4.2 SOILS

4.2.1 Introduction

This section describes potential impacts to soils resources associated with construction and operation of the proposed Project and connected actions and discusses potential mitigation measures that would avoid or minimize the potential impacts. The information, data, methods, and/or analyses used in this discussion are 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, and in many instances replicates that information with relatively minor changes and updates. Other information is entirely new or substantially altered from that presented in the Final EIS. Specifically, the following items have been substantially updated from the 2011 document related to impacts to soils resources:

- A new section, Section 4.2.2 "Impact Assessment Methodology," was added to explain the assessment methodology used to evaluate potential soils impacts associated with the proposed Project;
- The acreages of impacted soils with particular characteristics or constraints have been revised;
- Impacts to fragile soils (i.e., landscapes where the soil exhibits conditions similar to the NDEQ-identified Sand Hills Region and soils that are very susceptible to wind erosion) have changed due to the proposed Nebraska reroute;
- Section 4.2.4 "Recommended Additional Mitigation" provides a list of additional mitigation measures to further reduce impacts to soils;
- Revised procedures for topsoil and subsoil handling are described; and
- A discussion of the impacts to shelterbelts and proposed associated mitigation measures has been added.

4.2.2 Impact Assessment Methodology

The impacts of the proposed Project on the soil resources of the Project area are evaluated using a combination of quantitative and qualitative methods, including the following:

- Calculation of the miles and acreage of sensitive soils disrupted (summarized in Section 3.2, Soils); and
- Qualitative evaluation of the potential direct and indirect impacts to these soils resulting from the proposed project's construction and operation activities (discussed in this section).

4.2.3 Potential Impacts

4.2.3.1 Construction Impacts

Pipeline construction activities, including clearing, grading, trench excavation, backfilling, equipment traffic, and restoration along the construction right-of-way (ROW), could adversely affect soil resources. In addition, the construction of pump stations, pipe yards, valve sites, access roads, temporary work areas, and construction camps could also affect soil resources. Potential impacts could include temporary and short-term soil erosion, loss of topsoil, short- to long-term soil compaction, permanent increases in the proportion of large rocks in the topsoil, soil mixing, and short-term to permanent soil contamination. In addition, pipeline construction also could result in damage to existing tile drainage systems, irrigation systems, and shelterbelts. Special considerations and measures also would be undertaken in proposed Project areas in southern South Dakota and northern Nebraska where the soils are fragile (i.e., sandy soils that exhibit conditions similar to the Nebraska Department of Environmental Quality-identified Sand Hills Region that are highly susceptible to erosion by wind), (see Soils Environmental Setting sections 3.2.2.2, South Dakota, and 3.2.2.3, Nebraska), as described in detail below.

The proposed Project Construction, Mitigation, and Reclamation Plan (Appendix G, CMRP) includes construction procedures that are designed to reduce the likelihood and severity of proposed Project impacts. Proposed Project impacts on soils are assessed assuming these construction procedures and applicant-proposed environmental protection measures would be implemented.

Soil Erosion

Prior to construction, clearing of the temporary and permanent ROW would remove protective vegetative cover and could potentially increase soil erosion. Soil erosion could also occur during open-cut trenching and during spoil storage, particularly where the soil is placed within a streambed. Where soils are exposed close to waterbodies, soil erosion and mobilization to receiving water bodies could impact water quality through increased turbidity.

Soil erosion may result in loss of valuable topsoil from its original location through wind and/or water erosion. A small portion of the proposed Project route would cross drought-prone soils. Drought-prone soils would be relatively more prone to wind erosion during construction and would be more difficult to successfully stabilize and revegetate following construction.

Approximately 50 percent of the overall proposed Project route would cross soils characterized as highly erodible by either wind or water (see Table 3.2-2). Overall, the majority (85 percent) of these highly erodible soils are designated as highly erodible by water.

