schools
Antelope	Antelope County Sheriff, Brunswick PD, Elgin PD, Neligh PD, Tilden PD	Brunswick, Clearwater, Elgin, Neligh, Oakdale, Orchard, Royal, Tilden	Antelope Memorial Hospital (Neligh), Tilden Community Hospital	Elgin Public Schools Neligh-Oakdale Public Schools
Boone	Albion, Boone County Sheriff, St. Edward	Albion, Cedar Rapids, Petersburg, Primrose, St. Edward	Boone County Health Center (Albion)	Boone Central Schools
Nance	Nance County Sheriff	Bellgrade, Fullerton, Genoa	Boone County Health Center (Albion)	Twin River Public Schools Fullerton Public Schools
Merrick	Central City, Clarks, Merrick County Sheriff, Silver Creek	Central City, Chapman, Clarks, Palmer, Silver Creek	Litzenberg Memorial County Hospital (Central City)	None found
Polk	Polk County Sheriff	Osceola, Polk, Shelby, Stromsburg	Annie Jeffrey Memorial County Health Center, Osceola	Osceola Public Schools, High Plains Community Schools, Cross County Community Schools
York	Henderson PD, York PD, York County Sheriff	Benedict, Bradshaw, Gresham, Henderson, McCool Junction, Waco, York	York General Hospital	York City Schools, Heartland Community Schools, Centennial Schools, McCool Junction Public Schools

[a] *Denotes categories included in the* Final EIS *(DOS, 2011a) and verified for the Nebraska Reroute.*
[b] *Denotes information listed in Local Emergency Operations Plans for each county; found on the Nebraska Emergency Management Agency website at <http://www.nema.ne.gov/leops/nebraska-alpha.html>.*

[c] *Denotes initial information identified for each county along the Nebraska Reroute; emergency service providers would respond as appropriate from the facility closest to the incident or as interlocal agreements describe.*
[d] *Medical facility information was obtained from publically available information found during an Internet search of county websites and medical facility websites.*
[e] *Busing information was obtained from publically available information found during an Internet search of county websites and school websites.*

A network of fire departments provides fire protection and fire suppression services throughout the counties along the proposed Nebraska Reroute. Many fire departments, particularly those in rural areas, are staffed wholly or in part by volunteers. Medical facilities in the counties along the proposed Nebraska Reroute provide emergency medical care. In some cases, they serve as the base for local emergency medical response and provide emergency transportation services (see Table 4.14-1).

The proposed Nebraska Reroute would cross many federal, State, local, and county roads. Road crossings were identified using the footprint identified by Keystone for the Nebraska Reroute (see Table 4.14-2).

Table 4.14-2. Road Crossings along the Proposed Nebraska Reroute

Category	Road Name	Number of Road Crossings
Category I[a]	Numerous named, unnamed, and numbered local and county roads	163
Category II[b]	State Highway 14 State Highway 56 State Highway 32 State Highway 91 State Highway 39 State Highway 11 State Highway 12 State Highway 66 State Highway 92 State Highway 22	10
Category III[c]	U.S. Highway 275 U.S. Highway 281 U.S. Highway 20 U.S. Highway 30	4
Category IV[d]	None	0
	Subtotal Nebraska Reroute Road Crossings	**177**

[a] *Category I: local, neighborhood, rural, or city roads.*
[b] *Category II: secondary state and county highways.*
[c] *Category III: primary U.S. and state highways.*
[d] *Category IV: primary limited-access or interstate highways.*

Five railroad tracks would be crossed by the Nebraska Reroute corridor (see Table 4.14-3).

Table 4.14-3. Railroad Crossings along the Proposed Nebraska Reroute

Railroad	Number of Railroad Crossings	Location Description
BNSF Railway	1	In Antelope County, between Royal and Orchard
Union Pacific Railroad	4	One in Boone County, approximately 4.5 miles northwest of St. Edwards; one in Nance County, about 3.5 miles east of Fullerton; one in Merrick County approximately 3.5 miles northeast of Clarks; one in Polk County approximately 1.5 mile east of Polk
Subtotal Nebraska Reroute	**5**	

Thirteen pipelines and seven power lines would be crossed by the Nebraska Reroute corridor (see Table 4.14-4).

Table 4.14-4. Pipeline and Power Line Crossings along the Proposed Nebraska Reroute[a]

County[b]	Number of Pipelines (operator)	Number of Powerlines (operator and description)
Holt	1 (Source Gas)	2 (Nebraska Public Power District, 115 kilovolts; Western Area Power Administration, 345 kilovolts)
Antelope	1 (Kinder Morgan Interstate Gas Transmission LLC)	2 (Nebraska Public Power District, 115 kilovolts)
Boone	2 (Kinder Morgan Interstate Gas Transmission LLC)	1 (Nebraska Public Power District, 115 kilovolts)
Polk	1 (Central City Gas System)	1 (Nebraska Public Power District, 115 kilovolts)
York	8 (NuStar Pipeline Operating Partnership – 3, Magellan Pipeline Company – 2, KM Interstate Gas Transmission, Source Gas, and one unknown)	1 (Nebraska Public Power District, 115 kilovolts)
Total	**13**	**7**

[a] *Utilities would be verified during the design phase.*
[b] *Only counties with identified pipelines or power lines are listed.*

Several public airports and airfields serve the counties along the proposed Nebraska Reroute, but none are within the proposed Nebraska Reroute or near the ROW.

4.14.2 Potential Impacts

Agencies and the public were given the opportunity to provide comments to NDEQ and identify potential issues that would result from implementing the proposed Nebraska Reroute. Concerns frequently expressed by the public included:

- Will roads be improved prior to construction? How will Keystone compensate local governments for damages done to roads during construction? Will roads be improved prior to construction?
- What special measures will Keystone use to avoid underground electrical cables, telephone lines, and fiber-optic cables?

NDEQ sent early coordination letters to agencies and also hosted meetings. During coordination, no comments related to public services were provided by the agencies. A summary of the potential impacts to public services is provided in Table 4.14-5.

Table 4.14-5. Summary of Public Service Potential Impacts

Category	Potential Impact
Emergency services (police, fire, ambulance)	▪ Increased demand for emergency services for work crews and for crews at the construction camp[a] ▪ Increased patient load at local emergency rooms and clinics for work crew and for crews at the construction camp ▪ Increased response times due to road construction for upgraded access roads for equipment and materials
School enrollment and busing	▪ The presence of construction workers could slightly increase the number of school-aged children enrolling in area school systems. ▪ Potential temporary effect on school bus routes
Utilities	▪ Potential service interruption due to construction activities ▪ Potential need for potable water and waste water treatment facilities to support construction camp ▪ Potential utility needs to support construction camp ▪ Accumulation of solid waste from construction camp operations.
Roads and railroads[b]	▪ Potential traffic interruption and road safety concerns (including traffic delays, detours, and traffic management) due to construction activities ▪ Potential increased traffic volume adjacent to the construction camp, contractor yards, and pipe-storage sites due to vehicles carrying Keystone employees, camp employees, and camp and yard deliveries ▪ Degradation to road and bridges from use by heavy and oversized construction equipment and delivery of materials
Airports and airfields	▪ During construction and operation, it is likely that some of the public airports and airfields could be used to facilitate movement of personnel.

[a, b] *See the additional mitigation discussion below.*

Keystone would need temporary access roads during construction. These would be either new access roads or private roads that would be used for Keystone's construction activities and that might need improvements. The locations of these access roads are shown in the Appendix B of this Draft Evaluation Report.

4.14.3 Commitments to Reduce or Avoid Impacts

Keystone has committed to implement the actions prescribed in its CMRP (see Appendix C), except where those actions would conflict with federal, State, or local rules and regulations or other permits or approvals.

Keystone has committed to maintain construction roads in a condition that is safe for both construction traffic and the public. Keystone has agreed to a program that would include inspection (including a video record) of roadways and roadway structures, repair of damage that might occur to those facilities, establishment of an approved Traffic Management Plan, and coordination with State and local transportation agencies.

Keystone has committed that pipeline crossings with paved roads, highways, and railroads will comply with requirements stipulated in the road and railroad crossing permits and approvals obtained prior to construction. Generally, all paved and priority gravel roads and railroads would be traversed using conventional boring methods (see Chapter 2, Project Description). Where permitted by local authorities or private owners, open-cut methods will be used to cross smaller unpaved or secondary gravel roads and driveways (see Chapter 2, Project Description, for a description of open-cut methods).

Keystone has stated that a construction camp might be needed in Holt County. This camp "would be a completely self-contained camp with all infrastructures necessary to maintain up to 900 people, about the size of a workforce needed to build and supervise a pipeline spread" (Keystone, 2012b). A construction camp in northeast Nebraska would generate impacts as noted in the above Table 4.14-5. Keystone has agreed that, if a camp were needed and sited, Keystone would acquire the necessary permits from NDEQ and other State agencies (Keystone, 2012b). These permits are listed in Chapter 3, Project Regulatory Requirements.

- Before construction would begin, Keystone's contractors would develop detailed traffic plans that would address all applicable laws, regulations and ordinances. Keystone would take into account minimization of impacts on school bus routes in developing these traffic plans.
- Keystone would ensure that underground and overhead utilities are properly and accurately located and that Keystone would avoid contact and damage during construction.
- Keystone would ensure that contractors have Site Specific Safety Plans in place before commencing work that would address locating, avoiding, and protecting utilities.
- Keystone would dispose of construction camp trash (solid waste) by hauling it to a licensed disposal facility.

4.15 CULTURAL RESOURCES

Cultural resources are physical evidence of culturally and historically valued aspects of the human and natural environment on the landscape or represented by the landscape itself. They include historic and prehistoric properties as well as intangible sociocultural attributes such as social cohesion, social institutions, lifeways, folklore, and cultural practices that are considered historically or culturally important.

4.15.1 Regulatory Setting

The Nebraska SHPO is responsible for conducting reviews and overseeing Section 106 compliance activities with federal agencies having projects in the state of Nebraska. Section 106 refers to a section of the NHPA that directs federal agencies to take into account the effects of their undertakings on historic properties and to provide the Advisory Council on Historic Preservation a reasonable opportunity to comment on those undertakings. The Nebraska Reroute is part of the larger Keystone XL Pipeline project, which would require a federal permit from DOS to cross the United States' border with Canada. This federal action triggers the need for Section 106 activities, and DOS is the lead federal agency.

The regulations promulgated by the Advisory Council on Historic Preservation in 36 CFR § 800 set forth a sequential decision-making process. This process specifies how federal agencies are to comply with the requirements of Section 106 of the NHPA. *Historic property* is defined in 36 CFR § 800.16(l)(1) as:

> … any prehistoric or historic district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places (NRHP) maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria.

The provisions of Section 106 are administered by the Advisory Council on Historic Preservation. The SHPO role is to represent the interests of the people of their respective States in the Section 106 process. SHPO is part of the Nebraska State Historical Society.

In addition to the NHPA, there is potential for State law to apply. The Nebraska Unmarked Human Burial Sites and Skeletal Remains Protection Act (NRS 12-1201 through 12-1212) addresses human remains that are inadvertently discovered in the course of construction and the reporting of such finds. The Nebraska Archaeology Resources Protection Act (NRS 82-501 through 82-510) governs Nebraska State Historical Society review of State projects that can be defined as "undertakings." The Nebraska State Historical Society assumes that a pipeline siting through State-owned lands such as education land, State recreation areas, or roads would trigger reviews under Nebraska Revised Statutes § 82-505. The definition of undertaking in this law may apply to a State license or permit (Nebraska State Historical Society, 2012).

4.15.2 Project Background and Programmatic Agreement

For purposes of the original Keystone XL Pipeline project, DOS, as lead federal agency, chose to meet its Section 106 responsibilities through the development of a Programmatic Agreement (PA) pursuant to Section 36 CFR § 800.14(b). The PA is intended to satisfy the responsibilities

of DOS and other cooperating federal agencies under Section 106 of the NHPA. The PA was executed in August 2011, and it represents the culmination of negotiations conducted by DOS with 19 federal and State agencies and 44 interested Indian tribes. The Nebraska SHPO was a consulting party and a principal signatory to the PA.

Under the PA, DOS and other responsible federal agencies are obligated to comply with the terms of the PA for all actions associated with the original project that qualify as undertakings as defined at 36 CFR 800.16(y). DOS, as lead federal agency, is responsible for oversight of and adherence to its terms for all pertinent aspects of the project.

The significant terms of the PA include the following:

- The area of potential effects (APE) is identified as a 300-foot-wide corridor, 150 feet on either side of the centerline of the pipeline alignment.
- Identification and evaluation of historic properties and application of adverse effects criteria may proceed in a phased manner because of denial of access to the APE by landowners and because not all construction areas had been determined when the PA was negotiated and signed.
- DOS will incorporate the PA in its decision process for any Presidential Permit it may issue for the project and condition any permit on Keystone's adherence to the PA's terms and commitments.
- DOS is obligated to make a reasonable and good faith effort to complete the identification and evaluation of historic properties in construction spreads prior to initiation of Keystone's construction activities, or alternatively, approve a Coordination Plan that Keystone would develop describing the steps that would be taken to identify, evaluate, and treat properties during construction of the respective spread.
- Avoidance of adverse effects is the preferred treatment option, and DOS review and approval of avoidance measures would be required prior to implementation. The PA specifies that avoidance and minimization measures might include:
  - Avoidance through project redesign
  - Avoidance through abandonment of the construction route or feature
  - Avoidance through bore or directional drilling
  - Avoidance through narrowing the construction corridor
  - Avoidance through use of previously disturbed areas such as existing roadways for access purposes
- DOS is obligated to consult with the appropriate SHPO and other consulting parties, including tribes, when DOS determines that an adverse effect cannot be avoided. Adverse effect findings require Keystone to develop a Treatment Plan for each adversely affected historic property that specifies how adverse effects would be mitigated or minimized.
  - Keystone is obligated to submit draft Treatment Plans to appropriate parties for their review and comments and then submit Final Treatment Plans accounting for all comments to DOS for approval.
  - Copies of the approved Treatment Plans are to be distributed to all SHPOs, consulting tribes, and others.

  - Keystone is obligated to make a reasonable and good faith effort to complete implementation of the Treatment Plan prior to initiation of construction activities within the affected spread. If Keystone cannot complete the implementation of a Treatment Plan, Keystone must develop a Coordination Plan.
  - If a Coordination Plan is needed in any given state, Keystone must prepare the draft Coordination Plan for that state, and submit it for review, and ultimately, DOS approval.
- Keystone is also obligated to monitor construction under the terms of a Historic Trail and Archaeological Monitoring Plan based on areas identified by DOS that merit monitoring.
- A Tribal Monitoring Plan is required for areas identified by tribes as meriting construction monitoring because of the potential to affect previously unidentified historic properties of traditional religious and cultural importance.
- The Tribal Monitoring Plan and Historic Trail and Archaeological Monitoring Plan were attachments to the PA.
- The PA also specifies procedures for administration of the PA and other considerations, including:
  - Discovery situations during construction
  - Curation provisions for artifacts, materials, and records
  - Quarterly progress reports from DOS to nonfederal consulting parties
  - Dispute resolution provisions
  - Duration of the PA
  - Amendment procedure for the signatory parties
  - Termination procedure that allows, among other things, SHPOs to terminate the PA's applicability in their state

The proposed Nebraska Reroute would not in itself trigger inconsistencies with the terms of the PA. Except for adjustments to its terms such as the widening of the APE from a 300-foot-wide to a 500-foot-wide corridor and updated maps of the Nebraska Reroute corridor, the conditions leading to the PA have not changed substantially. However, consultation with tribes leading to the terms of the PA and the content of PA attachments intended to address tribal concerns, including the development of traditional cultural property studies and Tribal Monitoring Plans, might need to be reassessed or renegotiated. These studies and attachments were not available for this evaluation. Consequently, NDEQ was unable to assess whether an amendment to the PA or renegotiation of its terms would be necessary to accommodate tribal concerns over the Nebraska Reroute.

4.15.3 Existing Conditions

Although a final report of the proposed Nebraska Reroute cultural resource surveys is not available because surveys remain underway, a summary of the cultural resource work completed to date is available in Keystone's SER (Keystone, 2012b).

As of August 8, 2012, 40.5 percent of the proposed Nebraska Reroute corridor had been surveyed for cultural resources. The survey team recorded 40 archaeological sites, 26 archaeological-find spots, and 12 historic architectural properties within the 500-foot-wide survey corridor. The sites found are lithic scatters,[27] camps, activity areas, farmsteads, rural schools, a cemetery, dump/discard areas, multicomponent sites, find spots (locations containing one or two artifacts or other types of sites that provide limited information), windmills with water tanks, active railroads, and an outhouse. Of the 78 new sites found, 9 are considered eligible to be listed on the NRHP.

The proposed Nebraska Reroute would cross two historic trails: the California Trail and the Mormon Trail (see Figure 4.15-1). Information concerning the investigation of these trails is not available at this time.

Previous Research

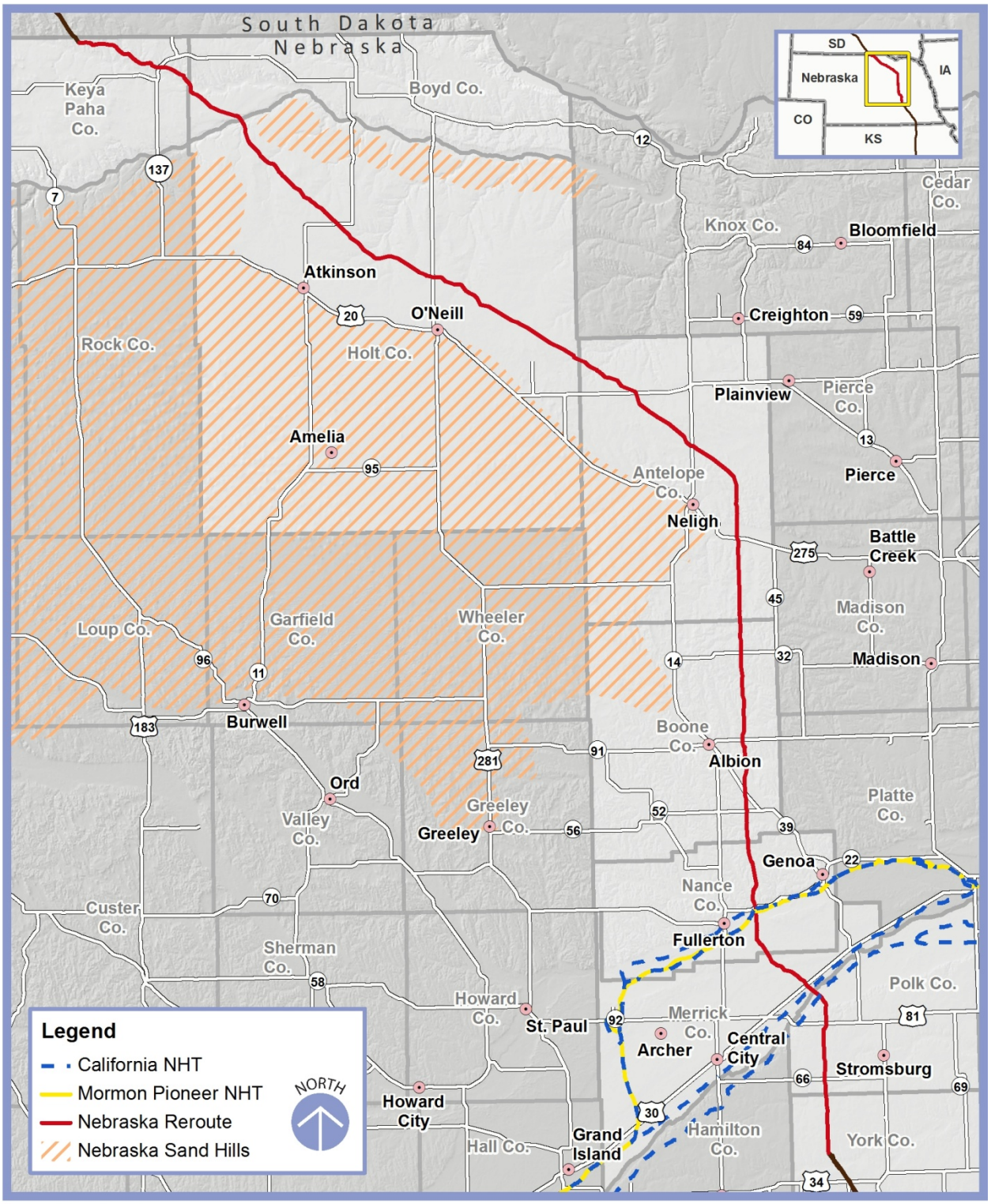
A total of 176 archaeological sites have been recorded within 5 miles of the Nebraska Reroute centerline (Titus et al., 2012). Thirty-one of these archaeological sites are within 1 mile of the centerline. The sites include prehistoric and early historic village sites and small lithic artifact scatters. The larger sites tend to be close to reliable water sources such as the Elkhorn and Loup Rivers and their larger tributaries.

Keystone determined through its examination of cartographic and archival sources that more than 127 historic-period properties are situated within 0.25 mile of the proposed Nebraska Reroute corridor (Keystone, 2012b). Most of these properties are houses and farmsteads dating to the late 19th and early 20th centuries, along with a few churches, cemeteries, schools, and historic transportation corridors.

Forty-three architectural properties have been recorded within 0.25 mile of the proposed Nebraska Reroute corridor (Keystone, 2012b). These architectural properties generally reflect the rural, agriculture-based, historic character of the area and include farmsteads, schools, cemeteries, and transportation corridors. Of the 43 architectural properties recorded within 0.25 mile of the Nebraska Reroute corridor, only 1 has been evaluated for NRHP eligibility.

[27] A lithic scatter is a surface scattering of flaked stone material that is evidence of primitive tool making.

Figure 4.15-1. Historic Trail Crossings along the Proposed Nebraska Reroute



Source: NDEQ 2012

No research reports or plans are available to NDEQ regarding the identification of properties of traditional religious and cultural significance to tribes or traditional cultural properties of importance to tribes or other traditional communities. The PA established for the previous Keystone XL Pipeline Application (August 2011) provided for tribal participation in project corridor development and project implementation. The original PA stated that nine tribes completed traditional cultural properties studies of the original route for planning purposes. However, those studies are confidential. Any information those reports might provide regarding the nature, distribution, or condition of properties of traditional religious and cultural importance or traditional cultural properties has not been made available for this Draft Evaluation Report (DOS. 2011b).

Identification of Cultural Resources

The proposal described in Titus et al. (2012) to conduct 100 percent survey coverage of a 500-foot-wide corridor (250 feet on either side of the Nebraska Reroute centerline) is appropriate for locating archaeological properties and historic structures that may be eligible for listing in the NRHP and that may be affected by constructing the proposed Nebraska Reroute. To evaluate historic properties, sufficient information about each property must be obtained to allow DOS and SHPO to concur about each property's eligibility for listing in the NRHP.

4.15.4 Potential Impacts

Potential impacts on cultural and historic resources may be direct, indirect, or cumulative under Section 106. Impacts occur when the qualities that contribute to the significance of historic properties are affected. For the purposes of Section 106, historic properties might be affected adversely or not adversely, depending on whether the qualities that contribute to their significance are diminished. Construction activities and subsequent operations are the primary sources of impacts that can affect historic properties. These impacts may accrue from physical disruptions and alterations or visual, audible, or atmospheric intrusions. All types of historic properties are vulnerable to the effects of construction and operation.

Visual effects on historic properties could extend beyond the proposed 500-foot-wide corridor for the Nebraska Reroute. Impacts from constructing the Nebraska Reroute would be temporary; areas that are excavated to install the pipeline would be returned to their original preconstruction contours and restored. In most cases, the landowner could return to the previous land use. Pasturelands could be returned to pasturelands and areas that are actively farmed could be returned to farming. The only exception is that a 50-foot-wide corridor centered over the pipeline must remain free of trees to comply with federal regulations 49 CFR §§ 194 and 195 and other applicable federal and State regulations. This maintained ROW through currently forested areas could reduce the aesthetic value of historic properties.

Under the terms of the original PA, electrical distribution and transmission facilities associated with the Nebraska Reroute that could have substantial and permanent visual impacts would be reviewed separately in accordance with 36 CFR §§ 800.3 through 800.7 by the Rural Utilities Service or the Western Area Power Administration. DOS would assume Section 106 responsibilities for any facilities that are necessary components of the proposed Nebraska Reroute and are outside the jurisdiction of another federal agency.

Commitments to Avoid or Reduce Impacts

Pursuant to the original PA, Keystone might, in consultation with appropriate parties, choose to implement avoidance measures prior to resolving the eligibility of a property. Avoidance is considered the preferred mitigation measure for cultural resources identified in the construction corridor.

The original PA directs that DOS will apply the criteria of adverse effects to historic properties that are identified in the APE in accordance with 36 CFR § 800.5(a). If DOS determines that a historic property could be adversely affected, DOS will consult further with appropriate parties to determine prudent and feasible avoidance measures. If DOS determines that an adverse effect could not be avoided, DOS is obligated to continue consultation with appropriate parties to develop appropriate mitigation measures that Keystone would present as a Draft Treatment Plan to appropriate parties for their review and comment. Ultimately, Keystone would prepare, for DOS approval, a Final Treatment Plan that would respond to any comments received from the reviewing parties. DOS would then be responsible for implementing and applying the Treatment Plan.

The original PA states that mitigation measures would be completed before the start of construction activities that could cause adverse effects. Provisions for monitoring plans and discovery procedures are included in the original PA to take into account unanticipated effects on previously recorded historic properties or effects on previously unknown historic properties. The original PA also includes discovery procedures in the event that human burials and associated funerary objects were encountered during construction.

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4.16 AIR QUALITY

Establishment of the proposed Nebraska Reroute has the potential to adversely affect air quality during construction as a result of increased emissions from the operation of vehicles and equipment and from fugitive dust from construction activity. During the operational phase of the project, air quality might be minimally affected by the additional power generation needed to operate pump stations and the small amounts of fugitive volatile organic compound (VOC) pipeline emissions that might occur at pump stations and MLV stations. The proposed Nebraska Reroute would not significantly affect regional or national air quality. This section provides an assessment of the project's potential effect on air quality and the measures that could be applied to reduce the potential for significant impacts.

4.16.1 Existing Conditions

Climate and Meteorological Conditions

The proposed Nebraska Reroute is located in an area with a humid continental climate. This type of climate is characterized by hot summers and cold winters, with large seasonal temperature variations (Peel et al., 2007). Variable weather patterns are also common in areas with this type of climate. Locations are classified as continental if they have more than 3 months of average daily temperatures above 50°F with a coldest-month temperature below 27° F and do not meet the criteria for arid or semiarid climates.

Representative meteorological data for the proposed Nebraska Reroute corridor are presented in Table 4.16-1. The data show the monthly average temperature range (daily maximum, minimum, and average), average monthly and total annual precipitation (in inches), and total monthly and annual snowfall (in inches of snow) for two meteorological stations located along the corridor at O'Neill and Albion, Nebraska.[28] The meteorological data reflect the 30-year period from 1981 to 2010. As shown in Table 4.16-1, July has the highest average maximum temperature and January the lowest average minimum temperature for both stations. In addition, annual average precipitation and snowfall were 25.3 and 26.3 inches, respectively, for the O'Neill station, and 27.9 and 27.6 inches, respectively, for the Albion station.

[28] Meteorological stations KONL located at the O'Neill Municipal Airport and KBVN located at the Albion Municipal Airport.

Table 4.16-1. Representative Meteorological Data along the Proposed Nebraska Reroute

Month	Avg. Max. Temperature (°F)	Avg. Min. Temperature (°F)	Mean Temperature (°F)	Precipitation (inches)	Snowfall (inches)
O'Neill Meteorological Station Normals (1981 to 2010)[a]					
January	32.2	10.9	21.6	0.5	4.7
February	36.2	14.0	25.1	0.6	4.0
March	46.9	23.1	35.0	1.8	5.8
April	59.2	34.2	46.7	2.7	2.7
May	70.7	46.2	58.5	3.7	0.0
June	81.2	56.3	68.7	3.6	0.0
July	87.6	61.7	74.7	3.1	0.0
August	85.3	59.6	72.5	3.0	0.0
September	75.8	48.7	62.2	2.5	0.0
October	61.7	35.9	48.8	2.1	0.5
November	45.6	23.3	34.5	1.1	3.3
December	32.9	12.7	22.8	0.7	5.3
Annual Avg.	59.7	35.7	47.7	25.3	26.3
Albion Meteorological Station Normals (1981 to 2010)[b]					
January	33.1	10.7	21.9	0.5	4.6
February	37.1	14.6	25.9	0.7	6.2
March	48.3	23.9	36.1	2.0	5.6
April	60.9	34.6	47.7	2.7	2.4
May	71.4	47.2	59.3	4.1	0.0
June	81.2	57.3	69.2	4.2	0.0
July	85.5	62.3	73.9	3.4	0.0
August	83.3	59.9	71.6	3.3	0.0
September	76.0	49.1	62.5	3.0	0.0
October	63.2	36.3	49.8	2.0	0.5
November	47.3	24.1	35.7	1.4	4.0
December	34.4	13.3	23.8	0.6	4.3
Annual Avg.	60.2	36.2	48.2	27.9	27.6

Source: National Climatic Data Center, 1981–2010 U.S. Climate Normals, 2011, <http://ggweather.com/normals>, retrieved July 30, 2012.

[a] *O'Neill Meteorological Station KONL, located at Latitude 42.47°, Longitude –98.688°, Elevation 619 meters.*

[b] *Albion Meteorological Station KBVN, located at Latitude 41.730°, Longitude –98.054°, Elevation 550.5 meters.*

Ambient Air Quality

Criteria Pollutants

EPA has established National Ambient Air Quality Standards (NAAQS) for each of the criteria pollutants that EPA considers to be common across the United States and that are considered to have adverse public health and environmental effects. The six criteria pollutants are carbon monoxide, nitrogen dioxide, sulfur dioxide, ozone, particulate matter (PM) (with an aerodynamic diameter of 10 micrometers or less [PM_{10}] and with an aerodynamic diameter of 2.5 micrometers or less [$PM_{2.5}$]), and lead.

There are two types of NAAQS: primary and secondary. The primary NAAQS are intended to protect public health, including that of sensitive populations such as children, the elderly, and people with asthma. Secondary NAAQS are intended to protect the public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings (EPA, 2012c).

NDEQ has adopted EPA's NAAQS. In addition, the State of Nebraska has adopted an ambient air quality standard for total reduced sulfur, which applies only within the state of Nebraska.

Background Air Quality

The primary sources of air pollutants originating within the proposed Nebraska Reroute corridor would be agricultural activities, which are the predominant land use in and near the corridor (see Section 4.10, Agricultural and Other Land Uses). One pollutant commonly found in the Nebraska Reroute corridor is PM, which originates from activities such as tilling soil and harvesting crops, as well as from erosion of agricultural soil by wind. Similarly, other pollutants, nitrogen dioxide and carbon monoxide, which are created by the combustion of diesel fuel (among other sources), originate from the engines of agricultural equipment during soil tilling and crop harvesting. However, these pollutants are generated only during intermittent agricultural activities.

NDEQ, with assistance from the Douglas County Health Department and Lincoln-Lancaster County Health Department, maintains a network of ambient air monitors across the state. NDEQ's ambient air monitoring program began in 1972 and is conducted to evaluate compliance with the NAAQS and to evaluate potential public health and welfare impacts related to air quality, as required by the federal Clean Air Act established in 1970. For this purpose, NDEQ publishes an annual summary of the ambient air quality monitoring data for the state (NDEQ, 2010).

Background air quality within the Nebraska Reroute corridor, as well as within the entire state, is currently in attainment[29] with the NAAQS (40 CFR § 81.328).

4.16.2 Potential Impacts

Potential air quality impacts from the Nebraska Reroute would include air pollutant emissions from construction activities as well as air pollutant emissions from operation of the pipeline.

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[29] "In attainment" means that ambient air monitoring data are within the limits of the corresponding NAAQS. Areas can also be classified as "Unclassifiable," which means there are insufficient monitoring data available to classify the area.

Construction Impacts

Construction of the proposed pipeline would create exhaust emissions from the combustion of fossil fuels. These emissions would come from vehicles and equipment directly involved in pipeline construction as well as from associated support equipment and fossil fuel-powered electric generators. These exhaust emissions would include the following criteria pollutants:

- Nitrogen dioxide
- PM_{10} and $PM_{2.5}$
- Sulfur dioxide
- VOC
- Carbon monoxide

The emissions would also include noncriteria pollutants such as hazardous air pollutants and carbon dioxide.

The types of equipment that would be used in constructing the pipeline include nonroad vehicles and equipment such as:

- Bulldozers
- Excavators
- Cranes
- Sidebooms
- Bending machines
- Front-end loaders
- Graders
- Farm tractors
- Generators
- Pumps

Onroad vehicles would include:

- Lowboys
- Flatbed trucks
- Winch trucks
- Mechanic trucks
- Dump trucks
- Pickup trucks
- Water trucks
- Stringing trucks
- Welding rigs

Keystone would also use buses for transporting construction workers to and from the job site and automobiles for general transportation. Construction impacts would also include fugitive dust emissions of PM, PM_{10}, and $PM_{2.5}$ from soil-disturbing activities within the ROW, such as clearing, grading, excavating, backfilling, and final grading, as well as from vehicle travel on unpaved access roads between the ROW and existing public roads.

Exhaust Emissions

NDEQ estimated the exhaust emissions from fossil fuel-powered equipment by applying emission factors for each pollutant and fuel type to the various types and sizes of engines that the applicant would use in a construction spread of equipment. A spread of equipment includes vehicles licensed for travel on public roads (onroad vehicles) such as automobiles and pickup trucks as well as equipment that is not suited for public roads (offroad vehicles) such as bulldozers and tractors.

The Final EIS (DOS, 2011a) listed the typical number of each type of equipment included in the construction spread as well as the corresponding fuel type, engine size, and daily operating hours

for each type of equipment. Emission factors for onroad vehicles (in grams per vehicle-mile) were obtained from EPA's MOBILE6.2 model using an assumed travel speed of 30 miles per hour for vehicles that would travel on a combination of public roads and construction roads within the ROW (such as automobiles, buses, and pickup trucks) and an assumed speed of 15 miles per hour for all other onroad vehicles that would travel predominantly within the ROW and at slower speeds.

NDEQ obtained emission factors for offroad vehicles (in grams per horsepower-hour) from EPA's NONROAD model (Version 2008.1.0) based on the fuel type and engine size of each type of equipment. A load factor was also obtained from NONROAD and applied to the emission estimates to refine the estimates based on the typical activity levels of certain types of equipment over the course of a workday.

Table 4.16-2 summarizes the estimated emissions of fossil fuel-powered construction equipment and vehicles. Emissions are presented in tons of pollutant for the onroad and offroad vehicles within the construction spreads and for the entire proposed Nebraska Reroute.[30]

Table 4.16-2. Estimated Construction Exhaust Emissions for Construction of the Proposed Nebraska Reroute

Pollutant	Onroad Vehicles and Equipment[a, b]	Nonroad Vehicles and Equipment[a, b]	Total Emissions[a, b]
PM_{10}	1.0	10.3	11.3
$PM_{2.5}$	0.7	10.0	10.7
Nitrogen dioxide[c]	18.9	164	183
Sulfur oxides[d]	0.1	0.3	0.4
Hydrocarbons[e]	5.3	18.6	24.0
Carbon monoxide	18.8	189	208
Carbon dioxide	12,200	35,600	47,800

[a] *These emissions are based on the assumption that construction would occur in 2014.*
[b] *Emissions are presented as tons of pollutant for the construction of the Nebraska Reroute based on a typical construction spread of equipment as presented in the Final Environmental Impact Statement, use of two spreads for the Reroute, and 7 months of construction per spread. Camp construction is also included.*
[c] *Expressed as nitrogen oxide.*
[d] *Expressed as sulfur dioxide.*
[e] *Expressed as volatile organic compounds.*

Fugitive Dust Emissions

Fugitive dust emissions from construction of the proposed Nebraska Reroute would consist of PM, PM_{10}, and $PM_{2.5}$. These emissions would be generated by earth-disturbing activities along the Reroute as well as similar construction activities at ancillary sites associated with the

[30] The proposed Reroute is expected to be constructed by two construction spreads, and the construction duration for each spread would be 7 months, based on the information provided in the SER (Keystone, 2012b).

pipeline, such as temporary workspace areas, pipe stockpile sites, contractor yards, a construction camp, pump stations, and access roads. The estimate of construction-related fugitive dust was based on the application of emission factors (tons per acre per month) to the estimated amounts of disturbed areas[31] for various aspects of the Reroute. The resulting estimate of tons of fugitive dust was then applied to the construction duration of the Reroute to establish an estimate of construction-related fugitive dust emissions for the Reroute.

Table 4.16-3 presents the estimated construction-related fugitive dust emissions for the Nebraska Reroute.

Table 4.16-3. Construction-Related Fugitive Dust Emissions Estimated for the Construction of the Proposed Nebraska Reroute

Construction Area	Surface Area (acres)[a]	Emission Factors[a, b] (tons/acre/mo)			Construction Duration (months)[c]	Emissions (tons)		
		PM	PM_{10}	$PM_{2.5}$		PM	PM_{10}	$PM_{2.5}$
Pipeline route	2,575	1.2	0.42	0.084	1	3,090	1,080	216
Temporary workspace areas[d]	127	1.2	0.42	0.084	7	1,070	373	75
Pipe stockpile sites, railroad sidings, and contractor yards[e]	540	1.2	0.42	0.084	7	4,540	1,590	318
Contractor camp[f]	70	1.2	0.42	0.084	3	252	88	18
Pump stations	45	1.2	0.42	0.084	7	378	132	26
Access roads	58	1.2	0.42	0.084	7	487	171	34

[a] *Keystone, 2012d.*

[b] *Emission factor for PM was obtained from AP-42, Section 13.2.3, January 1995, for heavy construction operation; emission factors for PM_{10} and $PM_{2.5}$ were obtained from EPA's* Preparation of Fine Particulate Emissions Inventories*, Student Manual, Air Pollution Training Institute (APTI) Course 419B, September 2004, for road construction.*

[c] *The Nebraska Reroute would be expected to be under construction for up to 7 months from the time of initial grading to final seeding. However, earth-disturbing construction activities (such as grading, trenching.) would occur along any given portion of the Reroute for a period equal to approximately 1 month. Therefore, fugitive dust emissions for the Reroute are based on a construction duration of 1 month. Ancillary facilities (such as temporary workspace areas, pipe stockpile sites) would be used for the duration of the construction spread (assumed to be 7 months).*

[d] *Temporary workspace areas outside the pipeline ROW are included here. Areas within the ROW are included in the pipeline Reroute area.*

[31] Surface area (acres) of disturbed areas were obtained from the SER. Disturbed areas include the portion of the Reroute corridor that would be graded or otherwise disturbed as well as additional areas such as temporary workspace areas, pipe stockpile sites, railroad sidings, contractor yards, a construction camp, pump stations, and access roads.

