2.1 OVERVIEW OF THE PROPOSED PROJECT

This section describes the proposed route and the overall land and borrow material requirements. The proposed Project would include construction of approximately 875 miles of pipeline within a new 110-foot-wide construction right-of-way (ROW) and a 50-foot-wide permanent ROW in Montana, South Dakota, and Nebraska, as follows:[1]

- Montana–approximately 285 miles
- South Dakota–approximately 316 miles
- Nebraska–approximately 274 miles

Certain ancillary facilities (e.g., pump stations, access roads, and mainline valves [MLVs]) would be needed to support pipeline operations. Table 2.1-1 outlines these ancillary facilities by state and by type. In addition, other facilities are needed to support pipeline construction, including access roads, pipe yards, railroad sidings, and construction camps. A description of this is included in Sections 2.1.5, Ancillary Facilities, and 2.1.6, Access Roads.

Table 2.1-1 Ancillary Facilities Supporting Operations by State

State	Ancillary Facilities
Montana	6 Pump Stations 21 permanent access roads 25 IMLVs[a]
South Dakota	7 Pump Stations 18 permanent access roads 15 IMLVs
Nebraska	5 Pump Stations [TBD] permanent access roads[b] 15 IMLVs
Kansas	2 Pump Stations

Source: exp Energy Services, Inc. 2012a.

[a] IMLV = intermediate mainline valve
[b] [TBD] = to be determined; the number of permanent access roads required in Nebraska is not yet finalized

Among these ancillary facilities, the proposed Project would involve the construction of 20 pump stations. Eighteen of these would be constructed and operated along the newly built pipeline on land parcels ranging in area from 5 to 15 acres; there would be six pump stations in Montana, seven in South Dakota, and five in Nebraska. The locations of four of the five Nebraska pump stations have yet to be finally determined. Two additional pump stations would be constructed or expanded in Kansas along the existing Keystone Cushing Extension (see Figure 2.0-1): one new pump station would be constructed on an undeveloped site in Clay County; another existing pump station would be expanded in Butler County. These pump stations would enable the proposed Project to maintain the pressure required to transport crude oil at the desired throughput volumes.

[1] Summed mileage for the individual states does not exactly equal the total mileage for the overall pipeline due to rounding.

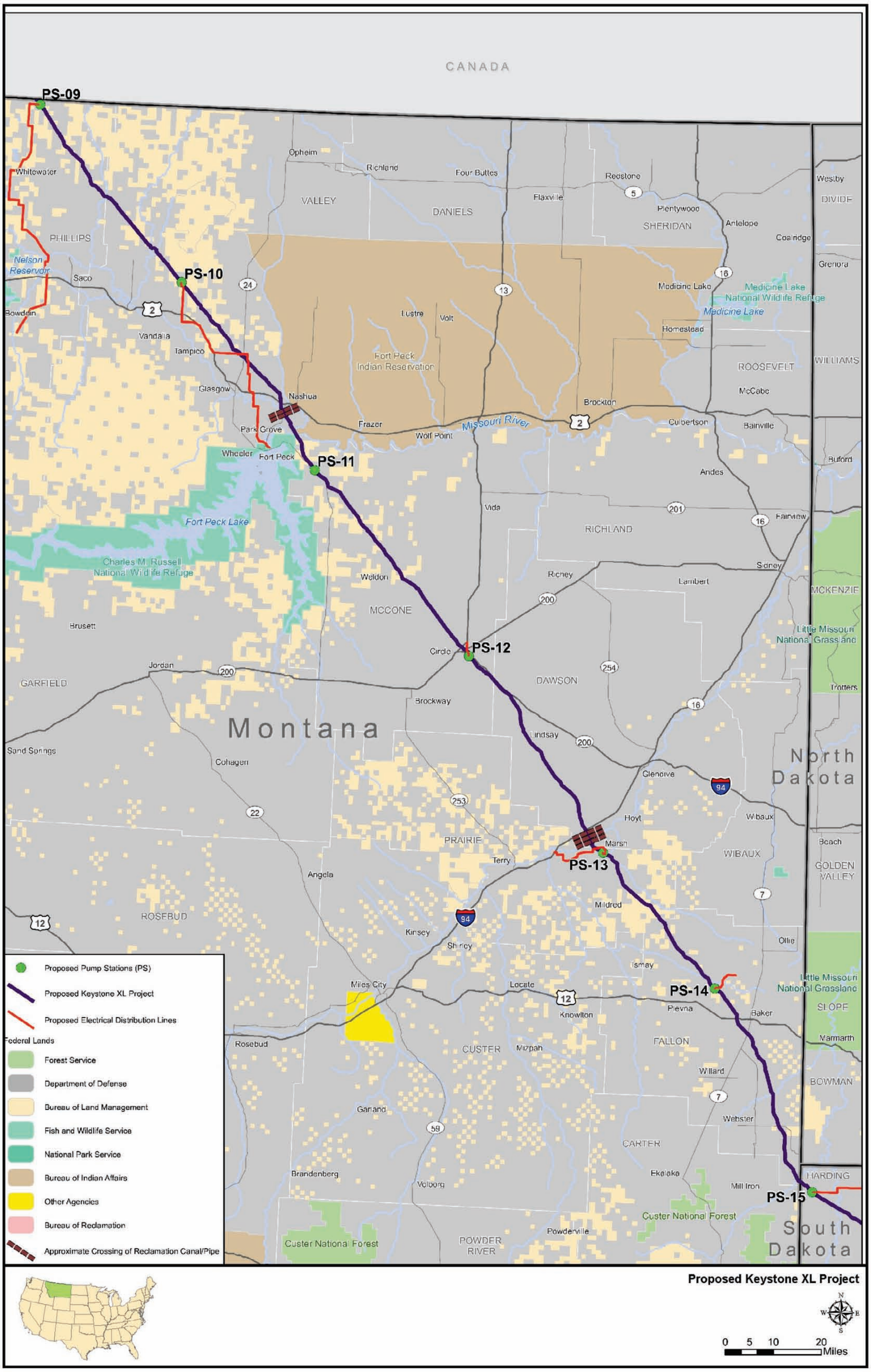
This Final Supplemental Environmental Impact Statement (EIS) also describes and addresses the impacts of three actions that are separate from the proposed Project and not part of the Presidential Permit application submitted by TransCanada Keystone Pipeline, LP (Keystone). Those actions have been determined to be *connected actions* for the purposes of this review, consistent with the National Environmental Policy Act (NEPA) as defined by Title 40 of the Code of Federal Regulations (CFR) Part 1508.25(a)(1), and are described in Section 2.1.12, Connected Actions.