TransCanada Keystone Pipeline, LP's (Keystone's) proposed construction methods to reduce soil erosion include installation of sediment barriers (silt fencing, straw or hay bales, and sand bags), trench plugs, temporary slope breakers, drainage channels or ditches, and mulching (see Appendix G, CMRP). These erosion control measures would be implemented wherever soil is exposed, steep slopes are present, or erosion potential is high. To enforce use of these methods, an environmental inspector (EI) would be assigned to each construction spread. The EI would have the authority to stop work and/or order corrective action in the event that construction activities deviate from the measures outlined in the CMRP, agreed landowner requirements, or any conditions of any applicable permits. Specifically, the EI would inspect temporary erosion-

control measures daily in areas of active construction or equipment operation, weekly in proposed Project areas without active construction or equipment operation, and within 24 hours of continuous rainfall greater than 0.5 inch along the ROW undergoing construction and in other construction ancillary areas where the rainfall occurred. The repair of any erosion control measures determined to be not functioning acceptably would be completed within 24 hours of detection, where reasonably practicable. If substantial precipitation or snowmelt events create erosion channels in proposed Project areas where soil is exposed, additional sediment control measures would be implemented as soon as practical after the rain or snowmelt event. Potential erosion control measures are described in greater detail in the CMRP.

Soil Contamination

If soils impacted by potentially hazardous substances (such as hydrocarbons, pesticides, or herbicides) would be disturbed by pipeline construction, adverse impacts could result. These may include the potential spread of impacted soils, hazardous material exposure to workers or the public, or mobilization of contaminants through soil erosion or contaminant leaching from soils to groundwater, which could affect groundwater or surface water quality. To accommodate potential discoveries of contaminated soils, contaminated soil discovery procedures would be developed in consultation with relevant agencies and these procedures would be added to the CMRP. In the event that the proposed Project encounters contaminated or potentially contaminated soils, based on obvious odor or discoloration, work in the area of the discovery would halt and equipment would be moved from the immediate area. Containment berms would be installed, as necessary, to prevent migration of runoff from the excavated material. The state agency responsible for site assessment and remediation would be contacted and a plan of action would be developed in consultation with that agency and the landowner. Testing of the potentially contaminated soil may be necessary. Depending upon the level of contamination found and based on approvals from the appropriate agency(ies), affected soil may be replaced in the trench, remediate *in situ*, or removed for off-site disposal.

Soil Compaction

On land with soils that are compaction prone (approximately 72 percent of the overall proposed Project route acreage; see Table 3.2-2), soil compaction may result from the movement of construction vehicles along the construction ROW, within additional temporary workspace areas, and on temporary access roads. The degree of compaction would be dependent on the moisture content and texture of the soil at the time of construction; although compaction can occur on nearly any soil type, compaction would be most severe where equipment operates on moist to wet soils with high clay contents. The likelihood for compaction would increase with increasing numbers of passes by construction equipment. Additionally, if soils are moist or wet during trenching and vehicle movement, topsoil would likely adhere to tires and/or tracked vehicles and be carried away (i.e., resulting in rutting of soil). Compaction control measures are described in the CMRP and include ripping (i.e., the loosening of the compacted soils with a dozer equipped with a ripper blade or a deep plow) to relieve compaction, particularly in proposed Project areas from which topsoil has been removed.

Prime Farmland Soil

Approximately 4,715 acres of prime farmland soil would be directly impacted by construction of the proposed pipeline (see Table 3.2-2 for a breakdown by state). The existing structure of prime farmland soil may be degraded by construction. Grading and equipment traffic could compact soil, reducing porosity and percolation rates, which can result in increased runoff potential. Construction methods that would reduce impacts to prime farmland soils and to soils in non-forested agricultural areas are discussed in the Topsoil and Subsoil Handling section below.

Topsoil and Subsoil Handling

In non-forested agricultural proposed Project areas, the top 12 inches of topsoil would be removed and segregated during excavation activities. Stripped topsoil would be stockpiled in a windrow along the edge of the ROW. The work would be conducted to minimize the potential for mixing topsoil and subsoil. Topsoil would not be used to fill low-lying proposed Project areas and would not be used to construct ramps at road or waterbody crossings. Additional methodology detailed in the CMRP (Appendix G) includes ripping to relieve compaction in proposed Project areas from which topsoil has been removed, removing all excess rocks exposed due to construction activity, and adding soil amendments to topsoil as warranted by conditions and agreed to by landowners and/or federal or tribal entities.