[e] *Three pipe stockpile areas, one rail siding, and one construction yard per spread; anticipate that two spreads would be used for construction of the Nebraska Reroute, according to the SER.*

[f] *Construction camp is assumed to be 70 acres based on SER information that a camp would be 50 to 100 acres, including a contractor yard of 30 acres. Construction duration could be up to 3 months, according to the TransCanada Keystone Pipeline, LP, Response to Nebraska Department of Environmental Quality, September 10, 2012 (Keystone, 2012e).*

Other Sources of Emissions

Construction of the proposed pipeline could generate other air pollutant emissions whose quantities are not provided here because the quantities are expected to be less than those of the exhaust and fugitive dust emissions quantified in Tables 4.16-2 and 4.16-3, above. These other sources of emissions include materials management storage piles, welding fumes, paint fumes, fueling and maintenance of construction equipment, vehicle traffic on public roads, and open burning. Emissions from these sources would be small in comparison with the air quality effects described above.

Operational Impacts

The operational activities of the pipeline would include small amounts of VOC emissions from the oil in the pipeline that could generate minor amounts of fugitive emissions through connections and flanges along the route, particularly at the pump and MLV stations. These types of fugitive VOC emissions are expected to be minimal because of the low volatility of crude oil as well as the limited exposure of the pipeline and piping components to the atmosphere.

Pumps at the pump stations and valves at the MLV stations would be electrically powered and would therefore not be a source of direct air pollutant emissions. Impacts from the additional demands on regional power providers are described in Section 4.18, Energy, of the Draft Evaluation Report. Diesel-fired backup generators would be provided at the MLV stations for emergencies and "upset conditions."[32] Emissions from the generators are expected to be minimal because they would operate only infrequently during upset periods or for occasional readiness testing and maintenance.

During pipeline operation, vehicle travel would occur to and from pump stations and MLVs for routine operational and maintenance activities. This type of activity is expected to be infrequent (perhaps weekly or monthly) and would create a negligible amount of emissions from engine exhaust and resuspension of roadway dust. Similarly, pipeline maintenance activities are expected to be infrequent and of relatively short duration.

4.16.3 Commitments to Reduce or Avoid Impacts

Keystone would be required by EPA and NDEQ regulations to use equipment with engines that comply with applicable EPA standards for nonroad engines and onroad engines found primarily at 40 CFR §§ 89 and 90 and 40 CFR § 86, respectively. These standards limit the allowable emissions of nitrogen oxide, hydrocarbons, carbon monoxide, and PM from the engines to specific levels that depend on each engine's age. In addition, current EPA regulations require the use of ultralow-sulfur diesel fuel for all onroad and nonroad engines.

[32] A pipe blockage or other situation that would trip automated systems that would, in turn, cause closure of an MLV(s).

For fugitive dust, NDEQ Title 129, Chapter 32, would generally require the contractor to prevent PM from becoming airborne such that it is not visible beyond the project premises. Keystone has committed to mitigating fugitive dust by applying water sprays and/or surfactant chemicals (such as calcium chloride on roads) to areas of disturbed soil and unpaved roads where the potential for dust would be greatest because of wind erosion and equipment movements. In addition, fugitive dust would be minimized by stabilizing disturbed areas with final seeding and mulching as quickly as possible after backfilling the trench.

Air quality impacts during operation of the proposed pipeline would be small. Diesel-fired generators would be required to comply with applicable portions of EPA regulations, primarily those at 40 CFR § 60, Subpart IIII, and 40 CFR § 63. Gasoline- or diesel-powered vehicles would be required to comply with applicable EPA standards for nonroad and onroad engines, as discussed above.

4.17 NOISE

The proposed Nebraska Reroute crosses lightly populated areas, with population densities ranging from approximately 1 person per square mile in Keya Paha County to approximately 24 people per square mile in York County. This section evaluates noise associated with construction and operational phase activity within a 1,000-foot-wide Study Area centered on the pipeline route. Potentially affected noise-sensitive uses are identified within the Study Area and measures that would be effective at mitigating noise exposure are discussed.

4.17.1 Existing Conditions

Noise is defined as an unwanted sound. Noise can be annoying under many circumstances (too loud, an unpleasant tone, occurring at night and interrupting sleep, etc.). Professionals in the field of environmental acoustics evaluate environmental noise in an attempt to prevent sleep disturbances, minimize annoyance, and comply with applicable noise regulations.

Counties along the Nebraska Reroute have provisions in zoning ordinances that are intended to minimize noise disturbances from commercial and industrial activities, but these provisions have no numeric noise limits.

Existing noise levels in the Study Area are dominated by natural sounds resulting from the interaction of wind with vegetation and from other weather-related events such as storms.

Land use in the Study Area is almost entirely agricultural. Although no municipalities are within 1 mile of the Nebraska Reroute, there are a few residences, and occasionally noise occurs that is related to transportation and agricultural activities, among other human activities.

Residences within 1,000 feet of the Nebraska Reroute (500 feet on each side of the Reroute) were identified from aerial photographs. Table 4.17-1 lists the number of houses near the alignment in each county.

Sound Level (dBA)	Source
120	Jet aircraft takeoff at 100 feet
110	Same aircraft at 400 feet
90	Motorcycle at 25 feet
80	Gas lawn mower at 3 feet
70	Garbage disposal
60	City street corner
50	Conversational speech
40	Typical office
30	Living room (without TV)

Source: Rau and Wooten, 1980

When noise levels are discussed in this section, common noise sources and representative noise levels (in A-weighted decibels, or dBA) are provided to give readers a sense of perspective.

This noise assessment used methods developed by EPA to estimate existing noise levels. The methodology evaluated the distance between the pipeline corridor and railroads, major roads, and population centers. For each of these distances, an estimate of the existing noise level at that distance was made; the highest resulting noise level was then selected as the estimate of existing noise levels in the Study Area.

To assess noise along the proposed Nebraska Reroute, an area-weighted existing noise level was calculated within a 500-foot-wide buffer on each side of the Nebraska Reroute. Barriers such as

walls used to mitigate noise would not be effective at distances beyond 500 feet—therefore, 500 feet is a reasonable and appropriate screening distance.

The estimated existing noise levels in the counties along the proposed Nebraska Reroute ranged from 35 to 50 dBA. This sound level range is comparable to the noise level of an office setting and people talking.

Table 4.17-1. Residences along the Proposed Nebraska Reroute

County	Residences within 500 Feet of the Nebraska Reroute
Keya Paha	1
Boyd	0
Holt	4
Antelope	6
Boone	7
Nance	2
Merrick	0
Polk	1
York	1

4.17.2 Potential Impacts

Construction

This assessment of construction noise is based on the types of equipment that would be used and on the duration of their use on an hourly basis. The construction phase represents the "worst-case" noise levels associated with the pipeline. Keystone identified construction equipment types with internal combustion engines. Keystone also prepared lists of the minimum number of vehicles and other equipment that are expected to be used during the different phases of construction (see Appendix E.16). These lists of equipment form the basis of this noise assessment.

Although there would be local areas of intensive activity, construction would occur throughout the proposed Nebraska Reroute corridor, with equipment spread out throughout the corridor. This assessment assumed that all equipment used during each phase of construction would be in use at one location at the same time. This assumption intentionally overestimates construction noise. Noise resulting from use of other equipment in addition to what is listed in Appendix E.16 was accounted for in this approach.

Construction of the proposed Nebraska Reroute would be subdivided into three spreads (see Chapter 2, Project Description). Construction activities would generally occur simultaneously in each spread. The pipeline construction can be divided into six discrete phases:

- Clearing and grading
- Trenching
- Stringing, bending, and welding
- Lowering in and backfilling
- Tying in to the mainline
- Cleaning up and restoring

See Section 2.4 in Chapter 2, Project Description, for more discussion of construction sequencing. Once each phase were completed, the equipment associated with that phase would move to a different location within the spread and construction equipment associated with the next phase would move in.

According to the Final EIS (DOS, 2011a), pipeline construction would generally proceed at a rate of approximately 20 completed miles per calendar month per spread (DOS, 2011a). However, because of the assembly-line method of construction, pipeline construction activities in any one area could last from 30 days to 7 weeks. Construction of a pump station would take approximately 18 to 24 months. Construction-related noise impacts typically would be local, intermittent, and short-term because construction spreads move relatively quickly (several hundred feet to 1.5 mile or more per day).

Table 4.17-2 presents an assessment of the noise associated with each phase of construction. The equipment types and their respective noise levels that were used to develop this table can be found in Appendix E.17.

Table 4.17-2. Combined Construction Noise Levels per Activity Proposed for the Nebraska Reroute

Activity	1-Hour Equivalent Sound Pressure Level (in A-Weighted Decibels)			
	At 25 feet	At 500 feet	At 1,000 feet	At 2,000 feet
Clearing and grading	102	76	70	64
Trenching	100	74	68	62
Stringing, bending, and welding	107	81	75	69
Lowering in and backfilling	105	79	73	67
Tie-ins to the mainline (six crews per spread; equipment listed for each crew)	103	77	71	65
Cleanup and restoration	94	68	62	56
Equipment deployed for each spread	104	78	72	66

The results of this construction noise assessment indicate that project-related construction noise could vary considerably, depending on the equipment used and the distance between the noise source and the receiver. Generally, at approximately 1,000 feet from construction, a person could hear noise at a level equivalent to that of a running garbage disposal. This assessment overpredicts construction noise by assuming that, during each phase of activity, all of the construction equipment would work in the same area. In reality, the construction equipment would be distributed throughout the pipeline segment being worked on (the spread).

Horizontal Directional Drilling

HDD would be used to cross five waterbodies during construction. The typical stationary equipment at the HDD construction site would include drilling rig, support air compressor, electrical generator, backhoe, crane, drill stem truck, light plants, and a mud makeup/recovery system. Each of these components would have an engine. Noise generated from the HDD operation would be relatively constant and would occur at a level from 90 to 95 dBA (U.S. Department of Energy, 2007).

HDD activities would occur on a 24-hour basis, with durations that could last beyond 1 week. The HDD equipment would be confined to an area that is small enough to benefit from temporary noise mitigation measures such as temporary construction noise walls.

Construction noise levels would decrease over distance. For instance, at a distance of 600 feet, the unmitigated noise level would be approximately 45 dBA, which is very close to existing noise levels (see Appendix E.17). As with other construction impacts, the increase in noise levels would be temporary.

Construction Camp

A construction camp consists of temporary living quarters; trailer-like modules are installed to provide amenities such as sleeping quarters, kitchen and dining facilities, and bathing and laundry facilities. The noise sources associated with these temporary living quarters could include diesel generators used to provide electricity, water treatment and wastewater treatment facilities, vehicles used to transport supplies (food, etc.) to the camp, personal vehicles, and heating, ventilation, and air conditioning systems. Keystone's CMRP includes provisions requiring the contractor to minimize noise during nondaylight hours and within 1 mile of residences or other noise-sensitive areas such as hospitals, motels or campgrounds. Keystone shall abide by all applicable regulations regarding noise near residential and commercial/industrial areas.

This noise assessment also evaluated noise associated with building the construction camp. Keystone identified equipment likely to be used for that process. Refer to the last portion of Appendix E.17 for estimates of construction noise associated with building the construction camp.

The results of this construction camp noise assessment indicate that project-related noise associated with creating the construction camp could vary from 97 dBA at 25 feet from the construction to 59 dBA 2,000 feet from construction. The process of building the construction camp is expected to be short in duration compared with the overall duration of construction of the proposed pipeline.

Operation

Keystone proposes to construct three pump stations along the Nebraska Reroute. The Final EIS states that the pump stations proposed by Keystone could use between three and five pumps, with a rated capacity of 6,500 horsepower each per pump station (DOS, 2011a). This analysis assumes three pumps per pump station and shows that the maximum noise level experienced would be 62 dBA at 300 feet from the pump station. Noise levels decline with distance and at a distance of 1,000 feet from a pump station, the noise level would decrease to 53 dBA (Table E.17-6, in Appendix E).

4.17.3 Commitments to Reduce or Avoid Impacts

Construction

There are very few residences in the Study Area (see Table 4.17-1). Keystone has prepared a construction noise mitigation plan, found in Appendix L of the SER, to minimize the effects of construction on individuals (Keystone, 2012b). Site-specific noise mitigation plans would be developed to comply with local regulations, and any applicable authorizations or variances would be obtained. The construction noise-mitigation plan states that noise-mitigation plans should be provided to construction contractors for implementation and that these plans would be enforced by construction inspectors using portable sound level meters. Keystone has committed to the following measures to minimize the effects of noise.

Keystone has committed to providing advanced notice to landowners within 500 feet of construction activities prior to starting construction. Keystone has further committed to minimizing noise within 1 mile of homes and other noise-sensitive areas during night construction, and in the immediate vicinity of livestock herds or poultry operations, which are especially sensitive to noise (DOS, 2011a).

Additionally, Keystone committed to the following (Keystone, 2012d):

- To the extent practicable, Keystone will not site pump stations close to noise-sensitive receptors
- For all pump stations, Keystone will observe the EPA standard of 55 dBA Ldn measured at the nearest noise sensitive receptor. Keystone will complete a Noise Impact Assessment (NIA) study for each pump station in Nebraska once their location is finalized. Where it is determined by this study that predicted noise levels might be higher than 55 dBA Ldn measured at the nearest noise sensitive receptor, Keystone will implement mitigation measures prior to the start-up. Noise abatement options considered are aboveground pipe lagging, pump blankets, motor air intake enclosures, and engineered sound barriers. Keystone will conduct noise surveys in the event of noise complaints from nearby noise receptors.

Operation

Noise levels from the proposed pump stations could be louder (see Table E.17-6, in Appendix E.17) than the ambient noise levels in rural Nebraska (which are assumed to range between 35 and 50 dBA on an average hourly basis). NDEQ suggests that, to the extent practicable, pump stations should not be located close to noise-sensitive land uses such as residences. If noise-sensitive receptors cannot be avoided, pump stations should be designed to control and reduce noise levels. This could include use of high-performance acoustical louvers that allow air to flow into and out of the pump stations but reduce noise levels. The pump station buildings should be constructed out of materials with enough mass to block noise transmission (for example, concrete block, not sheet metal).

4.18 ENERGY

Nebraska is the only completely public power state in the United States. Nebraska's public power utilities are not-for-profit. Electric power in Nebraska is generated primarily by six public utilities: NPPD, Omaha Public Power District, Lincoln Electric System, Hastings Utilities, Fremont Department of Utilities, and Grand Island Utilities Electrical Distribution Division. As of January 1, 2011, the total nameplate capacity in Nebraska was 8,505 megawatts (MW). An additional 240.5 MW is expected to come online by the end of 2012 (Nebraska Energy Office, 2012).

This section describes existing conditions and potential impacts on energy consumption during both construction and operation of the proposed Nebraska Reroute. Installation of the pipeline would mean short-term intensive energy commitments, as described in this section.

This evaluation considers the adequacy of generation capacity for the pipeline, the need for additional transmission and distribution lines to supply power to pump stations and ancillary facilities, and possible effects due to construction, including electrical supply to irrigation systems, which is addressed here and in Section 4.10, Agriculture and Other Land Uses.

4.18.1 Existing Conditions

The proposed Nebraska Reroute corridor is primarily in agricultural use and has considerable energy demands for irrigation systems.

Adding the power load needed for the proposed Keystone XL Pipeline to the NPPD power system would not affect NPPD's ability to provide power for customers and to meet foreseeable demand.

The proposed Nebraska Reroute corridor is within the area supplied by NPPD. NPPD distributes electricity to public power districts in portions of 91 counties in Nebraska (NPPD, n.d.). NPPD electricity is transmitted through 115 kV transmission lines[33] to distribution points located in each local public power district and then on to customers through a system of distribution lines and substations. Currently, 115 kV transmission lines run through Rock, Holt, Antelope, Boone, Nance, Merrick, and York Counties.

[33] In accordance with standard terminology, power lines with a capacity in excess of 100 kV are referred to as transmission lines and power lines with a capacity of less than 100 kV are referred to as distribution lines.

The counties within the proposed Nebraska Reroute corridor and the remainder of the proposed Keystone XL Pipeline route in Nebraska are served by parts of nine local public power districts (see Figure 4.18-1):

- KBR Rural Public Power District (Keya Paha County)
- Niobrara Valley Electric Membership Corporation (most of Holt County)
- North Central Public Power District (parts of Holt and Antelope Counties)
- Elkhorn Public Power District (parts of Antelope and Boone Counties)
- Cornhusker Public Power District (most of Boone and Nance Counties)
- Howard-Greeley Rural Public Power District (a small part of Nance County)
- Southern Public Power District (most of Merrick County)
- Polk Rural Public Power District (most of Polk County)
- Perennial Public Power District (most of York County)

Municipal power districts serve small areas, including Atkinson, O'Neill, Brunswick, Neligh, Raeville, Petersburg, Albion, St. Edward, Belgrade, Genoa, Fullerton, Central City, Stromsburg, and York, within these counties. Power in these counties is used primarily for agricultural (including center-pivot irrigation), commercial and industrial, and residential purposes. Statewide, center-pivot irrigation consumes at least one-third of the NPPD summer electrical output (NPPD, 2012a). Much of the electrical power needed for irrigation purposes can be reduced or shut off during peak loads, thereby decreasing localized power peaks on a given district's transmission lines.

Seven transmission lines, and numerous local service distribution lines cross the alignment.

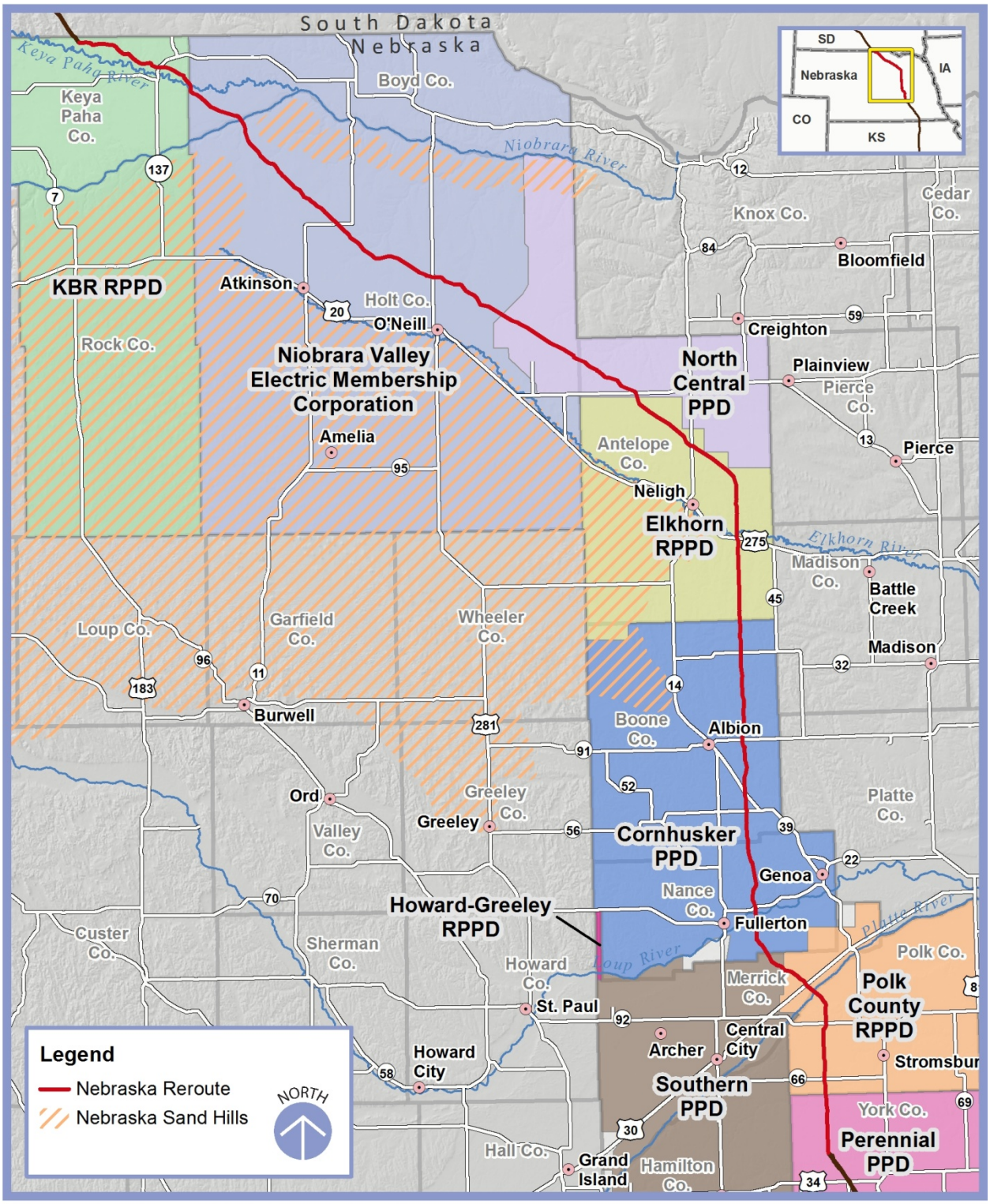
4.18.2 Potential Impacts

Construction Impacts

Energy would be needed to construct the proposed Nebraska Reroute, the ancillary facilities (such as pump stations and MLVs), power distribution lines, and substations to supply power to pump stations.

Equipment and vehicles needed for construction would use diesel and gasoline fuel as well as electrical power. Fuels would be provided by local vendors. Electricity would be supplied by diesel-powered generators, which would also supply electricity to temporary work and staging areas. These would all be short-term energy expenditures.

Figure 4.18-1. Public Power Districts along the Proposed Nebraska Reroute



Source: Public Power Districts, Nebraska Utility Review Board

Three new pump stations would be constructed for the proposed Nebraska Reroute:

- Pump Station 22 would be located approximately 8.5 miles northwest of O'Neill, in Holt County. Electricity would be supplied by the Niobrara Valley Electric Membership Corporation.
- Pump Station 23 would be located approximately 5 miles east-northeast of Neligh, in Antelope County. Electricity would be supplied by the Elkhorn Rural Public Power District.
- Pump Station 24 would be located approximately 3.5 miles southeast of Fullerton, in Nance County. Electricity would be supplied by the Cornhusker Public Power District.

Each pump station would need 115 kV power transmission lines to be constructed to connect to existing 115 kV power transmission lines. The pump stations would be located as closely as possible to existing transmission lines to minimize the length of new transmission lines needed (NPPD, 2012b). Based on preliminary findings, Pump Station 22 would be located approximately 3 miles north of an existing 115 kV transmission line. Pump Station 23 would be located approximately 4 miles east of an existing 115 kV transmission line. Pump Station 24 would be located approximately 10 miles southeast and northeast, respectively, of two existing 115 kV transmission lines. Once the final route of the pipeline and the locations of the pump stations were selected, the locations of new transmission lines to supply power to the proposed pump stations would be determined in coordination with NPPD as part of power transmission studies, and the transmission power line design and siting process would be completed by NPPD (2012b).

Depending on the length of the proposed transmission lines, the study, permit, and easement acquisition process would take from several months to more than 1 year (NPPD, 2012b). New transmission line routes would need to be approved by the Nebraska Power Review Board. NPPD would be responsible for connecting the existing 115 kV line to the new pump stations and would complete all environmental studies, consult with agencies, and acquire all permits. Keystone would pay for all studies, design, and construction of transmission lines needed to power pump stations; consequently, the project would not affect electricity rate structures (NPPD, 2012b).

A substation would be constructed at each pump station to reduce voltage from the transmission lines to pump station specifications (from 115 kV to 69 kV). The local public power district that serves the location of the pump station would construct this substation, and Keystone would assume the cost. Each substation would have a footprint of approximately 400 by 400 feet (nearly 4 acres) (NPPD, 2012b).

NPPD could also install three additional switching substations under (or adjacent to) existing 115 kV power lines. These switching substations would be the point of interconnection to the existing transmission system (Keystone, 2012b).

In all likelihood, NPPD would need to add capacitor banks at existing 115 kV substations to maintain voltage on these lines. These improvements would most likely be constructed on each existing site (within the existing fence line); therefore, Keystone expects that no additional land would be needed. The specific need for capacitor banks would be determined during transmission studies completed by NPPD (NPPD, 2012b).

Power for the MLVs would be supplied by service distribution lines with a voltage of less than 69 kV. Each line would typically be less than 200 feet long, with one or two poles and a transformer. Remotely operated valves would have remote power back-up to ensure that communications would be maintained during inclement weather. Each motor-operated valve station would include a diesel-fired emergency generator and a diesel fuel tank with secondary containment (DOS, 2011a).

Operation Impacts

For the proposed facility to become operational, power lines would need to be extended to pump station sites. These pump stations would have a continuous demand for energy. Each pump station would have between three and five electrically driven pumps of approximately 6,500 horsepower each. The exact electrical use would not be known until the final station design and hydraulic engineering for the pipeline were completed (Keystone, 2012b). The pump stations would operate using locally purchased electricity and would be fully automated for unstaffed operation. Each pump station would need 20 MW to 33 MW of power supplied by a 115 kV power transmission line (approximately 20 MW at start-up and 33 MW if the pipeline were to be operated at full capacity). In the event of an electrical power outage, batteries would be used to maintain power to all communication and specific control equipment.

NPPD would supply power to the local public power district, and the local public power district would distribute the power to the substation at the pump station. Adding the power load needed for the proposed Nebraska Reroute to the NPPD power system (an increase of only approximately 1 percent) would not affect NPPD's ability to provide power to customers and to meet foreseeable demand. NPPD periodically reviews generating and transmission capacity and is currently reviewing transmission capacity following the record heat and drought experienced during the summer of 2012. Keystone would pay for any additional transmission capacity needed for the Nebraska Reroute (NPPD, 2012b).

Keystone would purchase power at retail rates from the local public power district in which each pump station would be located. The local public power districts purchase power from NPPD at wholesale rates. Each pump station would annually consume between 175,000 MW-hours (based on a load of 20 MW of power) and 289,000 MW-hours (based on a load of 33 MW of power) based on continuous operation (DOS, 2011a). At recent average wholesale kilowatt-hour rates for sales to local public power districts, these power sales would yield approximately $9.4 to $15.6 million to NPPD. Based on average retail rates, the local public power districts would net approximately $5.3 to $8.7 million (after subtracting the wholesale power cost).

Keystone's Commitments

New transmission lines are subject to a separate regulatory/permitting approval process not included in this Draft Evaluation Report. Keystone would be required to comply with all conditions included in any permits/authorizations resulting from that process. However, Keystone has offered the following measures to avoid and minimize energy impacts in response to NDEQ concerns (Keystone, 2012d):

- During construction of the pipeline, to the extent practicable, Keystone would avoid relocating existing electric transmission lines and would avoid existing distribution lines.
- Where line construction cannot be avoided, Keystone would coordinate with the local public power district to temporarily or permanently relocate lines
- To the extent practicable, Keystone would coordinate, and has been coordinating, with the local public power district to minimize potential impacts to landowners resulting from construction of new transmission lines to pump stations.

4.19 WASTE MANAGEMENT

Waste materials and contaminated conditions from a variety of current or past activities, including pesticide application, spills and leaks from transformers, leaking fuel or oil tanks related to farming operations, and livestock waste sites and disposal practices might be encountered along the proposed Nebraska Reroute corridor. Contaminants could also be present that have migrated to a project site from off-site sources through groundwater flow.

Although a site might appear relatively pristine, it could still be contaminated by past releases into the soil, surface water, and groundwater. Workers, nearby residents, and agricultural resources such as feedlots or livestock feed or water sources could be exposed to such contaminants during the construction of the proposed pipeline.

NDEQ has investigated environmental conditions along the proposed Nebraska Reroute corridor to provide guidance to the efforts to avoid exposure to site contamination, with objectives that include:

- Identify hazardous materials or waste to enable Keystone to avoid such areas, or define provisions for managing contamination, or for cleanup.
- Determine BMPs that could be implemented to eliminate or reduce exposure risks if avoidance of specific environmental conditions would not be possible.

This section includes both a discussion of current environmental conditions along the Nebraska Reroute corridor and the potential for exposure to site contamination as a result of constructing, operating, and maintaining the Nebraska Reroute. Measures that Keystone has committed to implementing to reduce exposure to site contamination, as well as measures that NDEQ suggests Keystone consider implementing, are also discussed below.

4.19.1 Existing Conditions

A screening-level Environmental Site Assessment or hazardous materials review (HMR) was completed along the proposed Nebraska Reroute corridor. The HMR included a "windshield" (drive-by) survey and a review of databases maintained by EPA and NDEQ that encompass site listings related to the federal Resource Conservation and Recovery Act; the Comprehensive Environmental Response, Compensation, and Liability Act; and the National Priority List. NDEQ databases include leaking storage tanks, Integrated Waste Management Facilities, and a number of additional data sources (see Appendix E.19). Information for the HMR was obtained from on-line resources and a database search company, (Environmental Data Resources [EDR], 2012).

A windshield survey and data review were completed for the southern area of the Final EIS route from north of Central City to Steele City and for the northern reroute area from the South Dakota-Nebraska border to north of Atkinson, to north and east of O'Neill, and south to Central City (see Figure 1.1-1 in Chapter 1, Introduction and Background). The three most recent reroutes (Northern, Clarks, and Western, which are discussed in Keystone's SER) were evaluated using desktop tools (EPA, 2012d; NDEQ, 2012c, 2012d) and a supplemental EDR report (EDR, 2012).

Waste Management and Hazardous Materials Review

An HMR of the proposed Nebraska Reroute corridor was conducted. The HMR consisted of an EDR analysis and windshield survey of the proposed pipeline route within Nebraska. The EPA and NDEQ databases listed in Appendix E.19 were reviewed, and an EDR report was requested on August 3, 2012 (EDR Inquiry Number 3377994.1s) before the windshield survey. The EDR evaluation area included a 1-mile buffer on each side of Keystone's 2,000-foot-wide corridor. The windshield survey was completed between August 16 and 22, 2012. The primary types of sites (based on the relevant database) found in the proposed corridor are discussed in the following text.

The types of sites present within the Nebraska Reroute corridor that may be of concern during construction and operation of the pipeline are briefly discussed below.

Concentrated Animal Feeding Operations

Concentrated animal feeding operations (CAFOs) for swine and cattle were observed within the Nebraska Reroute corridor during the windshield survey. Livestock-waste-control facilities, which collect runoff and wastes from concentrated or other sources of animal wastes associated with CAFOs. Swine CAFOs were primarily housed in enclosed facilities, whereas those for cattle consisted of open-air confinement pens. Both types of CAFOs included ancillary support structures such as aboveground tanks, grain/feed bins and silos, waste lagoons, and other freestanding facilities.

Waste Sites

Waste sites (unlicensed dumps) were used for disposing of home, commercial, and potentially industrial wastes. There is the risk that chemicals such as pesticides, herbicides, fuel and solvent-related materials, including benzene, toluene, ethylbenzene, xylenes, trichloroethylene, and tetrachloroethylene, plus breakdown compounds, could be released and could contaminate soil and groundwater. NDEQ is not aware of any waste sites along the Nebraska Reroute corridor, but they could be encountered.

On-site Waste Water Treatment

On-site wastewater treatment systems are defined by NDEQ's Information Management System as: "Locations of any type of individual septic tank or domestic lagoon, as well as any facility which is not connected to a community wastewater treatment plant." NDEQ is not aware of any on-site wastewater treatment systems along the Nebraska Reroute corridor, but they could be encountered.

Leaking Storage Tanks

Leaking storage tank sites can include both aboveground storage tanks and underground storage tanks that contain petroleum products. Such tanks are used to store gasoline, diesel, or heating oil for home, commercial, or industrial use. Within the Nebraska Reroute corridor, a number of aboveground storage tanks were observed adjacent to groundwater pumping wells used for irrigation. There is also a strong potential for heating oil aboveground storage tanks and underground storage tanks at existing and abandoned homes or farmsteads, agricultural facilities, and other facilities that could need a backup generator (for a cell tower, pumping station, etc.). Based on a review of NDEQ's database, there are gas stations (both former and existing), homes,

and farms and ranches with leaking storage tanks near the Nebraska Reroute corridor. In addition, sites that are listed in the database could have residual soil or groundwater contamination present. If contamination is discovered, it should be addressed by Keystone.

Mining

Mining sites (which include sand- and gravel-mining operations) were identified within or adjacent to the Nebraska Reroute corridor in Holt, Antelope, Boone, Merrick, and Jefferson Counties. All sites appeared to be actively mined sand and gravel facilities, except for those located in Jefferson County. Hazardous materials typically found at these facilities include gasoline- and diesel-powered equipment and storage tanks. Because of the excavation required for sand and gravel operations, these sites are not compatible with buried pipelines.

Homes and Farms

Based on the windshield survey, it was apparent that farms, homes, and abandoned properties in the pipeline corridor could contain a number of potential contaminant sources similar to those listed in the NDEQ and EPA databases. Many home-based and farming activities are exempt from regulatory requirements; consequently, these sites would not be listed in the available databases. Each existing or abandoned homestead in the Nebraska Reroute corridor could include a drinking water well, a septic system, a heating oil tank (aboveground storage tank or underground storage tank) or propane tank, and potentially an unmanaged burn site or dumpsite. Additionally, homes could have associated buildings including barns, sheds, bins or silos, maintenance facilities, and livestock facilities.

4.19.2 Potential Impacts

Hazardous materials are present throughout the proposed Nebraska Reroute. The potential impacts of these materials would be to cause environmental damage to local surface and groundwater supplies, vegetation, and local wildlife in the event of an accidental release. Note that this discussion is with respect to the various lubricants, fuels, oils, and other materials that are commonly found on a construction site. The accidental release of materials from the pipeline once operation were to begin is discussed in Chapter 6, Pipeline Safety and Potential Spills.

An additional resource to address releases of contaminants to the aquifer can be found on the NDNR website.[34] This site illustrates the leaching potential of various compounds to the aquifer; however, this website does not contain information on materials that would be found within the pipeline. The website includes information on chlorinated VOCs, pesticides, and herbicides.

4.19.3 Commitments to Avoid or Reduce Impacts

Keystone's CMRP (see Appendix C) prescribes construction, operation, and maintenance procedures that are designed to reduce the likelihood and severity of impacts along the Nebraska Reroute corridor. These procedures would be implemented, as practicable, provided that they did not conflict with the requirements of any applicable federal, State, or local rules and regulations, or other permits and approvals applicable to the project. Keystone's commitments include procedures to ensure that all hazardous and potentially hazardous materials would be appropriately transported, stored, handled, and reported and that workers exposed to or required

[34] <http://dnrdata.dnr.ne.gov/clearinghouse/>

to handle hazardous materials would be trained in accordance with regulator and or manufacturer's recommendations.

Keystone has committed to prepare a project-specific SPCC Plan. This plan would control the use and management of hazardous materials on the construction ROW and all ancillary areas during construction. This would include the refueling or servicing of all equipment with diesel fuel, gasoline, lubricating oils, grease, and hydraulic and other fluids during normal upland applications and special applications within 100 feet of perennial streams or wetlands. Keystone would provide additional information to complete the SPCC Plan for each construction spread and would provide site-specific data that meet the requirements of 40 CFR § 112 for every location used for staging fuel or oil storage tanks and for every location used for bulk fuel or oil transfer. Each SPCC Plan would be prepared prior to introducing the subject fuel, oil, or hazardous material to the subject location.

Keystone might encounter previously unidentified soil or groundwater contamination during construction, and this contamination could entail additional health and safety requirements for protecting workers. Constructing the pipeline through sites identified in the HMR or EDR could create a conduit for contaminants to migrate.

Keystone has committed to stop work immediately if toxic or hazardous waste materials or containers are encountered during construction in order to prevent disturbing or further disturbing the waste material.

Keystone would contact each landowner within the Nebraska Reroute corridor to identify the presence of drinking water wells, underground storage tanks, septic systems, disposal pits, and other facilities that could contain hazardous materials.

In addition, Keystone has committed to the following (Keystone, 2012d):

- During construction, Keystone would make individuals available who are trained in identifying and disposing of hazardous materials.
- If tanks or contamination are found, they would be managed according to federal, State, and/or local regulations.
- If an unregistered well is found, Keystone would provide the landowner with technical assistance to register the well.
- If a well would need to be abandoned, the well would be abandoned in accordance with State regulations.

CHAPTER 5

MITIGATION MEASURES

In addition to identifying and characterizing resources and potential impacts on resources, Chapter 4, Affected Environment and Environmental Consequences, of this Draft Evaluation Report includes considerable discussion of mitigation for potential impacts. Much of the mitigation and project components discussed in Chapter 4 are derived from DOS's Final EIS, Keystone's *Supplemental Environmental Report*, and Keystone's letter to NDEQ, dated October 18, 2012.

This chapter presents NDEQ's overall approach to mitigation for the proposed Nebraska Reroute and the major plans from which mitigation commitments have been identified to date. It also presents mitigation resulting from NDEQ relating Nebraskan's concerns to Keystone.

5.1 NEBRASKA DEPARTMENT OF ENVIRONMENTAL QUALITY'S APPROACH TO MITIGATION

This evaluation review began with public meetings to collect Nebraskan's concerns regarding the Nebraska Reroute. The concerns set the foundation for this report and focused NDEQ on impacts that needed to be mitigated. In conducting the evaluation of the Nebraska Reroute, NDEQ performed the following:

- Careful and thorough review of all public comments
- Consultations with federal, regional, State, and local agencies
- Site visits
- Review of existing documentation including the Final EIS (DOS, 2011a)
- Full consideration of the proposed Nebraska Reroute information supplied by Keystone

NDEQ's approach to mitigation of impacts follows a sequence: (1) seek ways to avoid impacts, (2) minimize impacts, and (3) conduct restoration.

Keystone refined the proposed Nebraska Reroute to avoid fragile soils in the northern portion. The Clarks Alternative was developed to address NDEQ's concerns regarding the location of Keystone's preferred reroute corridor in an area where the aquifer is very thin, wells are shallow, and bedrock is close to the surface. This area was upgradient (west) of the boundary of the Clarks WHPA. The Clarks Alternative would route the proposed pipeline downgradient (east) of the WHPA.