2.1.1 Pipeline Route

The proposed Project would extend from an oil supply hub near Hardisty, Alberta, Canada, and extend to the United States (U.S.) border pursuant to an alignment that has been approved by the Government of Canada. The proposed 875-mile-long pipeline route in the United States that is the subject of this Final Supplemental EIS is similar to the original Steele City Segment evaluated in the August 2011 Keystone XL Project Final EIS in that it would enter the United States near Morgan, Montana; traverse Montana, South Dakota, and Nebraska; and terminate at a delivery point at Steele City, Nebraska (see Figures 2.1.1-1, 2.1.1-2, and 2.1.1-3).

The proposed Project route in Montana (Figure 2.1.1-1) and South Dakota (Figure 2.1.1-2) is largely unchanged from that presented in the Final EIS except for route modifications to improve constructability and in response to agency and landowner comments (see Table 2.1-2). Keystone will make minor adjustments to the proposed pipeline alignment during final design based on additional information obtained from field surveys or landowners. These minor route variations (micro-alignments) could be implemented to address specific landowner concerns, avoid certain features (such as structures, wells, or irrigation systems), minimize impacts to environmental resources, or facilitate construction in such areas as steep terrain or waterbody crossings.

In Montana and South Dakota, minor route changes of 200 feet (ft) up to a quarter mile were made to the proposed route to avoid small surface water crossings or address landowner concerns. These changes are too small to be noted in Figures 2.1.1-1 and 2.1.1-2, given the map scale. Additional maps of the current proposed pipeline route can be found in Section 3.3.3, Surface Water.



Source: Esri 2013, exp Energy Services, Inc. 2012b

Figure 2.1.1-1 Proposed Project Overview—Montana

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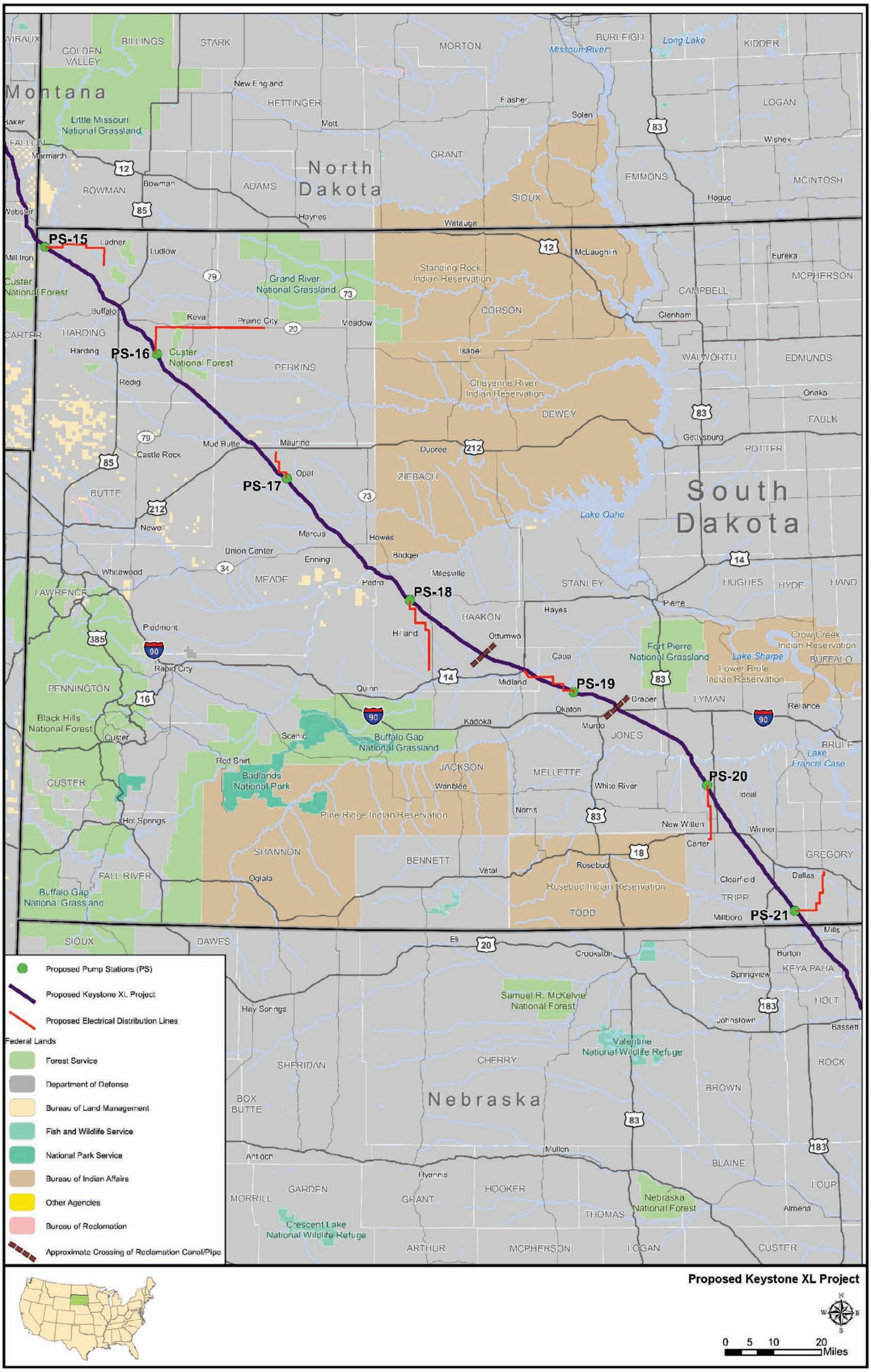

