3.2 SOILS

3.2.1 Introduction

This section discusses the soils resources in the proposed Project area. The description of the soils resources is based on information provided in the 2011 Final Environmental Impact Statement (Final EIS) as well as new circumstances or information relevant to environmental concerns that have become available since the publication of the Final EIS, including the proposed reroute in Nebraska. The information that is provided here builds on the information provided in the Final EIS as well as the 2013 Draft Supplemental EIS and, in many instances, replicates that information with relatively minor changes and updates; other information is entirely new or substantially altered.

Specifically, the following information, data, methods, and/or analyses have been substantially updated in this section from the 2011 document:

- The number of miles of soil types crossed in the National Inventory Grouping; and
- The approximate acreage of impacted soil types in the National Inventory Grouping.

The following information, data, methods, and/or analyses have been substantially updated from the 2013 Draft Supplemental EIS:

- A map depicting of the approximate acreage of soil types in the National Inventory Grouping affected by the proposed Project has been developed;
- A map depicting the Nebraska Department of Environmental Quality (NDEQ)-Identified Sand Hills Region in relation to the pipeline route has been included; and
- In response to public and agency comments, text has been revised throughout the section where necessary.

Summary

The proposed Project route would affect approximately 875 miles and approximately 15,296 acres of soils within the 110-foot-wide pipeline construction right-of-way (ROW), temporary and permanent work spaces and access roads, staging areas, pump stations, valve sites, construction camps, construction yards, and pipe yards. Affected soils belong to multiple National Inventory Groups that include: highly erodible, prime farmland, hydric, compaction-prone, stony/rock, shallow-bedrock, and drought-prone (see Figure 3.2.1-1). The soil groups that would have the highest amount of affected acreage include high erodible, compaction-prone, and prime farmland. Soil types vary from clayey, silty, loamy, to sandy across the proposed pipeline route, with some soils exhibiting characteristics similar to soils found in the Nebraska Department of Environmental Quality (NDEQ)-identified Sand Hills Region. This region consists of a prairie landscape that supports livestock grazing, wildlife habitat, and recreation where soils are very susceptible to damage from ground disturbance activities such as pipeline construction. The soils

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1 The National Inventory Soil Groupings were developed by the U.S. Department of Agriculture (USDA) to group soils with a specific set of characteristics of national concern with regards to the environment and with agricultural commodity production.
of this region are of particular concern because they are vulnerable to wind erosion; however, this region would be avoided by the proposed route.

![Figure 3.2.1-1 Approximate Acreage of Soils in National Inventory Groups Affected by the Proposed Project](image)

Connected actions include the proposed Bakken Marketlink Project, the Big Bend to Witten 230-kilovolt (kV) Transmission Line, and electrical distribution lines and substations. These connected actions would be constructed in areas similar to the proposed Project route or in similar landscapes; therefore, the same soil conditions discussed for the proposed Project route are expected.

### 3.2.2 Environmental Setting

Soil characteristics present along the proposed Project route were evaluated and areas categorized by inventory groupings as defined by the Natural Resources Conservation Service Soil Survey Geographic database (Natural Resources Conservation Service [NRCS] n.d.). The evaluation focused on soil characteristics of particular interest to the proposed pipeline construction and operation. The following soil groups were evaluated:

- Highly erodible soils—these are prone to high rates of erosion when exposed to wind or water by removal of vegetation.
- Prime farmland soils—these have combinations of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if
they are treated and managed according to acceptable farming methods. Undeveloped land with high crop production potential may be classified as “prime farmland”.

- **Hydric soils**—these are “formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part” (Federal Register, July 13, 1994). These soils under normal conditions are saturated for a sufficient period of time during the growing season to support the growth of hydrophytic vegetation (USDA 2006).

- **Compaction-prone soils**—these include surface clay loam or soils of finer textures in somewhat poor to very poor drainage classes.