When impacts cannot be avoided, NDEQ identifies opportunities that minimize impacts on resources. Chapter 4 discusses numerous measures to minimize impacts, and these measures continue to be developed. Lastly, when impacts cannot be avoided and are minimized to the extent possible, residual impacts are mitigated through compensation or restoration by Keystone.

5.1.1 Nebraska Department of Environmental Quality Authority

Under Nebraska law, NDEQ is charged with protecting the quality of Nebraska's land, water, and air. NDEQ has the authority and general jurisdiction for the administration and enforcement of environmental laws in the state pursuant to Nebraska Revised Statutes § 81-1504. With respect to the Nebraska Reroute, NDEQ is responsible for submitting to the Governor an evaluation of the impacts, including a discussion of the actions that will mitigate impacts likely to result from construction, maintenance, and operation of the proposed Nebraska Reroute.

5.1.2 Mitigation Commitments and Landowner Agreements

NDEQ encourages Keystone to negotiate mutually acceptable agreements with adversely affected landowners to address potential construction and restoration issues. According to Keystone, all landowner agreements will comply with federal, State, and local permits.

5.2 PUBLIC REVIEW OF MITIGATION MEASURES

NDEQ encourages the public and agencies to review and comment on the mitigation measures in the Draft Evaluation Report. For NDEQ to assess the comments effectively, the public must be specific about any mitigation and the reasons why the suggested mitigation would be appropriate. NDEQ will consider suggested mitigation measures before presenting the Final Evaluation Report to the Governor.

DOS is in the process of supplementing the Final EIS based on a revised Presidential Permit application from Keystone. Additional commitments may be developed during DOS's Supplemental EIS process.

5.3 COMMITMENTS MADE BY KEYSTONE

Keystone has made mitigation commitments that are recorded in several documents discussed below. The DOS's Final EIS and its appendices contain commitments Keystone made to address a wide variety of environmental impacts identified during DOS's environmental review. In addition, Keystone expanded and enhanced its mitigation commitments in response to specific issues that were raised by NDEQ and the public concerning the proposed Nebraska Reroute. Keystone has stipulated that it will adhere to applicable mitigation commitments outlined in DOS's Final EIS and Keystone's SER. Refer to the Final EIS and to Appendix C and Appendix F.2 of this Draft Evaluation Report for a listing of mitigation measures.

5.3.1 Construction, Mitigation, and Reclamation Plan

Keystone provided an updated CMRP in its SER (Keystone, 2012b), located in Appendix C of this Draft Evaluation Report. The requirements described in the CMRP apply to the entire Keystone XL Pipeline project, including:

- Uplands, including agricultural (cultivated or capable of being cultivated) lands; pasture lands; rangelands; grasslands; forested lands; lands in residential, commercial, or industrial areas; lands in public and private ROW
- Wetlands
- Waterbodies and riparian areas

Keystone committed to implementing construction, mitigation, and reclamation actions contained in the CMRP to the extent that they do not conflict with the requirements of any applicable federal, State, or local rules and regulations, or other permits and approvals applicable to the project. Additionally, Keystone may negotiate with individual private landowners, activities that could result in adjustments to stated requirements in the CMRP on individual private land. Specific site conditions may also result in adjustments to the CMRP. All work will comply with federal, State, and local permits.

The proposed Nebraska Reroute will be designed, constructed, operated, and maintained in a manner that meets or exceeds applicable industry standards and regulatory requirements.

The CMRP contains general conditions and conditions for uplands, drain tile systems, wetland crossings, waterbodies and riparian lands, and hydrostatic testing.

Because the proposed Nebraska Reroute avoids the Sand Hills, Keystone updated the CMRP since the publication of the Final EIS to include reclamation and revegetation commitments in areas of fragile soils. Fragile soils are defined as those that have a high percentage of sand, high wind and water erosion potential, low water-holding capability, and rolling-to-steep terrain. See Appendix C for the details of each commitment.

5.3.2 Spill Prevention, Control and Countermeasure Plan

Appendix C of the Final EIS (DOS, 2011a) contains a Draft SPCC Plan. The purpose of the SPCC Plan is to establish procedures to prevent the discharge of hazardous or regulated materials during the construction of the Nebraska Reroute, particularly into or upon waters of the United States. The SPCC Plan applies to construction activities of the pipeline. The focus is primarily on fuels, lubricating substances, hydraulic fluids, and other hazardous materials present on the site. The SPCC Plan does not cover potential releases from the pipeline during operation. For information on spills associated with pipeline operation, including a required Pipeline Spill Response Plan (PSRP), see Chapter 6, Pipeline Safety and Potential Spills. The SPCC Plan is designed to reduce the likelihood of a spill during construction, provide for prompt identification and proper removal of contaminated materials if a spill does occur, comply with applicable State and federal laws and project permits, and protect human health and the environment. The SPCC Plan complements existing laws, regulations, rules, standards, policies, and procedures pertaining to safety standards and pollution rules in order to minimize the potential for unauthorized releases of hazardous materials, fuels, and lubricants.

The Draft SPCC Plan in the DOS Final EIS is a template for the pipeline construction contractor and will be finalized by each contractor based on all required site-specific information. The SPCC Plan describes all actions that Keystone will take to prevent spills, including training, site security, equipment inspection and maintenance, materials storage and handling, spill control and countermeasures, documentation and reporting, inspection and record keeping, applicable State requirements, and certification of nonsubstantial harm.

5.3.3 Emergency Response Plan

Appendix C of the Final EIS (DOS, 2011a) contains Keystone's Draft Emergency Response Plan (ERP). Keystone will submit an ERP prior to project operation. However, DOS required Keystone to include a Draft ERP in the Final EIS to provide the public with basic information on the likely procedures that will be followed in the event of an accidental release from project

facilities. The Draft ERP describes the key procedures, coordination activities, anticipated contacts, equipment to be used, possible cleanup activities, and other information needed to understand how Keystone will respond to an accidental release of crude oil during operation of the project. The ERP will be updated to include the proposed Nebraska Reroute-specific emergency preparedness and emergency response information prior to the project beginning operation.

5.3.4 Fragile Soils Clean-up and Reclamation/Revegetation

Section 4.15 of the CMRP (see Appendix C of this document) contains techniques Keystone has committed to use in areas of fragile soils within the Nebraska Reroute. The measures focus on reducing construction disturbance, specifying appropriate reclamation, and committing to postconstruction monitoring. Keystone coordinated with representatives from the University of Nebraska, South Dakota State University, NRCS (Holt County), and the Nebraska Department of Roads to develop these techniques.

5.3.5 Pipeline and Hazardous Materials Safety Administration Special Conditions

Appendix F.2 of this document contains a list of 57 Special Conditions that PHMSA recommended that DOS impose if a Presidential Permit were granted to the Keystone XL Pipeline project. Keystone has committed to implementing these 57 Special Conditions as part of the Nebraska Reroute and has stipulated that the conditions are enforceable by PHMSA. These 57 Special Conditions address areas such as material requirements; construction requirements; operation and maintenance; and reporting, records retention, and senior level certification requirements.

5.4 ADDITIONAL KEYSTONE COMMITMENTS

NDEQ evaluated the public comments and the impact of the Nebraska Reroute on Nebraska's resources (presented in Chapter 4). NDEQ identified and discussed with Keystone additional opportunities to mitigate impacts. As a result, Keystone responded with a letter dated October 18, 2012, that lists additional commitments. Several of the commitments were previously proposed.[1]

5.4.1 Keystone's Commitments

The following is a list of Keystone's additional commitments verbatim (Additional Commitments from Keystone letter, October 18, 2012, in Appendix C). Items from the letter that were a review of existing commitments or regulatory processes are not included here. See the Additional Commitments from Keystone letter, dated October 18, 2012, in Appendix C for complete text.

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[1] After DOS issued the Final EIS in August 2011, Keystone sent a letter to the Nebraska State Legislature to offer mitigation measures that would address concerns raised by Nebraskans concerning the Sand Hills route. The measures proposed within the letter were withdrawn by Keystone after the decision was made to reroute the pipeline to avoid the Sand Hills. The public suggested that several of the proposed mitigation measures would still be applicable for the Nebraska Reroute.

Public Liaison Officer

To address potential issues to landowners affected by Keystone XL:

- Prior to construction, Keystone would select, subject to NDEQ approval, and pay for, a public liaison officer to facilitate the exchange of information between Keystone and landowners, local communities, and residents. The purpose of the public liaison officer would be to respond to questions or concerns and to resolve promptly any complaints or problems that may develop as a result of the pipeline's construction. The public liaison officer would report to NDEQ or as otherwise directed by NDEQ. Keystone will consider agricultural extension agents, as well as other qualified individuals, in selecting a public liaison officer.

Water Well Testing

- Keystone would conduct baseline water quality testing for domestic and livestock water wells within 300 ft of the final centerline of the approved route in Nebraska, upon the request of individual landowners who provide the necessary access to perform the testing. These baseline samples would be collected prior to placing the pipeline in service. Subsequently, in the event of a significant spill in the area, Keystone would conduct water well testing as required by NDEQ pursuant to Title 118, Nebraska Administrative Code. Keystone would also provide an alternate water supply for any well where water quality was found to be compromised by a spill.

Leak Detection

- Keystone would commit to keep abreast of the latest developments in external leak detection technologies (above and beyond those already proposed to be implemented on the Project, as described in the August 2011 Final Environmental Impact Statement), that could be installed along the pipeline at sensitive locations. Keystone would report to, and discuss with, the Department of Environmental Quality the status of innovation in such pipeline leak detection equipment and methods on or before January 1, 2014, and at such additional times thereafter until 2024 as the DEQ shall specifically request, but in no case more frequently than once every three years.

Emergency Response

- Once a final Project route is determined in Nebraska, Keystone will conduct a detailed spill risk assessment for the section of the Keystone XL Pipeline system in the State. Utilizing that assessment, Keystone will determine the optimal location of spill response equipment and resources, taking into account response times to sensitive areas and receptors. These spill response locations will be reflected in the Emergency Response Plan that Keystone will submit to the federal Pipeline and Hazardous Materials Safety Administration for review and approval.

Assurance – Spill Clean-up

- Keystone is committed to ensuring the safe operation of its pipeline system and to prevent any incidents from occurring. Should a release occur from the Keystone XL pipeline, Keystone is committed to clean up any releases that may occur. Keystone is also legally required to clean up spills under Title 118 and OPA 90. In addition to all of

the above, and in response to public concern, Keystone would commit to file annually with Nebraska DEQ, by May 1 of each year:

a) A certificate of insurance as evidence that it is carrying a minimum of $200 million in third party liability insurance as adjusted by calculating the GDP-IPD from the date a Presidential Permit is issued for the Project and adjusting the amount of the third party liability insurance policy by this percentage. The third party liability insurance shall cover sudden and accidental pollution incidents from Keystone XL Pipeline in Nebraska; and

b) A copy of Keystone's SEC Form 10-K and Annual Report.

Surface Water

- As outlined in Keystone's Construction Mitigation and Reclamation Plan (CMRP), trenches through water bodies that are dry or contain non-moving water at the time of crossing will not be left open for more than 24 hours, except in extenuating circumstances, to reduce chances of sediment discharge from a sudden storm event resulting in runoff. This commitment would not apply where excavation of rock by blasting or mechanical means may be required in the water body.
- Keystone will also abide by mitigation measures outlined in applicable water withdrawal and discharge permits to protect sensitive receptors, such as fisheries.
- As a standard procedure and as part of its water withdrawal and discharge permits, Keystone identifies water rights that could be affected by temporary interruptions of water flow.
- As the pump station location and design for Pump Station 24 is finalized, Keystone will develop an access plan for this pump station given its location near the Loup River that takes into account access issues during flood conditions.

Wetlands

- Keystone would develop compensation for impacts for forested wetlands impacted by the construction right-of-way through the U.S. Army Corps of Engineers (USACE) Clean Water Act Section 404 and 401 permitting program. Keystone would mitigate for impacts to non-jurisdictional, as well as jurisdictional forested wetlands.

Terrestrial Vegetation

- Keystone would work with landowners and the NRCS to determine appropriate seed mixes.
- Prior to construction, Keystone will mark all areas of the right-of-way which contain infestations of noxious, invasive species or soil-borne pests. Keystone will implement Best Management Practices (BMPs) for conducting vegetation control where necessary before and after construction. Agricultural herbicides used would be developed in consultation with county or state regulatory agencies. All herbicides applied prior to or during construction will be non-residual. Herbicides will not be used in or within 100 feet of a wetland or waterbody.
- Where appropriate, Keystone will retain a local rangeland expert to coordinate area-specific seed mixes.

Wildlife

The following are measures to mitigate habitat loss and wildlife mortality:

- To prevent unauthorized access, and to the extent permitted by landowners, Keystone would secure/lock temporary gates when construction activities are not occurring in the area where access is through that gate. Also to the extent permitted by landowners, Keystone would make reasonable efforts to restrict access to the pipeline corridor via access roads after construction to minimize alteration of human activity patterns in formerly inaccessible areas.

The following additional measures would be implemented to manage habitat alteration:

- The use of soil additives such as fertilizers and pH modifiers in native rangelands to minimize the potential spread of non-native and invasive species would be discussed with agricultural extension agents/rangeland experts as required to assess suitability.
- Keystone would request landowners to discourage intensive grazing in the construction ROW during the first five growing seasons where forested areas will be reclaimed.

Agriculture and Other Land Uses

Keystone would commit to the following mitigation measures address potential impacts to agriculture in Nebraska:

- If construction were to adversely affect wetlands in NRCS conservation lands (such as the Wetland Reserve Program) Keystone would follow applicable NRCS procedures in addition to other federal permit requirements.
- When agricultural (tilled) fields are disturbed, Keystone would work with the landowner regarding the type of vegetation that would be reestablished.
- Where Keystone is made aware of the presence of certified organic farms along the Project route prior to construction, Keystone would work with those organic farm operations to ensure that pipeline construction does not impair the farm's organic status. Keystone would take reasonable steps to identify organic farms along the Project route.
- If the Project crosses an organic farm, Keystone will work with the landowner to take reasonable steps to avoid mixing organic soil and non-organic soil.

Public Services

- Before construction begins, Keystone's contractors develop detailed traffic plans that address all applicable laws, regulations and ordinances. Keystone would take into account minimizing impacts to school bus routes in developing these traffic plans.
- Keystone would ensure that underground and overhead utilities are located and that Keystone avoids contact and damage during construction.
- Keystone would ensure that contractors will have Site Specific Safety Plans in place before commencing work that will address locating, avoiding and protecting utilities.
- Keystone would dispose of construction camp trash (solid waste) by hauling to a licensed disposal facility.

Noise

- To the extent practicable, Keystone will not site pump stations close to noise-sensitive receptors.
- For all pump stations, Keystone will observe the U.S. Environmental Protection Agency standard of 55 dBA Ldn measured at the nearest noise sensitive receptor. Keystone will complete a Noise Impact Assessment (NIA) study for each pump station in Nebraska once their location is finalized. Where it is determined by this study that predicted noise levels might be higher than 55 dBA Ldn measured at the nearest noise sensitive receptor, Keystone will implement mitigation measures prior to the start-up. Noise abatement options considered are: above-ground pipe lagging, pump blankets, motor air intake enclosures, and engineered sound barriers. Keystone will conduct noise surveys in the event of noise complaints from nearby noise receptors.

Energy

- During construction of the pipeline, to the extent practicable, Keystone would avoid relocating existing electric transmission lines and would avoid existing distribution lines.
- Where line relocation can not be avoided, Keystone would coordinate with the local public power district to temporarily or permanently relocate lines.
- To the extent practicable, Keystone would coordinate, and has been coordinating, with the local public power district to minimize potential impacts to landowners resulting from the construction of new transmission lines to pump stations. It should be noted that any new transmission lines are subject to a separate regulatory/permitting process.

Hazardous Sites and Materials

- During construction, Keystone would make individuals available who are trained in identifying and disposing of hazardous materials.
- If tanks or contamination are found, they should be managed according to federal, State, and/or local regulations.
- If an unregistered well is found, Keystone would provide the landowner with technical assistance to register the well.

5.4.2 Next Steps on Additional Commitments

The mitigation measures identified above in 5.4.1 were provided to NDEQ on October 18, 2012. NDEQ will continue to evaluate and further refine these provisions. NDEQ encourages the public to review and comment as well.

CHAPTER 6

PIPELINE SAFETY AND POTENTIAL SPILLS

Product releases from the pipeline are a threat to the environment. In response to those concerns, NDEQ has assessed the safeguards that would be incorporated to prevent a release and Keystone's actions that would be taken if a release were to occur. Federal regulations require compliance with standards regarding construction, operation, and maintenance, as well as a detailed ERP outlining the actions that would be taken during a spill. In this chapter, NDEQ describes this response planning and regulations that govern pipeline safety. The chapter also provides a brief historical account of notable oil spills and some of the "lessons learned" from those spills. In addition, some specific characteristics of the proposed pipeline and the materials it would transport are provided, and agency and pipeline operator responsibilities related to pipeline safety and spills.

6.1 PIPELINE SAFETY REGULATIONS

To provide consistency across the nation, pipeline safety is regulated by the federal government. PHMSA is responsible for safety regulations pertaining to the design, construction, testing, operation, maintenance, reporting, records retention, and spill-response planning for pipelines, including the proposed Keystone XL Pipeline.

Section 3(2) of Nebraska LB 1161, which recognizes this federal regulatory structure, states:

> Nothing in the Major Oil Pipeline Siting Act shall be construed to regulate any safety issue with respect to any aspect of any interstate oil pipeline. The Major Oil Pipeline Siting Act is intended to deal solely with the issue of siting or choosing the location of the route aside and apart from safety considerations. The [Nebraska] Legislature acknowledges and respects the exclusive federal authority over safety issues established by the federal law, the Pipeline Safety Act of 1994, 49 U.S.C. 60101 et seq., and the express preemption provision stated in that act.

PHMSA carries out a national program to ensure the safe, reliable, and environmentally sound operation of the nation's pipeline transportation system.

Key actions carried out by PHMSA include:

- Administers pipeline safety regulatory programs
- Oversees pipeline operator implementation of risk management and risk-based programs
- Administers a national pipeline inspection and enforcement program
- Provides technical and resource assistance for State pipeline safety programs to ensure oversight of intrastate pipeline systems and educational programs at the local level
- Supports the development of and conducts pipeline safety training programs for federal and State regulatory and compliance staff and the pipeline industry

6.1.1 Federal Regulatory Codes Governing Pipeline Safety

Regulations governing pipeline safety are described in 49 CFR §§ 190–199. These regulations cover both gas and hazardous liquid pipelines. Sections 190, 194, 195, 198, and 199 are relevant to hazardous liquids (including crude oil) pipelines and NDEQ's evaluation of the Nebraska Reroute. Many of the regulations are written as performance standards that establish the minimum level of safety to be attained. This approach of developing performance standards allows pipeline operators to use various technologies to achieve the required level of safety.

A brief description of those portions of the code applicable to crude oil pipelines is presented below.

49 CFR § 190 – Pipeline Safety Programs and Rule Making Procedures

Section 190 clarifies the authority and procedures PHMSA follows in rule making and enforcement. The section authorizes inspections, investigations, and administration of violation notices.

49 CFR § 194 – Response Plans for Onshore Oil Pipelines

Section 194 contains requirements for onshore oil spill ERPs that are intended to reduce the environmental impact of oil unintentionally discharged from onshore oil pipelines. Additional information on the requirements of 49 CFR § 194 is presented in Section 6.6 of this chapter.

49 CFR § 195 – Transportation of Hazardous Liquids by Pipeline

Regulations described in 49 CFR § 195 are directly related to pipeline system integrity, including design, construction, operation, maintenance safety standards, and reporting requirements for pipelines that transport hazardous liquids, including crude oil.

An important aspect of 49 CFR § 195 is found in § 195.452. This section describes HCAs and the Liquid Pipeline Integrity Management in High Consequence Areas for Hazardous Liquid Operators (commonly referred to as the Liquid IM Rule). HCAs are defined as commercially navigable waterways, population areas, and unusually sensitive areas. Unusually sensitive areas are further defined to include both drinking water and ecological resources.

> An operator must take measures to prevent and mitigate the consequences of a pipeline failure that could affect a High Consequence Area.
>
> – 49 CFR § 195.452(i)

The Liquid IM Rule specifies how Keystone must identify, prioritize, assess, evaluate, repair, and validate the integrity of the proposed pipeline that could, in the event of a leak or failure, adversely affect HCAs. The goal of the Liquid IM Rule is to provide added protection to these particularly sensitive areas.

The regulations specify that an operator must take measures to prevent and mitigate the consequences of a pipeline failure that could affect an HCA. Examples of these additional measures include enhanced damage prevention programs, more frequent inspections, corrosion control program improvements, leak detection system enhancements, installation of emergency flow restricting devices, and emergency preparedness improvements. For a new hazardous liquid pipeline project such as the Keystone XL Pipeline, the regulations require that HCAs be

identified prior to operation and that a written Integrity Management Plan be in place within 1 year of the start of operation.

For the Nebraska Reroute, Keystone is working with NDEQ, DOS, and PHMSA to identify and map drinking water and ecological unusually sensitive areas, including WHPAs. There are no commercially navigable waterways along the Nebraska Reroute, and the route avoids populated areas.

Once HCAs are identified and located, Keystone would perform a risk assessment to determine the likelihood of a pipeline release and assess how a release could affect HCAs. Segments of pipeline where a release could adversely affect an HCA would be subject to additional prevention, mitigation, and response measures. At least 6 months prior to construction, Keystone would have to review with PHMSA how Keystone determined which HCAs could be adversely affected. At that time, Keystone would also be required to review with PHMSA the design of the pipeline, pump stations, valves, and other facilities in those segments that could adversely affect HCAs in the event of a spill (see Appendix F.2, Special Condition 14).

Keystone prepared a pipeline risk assessment as part of the EIS process (DOS, 2011a: Appendix P), in part to determine the effects of a pipeline spill on HCAs. After the Final EIS was published, DOS, along with PHMSA and EPA, concluded it would be prudent if an independent risk assessment were performed. The independent evaluation is underway and, therefore, not available as of the writing of this Draft Evaluation Report.

49 CFR § 198 – Regulations for Grants to Aid State Pipeline Safety Programs

Section 198 describes regulations for grants to aid States that choose to implement pipeline safety compliance programs. Nebraska does not have a pipeline safety compliance program and acknowledges and respects the exclusive federal authority over safety issues established by federal law and implemented by PHMSA through its regulations.

49 CFR § 199 – Drug and Alcohol Testing

Part 199 requires operators of natural gas, liquefied natural gas, and hazardous liquid pipeline facilities to establish programs for preventing alcohol misuse and to test employees for the presence of alcohol and prohibited drugs.

6.1.2 Special Conditions for Keystone XL Pipeline

Keystone has worked with PHMSA and DOS to establish a set of 57 Special Conditions that would apply to the construction, operation, and maintenance of the Keystone XL Pipeline, including the Nebraska Reroute. Exhibit C of the Keystone XL Pipeline Project, Presidential Permit Application summarizes the pipeline specifications. The exhibit is presented in Appendix F.1. Included in the pipeline specification is the following statement regarding the 57 Special Conditions:

> The pipeline will be designed consistent with the **57 Special Conditions** included in the Department of State's August 26, 2011 Final Environmental Impact Statement (FEIS) for the Keystone XL Pipeline Project (Appendix U to FEIS) and to specifications sufficient to support a future application for a special permit from the U.S. Department of Transportation, Pipeline and Hazardous Materials

Administration (PHMSA) to operate at a higher pressure and greater throughput than would otherwise obtain under the current PHMSA regulations.

Chapter 3 of the Final EIS (DOS, 2011a) states that Keystone agreed that if the Presidential Permit were to be granted, it would incorporate the 57 Special Conditions into its manual for operations, maintenance, and emergencies as required by 49 CFR § 195.402. PHMSA has the legal authority to inspect and enforce any items contained in Keystone's operations, maintenance, and emergencies manual and would, therefore, have the legal authority to inspect and enforce the 57 Special Conditions if the proposed Nebraska Reroute were to be approved.

NDEQ reviewed the 57 Special Conditions and compared them with 49 CFR § 195 and industry design standards. The review concluded that many of the conditions would result in more rigorous adherence to 49 CFR § 195 and would necessitate specific timelines and management activities, rather than leaving interpretation of the code up to the pipeline operator. Incorporation of the 57 Special Conditions would result in Keystone having more specific and frequent communication with PHMSA's regulatory personnel, and should provide a well-defined set of management practices to be followed during pipeline operation. A list of the 57 Special Conditions is presented in Appendix F.2.

6.2 RELEVANT PIPELINE SPILL INCIDENT HISTORY

Recent spills in Nebraska and elsewhere in the United States were frequently mentioned by the public during the public information meetings. NDEQ reviewed historical spills to understand how they occurred and the effectiveness of response. This analysis was used when considering impacts on resources from a potential oil spill. Spills of the size described in this section are relatively infrequent events; in fact, more than 80 percent of all liquid pipeline spills result in the release of less than 50 barrels. Large spills, such as some of those described below, although rare, can be catastrophic, heightening public awareness and frequently resulting in improved procedures for pipeline operators and spill-response professionals.

6.2.1 Enbridge Oil Spill, Kalamazoo River, Marshall, Michigan, July 2010

The release from Enbridge's Line 6B is described in detail because this pipeline carried dilbit, a mixture of heavy Canadian bitumen (see Section 6.3.1) diluted with liquid chemicals—some toxic—and heavy crude oil, similar to the type of products that would be carried by the Keystone XL Pipeline. This release highlights some of the issues raised in public comments:

- The volume of oil that could be spilled
- The time that could elapse before a leak would be detected
- The coordination between the pipeline company and local emergency response teams
- The effectiveness of the pipeline operator's operating procedures and spill response planning
- The particular issues associated with the cleanup of dilbit compared with those of conventional crude oil

This leak occurred in Marshall, Michigan, on July 25, 2010, when a pipeline segment ruptured in the final stages of a planned pipeline shutdown. Enbridge shut off a sequence of pumps along the line while increasing pressure at a pressure control valve downstream. About 1 minute after increasing the pressure, the pipeline ruptured downstream of the Marshall pump station, spilling

approximately 160,000 gallons (3,810 barrels) of oil. While attempting to start up the pipeline after the planned shutdown, Enbridge pumped an additional 683,000 gallons (16,270 barrels) of Cold Lake Blend dilbit and Western Canadian heavy crude oil into the ruptured pipeline, erroneously believing that the alarms that sounded in the Enbridge control center did not indicate that a rupture had occurred. A total of approximately 843,000 gallons (20,080 barrels) of a mixture of crude oil and dilbit were released.[1]

The National Transportation Safety Board (NTSB) conducted a thorough investigation of the incident and released its Accident Report in July 2012 (NTSB, 2012).

The rupture occurred in an area of wetlands south of Talmadge Creek, a tributary of the Kalamazoo River. Because heavy rainfalls had increased the flows of Talmadge Creek and the Kalamazoo River, the oil quickly spread, eventually adversely affecting 25 miles of the Kalamazoo River. Efforts to extract the pipe and contain the oil were delayed by these wet conditions. During the initial hours of the response, the EPA On Scene Coordinator (OSC) identified that Enbridge did not have adequate resources to contain or control the flow of oil into Talmadge Creek and the Kalamazoo River. Therefore, EPA directed Enbridge to secure more resources and directed these resources to local contractors to facilitate a quicker response.

Enbridge Line 6B oil spill. Photo from NTSB, 2012.

The release occurred in an area with a concentrated population. Hundreds of people, including several work-site employees, reported symptoms of adverse health effects (headache, nausea, and respiratory problems) consistent with exposure to crude oil. Because of high concentrations of benzene in the air, the Calhoun County Public Health Department issued a voluntary evacuation notice for about 50 homes near the oil spill site.

[1] Two additional large failures of Enbridge pipelines have occurred: on July 4, 2002, near Cohasset, Minnesota, and on April 15, 2007, near Glenavon, Saskatchewan. Approximately 252,000 gallons (6,000 barrels) and 200,000 gallons (4,760 barrels) of crude oil were released, respectively.

Two weeks later, the benzene concentrations in the air were low enough to lift the request for a voluntary evacuation of homes. As a precautionary measure, the Calhoun County and Kalamazoo County Public Health Departments issued an advisory to residents with private wells within 200 feet of the Kalamazoo River and Talmadge Creek to stop using water for drinking and cooking. Enbridge was required to sample all private and public drinking water wells within the same 200–foot zone. After reviewing the Enbridge report and sampling results, the local health departments lifted the drinking water advisory. The county health departments and the State Department of Community Health also prohibited the use of surface waters for irrigation, livestock, recreation, and fish consumption. Calhoun County's ban, except for the Morrow Lake Delta, was lifted on June 21, 2012.

Residential area affected by Enbridge spill. Photo from EPA, 2010

During the spring of 2011, it was determined that weathering, or the natural evaporation of the lighter components of the crude oil and dilbit spilled, had turned the remaining oil into a tar-like solid and that a significant amount of material had sunk to the bottom of the river.

More than 220 areas of moderate-to-heavy contamination, covering around 200 acres of river bottom, and more than 300 solidified oil deposits have been identified as needing cleanup. Different cleanup methods are required for submerged oil (EPA, 2011a).

Cleanup of submerged oil. Photo from EPA, 2011

Although many members of the public called 911 to report strong odors indicating a petroleum spill, local firefighters did not discover the ruptured segment. The NTSB report concluded that if Enbridge had operated an effective public awareness program, local emergency response agencies might have found the spill before Enbridge pumped additional oil into the line, and the size of the spill could have been reduced (NTSB, 2012).

Enbridge's Line 6B pipeline had been coated with a wrapping of polyethylene tape with an adhesive backing to prevent corrosion.[2] According to the NTSB Accident Report released in July 2012, the tape coating in the ruptured segment of the pipeline was no longer adhering to the pipeline, which allowed moisture to become trapped between the pipeline and the tape. Corrosion then occurred, resulting in corrosion fatigue cracks that, in turn, caused the failure of the pipe wall.

NTSB photo showing the ruptured segment of Line 6B. The red circle shows the location where the polyethylene tape coating separated from the pipe surface.

Three organizational failures by Enbridge were cited in the report:

- Deficient integrity management procedures, which allowed well-documented crack defects in corroded areas to propagate until the pipeline failed
- Inadequate training of control center personnel, which allowed the rupture to remain undetected for 17 hours and through two startups of the pipeline
- Deficient facility response plan, which did not provide adequate training to first responders and sufficient emergency response resources to respond to a worst-case scenario

The NTSB report also identified weak regulation by PHMSA as a contributing factor in the accident, noting a lack of regulatory guidance for pipeline emergency response planning and PHMSA's approval of a deficient facility response plan. NTSB made a series of recommendations to PHMSA, including the following:

- Revise 49 CFR § 195.452 to provide specific guidance for pipeline operators regarding assessments and repair of crack defects.
- Issue an advisory bulletin to all pipeline operators describing the accident and the deficiencies in Enbridge's integrity management program and asking the company to take appropriate action to eliminate similar deficiencies.
- Develop requirements for training control center staff.
- Amend 49 CFR § 194 to ensure that pipeline operators have adequate resources available to respond to worst-case discharges.

[2] Polyethylene tape is no longer an industry standard. The proposed pipeline would instead be factory-coated with FBE to prevent corrosion. This durable coating is further described in Section 6.5.

PHMSA is in the process of responding to these recommendations.[3] NTSB's report was also critical of PHMSA's procedures for reviewing pipeline response plans. Conclusions of the NTSB report regarding PHMSA's role included:

- PHMSA failed to pursue findings from previous inspections and did not require Enbridge to excavate pipe segments with injurious crack defects.
- PHMSA's regulatory requirements for response capability planning do not ensure a high level of preparedness equivalent to the more stringent requirements of the Coast Guard and EPA.
- Without specific federal spill response preparedness standards, pipeline operators do not have response planning guidance for a worst-case discharge.
- If PHMSA had dedicated the resources necessary and conducted a thorough review of the Enbridge facility response plan, it would have disapproved the plan because it did not adequately provide for response to a worst-case discharge (NTSB, 2012).

As of September 2012, cleanup efforts were continuing. EPA reported 1,148,413 gallons of oil collected,[4] 17.1 million gallons of oil/water collected and disposed, and 187,302 cubic yards of soil/debris disposed as of August 8, 2012 (EPA, 2012e). Cleanup costs have exceeded $767 million (NTSB, 2012).

6.2.2 Magellan Oil Products Pipelines, Nemaha County, Nebraska, December 2011

A December 2011 release from the Magellan oil products pipelines is an example of a recent spill in Nebraska that was accidentally caused by excavation, a common cause of pipeline rupture. Approximately 11 percent of hazardous liquid pipeline incidents are caused by excavation near the pipeline. The leak occurred in Nemaha County, Nebraska, when a tenant operating a bulldozer struck two parallel pipelines: one 8-inch-diameter line transporting diesel fuel and one 12-inch-diameter line transporting jet fuel and gasoline. Approximately 27,300 gallons of diesel fuel, 27,500 gallons of jet fuel, and 64,200 gallons of gasoline were spilled (Burkhardt, 2011; Piersol, 2011).

Seven temporary dams and two interception trenches were constructed to contain the spill and prevent it from flowing downstream to the Little Nemaha River. Some of the site was saturated with fuel to a depth of up to 20 feet. NDEQ's response to this pipeline spill is discussed in Section 6.6.2.

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[3] A complete list of the NTSB recommendations to which PHMSA is responding and the status of the response is available online at <http://www.phmsa.dot.gov/pipeline/regs/ntsb/open>. The complete NTSB report is available online at <http://www.ntsb.gov/doclib/reports/2012/PAR1201.pdf>.

[4] This value is higher than NTSB's estimate of the volume spilled from the pipeline and may include other materials collected during the cleanup.

6.2.3 ExxonMobil Crude Oil Pipeline Spill, Yellowstone River, July, 2011

On July 1, 2011, approximately 64,000 gallons (1,520 barrels) of crude oil were released from ExxonMobil's 12-inch Silvertip crude oil pipeline into the Yellowstone River about 20 miles upstream of Billings, Montana (EPA, 2012f; ExxonMobil, 2012). It is believed that the pipeline may have been exposed by high water in spring 2011 and subsequently damaged by debris carried by the river (Associated Press, 2012). PHMSA's Office of Pipeline Safety is investigating the cause of the leak. PHMSA's corrective action order stated that the pipe failed at approximately 10:40 p.m. ExxonMobil began shut down at approximately 10:47 p.m., but did not close both block valves to isolate the failed segment of pipeline for nearly 50 minutes, until approximately 11:36 p.m. The failed section of the Silvertip Pipeline crossing the Yellowstone River was constructed in 1991; however, the original portions of the Silvertip Pipeline were primarily constructed between 1949 and 1954 (PHMSA, 2011a).

Because the flooding of the Yellowstone River dispersed the oil away from the spill site, booms and pads were not very effective in absorbing the oil. Oil was observed on the water surface 45 miles downstream of the point where the pipeline ruptured (mt.gov, 2011). Water intakes for the City of Billings, located immediately downstream of the pipeline crossing, had to be temporarily shut down (PHMSA, 2011a). No contaminants were found in drinking water sampled after the pipeline spill. EPA led the cleanup, coordinating with the Montana Department of Environmental Quality and other federal agencies including the U.S. Coast Guard and USFWS. In August 2011, over 1,000 workers were engaged in cleanup and shoreline assessment efforts (EPA, 2012f).

As a result of this incident, ExxonMobil reinstalled the pipeline at the Laurel Crossing approximately 60 feet below the Yellowstone River bottom. In addition, ExxonMobil installed new segments of pipeline 30 feet or more below the Silvertip river crossings at Rock Creek and Clarks Fork, also in Montana (ExxonMobil, 2012). ExxonMobil stated that while the Silvertip Pipeline routinely carries oil sands-derived products (similar to those that would be carried by the proposed pipeline, as discussed in Section 6.3), the oil in the pipeline at the time of the spill was a light crude oil from Wyoming (Zuckerman, 2011).

6.2.4 Enbridge Oil Spill, Wisconsin, July 2012

A spill from Enbridge's Line 14 in Wisconsin is the most recent spill discussed in this section and is also an example of some of the regulatory steps PHMSA can take following a release. The leak occurred in Grand Marsh, Wisconsin, on July 27, 2012, when a rupture released 50,400 gallons (1,200 barrels) of light crude oil in a rural area. Two landowners were affected (O'Brien, 2012) and several cows and horses needed veterinary attention (PHMSA, 2012a) Line 14 is a 24-inch-diameter pipeline that was installed relatively recently, in 1998. A landowner reported oil spraying on the pipeline ROW at approximately the same time that the Enbridge control center noted signs of a possible release. The section containing the ruptured pipe was isolated about 10 minutes later by closing remotely controlled valves located upstream and downstream of the site of the release.

On July 30, 2012, PHMSA issued a Corrective Action Order to Enbridge requiring it to take immediate corrective action to ensure the safe operation of Line 14. On August 1, 2012, PHMSA issued an amendment to the Corrective Action Order requiring additional corrective actions that Enbridge must perform before the line could be approved for restart (PHMSA,

2012b). On August 6, 2012, PHMSA announced that Enbridge had met the requirements of the amended corrective action order and executed a consent agreement. The consent agreement required Enbridge to meet a series of safety provisions and, in return, Enbridge was given authority to restart the pipeline (U.S. Department of Transportation, 2012).

6.2.5 Keystone Oil Pipeline Spills, 2010–2011

The 30-inch-diameter Keystone Oil Pipeline that runs from Canada to Oklahoma had 14 unintentional releases of crude oil prior to May 29, 2011. None of these releases were from pipeline ruptures, but rather were releases at MLVs and pump stations. The 14 releases are listed in Table 6.2-1 (DOS, 2011a). All of the spills were contained on-site except for the largest spill, the Ludden Pump Station spill of May 7, 2011. This spill was first reported by a local citizen, not by Keystone. Although most of this spill (approximately 18,000 gallons [430 barrels]) was contained by a berm that surrounds the pump station, the pressure of the pipeline created a geyser-like release and approximately 2,100 gallons (50 barrels) of oil sprayed onto a neighboring field and trees. Low-level residual off-site oil spray impacts were treated in-place in accordance with North Dakota State guidelines.

Following the Ludden and Severance leaks, PHMSA issued a Corrective Action Order (PHMSA, 2011b) on June 3, 2011. In the Corrective Action Order, PHMSA listed a number of actions required prior to resuming operation of the pipeline, and also noted that another leak at the Roswell Pump Station had occurred on May 25, 2011, that did not meet the reportable criteria. Keystone submitted a "Keystone System Re-Start Plan" with results of metallurgical testing on the failed equipment on June 4, 2011, and received approval from PHMSA to restart operation of the Keystone Pipeline on June 5, 2011 (PHMSA, 2011c).