Source: Esri 2013, exp Energy Services, Inc. 2012b

Figure 2.1.1-2 Proposed Project Overview—South Dakota

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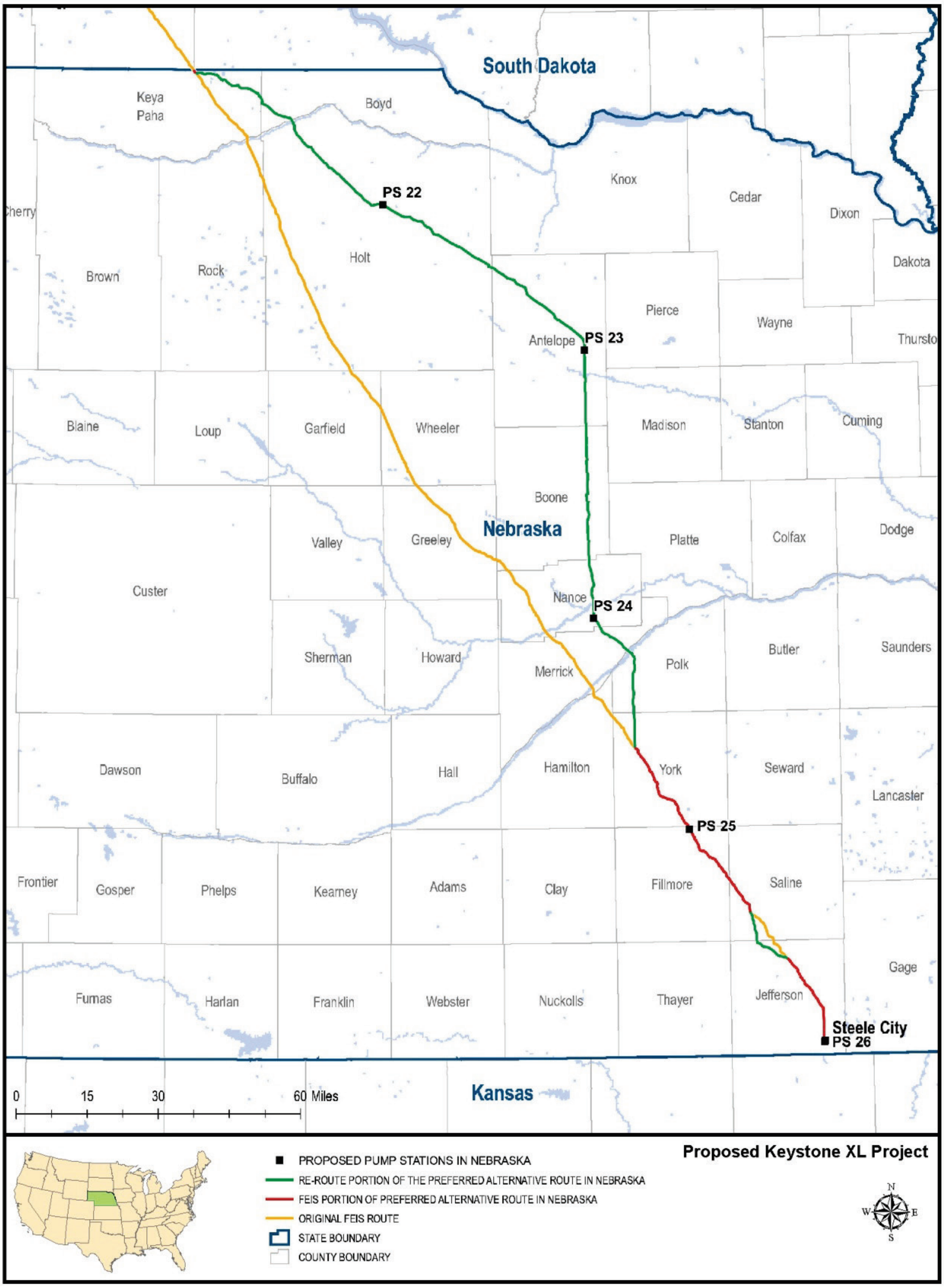

Source: Esri 2013, exp Energy Services, Inc. 2012a

Figure 2.1.1-3 Proposed Project Overview—Nebraska

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Table 2.1-2 Pipeline Route Modifications

County	Begin Milepost	End Milepost	Base Route Length (Miles)	Reroute Length (Miles)	Maximum Perpendicular Distance from Center Line (Feet)	Reason for Route Change[a]
Montana						
Phillips	25.17	25.67	0.54	0.51	229	To accommodate an HDD through Frenchman Creek as opposed to the original open-cut method.
McCone	108.10	110.31	2.19	2.21	209	To avoid paralleling a creek and to eliminate two creek crossings.
South Dakota						
Harding	296.22	297.72	1.46	1.49	2,307	To avoid constructability issues (rough terrain, large hill, multiple drop-offs, side hill construction, etc.) and future pipeline integrity issues. Landowner prefers this more southerly route.
Harding	315.09	315.75	0.66	0.67	260	To shift CL and TWA away from a side slope and avoid difficult construction and restoration.
Harding	331.94	332.92	0.97	0.99	356	To avoid crossing drainage multiple times, to avoid paralleling drainage, and to avoid one drainage entirely.
Harding	350.84	351.58	.073	0.74	370	To shift CL and TWA away from a pond.
Harding	354.62	355.27	0.64	0.65	313	To avoid approximately 350 ft of difficult terrain features.
Butte/ Perkins	361.76	362.44	0.67	0.68	251	To avoid a hill that would require additional soil handling and TWA.
Perkins	366.31	366.82	0.49	0.51	234	To avoid multiple creek crossings. Would also eliminate two of the three current creek crossings.
Perkins	370.18	370.82	0.59	0.64	701	To shift CL and TWA to a more constructible creek crossing locale.
Meade	380.56	381.20	0.64	0.65	214	To avoid laying pipeline along drainage feature and eliminate one of the two current creek crossings.
Meade	388.26	388.90	0.62	0.64	244	To avoid a well and levee.
Meade	398.24	400.78	2.55	2.54	733	To avoid multiple stream crossings and more difficult construction.
Meade	424.03	426.52	2.44	2.50	2,225	To shift CL and TWA to avoid ridgelines, rough terrain, and drop-offs, and eliminate the one HDD.
Meade/ Haakon	426.83	436.12	9.00	9.29	1,980	To avoid ridgelines, rough terrain, and drop-offs, and eliminate two HDDs. Also to improve the current HDD crossing location of the Cheyenne River and straighten the route to allow the use of HDD at two locations south of the Cheyenne River crossing.
Haakon	447.16	448.77	1.59	1.61	788	To avoid a creek crossing that is too close to a road and to avoid impacting a wetland area and tree removal.