The proposed Project route was evaluated to identify areas where special handling and additional soil salvage techniques could be necessary to conserve agricultural capability. Physical (i.e., texture, organic matter content) and chemical (i.e., salinity, sodicity, pH) characteristics of individual soil horizons, as well as more general factors such as geographic setting, climate, and associated ecology, have been evaluated as required for South Dakota soils consistent with South Dakota Public Utilities Commission conditions. These same characteristics also would be evaluated prior to construction in other proposed Project areas where soils with similar chemical and physical characteristics occur in low-precipitation portions of the Project route. Soils considered for special handling are those that contain suitable growing conditions in the topsoil horizon and upper subsoil horizon (horizons immediately underlying the topsoil), but contain undesirable soil conditions at greater depths; excavation and replacement of these soils could potentially result in degradation of agricultural capability if not managed appropriately. The criteria for special handling of soils to conserve agricultural capability were developed in consultation with the Natural Resources Conservation Service (NRCS) to determine proposed Project areas where special handling may be warranted. Meetings covering these criteria were held in 2011 in Montana and in 2010 in South Dakota and Nebraska. Characteristics that trigger consideration for special handling include soil with contrasting levels of salinity/sodicity, interbedded coarse soil layers, or shallow-to-moderate depths to bedrock that occur within cultivated fields or high-quality native prairie or rangeland. Candidate soils for special handling would be identified using publicly available NRCS soil survey data (Soil Survey Geographic Database) for all upper subsoil horizons within 24 inches of the surface. These data would be overlain on land-use mapping compiled from pedestrian and vehicle surveys and aerial photo-interpretation. The criteria for each soil property are presented in Table 4.2-1.

Table 4.2-1 Soil Criteria for Determining Special Handling Techniques in Cultivated Land and High-Quality Prairie or Rangeland

Characteristics	Upper Subsoil Horizon	Lower Subsoil Horizons
Salinity (EC)	<8 mmhos/cm[a]	≥4 mmhos/cm higher than EC of upper subsoil horizon
Sodicity (SAR)	<13	≥13
Coarse Fragments—percent by volume	<15%	≥15%
Lithic/Paralithic Contact	Soil series with lithic or paralithic contact between 15 inches and 40 inches of depth from surface	

[a] mmhos/cm = millimhos per centimeter.

Using NRCS soil series data, the properties of the upper subsoil horizons would be compared to data from the lower subsoil horizons to identify soil series with characteristics meeting the special handling criteria. A soil series would be selected for special handling if it meets the criteria for both the upper and lower subsoil horizons. Additionally, the upper subsoil horizons must be at least 6 inches thick or thicker to be selected for special handling. Each soil series meeting special handling criteria would be evaluated to determine the magnitude of the inter-horizon differences in relation to factors such as the physical or chemical characteristics of the other horizons within the soil profile. This case-by-case evaluation would be conducted by Keystone prior to construction. The exact locations of soils that require special soil handling would be mapped prior to construction and then field-verified along the proposed Project route.

The standard plan for the proposed Project route is to salvage topsoil from the pipeline ROW and other construction sites where excavation or grading would occur. Topsoil stripping depths have been determined through a combination of field surveys along the proposed route and review of topsoil depths reported by NRCS soil surveys. Salvage depths would vary from 4 inches in shallow soils to 12 inches in highly productive soils. In general, 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. Two primary means of salvaging soil in proposed Project areas that meet the criteria outlined in Table 4.2-1 include "over-stripping" and "triple lift."

In proposed Project areas recommended for over-stripping of topsoil, the soil salvage would extend below the surface horizon into the underlying subsurface soils (usually a B-horizon). This type of salvage would be used as a precautionary approach to conserve native seed and organics in the topsoil. In general, soils recommended for over-stripping of topsoil commonly are of low quality and support perennial grasses.