- **Stony/rocky soils**—these have a cobbly, stony, bouldery, gravelly, or shaly modifier to the textural class; or comprise more than 5 percent stones larger than 3 inches in the surface layer.

- **Shallow-bedrock soils**—these are typically defined as soils that have bedrock within 60 inches of the soil surface. However, for the purpose of the proposed Project, shallow-bedrock soils are defined as those containing bedrock within 80 inches of the surface, because trenching typically would be done to that depth.

- **Drought-prone soils**—these include coarse-textured soils (sandy loams and coarser) that are moderately well to excessively drained.

Tables 3.2-1 and 3.2-2 summarize the approximate miles of pipeline ROW, by state, that would cross soils in these groups as well as the approximate acreage of soils in these groups that would be disturbed by the proposed Project. More detail is provided in Appendix M, Soil Summary for Montana, South Dakota, and Nebraska, including a table listing soil series from the Natural Resources Conservation Service (NRCS) Soil Survey Geographic database by milepost (MP) along the proposed Project route.

### 3.2.2.1 Montana

The proposed Project route in northern Montana would be located within the Northern Great Plains Spring Wheat Land Resource Region (USDA 2006). This region is characterized by glacially deposited till and lacustrine deposits. Soil profiles typically contain thick, dark topsoils that may contain bentonite (smectitic mineralogy). Soils are generally very deep, well-drained, and loamy or clayey. Small areas of alluvial deposits are present along rivers and drainage ways, and shale is exposed in some uplands. In northern Montana, soils generally are formed in glacial till. From McCone County to Fallon County along the proposed Project route (east-central Montana), soils are formed on eroded plateaus and terraces. These soils are shallow to very deep, well-drained, and clayey or loamy. Some soils in this area have high bentonite contents and exhibit saline or sodic chemical properties. In east-central Montana, the proposed pipeline route would lie within the Western Great Plains Range and Irrigated Land Resource Region (USDA 2006). This region consists of an elevated piedmont plain that is dissected by rivers and contains steep-sided buttes and badlands. Soil types vary from deep organic soils to shallow soils with thin topsoil thickness. In Montana, prime farmland soils occupy approximately 22 percent of the proposed pipeline route.
## Table 3.2-1 Approximate Miles of Soils by National Inventory Grouping Crossed by the Proposed Project Route

<table>
<thead>
<tr>
<th>State</th>
<th>Total Miles Affected</th>
<th>Highly Erodible (Wind)</th>
<th>Highly Erodible (Water)</th>
<th>Prime Farmland</th>
<th>Hydric</th>
<th>Compaction-Prone</th>
<th>Stony/Rocky</th>
<th>Shallow Bedrock</th>
<th>Drought-prone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Montana</td>
<td>285.4</td>
<td>6.1</td>
<td>208.1</td>
<td>63.1</td>
<td>6.0</td>
<td>63.1</td>
<td>11.2</td>
<td>4.8</td>
<td>22.3</td>
</tr>
<tr>
<td>South Dakota</td>
<td>316.3</td>
<td>18.3</td>
<td>162.3</td>
<td>109.9</td>
<td>1.2</td>
<td>150.0</td>
<td>2.2</td>
<td>0.2</td>
<td>67.1</td>
</tr>
<tr>
<td>Nebraska</td>
<td>274.0</td>
<td>48.1</td>
<td>178.0</td>
<td>175.8</td>
<td>47.1</td>
<td>169.4</td>
<td>40.5</td>
<td>0.3</td>
<td>41.0</td>
</tr>
<tr>
<td>Kansas</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>North Dakota</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>875</td>
<td>72.5</td>
<td>548.4</td>
<td>348.8</td>
<td>54.3</td>
<td>382.5</td>
<td>53.9</td>
<td>5.3</td>
<td>130.4</td>
</tr>
</tbody>
</table>

*a Rounded to nearest tenth of a mile.

*b Total miles affected, which include non-sensitive and sensitive soils and other substrates.