County	Begin Milepost	End Milepost	Base Route Length (Miles)	Reroute Length (Miles)	Maximum Perpendicular Distance from Center Line (Feet)	Reason for Route Change[a]
Haakon	449.61	450.13	0.51	0.52	270	To avoid laying pipeline along a drainage feature.
Haakon	452.01	453.00	0.98	0.99	343	To relocate the CL crossing at Highway 73 to a narrower area of state-road ROW, reduce the crossing length, and avoid steep slopes at highway's edge. Also relocates the pipeline away from the side slope of a meandering waterbody.
Haakon	455.22	456.75	1.56	1.53	635	To eliminate a PI and straighten the route.
Haakon	461.83	462.26	0.45	0.43	315	To eliminate a PI and straighten the line, place MLV-19A on higher ground, and move CL/TWA away from an existing culvert south of current CL.
Haakon	475.48	477.77	2.27	2.29	630	To avoid difficult construction and save cost of reclamation by avoiding routing along a drainage feature and have a better crossing location at a creek. Also avoids three creek crossings and moves CL away from a pond.
Haakon	484.38	486.13	1.76	1.75	498	To avoid a drop-off and eliminate approximately80 ft of wetland crossing, relocate CL to a first ridge where landowner has already excavated some portions, avoid elevation, terrain, and slope changes, and straightens alignment to accommodate a HDD crossing of the Bad River, the Bad River road and a railroad.
Jones	493.54	494.98	1.45	1.44	550	To shorten the route.
Jones	501.75	503.60	1.87	1.85	442	To shorten the route and remove one PI.
Jones	506.33	507.63	1.26	1.30	329	To avoid CL and TWA crossing a pond and a levee, avoid terrain issues such as a side slope/side hill, and eliminate reclamation issues at the pond/levee.
Lyman	534.03	535.07	1.01	1.04	253	To avoid a drainage feature, straighten a road crossing, and move MLV-22 to suitable ground.
Lyman	540.23	541.06	0.95	0.82	1,142	To move CL and TWA off a side slope. Would impact the entry/exit point at the White River HDD.
Tripp	542.62	545.21	2.54	2.59	810	To shift the CL off a side hill, avoid CL running under field road by shifting it out of field road, and eliminate approximately 5,626 ft of side slope construction.
Tripp	547.33	549.23	1.87	1.90	555	To avoid difficult terrain (side slopes, bluffs) and having TWA inside a drainage/creek.

County	Begin Milepost	End Milepost	Base Route Length (Miles)	Reroute Length (Miles)	Maximum Perpendicular Distance from Center Line (Feet)	Reason for Route Change[a]
Tripp	578.31	579.00	0.65	0.69	550	To accommodate two requests from landowners: avoid locating the pipeline on tract ML-SD-TR-11345 and avoid a row of trees.
Tripp	599.41	599.88	0.47	0.47	415	To avoid a drainage crossing, straighten a road crossing, and eliminate reclamation issues at the drainage crossing.
Nebraska						
Keya Paha, Boyd, Holt	601.76	637.42	34.57	35.67	41,951	See Section 2.3-1 of Nebraska Supplemental Environmental Report (SER). Approximately, 74 tracts, 36 new landowners and one State Land tract (Board of Education Lands, School Lands) impacted. Additionally, eight new CARs would be added for the reroute; one MLV would be impacted (CK-MLV-25).
Holt	657.93	658.43	0.49	0.50	279	The proposed route variation accommodates landowner's (tract ML-NE-HT-30345.000) request to avoid a newly planted (3 years) shelter belt on the property as well as a cattle feed lot by shifting the CL and TWAs further south.
Holt	659.08	660.83	1.68	1.75	1,481	Landowner preference
Holt	661.82	663.75	1.77	1.94	1,796	The primary reason for this proposed reroute is to avoid landowner's row of trees located in tract ML-NE-HT-30405.000 by shifting the CL and TWAs east.
Holt	665.44	667.47	1.85	2.03	1,845	Landowner preference
Boone	740.05	741.02	0.93	0.98	457	Landowner preference
Boone	745.45	746.88	1.47	1.44	1,344	Landowner preference
Boone	749.98	750.94	0.96	0.96	201	The primary reason for this proposed reroute is to avoid a large drain that is located next to a road and to allow the drainage feature and road to be crossed separately by shifting the centerline and work spaces further west.
Nance, Merrick, York, Polk	764.99	796.31	31.49	31.33	50,938	See Table 2.3-2 of Nebraska SER (exp Energy Services, Inc. 2012a).
Saline, Jefferson	840.95	855.03	13.49	14.08	18,546	See Table 2.3-3 of Nebraska SER (exp Energy Services, Inc. 2012a).
Jefferson	873.29	874.50	1.29	1.20	275	The primary reason for this proposed reroute is to shift CL and TWAs away from fence that runs parallel to the current CL.