The triple lift soil salvage technique would be implemented in proposed Project areas where the topsoil to be excavated is deep/thick, primarily over the pipeline trench in cultivated fields. In these proposed Project areas, the topsoil (i.e., the "first lift") would be salvaged across the entire proposed Project route ROW according to the depth determined during pre-construction surveys. The "second-lift" material would then be salvaged and windrowed next to the salvaged topsoil. The trench spoil material (the "third lift") would then be placed adjacent to the second-lift material. Following construction, the soils would be replaced in the opposite order of extraction and would be feathered across the proposed Project route area. An example of this procedure is shown in Details 67 and 67A of the CMRP (Appendix G).

Range and Pasture Land

On range, pastures, and other proposed Project areas not suitable for farming, construction and maintenance activities may lead to localized soil compaction in soils listed as hydric or compaction prone. This compaction could lead to slower or less successful vegetation re-establishment following construction. Productivity of range and pasture land along the proposed Project route would be restored consistent with easement agreements with landowners and agencies and compensation would be provided for demonstrated losses from decreased productivity resulting from pipeline operations. Additional environmental protection measures to be employed on pasture and range lands are summarized in the CMRP.

Wet Weather Conditions

All soil types could be impacted by erosion during major or continuous precipitation events. Soils identified as compaction-prone are subject to rutting and displacement as a result of movement of construction vehicles, in particular when their moisture levels are high. Rutting may cause reduced aeration and infiltration of the soil and may cause surface water pooling or water diversion, which increases localized soil erosion.

Stockpiled topsoil and trench spoils could cause water to pond during precipitation events (i.e., because they could represent artificial barriers to natural surface water flow). Despite the protection measures described below, it is possible that precipitation events may cause unavoidable soil erosion by water.

The CMRP includes methods to determine when to restrict or stop work due to wet weather and describes methods to reduce impacts when construction activities are conducted in wet conditions. Work would be restricted or suspended during wet conditions when potential rutting could cause mixing of topsoil and subsoil, excessive buildup of mud or soil on tires, increased ponding of surface water in the work area, and the potential for severe soil compaction. During excessive wet conditions, protection measures that could be implemented include limiting work to proposed Project areas that have adequately drained soils or have sufficient vegetation cover to prevent mixture of topsoil with subsoil, installing geotextile material or construction mats in saturated proposed Project areas, or using low-impact construction techniques such as using low-ground-weight or wide-track equipment. Additionally, a stop-work directive would be implemented when recommended by the EI.

Construction in Rocky Soils

In proposed Project areas where rocky soil or shallow bedrock is present, pipeline backfill activities could result in concentration of large clasts near the surface. As detailed in the CMRP, specific construction methods would be utilized to ensure that disturbed proposed Project areas are returned to conditions consistent with pre-construction use and capability. These methods include topsoil removal, segregation, and redistribution during backfilling, and off-site removal of excess rocks and rock fragments. The size threshold for rock removal would be consistent with that found in adjacent surface soils that are undisturbed off the ROW. The intent of this effort would be to ensure an equivalent quantity, size, and distribution of rocks in the backfilled surface horizon to that found in the surface horizon on adjacent lands.

Soils Drained by Drain Tile Systems and Irrigation Systems

Construction of the proposed pipeline would occasionally necessitate disruption of existing drain tile and irrigation systems. Drainage tiles and irrigation systems would be identified and avoided or if necessary repaired or replaced if damaged by pipeline construction. Adherence to these procedures should eliminate or compensate for any long-term impacts to drain tile function or irrigation systems; however, temporary impacts to drain tile and irrigation systems during construction could result in soils becoming saturated during wet weather conditions or during periods of continuous precipitation or in temporary disabling of irrigation systems. Any demonstrated agricultural losses resulting from temporary disruption of drain tile systems and/or irrigation systems would be compensated in accordance with landowner and land manager easement agreements.