## Table 3.2-2 Approximate Acreage of Soils by National Inventory Grouping Affected by the Proposed Project During Construction and Operation

<table>
<thead>
<tr>
<th>State</th>
<th>Total Acres Affected</th>
<th>Highly Erodible (Wind)</th>
<th>Highly Erodible (Water)</th>
<th>Prime Farmland</th>
<th>Hydric</th>
<th>Compaction-Prone</th>
<th>Stony/Rocky</th>
<th>Shallow Bedrock</th>
<th>Drought-prone</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Montana</td>
<td>5,462.4</td>
<td>69.1</td>
<td>4,067.5</td>
<td>1,359.9</td>
<td>14.5</td>
<td>1,245.3</td>
<td>306.2</td>
<td>71.3</td>
<td>359.0</td>
</tr>
<tr>
<td>South Dakota</td>
<td>5,777.8</td>
<td>312.0</td>
<td>2,962.0</td>
<td>2,179.2</td>
<td>24.1</td>
<td>2,735.7</td>
<td>27.9</td>
<td>3.2</td>
<td>1,157.3</td>
</tr>
<tr>
<td>Nebraska</td>
<td>3,984.7</td>
<td>673.4</td>
<td>3,523.0</td>
<td>2,572.0</td>
<td>687.9</td>
<td>2,474.6</td>
<td>578.6</td>
<td>3.3</td>
<td>600.7</td>
</tr>
<tr>
<td>Kansas</td>
<td>15.2</td>
<td>0.0</td>
<td>1.0</td>
<td>14.0</td>
<td>0.0</td>
<td>15.2</td>
<td>2.0</td>
<td>6.0</td>
<td>0.0</td>
</tr>
<tr>
<td>North Dakota</td>
<td>56.1</td>
<td>0.0</td>
<td>56.1</td>
<td>44.9</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>15,296.2</td>
<td>1,054.4</td>
<td>10,609.5</td>
<td>6,169.6</td>
<td>726.5</td>
<td>6,470.7</td>
<td>914.7</td>
<td>83.7</td>
<td>2,117.0</td>
</tr>
</tbody>
</table>

**Operation**

| Montana    | 1,834.9              | 25.4                   | 1,342.5                 | 417.0          | 3.8    | 411.3            | 118.7       | 29.1           | 138.9         |
| South Dakota | 2,000.1              | 111.2                  | 1,016.7                 | 696.9          | 7.5    | 934.4            | 13.1        | 1.5            | 422.6         |
| Nebraska   | 1,718.9              | 291.5                  | 1,539.7                 | 1,108.7        | 297.4  | 1,063.9          | 258.6       | 1.5            | 271.1         |
| Kansas     | 15.2                 | 0.0                    | 1.0                     | 14.0           | 0.0    | 15.2             | 2.0         | 6.0            | 0.0           |
| North Dakota | 0.0                  | 0.0                    | 0.0                     | 0.0            | 0.0    | 0.0              | 0.0         | 0.0            | 0.0           |
| Total      | 5,569.1              | 428.1                  | 3,899.9                 | 2,236.6        | 308.7  | 2,424.8          | 392.4       | 38.1           | 832.6         |

*a Rounded to nearest tenth of an acre.

*b Based on a 110-foot-wide pipeline construction ROW for a 36-inch pipeline, including temporary and permanent work spaces and access roads, staging areas, pump stations, valve sites, construction camps, construction and pipe yards, and the two pump stations in Kansas as well as pipe yard and rail siding in North Dakota. Acreage does not account for disturbance associated with power lines and rail sidings. Individual soils may occur in more than one National Inventory Group. Discrepancies in total mileage are due to rounding.
3.2.2.2 **South Dakota**