Source: exp Energy Services, Inc. 2012a
[a] CL = centerline; TWA = temporary workspace area; HDD = horizontal directional drill; MLV = mainline valve; PI = point of inflection (angle)

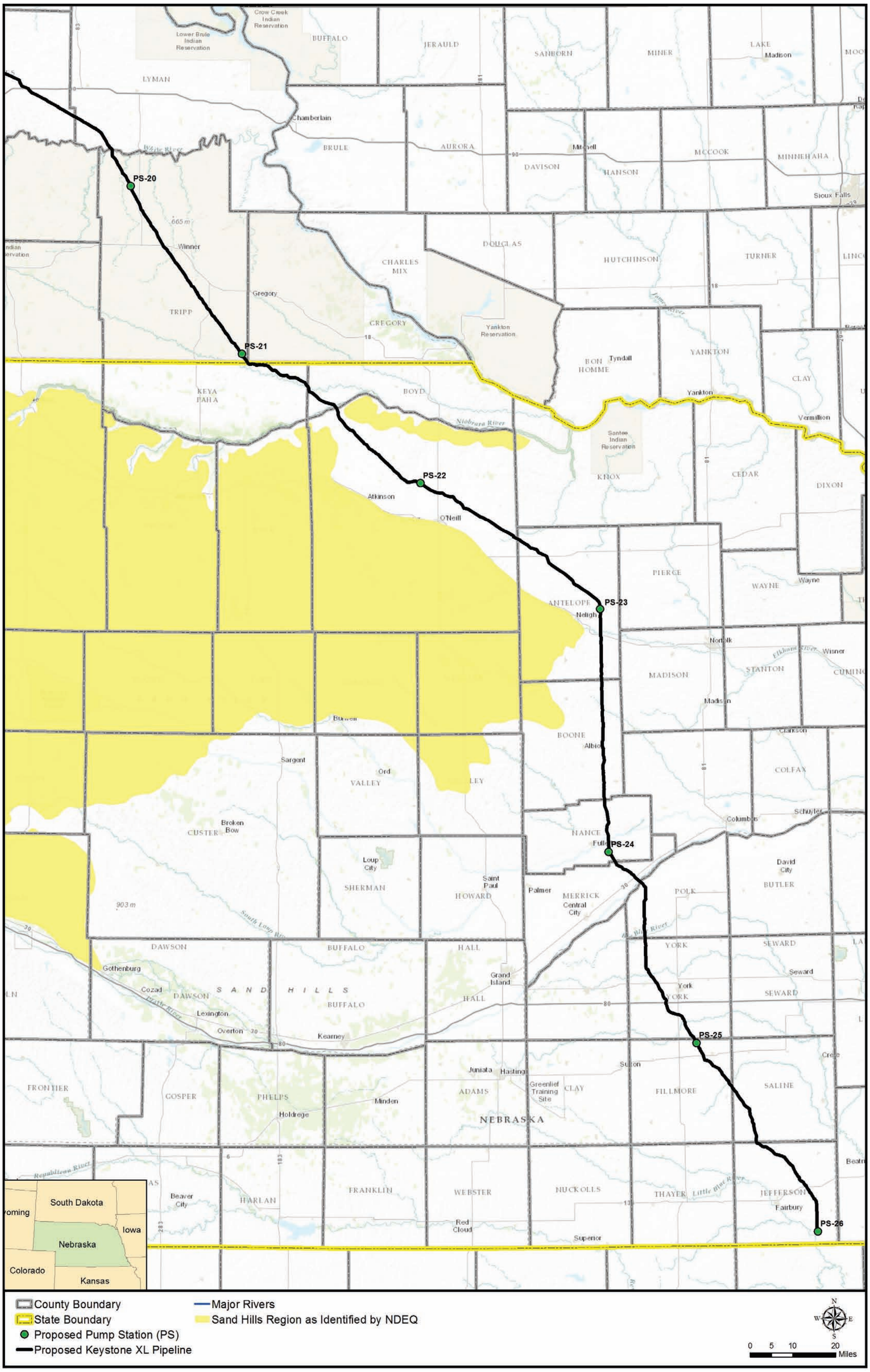
More significant changes were made to the proposed route in Nebraska (Figure 2.1.1-3). The route as proposed by Keystone is modified from the Final EIS route to avoid the Nebraska Department of Environmental Quality (NDEQ)-identified Sand Hills Region (Figure 2.1.1-4). This route modification is referred to on Figure 2.1.1-5 as the *April Route Alternative*. The original pipeline route in Nebraska as presented in the Final EIS (identified as the FEIS Route) trended northwest to southeast beginning at the South Dakota and Nebraska border in Keya Paha County, Nebraska, and ending at Steele City, Nebraska. NDEQ identified the areas that it considers to be Nebraska Sand Hills based on a 2001 map published by the USEPA title *Ecoregions of Nebraska and Kansas*. The route as proposed by Keystone avoids the NDEQ-identified Sand Hills Region as well as some areas in Keya Paha County identified by the NDEQ that have soil and topographic characteristics similar to the Sand Hills Region in Nebraska[2].

The proposed route is shown as the *Alternative* route on Figures 2.1.1-5 and 2.1.1-6. The proposed route also avoids the Village of Clarks wellhead protection areas in response to concerns expressed by NDEQ and other stakeholders. The proposed route places the pipeline approximately 4 miles downgradient and to the east of the wellhead protection area boundary as shown in Figure 2.1.1 5. The proposed route also avoids the newly designated Village of Western wellhead protection area, which is depicted in Figure 2.1.1-6.

The original Final EIS route for Nebraska included approximately 255 miles of pipeline and associated project facilities. The total proposed route in Nebraska is now approximately 274 miles long, of which approximately 209 miles comprise the route modification portion of the proposed route. Table 2.1-3 shows the changes between the original Final EIS route and the proposed route. Keystone's proposed route also includes five pump stations. There is one additional pump station on the portion of the proposed route that has not changed from the original route evaluated in the Final EIS.

There are currently 48 access roads (private roads) along the Nebraska portion of the proposed route, but additional access roads may be needed. The proposed Project would also include contractor yards, pipe yards, and rail sidings. In addition, a construction work camp would be required in northern Nebraska due to insufficient available capacity of rental units and hotel rooms. All pigging facilities (high-resolution internal line inspection, maintenance, and cleaning tools) would be located within pump station yards (see Section 2.1.4.1, Pump Stations). All proposed Project facilities for which the locations have been selected are depicted on the pipeline route sheets in Figures 2.1.1-3, 2.1.1-4, and 2.1.1-5. Section 2.1.2, Land Requirements, provides a full description of land requirements for the project.

[2] Other areas that would be crossed by the proposed pipeline exhibit soil characteristics similar to the soils found in the NDEQ-identified Sand Hills Region, as described in Section 3.2, Soils.