Table 6.2-1. Spills on Existing Keystone Pipeline

Location of Release	Date of Release	Amount of Release	Reason of Incident
Carpenter Pump Station, Carpenter, South Dakota	May 21, 2010	About 5 gallons	Fitting failure at mainline isolation valve
Roswell Pump Station Howard, South Dakota	June 23, 2010	About 100 gallons	Fitting failure on sump pump
Freeman Pump Station Freeman, South Dakota	August 10, 2010	About 2 gallons	Improperly installed fitting at pig trap receiver
Hartington Pump Station Hartington, Nebraska	August 19, 2010	10 gallons	Improperly installed aboveground fitting
Ferney Pump Station Andover, South Dakota	January 5, 2011	Less than 2 gallons	Station pump seal bearing leak
Severance +2 1 Valve Site, Doniphan County, Kansas	January 8, 2011	Less than 3 gallons	Leak on seal packing on valve
Turney Pump Station Turney, Missouri	January 31, 2011	Less than 10 gallons	Seal failure on pump
Cushing Station Cushing, Oklahoma	February 3, 2011	Less than 15 gallons	Temporary vent gas separator
David City Pump Station, David City, Nebraska	February 11, 2011	Less than 100 gallons	Seal failure on pump
Rock Pump Station Udall, Kansas	February 23, 2011	30 gallons	Valve seal leak on drain line of a pump suction line
Ludden Pump Station Brampton, North Dakota	March 8, 2011	Less than 5 gallons	Leak at pump unit bearing housing
Seneca Pump Station Seneca, Kansas	March 16, 2011	500 gallons	Pump seal failure
Ludden Pump Station Brampton, North Dakota	May 7, 2011	18,900–21,000 gallons	Pipe nipple failure
Severance Pump Station	May 29, 2011	Less than 420 gallons	Leak at nipple on pressure transmitter

Source: Table based on the Final EIS (DOS, 2011a: Table 3.13.1-4 Reported Incidents for Existing Keystone Oil Pipeline).

6.3 CHARACTERISTICS OF OIL TRANSPORTED IN PIPELINE

To determine the environmental consequences of an accidental release, it is important to understand the material that is carried in the pipeline. Crude oils are complex mixtures of hydrocarbons, ranging from light molecules with relatively low boiling points to heavy molecules containing a large number of carbon and hydrogen atoms, which are solids at room temperature. Concerns have been raised by the public that some of the physical and chemical characteristics of the materials carried by the proposed pipeline could make a spill more likely or that the material could be more toxic if spilled.

The operating life of the project would be expected to span multiple decades, and over that time the exact product and source would vary. Keystone has identified five types of crude oil that would be transported through the pipeline:

- Dilbit, produced from the Alberta oil sands in Canada
- Synthetic crude oil, produced from the Alberta oil sands
- Synbit, produced from the Alberta oil sands
- Dilsynbit, produced from the Alberta oil sands
- Conventional light crude oil, produced from the Bakken Formation in Montana and North Dakota

The physical and chemical characteristics of these types of crude oils are further described in the following sections.

The precise composition of crude oils, including dilbit and synthetic crude oil, is determined by the producers or shippers and is considered proprietary information.[5] However, Keystone would provide to each shipper a set of technical specifications regarding vapor pressure, solids content, temperature, density, viscosity, and other chemical characteristics that should not be exceeded (DOS, 2011a). Keystone would not blend materials and would not add any products to the crude oils transported by the pipeline. It would be the responsibility of each shipper to ensure that each batch of crude oil would meet Keystone's specifications.

Table 6.3-1 provides publicly available information on a variety of crude oils, including oil sands-derived crude oils. The specific crude oils presented in Table 6.3-1 were selected to present typical products that would be transported by the pipeline compared with other crude oils. Conventional heavy, medium, and light crude oils are also presented as examples of different crude oils from around the world that are processed in the United States.

[5] In the case of a spill, Keystone would provide the specific constituents present in the spilled material to NDEQ, as described in Section 6.6.

Table 6.3-1. Selected Physical Properties of Various Crude Oils, Dilbits, and Dilsynbit

Source	Crude Oil Name	Physical Characteristics		
		Density (grams per milliliter)	Degrees API Gravity	Total Acid Number
Western Canada Oil Sands-Derived Crude Oils				
Western Canadian Dilbit	Western Canadian Select[a]	0.930	20.6	0.94
Western Canadian Dilbit	Cold Lake Dilbit Blend[a]	0.928	20.8	0.98
Western Canadian Dilbit	Seal Heavy[a]	0.931	20.4	1.82
Western Canadian Dilsynbit	Albian Heavy[a]	0.939	19.1	0.50
Selected Conventional Heavy Crude Oils				
Western Canada	Western Canadian Blend[a]	0.930	20.6	0.74
Western Canada	Lloyd Blend[a]	0.928	20.8	0.81
Mexico[b]	Maya[c]	0.926	21.3	0.43
Venezuela[b]	Boscan[d]	NA	10.1	0.91
California[b]	Hondo Monterey[e]	0.849	19.4	0.43
Selected Medium and Light Crude Oils				
Canada	Suncor Synthetic A[a]	0.859	33.1	NA
North Dakota	Bakken Crude[f, g]	NA	42.8	<0.05
Saudi Arabia[b]	Arabian Light[f]	NA	33.3	<0.05
U.S. Gulf of Mexico[b]	Hoops Blend[h, i]	NA	31.6	1.07

Density: Density is a measure of the weight of crude oil per unit of volume, expressed in grams per milliliter. For comparison, the density of water is 1.0 grams per milliliter. Oils typically have densities less than 1.0.

Degrees API Gravity: This measure was defined by the American Petroleum Institute (API) for the density of various petroleum liquids, and is reported in "degrees API." Higher API gravity values indicate lighter materials. For example, the API gravity of natural gas condensates ranges between 50 degrees and 120 degrees. Light crude oil usually has a gravity above 40 degrees API, and heavy crude oils are often defined as those with a gravity below 22.3 degrees API. A material with an API lower than 10 degrees would be heavier than water.

Total Acid Number: A measure of the amount of acids present in the oil, measured as the number of milligrams of base (potassium hydroxide) needed to neutralize the acids in one gram of oil. In a high-temperature refinery setting, a higher total acid number can indicate a higher potential for corrosion.

NA = Not available or not analyzed

[a] *Five-year average in crudemonitor.ca for Canadian oils*

[b] *These crude oils are presented for comparison purposes but are not planned to be transported by the proposed pipeline (lightest shaded rows).*

[c] *<www.ogj.com/articles/print/volume-98/issue-20/processing/guide-to-the-world-crudes.html>*

[d] *Venezuelan Crude Oil Specifications at <www.genesisny.net/commodity/oil/ospecs.html>*

[e] *<http://www.ogj.com/articles/print/volume-90/issue-13/in-this-issue/refining/four-california-ocs-crudes-assayed.html>*

[f] *Capline at <www.caplinepipeline.com/reports1.aspx>*
[g] Argus White Paper at <www.argus media.com> and <http://www.coqa-inc.org/20110609_Mick.pdf> (Sinclair Presentation June 9, 2011 by Jay Mick-VP Sinclair)
[h] *BP Crude Oil Assay <www.bp.com>*
[i] *ExxonMobil Crude Oil Assays at <www.exxonmobil.com/crudeoil>*

6.3.1 Products Derived from Oil Sands and Bitumen

Oil sands from Alberta, Canada, are the source of the majority of the crude oil scheduled for shipment through the proposed Keystone XL Pipeline. Oil sands are a combination of clay, sand, water, and heavy black viscous oil known as bitumen. Although conventional crude oil can be pumped from underground deposits to the surface, the bitumen in oil sands is too heavy to be pumped from the ground in its natural state. Instead, bitumen is removed from the ground by surface mining or through in-situ methods.

Oil sands occurring nearer to the surface are surface mined and transported to processing facilities for separation processing to recover the bitumen. For deeper oil sands, in-situ methods are used, injecting steam into the ground to heat the bitumen, allowing it to be pumped to the surface.

Oil sands. Source: Oil Shale and Tar Sands Programmatic Environmental Impact Statement (PEIS) Information Center, a website maintained by Argonne National Laboratory for the Bureau of Land Management.

Bitumen. Source: www.sciencephoto.com

The bitumen recovered by surface mining or in-situ methods is too heavy and thick to be transported by pipeline. Therefore, bitumen is blended or treated in an upgrading facility to form crude oil products with a viscosity and density that makes them suitable to be carried by a hazardous liquids pipeline. Bitumen can be blended or treated to form four different products (dilbit, synthetic crude oil, synbit, and dilsynbit) that are transportable by pipeline. These products are described below.

In response to NDEQ's data request of September 10, 2012, Keystone stated that any of these four products may be transported by the proposed pipeline (Keystone, 2012e). The relative percentage of dilbit, synbit, dilsynbit, and synthetic crude oil produced in Western Canada would likely depend on a variety of economic and logistical considerations, including the availability of condensate for blending (DOS, 2011a: Appendix V: 2010 EnSys Report).

Oil (including synthetic crude oil and the diluted bitumen products dilbit, synbit, and dilsynbit) from the Western Canadian production fields would be transported to Hardisty, Alberta, where it would be batched up according to shipper and sent through the line. Oil entering at Hardisty would flow at a rate of about 5 miles per hour through the proposed pipeline and join the existing Keystone Pipeline in Steele City, Nebraska. From Steele City, the oil would travel through existing and currently-being-built pipelines to delivery points in the Midwest; Cushing, Oklahoma; and the Gulf Coast of Texas. These delivery points provide access to many other existing pipelines and refineries.

Dilbit

One method of treating the bitumen is to dilute it with a mixture of lighter liquid hydrocarbons to form a homogeneous mixture known as dilbit. The material used to dilute the bitumen is known as a diluent. One of the materials that could be used as a diluent is natural gas condensate, the liquids that condense from natural gas when it is processed. As it comes from a well, natural gas consists primarily of methane, but it also contains some other naturally occurring hydrocarbons such as ethane, propane, butanes, pentanes, and hexanes, and some amount of benzene, toluene, ethylbenzene, and xylene (BTEX), which together are often known as light-end hydrocarbons. When the natural gas is processed, these light-end hydrocarbons are separated from the methane and are captured and sold separately as natural gas condensate. This condensate may be transported to refineries for processing or may be used as a diluent that is combined with bitumen to form dilbit.

Dilbit is typically blended using 70 to 75 percent bitumen and 25 to 30 percent diluent (Ramseur et al., 2012; Zhou and Been, 2012).

Synthetic Crude Oil

Upgrading facility in Alberta, Canada. Source: Pembina Institute

A second method of treating bitumen consists of refining the bitumen, through a process termed upgrading, into a product known as synthetic crude oil. Upgrading facilities treat the bitumen using a number of steps (somewhat similar to those used by a refinery) to create a product that can be transported by pipeline without adding a solvent or diluent (University of Alberta, 2001). Synthetic crude oil is usually low in sulfur and metals. The upgrading process removes enough of the heavier hydrocarbons naturally occurring in bitumen that the synthetic crude oil is classified as a light crude oil.

Synbit

A third method of treating the bitumen is to dilute the bitumen with synthetic crude oil, resulting in a product known as synbit. The combination of the lighter synthetic crude oil with the heavier

bitumen typically results in a product that shares many characteristics with conventional crude oils. Synbit has a higher concentration of sulfur than synthetic crude oil, and a higher density, and is classified as a heavy crude oil. The ratio of bitumen to synthetic crude oil is usually about 1:1, although this ratio may vary.

Dilsynbit

A fourth product created from bitumen is dilsynbit, which is a combination of bitumen blended with both synthetic crude oil and a diluent similar to natural gas condensate. Dilsynbits are classified as heavy crude oil.

6.3.2 Characteristics of Light Crude Oil

Crude oils are generally classified as heavy, medium, or light, based on their density (weight relative to volume). Heavy oils are thick and more resistant to flow (viscous). Light oils are thinner and flow more easily.

Oil produced from the Bakken formation in Montana and North Dakota is considered light crude oil and would be the fifth product that may also be transported by the proposed pipeline. This oil is conventionally produced, meaning that it is extracted in a liquid form by drilling wells into an underground formation without being heated or diluted (Gordon, 2012).

Crude oils also contain small amounts of other naturally occurring compounds, including sulfur-containing compounds, metals, and salts. Crude oils are also classified as "sour" or "sweet," based on the oil's sulfur content. Oil sands-derived crude oils contain enough sulfur that they are classified as "sour." Crude oil from the Bakken formation is classified as "sweet."

Physical characteristics of the products that would be transported by the proposed pipeline are presented in Table 6.3-1. Chemical characteristics of these products are presented in Table 6.3-2. Characteristics of selected other crude oils are presented in these tables for comparison purposes.

6.3.3 Public Concerns Regarding Oil Sands-Derived Crude Oils

Concerns have been raised that dilbit and other oil sands-derived products have characteristics that make them more likely to cause a pipeline incident or spill. Concerns have been noted about sulfur and sediment and their effects on pipeline corrosion. Concerns about the volatility of the hydrocarbon mixtures used to dilute the bitumen and the potential for gas bubble formation has also been noted. Concerns have also been raised regarding the additional risks that could accompany a dilbit spill, including risks associated with increased toxicity or increased difficulty of cleanup. Because of these concerns, Congress has passed Public Law 112-90 requiring PHMSA to conduct a study of the safety of pipeline transportation of dilbit products. The status of this study is described further in Section 6.3.4.

Volatility

Some commenters raised the possibility that volatile chemicals (in the condensate or other diluent blended with the bitumen to create dilbit or dilsynbit) could volatilize within the pipeline and form a large gas bubble or vapor pocket. Liquid column separation, or "slack flow", can occur in liquid pipelines if the pipeline pressure drops below the vapor pressure of the liquid being transported. Commenters raised the possibility that this process could be more likely to

occur with dilbit or other mixtures containing volatile condensate. In response to a data request from DOS, Keystone made the following statement:

> Slack flow is defined as a condition where the pressure of the crude oil inside the pipeline is reduced such that the pipeline pressure is less than the vapor pressure of the crude oil itself. The Keystone XL pipeline, under design operating conditions, will not operate in slack flow. Keystone has ensured the operating regime allows for adequate pressure on the crude oil such that a slack flow condition will not arise (DOS, 2011a).

The Final EIS (DOS, 2011a: 3.13) examined volatility and instability of dilbits, including assertions that the volatile components of the condensate used to dilute the bitumen could result in liquid-column separation.[6] The Final EIS did not find that the data presented by commenters supported assertions that the proposed pipeline would be likely to rupture due to pressure spikes or that the dilbit would be unstable at pipeline operating temperatures of 120°F to 150°F.

It is anticipated that the PHMSA study of the safety of pipeline transportation of dilbit products (see Section 6.3.4) will also address these issues.

Corrosivity

Local residents are concerned about the possibility of corrosion weakening the pipeline to a point of pipe failure. Commenters have focused on three physical characteristics of crude oil and dilbit as possible sources of increased corrosion:

- Sulfur content
- Total Acid Number
- Abrasive solids

Sulfur Content

The sulfur content of dilbits, synbits, and dilsynbit is generally at the higher end of the range for crude oils, similar to other heavy crude oils but higher than in light crude oils as shown in Table 6.3-2. This sulfur may exist in many forms in the crude oil, but not all forms of sulfur would be corrosive. One form of sulfur, hydrogen sulfide, would be corrosive, but the concentrations of hydrogen sulfide in crude oils are not typically published. However, the Final EIS concluded on page 3.13-39 that "it does not appear that dilbits have elevated hydrogen sulfide levels compared to other crude oils, nor that a higher total sulfur content for a crude oil directly correlates to higher hydrogen sulfide content in the crude oil" (DOS, 2011a: 3.13-9). These concerns are also discussed in the paper "Oil Sands and the Keystone XL Pipeline: Background and Selected Environmental Issues" prepared by the Congressional Research Service (Ramseur et al., 2012), which concluded that experience with sulfur corrosion at refineries may not be applicable to pipeline corrosion.

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[6] Liquid-column separation can lead to sensor readings similar to a pipeline rupture. Since liquid column separation is more common than pipeline rupture, pipeline operators could mistakenly treat it as a false alarm, as in the case of the Enbridge Line 6B spill, described in Section 6.2.1.

Table 6.3-2. Selected Chemical Properties of Various Crude Oils, Dilbits, and Dilsynbit

Source	Crude Oil Name	Chemical Characteristics						
		Sulfur (percentage by weight)	Benzene (percentage by weight)	BTEX (percentage by weight)	Nickel (milligrams per liter)	Vanadium (milligrams per liter)	Sediment (parts per million by weight)	Light Hydrocarbons (percentage by volume)
Western Canada Oil Sands-Derived Crude Oils								
Western Canadian Dilbit	Western Canadian Select [a]	3.5	0.16	0.64	57.6	138	360	10.1
Western Canadian Dilbit	Cold Lake Dilbit Blend[a]	3.8	0.23	0.78	65.4	170	174	12.6
Western Canadian Dilbit	Seal Heavy[a]	4.7	0.2	1	55	154	164	10.4
Western Canadian Dilsynbit	Albian Heavy[a]	2.4	0.14	0.96	43.1	85.4	754	10.7
Selected Conventional Heavy Crude Oils								
Western Canada	Western Canadian Blend[a]	3.2	0.1	0.49	45.5	99	302	7.42
Western Canada	Lloyd Blend[a]	3.5	0.2	0.72	58.6	131	329	10.5
Mexico[b]	Maya[c, d]	5.4	0.05	NA	53.4	298	0.2	NA
Venezuela[b]	Boscan[e]	5.4	NA	NA	NA	11,200	NA	NA
California[b]	Hondo Monterey[f]	4.7	NA	NA	0.05	0.07	NA	NA
Selected Medium and Light Crude Oils								
Canada	Suncor Synthetic A[a]	0.2	0.05	0.89	ND	ND	NA	8.72
North Dakota	Bakken Crude [g, h, i]	0.1	NA	NA	0.3	0.3	NA	16.3
Saudi Arabia[b]	Arabian Light [g, d]	2.0	0.99	NA	4	13	NA	NA
U.S. Gulf of Mexico[b]	Hoops Blend [j, k]	1.1	NA	NA	8	12	NA	NA

BTEX: Benzene, toluene, ethylbenzene, xylene

Nickel, Vanadium: These are two heavy metals which naturally occur in crude oil in trace amounts. The concentrations of these metals in crude oil are monitored by refineries for their processes.

Light Hydrocarbons: Crude oils from different sources contain different proportions of light hydrocarbons. The table presents the sum of the butanes, pentanes and hexanes (as a percentage) as an indicator of each oil's relative weight (light or heavy).

NA = Not available or not analyzed; ND = Not detected

[a] *Five-year average in <crudemonitor.ca> for Canadian oils*
[b] *These crude oils are presented for comparison purposes but are not planned to be transported by the proposed pipeline (lightest shaded rows).*
[c] *<www.ogj.com/articles/print/volume-98/issue-20/processing/guide-to-the-world-crudes.html>*
[d] *U.S. Department of State, 2011a*
[e] *Venezuelan Crude Oil Specifications at <www.genesisny.net/commodity/oil/ospecs.html>*
[f] *<http://www.ogj.com/articles/print/volume-90/issue-13/in-this-issue/refining/four-california-ocs-crudes-assayed.html>*
[g] *Capline at <www.caplinepipeline.com/reports1.aspx>*
[h] *Argus White Paper at <www.argus media.com> and http://www.coqa-inc.org/20110609_Mick.pdf (Sinclair Presentation June 9, 2011 by Jay Mick-VP Sinclair)*
[i] *Keystone Response to NDEQ Data Request, 9/10/2012, Revised Table 3.11-1 from Supplemental Environmental Report (light hydrocarbons)*
[j] *BP Crude Oil Assay <www.bp.com>*
[k] *ExxonMobil Crude Oil Assays at <www.exxonmobil.com/crudeoil>*

Total Acid Number

The total acid number is also used by refinery operators to determine the corrosivity of incoming crude oil. Like sulfur, high total acid number values may not correlate with increased corrosion in pipelines (DOS, 2011a; Ramseur et al., 2012). As shown in Table 6.3-2, total acid number values for dilbit and other oil sands-derived products may be slightly higher but are generally comparable to other heavy crude oils.

Sediment

Crude oils naturally contain varying amounts of sediment. Higher levels of abrasive solids, especially hard silicate particles from oil sands, could result in increased erosion of the interior of the pipeline. Keystone's tariff would restrict the amount of combined sediment and water to 0.5 percent, by volume, in the crude oil accepted for transportation in the proposed pipeline (DOS, 2011a). Special Condition 34 (Appendix F.2) would require Keystone to report annually to PHMSA the actual levels of basic sediment and water that have been transported through the pipeline. Table 6.3-2 indicates that sediment in dilbits and other oil sands-derived crude oils is generally similar to the amount in conventional crude oils. However, these sediment data do not include the exact composition or characteristics of the sediment in each type of oil. Congress has directed PHMSA to perform a study (described in more detail in Section 6.3.3) to determine whether pipeline transportation of dilbit results in an increased risk of release. This study is being conducted by the National Academy of Sciences and is described in further detail in Section 6.3.4. Additional information on pipeline corrosion can also be found in Section 6.5.

Toxicity

Toxicity refers to the degree of harm to humans that could result from exposure to a given compound. Of the crude oil products that would be carried by the proposed pipeline, two groups of compounds are most notable for their toxicity:

- BTEX
- Polycyclic aromatic hydrocarbons (PAHs)

Benzene is known to be one of the most toxic components of crude oil, and is a known carcinogen. The diluents that are blended with bitumen to form dilbit contain BTEX. BTEX occur at higher concentrations in condensate or other lighter petroleum products, and at lower concentrations in bitumen, crude oil, and other heavy petroleum products. Keystone stated in its SER (2012b: Appendix N) that the products carried by the proposed pipeline would contain between 0.05 and 1 percent benzene, 1 to 5 percent toluene, and up to 1.5 percent xylene[7].

Dilbit and other oil sands-derived products (except for synthetic crude oil) are classified as heavy crude oils, meaning they generally have a lower percentage of light hydrocarbons (such as BTEX) than light crude oils. As shown in Table 6.3-2, levels of benzene in dilbit, synbit, and dilsynbit are generally similar to or lower than in conventional crude oils. Following large oil spills, levels of benzene in the air are usually monitored. As described in Section 6.2, high benzene concentrations resulted in voluntary evacuations following the 2010 Enbridge spill into the Kalamazoo River. Benzene is one of the most water-soluble of the many chemicals that make up crude oil. The spread of benzene in surface water or ground water is described in detail in Section 6.4.

Bitumen and crude oil also naturally contain a group of chemicals known as PAHs. PAHs contain multiple, linked carbon rings and are relatively heavy and less likely to evaporate. Over 100 different chemicals are classified as PAHs. PAHs are also formed by incomplete combustion of coal and other products, and humans are exposed to PAHs by breathing air contaminated by wild fires or coal tar, smoking tobacco, or eating grilled or charred meats. Most PAHs do not readily dissolve in water and they tend to stick to solid particles and sink to the bottom of waterbodies. PAHs spilled on soil also are most likely to stick tightly to particles, although certain PAHs can move through soil to contaminate groundwater. Many PAHs are considered carcinogenic (U.S. Department of Health and Human Services, 1996). Bitumen has a higher concentration of PAHs than crude oil. Levels of PAHs in crude oils are not commonly reported, and it is not clear whether dilbit or the other oil sands-derived products would contain more PAHs than conventional crude oils.

Density

Crude oils transported in pipelines have a density of less than 1 gram per milliliter, meaning the oil floats on water. However, as described in Section 6.2 for the 2010 Enbridge spill, weathering of spilled oil or dilbit in the open environment results in the evaporation of the lighter components of the oil. For very heavy crude oils such as dilbit, synbit, and dilsynbit, the

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[7] For comparison purposes, EPA limits benzene in gasoline. Beginning in 2011, refiners must meet an annual average gasoline benzene content standard of 0.62 percent by volume on all gasoline, both reformulated and conventional, nationwide. Refiners must also meet a maximum average of 1.3 percent by volume for gasoline produced beginning on July 1, 2012 (72 FR 8428).

remaining mixture may become heavier than water and sink. In surface water, submerged oil needs different cleanup methods than those used for oil floating on the water's surface. Sediment is agitated to reintroduce submerged oil to the surface for cleanup, which can adversely affect plant and animal species and sediments on the bottom of a river or lake.

6.3.4 National Academy of Sciences Study

Because of public concerns regarding pipelines carrying oil sands-derived crude oil, Congress directed the U.S. Secretary of Transportation to conduct a study to determine whether pipeline transportation of dilbit results in an increased risk of release (Public Law 112-90, the Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011).

PHMSA has contracted with the National Academy of Sciences, which has formed a committee to perform an independent study. The first phase of the study will be to examine whether dilbit can create an increased likelihood of spills relative to other crude oils transported through pipelines. Results from the first phase of the study will be presented to Congress in July 2013. If the study does find an increased probability of release, the National Academy of Sciences would then conduct a second study to determine whether hazardous liquid pipeline regulations are sufficient to mitigate the increased likelihood of release (National Academy of Sciences, n.d.). The National Academy of Sciences website indicates that both phases of the study should be completed by March 2014.[8]

A group of concerned stakeholders, including the Sierra Club, the National Resources Defense Council, the National Wildlife Federation, and others has requested that the Secretary of Transportation expand the study to determine whether dilbit spills pose greater risks to the environment than conventional crude oil spills and whether pipeline operators transporting dilbit should therefore be required to include different mitigation measures in their ERPs (Bold Nebraska et al., 2012).

6.4 CONSEQUENCES OF A PIPELINE SPILL

The accidental release of oil from the proposed pipeline is of primary concern to many Nebraskans. Particular concern has been voiced about the impact a spill could have on sensitive environments such as shallow groundwater, flowing surface water, and wetlands. High-profile oil spill events such as the July 25, 2010 Enbridge spill near Marshall, Michigan, have served to reinforce these concerns. Spills do occur; however, the size of spills and the extent and magnitude of their impacts are difficult to predict.

The impacts of an oil release would depend on many different factors such as spill size, terrain, ground cover, soil type, depth to groundwater, weather conditions, and proximity to surface water. In addition, rapid and effective emergency response is paramount to mitigating the impacts of a spill. Keystone is required by 49 CFR § 194 to prepare an ERP specific to the Keystone XL Pipeline.

[8] See <http://www.nationalacademies.org/cp/projectview.aspx?key=49461>.

6.4.1 Pipeline Incidents

Accidental releases of oil from the proposed pipeline could occur from the pipeline or ancillary facilities such as pump stations and valves. PHMSA requires that hazardous liquid pipeline operators record spill incidents for spills greater than 5 gallons, including the cause of the incident and the content of the pipeline. PHMSA maintains a publicly accessible database that identifies approximately 50 specific incident types organized into seven incident categories. Table 6.4-1 presents a list of these incident categories and the percentage of pipeline spill incidents by category.

Table 6.4-1. Causes of Onshore Hazardous Liquid Pipeline Incidents in the U.S.

Reported Cause of Incident	Number of Incidents Reported (1992 to 2011)	Percentage of Total Incidents
Material, weld, and equipment failure	2,050	37.7
Corrosion	1,241	22.8
Excavation damage	598	11.0
Incorrect operation	516	9.5
Natural force damage	214	3.9
Other outside force damage	83	1.5
All other causes	737	13.6

Source: <http://primis.phmsa.dot.gov/comm/reports/safety/Allpsi.html?nocache=3922#_liquidon>. Data includes spills from crude oil pipelines and other hazardous liquids pipelines.

6.4.2 Movement and Fate of Spilled Oil

Crude oil released to the environment weathers and changes composition through processes such as spreading, evaporation, adsorption, infiltration, degradation and dissolution. These processes are not exclusive of each other and may occur simultaneously. Oil remaining in the environment for more than a few days or weeks will also begin to be affected by processes such as biodegradation. This section describes how oil moves and weathers in various environments, including dry ground, surface water, and groundwater.

Spill Volumes

Oil volumes are typically measured in units of barrels or gallons. Each barrel of oil is equivalent to 42 gallons. NDEQ selected the following spill volumes to provide context to the discussion of oil movement, weathering and spill consequences:

- Small spill: 5 to < 50 barrels (210 to 2,099 gallons)
- Medium spill: 50 to < 1,000 barrels (2,100 to 41,999 gallons)
- Large spill: 1000 to 20,000 barrels (42,000 to 840,000 gallons)
- Very large spill: greater than 20,000 barrels (more than 840,000 gallons)

To better understand how frequently spills occur, NDEQ reviewed two PHMSA incident data sets: one included incidents that occurred in the U.S. between 2002 and 2009, and the other included incidents from January 2010 through August 2012. Both data sets yielded similar results when comparing the percentage of spills with spill size. Table 6.4-2 presents the number of incidents for each spill size, using the most recent data. The table presents incidents for all

hazardous liquid pipelines and the subset of crude oil pipelines. The data indicates that the majority of spills involve less than 50 barrels.

Table 6.4-2. Onshore Hazardous Liquid and Crude Oil Pipeline Spill Incidents in the U.S. by Volume from January 2010 to August 2012

Spill Size	Range of Spill Volumes (barrels)	Number of Hazardous Liquid Pipeline Spill Incidents Recorded	Percent of Spills	Number of Crude Oil Spill Incidents Recorded[a]	Percent of Crude Oil Spills[a]
Small spill	<50	736	80.7	326	78.6
Medium spill	50–999	133	14.6	70	16.9
Large spill	1,000–20,000	42	4.6	18	4.3
Very large spill	>20,000	1	0.1	1	0.2
Total		**912**	**100**	**415**	**100**

Source: Data extracted from <http://primis.phmsa.dot.gov/comm/reports/safety/SIDA.html?nocache=9427>. Unzip the "Current Data Incident File" and select the file: [hl2010toPresent]. Data represents all onshore hazardous liquid pipeline spills in the U.S. from January 1, 2010, to August 31, 2012.

[a] *Crude oil spills are a subset of the total onshore hazardous liquid pipeline incidents.*

Since 2009, there has been one reported spill larger than 20,000 barrels.[9] Between 2002 and 2009 there were seven spills larger than 20,000 barrels, four of which were crude oil spills. Even though large spills are less common, their effects on the environment can persist.

Some reported spills occur within secondary containment areas and may not result in impacts on the environment. Most of the spills that occurred between January 2010 and August 2012 were contained within operator-controlled property, although some migrated onto adjacent property, and some occurred along the pipeline ROW, as shown in Table 6.4-3.

[9] Enbridge spill on Line 6B near Marshall, Michigan (see Section 6.2 of this Draft Evaluation Report for details).

Table 6.4-3. Onshore Crude Oil[a] Pipeline Spill Incidents, by Location, in the United States from January 2010 to August 2012

Spill Location	Number	Percentage
Spill originated and contained on operator-controlled property	306	73.7
Spill originated on operator-controlled property but spill migrated off property	28	6.8
Spill occurred in Pipeline ROW	74	17.8
Location not recorded in database	7	1.7
Total	**415**	**100**

Source: Data extracted from <http://primis.phmsa.dot.gov/comm/reports/safety/SIDA.html?nocache=9427>. Unzip the "Current Data Incident File" and select the file: [hl2010toPresent]. Data represent all onshore hazardous liquid pipeline spills in the U.S. from January 1, 2010, to August 31, 2012.

[a] *Crude oil spills are a subset of the total onshore hazardous liquid pipeline incidents.*

Overland Spreading and Weathering of Spilled Oil

Spills may occur aboveground at pump stations or valves or belowground at pipeline depths. Spills occurring at pipeline depth may initially remain within the backfill material in the pipeline trench. Backfilled soils, having been disturbed, are characteristically less compacted than the surrounding undisturbed soil. Spills approaching medium size and larger are likely to be visible at the ground surface. Large and very large spills will most certainly show up on the ground surface because the volume of oil is greater than the void spaces in the soil immediately surrounding the release point.

Oil spilled on the ground surface will begin to thin as it spreads. For spills that occur on dry land, the spreading of oil is controlled by properties of the oil such as viscosity and the physical characteristics of the environment such as terrain, vegetation, and soil type. Meteorological conditions also play a role in the movement of spilled oil.

Terrain features such as ditches, gullies, dry creek beds, and other depressions are the largest factor controlling the overland spread of oil. Spreading oil fills depressions and flows downhill under the influence of gravity, seeking the path of least resistance. Depressions can help contain a spill, but channel features can also serve to convey it. A large or very large spill that spreads into a dry creek bed might be contained by the width of the creek bed but could flow downgradient for significant distances. In addition, heavy rains can transport oil that may have otherwise become immobile.

The areal extent of the spill is determined by the volume and pool thickness of the oil. Table 6.4-4 displays information on the potential area of impact associated with spills of varying volumes and thicknesses. The actual thickness of the oil as it spreads across the landscape depends on the characteristics of the oil (e.g., viscosity), terrain, soil type, vegetation, and weather conditions. To provide a general sense of the areal extent of a spill, 4 presents very simplified conditions.

Table 6.4-4. Approximate Surface Area Covered by Crude Oil Spill on Land, for Varying Spill Volumes and Oil Thicknesses

Oil Volume (barrels)	Oil Volume (gallons)	Assumed Oil Spread Thickness (inches)	Spill Radius (feet)	Approximate Area (acres)
50	2,100	0.5	46	0.2
50	2,100	1.5	27	0.1
1,000	42,000	0.5	207	3.0
1,000	42,000	1.5	120	1.0
20,000	840,000	0.5	926	62.0
20,000	840,000	1.5	535	21.0

Note: The calculation of spill area assumes a uniform thickness and radial distribution. Actual conditions in the environment are likely to be much more variable.

As oil spreads, it infiltrates into open voids in the soil and adsorbs (attaches) to soil particles and vegetation. The degree to which the oil infiltrates and adsorbs is a function of soil type. Sandy (well-drained) soils such as those found in the northern and Platte River portions of the Nebraska Reroute have greater potential for infiltration than soils with higher clay content (poorly drained) in the central part of the Nebraska Reroute. Oil tends to adsorb more to soil high in organic material than to soil that is high in minerals.

As the oil continues to spread and more surface area is exposed, evaporation of lighter compounds within the oil matrix increases. Evaporation, also called volatilization, is the partitioning of lighter compounds such as pentane or benzene from the liquid phase to the vapor phase or gas phase. The evaporated compounds enter the atmosphere and air and dissipate.

Oil Movement and Weathering on Surface Water

When coming into contact with surface water, oil tends to spread farther and create a much thinner film than would be expected on dry land. This thin film also results in more exposed surface area and more rapid evaporation of the lighter compounds. The result is a larger area of impact and a higher density of the residual oil. Oil on water can be more difficult to contain and is a greater threat to the environment than a dry land spill. Oil movement on water is primarily influenced by the speed of the current and can also be affected by meteorological conditions such as wind, rain, and snow, which create greater challenges for cleanup responders.

Oils moving through the pipeline are lighter than water and relatively insoluble in water and will therefore tend to float; however, some of the more soluble chemicals, including benzene, do have the potential to dissolve in water. As mentioned above, some of the volatile compounds will also evaporate.

Oil floating on the Kalamazoo River, Enbridge Spill, near Marshall, Michigan. Photo from EPA, 2010

Oil that remains after evaporation and dissolution can become dense enough to sink. Following the Enbridge spill near Marshall, Michigan, EPA determined that weathering and evaporation of the lighter components of the crude oil had turned the remaining oil into a tar-like solid and that a significant amount of material had sunk to the bottom of the river (EPA, 2011a).

Turbulent water in high-velocity steams or wind-chopped lakes and ponds can cause oil globules to break free from the larger oil mass and become suspended in the water column. If the oil particles are small enough they can remain in suspension; this is known as emulsification. Because emulsified oils remain in suspension, they are more difficult to capture in a cleanup process. As a result, emulsified oils can persist and move farther downstream in flowing water.

Oil Movement in Groundwater

Oil would come in contact with groundwater if a spill occurs in a buried pipeline section that is submerged or partially submerged in the groundwater. If the spill is at an aboveground facility such as a pump station or valve, or in a section of buried pipeline that is above the groundwater, the oil could migrate downward through the unsaturated soil zone until it reaches the groundwater table. As the oil migrates downward, a portion of the oil is retained in soil pore spaces by capillary forces and attached to soil particles by adsorption. The infiltration of oil into the subsurface will occur more readily in relatively porous and well-drained soils.

As oil reaches the groundwater table, pore spaces in the soil are occupied by water and the oil begins to move laterally. The oil will continue to spread laterally and accumulate until the saturation capacity of the soil is reached. This accumulation of oil forms a lens at the ground-water table. As long as there is a sufficient supply of oil from above, the lens will continue to increase in thickness and areal extent, lengthening in the direction of groundwater flow.

Because groundwater elevations fluctuate, the lens of oil can be smeared upward when groundwater rises and, conversely, the oil can migrate deeper if the groundwater elevation falls. This smear zone or the lens becomes the source of soluble oil compounds that dissolve into the groundwater.

Groundwater flows from areas with a higher water table elevation to areas with a lower water table elevation. Contaminants dissolved in groundwater are carried with the water and move in the direction of groundwater flow. Flow is both horizontal and vertical, although groundwater primarily moves horizontally. The concentration of contaminants is highest at the source, with contaminants decreasing in concentration as they travel away from the source because of processes such as dispersion, sorption, and biodegradation. The dissolved contaminants create a plume that can extend for several hundred feet outward depending on the concentration of the compounds and subsurface conditions. The size of the plume can stabilize due to natural attenuation factors (API, 1998). Over an extended period of time, if the source of the contamination is removed, the size of the plume can begin to shrink. Details of potential contaminant concentrations and plume travel are further described in Section 6.4.3.

6.4.3 Potential Impacts on Resources

Crude oil accidentally released during pipeline operation may adversely affect natural resources important to Nebraskans. A spill has the potential to adversely affect the quality of soil, groundwater, surface water, health of humans, and wildlife and plants. The degree of impact depends on variables such as spill volume, oil characteristics, areal extent, weather conditions, terrain, ground cover, soil type, depth to groundwater, and proximity to surface water. In addition, rapid and effective emergency response is crucial in mitigating the impact of a spill.

When evaluating impacts, NDEQ considered a broad range of factors that might affect environmental resources. These factors are described in this chapter and elsewhere in the Draft Evaluation Report. The evaluation of impacts does not consider site-specific information, but does give consideration to environmental conditions found in Nebraska. The following factors were considered common to all resource categories when assessing impacts (consideration is given to pipeline spills only):

- Project location, configuration, and operating conditions
- Composition and characteristics of the oil in the pipeline
- Behavior and movement of oil in the environment
- Keystone's response time and effectiveness of spill cleanup
- Categorical description of small, medium, large, and very large spill volumes

Soils

Soil would be adversely affected as a result of oil spreading overland, attaching to soil particles, and infiltrating into soil voids. Soil would also be affected by overland traffic and excavation activities during cleanup operations (both short-term emergency response and subsequent remediation).