Shelterbelts

Shelterbelts include planted tree and shrub stands and windbreaks typically located at field margins, near roadsides, or around residences. Construction of the proposed pipeline would occasionally necessitate the disruption of existing shelterbelts. Shelterbelts potentially impacted by the pipeline construction would be avoided by the pipeline construction where practicable, or measures would be implemented to mitigate or compensate for impacts, as specified in Appendix R, Construction/Reclamation Plans and Documentation. Where shelterbelts would be disrupted, the ROW would be revegetated and seeded, and wind fences would be installed across the ROW in areas where trees and/or shrubs have been removed. Adherence to these procedures should minimize or mitigate long-term impacts to shelterbelts. Demonstrated agricultural losses resulting from the disruption of shelterbelts would be compensated in accordance with landowner and land manager easement agreements.

Fragile Soils in Southern South Dakota and Northern Nebraska

In southern South Dakota and northern Nebraska, the proposed Project route would enter an area with fragile soils (i.e., landscapes where the soil exhibits conditions similar to the Nebraska Department of Environmental Quality-identified Sand Hills Region and the soils are very susceptible to wind erosion; see Soils Environmental Setting sections 3.2.2.2, South Dakota, and 3.2.2.3, Nebraska, and Figure 3.2.2-1, Highly Wind Erodible Soil). To address concerns related to potential erosion in the region, specific construction, reclamation, and post-construction procedures have been developed, as described in the CMRP (Appendix F, Fragile Soils).This document provides site-specific reclamation plans that itemize construction, erosion control, and revegetation procedures for these fragile areas. Additionally, Keystone would implement micro-routing adjustments where practicable and appropriate to minimize steep topography with fragile soils.

To reduce potential impacts related to severe wind and water erosion, the following provides a summary of proposed Project Best Management Practices (BMPs) that would be implemented during construction, reclamation, and post-construction. These BMPs are included in the CMRP for fragile soil areas. Additional procedures are also described in Sandy Prairie Construction/Reclamation Unit Plan (Appendix R, Construction/Reclamation Plans and Documentation):

- Keystone would educate construction personnel regarding the necessity to strictly adhere to the proposed Project BMPs designed to minimize impacts to fragile soil landscape areas.
- Minor route re-alignments would be incorporated through these fragile areas to avoid particularly erosion-prone locations, such as ridgetops and existing blowouts as much as practicable.
- Keystone would avoid highly saturated areas, such as wetlands, to the maximum extent possible.
- Construction soil handling procedures would strive to reduce the width of disturbance to the native prairie landscape by adopting Trench-line or Blade-width stripping procedures where practicable.
- Topsoil conservation would be conducted on all areas where excavation occurs.
- Topsoil piles would be protected from erosion through matting, mulching, watering, or tackifying as deemed practicable.
- Traffic management limitations would be employed on specific areas possessing high erosion potential or sensitive habitat.
- Native seed mixes would be developed with input from the local NRCS offices and through collaboration with regional experts. All seed would be certified noxious weed-free and would be calculated on a pure live seed basis.
- Straw or native prairie hay may be used as mulch, applied to the ROW, and crimped into the soil to prevent wind erosion. All mulch would be documented as noxious weed-free.
- Land imprinting may be employed to create impressions in the soil, thereby reducing erosion, improving moisture retention, and creating micro-sites for seed germination.
- Sediment logs or straw wattles would be used in place of slope breakers (short terraces) that are constructed of soil. Using sediment logs would result in less soil disturbance to the ROW.
- Photodegradable matting would be applied on steep slopes or areas prone to extreme wind exposure such as north- or west-facing slopes and ridge tops. Biodegradable pins would be used in place of metal staples to hold the matting in place.
- Keystone would work with landowners to evaluate fencing the ROW from livestock, or alternatively, provide compensation to rest a pasture until vegetation can become established.
- Management concerns such as livestock access to water or movement within a pasture would be addressed as necessary.
- As part of post-construction monitoring and repair, Keystone would monitor reclamation on the ROW for several years and repair erosion and reseed poorly revegetated areas as necessary. During monitoring, landowners would be informed of these efforts and intended actions going forward.
- A noxious weed management plan would be established based on consultation with state and county experts.

Potential Spills and Leaks

Construction impacts resulting from fuel or lubricating oil leaks or spills during construction are addressed in Section 4.13, Potential Releases.