The proposed Project route in South Dakota would be located within the Western Great Plains Range and Irrigated Land Resource Region (USDA 2006). In northwestern South Dakota, soils are shallow to very deep, well-drained, and loamy or clayey. To the southeast through Meade County, soils are shallow to very deep, somewhat excessively drained to moderately well-drained, and loamy or clayey. In southern South Dakota, from Hakkon County to Tripp County, areas of smectitic clays are present that have shrink-swell potential and may cause significant problems for roads and structural foundations. From central Tripp County to the state line, these clayey soils contain thick, dark, organically enriched layers of topsoil. Beginning at approximately MP 572, transitional eolian sandy soils are present that generally consist of eolian sands, sandy alluvium, and lesser amounts of loess and glacial outwash. In southern Tripp County to the state line, soils grade into deep, sandy deposits that are similar in characteristics to the NDEQ-identified Sand Hills Region soils in Nebraska. Figure 3.2.2-1 shows the NDEQ-identified Sand Hills Region in Nebraska. In South Dakota, prime farmland soils occupy approximately 35 percent of the proposed pipeline route.

3.2.2.3 **Nebraska**

The proposed Project route in northern Nebraska would be located within the Western Great Plains Range and Irrigated Land Resource Region (USDA 2006). This region is characterized by a nearly level to gently rolling fluvial plain. Keya Paha, Boyd, and Holt counties lie within the Dakota-Nebraska Eroded Tableland Resource Area. These soils are generally sandy, very deep, and excessively drained to somewhat poorly drained. Also, within Holt and Boyd counties in the Tableland Resource Area, there are soils types that are silty or sandy loam soils.

In Antelope and Boone counties, the proposed Project route would encompass the Central Feed Grains and Livestock Land Resource Region. This area is further classified as the Loess Uplands Resource Area, with soils consisting of deep loess deposits that are susceptible to erosion if unvegetated. In the northern section of Antelope County, the soils are sandy loams which are frequently layered with very fine-grained ash layers that are susceptible to erosion by rain and wind. In Nance and Merrick counties, the proposed Project route would cross the Central Nebraska Loess Hills and the Central Loess Plains Resource Areas (Central Great Plains Winter Wheat and Range Land Resource Region). These areas feature soils consisting of deep loess with some organic enrichment.

South of the Platte River, the proposed Project route would cross flat to rolling loess-covered plains of the Rainwater Basin Plains, one of the largest concentrations of natural wetlands found in Nebraska. Many of the wetlands were drained for cultivation, with much of the area pivot irrigated to help provide a fertile area for crops. The soils are largely silty loams with fine sands in both flooded and rarely flooded areas. Glacial till is scattered throughout the area south of the Platte River and is encountered along the southern section of the proposed pipeline route.

In northern Nebraska, the proposed Project route from approximately MP 619 to MP 707 in Boyd, Holt, and Antelope counties would enter an area where the soils tend to be highly susceptible to erosion by wind and often exhibit characteristics of the NDEQ-identified Sand Hills Region (i.e., fragile soils [see Figure 3.2.2-2]).

These soils consist of eolian fine sands, loamy fine sands, or sandy alluvium and are generally deep, well-to-excessively drained, and nearly level to moderately steep on uplands and streams.
terraces. The sandy soils, typical of the NDEQ-identified Sand Hills Region, have a high infiltration rate and high permeability; however, the fine-grained loess deposits further to the east can be as thick as 200 feet and can locally restrict water flow where fractures are absent (Stanton and Qi 2007, Johnson 1960).

Where the vegetative cover has been disturbed or removed without restoration, severe wind erosion associated with the prevailing northwesterly winds may create steep-sided, irregular, or conical depressions referred to as blowouts. Blowouts are most commonly associated with fence lines, windmills, and other features where cattle create trackways that allow the initiation of wind funneling (Mason et al. 2004; Dave Wedin, Personal Communication, June 29, 2011). Two blowouts identified in the vicinity of the proposed Project route include a blowout in Keya Paha County, located approximately 6.5 miles south of MP 611, and a blowout in Holt County, located approximately 1.6 miles southwest of MP 634.