Source: Esri 2013, NDEQ 2013

Figure 2.1.1-4 NDEQ-Identified Sand Hills Region

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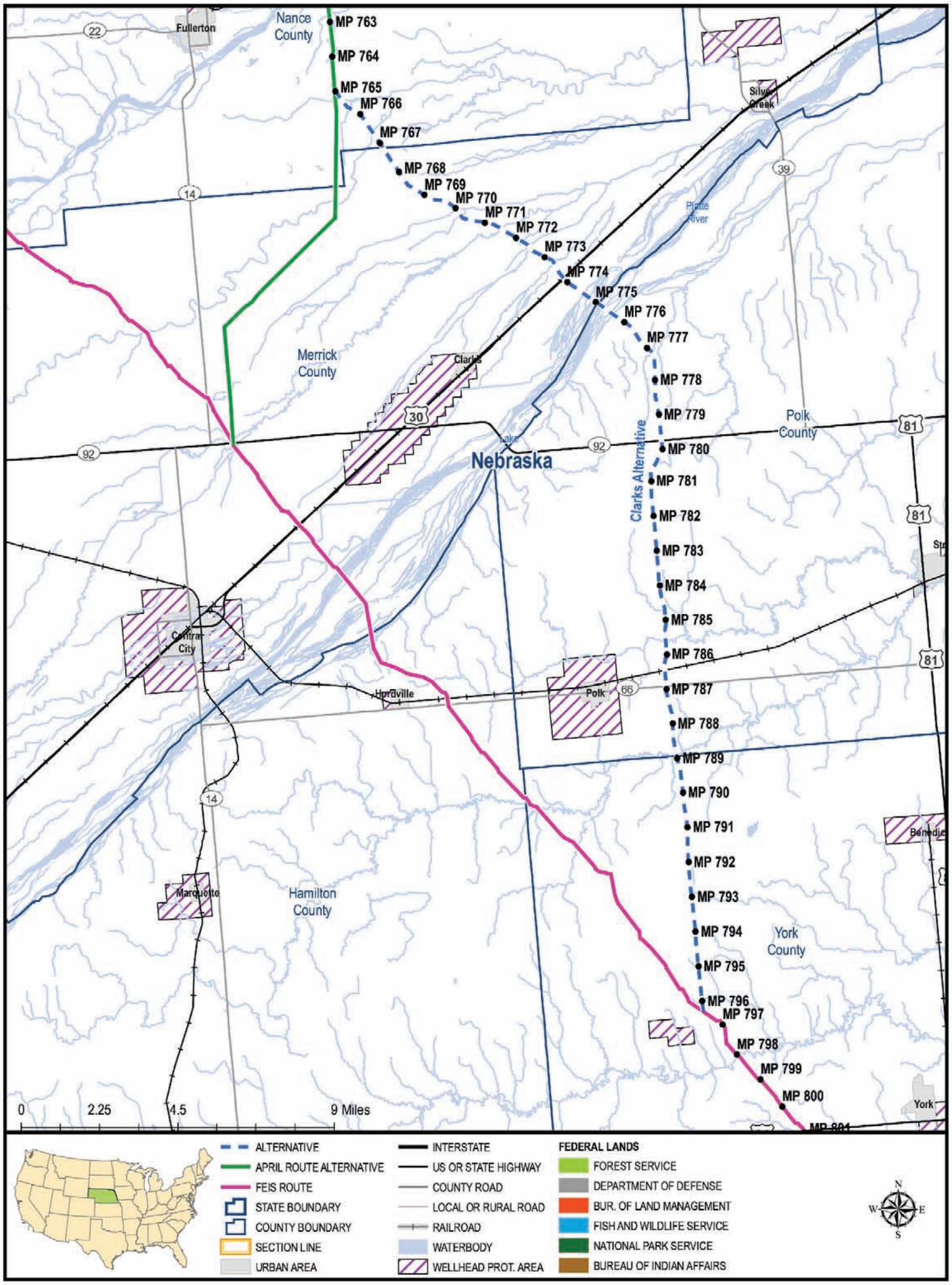
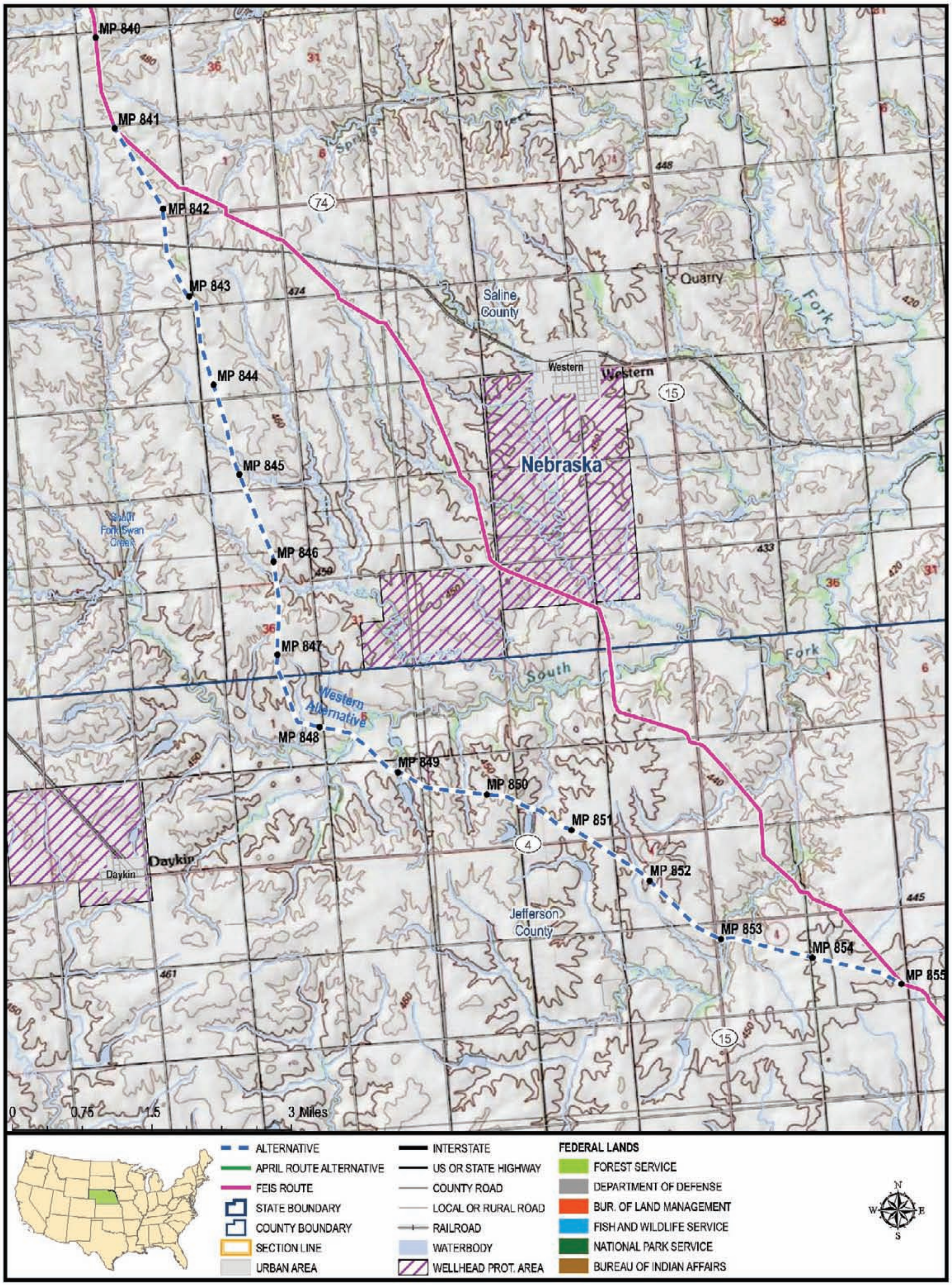