4.2.3.2 Operation Impacts

During the operational phase of the proposed Project, small-scale isolated surface disturbance impacts could occur from pipeline maintenance traffic and incidental repairs. This could result in accelerated erosion, soil compaction, and related reductions in the productivity of desirable vegetation or crops. Impacts related to excavation and topsoil handling would be limited to small proposed Project areas where pipeline maintenance activities take place. During operation, these types of impacts would be addressed with the affected landowner or land management agency and a mutually agreeable resolution reached.

Soil Erosion

Operational maintenance of cleared proposed Project areas could lead to minor increases in soil erosion by wind or water; however, these impacts would be very localized in nature. These impacts are expected to be minor. If necessary, localized soil erosion would be reduced using measures outlined in the CMRP. BMPs may include installation of sediment barriers (silt fencing, straw or hay bales, sand bags, etc.), trench plugs, temporary slope breakers, drainage channels or ditches, and mulching. These erosion control measures would be implemented wherever soil is exposed, steep slopes are present, or wherever erosion potential is high.

Soil Compaction

Maintenance activities could lead to localized compaction due to vehicular traffic during maintenance operations. These impacts are expected to be minor. In the event that agricultural productivity is impaired by vehicular compaction associated with the proposed Project, landowners and land managers would be compensated for demonstrated losses associated with decreased productivity.

Soil Productivity

The ROW would be monitored to identify any proposed Project areas where soil productivity has been degraded as a result of pipeline operation. Necessary reclamation measures would be implemented to rectify any such concerns. The U.S. Department of State (Department) understands that Keystone is negotiating easement agreements with landowners and land management agencies that would require Keystone to restore the productivity of the ROW and provide compensation for demonstrated losses from decreased productivity resulting from pipeline operations to the extent required by the easements or ROW agreements.

Differential Settling

In the first year after construction, the ROW would be inspected to identify areas of erosion or settling. Consequently, erosion and settling would be monitored through aerial patrols consistent with an Integrity Management Plan, and through landowner reporting. Landowner reporting would be facilitated through use of a toll-free telephone number that would be provided to all landowners and land managers along the proposed Project ROW (see Appendix G, CMRP).

Soil Temperature Impacts

Due to the relatively high temperature of the oil in the pipeline, increased pipeline operation temperatures may cause a localized increase in soil temperatures and a decrease in soil moisture content. A detailed analysis of the effects of pipeline operations on winter and summer soil temperatures in three locations along the proposed route (one in each state) was conducted based on operating volumes of 900,000 barrels per day (see Appendix S, Pipeline Temperature Effects Study). The modeled temperature effects are likely to be conservative since the maximum operating volume of the proposed Project is now 830,000 barrels per day. Based on these analytical results, operation of the proposed Project would be expected to cause slight increases in soil temperature 6 inches below the surface of 10 to 15 degrees Fahrenheit. However, this increase in temperature is not expected to have any significant effects to the surficial temperature of the soils, particularly during the growing season. Soil temperatures close to the pipeline (the depth to the bottom of the pipeline is, on average, between 7 and 8 feet below ground surface) could be as much as 40 degrees Fahrenheit warmer than the ambient surrounding soil temperature. See Sections 4.4, Wetlands, and 4.5, Terrestrial Vegetation, for corresponding effects on wetlands and vegetation due to soil temperature increases.

Fragile Soils in Southern South Dakota and in Northern Nebraska

To address concerns related to potential erosion in the fragile soil areas in southern South Dakota and northern Nebraska, specific construction, reclamation, and post-construction procedures have been developed, as described in the CMRP (see Appendix R, Construction/Reclamation Plans and Documentation, Sandy Prairie Construction/Reclamation Unit). This document provides a site-specific reclamation plan that itemizes construction, erosion control, and revegetation procedures in sandy prairie soil areas. The proposed Project ROW through this region would be monitored for several years to ensure that reclamation and revegetation efforts are successful. Any proposed Project areas where reclamation and revegetation efforts are initially unsuccessful would be re-evaluated and restored.

Potential Spills and Leaks

Impacts due to leaks or spills during operation of the proposed Project are addressed in Section 4.13, Potential Releases.