In this region, the most erosive months of the year (months where the wind speed is high enough to have the potential to cause wind erosion) are March, April, and May and the least erosive months are June, July, and August (AmeriFlux 2013; Dave Wedin, Personal Communication, June 29, 2011). In the spring months, sustained winds of 35 to 45 miles per hour are common, with gusts approaching 100 miles per hour (AmeriFlux 2013). The proposed Project route would cross approximately 48 miles of highly wind erodible soils in Nebraska (see Table 3.2-1). In Nebraska, prime farmland soils occupy approximately 64 percent of the pipeline route.

### 3.2.2.4 Kansas

Two new pump stations would be located in Clay and Butler counties at MP 49.7 and MP 144.5, respectively, as part of the proposed Project. Shallow soils of the Hedville series are present in these areas. These soils are loamy soils that developed from the erosion of weathered non-calcareous sandstone.

### 3.2.2.5 North Dakota

During construction activities, a pipe yard and rail siding would be needed for on-site storage of pipes in North Dakota. The yard would be located in Bowman County in a flat and upland landscape area. The soils found in the area include the Belfield, Stady, and Stady-Lehr soil series. These soils are deep, well to moderately well drained soils that derived from material that consists of clayey or loamy alluvium from sedimentary rock. The shrink-swell potential of these soils is low.
Figure 3.2.2-1  NDEQ-Identified Sand Hills Region

Source: Esri 2013, NDEQ 2011

Source: Esri 2013, NDEQ 2011
Figure 3.2.2-2  Highly Wind Erodible Soils

Source: Esri 2013, USDA 2007
3.2.3 Connected Actions²

3.2.3.1 Bakken Marketlink Project

Construction and operation of the proposed Bakken Marketlink Project would consist of a 16-inch pipeline approximately 5 miles in length, additional piping, booster pumps, meter manifolds, and two 250,000-barrel tanks that would be used to store crude from connecting third-party pipelines and terminals. The proposed Bakken Marketlink Project facilities would be located within private land currently used as pastureland and hayfields. A survey of the property indicated that there were no waterbodies or wetlands on the property. The soils found in the proposed Project area include the Kremlin soil series, which consist of deep, well drained, and moderately permeable loamy soils that are in alluvial fans, stream terraces, and sedimentary plains.

3.2.3.2 Big Bend to Witten 230-kV Transmission Line

The Big Bend to Witten 230-kV Transmission Project is located in Lyman and Tripp counties in south-central South Dakota. The project would consist of replacing the existing Big Bend-Fort Thompson No. 2 230-kV Transmission Line Turning Structure on the south side of the Big Bend Dam on Lake Sharpe; constructing a new double-circuit 230-kV transmission line for approximately 1 mile southwest of the dam; and constructing a new Lower Brule Substation south of the dam. The existing Witten Substation would be expanded immediately to the northeast to accommodate the new 230-kV connection. The soils found along the proposed transmission line route consist of two soil associations: the Millbor-Lakoma and the Sansarc-Opal. The Millboro-Lakoma association consists of deep to moderately deep, nearly level to strongly sloping, and well drained soils that are typically clayey. The Sansarc-Opal association consists of shallow to moderately deep, strongly sloping to steep, and well drained clayey soils.

3.2.3.3 Electrical Distribution Lines and Substations

Multiple private power companies or cooperatives would construct distribution lines to deliver power to 20 pump stations located along the length of the pipeline in the United States. These distribution lines would range in length from approximately 0.1-mile to 62 miles, with the average being 13 miles long, and are estimated to extend about 377 miles, combined. The distribution lines would range in capacity from 69 kV to 240 kV, but the majority would have a capacity of 115 kV. The lines would be strung on a single-pole and/or on H-frame wood poles. In general, the transmission lines would be constructed in the vicinity of the proposed Project route or in similar landscapes; as such, the same soil conditions discussed previously for Montana and South Dakota are expected to be encountered along the transmission line routes (see Sections 3.2.2.1, Montana, and 3.2.2.2, South Dakota).

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


NDEQ. See Nebraska Department of Environmental Quality.


USDA. See United States Department of Agriculture.