Oil released to soil would migrate horizontally and vertically through the soil column, but the extent of migration in each direction would depend on the soil properties, oil characteristics, and size of the release. In general, however, sandy (well-drained) soils such as those found in the northern and Platte River portion of the Nebraska Reroute would have greater potential for deeper vertical migration than soils with higher clay content (poorly drained) in the central part of the Nebraska Reroute.

Also, the fragile soils found in the northern part of the Nebraska Reroute would be particularly sensitive to the traffic needs of a cleanup effort and would likely be more difficult to reclaim.

Surface Water

Spills reaching surface water would have a direct impact, affecting the water surface, the water column, and the stream or pond bed and banks. The extent of the spill depends on the volume of oil released and the velocity of the stream. For example, Enbridge's Line 6B spill adversely affected up to 25 miles of the Kalamazoo River. A spill could directly affect habitat associated with streams or ponds. For example, oil floating on the surface would adversely affect waterfowl using the stream surface. In fast-flowing rivers, the turbulence of the flow could increase volatilization. Oil floating on the surface would also limit oxygen exchange between water and air, thereby reducing dissolved oxygen and adversely affecting fish and other aquatic species. Impacts and spill response strategies would be complicated by the presence of ice.

Oil sheen and boom on the Kalamazoo River, Enbridge Spill, near Marshall, Michigan. Photo from EPA, 2010

Oil washing onto the banks would adversely affect riparian vegetation as well as wildlife using streams or ponds as water sources. As noted above, oil that remains after evaporation and dissolution can become dense enough to sink. As this material settles to the bed, invertebrate communities could also be adversely affected.

For flowing waters, the flow rate at the time of a spill would be a critical factor in determining the extent of the impact. The Nebraska Reroute would cross a number of streams that would have a wide range of velocities. NDEQ recognizes the importance of rapid deployment and effective emergency response operations to limit impacts on surface water.

The importance of rapid and effective emergency response is illustrated through a review of the 2010 Enbridge Pipeline release in Marshall, Michigan. The NTSB findings show that the emergency response efforts were focused on oil containment measures downriver of the advancing oil sheen (many miles from the release site) on the river. NTSB noted that the emergency response efforts should have been focused in the source area of the release, and that doing so would have reduced both the exposure risk to citizens living downriver and the severity and extent of the pollution resulting from the release. NTSB concluded that "a more effective approach to mitigating the effects of the oil spill with limited resources would have been to focus on containing the bulk of the oil as close to the point of release as possible" (NTSB, 2012).

Groundwater

In Nebraska, the principal aquifer underlying the Nebraska Reroute is the High Plains Aquifer. The Ogallala Formation is the principal geologic unit in the aquifer. The High Plains Aquifer consists mostly of near-surface sand and gravel deposits. The geologic units that make up the High Plains Aquifer can be hydraulically interconnected, and this interconnection could support a continuous water table throughout most of the region.

Crude oil constituents coming in contact with groundwater will dissolve into the aqueous phase. The rate at which these constituents go into solution is attributable to several factors such as solubility of the constituents and velocity of the groundwater. In general, higher dissolution is associated with higher solubility compounds and relatively high groundwater velocities (EPA, 1995).

The vulnerability of groundwater to contamination from a spill or leak depends on a number of factors and conditions. Factors that would influence the extent of impact on groundwater include:

- Volume of product released and characteristics of spilled oil
- Location of the release relative to the groundwater table
- Surface topography
- Type and thickness of overlying soil deposits
- Rate and direction that groundwater flows
- Weather and soil conditions

In parts of Nebraska, groundwater may be just a few feet below the surface, while in other areas it may be a few hundred feet underground. The amount of water that can be withdrawn from a given aquifer may range from a few gallons per minute (which is enough to supply a typical household) to many hundreds or even thousands of gallons per minute (which is the yield of large irrigation, industrial, or public water supply wells) (NDEQ, 2011).

A database (NDNR, 2012) analysis was conducted to determine the number of registered groundwater wells within 1,000 feet of the proposed Nebraska Reroute. Stock and domestic wells drilled before 1993 are not required to be registered. Certain dewatering and other temporary wells are also not required to be registered. Table 6.4-5 presents the results of the database query and indicates 276 groundwater wells are within 1,000 feet of the Nebraska Reroute.

Table 6.4-5. Groundwater Wells within 1,000 feet of Nebraska Reroute

Number of Groundwater Wells and Distance from Nebraska Reroute		
Wells within 500 feet	Wells within 750 feet	Wells within 1,000 feet
116	188	276

Note: Ground Water Well Registrations Online Search. Retrieved October 16, 2012. <http://dnrdata.dnr.ne.gov/wellscs/Menu.aspx>.

Shallow Aquifers

Shallow aquifers are more at risk from impacts from spills and leaks because of the proximity to the land surface where spills and leaks would occur. Shallow groundwater is of special concern where the water resource is used for domestic and livestock watering uses. The Nebraska Reroute crosses approximately 13 miles of areas where the groundwater is less than 10 feet bgs.

Wellhead Protection Areas

WHPAs located downgradient of the proposed pipeline would be susceptible to potential impact from a spill or leak. WHPAs may be the only source of drinking water for local residents and livestock. In Nebraska, WHPAs are modeled for a 20-year time of travel from their boundary to the wellhead. Keystone rerouted the pipeline to avoid the WHPA of the community of Western. As a result, the Nebraska Reroute does not pass through any mapped WHPAs. WHPAs along the Nebraska Reroute are further discussed in Chapter 4, Affected Environment and Environmental Consequences (Section 4.3), of this Draft Evaluation Report.

Dissolved Phase Crude Oil Constituents in Groundwater

Because groundwater is such an important resource for Nebraskans, NDEQ evaluated the movement of dissolved phase crude oil constituents in groundwater. The purpose of this evaluation was twofold: 1) estimate the approximate time for dissolved phase constituents to reach potential receptors, and 2) estimate the extent or length of a dissolved phase contaminant plume.

Benzene was selected as a surrogate compound to represent the dissolved phase constituents because it is a relatively soluble constituent of crude oil and also a known carcinogen. Benzene is frequently cited in literature related to petroleum hydrocarbon spills.

A spreadsheet model available through the California Environmental Protection Agency was used to estimate the time of travel of benzene and the length of the groundwater plume (California Environmental Protection Agency, 2012). The evaluation assumed crude oil in contact with groundwater for an extended period of time, creating a continuous contaminant source.

A concentration of 5 micrograms per liter (µg/L) was selected for evaluating the distance downgradient from a potential release that a receptor would be affected. This value is the Safe Drinking Water Act Maximum Contaminant Level and is also the groundwater protection standard for benzene in Nebraska Title 118 Groundwater Quality Standards and Use Classification.

Soil and aquifer inputs for the model were based on characteristics similar to those of the Sand Hills region. Although the Nebraska Reroute avoids the Sand Hills region, similar soil and aquifer conditions are present along portions of the alignment.

The evaluation estimated that the concentration of benzene could reach 5 µg/L at a well 500 feet downgradient in approximately 2 years and in 4 years could reach that concentration in a well that is 750 feet downgradient. The results indicate the plume would likely stabilize and not reach an estimated benzene concentration of 5 µg/L at a well 1,000 feet downgradient. The leading edge of the plume would have concentrations of benzene below 5 µg/L and would be expected to arrive more quickly at the receptor wells and extend farther from the source, possibly exceeding 1,000 feet in length.

The results of the NDEQ evaluation provide a rough estimate of how a plume of dissolved phase contaminants might behave under certain conditions in Nebraska. The results of the evaluation are consistent with published literature on dissolved phase hydrocarbon plumes. In a review of 604 petroleum release sites (API, 1998), the lengths of combined plumes of BTEX were evaluated. The majority of plume lengths were less than 200 feet in length. In general, the plume delineation concentration in the study varied from 1 µg/L to 10 µg/L. Fewer than two percent of all BTEX plumes reviewed were greater than 900 feet long. The results of the NDEQ evaluation appear to be reasonable when compared with the API study.

The NDEQ evaluation and published literature suggest that dissolved contaminants moving in groundwater have limits to the extent they migrate. Although the formations within the High Plains Aquifer are hydraulically interconnected, and this interconnection supports a continuous water table throughout most of the region, a crude oil spill that comes in contact with groundwater would have consequences on a local level rather than a regional level.

Water Well Testing

If requested by Nebraska landowners, prior to the date the proposed pipeline would be placed in service, Keystone would conduct baseline water quality testing for domestic and livestock water wells within 300 feet of the final centerline of the pipeline in Nebraska. In the event of a spill in the area, Keystone would conduct water well testing for wells as directed by NDEQ under Title 118. Keystone would also provide an alternate water supply for any well where water quality was found to be compromised by a spill (Keystone, 2012d).

Wetlands

Spills into wetlands would result in impacts similar to those on surface water but would also include impacts on wetland vegetation. Impacts on wetlands would be influenced by the amount and proportion of water surface area covered by the spill and the type of vegetation present in the wetland.

Terrestrial Vegetation

Spills spreading overland would have a direct impact on terrestrial vegetation. According to the Final EIS, "The extent of the impact would be related to the areal extent of the spill. The majority of spills would likely be very small and would typically cover less than 1 acre, but large to very large spills could be extensive, with the areal extent partially dependent on topography and the density, rigidity, and complexity of the vegetation" (DOS, 2011a).

A spill could coat vegetation downslope from the spill site, resulting in damaged crops, pasture, or wildlife habitat. Adversely affected vegetation might not be suitable for grazing animals, and any commercial row or field crops might not be marketable.

A subsurface leak below the water table would reach the root zones of surface vegetation. This could assist in aerial detection of the leak through visible patches of affected vegetation along the pipeline ROW resulting from oil interference with water and nutrient uptake by the plant root systems (DOS, 2011a). PHMSA Special Condition 41 would require Keystone to conduct a minimum of 26 flights per year to perform aerial inspections of the pipeline ROW.

Wildlife

Large and very large spills would have a direct impact on wildlife habitat through vegetation damage and saturation of soils, which could flood animal burrows and result in habitat loss. Waterfowl could be affected directly and indirectly. Direct mortality could occur to small animals such as snakes, lizards, and small mammals that use burrows. If a large volume of released oil spread fast enough, these animals would not have time to detect the threat and abandon threatened burrows. If the release migrated over the land surface to surface water, indirect effects on terrestrial wildlife could occur through ingestion of contaminated water or prey such as fish or aquatic invertebrates.

Fisheries

As described in the 2011 Final EIS (DOS, 2011a), spills would have the potential to impact fish if oil spilled directly into the surface water or entered water bodies after having flowed over land. Toxic concentrations of oil might cause direct mortality to fish and food resources. Because of their reduced mobility, larval- or juvenile-stage fish are generally more sensitive than adults. Sublethal effects might include alteration of overwintering and spawning behavior, reduction in food resources, consumption of prey, and temporary displacement. Sublethal effects over a long period could also lead to mortality from decreased fitness.

Threatened and Endangered Species

Spills could have a direct impact on the individual species and habitats of federal and State-listed threatened, endangered, and protected species. General impacts from spills on habitats or species are discussed in this document by resource category (e.g., wildlife, terrestrial vegetation, wetlands, and fisheries). The primary difference to threatened, endangered, and protected species is that these individuals or populations occur in much smaller numbers or only in specific areas within broad habitat types. While the likelihood of a spill in an area containing threatened, endangered, and protected species is reduced because of the lower occurrence of these species, the impact would be serious if a spill were to adversely affect threatened, endangered, or protected species. In this case, Keystone would need to coordinate with NGPC and USFWS to develop a strategy to minimize further impacts on listed species. Based on previous formal consultation results between DOS and USFWS, any oil spill in designated American burying beetle habitat would require initiation of additional consultation to determine appropriate response actions and follow-up (DOS, 2011a: Section 3.13.6.4). It is anticipated that these conditions would be considered part of future consultation between DOS and USFWS.

Additional detail on listed species with the potential to occur along the proposed Nebraska Reroute can be found in Chapter 4, Affected Environment and Environmental Consequences (Section 4.9) and Appendix E.9.

Agriculture and Land Use

In the event of an oil spill from the proposed pipeline, productivity of agricultural land would be lost until the spills were remediated. The size of the impact would depend on the size of the spill. To the extent that soils would be affected, crops would, in turn, be killed or damaged. To restore agricultural productivity, contaminated soil would need to be removed, disposed of, and replaced with soil having physical and chemical properties similar to those of the original soil. The length of time that cropland would be affected would depend on the magnitude and location

of the spill, but in the affected area, a minimum of one growing season's crop would be lost. Productivity in cropland and pastureland would not be restored until contaminated soil were remediated and the substitute soil properly replaced and graded. In the event that pastureland were affected, productivity would not be restored until vegetation were reestablished to the extent that grazing could resume.

An oil spill or its cleanup could adversely affect drainage tiles or terraces. As described in Section 6.6, Keystone would be financially responsible for taking remedial action to clean up these structures in accordance with Nebraska and federal law. NDEQ would review and approve Keystone's remedial actions. If a spill were to contaminate surface water or groundwater, irrigation systems using these sources would have to be shut down until remediation were completed. Productivity that would have been gained by irrigation would be lost until the water source were remediated. Crop yields for 2011 in the nine counties within the Nebraska Reroute for irrigated corn are, on average, 57 bushels per acre higher than that of nonirrigated corn. Individual county values range from 34 to 92 bushels per acre higher. Crop yields for soybeans are, on average, 10 bushels per acre higher on irrigated land. Individual county values range from 4 to 25 bushels per acre higher (USDA, 2012a and 2012c).

Certified organic farms affected by a spill would need to be recertified before crops could be marketed as organic.

Any conservation land (for example, CRP or Wetlands Reserve Program lands) adversely affected by a spill would need to be restored to pre-spill condition. The governing agency (NRCS or FSA) would conduct a site visit to document that the land had been acceptably restored.

Visual and Recreational Impacts

The important visual elements of the landscape that surrounds the Nebraska Reroute include the rivers and streams, the topography, and the vegetation that blankets that topography. These elements could be substantially affected by an oil spill and its subsequent response activities.

Impacts would involve effects on vegetation located in or near the accidental release area. If a spill occurred in an area visible to the public, short-term impacts would result from the response to the release and from equipment, supplies, and personnel related to remediation efforts.

Cleaning of Talmadge Creek, Enbridge Line 6B spill near Marshall, Michigan. Photo courtesy of EPA.

Public recreational resources that would be crossed by the Nebraska Reroute include the Cowboy Trail and the Outlaw Trail Scenic Byway. Portions of the Niobrara River that would be crossed by the Nebraska Reroute are not part of the Wild and Scenic River system or the Niobrara Canoe Trail, but are still used by the public for canoeing, kayaking, and other activities. Should a spill occur in, under or near waterbodies, recreational activities in those waterbodies would be affected until remediation were complete. The Nebraska Reroute would cross the Niobrara River, Elkhorn River, Loup River, and Platte River watersheds, including a portion of the East Branch Verdigre Creek watershed in Antelope County.

Grove Lake Trout Station Fish Hatchery is located within the East Branch Verdigre Creek watershed, approximately 3 miles northeast of the Nebraska Reroute. NGPC, in a letter to NDEQ, noted it views the fish hatchery as an important recreational resource.[10] Impacts from a spill within this watershed could affect the East Branch Verdigre Creek, the aquatic species within it, the recreational use of the creek, as well as the Fish Hatchery.

The proposed Nebraska Reroute would cross the Niobrara River approximately 46 miles upstream of an area designated as a recreational resource under the National Wild and Scenic Rivers Act. If a spill were to occur into the Niobrara River, and the spill were not contained within the river prior to its reaching the recreational area, then the spill would adversely affect recreational uses of this resource until the adversely affected sections of the recreational area were remediated. However, because of (1) the spill detection systems required by PHMSA and proposed to be used by Keystone, (2) the probable location of an intermediate MLV and/or check valve near the crossing that could reduce the volume of a potential spill, (3) the emergency response proposed by Keystone, and (4) the distance between the Niobrara River crossing and the reach designated as the national recreational river would reduce the likelihood of impacts on the recreational areas if a spill were to occur.

Population and Environmental Justice

As discussed in Section 4.12-1, Existing Conditions, population density in the vicinity of the Nebraska Reroute is generally low, ranging from 1 to 24 persons per square mile. Densities in the northern part of the proposed route are much lower than along the southern part. While the closest towns to the route (Polk and Royal) are approximately 1.6 mile from the centerline of the proposed route, most cities are 5 or more miles from the corridor. Consequently, it is anticipated

[10] From comments received on the Keystone XL reroute in Nebraska. Commenter: Cary Grell, Environmental Analyst, NGPC. June 15, 2012 (NGPC, 2012).

that few people would be exposed to contaminants from a spill over land areas. Somewhat higher populations could be affected by a spill to a surface water body.

Given the limited areas with vulnerable-age or low-income populations, and that no substantially greater minority populations were identified within the 2-mile buffer of the Nebraska Reroute alignment, these populations would not be disproportionately adversely affected by a pipeline spill.

There are small populations of those who speak Spanish or Asian languages—but do not speak English well—located along the Nebraska Reroute. These populations could be more vulnerable to impacts in the event of a spill because of a language barrier that might prevent or limit the understanding of health warnings from emergency response teams.

Public Services

In the event of a large or very large oil spill, public services would be affected if the spill or spill response activities degraded or damaged a public road, railroad, or any utility. Spill response activities typically use heavy construction equipment that could damage roads and related infrastructure. The increased traffic from response equipment could temporarily limit access to fields and farmsteads. The damaged road surface, railroad, or utility would need to be reconstructed to pre-spill condition. Road travel, rail, or utility service could be temporarily and adversely affected; the duration of which would depend on the extent of the spill.

Because the Nebraska Reroute has been routed outside of WHPAs, public water supplies should not be affected. However, if a spill reached a public water supply, it would be adversely affected. Fire suppression services would be adversely affected if the water supply were unavailable, reduced, or contaminated. Drinking water supplies affected by a spill would inhibit the ability of the public water provider to deliver water to the population dependent on the supply. A secondary source of water would need to be provided to meet the population's needs.

Air Quality

According to the Final EIS (DOS, 2011a), air quality impacts of an accidental release of crude oil from the proposed pipeline would be expected to be localized and short-term, with relatively minor consequences to the biological and physical resources in the area. The primary air quality impact of a release would be through volatilization. Lighter hydrocarbons, such as benzene and toluene, would volatilize initially and would quickly dissipate into the atmosphere, followed by progressively heavier volatile and semivolatile hydrocarbons such as PAHs. The rate of volatilization would depend on ambient weather conditions (such as air temperature, surface temperature, or wind) and surface area of the released oil and would be expected to peak within a day to a few days, depending on the conditions and volume of the release.

As described in Section 6.6, personnel responding to an oil spill would monitor the air for hydrocarbons in the vicinity of the release, if necessary, and would restrict public access to areas exceeding specified risk levels. For the vast majority of spills (such as the smaller spills that occurred on the existing Keystone Pipeline), the levels of hydrocarbons would not be expected to pose a hazard to human health, crops, livestock, or the environment. However, for large spills (such as the Enbridge Line 6B spill), air quality impacts did occur, and residents were asked to voluntarily evacuate their homes. In the event of a large or very large spill along the Nebraska

Reroute, NDEQ would conduct air quality monitoring to gauge potential human health risk and would implement an appropriate response based on the monitoring results.

Noise

Noise impacts associated with a spill response would be similar to impacts associated with pipeline construction. Noise-generating activities associated with a response team would include spill containment and remediation. The duration of cleanup activities (and associated noise) would depend on the magnitude of the spill.

Energy

An oil spill would not be expected to adversely affect energy resources. Spill response equipment would use diesel-generated power sources.

Hazardous Materials Sites

An oil spill would not be expected to adversely affect existing hazardous materials or sites along the Nebraska Reroute. However, pipeline oil spills do have the potential to generate new hazardous waste sites.

6.4.4 Economic Impacts of Spills

Once the Nebraska Reroute were completed and in operation, the region would face the risk of pipeline failure due to a variety of threats such as corrosion, material and construction flaws, incorrect pipeline operations, accidental damage due to third-party excavations, and natural hazards. Depending on the size and location of the failure, the volume of oil spilled and the subsequent potential effects on humans and natural resources would change.

The construction of a pipeline would introduce a new risk to the region: the risk of pipeline failure and oil spills and the subsequent negative impacts on humans and natural resources. Specifically, the economic impacts of a spill would include the cost to local residents from contaminated drinking water, the cost to farmers from contaminated irrigation water, the cost to residents from property damage, and the cost to the public from contaminated natural areas.

Methodology for Estimating Financial Impacts

Methodologies for estimating natural areas damages can be found in the U.S. Department of the Interior's Natural Resource Damage Assessment Handbook (U.S. Department of the Interior, Bureau of Land Management, 2008). The cost to damaged resources is generally estimated by the acreage affected, the duration of the impact, and the damage to wildlife habitat. This includes the cost to restore natural areas by type of resource including deciduous forests, open water, emergent herbaceous wetlands, and forested wetlands.

The costs of contaminated drinking water would be associated with the increased cost of supplying clean drinking water over the period of contamination. This impact would depend on the area of contamination around the spill site, the duration of contamination, and the cost of alternate water supplies. This cost would be a function of treatment costs for household drinking water, spill site cleanup, groundwater cleanup, and long-term monitoring of groundwater supplies.

The costs to farmers from contaminated irrigation water would be associated with the loss in production for crops that depend on irrigation. This impact would depend on the area of contamination around the spill site, the duration of contamination, and the level of lost productivity from either forgoing irrigation or using contaminated irrigation water. This cost would be a function of damaged crops, reduced agricultural production, spill site cleanup, and long-term monitoring of groundwater supplies.

Table 6.4-6 shows the types of resources and activities with monetary impact that could be affected and the types of cost structure that could be used in the event of an oil spill. Additional and more specific resource categories and unit pricing could also be developed depending on spill impact. Developing cost for affected resources using the Natural Resource Damage Assessment method is one way landowners and other Nebraska stakeholders could establish monetary value to resources.

Table 6.4-6. Categories of Potential Spill Damage

Type of Resource	Type of Activity with Monetary Impact	Unit
Natural Areas Damages		
Deciduous forest	Replanting and monitoring	$/acre
Emergent herbaceous wetlands	Mitigation, replacement, and monitoring	$/acre
Open water spills	Cleanup and monitoring	$/spill
Forested wetlands	Mitigation, replacement, and monitoring	$/acre
Agricultural Damages		
Cultivated crop damages	Damages to crops	$/acre
Weed treatment	Incremental cost of additional weed control after spill restoration	$/acre
Land cleanup costs	Soil clearing and remediation	$/acre
Center-pivot damages	Replacement of irrigation center pivots	$/spill
Contaminated Groundwater: Drinking Water Supply Wells		
Household drinking water treatment costs	Household water treatment through carbon filtration	$/well
Soil cleanup costs	Spill site excavation and cleanup	$/acre
Drinking well monitoring	Drilling and operations for monitoring wells	$/year
Contaminated Groundwater: Irrigation Water Supply Wells		
Crop losses	Damages to crops	$/acre
Loss of production post-spill	Reduction in irrigated acres	$/acre
Irrigation well cleanup	Spill site excavation and cleanup	$/acre
Irrigation well monitoring	Drilling and operations for monitoring wells	$/year

6.4.5 Summary

The operation of the Nebraska Reroute would introduce a new risk of contamination to groundwater and soil in the event of a pipeline failure and a release of crude oil. Crude oil released during pipeline operation might affect resources important to Nebraskans. A large or very large spill has the potential to substantially adversely affect the quality of groundwater, surface water, human health, and sensitive wildlife and plants.

The degree of impact would depend on variables such as spill volume, extent and duration of spill, and the sensitivity of the location. In addition, rapid and effective emergency response would be paramount to mitigate the impact of a spill. Although very large spills are relatively infrequent events, they pose a degree of risk that should be mitigated.

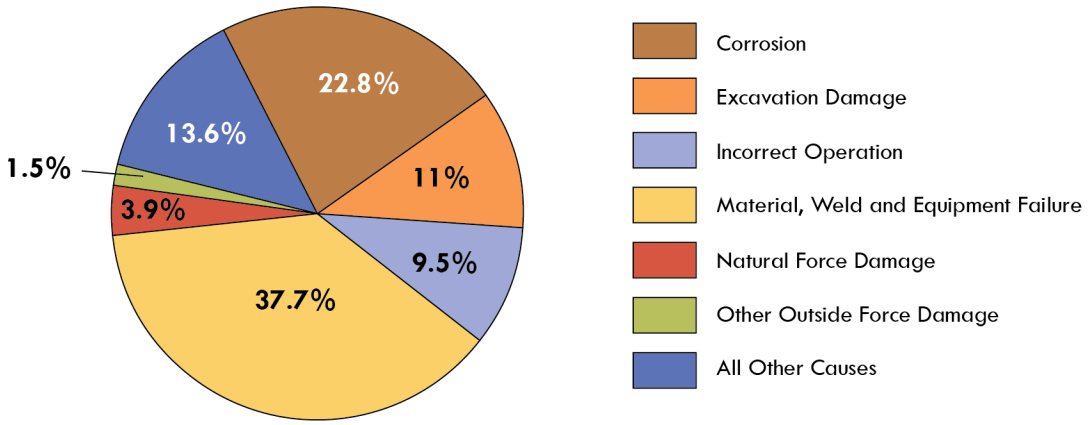
In the event of a spill, monetary values could be established for resources to allow for fair compensation from parties responsible for the spill. The value of impaired resources would depend on the size and location of the failure, the volume of oil spilled and the subsequent potential effects on humans and natural resources. The Natural Resource Damage Assessment Handbook describes methods that could be used to place monetary values on affected resources. Keystone has committed to carrying a minimum of $200 million in third party liability insurance to cover sudden and accidental pollution incidents from Keystone XL Pipeline in Nebraska.

6.5 SPILL PREVENTION AND DETECTION DURING PIPELINE OPERATION

Keystone has integrated a number of measures intended to prevent and detect spills during pipeline operation. NDEQ has reviewed and evaluated these measures, which are discussed in this section.

PHMSA requires pipeline operators to report spill incidents, including cause, for any release greater than 5 gallons. Figure 6.5-1 shows a summary of the causes of all incidents PHMSA has recorded in its database for hazardous liquid pipelines, from 1992 to 2011. (This information is also presented in Table 6.4-1). The measures Keystone has adopted to reduce the chance of an accidental release, by each cause shown in the figure, are described in the following sections.

Figure 6.5-1. Causes of On-Shore Liquid Pipeline Incidents, 1992-2011



6.5.1 Spill Prevention Measures to Be Incorporated during Design and Construction of the Pipeline

As shown in Figure 6.5-1, the most common cause of pipeline incidents is failure of materials, including manufacturing and construction-related failures of pipeline seams and welds and pump equipment or fittings. Keystone would incorporate measures described below to prevent material, weld, and equipment failures during design, manufacture, and construction of the pipeline. PHMSA has recommended to DOS that it should impose 57 Special Conditions if a Presidential Permit is to be granted and that the State Department should require Keystone to include all of the 57 Special Conditions in its written design, construction, and operating and maintenance plans and procedures.

PHMSA identified four areas of focus for the 57 Special Conditions:

- Materials (Special Conditions 1 through 9)
- Construction Requirements (Special Conditions 10 through 23)
- Operations and Maintenance (Special Conditions 24 through 49)
- Reporting, Records Retention, and Senior Level Certification Requirements (Special Conditions 50 through 57).

Keystone stated in its Presidential Permit Application, filed with DOS in May 2012, that it would commit to following the 57 Special Conditions. These conditions are provided in Appendix F.2.

Pipe Specifications, Manufacture, and Inspection

Keystone's 2012 Presidential Permit application describes the design criteria for the steel pipe Keystone would use to construct the project. The pipe specifications are presented in Appendix F.1. Conditions 1 through 9 of the 57 additional measures recommended by PHMSA (Appendix F.2) further specify requirements for the pipe during its manufacture, coating, and transportation to the construction area. The pipeline design would be based on a maximum 1,308 pounds per square inch gauge discharge pressure at each pump station. As specified in 49 CFR § 195.106, the wall thickness of the line pipe would be a minimum of 0.465 inch. The wall thickness would be increased in certain areas, up to 0.748 inch at uncased railway crossings and HDD crossings under streams. Keystone-authorized inspectors would be stationed in the pipe mill through the duration of pipe production to monitor compliance with specifications throughout the manufacturing process and to inspect the finished pipe.

Welding

Pipeline welding is described in detail in the Final EIS (DOS, 2011a: Section 2.3.2.4). All welds would be inspected using nondestructive radiographic, ultrasonic, or other methods that would meet or exceed the requirements of 49 CFR § 195.228 and Special Conditions 4, 5, 6, 12, 18, and 20 of the 57 additional measures recommended by PHMSA (Appendix F.2). If weld inspectors determined that a weld did not meet established specifications, the weld would be repaired or removed and replaced. Once the welds were approved, the weld area would be sandblasted and heated and a protective epoxy coating (similar to the FBE coating applied to the rest of the pipe at the manufacturing facility) would be applied to the welded joints to inhibit corrosion.

Pipe Coating Inspection

Before the pipe is lowered into the trench, the protective epoxy coating (both factory-applied and postweld coatings) would be checked for damage. Instruments known as "holiday detectors," or "jeepers," would be used to detect holidays—pinholes, thin places, or bare spots—in the epoxy coating. These instruments apply high voltage to the coating to nondestructively test for flaws. Any coating defects found would be repaired and rechecked before the coated pipe would be buried underground. Specifications for this nondestructive, high-voltage testing are the topic of PHMSA Special Conditions 9 (for the pipe) and 10 (for the field-applied coating to girth welds).

Hydrostatic Testing

Once a section of pipeline were lowered into the trench and backfilled—and prior to putting the pipe in service—Keystone would perform hydrostatic testing. This testing would be performed by filling a section of the pipe (30 to 50 miles long) with water and subjecting the pipeline section to a specific pressure that would be higher than the operating pressure. The exact pressure would be specified by the regulatory requirements of 49 CFR § 195, Subpart E (Pressure Testing), and by the stipulations in PHMSA Special Conditions 5, 20, 22, and 23. The pressure would be maintained for a period of 8 continuous hours to ensure that the pipeline segment would be capable of withstanding the maximum operating pressure. Pump stations would also undergo hydrostatic testing. Hydrostatic testing is described in further detail in Chapter 2, Project Description, of this Draft Evaluation Report.

Pipe Installed by the Horizontal Directional Drilling Method

Some sections of the proposed pipeline in the Nebraska Reroute would be installed using HDD, as described in Chapter 2, Project Description. There were some public concerns that use of HDD could damage the protective coating of the pipe or the pipe itself.

During HDD installations, the pipeline would be protected by application of an abrasion-resistant overcoating to the FBE coating on the segments of pipe (pipe joints) designated for HDDs. This overcoating prevents damage to the corrosion-resistant FBE coating as the pipe is pulled through the bored hole. During typical HDDs, the reamed hole is significantly larger than the pipe's outside diameter, and bentonite drilling mud is pumped through the bore hole to reduce friction and provide lubrication as the pipe is pulled back through the boring. Keystone would follow these practices.

Final Testing

Special Condition 43 would require that Keystone run a deformation tool through all mainline piping prior to putting the product in the pipeline and that it remediate all expanded pipe in accordance with PHMSA's 57 Special Conditions (Appendix F.2). The final pipeline tie-ins would then be welded and inspected. Keystone would also be required to perform a baseline in-line inspection using a "geometry tool" no later than 6 months after placing the pipeline in service. The geometry tool (or "caliper pig") would record the inside measurements of the pipe and any dents, wrinkles, or ovality. If necessary, based on the results of the in-line inspection, pipe sections would be replaced in accordance with the requirements of 49 CFR § 195 and the Special Conditions.

6.5.2 Corrosion Protection Measures

PHMSA statistics indicate that 22.8 percent of hazardous liquid pipeline incidents are caused by corrosion. External corrosion was the cause of 9.7 percent of incidents, internal corrosion caused 7.9 percent, and for 5.2 percent of incidents, the type of corrosion was unspecified. The buried external surface of the proposed pipeline would be exposed to a wide variety of environmental conditions, from dry soils (considered to be less corrosive) to wet soils containing salts and byproducts from fertilizers, agricultural chemicals, or animal wastes (considered to be more corrosive). A combination of measures would be used to protect the pipeline from corrosion as described below. External corrosion protection for the pipeline would involve a combination of external coating and cathodic protection systems. Internal corrosion would be monitored through in-line inspections. External corrosion and internal corrosion are described in further detail below.

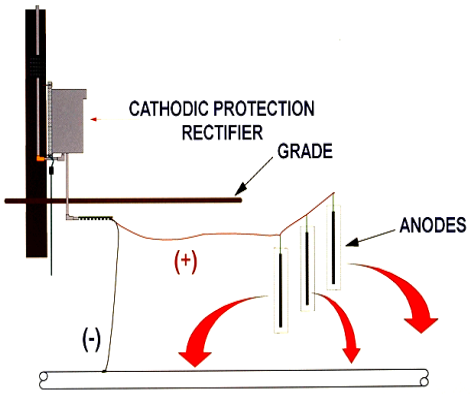
External Corrosion Protection

Corrosion is the deterioration of a material that results from a reaction with its environment. In the most common use of the word, this refers to the electrochemical oxidation of metals. Rusting, the formation of iron oxides, is a well-known example of electrochemical corrosion.

Fusion-Bonded Epoxy Coating

To protect the pipeline against corrosion, the first line of corrosion defense for the pipeline would be a coating that would provide an electrical and mechanical barrier between the surface of the pipe and the surrounding soil. The proposed pipeline would be coated with FBE, which would strongly adhere to the surface of the steel pipe. The thickness of the FBE coating would provide a tough mechanical barrier that would prevent direct contact with the soil environment. The FBE is an effective electrical insulator that would prevent the flow of current needed for the electrochemical reactions that result in corrosion.

Cathodic Protection



Cathodic protection.
Source: HDR Engineering, Inc.

The second line of corrosion defense for the proposed pipeline would be an impressed current cathodic protection (CP) system. In such a system, electricity is provided from an outside source to create an electrical circuit. Anode beds, containing anodes buried in coke powder, are constructed near the pipeline. The pipeline becomes the cathode of the electrical circuit. Electricity is applied to the pipeline to cause a protective current to flow from the buried anodes to the pipeline.

The primary impressed current CP system would be rectifiers coupled to semi-deep vertical anode beds at each pump station, and rectifiers coupled to deep-well anode beds at selected intermediate mainline valve sites. The rectifiers would convert incoming AC power to DC voltage and current to provide the electrical current. The rectifiers would have a negative cable connection to the design structure and a positive cable connection to the anode

beds. The red arrows in the diagram represent the direction of flow of the protective current from anodes to the pipe.

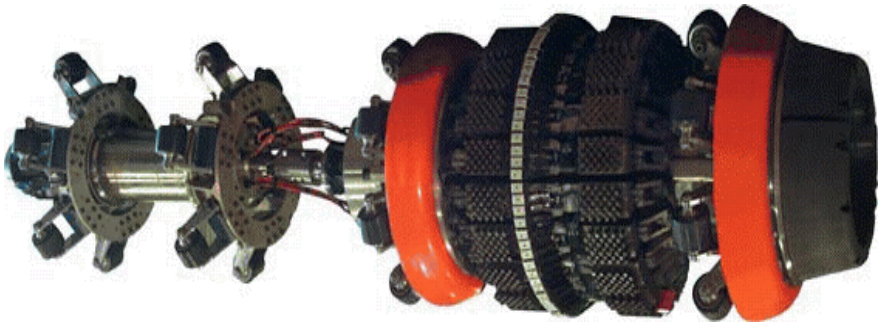
The anode beds would consist of high-silicon cast iron anodes backfilled with a highly conductive coke powder. The anodes and anode beds can have a lifetime of up to 20 years, depending on site-specific conditions, and would be replaced over the life of the pipeline when indicated by monitoring results. During operation, the CP system would be monitored and remediation performed to prolong the anode bed and systems. The semi-deep anode beds would be 12-inch-diameter vertical holes spaced 15 feet apart with a bottom depth of approximately 45 feet. The deep-well anode bed would be a single 12-inch-diameter vertical hole with a bottom depth of approximately 300 feet.

The use of a corrosion protection system similar to that described above is required by Subpart H of 49 CFR § 195. Special Conditions 34 through 39 of the 57 additional measures developed by PHMSA for the Keystone XL pipeline require more frequent testing of the corrosion monitoring systems than is required by Subpart H.

Internal Corrosion Protection

Keystone would monitor the effects of corrosion inside the pipeline using in-line inspections. Keystone would limit the allowable amount of sediment and water in the crude oil to 0.5 percent by volume to reduce the amount of corrosion-producing materials inside the pipeline. Keystone has proposed to operate the pipeline without corrosion inhibitors.

Pipeline operators use in-line inspections that employ various nondestructive testing methods and tools (pigs) as part of a quality management program. Magnetic flux leakage pipeline inspection tools use a powerful magnet to magnetize the steel pipe. In areas of corrosion or missing metal, the magnetic field "leaks" from the steel and would be detected by the tool.



Magnetic flux leakage pipeline inspection tool

Ultrasonic inspection uses sound of short wavelength and high frequency to detect flaws or to measure material thickness. Ultrasonic tools give excellent results and anomaly accuracy and are used to check for stress corrosion cracking and other forms of corrosion.

Ultrasonic testing inspection tool

The required frequency of these in-line inspections is specified in 49 CFR § 195 and Special Condition 34 of the 57 additional measures developed by PHMSA for the Keystone XL pipeline (Appendix F.2).

For example, a recent inspection of the existing Keystone crude oil pipeline identified an anomaly on the outside of the pipe. The pipeline was shut down October 18, 2012. Keystone reported to PHMSA that it had shut down the existing Keystone system pipeline to conduct additional inspections in an area which required integrity tests to identify possible safety issues. A small segment of pipeline was excavated and inspected, and actions were taken to address the anomaly. No evidence of a leak was found. Keystone restarted the Keystone crude oil pipeline on October 22, 2012.

As noted in Section 6.2, the recent NTSB report evaluating the 2010 rupture of Enbridge's pipeline in Marshall, Michigan, found no evidence of internal corrosion. This pipeline carried dilbit and other crude oils. The Enbridge pipeline was installed in 1969. The report states, "NTSB's examination of the ruptured pipe segment showed that the internal pipe surfaces were free from any apparent corrosion or other visible surface anomalies. Therefore, internal corrosion was not a factor in the rupture" (NTSB, 2012)[11].