4.2.4 Recommended Additional Mitigation

The following sections list potential additional mitigation measures that are recommended and/or would be required based on input received from regulatory agencies and local experts.

4.2.4.1 Construction

A site-specific erosion control and revegetation plan for Montana should be prepared for agency approval prior to the start of construction (Montana Department of Environmental Quality [MDEQ]). Ripping of subsoils on Montana range and pasture lands should be performed if requested by the landowner or land management agency (MDEQ).

4.2.4.2 Operation

Ground patrols should be performed to detect and repair any differential settling or subsidence holes that develop over the life of the proposed Project in Montana (MDEQ). As discussed in Section 4.13, Potential Releases, regular aerial patrols would occur and these patrols would look for evidence of differential settling or subsidence along the proposed Project route. Keystone has indicated that based on landowner concerns, additional ground-level inspections are not feasible due to potential disruption of normal land use activities (e.g., farming, animal grazing).

Proposed Project areas that have been revegetated would be attractive as cattle forage, and fencing of the ROW may be advisable. Animal trackways can serve as incipient blowout areas, and due to potentially warmer soils in the immediate vicinity of the proposed pipeline, early forage may be concentrated along the ROW over time (Wedin 2011). Keystone has agreed to inform landowners of this concern. As described previously, Keystone would work with landowners to evaluate fencing the ROW from livestock, or alternatively, provide compensation to rest a pasture until vegetation can become established.

Also as previously indicated, Keystone would monitor reclamation on the ROW for several years and repair erosion and reseed poorly revegetated areas as necessary. Additionally, based on comments received from NRCS, it is recommended that Keystone employ a method of assessment of soil productivity such as yield comparison between ROW and non-ROW areas.

4.2.5 Connected Actions

4.2.5.1 Bakken Marketlink Project

Construction and operation of the Bakken Marketlink Project would include an approximately 5-mile-long pipeline, metering systems, three new storage tanks near Baker, Montana, and two new storage tanks within the boundaries of the proposed Cushing tank farm. Keystone reported that the property proposed for the Bakken Marketlink facilities near Pump Station 14 is currently used as pastureland and hayfields. The Department reviewed aerial photographs of the Project area and confirmed the current use of the land. A site inspection by a Department third-party contractor confirmed these findings. As a result, the potential impacts to soils associated with expansion of the pump station site to include the Bakken Marketlink facilities likely would be similar to those described above for the proposed Project in that area.

4.2.5.2 Big Bend to Witten 230-kV Transmission Line

The proposed Big Bend to Witten electrical lines would be a 230-kilovolt (kV) single circuit transmission line strung to a single-pole structure. The poles typically would be about 110-feet-high steel poles with wire span distances averaging 800 feet. The poles would be directly embedded into excavated holes to a depth of about 20 feet. All substation and switchyard work installation activities, including the placement of concrete foundations, erecting support structures, construction of control buildings, and the installation of electrical equipment would involve surficial land clearance and landscape leveling. Excess fill material would be spread throughout undeveloped areas within the substation sites.

Since the construction and operation of electrical distribution lines and substations would require minor disturbances to the landscape of the area, the impacts to the soils resources are expected to be negligible.

4.2.5.3 Electrical Distribution Lines and Substations

The proposed Project would require electrical service from local power providers for pump stations and other aboveground facilities in Montana, South Dakota, Nebraska, and Kansas. Most of the proposed new electrical lines to service pump stations would be 115-kV lines stung a single-pole and/or H-frame wood poles. The poles would be typically about 60 to 80 feet high with wire span distance of about 250 to 400 feet. Poles would be either wood or steel and would be directly embedded into the excavated holes using a mobile crane or picker truck where appropriate. Anchors may be required at angles and dead ends.

Since the construction and operation of electrical lines and associated structures would require minor disturbances to the landscape of the area, the impacts to the soils resources are expected to be negligible.

4.2.6 References

Wedin, D. Pers. Comm. 2011. Teleconference with Professor Dave Wedin, University of Nebraska. June 29, 2011.