Source: Esri 2013, exp Energy Services, Inc. 2012b

Note: The *April Route Alternative* is the initially proposed alternative to the *FEIS Route*, designed to avoid the NDEQ-defined Sand Hills Region. The *Alternative* is the subsequent modification to the FEIS Route, designed to avoid various wellhead protection areas.

Figure 2.1.1-5 Clarks Route Modification



Source: Esri 2013, exp Energy Services, Inc. 2012b

Note: The *April Route Alternative* is the initially proposed alternative to the *FEIS Route*, designed to avoid the NDEQ-defined Sand Hills Region. The *Alternative* is the subsequent modification to the FEIS Route, designed to avoid various wellhead protection areas.

Figure 2.1.1-6 Western Route Modification

Table 2.1-3 Summary of Lands Affected

	Route in Nebraska			
	Final EIS Route		Proposed Project Route	
Facility	Land Affected During Construction[a] (acres)	Land Affected During Operation[b] (acres)	Land Affected During Construction[a] (acres)	Land Affected During Operation[b] (acres)
Pipeline ROW	3,384.8	1,543.8	3,631.1	1,660.8
Additional TWAs	349.5	0.0	225.0	0.00
Pump Stations	42.2	42.2	58.0	58.0
Access Roads[c]	53.3	0.0	70.5	0.0
Pipe Yards, Rail Sidings, Contractor Yards	515.6	0.0	TBD[d]	0.0
Construction Camp	0.0	0.0	TBD[d]	0.0
Totals	4,345.3	1,586.1	3,984.6	1,718.8

[a] Disturbance is based on a total of a 110-foot construction ROW for a 36-inch-diameter pipe, except in certain wetlands, cultural sites, shelterbelts, residential areas, and commercial/industrial areas where an 85-foot construction ROW would be used, or in areas requiring extra width for workspace necessitated by site conditions.
[b] Operational acreage was estimated based on a 50-foot permanent ROW in all areas. Any pigging facilities (i.e., high-resolution internal line inspection, maintenance, and cleaning tools) would be located within pump stations. Intermediate mainline valves (IMLVs) and densitometers (i.e., instrumentation used to measure the density of a material) would be constructed within the construction easement and operated within a 50-foot-by-50-foot area or 50-foot-by-66-foot area, respectively, within the permanently maintained 50-foot ROW. All MLVs and meters would be located within the area associated with a pump station or permanent ROW. Consequently, the acres of disturbance for these aboveground facilities are captured within the Pipeline ROW and Pump Station Facilities categories within the table.
[c] Temporary and permanent disturbances associated with access roads are based on 30-foot width; all non-public roads are conservatively estimated to require upgrades and maintenance during construction.
[d] Typical sizes and numbers of ancillary facilities are: three pipe yards per spread averaging 40 acres each, one rail siding per spread averaging 10 acres, and one main contractor yard per spread averaging 30 acres. Construction camp sites could range between 50 and 100 acres in size (may include a contractor yard adjacent to the camp).
TBD = To Be Determined

2.1.2 Land Requirements

Approximately 15,296 acres of land would be disturbed during construction. The permanent ROW and aboveground facilities would occupy a total of approximately 5,569 acres. Table 2.1-3 shows the areas in acres affected by construction and operation of the proposed Project. The following are proposed Project activities that would require temporary and permanent use of land.

- Temporary land use:
  - Additional temporary workspace areas (TWAs)
  - Pipe yards, rail sidings, and contractor yards
  - Construction camps
  - Temporary access roads

- Permanent land use:
  - Pipeline ROW
  - Pump stations and delivery facilities
  - Permanent access roads

Construction of the proposed Project would require a 110-foot-wide construction ROW. In certain sensitive areas, which may include wetlands, cultural sites, shelterbelts, residential areas, or commercial/industrial areas, the construction ROW would be reduced to 85 ft to minimize impacts to these sensitive areas. Figure 2.1.2-1 illustrates typical dimensions for the temporary (construction) ROW and permanent (operation) ROW. After construction, the ROW would be restored consistent with applicable federal and state regulations and permits, the easement agreements negotiated between Keystone and individual landowners or land managers, and the construction methods and environmental protection procedures described in the Keystone Construction, Mitigation, and Reclamation Plan (CMRP) (presented in Appendix G and described in Section 2.1.7, Pipeline System Design and Construction Procedures). Those measures would be incorporated into the proposed Project to reduce the potential impacts of construction. After restoration, the approximately 9,727 acres of temporary ROW would be returned to the property owners for their use.