6.5.3 Measures to Prevent Excavation Damage

Depth of Cover and Pipeline Markers

Excavation damage was identified as the cause of 11 percent of pipeline incidents between 1992 and 2011. The risk of excavation damage to the pipeline would be reduced by implementation of the 57 Special Conditions.

Several of PHMSA's Special Conditions would provide additional safety measures beyond those specified by 49 CFR § 195. For example, Special Condition 54 would require Keystone to develop and implement a ROW management plan to protect the Keystone pipeline from damage attributable to excavation, third party activities, and other activities. In any areas where increased activities or natural forces could lead to increased threats to the pipeline, the management plan must include increased inspections. PHMSA would require Keystone to

[11] Enbridge had implemented an internal corrosion management program in 1996 that used biocide and corrosion inhibitors in addition to cleaning pigs to mitigate internal corrosion of its pipelines.

update the ROW management plan annually. The management plan must also include ROW inspection activities to complement the following:

- Depth of Cover (Special Condition 19)
- Pipeline Markers (Special Condition 40)
- Pipeline Patrolling (Special Condition 41)
- Damage Prevention Program (Special Condition 48)
- Threat Identification and Evaluation (Special Condition 53)

Special Condition 19 requires that the pipeline be constructed so that it would be covered with a minimum of 48 inches of soil (except in consolidated rock, where the minimum depth of cover would be 36 inches). A common problem with pipeline construction is settlement of the backfill material. Special Condition 19 would also require Keystone to maintain the soil cover to a depth of 42 inches during the operational life of the pipeline, except in cultivated areas where it must be maintained at 48 inches. (Some exceptions in cultivated areas would be allowed where conditions prevent maintenance of 48 inches of cover, and then additional line-of-sight pipeline markers and warning tape would be required.) If Keystone's routine ground or aerial surveillance of the pipeline were to indicate a possible loss of pipeline cover because of excavation, farming, weather, or other factors, Keystone would be required to perform a depth-of-cover study and replace the cover within 6 months. A detailed depth-of-cover study along the full length of the pipeline would be required every 10 years. These requirements exceed those in 49 CFR § 195.248, which requires 36 inches of cover and 30 inches of cover in rock, and do not require maintenance or surveys of depth of cover during pipeline operation.

Example Pipeline Marker

Source: PHMSA

Puncture Resistance

Special Condition 7 (Appendix F.2) requires that the "steel pipe must be puncture resistant to an excavator weighing up to 65 tons with a general purpose tooth size of 3.54 inches by 0.137 inches."

Call 811

To avoid damage to pipelines and other underground utilities, Nebraska law requires that anyone who excavates or disturbs the surface of the ground in the State of Nebraska must first contact Digger's Hotline (1-800-331-5666 or 811) two business days in advance to have all underground utilities located. This law applies to any excavation, including fairly small activities performed by homeowners such as planting trees or installing mailboxes. The 811 phone number will connect the caller to the local One Call Center (Digger's Hotline), which will then notify local utilities companies, including pipeline companies, about the intent to dig. The One Call Center will send a locator to mark the approximate location of underground lines, pipes and cables prior to excavation. There is no charge for this service.

6.5.4 Leak Detection

Keystone would implement a Pipeline Maintenance Program to perform annual valve maintenance, periodic in-line inspections, and cathodic protection readings. Keystone would use its SCADA system to continuously monitor the pipeline system in accordance with the requirements of 49 CFR § 195 and Special Conditions 24 through 31 (Appendix F.2). The SCADA system would provide real-time information on intermediate MLV positions, delivery flow, and total volume. Keystone personnel could start and stop pump stations and open and close MLVs using the SCADA system.

The Final EIS (DOS, 2011a: Section 2.4.2) describes Keystone's plans for addressing abnormal pipeline operational events, including pipeline spills. The SCADA system in conjunction with Computational Pipeline Monitoring or model-based leak detection systems would detect leaks to a level of approximately 1.5 to 2 percent of the pipeline flow rate (DOS, 2011a). Keystone has stated that it could detect a leak of this size within 102 minutes (Keystone, 2012b). Computer-based, non-real time, accumulated gain/loss volume trending would also be used to assist in identifying low rate or seepage releases. If a leak were detected, the operator would shut down the operating pumping units and close the isolation valves. Once shutdown activities were initiated, it would take approximately 12 minutes to shut down operating pumping units and close the isolation valves.

Keystone would inspect the pipeline ROW using aerial and ground surveillance to identify conditions that could result in pipeline leaks or in damage to the pipeline. Intermediate MLVs and MLVs at pump stations would be inspected at least twice each calendar year. As required by 49 CFR § 195.412, the aerial surveillance of the pipeline ROW would be carried out at least 26 times per year at intervals not to exceed 3 weeks.

Because of concerns about pipeline leaks raised by EPA and the public, DOS, in consultation with PHMSA and EPA, determined that Keystone should commission an engineering analysis by an independent consultant who would review the proposed project risk assessment and proposed placement of isolation valves. The engineering analysis would, at a minimum, assess the advisability of additional valves and/or the deployment of external leak detection systems in areas of particularly sensitive environmental resources. The scope of the analysis and the selection of the independent consultant would be approved by DOS, in consultation with PHMSA and EPA. After completion and review of the engineering analysis, DOS with concurrence from PHMSA and EPA, would determine the need for any additional mitigation measures. This independent analysis is ongoing and the results are not yet complete.

As described in Section 6.2, the existing Keystone Pipeline had 14 leaks during its first year of operation. The 2011 Final EIS stated, in its Section 2.4.1:

> [I]n the start-up year it is not uncommon for pipelines to experience a higher frequency of spills from valves, fittings, and seals. Such incidences are often related to improper installation, or defects in materials. In light of this fact, DOS in consultation with PHMSA and EPA determined that if the proposed Project were permitted, it would be advisable for the applicant to conduct inspections of all intermediate valves, and unmanned pump stations during the first year of operation to facilitate identification of small leaks or potential failures in fittings and seals.

6.6 PLANNING FOR PIPELINE SPILLS AND RESPONSE TO PIPELINE EMERGENCIES

This section describes spill response planning for petroleum pipelines such as the Keystone XL and the actions that would be taken by Keystone, the federal government and the State of Nebraska in the event of an oil release from the proposed pipeline or other pipeline facility, including valves and pumping stations.

6.6.1 Planning for Pipeline Spills

By federal regulation, Keystone would be responsible for developing ERPs for oil spills associated with the operation of the Keystone XL Pipeline and ancillary facilities. In addition, spill response planning is conducted by the EPA, PHMSA, the National Response Center (NRC), and other federal agencies. NDEQ and local emergency responders in communities throughout Nebraska conduct spill response planning and training. These response planning requirements and programs are summarized below.

Keystone's Spill Response Planning

To address abnormal pipeline operational events and emergencies, Keystone would be required to prepare and follow written procedures that would include Keystone's ERP. This plan is a requirement of 49 CFR § 194 (Response Plans for Onshore Oil Pipelines). In response to a September 2010 request from the DOS for a draft ERP, Keystone provided the publicly available portions of the ERP for the existing Keystone Pipeline. These are included as Appendix F.3 to this report.

Keystone has stated that in accordance with 49 CFR § 194, the ERP would include worst case discharge calculations, identify where those might take place, and include response procedures to specifically address a worst-case discharge.[12]

According to the SER (Keystone, 2012b: Appendix C), Keystone would stage personnel and emergency response equipment in locations that would allow responses within a maximum of 6 hours in high-volume areas and 12 hours in other areas, as required by regulations. "Company-owned equipment such as, but not limited to, skimmers, boom, boats and tanks will be stored in multiple mobile trailers located along the pipeline system to effectively contain, recover and store oil. In addition, Keystone XL [would] contract with spill response organizations that are capable of providing supplemental equipment and personnel as required" (Keystone, 2012b).

[12] Keystone response to NDEQ's September 10, 2012, Data Request, Question #55 (Keystone, 2012e).

Keystone training exercise, including containment boom, skimmer, and trailer. Boats are stored on top of the trailer. Photos: HDR Engineering, Inc.

Keystone stated in its response to DOS and in its SER (Keystone, 2012b: Appendix C) that it would update its current ERP to include Keystone XL-specific emergency preparedness and emergency response information prior to beginning operation of the project. If the proposed pipeline were approved, current PHMSA regulations would require that Keystone submit its ERP for the new Keystone XL Pipeline system for approval at least 6 months before beginning pipeline operation. Keystone has also stated in Appendix C of the SER that it "has committed to consult and communicate with Local Emergency Planning Committees (LEPCs) and other emergency service agencies during ERP development to ensure ERPs are aligned. During an emergency, Keystone would form a Unified Command with local first responders and liaise with all impacted community stakeholders including the LEPCs" (Keystone, 2012b).

Keystone would also be required to prepare a PSRP and submit it to PHMSA prior to initiating operations of the proposed pipeline in accordance with the requirements of 49 CFR § 194. The PSRP would detail Keystone's spill response. The plan would describe the maximum spill scenario and the procedures that would be in place to deal with the maximum spill. The PSRP requires PHMSA review and approval; however, there is a 2-year grace period under which operation of the pipeline can proceed while PHMSA reviews and approves the PSRP. This period would allow PHMSA to review the Keystone XL pipeline in its final, as-built state (DOS, 2011a).

Federal Agency Spill Response Planning

Nearly 14,000 oil spills are reported each year in the United States (EPA 2011a). The majority of these spills come from sources other than pipelines. Pipelines containing crude oil or other hazardous liquids have averaged 344 spills per year over the period 2007 to 2011 (PHMSA, 2012a). Many spills are contained and cleaned up by the party responsible for the spill, but some spills require assistance from local and State agencies, and occasionally the federal government. As described in 40 CFR § 300, EPA has authority under Section 311(d) of the CWA, as amended by Section 4201 of the Oil Pollution Act of 1990, to conduct spill prevention and preparedness activities and to provide for efficient, coordinated, and effective action to minimize adverse impacts from oil discharges and hazardous substance releases.

NRC is the sole federal point of contact for reporting oil and chemical spills. The NRC is staffed 24 hours a day by U.S. Coast Guard officers. Spills reported to the NRC activate the National Contingency Plan, and each spill report is relayed to the predesignated federal OSC. For oil spills occurring in inland areas and waters, EPA is the lead federal response agency (EPA 2011b). In the case of a pipeline spill, NRC notifies PHMSA and other applicable federal agencies as needed (NRC, 2012; EPA, 2011b).

PHMSA is responsible for implementing the Oil Pollution Act of 1990 as it relates to onshore oil pipelines.[13] Requirements for oil spill response plans to reduce the environmental impact of oil discharged from onshore oil pipelines are contained in 49 CFR § 194. PHMSA is responsible for reviewing the response plans submitted by pipeline operators to ensure the plans comply with the regulations.

NDEQ's Spill Response Planning

NDEQ is the agency in Nebraska responsible for planning and responding to spills of crude oil or other hazardous liquids from pipelines. NDEQ's Release Assessment Program has been developed to train and equip its Immediate Response Team, a team of personnel who provide initial response to chemical spills. NDEQ's Release Assessment personnel represent the environmental interests of the State at the scene of a petroleum spill or other environmental emergency. If a spill from the proposed pipeline or other hazardous liquid pipeline should occur, the Release Assessment team is on call 24 hours per day to respond and provide initial assistance. The team has been trained in spill response and would coordinate closely with Keystone and local, State and federal agencies to oversee cleanup of the spill and assist first responders as needed. To improve response and to better communicate issues related to spill reports and complaints, a Release Assessment Coordinating group has been formed.

Once the spill had been contained and any immediate threats to health and safety have been addressed, the response for a petroleum pipeline spill would transition from NDEQ's Release Assessment Program to NDEQ's Petroleum Remediation Program. This program oversees the investigation and cleanup of petroleum contamination. If a threat to health, safety, welfare, or the environment were indicated, NDEQ would require a detailed study of the affected groundwater and soil to discover the severity of the contamination, direction of groundwater flow, and potential water supplies or points of exposure that might be adversely affected. Program professionals would review the results to determine whether additional cleanup would be needed and would issue public notices with their decisions. NDEQ staff would review remedial actions throughout the project and determine when sufficient cleanup has been accomplished.

Examples of NDEQ's response to recent petroleum spills, including spills from the existing Keystone Pipeline, are described in Section 6.6.2.

[13] See <http://www.phmsa.dot.gov/pipeline/initiatives/opa>.

6.6.2 Response to Pipeline Emergencies

In the case of an accidental release from the proposed pipeline or of other emergency, primary responsibility for spill containment and cleanup would rest with Keystone. Keystone's emergency phone number is 1-800-447-8066.

Local fire departments or other local emergency service responders might be first on the scene. Keystone has committed to "conduct and pay for company emergency responder training. Keystone will also invite emergency services agencies to participate in company training/exercises free of charge" (Keystone, 2012b). NDEQ attended an emergency exercise held by Keystone in September 2012 in Yankton, South Dakota, near the location where the existing Keystone oil pipeline crosses under the Missouri River. Other agency personnel also attended this exercise, including representatives from the National Park Service, South Dakota Department of Environment and Natural Resources, and the Emergency Managers from Dakota, Knox, Thurston, and Wayne Counties. Keystone's field technicians and personnel from Keystone's spill response contractors worked together during the training exercise to set up an incident command structure, launch boats on the river, deploy containment boom in a cascade configuration and use a skimmer to demonstrate the ability to capture material on the water surface.

Keystone Emergency Exercise, Yankton, South Dakota. September, 2012.
Photo: HDR Engineering, Inc.

Keystone states that it does not expect all fire departments or local emergency responders to have the specific experience or equipment to respond to a pipeline leak. Keystone also states, "Emergency Service Agencies are requested to protect themselves and the public by controlling access to the affected area. Keystone personnel have the training required to be first and ongoing responders as well as all necessary resources, equipment, and personnel are located such that they can conduct a timely response to any emergency" (Keystone, 2012b). Keystone now has offices in Omaha; Brookings, South Dakota; and Houston, Texas. Keystone would contract with spill response contractors and would store equipment at various locations along the pipeline route, as it currently does for the existing Keystone oil pipeline.

However, different emergency response techniques could be needed, depending on which product was being carried by the pipeline at the time of a release. EPA stated that "deposits from heavy oils generally require more aggressive cleanup than those from lighter ones" (EPA, 1999). NDEQ has requested that Keystone provide a timely and detailed accounting of any material spilled from the pipe. In the event of a spill, Keystone would provide the applicable Material Safety Data Sheets to NDEQ at the same time that the spill were reported to NDEQ and would do so by the quickest means possible, including facsimile and/or email.[14] Keystone would be required to make regulatory notifications immediately upon recognition of the spill as required by federal and State regulations.

NDEQ would respond to the spill, as needed, and would request assistance from EPA if the size of the spill or deficiencies in the pipeline operator's response were to create a need for additional resources.

Cleanup Following 2010 Oil Spill in Kalamazoo River, Michigan. Source: EPA, 2011

To control oil spills and minimize their impact on human health and the environment, a number of techniques are available. Damage to areas directly contaminated by spills and dangers to other threatened areas can be reduced by timely and proper use of containment and recovery equipment. Mechanical containment or recovery is the primary line of defense against oil spills in the United States (EPA, 2011c). Containment and recovery equipment includes a variety of booms, barriers, and skimmers, as well as natural and synthetic sorbent materials. Mechanical containment is used to capture and store the spilled oil until it can be disposed of properly. With agency approval, chemical and biological methods can be used in conjunction with mechanical means for containing and cleaning up oil spills. To clean up shorelines, physical methods, such as wiping with sorbent materials, pressure washing, and raking and bulldozing can be used. In some cases, sound, visual, and mechanical methods (such as propane cannons, recorded distress calls, Mylar tape, balloons, or grids) may be used to protect birds and animals by keeping them away from oil spill areas.

[14] Keystone response to NDEQ's September 10, 2012, Data Request, Question #57 (Keystone, 2012e).

Cleanup Following 2010 Dilbit Spill in Kalamazoo River, Michigan. Containment boom (orange), absorbent boom (white) and absorbent tiles placed at the confluence of the Talmadge Creek and Kalamazoo River. Source: EPA, 2010, <http://www.flickr.com/photos/usepagov/4887995357/>.

If a spill were to occur from the proposed Keystone XL Pipeline, in accordance with the Oil Pollution Act of 1990, Keystone would be responsible for certain specified damages resulting from the discharged oil and would be responsible for removal costs. (If the damages were caused solely by a third party, the third party could be held liable for the costs and damages.) For the July 25, 2010, crude oil spill near Marshall, Michigan, PHMSA proposed a $3.7 million civil penalty and 24 enforcement actions against Enbridge Energy.

Keystone's Responsibilities

In the case of a spill, Keystone would be required to follow its ERP. The "Responsive Portions of the Existing Keystone Pipeline ERP" is included as Appendix F.3, and its main sections and appendices are summarized below.

Notification Procedures – This section describes internal notifications, from an employee discovering the discharge up through Keystone's chain of command. It also describes external notifications that would be made to emergency response subcontractors; spill management contractors; and government agencies, including federal agencies in the United States and Canada, State and provincial environmental agencies such as the NDEQ, and LEPCs. Phone numbers for the LEPCs for the counties crossed by the existing Keystone Pipeline are listed in the ERP.

Response Actions – This section describes the initial response actions that would be taken by Keystone personnel in the case of several different emergencies, including a spill, fire, flooding, tornadoes, earthquakes, and a release to groundwater, among others. For each type of emergency, a specific set of emergency responses is provided. For a pipeline break or leak

(including the leak or rupture of the pipeline or valve or a manifold failure), the Keystone ERP procedures are described below:

- Shut down pipeline.
- Close upstream and downstream block valves.
- Perform notifications (as outlined above)
- Mitigate spreading of the product, as the situation demands. See Release to Groundwater, Specific Response for more detailed information. Potential containment land-based strategies include:
  - Prevent the spill from entering the waterways, sewer, etc. to the greatest extent possible.
  - Determine the direction and expected duration of spill movement. Refer to the maps in this plan.
  - Review the location of socioeconomic and environmentally sensitive areas identified in this plan and the Area Contingency Plan. Determine which of these may be threatened by the spill and direct the response operation to these locations. Initiate protection and recovery actions.
- Response contractor under Keystone direction utilizes combustible gas indicator, oxygen meter, proper colorimetric indicator tubes and/or other air sampling measurements to assure that areas are safe to enter for continued response operations. Follow appropriate procedures if flammable vapors are detected.
- Drain the line section, as the situation demands.
- Inform local operators of utilities such as the power company, telephone company, railway.
- Clean up spilled product to eliminate any possible environmental problems. Be alert for underground cables.
- Make all necessary repairs.
- Return the line to service when repairs are complete, if or when approved.
- Complete follow-up and written reporting, as the situation demands.

Keystone deployment of oil spill containment booms in cascade configuration and oleophilic skimmer to capture oil on water surface during training exercise.
Source: HDR Engineering, Inc.

For a release of pipeline materials to groundwater, some of the Keystone ERP procedures are described below:

- Evaluate the topography and evidence of surface contamination.
- Establish containment, accounting for public safety, spill volume, terrain, and presence of surface water.
- Notify landowner and appropriate public agencies of potential groundwater contamination.
- Immediately retain an independent consultant with expertise in this area to evaluate impacts and remediation options.
- Consult with appropriate agencies regarding remediation, including water and soil cleanup levels, and need for groundwater monitoring.
- Notify and procure additional response equipment and personnel as necessary to address site-specific conditions.
- Segregate waste streams to minimize later disposal.
- Based on anticipated release, stage temporary storage and additional vacuum trucks to ensure recovery efforts continue without interruption.
- Enlist additional experts, as appropriate, for continuing long-term remediation and coordination with appropriate agencies.

This section of Keystone's ERP also contains procedures for storage and disposal of waste materials from the spill cleanup, measures to protect the safety of spill response workers, including air monitoring, personal protective equipment, decontamination procedures, and emergency medical treatment information.

Response Teams – This section of Keystone's ERP defines the roles and reporting structure for the local and regional teams who would respond to a spill and describes the incident command system. Roles for many unit leaders are described. For example, the Environmental Unit Leader would have the following responsibilities as described below:

- Participate in Planning Section meetings.
- Identify sensitive areas and recommend response priorities.
- Following consultation with natural resource trustees, provide input on wildlife protection strategies (e.g., removing oiled carcasses, pre-emptive capture, hazing, and/or capture and treatment).
- Determine the extent, fate and effects of contamination.
- Acquire, distribute and provide analysis of weather forecasts.
- Monitor the environmental consequences of cleanup actions.
- Develop shoreline cleanup and assessment plans. Identify the need for, and prepare any special advisories or orders.
- Identify the need for, and obtain, permits, consultations, and other authorizations including ESA provisions.
- Following consultation with the federal OSC's Historical/Cultural Resources Technical Specialist, identify and develop plans for protection of affected historical/cultural resources.
- Evaluate the opportunities to use various response technologies.
- Develop disposal plans.
- Develop a plan for collecting, transporting, and analyzing samples.

Spill Impact Considerations – In this section, Keystone's ERP discusses critical areas to protect in the case of a spill, classified as areas of high, moderate, or low sensitivity. High-sensitivity areas include areas that are high in productivity or number of species, areas that are difficult to rehabilitate, or areas that contain threatened/endangered species or cultural resources. High-sensitivity areas, defined in the ERP, include forested areas, brush/grassy areas, wooded lake areas, freshwater marshes, wildlife sanctuaries or refuges, and vegetated river/stream banks. Low-sensitivity areas include areas of gravel, sand, or clay material, barren/rocky riverbanks and lake edges, man-made structures, and concrete drainage ditches. The plan summarizes Keystone's commitments and designs to protect fish habitat and wildlife in the case of an oil spill, including methods for deterring birds and wildlife from the scene and rehabilitation of contaminated wildlife in coordination with federal, State, and local agencies. This section also provides descriptions of methods to be used for containment and recovery in the event of a spill. Containment and removal methods are provided for spills on soil or land, calm or slow-moving waters, fast-flowing creeks, large rivers, streams which flow into lakes or ponds, urban areas, under ice in a river or lake, on ice, and in wetland areas. Keystone states that it will create maps to identify environmentally sensitive areas in each response zone.

This section of the ERP also describes in situ burning and use of dispersants as alternative response strategies, and states that "there are no pre-approved response options for inland spills with the United States. Any plans to use dispersants or in situ burn by the Company will be submitted to the Federal On-Scene Coordinator" prior to such action being taken.

Three appendices to the ERP (in Appendix F.3 of this Draft Evaluation Report) are included:

Response Equipment/Resources Appendix A – describes company-owned spill response equipment and the location of its response trailers.

Disposal Plan Appendix B – describes the methods that would be used to categorize and handle the potentially large quantities of waste materials generated during an oil spill.

Basics of Spill Response Appendix C – provides more information on spill containment techniques that would be used by Keystone's spill response contractors in the event of a spill. These techniques include construction of dikes, berms, and dams and the use of booms to deflect oil away from a sensitive area, to contain the oil, or to divert spilled oil to a specific site for recovery.

Water Well Testing – If a spill occurs, Keystone will perform water well testing as required by NDEQ. Keystone has committed to provide an alternate water supply for any well where water quality was found to be compromised by a spill.

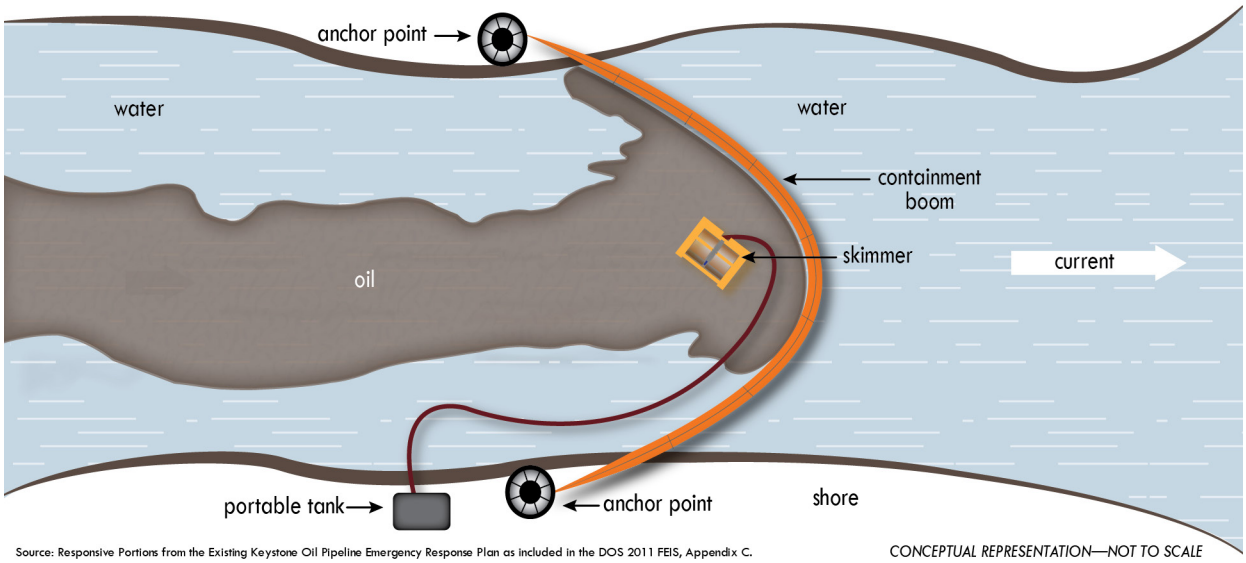
EPA's Responsibilities

As the lead federal agency for responding to oil spills in inland waters, EPA is responsible for monitoring and, if necessary, directing spill response efforts. Under the Oil Pollution Act of 1990, EPA is required to direct the response in cases where the spill "is of such a size or character as to pose a substantial threat to the public health or welfare." EPA may also "take the lead in managing the response if requested to do so by state or local response officials, or if EPA determines that the responsible party is incapable of responding adequately to the spill" (EPA, 2011b).

Disposal of Contaminated Materials

The cleanup and remediation methods would depend on the circumstances, such as the characteristics of the material released, the size of the spill and the characteristics of the environment affected (for example, soil, surface water, groundwater). Oil would be recovered if possible, for example in the case of a spill on surface water. Materials contaminated by oil during the spill response, such as soil, sorbent materials, and containment booms, would be decontaminated or disposed of according to State and federal regulations.

Figure 6.6-1. Oil Spill Containment Boom



If a federal response were required for a spill from the proposed pipeline in Nebraska, an EPA OSC would be designated. The responsibilities and resources available to the OSC are described below.

> The OSC also will conduct an immediate assessment to evaluate several factors, including the size and nature of the spill, the type of oil spilled, its potential hazards, and the resources needed to contain and clean it up. The OSC also will monitor any existing response efforts to determine whether additional technical support or federal involvement is necessary. If the OSC determines that federal involvement is needed, the OSC will assume control of all spill response operations at the site and will obtain and direct all needed resources, such as cleanup personnel and equipment. If the OSC determines that the personnel and equipment already deployed at the spill site are inadequate, the OSC will employ spill contractors using available federal response funds or, if necessary, funds from the Oil Spill Liability Trust Fund.
>
> For oil spills that require a greater scope of federal support and resources, the OSC may activate the Regional Response Team to provide broader technical advice, equipment, or manpower to assist with a response. In addition, the OSC can request support from EPA's Environmental Response Team, which is available 24 hours-a-day to provide oil spill expertise and special response equipment to the spill responders. The OSC also can access various National Oceanic and Atmospheric Administration (NOAA) Scientific Support Coordinators with expertise in different aspects of oil spills, as well as support from non-governmental organizations that specialize in wildlife rescue and rehabilitation. [EPA, 2011b]

NDEQ's Responsibilities

Any person who suspects a spill or accidental release from a pipeline or other facility should call the Nebraska NDEQ main office number, 402-471-2186, or 911 if appropriate.

If the call to NDEQ were made during normal business hours, NDEQ personnel would speak with the caller to obtain as much information as possible regarding the potential spill and then forward a message to the appropriate responder within NDEQ. If the call were to be made outside regular business hours, the caller would hear a message directing him or her to call the Nebraska State Patrol Dispatch. The State Patrol would then page the appropriate NDEQ professional. The NDEQ has a trained spill responder on call 24 hours per day, 7 days per week.

> If an oil spill is observed or suspected, call the NDEQ main office number 402-471-2186 or 911

NDEQ would work with Keystone and with local emergency responders to confirm the location of the suspected spill, the product released, and the volume. Once a spill were confirmed, NDEQ would work with local emergency response teams to obtain as much information as possible about the spill, including whether it had entered a waterway or would present an immediate threat to health and safety of nearby residents or emergency responders. NDEQ would also contact Keystone and inform its representatives of its responsibility to contain and clean up the spill.[15] If necessary, NDEQ could provide Keystone with contact information for local spill response contractors and could provide some spill response equipment. If the spill would present an immediate threat to health and safety of nearby residents or emergency responders, NDEQ and local first responders, in addition to taking immediate steps to respond to the threat, may perform air monitoring and document the scene by taking photographs. NDEQ would make important information available to the public and news media.

In the case of a large spill, NDEQ would dispatch one or more responders the scene of the spill and provide guidance and determine whether additional resources or staffers were needed onsite. For example, if drinking water sources could be adversely affected, NDEQ would notify the State Drinking Water Program of the Nebraska Department of Health and Human Services. If the spill could result in impacts on wildlife, fish, birds, or threatened and endangered species, NDEQ would notify NGPC and USFWS. If NDEQ were to determine that the spill was very large or would have the potential to enter a waterway or has the potential to exceed Keystone's the response capabilities, NDEQ would also notify EPA Region 7, who could also send an OSC to the site of the spill to offer additional assistance and guidance if requested by NDEQ.

Once the spill had been contained and any immediate threats to human health and safety had been addressed, the spill response would transition from NDEQ's Release Assessment Program to NDEQ's Petroleum Remediation Program, as described in Section 6.6.1.

The recent pipeline releases in Nemaha County near Auburn serve as an example of the measures taken by NDEQ, other agencies, and the pipeline operator to respond to a spill.

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[15] If a third party other than Keystone was determined to be responsible for the spill, the Oil Pollution Act of 1990 provides "that if a responsible party can establish that the removal costs and damages resulting from an incident were caused solely by an act or omission by a third party, the third party will be held liable for such costs and damages third party could be required to conduct the cleanup and be responsible for damages."

The leak occurred on December 10, 2011, when a landowner's tenant, who was clearing trees along a fenceline with a bulldozer at the edge of an agricultural field, struck two pipelines buried 3 feet bgs: an 8-inch-diameter line that transports diesel fuel, and a 12-inch-diameter line that transports jet fuel and gasoline. Approximately 1,500 barrels of gasoline, 650 barrels of #2 diesel fuel, and 650 barrels of JP-8 jet fuel were spilled. The NRC was notified, and NDEQ and EPA representatives were on the scene along with Magellan personnel from December 10 to 12, 2011.

The fuels released from the pipelines traveled overland across the downward-sloping and terraced corn field, through a grass swale and into an unnamed tributary to Jarvis Creek about 1,600 feet south of the rupture. The spill adversely affected soils, groundwater, surface water, and sensitive habitat along the creek. Jarvis Creek flows into the Little Nemaha River, which flows into the Missouri River. A domestic water well is located about 2,300 feet south of the spill release point, and therefore NDEQ notified the Nebraska Department of Health and Human Services of a potential threat to a drinking water source.

Magellan and its contractors responded to the spill on December 10, 2011, with vacuum trucks, absorbent booms, and applications of peat to absorb the free product. Magellan also placed containment booms on Jarvis Creek at multiple locations, and constructed two underflow dams[16] on the creek on the day of the spill. Keystone's ERP (Appendix F.3) describes use of underflow dams for use on a small-to-medium-size stream such as Jarvis Creek.

Magellan performed sampling and laboratory analysis of soils, surface water, ground water, and water from the nearby domestic well. Based on the results of the sampling, an additional five temporary dams and two interception trenches were constructed to contain the spill and prevent it from flowing downstream to the Little Nemaha River. The interceptor trenches were dug 12 to 17 feet bgs, and 25 oil recovery sump pumps were installed in the two trenches. The trenches were then backfilled with pea gravel and capped with clay. Fluids were recovered from the sump pumps and collected for treatment or disposal. The remediation process is ongoing as of October, 2012.

On Monday, December 12, 2011, NDEQ and EPA determined that the emergency phase of the release had ended and the incident command was dissolved. On February 6, 2012, NDEQ formally notified Magellan of its responsibilities for remediation including:

- Tier 1 Site Investigation to determine the source of the spill, the potential receptors of contamination from the spill, contaminant levels in the area of the spill, and the hydrogeologic characteristics of the spill site
- Tier 2 Site Investigation (if necessary) to fully delineate soil and water contamination resulting from the release and the effects of the contamination
- Development of a Remedial Action Plan to remove or manage the contamination
- Cleanup and monitoring of the spill site until the requirements specified in the Remedial Action Plan have been completed
- Site closure, including removal of monitoring wells and other equipment.

[16] While constructing the underflow dam, a pipe is placed at an angle through the dam so that the height of the downstream end of the pipe determines the height of the water that can rise in a pool behind the dam. A boom or other sorbent is placed in the pool to trap materials floating on the surface of the water, including petroleum products.

NDEQ sent letters to Magellan in February and July 2012 with demand for reimbursement for the nearly $10,000 costs NDEQ incurred as a result of the spill. The February letter requested approximately $3,000, which has been paid. The July letter billed Magellan for the difference, approximately $6,600.

Magellan submitted its Tier 1 Investigation Report Form to NDEQ on April 26, 2012. The investigation report provided a narrative describing the spill and the remediation activities Magellan had performed, along with mapping, soil boring logs, and the laboratory results for field sampling. On April 26, 2012, Magellan also submitted a Remedial Action Plan to NDEQ. The plan calls for monthly sampling and laboratory analysis of water from five surface water locations and the domestic well, until NDEQ approves less frequent sampling.

NDEQ's Petroleum Remediation Program will continue to review the results of the monthly sampling and continuing remediation activities until the cleanup is complete.

6.6.3 Financial Responsibilities

Keystone would be financially responsible for spill cleanup.

The Nebraska Environmental Protection Act (Nebraska Reissue Revised Statutes Section 81-1501, et seq.); the Nebraska Administrative Code, Title 126, Chapter 18; and the federal Oil Pollution Act of 1990 place liability on the operator if a pipeline were to release oil or other hazardous substance in or on land or waters of the state.

In response to public concerns, Keystone has committed to filing with NDEQ a certificate of insurance. This certificate would be filed annually, by May 1 of each year. The certificate would provide evidence that Keystone is carrying a minimum of $200 million in third-party liability insurance[17] which would cover "sudden and accidental pollution incidents from Keystone XL Pipeline in Nebraska" (Keystone, 2012d).

[17] Keystone states that the $200-million value of the insurance would be "adjusted by calculating the GDP-IPD from the date a Presidential Permit is issued for the Project and adjusting the amount of the third-party liability insurance policy by this percentage" (Keystone, 2012d).

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CHAPTER 7

OUTREACH AND AGENCY COORDINATION

In LB 1161, the Nebraska Legislature instructed NDEQ to "provide opportunities for public review and comment" on the Nebraska Reroute. NDEQ implemented an extensive outreach and agency coordination effort to inform and educate the public about the Nebraska Reroute. Efforts included public information meetings, a self-directed online meeting, press releases, and land owner collaboration meetings with State and federal agency representatives. Extensive outreach and agency coordination efforts have provided feedback to NDEQ, which was then analyzed and documented as part of this Draft Evaluation Report. This chapter describes NDEQ's role and outreach efforts in accordance with LB 1161.

7.1 ROLE OF NEBRASKA DEPARTMENT OF ENVIRONMENTAL QUALITY

NDEQ prepared this Draft Evaluation Report to document the environmental, economic, social, and other associated impacts of the Keystone XL Pipeline Nebraska Reroute to avoid the Nebraska Sand Hills. Acting as the lead agency, NDEQ has obtained input from other Nebraska, federal, and local agencies. NDEQ has also solicited public input, in accordance with requirements of LB 4, whose objectives include a "full and careful agency and public review" of the proposed pipeline. In preparing this Draft Evaluation Report, NDEQ reviewed agency and public input to identify issues, concerns, and areas of potential environmental impact.

NDEQ is currently seeking further comments from the public and agencies regarding the Nebraska Reroute. Comments received will be reviewed, categorized, and addressed in the Final Evaluation Report. Any additional environmental analyses that NDEQ determines necessary will be conducted prior to publishing the Final Evaluation Report. NDEQ will prepare the Final Evaluation Report, which will, in accordance with LB 1161, be provided to the Governor for consideration prior to his recommendation.

7.2 PUBLIC INVOLVEMENT

Significant outreach was conducted by NDEQ to properly inform and educate the public, along with soliciting public input. NDEQ's public involvement and outreach efforts included a Nebraska Reroute website, an online meeting, in-person public information meetings, a telephone information line, press releases to multiple media outlets, and mapbook distribution to local libraries for public review.

7.2.1 Public Information Meetings

In May 2012, NDEQ held four public information meetings over the course of 2 weeks. The purposes of the public information meetings were to inform and educate the public regarding NDEQ's review process and to solicit additional public input. Locations for each meeting were determined by using proximity to the Nebraska Reroute corridor and its relation to suitable community facilities. In selecting meeting locations, convenient access to facilities and available

capacity were important criteria. The public information meetings took place from 4 p.m. to 7 p.m. at the following locations:

- O'Neill Community Center, 501 South 4th Street, O'Neill, on May 9
- Neligh-Oakdale High School, 600 J Street, Neligh, on May 10
- Boone County Fairgrounds, 2616 Fairgrounds Road, Casey's Building, 11th Street and Fairview Avenue, Albion, on May 16
- City Hall, Central City Community Room, 1515 17th Street, Central City, on May 17

DOS was an active partner and participant with NDEQ in the public information meetings. DOS representatives made themselves available at all four of the public information meetings to interact with the individuals who attended the meetings and answer questions concerning the DOS process and issues related to the Keystone XL Pipeline outside of Nebraska.

Meeting Format

The public information meetings were conducted in an open-house format to facilitate open, one-on-one discussions; provide an opportunity to review Nebraska Reroute information; provide opportunities to speak with NDEQ officials; and allow attendees to submit comments and concerns. DOS representatives were present to discuss concerns with the public and answer questions. In addition, Keystone representatives were present to share information, answer questions, and address concerns.

Meeting Materials

Materials made available for public review at the public information meetings included scroll maps of the proposed pipeline route, display boards, and mapbooks. The public was provided handouts to take home for further review. Comment forms were also made available to all meeting attendees, with public comments encouraged. Map request cards were also provided at each public information meeting. The request cards facilitated individuals' receiving a set of maps for further review. For further reference, the meeting materials are included in Appendix G.1.

Meeting Attendance

Over 2 weeks, four public information meetings were conducted, with a combined attendance of 669.[1] Signing into the meeting was recommended, but not required; therefore, more attendees were probably present at the meetings than accounted for in the 669 total. Figure 7.2-1 illustrates the meeting attendees' approximate home locations, categorized by the four public information meeting locations. The four public information meetings were attended by 215 individuals in O'Neill, 121 in Neligh, 172 in Albion, and 161 in Central City.

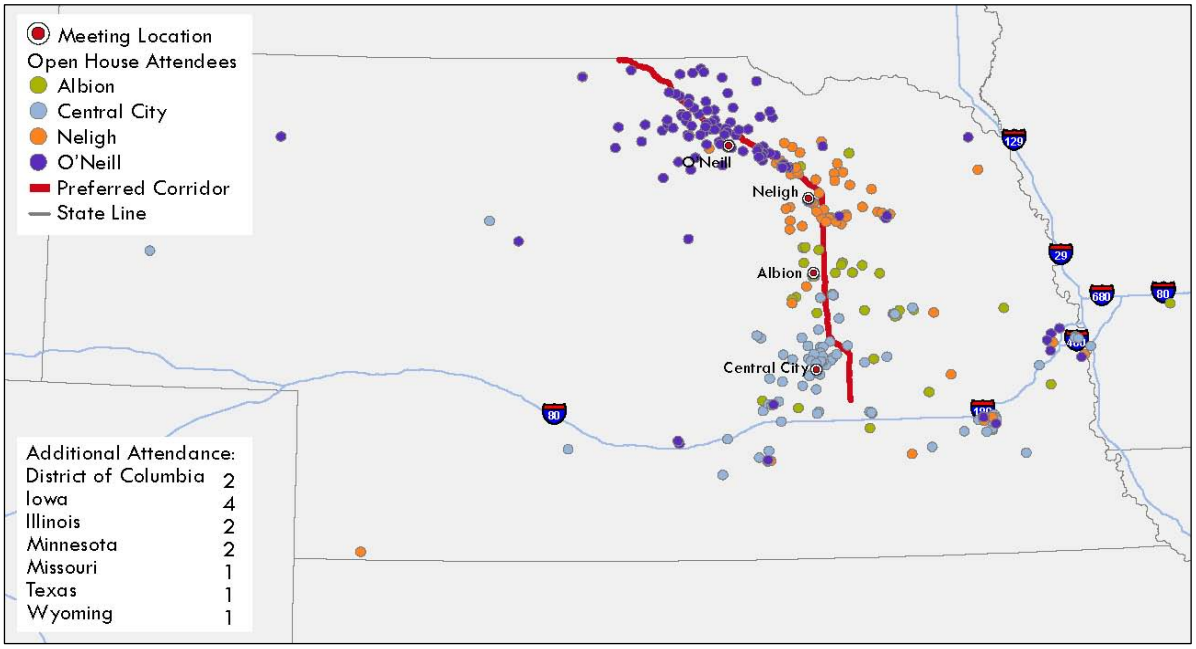
Group Participant Attendance

The public information meetings were attended by a variety of individuals and groups wishing to formally participate, including numerous elected officials and representatives of not-for-profit organizations. The elected officials participated in the public information meetings by engaging

[1] Because meeting registration was optional, the meeting attendance is NDEQ's estimated tally.

in conversations with the public and answering questions. Groups had the opportunity to leave behind information on a table located inside the meeting facility. Several of the groups participated by staffing information tables outside the meeting facility.

Figure 7.2-1. May 2012 Public Information Meetings and Attendance



Source: NDEQ, 2012

NDEQ invited Keystone to make representatives available at the public information meetings to answer questions and receive public comments. Keystone staffed an information booth to receive public comments and answered questions from participants.

Media Attendance

Representatives from television, radio, and print media outlets were in attendance at each of the four May 2012 public information meetings (see Table 7.2-1).

Table 7.2-1. Media Attendance at May 2012 Public Information Meetings

Location – Date	Media Outlet
O'Neill – May 9	• *DTN/The Progressive Farmer* • *Frontier and Holt County Independent* • *Lincoln Journal Star* • *Norfolk Daily News* • *Omaha World Herald*
Neligh – May 10	• KOLN/KGIN-Channel 10/11 (Lincoln/Grand Island) • Nebraska Public Radio
Albion – May 16	• *Albion News* • *Columbus Telegram* • NTV News
Central City – May 17	• *Aurora News-Register* • *Central City Republic Nonpareil* • *Hastings Tribune* • KHAS-TV • KRGI-AM • NU Press • *Nebraska Watchdog*

7.2.2 Online Meeting

A self-guided, online meeting tool was established to provide an online version of the in-person May 2012 public information meetings. The online meeting provided an easy and convenient alternative method to gain access to Nebraska Reroute information. Materials and information presented during the online meeting paralleled that presented and made available at the in-person public information meetings. An online comment form was available for directly submitting comments while viewing the online meeting. Online, through a recorded video, NDEQ Director Mike Linder introduced the Nebraska Reroute. Access to the online meeting is through NDEQ's Nebraska Reroute website at <https://ecmp.nebraska.gov/deq-seis>.

Online Meeting Attendance

Participation in the online meeting complemented that of the in-person public information meetings. As of October 15, 2012, 402 visits were made to the online meeting, of which 306 visits were unique.

The online meeting was visited primarily during periods other than early evenings, when public information meetings occurred. Peak use for the online meeting in June was between noon and 2 p.m. During July, peak use was between 8 a.m. and 10 a.m. Thus, the combination of in-person and online meetings appears to have provided the public ample and flexible opportunities to express opinions and concerns regarding the Nebraska Reroute.

7.2.3 Press Releases

Between April 19 and October 15, 2012, NDEQ issued five press releases regarding the Nebraska Reroute. These covered topics highlighting different project-related milestones. For further reference, copies of the press releases are included in Appendix G.2 and listed in Table 7.2-2.

Table 7.2-2. 2012 Press Release Distribution Dates

Date	Press Release Title
April 19	*NDEQ Receives Pipeline Route Corridor Report from TransCanada*
April 26	*Four NDEQ Pipeline Information Sessions to be Held in May*
June 1	*Pipeline Corridor Map Books Located at Six Libraries; Detailed Information Now Featured in "Online Meeting"*
July 16	*NDEQ Provides Initial Feedback Report to TransCanada*
September 5	*NDEQ Receives Environmental Report from TransCanada*

7.2.4 Website

In December 2011, NDEQ established a Nebraska Reroute website, Nebraska's Keystone XL Pipeline Evaluation, located at <https://ecmp.nebraska.gov/deq-seis/>. The website is updated regularly. As of October 15, 2012, the website had approximately 9,620 visits.

The Nebraska Reroute website provides information regarding NDEQ's role, the evaluation process, the opportunities to provide comments, and a retrieval process for gaining access to records, documents, and comments.

The website features a searchable comment function and includes the following pages: Welcome, Frequently Asked Questions, Public Documents Search, Meeting Documents Search, and Press Releases. NDEQ has also posted a Google Earth™ link to an interactive map displaying Nebraska Reroute information, the MOU between NDEQ and DOS (see Section 7.3.2), and a link to the online meeting.

7.2.5 Information Line

To provide information to all interested parties, a telephone information line (800-295-8912) was established on April 27, 2012, and will be maintained as the Nebraska Reroute progresses. The information line provided an option for interested parties to leave comments orally. Between April 27 and October 15, 2012, the toll-free number received 688 comments.

As of October 15, 2012, the information line is used for information purposes only. Callers are provided with a message with information regarding the efforts of NDEQ and the December Information Session and Public Hearing date, time, location, and format. The information line will announce the Final Evaluation Report publication and availability for public review and will remain available until the Governor's decision.

7.2.6 Meeting Material Distribution

Nebraska Reroute materials were made available for public review at six local libraries along the proposed pipeline corridor in May 2012. Included with the materials were mapbooks and map request cards. For reference, the mapbook cover, dated May 25, 2012, is available in Appendix G.3. Table 7.2-3 lists, from north to south, the local libraries that housed Nebraska Reroute information. As of October 15, 2012, 15 map cards were received requesting additional information.

Additionally, in July 2012, printed copies of Nebraska's Keystone XL Pipeline Evaluation Feedback Report were placed in each of the six local libraries along the Nebraska Reroute corridor. The printed copies included a CD[2] with annotated project-related geographic information. The map comments are included in Appendix H.1 (Feedback Report).

After the September 5, 2012, Reroute Alternatives were received from Keystone, updated mapbooks were provided in the libraries listed in Table 7.2-3. For reference, the mapbook cover, dated September 5, 2012, is provided in Appendix G.3.

Table 7.2-3. Library Locations for Material Distribution prior to September 5, 2012

County	Community	Local Library Address
Keya Paha	Springview	Keya Paha County Library, 118 South Main Street
Holt	O'Neill	O'Neill Public Library, 601 East Douglas Street
Antelope	Neligh	Neligh Public Library, 710 Main Street
Boone	Albion	Albion Public Library, 427 South 3rd Street
Nance	Fullerton	Fullerton Public Library, 903 Broadway Street
Merrick	Central City	Central City Public Library, 1604 15th Avenue

In early September, the Reroute was modified to include a refined Northern, Clarks, and Western Alternative. During the week of September 24, 2012, updated mapbooks were distributed to 10 libraries. The 10 libraries listed in Table 7.2-4 each house a mapbook for the public to view.

[2] CD is initials for *compact disc*; a CD is used to store digital data.

Table 7.2-4. Library Locations for Material Distribution as of September 24, 2012

County	Community	Local Library Address
Keya Paha	Springview	Keya Paha County Library, 118 South Main Street
Holt	O'Neill	O'Neill Public Library, 601 East Douglas Street
Antelope	Neligh	Neligh Public Library, 710 Main Street
Boone	Albion	Albion Public Library, 427 South 3rd Street
Nance	Fullerton	Fullerton Public Library, 903 Broadway Street
Merrick	Central City	Central City Public Library, 1604 15th Avenue
Polk	Stromsburg	Stromsburg Public Library, 320 Central Street
York	York	Kilgore Memorial Library, 520 Nebraska Avenue
Saline	Western	Struckman-Baatz Public Library, 104 North West Avenue
Jefferson	Fairbury	Fairbury Public Library, 601 7th Street

7.3 AGENCY COORDINATION

NDEQ invited agencies with jurisdiction, expertise, or interest in the Nebraska Reroute to participate in the environmental review process. The agencies were asked to help identify potential environmental issues and concerns. This subsection summarizes the agency coordination efforts.

7.3.1 Agency Outreach

NDEQ coordinated with State and federal agencies. In May 2012, coordination letters were sent to key resource agencies: six federal agencies, six State agencies, and nine local NRDs. The key resource agencies are listed in Table 7.3-1. To help facilitate coordination with NRDs, NDEQ also invited comments from the Nebraska Association of Resources Districts, the professional association for Nebraska's 23 NRDs. NDEQ met with representatives from seven NRDs located in or along the Nebraska Reroute corridor. The meeting was held on May 2, 2012, in Grand Island at the Central Platte NRD office. NRD managers helped NDEQ identify and characterize concerns regarding potential impacts from implementing the Nebraska Reroute.

Following the May 2012 public information meetings, NDEQ met with representatives from the Nebraska Department of Health and Human Services, NDNR, NGPC, the Nebraska SHPO, the Lower Niobrara NRD, and NRCS. Coordination with the Nebraska State Historical Society was initiated on June 28, 2012, regarding potential historic and/or cultural resources.

Informal consultation was initiated with USFWS and NGPC to fulfill responsibility under the Nebraska Nongame and Endangered Species Conservation Act. NDEQ participated in coordination meetings that took place with USFWS, NGPC, and DOS on the following dates in 2012: July 9, July 19, August 17, September 13, September 29, and October 10–11.

NDEQ also met with EPA on July 12, 2012. The meeting took place at EPA's laboratory in Kansas City, Kansas. Discussion included the federal process that took place during the original environmental studies regarding the proposed Keystone XL Pipeline in eastern Nebraska and EPA's role in reviewing Keystone's application for a Presidential Permit under Executive Order 13337 for the Nebraska Reroute.

Table 7.3-1. Key Resource Agencies

Agency Type	Key Resource Agency	Jurisdiction or Area of Expertise
Federal	U.S. Department of State	Conduct American diplomacy at the federal level.
	U.S. Environmental Protection Agency	Protect human health and the environment at the federal level.
	U.S. Department of the Interior, U.S. Fish and Wildlife Service	Conserve, protect, and enhance fish, wildlife, and plants and their habitats.
	U.S. Department of Agriculture, Natural Resources Conservation Service	Work with the State of Nebraska to improve soil, water, and other natural resources.
	U.S. Department of the Interior, U.S. Geological Survey	Provide information on the health of ecosystems and the environment, natural hazards, reliance on natural resources, impacts of climate and land use change, and the core science systems used to provide timely, relevant, and usable information.
State	Nebraska Game and Parks Commission	Steward Nebraska's fish, wildlife, park, and outdoor recreational resources.
	Nebraska State Historical Society	Encourage, promote, and assist the advancement of programs to preserve and make accessible historical records in Nebraska.
	Nebraska Department of Health and Human Services	Help to ensure the overall health and well-being of the public (specifically with respect to drinking water for the Nebraska Reroute).
	Nebraska Department of Natural Resources	Ensure sustainable and proper management of Nebraska's natural resources.
	Nebraska Department of Roads	Ensure adequate and safe transportation resources for all Nebraska citizens and government officials.
	Nebraska Department of Revenue	Serve the public by administering the State revenue laws with integrity, efficiency, and consistency.

Agency Type	Key Resource Agency	Jurisdiction or Area of Expertise
Local	Central Platte Natural Resources District (NRD) Little Blue NRD Lower Big Blue NRD Lower Loup NRD Lower Niobrara NRD Lower Platte North NRD Lower Platte South NRD Upper Big Blue NRD Upper Elkhorn NRD Nebraska Association of Resource Districts	Conserve, sustain, and improve Nebraska's natural resources and environment.

7.3.2 DOS and NDEQ Memorandum of Understanding

On May 24, 2012, NDEQ and DOS entered into an MOU for conducting an environmental review for the Nebraska Reroute. The MOU documents agreement between DOS and NDEQ regarding relative roles, responsibilities, and procedures to be followed in conducting an environmental review of the Nebraska Reroute. The MOU also ensures that the environmental review is thorough, efficient, and adequate and that it satisfies all environmental compliance requirements of the lead and cooperating agencies consistent with NEPA. In terms of public outreach and involvement, one of the purposes of the MOU between NDEQ and DOS is to acknowledge and affirm that both agencies cooperate in a multistakeholder process to collectively consult with and seek the involvement and participation of other interested persons or entities.

7.4 COMMENTS RECEIVED

Comments were submitted in efforts to formulate the Feedback Report and have continued to be submitted. The official comment period for the Draft Evaluation Report will close at midnight on December 4, 2012 (the date of the Information Session and Public Hearing). From April 19 to October 15, 2012, NDEQ received 1,020 comments. Table 7.4-1 list the number of comments by method of submittal. Comments submitted on the Draft Evaluation Report will be gathered and considered for inclusion into the Final Evaluation Report.

Table 7.4-1. Comments Received (April 19, 2012 through October 15, 2012)

Method of Comment Submittal	Number of Comments Received
Letter	28
Email	80
Information telephone line	688
Comment form	76
Online comment form	148
Total	**1,020**

7.4.1 Summary of Issues Raised by Comments

NDEQ initiated a comprehensive effort to gather public input regarding the Nebraska Reroute. Agency and public comments received are reviewed, categorized, and addressed in this Draft Evaluation Report.

A variety of issues were raised including economic benefits, alternative corridors, and the Sand Hills. The full range of issue topics is addressed in Table 1.4-1, Issues Identified by Nebraskans, in Chapter 1, Introduction and Background. Listed below is a summary of issue topics NDEQ received from agency and public comments:

- Economic benefits
- Alternative corridors
- Sand Hills
- Ogallala Aquifer and water quality
- Pipeline construction, operation, and maintenance
- Waterbodies
- Corrosion
- Spills, contamination, and clean up
- Leak detection
- Product characteristics and health effects
- Temperature
- Soil and erosion
- Geology
- Property values
- Easements
- Farm or ranch operations and associated infrastructure
- Public services
- Special land designations
- Native American and cultural resources

7.5 DRAFT EVALUATION REPORT DISTRIBUTION

NDEQ encourages all interested parties to submit written comments on any aspect of this Draft Evaluation Report. NDEQ will consider all comments in preparing the Final Evaluation Report. With publication of this Draft Evaluation Report, NDEQ encourages the public to review and comment on it. The report is being distributed through the following methods:

- Electronic placement of the Draft Evaluation Report on the Nebraska Reroute website, <https://ecmp.nebraska.gov/deq-seis/>
- Printed copy placement in 10 local libraries (see Table 7.2-4 for a list of library locations by County)
- Printed copy placement at the NDEQ's main office in Lincoln and in each NDEQ regional field office in the state: Omaha, Norfolk, Holdrege, North Platte, Scottsbluff, and Chadron
- Direct mail notice and/or email notice of the document's availability on the Nebraska Reroute website and at local libraries. Notice will be sent out to all participants who provided a mailing address (direct mail notice) or an email address (email notice) at the public information meetings and through the comment process.
- Direct mail to key resource agencies

The key resource agencies will be provided a full printed document or the Executive Summary accompanied by the full report on CD. The distribution to key resource agencies and stakeholders is listed in Table 7.5-1.

Table 7.5-1. Draft Evaluation Report Distribution

Format	Description	Key Resource Agency Recipient
Printed full report	Full printed and bound versions of the Draft Evaluation Report and mapbook for public and agency review of the full report	▪ Governor ▪ 10 public libraries: Albion Public Library (Boone County), Fullerton Public Library (Nance County), Stromsburg Public Library (Polk County), Keya Paha County Library (Key Paha County), O'Neill Public Library (Holt County), Neligh Public Library (Antelope County), Central City Public Library (Merrick County), Fairbury Public Library (Jefferson County), Struckman-Baatz Public Library (Saline County), and Kilgore Memorial Library (York County) ▪ NDEQ offices ▪ Nebraska Game and Parks Commission ▪ Nebraska Department of Natural Resources ▪ Nebraska State Historical Society ▪ U.S. Department of State
Executive summary with full report on CD	Printed executive summary accompanied by a CD containing the full report and all maps	▪ Central Platte, Little Blue, Lower Big Blue, Lower Loup, Lower Niobrara, Lower Platte North, Lower Platte South, Upper Big Blue, and Upper Elkhorn Natural Resources Districts ▪ Nebraska Association of Resources Districts ▪ Nebraska legislators ▪ Nebraska Department of Health and Human Services ▪ Nebraska Department of Roads ▪ Nebraska Conservation and Survey Division ▪ U.S. Environmental Protection Agency ▪ U.S. Department of the Interior, U.S. Fish and Wildlife Service ▪ U.S. Department of Agriculture, Natural Resources Conservation Service ▪ U.S. Department of the Interior, U.S. Geological Survey
Postcard/Email notice	A notification will be sent by either postcard or email, depending on the contact information for each individual. The content will be consistent between both email and postcard notification. Information will include the release of the Draft Evaluation Report; Nebraska Reroute website address; Information Session and Public Hearing date, time, and location; library listings; and comment methods.	▪ Nebraska Department of Environmental Quality stakeholder and agency mailing list ▪ Public meeting attendees ▪ Comment participants

NDEQ's comment period for the Draft Evaluation Report will remain open through the Public Hearing on December 4, 2012. Multiple opportunities to comment on the Draft Evaluation Report are provided, including:

- Online comment form using the Nebraska Reroute website: <https://ecmp.nebraska.gov/deq-seis/>
- Email: <NDEQ.SEISpubliccomment@Nebraska.gov>
- Comment form available at the Information Session
- Verbal testimony left with court reporter at the December Public Hearing
- Direct mail:

  Nebraska Department of Environmental Quality
  1200 N Street, Suite 400
  P.O. Box 98922
  Lincoln, NE 68509

7.6 INFORMATION SESSION AND PUBLIC HEARING

NDEQ will host an Information Session and Public Hearing on December 4, 2012. The Information Session will be conducted in an open house format and will take place immediately before the Public Hearing. The open house format provides an opportunity for one-on-one interactions with members of the project team and for learning about the evaluation process from display and outreach materials. The Information Session will provide the public with information regarding the Nebraska Reroute and the Draft Evaluation Report and will gather comments from the public regarding the evaluation process and the anticipated impacts of the Nebraska Reroute. The Public Hearing will provide a formal opportunity for the public to provide testimony for inclusion in the public record—it is also a requirement of LB 1161.

Planned activities for the December 4, 2012, Information Session and Public Hearing are:

Location:	Event Center and Casey's Building (S. 11th Street and Fairview Road) located at the Boone County Fairgrounds, 2616 Fairgrounds Road Albion, Nebraska
Date:	December 4, 2012
Time:	Information Session: 3:00 p.m.–5:30 p.m. Public Hearing: 6:00 p.m.

7.6.1 Rules for Participation

Any interested persons who would like to provide oral comments at the Public Hearing will be welcomed on a first-come basis. A speaker sign-in sheet will be available at the registration table located at the entrance to the both the Information Session and the Public Hearing. Individuals with extensive comments are encouraged to submit them in writing, and all interested parties who provide oral comments are encouraged to also provide such comments in writing.

At the start of the Public Hearing, the hearing officer will review the ground rules for providing oral comments.

7.6.2 Agency and Other Group Participation

Although allowed at the May 2012 public information meetings, groups or individuals will not be allowed to provide any handouts and/or set up tables inside the facilities for the Information Session and Public Hearing (at the Event Center or Casey's Building).

7.6.3 Next Steps to Complete the Nebraska Evaluation

Following the public information session and public hearing, all comments received on this Draft Evaluation Report will be considered in NDEQ's Final Evaluation Report. The Final Evaluation Report will be submitted to Nebraska's Governor. In accordance with the process directed in LB 1161, the Governor will indicate to DOS "whether he or she approves any of the routes reviewed in the supplemental environmental impact statement" [LB 1161, Sec. 3. (4)] regarding the Nebraska Reroute. DOS will complete its Final Supplemental EIS and incorporate the Governor's decision.

CHAPTER 8

LIST OF PREPARERS

8.1 NEBRASKA DEPARTMENT OF ENVIRONMENTAL QUALITY

The following members of NDEQ were responsible for overall project management, technical direction, and writing, reviewing, and editing the Draft Evaluation Report.

Name	Project Role
Michael Linder, Esq.	Director
Jay Ringenberg	Deputy Director
Pat Rice, PE	Project Manager
Doug Barry	Mechanical Engineer
John Bender	Water Quality
Brian McManus	Public Information Officer
David Miesbach, PG	Geologist
Linda Rohn	Administrative Support

8.2 CONTRACTORS

HDR Engineering, Inc., and its subconsultants assisted NDEQ in preparation of the Draft Evaluation Report. The following individuals were key members of the project team:

Name	Background	Project Role
	Project Management	
Tim Crockett, PE	▪ M.S., Civil Engineering ▪ B.S., Mathematics ▪ Twenty-three years in project management and in multiple facets of civil engineering related to solid waste, water resources, and environmental studies	Project Principal
John Morton, PE	▪ M.S., Engineering Management ▪ B.S., Civil Engineering ▪ Thirty-eight years in the design, permitting, and approval of civil engineering structures; NEPA and other environmental compliance; mitigation design; public involvement, interagency coordination, and management of interdisciplinary teams	Project Manager

Name	Background	Project Role
Audrey Unger, PMP	▪ M.S., Environmental Planning ▪ B.S., Environmental Sciences/Studies ▪ Thirteen years in NEPA compliance, environmental justice, social conditions, Environmental Management Systems, sustainability, conceptual master planning, and brownfields redevelopment, plus experience supervising large groups of interdisciplinary professionals	Deputy Project Manager Chapter Manager – Air, Noise, Hazardous Sites and Materials
Lucy Bowen	▪ B.A., Technical Journalism ▪ Thirty-six years in the management of environmental regulatory programs, and multidisciplinary teams, preparation of environmental impact statements (EISs), environmental assessments, and technical reports for a wide variety of projects including high-voltage transmission lines, pipelines, and flood control facilities	Senior Reviewer
Rosemary Hargrave	▪ M.S., Biology ▪ B.S., Biology ▪ Thirty-five years in the management of environmental regulatory programs, and multidisciplinary teams, preparation of EISs, environmental assessments, and technical reports for a wide variety of projects	Senior Reviewer
Craig Osborn, PE	▪ B.S., Civil Engineering ▪ B.S., Conservation/Renewable Natural Resources ▪ Thirty-seven years as an environmental specialist, project engineer, and project manager for environmental assessments; permit applications; compliance inspection; site restoration; and design for industrial, hazardous, and radioactive waste facilities	Quality Control Manager
Mark Wollschlager, J.D.	▪ J.D. ▪ B.S., Biological/Life Sciences ▪ Thirty-two years in environmental law, impact analysis, permitting, and quality control; strategy, coordination, guidance, review, analysis, and interpretation of federal and state environmental and energy laws and regulations affecting various types of projects and facilities	Affected Environment and Environmental Consequences Chapter Manager Senior Reviewer – Agriculture and Land Use, Recreation and Visual Resources, Population and Environmental Justice, Employment and Fiscal Impacts, Energy

Name	Background	Project Role
	Technical Analysis	
Christopher Behr	▪ M.S., Civil Engineering ▪ M.S., Natural Resources (Natural Resource, Economics) ▪ B.A., Economics/Finance ▪ Twenty-two years in the evaluation of infrastructure investments and environmental impacts and application of diverse analytical tools such as cost-benefit analyses, cost-risk analyses, environmental valuation, and statistics	Resource Specialist – Economics and Fiscal Impacts
John Cambridge, PE, CFM	▪ B.S., Civil Engineering ▪ Thirty-four years in a wide range of water resources projects, including storm water management, watershed planning, channel stabilization, and flood control projects, performing hydrologic analysis, hydraulic design, and design of structures	Resource Specialist – Surface Water
Garson Carothers	▪ B.S., Civil Engineering ▪ Twenty-four years in environmental studies, primarily in the oil and mining sector; environmental data collection; and design and implementation of innovative remediation approaches	Chapter Manager – Pipeline Safety and Potential Spills
Timothy Casey	▪ B.S., Biology ▪ Twenty-three years performing and managing noise and vibration analyses for projects involving stationary and mobile sources, including combustion turbines, wind farms, and other noise sources associated with the power and energy industries	Resource Specialist – Noise
Jeremy Cook	▪ M.A., Economics/Finance ▪ B.A., Economics/Finance ▪ Twelve years performing economic and statistical modeling and fiscal analysis of various water resources projects; cash flow models and finance alternatives for public infrastructure; market analysis of construction materials; and development of optimization models	Resource Specialist – Employment and Fiscal Impacts
Jeff Franco	▪ M.S., Biosciences Management ▪ B.S., Environmental Sciences ▪ Seven years conducting environmental site assessments and EISs, wetland delineation, Section 404 permitting, prairie ecology and restoration, and invasive species monitoring and control	Resource Specialist – Recreation and Visual Resources

Name	Background	Project Role
Fiona Goodson	▪ B.S., Ecology ▪ Seventeen years in the environmental field including wildlife, biology, wetlands, species-specific surveys; project management; and environmental regulatory compliance with NEPA, Sections 404 and 401 of the Clean Water Act, and the Endangered Species Act	Chapter Manager – Wetlands, Terrestrial Vegetation, Wildlife, Fisheries, Threatened and Endangered Species and Species of Conservation Concern
Erin Hatchett	▪ M.S., Wildlife and Fisheries Sciences ▪ B.S., Wildlife Biology ▪ Fifteen years in wildlife biology, threatened and endangered species habitat assessment, and presence/absence surveys; environmental site assessment; hazardous materials investigations; NEPA documentation; and wetland delineation and permitting	Resource Specialist – Wildlife
Tom Hess	▪ B.S., Geomechanics ▪ Twenty-eight years of experience in the pipeline and utility construction industries, including project management, permit acquisition, environmental inspection, and construction foreman	Senior Pipeline Advisor
Larry Land, PE	▪ M.S., Agricultural Engineering ▪ B.S., Agricultural Engineering ▪ Forty-seven years in water resource planning, development, monitoring, well design, well field evaluation, and conjunctive use of surface water and groundwater	Senior Reviewer – Geology, Surface Water, Groundwater
Bruce Larsen, PE	▪ B.S., Civil Engineering ▪ Thirty-three years in environmental compliance, analysis and design of water and wastewater treatment facilities, soil and groundwater investigations, groundwater monitoring system design, feasibility studies, groundwater modeling and remediation	Senior Reviewer – Hazardous Sites and Materials
Samuel Less	▪ M.S., Environmental Planning ▪ B.A., Philosophy ▪ Thirty years in the preparation of NEPA documentation using guidance issued by 10 different federal agencies, including FTA, FHWA, USACE, USDA, FAA, USDOE, USCG, GSA, EDA, and FRA; co-author of Chapter 1, *Highway Engineering Handbook*, McGraw Hill (Third Edition), 2009	Senior Reviewer – Affected Environment and Environmental Consequences Chapter

Name	Background	Project Role
Edward Liebsch	▪ M.S., Meteorology ▪ B.A., Earth Science/Chemistry ▪ Thirty-two years as an air quality specialist, project manager, and group leader for air quality impact analysis and permitting, including dispersion modeling of air pollution, regulatory evaluations, and air quality analyses under NEPA and state environmental review programs	Senior Reviewer – Air Quality
Christine Magers	▪ M.S., Environmental Management ▪ B.S., Wildlife and Fishery Science ▪ Seven years in environmental analysis and documentation, surveys of rangeland and wildlife systems, Section 404/401 permitting, feasibility studies, and wetland delineations	Resource Specialist – Wetlands, Terrestrial Vegetation
Scott Mars, PE	▪ M.S., Water Resources ▪ B.S., Environmental Engineering ▪ Twenty-four years in water resources planning and hydrology, water quality, water rights, NEPA permitting and analysis, land use planning, stream restoration, property acquisitions/transactions and redevelopment, and soil and groundwater investigation and remediation	Chapter Manager – Geology, Soils and Sediment, Groundwater, Surface Water
Randall McCart	▪ M.A. and B.S., Geography ▪ B.S., Education ▪ Thirty-one years in NEPA studies evaluating a wide range of projects including radioactive waste facilities and natural resource management. Mr. McCart has specialized in impacts on air and water quality, hazardous material, energy, geology and soils, farmland, and environmental justice	Resource Specialist – Agriculture and Land Use, Population and Environmental Justice, Energy
Craig McColloch, PE	▪ B.S., Civil Engineering ▪ Thirty-four years in public involvement, preparation and management of NEPA documents, Phases I and II environmental site assessments, soil and groundwater remediation, and construction oversight of environmental remediation and hazardous waste disposal	Comment/Response Coordinator

Name	Background	Project Role
Carrie Minnich	▪ M.S., Geology ▪ B.S., Geology ▪ Eight years in preparation and management of Phases I and II environmental site assessments, soil and groundwater remediation, installation and sampling of groundwater monitoring wells, soil borings and test pits; processing and analysis of field and laboratory data; preparation of site-specific maps with posted analytical data using ArcGIS; and investigative and remedial report writing	Resource Specialist – Geology, Soils and Sediments, Groundwater
Gregg Mitchell, PG	▪ B.S., Environmental Technology ▪ Twenty-four years in the preparation of EISs and critical issues analyses on a number of alternative energy planning projects; assessment of soil, surface geologic, groundwater, and mining resources; and identification of potential geologic hazards, geotechnical constraints, and engineering mitigations	Senior Reviewer – Soils and Sediment
Jim Pavlik, PE	▪ B.S., Civil Engineering ▪ Twenty-three years in air quality permitting and compliance of complex Prevention of Significant Deterioration, Title V and NEPA projects as well as environmental site assessments and investigations, Resource Conservation and Recovery Act, industrial stormwater pollution prevention plans, spill prevention control and countermeasures plans, and Superfund Amendments and Reauthorization Act, Title III	Resource Specialist – Air Quality
Matt Pillard	▪ M.S., Plan Sciences (Community and Regional Planning) ▪ B.S., Natural Resources ▪ Nineteen years in technical development of environmental assessments, EISs, and environmental permitting; Section 404 of the Clean Water Act; and environmental resource planning and management	Resource Specialist – Fisheries, Threatened and Endangered Species and Species of Conservation Concern
Steve Rowe	▪ M.S., Environmental Sciences ▪ B.A., Biology ▪ Twenty-one years in preparation and review of environmental assessments and EISs; development and implementation of permitting strategy and technical plans for pipelines, gas storage fields, and other energy projects	Senior Pipeline Advisor

Name	Background	Project Role
Steve Sabatke	▪ M.A., Anthropology/Archaeology ▪ B.A., Anthropology/Archaeology ▪ Thirteen years in cultural resources management of federal and nonfederal projects; development of cultural resources project permitting strategies and development of project-specific cultural resource technical procedures, cultural resources project lead, cultural resources group lead, and cultural resources field supervisor	Resource Specialist – Cultural Resources
Cheryl Schmidt	▪ Ph.D., Biology ▪ M.S., Biology ▪ B.S., Biology ▪ Twenty-eight years in ecological resources, habitat management, multitaxonomic field work in a wide variety of localities, and environmental planning and monitoring	Senior Reviewer – Wetlands, Terrestrial Vegetation, Wildlife, Threatened and Endangered Species and Species of Conservation Concern
Alan Stanfill	▪ M.A., Anthropology ▪ B.A., Anthropology ▪ Thirty-nine years as an archaeologist and cultural resource manager; negotiation of programmatic and memoranda of agreement to resolve conflicts under Section 106 of the National Historic Preservation Act; design of procedural mechanisms to complete the steps of the Section 106 process	Senior Reviewer – Cultural Resources
Catherine Storey	▪ B.S., Chemistry ▪ Twenty-eight years in chemistry and environmental science, including environmental assessments, EISs, and environmental permitting for Federal Energy Regulatory Commission and NEPA projects including natural gas pipelines and storage fields	Resource Specialist – Pipeline Safety and Potential Spills
Scott Stuewe	▪ B.S., Fishery Sciences ▪ Thirty-five years in aquatic management, ecosystem restoration, water quality and supply, interjurisdictional species management, and control of aquatic nuisance species	Senior Reviewer − Fisheries
Patricia Terhaar	▪ M.S., Geology ▪ B.S., Geological and Related Sciences (Earth Science) ▪ Twenty-nine years in preparation of documents supporting NEPA compliance for energy projects, Phases I and II site assessments, hydrogeologic investigations, remedial investigations and feasibility studies associated with landfills, hazardous waste sites, and chemical and petroleum spills	Technical Lead – Project Description

Name	Background	Project Role
Cindy Veys	▪ M.A., Environmental Management ▪ B.S., Geography ▪ Thirty-six years in environmental resource planning and management, preparation and review of NEPA documents, including Categorical Exclusion reviews, Environmental Assessments, and EISs for public projects in transportation, utilities, pipelines and water. Ms. Veys also is experienced in managing a large interdisciplinary staff in the preparation of environmental documents and permits	Senior Reviewer – Agriculture and Land Use, Recreation and Visual Resources, Population and Environmental Justice, Energy
Todd Wilson	▪ M.S., Pharmaceutical Sciences ▪ B.S., Chemistry ▪ Twenty-one years in management of hazardous toxic and radioactive waste sites; chemical sampling, testing, and analysis of wastes; field audits and review of laboratory Chemical Quality Assurance and Health and Safety requirements; and evaluation of innovative technologies for applications in the remediation of hazardous toxic and radioactive waste sites	Resource Specialist – Hazardous Sites and Materials
Leanne Ziettlow, PE	▪ M.S., Civil Engineering ▪ B.S., Civil Engineering ▪ Twenty-seven years in the planning, design, and implementation of transportation, traffic engineering, and public involvement projects including preparation of project reports and documents	Resource Specialist – Public Services
Outreach and Agency Coordination		
Stephanie White	▪ M.B.A., Business Administration/Management ▪ B.A., Sociology ▪ Sixteen years in leading local, regional, and statewide communications and outreach activities; training; strategic planning; economic analysis; marketing; and public relations strategy	Senior Reviewer – Outreach and Agency Coordination Chapter
Katie Hatfield-Edstrom	▪ Ph.D., Communications ▪ M.A., Communications ▪ B.A., Communications ▪ Eleven years in message construction, audience analysis, and group facilitation, including small group communication, mass media and culture, public communication, persuasion, social movements, interpersonal communication, and argumentation and debate	Chapter Manager – Outreach and Agency Coordination Chapter

Name	Background	Project Role
Adriana Servinsky	▪ B.S., Civil Engineering ▪ Nine years in public involvement and and transportation planning including the preparation of project development reports and environmental studies	Resource Specialist – Outreach and Agency Coordination Chapter
Document Production		
Barry Butterfield	▪ M.S., Water Resources/Civil Engineering ▪ B.S., Civil Engineering ▪ Thirty-eight years as a project engineer and project manager for a wide variety of water resources, transportation, energy, and waste management projects; NEPA studies; contract negotiations; and technical production	Document Production Manager
Molly Brown	▪ B.S., Environmental Studies ▪ Seventeen years in the preparation of NEPA projects and environmental permitting, public involvement, scheduling, progress reporting, and quality assurance	Technical Lead – GIS and Graphics Chapter Manager – Mitigation
Lori Buffington	▪ B.S., Business Administration (degree not complete) ▪ Thirty-five years in editorial review of technical documents, and preparation and review of environmental impact studies, biological assessments, and environmental assessments	Technical and Copy Editor
Dorothy Bungert	▪ B.F.A., Graphic Design ▪ Thirty-one years in creation and management of graphic, marketing, and public outreach communications, design briefs, textbooks, and environmental documents; experienced in full-service art direction and document management in traditional and digital print processes	Resource Specialist – Graphics
Ruth Ellen Hughes	▪ B.A., English and Journalism ▪ Two years in copyediting, development of templates and style guidelines, and formatting and preparation of documents for publication	Technical Writer – References
Britton Marchese	▪ M.S., Environmental Sciences ▪ B.S., Psychology ▪ Fifteen years in technical writing and editing; NEPA documentation and coordination; and socioeconomic, cultural, visual, and hazardous waste analyses	Technical Editor

Name	Background	Project Role
Sara Merchán Paniagua	▪ M.S., Environmental Sciences ▪ B.S., Environmental Biology ▪ Six years in NEPA compliance, Sections 404/401 permitting, wetland delineations, editing, and document production	Affected Environment and Environmental Consequences Chapter Coordinator Resource Specialist – Mitigation Technical Writer – List of Preparers
Michele Myers	▪ B.S., Graphic Design/Artist ▪ Thirteen years in graphic design	Resource Specialist – Graphics
Carl Petrich	▪ M.B.A. ▪ M.L.A., Landscape Architecture ▪ B.S., Botany ▪ Forty-three years leading the editing of major environmental projects; experienced in scenario planning, strategic thinking, organizational development aesthetic analysis, and international energy and environmental planning	Senior Technical Editor
Meagan Schnoor	▪ B.S., Biology ▪ Ten years in biological sciences, threatened and endangered species, wetland delineations, and NEPA studies	Technical Lead – Executive Summary, Introduction and Background, Project Regulatory Requirements, Mitigation
Amy Sorensen	▪ Associate of Science, Geographic Information Systems ▪ Associate of Science, Education ▪ Eight years in GIS including reading, interpreting and understanding legal descriptions, maps, plats, aerial photographs and other GIS-related source information	GIS Coordinator
Travis Talbitzer, GISP	▪ M.A., Geography ▪ B.S., Natural Resources ▪ Nine years in biological surveys, wetland delineations, Section 404 permitting, GIS, and environmental documentation	GIS Coordinator
Wendy Thompson	▪ B.S., Nursing (degree not complete) ▪ Eleven years in public involvement and outreach activities, and project assistance including development of project-specific outreach plans, newsletters, proposals, presentations, and preparation of environmental studies	Document Coordinator Project Administrative Assistant
Carrie Ulrich	▪ M.S., English ▪ B.S., Environmental Studies ▪ Nineteen years in technical writing, editing, and document production	Technical Editor

Name and Firm	Background	Project Role
	Subconsultants	
Charles Butterfield Chadron State College	▪ Ph.D., Rangeland Ecology ▪ M.S., Grazing Management ▪ B.S., Range Ecology	Rangeland Management Consultant
Robert Perla, PE RPMS Consulting Engineers	▪ B.S.	Pipeline Design and Construction
David Seep DCS and Associates, LLC	▪ B.S.	Assessment and Document Reviewer
Amy Smith Northeastern Oklahoma State University and Tetra Tech, Inc.	▪ Ph.D., Biology ▪ B.S., Biology	American Burying Beetle Consultant

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CHAPTER 9

REFERENCES

American Petroleum Institute (API). 1998. *Characteristics of Dissolved Petroleum Hydrocarbon Plumes*. Version 1.1. Prepared by Groundwater Service, Inc., for API Soil and Groundwater Technical Task Force. December 1998.

Antelope County, Nebraska. 2007. *Comprehensive Plan of Antelope County, Nebraska*. January 9. Amended September 2010. Retrieved July 22, 2012. <http://www.co.antelope.ne.us/content/Antelope_County_Comprehensive_Plan>.

Associated Press. 2012. "Investigation of Yellowstone River Oil Spill to be Complete in September." *Missoulian*, August 18, Montana and Regional section, online edition. <http://missoulian.com/news/state-and-regional/investigation-of-yellowstone-river-oil-spill-to-be-complete-in/article_efbac016-e975-11e1-9b7a-0019bb2963f4.html>.

Bedick, Jon C., Brett C. Ratcliffe, Wyatt W. Hoback, and Leon G. Higley. 1999. "Distribution, ecology, and population dynamics of the American burying beetle (*Nicrophorus americanus* Olivier [Coleoptera, Silphidae]) in south-central Nebraska, USA." *Journal of Insect Conservation* 3(3):171–181.

Berry, Walter, Norman Rubinstein, Brian Melzian, and Brian Hill. 2003. *The Biological Effects of Suspended and Bedded Sediment (SABS) in Aquatic Systems: A Review*. U.S. Environmental Protection Agency Report. August 20. Retrieved on August 21, 2012. <http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/pollutants/sediment/upload/2004_08_17_criteria_sediment_appendix1.pdf >.

Bleed, Ann and Charles Flowerday, eds. 1998. *An Atlas of the Sand Hills*. Resource Atlas No. 5a. Second Edition. May 1990. Conservation and Survey Division, Institute of Agriculture and Natural Resources, University of Nebraska–Lincoln.

Bold Nebraska, Center for Biological Diversity, Chesapeake Climate Action Network, Environment America, Friends of the Earth, Labor Network for Sustainability, League of Conservation Voters, National Wildlife Federation, Natural Resources Defense Council, Pembina Institute, Sierra Club, and Voices for Progress. 2012. Letter to Ray LaHood (Secretary of Transportation) regarding a request for expansion of the scope of National Academy of Sciences study on Pipeline Transportation of Diluted Bitumen. July 20. <http://www.usclimatenetwork.org/resource-database/letter-to-the-department-of-transportation-urging-an-expanded-tar-sands-pipeline-safety-study>.

Boone County Board of Commissioners. 2011. *Minutes of Public Hearing Proceedings*. December 12. Retrieved July 25, 2012. <http://www.co.boone.ne.us/posting_files/pdfs/board/minutes/2011/20111212_162129_board_minutes.pdf>.

Burkhardt, Paul. 2011. "Magellan Reduces Nebraska Line Spill Estimate to 2,834 Barrels." *Bloomberg Businessweek*, December 13. <http://www.businessweek.com/news/2011-12-13/magellan-reduces-nebraska-line-spill-estimate-to-2-834-barrels.html>.

California Environmental Protection Agency. 2012. "UST – Analytical Models for Non Steady State Contaminant Transport in Groundwater." Domenico Non-Steady State Analytical Model (Continuous Source Release Boundary Condition). <http://www.waterboards.ca.gov/rwqcb4/water_issues/programs/ust/model_non_steady.shtml>.

Canadian Association of Petroleum Producers (CAPP). 1996. *Hydrostatic Test Water Management*. CAPP Publication Number 19960014. Retrieved August 21, 2012. <http://www.capp.ca/library/publications/industryOperations/pages/pubInfo.aspx?DocId=179764>.

Canadian Association of Petroleum Producers (CAPP), Canadian Energy Pipeline Association, and Canadian Gas Association. 2005. *Pipeline Associated Watercourse Crossings*. Prepared by TERA Environmental Consultants and Salmo Consulting, Inc., Calgary, Alberta. Retrieved August 21, 2012. <http://www.neb-one.gc.ca/clf-nsi/rsftyndthnvrnmnt/nvrnmnt/lfcclpprch/pplnwtrcrssngs2005-eng.pdf>.

Chapman, Shannen S., James M. Omernik, Jerry A. Freeouf, Donald G. Huggins, James R. McCauley, Craig C. Freeman, Gerry Steinauer, Robert T. Angelo, and Richard L. Schlepp. 2001. *Ecoregions of Nebraska and Kansas* [color poster with map, descriptive text, summary tables, and photographs]. 1:1,950,000. Reston, Virginia. U.S. Geological Survey (USGS).

Condra, Geo E., and E. C. Reed. 1943. "The Geological Section of Nebraska." *Nebraska Geological Survey Bulletin*. no. 14.

Cordone, Almo J., and Don W. Kelley. 1961. "The Influence of Inorganic Sediment on the Aquatic Life of Streams." *California Fish and Game* 47:189–223.

Cowardin, Lewis M., Virginia Carter, Francis C. Golet, and Edward T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. Version 04DEC1998. U.S. Department of the Interior, U.S. Fish and Wildlife Service, Washington, D.C. Jamestown, North Dakota: Northern Prairie Wildlife Research Center. Retrieved July 23, 2012. <http://www.npwrc.usgs.gov/resource/wetlands/classwet/index.htm>.

Crone, Anthony J., and Russell L. Wheeler. 2000. *Data for Quaternary Faults, Liquefaction Features, and Possible Tectonic Features in the Central and Eastern United States, East of the Rocky Mountain Front*. U.S. Geological Survey Open-file Report 00-260. Reston, Virginia. U.S. Geological Survey(USGS). Retrieved July 31, 2008. <http://pubs.usgs.gov/of/2000/ofr-00-0260/ofr-00-0260.pdf>.

Department of Fisheries and Oceans Canada. 2009. *Isolated and or Dry Open Cut Stream Crossings: Fisheries and Oceans Canada Quebec Operational Statement*. Retrieved August 21, 2012. <http://www.dfo-mpo.gc.ca/habitat/what-quoi/os-eo/qc/pdf/stream-eng.pdf >.

Diffendal, Robert, Jr., Roger K. Pabian, and J. R. Thomasson. 1996. "Geologic History of Ash Hollow State Historical Park, Nebraska." Conservation and Survey Division, Paper 3. Retrieved September 6, 2012. <http://digitalcommons.unl.edu/conservationsurvey/3>.

Driftwatch. 2012. Interactive map of Sensitive Areas and Organic Producers in Nebraska. Retrieved September 15, 2012. <http://nebraska.agriculture.purdue.edu/applicators.html>.

Environmental Data Resources, Inc. (EDR). 2012. *TransCanada XL Pipeline, Merrick, NE*. Inquiry Number: 337794.1s. August 3.

ExxonMobil. 2012. *2011 Corporate Citizenship Report*. Irving, Texas, May 22. <http://www.exxonmobil.com/Corporate/Files/news_pub_ccr2011.pdf>.

Federal Energy Regulatory Commission (FERC), Office of Energy Projects. 2004. *Research of Wetland Construction and Mitigation Activities for Certificated Section 7(c) Pipeline Projects*. Final Report. Washington, D.C., March.

Forkert Engineering & Surveying, Inc., and Chambers Group, Inc. 2008. *Horizontal Directional Drilling: Contingency and Resource Protection Plan for Construction of the AT&T Fiber Optic Cable Installation Project, Clark County, Nevada and San Bernardino County, California*. July. Prepared for AT&T. Retrieved on August 21, 2012. <http://www.slc.ca.gov/division_pages/DEPM/DEPM_Programs_and_Reports/ATT_Fiber_Optic/PDF/Appendices/Ap-I_HDD_Plan.pdf>.

Fry, Joyce A., George Xian, Suming Jin, Jon A. Dewitz, Collin G. Homer, Limin Yang, Christopher A. Barnes, Nathaniel D. Herold, and James D. Wickham. 2011. *Completion of the 2006 National Land Cover Database for the Conterminous United States, PE&RS*. Vol. 77(9):858–864.

Galloway, Devin L., D. R. Jones, and Steven E. Ingebritsen. 2000. *Land Subsidence in the United States*. USGS Fact Sheet: 165-00.

Gordon, Deborah. 2012. "Understanding Unconventional Oil." May. <http://www.carnegieendowment.org/files/unconventional_oil.pdf>.

Gutentag, Edwin D., Frederick J. Heimes, Noel C. Krothe, Richard R. Luckey, and John B. Weeks. 1984. *Geohydrology of the High Plains Aquifer in Parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas and Wyoming*. U.S. Geological Survey Professional Paper 1400-B.

Korus, J. T., and R. M. Joeckel. 2011. "Generalized geologic and hydrostratigraphic framework of Nebraska 2011." Version 2. Conservation and Survey Division, School of Natural Resources, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln. Geologic Maps and Charts (GMC) 38.

Krzic, M., K. Wiseman, L. Dampier, and D. Gaumont-Guay. 2004. SoilWeb200: an on-line teaching tool for APBI 200 course. The University of British Columbia, Vancouver. Retrieved September 2012. <http://www.landfood.ubc.ca/soil200/index.htm>.

Lower Platte North Natural Resources District (NRD). 2009. *Hydrogeologic Evaluation and Subarea Delineation Study*. Report prepared by Olsson and Associates.

McWilliams, D. A., D. R. Berglund, and G. J. Endres. June 1999. Soybean Growth and Management, Quick Guide.

Madson, Chris. 2006. "Gasfields and wildlife: Nearly a decade of research is showing the effects of energy development on a wide variety of Wyoming's wildlife." *Wyoming*

Wildlife, October, pp. 10–19. Wyoming Game and Fish Department, Cheyenne, Wyoming.

Maher, Harmon D., Jr., George F. Engelmann, and Robert D. Shuster. 2003. *Roadside Geology of Nebraska*. Missoula, Montana: Mountain Press Publishing Company.

Miller, James A., and Cynthia L. Appel. 1997. *Groundwater Atlas of the United States, Kansas, Missouri and Nebraska*. USGS Publication HA-730-D.

mt.gov, Office of Governor Brian Schweitzer. 2012. "Frequently Asked Questions: Yellowstone River Oil Spill." <http://www.yellowstoneriveroilspill.mt.gov/faq.asp>.

Nance County, Nebraska. 1999. *Nance County, Nebraska Comprehensive Development Plan*. Retrieved July 17, 2012. <http://www.co.nance.ne.us/webpages/zoning/zoning.html>.

National Academy of Sciences. n.d. "Project Information: Pipeline Transportation of Diluted Bitumen." Retrieved September 11, 2012. <http://www8.nationalacademies.org/cp/projectview.aspx?key=49461>.

National Atlas. 2008. "Map Layers." Retrieved July 11, 2008. <http://nationalatlas.gov/maplayers.html?openChapters=chpgeol>.

National Conservation Easement Database. 2012. "What is the NCED?" July 12. Retrieved July 23, 2012. <http://nced.conservationregistry.org/>.

National Response Center (NRC). 2012. "NRC Background." Retrieved September 13, 2012. <http://www.nrc.uscg.mil/nrcback.html>.

National Transportation Safety Board (NTSB). 2012. *Enbridge Incorporated Hazardous Liquid Pipeline Rupture and Release, Marshall, Michigan, July 25, 2010.* Pipeline Accident Report NTSB/PAR-12/01.

Nebraska Aquatic Nuisance Species Planning Committee. 2010. *Nebraska Aquatic Nuisance Species Management Plan*. August 11. Retrieved on August 21, 2012. <http://snr.unl.edu/invasives/documents/Nebraska%20ANS%20Plan%20Final.pdf>.

Nebraska Department of Environmental Quality (NDEQ). 2001. *Wellhead Protection Plan Guidance*. Wellhead Protection Program. September 18.

———. 2010. *Nebraska Air Quality 2010*. Air Quality Division. Retrieved August 7, 2012. <http://deq.ne.gov/Publica.nsf/0/a12a5ada6cce1c1686257a47004e0633/$FILE/AirQuality%202010.pdf>.

———. 2011. *2011 Nebraska Groundwater Quality Monitoring Report*. December 30.

———. 2012a. *Nebraska's Keystone XL Pipeline Evaluation Feedback Report*. July.

———. 2012b. *2012 Water Quality Integrated Report*. Water Quality Division. April 1.

———. 2012c. "NDEQ Interactive Mapping System." Retrieved September 19, 2012. <http://deqims.deq.state.ne.us/DEQ/index.jsp>.

———. 2012d. "Leaking Underground Storage Tank and Surface Spill Site Information." Retrieved September 19, 2012. <http://www.deq.state.ne.us/lustsurf.nsf/pages/sssi>.

Nebraska Department of Health and Human Services. 2012a. *State of Nebraska Roster: Long Term Care Facilities*. June 12. Retrieved September 8, 2012. <http://dhhs.ne.gov/publichealth/Documents/LTCRoster.pdf>.

———. 2012b. *State of Nebraska Roster: Assisted-Living Facilities*. August 15. Retrieved September 8, 2012. <http://dhhs.ne.gov/publichealth/Documents/ALF%20Roster.pdf>.

Nebraska Department of Natural Resources (NDNR). 2005. *2006 Annual Evaluation of Availability of Hydrologically Connected Water Supplies*. December 30.

———. 2012. "Registered Groundwater Wells Data Retrieval." Retrieved September 4, 2012. <http://dnrdata.dnr.ne.gov/wellscs/Menu.aspx>.

Nebraska Energy Office. 2012. "Wind Energy Generation in Nebraska." <http://www.neo.ne.gov/statshtml/89.htm>.

Nebraska Game and Parks Commission (NGPC). 2011a. "Appendix 10: Map of the Ecoregions of Nebraska." In *Nebraska Natural Legacy Project*. Retrieved July 28, 2012. <http://outdoornebraska.ne.gov/wildlife/programs/legacy/pdfs/appendix10.pdf>.

———. 2011b. "Chapter 6: Mixed-grass Prairie Ecoregion." In *Nebraska Natural Legacy Project*. Retrieved July 28, 2012. <http://outdoornebraska.ne.gov/wildlife/programs/legacy/pdfs/chapter6.pdf>.

———. 2011c. "Chapter 5: Tallgrass Prairie Ecoregion." In *Nebraska Natural Legacy Project*. Retrieved July 28, 2012. <http://outdoornebraska.ne.gov/wildlife/programs/legacy/pdfs/chapter5.pdf>.

———. 2012. Letter from Carey Grell (Environmental Analyst, Realty and Environmental Services Division, NGPC) to Patrick Rice (NDEQ). Regarding request for species occurrence for the Keystone XL Pipeline. June 15.

Nebraska Land Trust (NLT). 2012a. "The Nebraska Land Trust: A Trust for Conservation of Private Land." Retrieved August 23, 2012. <http://nelandtrust.org/>.

———. 2012b. Letter to Nebraska Department of Environmental Quality (NDEQ) regarding the Proposed Keystone XL Pipeline Corridor Across Hosford Farm in Boone County. June 4, 2012. Received from NDEQ.

———. 2012c. Personal communication with Dave Sands, Executive Director, Nebraska Lands Trust. August 8, 2012.

Nebraska Oil and Gas Conservation Commission. 2008. Online data delivery system, search of well database. Retrieved August 14, 2008. <http://www.nogcc.ne.gov/NOGCC OnlineGIS/>.

Nebraska Public Power District (NPPD). n.d. "About Us." Retrieved September 8, 2012. <http://www.nppd.com/about-us>.

———. 2012a. *Current Headlines. NPPD Appeal: Reduce Use.* July 22. Retrieved September 8, 2012. <http://www.nppd.com/2012/nppd-appeal-reduce-use/>.

———. 2012b. Personal communication with Don Veseth, Asset Value Coordinator, NPPD, August 9.

Nebraska State Historical Society. 2012. Comment letter on Keystone Supplemental Environmental Report. September 14, 2012. Letter from NSHS attached. June 13, 2012.

Nebraska Tourism Commission. 2012. *Nebraska Travel Guide*.

O'Brien, Brendan. 2012. "Enbridge Races to Clean Up Wisconsin Oil Spill, Restart Line." Reuters, July 29. <http://www.reuters.com/article/2012/07/29/us-enbridgeenergy-crudeoil-idUSBRE86R01O20120729>.

Omaha Public Power District. n.d. "Wind Energy Projects: OPPD Receives Energy from Wind Farms across Nebraska." Retrieved September 8, 2012. <http://www.oppd.com/AimGreen/Environment/22_005794>.

Peel, M. C., B. L. Finlayson, and T. A. McMahon. 2007. "Updated World Map of the Köppen-Geiger Climate Classification." *Hydrology and Earth System Sciences* 11: 1633–1644. Retrieved July 24, 2012. doi:10.5194/hess-11-1633-2007.

Peterson, Steven M. 2007. "Groundwater Flow Model of the Eastern Model Unit of the Nebraska Cooperative Hydrology Study (COHYST) Area." January 26. Retrieved August 22, 2012. <http://cohyst.dnr.ne.gov/adobe/dc012EMU_GRMF_090507.pdf>.

Piersol, Richard. 2011. "Magellan: Nemaha Oil Spill Smaller than First Thought." *Lincoln Journal Star*, December 13.

Ramseur, J. L., R. K., Lattanzio, L. Luther, P. Parfomak, and Nicole Carter. 2012. *Oil Sands and the Keystone XL Pipeline: Background and Selected Environmental Issues*. Congressional Research Service Report for Congress R42611. Retrieved August 24, 2012. <http://www.fas.org/sgp/crs/misc/R42611.pdf>.

Schneider, R., K. Stoner, G. Steinauer, M. Panella, and M. Humpert, eds. 2011. *The Nebraska Natural Legacy Project: State Wildlife Action Plan*. Second edition. The Nebraska Game and Parks Commission, Lincoln, NE.

Titus, Steve, Monica Shah Lomas, and Cally Lence. 2012. *Research Design and Methodology for a Phase I Cultural Resources Investigation of a Proposed Reroute in Keya Paha, Rock, Holt, Antelope, Boone, Nance, and Merrick Counties within the Nebraska Segment of the Proposed Keystone XL Pipeline Project.* American Resources Group, Ltd. Carbondale, Illinois.

TransCanada Keystone Pipeline, LP (Keystone). 2012a. *Initial Report Identifying Alternative and Preferred Corridors for Nebraska Reroute*. Prepared by exp Energy Services, Inc., Tallahassee, Florida, for TransCanada Keystone Pipeline LP, Houston, Texas. April 18.

———. 2012b. *Supplemental Environmental Report for the Nebraska Reroute*. Document Number KXL-TAL-1005-002. Prepared by exp Energy Services Inc., Tallahassee, Florida, for TransCanada Keystone Pipeline, LP, Houston, Texas. September 5.

———. 2012c. "Application of TransCanada Keystone Pipeline, L.P. for a Presidential Permit Authorizing the Construction, Connection, Operation, and Maintenance of Pipeline Facilities for the Importation of Crude Oil to be Located at the United States-Canada Border." May 4. Prepared by TransCanada Keystone Pipeline, LP (Keystone), for U.S. Department of State (DOS).

———. 2012d. Personal Communication from Corey Goulet (Vice President, Keystone Pipeline Project) to Mike Linder (Director, NDEQ). October 18, 2012.

———. 2012e. Response to NDEQ Data Request 1.0. Keystone XL Pipeline Project. September 10.

University of Alberta. 2001. "Tutorial on Upgrading of Oilsands Bitumen." Retrieved September 20, 2012. <http://www.ualberta.ca/~gray/Library/Tutorials/Upgrading/sld001.htm>.

University of Nebraska–Lincoln (UNL). 1998. G96-1362 Soil Temperatures and Spring Planting Dates. Retrieved September 26, 2012. <http://digitalcommons.unl.edu/extensionhist/733>.

———. 1999. "Plant and Soil Sciences eLibrary." Retrieved September 2012. <http://passel.unl.edu/pages/informationmodule.php?idinformationmodule=1130447038&topicorder=1&maxto=10>.

———. 2012a. "Geological Survey." Conservation and Survey Division. Retrieved August 15, 2012. <http://snr.unl.edu/csd/surveyareas/geology.asp>.

———. 2012b. "The Mormon Trail." Center for Digital Research in the Humanities. Retrieved July 27, 2012. <http://cdrh.unl.edu/diggingin/trailsummaries/di.sum.0006.html>.

U.S. Census Bureau. 2010a. "H3 – Occupancy Status." 2010 Census Summary File 1. American Fact Finder. April 1. Retrieved July 19, 2012. <http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_SF1_H3&prodType=table>.

———. 2010b. "H5 – Vacancy Status." 2010 Census Summary File 1. American Fact Finder. April 1. Retrieved July 19, 2012. <http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_SF1_H5&prodType=table>.

U.S. Department of Agriculture (USDA). 2012a. "Quick Stats." National Agricultural Statistics Service (NASS). Retrieved July 20, 2012. <http://www.nass.usda.gov/Quick_Stats/>.

———. 2012b. "2007 Census Publications." Census of Agriculture. Retrieved July 20, 2012. <http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/Nebraska/index.asp>.

———. 2012c. "Quick Stats." National Agricultural Statistics Service (NASS). Retrieved August 18, 2012. <http://www.nass.usda.gov/Quick_Stats/>.

———. 2012d. "Organic Agriculture." Retrieved October 4, 2012. <http://www.ers.usda.gov/topics/natural-resources-environment/organic-agriculture/organic-certification.aspx>.

U.S. Department of Agriculture, Farm Service Agency (FSA). 2009. "Farmable Wetlands Program: Overview." September 18. Retrieved July 24, 2012. <http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=fwp>.

———. 2012a. "Conservation Reserve Program: Overview." Retrieved July 24, 2012. <http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp>.

———. 2012b. "Conservation Reserve Enhancement Program." Retrieved July 24, 2012. <http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=landing>.

———. 2012c. Personal communication with Greg Reisdorff, Conservation Program Chief, Nebraska FSA. August 27, 2012.

U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS). n.d. Soil Climate Analysis Network. Data for SCAN Site Rogers Farm 2001, Lancaster County, Nebraska, SCAN Site Shagbark Hills 2068, Woodbury County, Iowa, and SCAN Site EROS Data Center 2072, Minnehaha County, South Dakota. Retrieved September 26, 2012. <http://www.wcc.nrcs.usda.gov/scan/>.

———. 2006. *Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin*. U.S. Department of Agriculture Handbook 296. <ftp://ftp-fc.sc.egov.usda.gov/NSSC/Ag_Handbook_296/Handbook_296_low.pdf>.

———. 2012a. "Web Soil Survey." Updated April 2011. Retrieved August 27, 2012. <http://www.ne.nrcs.usda.gov/technical/soils.html>.

———. 2012b. "Soil Survey Geographic (SSURGO) Database for Antelope County, Nebraska." Retrieved August 27, 2012. <http://soildatamart.nrcs.usda.gov/Metadata.aspx?Survey=NE003&UseState=NE>.

———. 2012c. "Soil Survey Geographic (SSURGO) Database for Boone County, Nebraska." Retrieved August 27, 2012. <http://soildatamart.nrcs.usda.gov/Metadata.aspx?Survey=NE011&UseState=NE>.

———. 2012d. "Soil Survey Geographic (SSURGO) Database for Boyd County, Nebraska." Retrieved August 28, 2012. <http://soildatamart.nrcs.usda.gov/Metadata.aspx?Survey=NE015&UseState=NE >.

———. 2012e. "Soil Survey Geographic (SSURGO) Database for Holt County, Nebraska." Retrieved August 28, 2012. <http://soildatamart.nrcs.usda.gov/Metadata.aspx?Survey=NE089&UseState=NE >.

———. 2012f. "Soil Survey Geographic (SSURGO) Database for Keya Paha County, Nebraska." Retrieved August 28, 2012. <http://soildatamart.nrcs.usda.gov/Metadata.aspx?Survey=NE103&UseState=NE >.

———. 2012g. "Soil Survey Geographic (SSURGO) Database for Merrick County, Nebraska." Retrieved August 28, 2012. <http://soildatamart.nrcs.usda.gov/Metadata.aspx?Survey=NE121&UseState=NE >.

———. 2012h. "Soil Survey Geographic (SSURGO) Database for Nance County, Nebraska." Retrieved August 29, 2012. <http://soildatamart.nrcs.usda.gov/Metadata.aspx?Survey=NE125&UseState=NE >.

———. 2012i. "Soil Survey Geographic (SSURGO) Database for Polk County, Nebraska." Retrieved August 29, 2012. <http://soildatamart.nrcs.usda.gov/Metadata.aspx?Survey=NE143&UseState=NE >.

———. 2012j. "Soil Survey Geographic (SSURGO) Database for York County, Nebraska." Retrieved August 29, 2012. <http://soildatamart.nrcs.usda.gov/Metadata.aspx?Survey=NE185&UseState=NE >.

———. 2012k. National Soil Survey Handbook. Retrieved October 4, 2012. <http://soils.usda.gov/technical/handbook/contents/part622.html>.

———. 2012l. "Conservation Stewardship Program." June 22, 2012. Retrieved July 24, 2012. <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/csp>.

———. 2012m. Farm and Ranch Lands Protection Program." Updated February 10, 2012. Retrieved September 17, 2012. <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/farmranch>.

———. 2012n. "Grassland Reserve Program." July 10. Retrieved July 24, 2012. <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/grassland>.

———. 2012o. "Wetlands Reserve Program." Retrieved August 29, 2012. <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/wetlands>.

———. 2012p. Personal communication with Brad Soncksen (Assistant State Conservationist, Nebraska NRCS). August 24, 2012.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration. 1978. *Geodetic Bench Marks.* NOAA Manual NOS NGS 1. Retrieved September 26, 2012. <http://www.ngs.noaa.gov/PUBS_LIB/GeodeticBMs.pdf>.

U.S. Department of Energy, Office of Electricity Delivery and Energy Reliability and Bonneville Power Administration. 2007. *Final Environmental Impact Statement for the Port Angeles–Juan de Fuca Transmission Project.* October.

U.S. Department of Health and Human Services. 1995. "Medically Underserved Areas & Populations (MUA/Ps)." Health Resources and Services Administration. <http://bhpr.hrsa.gov/shortage/muaps/index.html>.

U.S. Department of Health and Human Services, Centers for Disease Control, Agency for Toxic Substances and Disease Registry. 1996. *Polycyclic Aromatic Hydrocarbons (PAHs).* ATSDR ToxFAQs Fact Sheet: September. Updated March 3, 2011. <http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=121&tid=25>.

U.S. Department of the Interior, Bureau of Land Management. 1986. *Manual H-8410-1: Visual Resource Inventory*. January 17. Retrieved July 28, 2012. <http://www.blm.gov/pgdata/etc/medialib/blm/wo/Information_Resources_Management/policy/blm_handbook.Par.31679.File.dat/H-8410.pdf>.

U.S. Department of the Interior, Bureau of Land Management. 2008. *Natural Resource Damage Assessment and Restoration Handbook.* BLM Manual, Rel. 1-1712, 2008.

U.S. Department of the Interior, Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service (USFWS), and U.S. Department of Agriculture, Forest Service. 2012. "Niobrara River, Nebraska." National Wild and Scenic Rivers System. Retrieved July 28, 2012. <http://www.rivers.gov/rivers/rivers/niobrara.php>.

U.S. Department of the Interior, National Park Service. 2012a. "Affected Environment." Niobrara National Scenic River, Final GMP/EIS. Retrieved August 22, 2012. <http://www.nps.gov/niob/parkmgmt/upload/NIOB>.

———. 2012b. "Nebraska Segments." Nationwide Rivers Inventory. Retrieved July 28, 2012. <http://www.nps.gov/ncrc/programs/rtca/nri/states/ne.html>.

U.S. Department of the Interior, U.S. Fish and Wildlife Service (USFWS). 2008. *Birds of Conservation Concern, 2008.* Division of Migratory Bird Management. Arlington, Virginia.

———. 2010a. Listing of Sprague's Pipit under ESA Warranted but Precluded. September 14.

———. 2010b. Letter to David Levy (Baird Holm, attorneys at Law) from John Cochnar (Acting Nebraska Field Supervisor, USFWS). Regarding the Laredo Ridge Wind Project – Mitigation Proposal. April 6. <http://www.fws.gov/filedownloads/ftp_region6_upload/FOIA%20READING%20ROOM/Letters%20to%20Wind%20Power%20Owners-Developers/MX-4501N_20120703_144219.pdf>.

———. 2012a. "National Wetlands Inventory." Retrieved September 26, 2012. <http://www.fws.gov/wetlands>.

———. 2012b. News Release: Platte River Caddisfly Not Warranted for Endangered Species Protection. August 29, 2012.

U.S. Department of the Interior, U.S. Geological Survey (USGS). 2004. "Landslide Types and Processes." USGS Fact Sheet 2004-3072. Retrieved July 31, 2008. <http://pubs.usgs.gov/fs/2004/3072/pdf/fs2004-3072.pdf>.

———. 2008a. "2008 Minerals Yearbook, Nebraska". Retrieved October 17, 2012. <http://minerals.usgs.gov/minerals/pubs/state/2008/myb2-2008-ne.pdf>.

———. 2008b. "Earthquake Search." U.S. Geological Survey/National Earthquake Information Center 1973 to present database. Retrieved August 14, 2008. <http://neic.usgs.gov/neis/epic/epic_rect.html>.

———. 2011. "National Hydrographic Dataset." Retrieved June, 2011. <http://nhd.usgs.gov/>.

———. 2012a. "Carlile Shale." Retrieved September 7, 2012. <http://mrdata.usgs.gov/geology/state/sgmc-unit.php?unit=NEKc;0>.

———. 2012b. "Download Land Cover Data." National Gap Analysis Program. Retrieved October 16, 2012. <http://gapanalysis.usgs.gov/gaplandcover/data/download/>.

U.S. Department of the Interior, U.S. Geological Survey (USGS) and Montana Bureau of Mines and Geology. 2006. "Quaternary Fault and Fold Database of the United States." Retrieved September 5, 2012. <http://earthquakes.usgs.gov/regional/qfaults/>.

U.S. Department of State (DOS), Bureau of Oceans and International Environmental and Scientific Affairs. 2011a. *Final Environmental Impact Statement: Keystone XL Pipeline Project*. Washington, D.C. August 26.

U.S. Department of State (DOS), Bureau of Oceans and International Environmental and Scientific Affairs. 2011b. *Programmatic Agreement Regarding the Keystone XL Pipeline Project.* PA filed with the Advisory Council on Historic Preservation. August.

U.S. Department of State (DOS) and Nebraska Department of Environmental Quality (NDEQ). 2012. Memorandum of Understanding Between U.S. Department of State and The

Nebraska Department of Environmental Quality, For Conducting An Environmental Review For The Keystone XL Pipeline Project. May 24.

U.S. Department of Transportation, Office of Public Affairs. 2012. "DOT Issues Consent Agreement; Allows Restart of Line 14 in Wisconsin." PHMSA 19-12, August 6. Retrieved September 17, 2012. <http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Files/Pipeline/phmsa1912.pdf>.

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration (PHMSA), Office of Pipeline Safety. 2011a. Letter from Jeffrey Wiese (Associate Administrator for Pipeline Safety, PHMSA) to Gary Pruessing (President, ExxonMobil Pipeline Company). Corrective Action Order. CPF No. 5-2011-5017H. July 5. <http://primis.phmsa.dot.gov/comm/reports/enforce/documents/520115017H/520115017H_CAO_07052011_text.pdf>.

———. 2011b. Letter from Jeffery Wiese (Associate Administrator for Pipeline Safety, PHMSA) to Robert Jones (Vice President, TC Oil Pipeline Operations, Inc.) and Vern Meier (Vice President, U.S. Pipeline Operations, TransCanada Corporation). Corrective Action Order. CPF No. 3-2011-5006H. June 3. <http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Keystone%20CAO%20and%20Restart%20Approval.pdf>.

———. 2011c. Letter from David Barrett (Director, Central Region, PHMSA) to Vern Meier (Vice President, U.S. Pipeline Operations, TransCanada Corporation). Approval of TC Oil Pipeline Operations, Inc.'s "Keystone System Re-Start Plan." CPF No. 3-2011-5006H. June 4. <http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Keystone%20CAO%20and%20Restart%20Approval.pdf>.

———. 2012a. Letter from Jeffery Wiese (Associate Administrator for Pipeline Safety, PHMSA) to Richard Adams (Vice President, U.S. Operations, Enbridge Energy, LP). Corrective Action Order. CPF No. 3-2012-5017H. July 30. Retrieved September 17, 2012. <http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Files/Pipeline/Corrective_Action_Order_073012.pdf>.

———. 2012b. Letter from Jeffery Wiese (Associate Administrator for Pipeline Safety, PHMSA) to Richard Adams (Vice President, U.S. Operations, Enbridge Energy, LP). Amendment to the July 30, 2012 Corrective Action Order. CPF No. 3-2012-5017H. August 1.

U.S. Environmental Protection Agency (EPA). 1995. Light Nonaqueous Phase Liquids. Ground Water Issue. Document Number EPA 540-S-95-500. <http://www.epa.gov/tio/tsp/download/lnapl.pdf>.

———. 1998. *Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses*. April 15.

———. 1999. "Understanding Oil Spills and Oil Spill Response," EPA Office of Emergency and Remedial Response, Oil Program Center, EPA 540-K-99-007. Retrieved September 30, 2012. <http://www.epa.gov/oem/content/learning/pdfbook.htm>.

———. 2011a. "Cleanup Continues; Focus On Submerged Oil: July 2010 Enbridge Oil Spill." Marshall , Michigan, August. Retrieved September 19, 2012. <http://www.epa.gov/enbridgespill/pdfs/enbridge_fs_20110811.pdf>.

———. 2011b. "U.S. EPA Oil Spill Response Management." Retrieved September 10, 2012. <http://www.epa.gov/emergencies/content/learning/respmgnt.htm>.

———. 2011c. "U.S. EPA Oil Spill Response Techniques." Retrieved September 10, 2012. <http://www.epa.gov/emergencies/content/learning/oiltech.htm>.

———. 2012a. "Safe Drinking Water Act (SDWA)." Retrieved August 15, 2012. <http://water.epa.gov/lawsregs/rulesregs/sdwa/index.cfm>.

———. 2012b. "Ecoregion Maps and GIS Resources." Retrieved September 16, 2012. <http://www.epa.gov/wed/pages/ecoregions/ecoregions.htm>.

———. 2012c. "National Ambient Air Quality Standards (NAAQS)." Updated July 16, 2012. Retrieved July 25, 2012. <http://www.epa.gov/air/criteria.html>.

———. 2012d. "Query Form." Facility Registry System (FRS). Retrieved September 19, 2012. <http://www.epa.gov/enviro/html/fii/fii_query_java.html>.

———. 2012e. "Cleanup By the Numbers." Updated August 8. http://www.epa.gov/enbridgespill/index.html.

———. 2012f. "Yellowstone River Spill." Updated August 25. <http://www.epa.gov/yellowstoneriverspill/>.

Voorhies, Michael R. 1994. *Slices of Time*. NEBRASKAland Magazine's The Cellars of Time: Paleontology and Archaeology in Nebraksa. Vol. 72, No. 1. Lincoln: Nebraska Game and Parks Commission, 1994.

Weaver, J. E. 1926. *Root Development of Field Crops*. McGraw-Hill Book Company, Inc., New York, New York.

Weeks, John B., Edwin D. Gutentag, Frederick J. Heimes, and Richard R. Luckey. 1988. Summary of the High Plains Regional Aquifer-System Analysis in Parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming. U.S. Geological Survey Professional Paper 1400-A.

Zhou, John, and Jenny Been. 2012. "Comparison of the Corrosivity of Dilbit and Conventional Crude: A Presentation to the Committee for A Study of Pipeline Transportation of Diluted Bitumen, National Academy of Science, Washington, DC July 23–24, 2012." <http://onlinepubs.trb.org/onlinepubs/dilbit/ZhouBeen072312.pdf>.

Zuckerman, Laura. 2011. "Exxon: Ruptured Pipeline Carried Tar Sands Crude." *Reuters*, July 15. <http://www.reuters.com/article/2011/07/15/us-oil-spill-montana-idUSTRE76E6WN20110715>.

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