The permanent ROW would be approximately 5,569 acres, which includes approximately 260 acres for pump stations, valves, and other aboveground facilities. Access to the permanent ROW would be maintained for the life of the proposed Project to support surface and aerial inspections and any repairs or maintenance as necessary.

2.1.3 Borrow Material Requirements

Borrow (or fill) material would be required for temporary sites (such as storage sites, contractor yards, temporary access roads, and access pads at ROW road crossings) to stabilize the land for permanent facilities (including pump stations, valve sites, and permanent access roads), and for padding the bottom of the pipeline trench in some areas. All gravel and other borrow material would be obtained from existing, previously permitted commercial sources located as close to the pipe or contractor yards as possible.

In general, about 7,000 cubic yards of gravel would be required for each pipe yard, and about 4,600 cubic yards of gravel would be required for each contractor yard. The approximately 191 access roads (some of which would be permanent, and some of which would be temporary and maintained only during construction) would be graveled, as would access pads at ROW crossings of public and private roads. About 6 inches of gravel would typically be used at pump stations and MLV sites. Along portions of the route, the trench bottom would be filled with padding material such as sand or gravel, to protect the pipeline coating. Table 2.1-4 lists the approximate amount of borrow material that would be required in each state and Table 2.1-5 lists the borrow material required for each facility type.

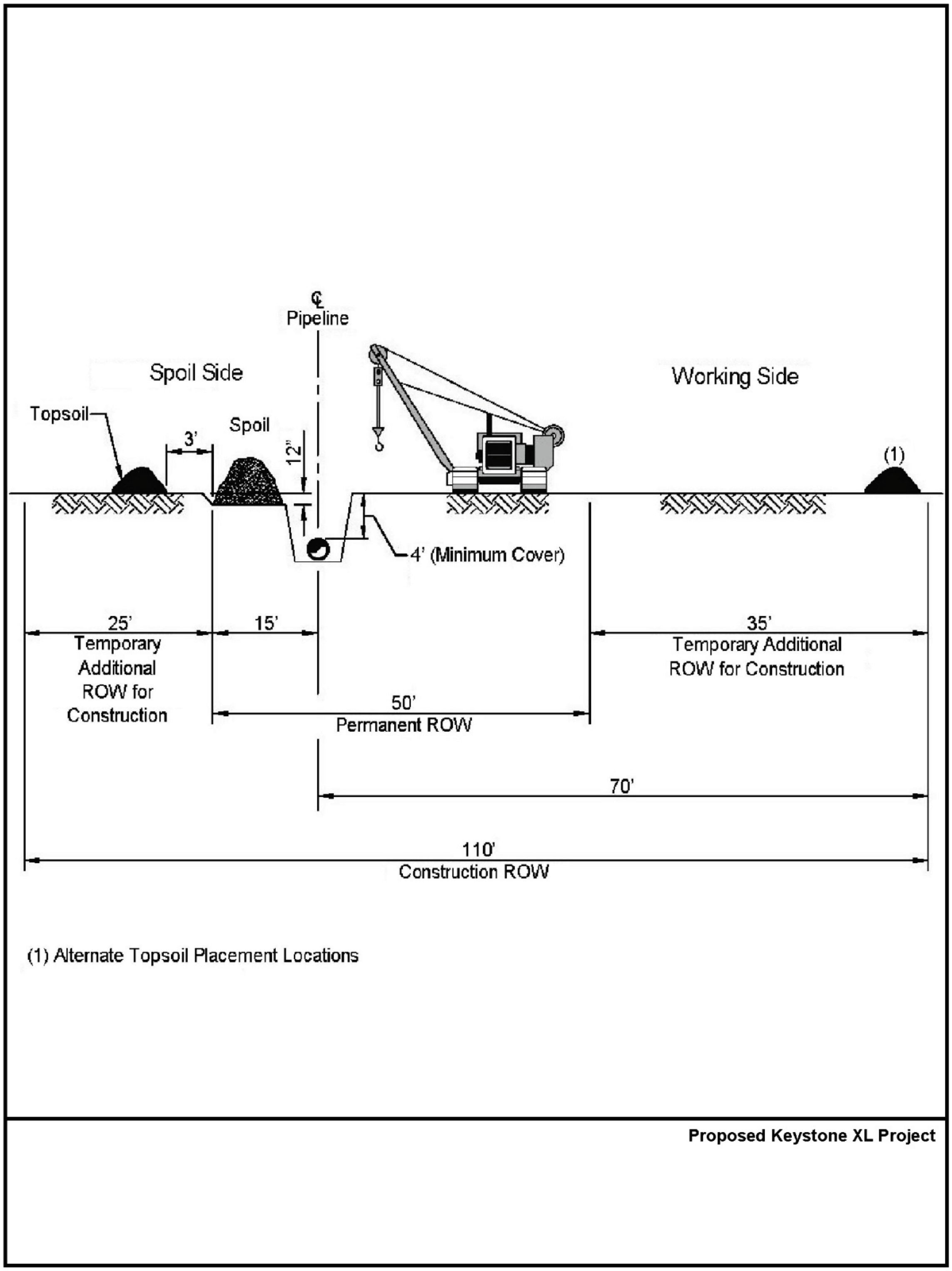


Figure 2.1.2-1 Construction ROW without Adjacent Pipeline

Table 2.1-4 Borrow Material Requirements by State

State	Cubic Yards of Material
Montana	180,267
North Dakota[a]	Quantities unknown at this time
South Dakota	167,615
Nebraska	128,735
Kansas[b]	8,830

[a] Quantities for the pipe yard in North Dakota are not currently known.
[b] Borrow material required for the two proposed pump stations on the Keystone Cushing Extension.

Table 2.1-5 Total Borrow Material Requirements by Facility Type

Facility Type	Cubic Yards of Material
Pipe Yard[a]	Quantities unknown at this time
Contractor Yard	134,400
Temporary Access Roads	28,579
Access Pads for Road Crossings	37,860
Pump Stations	180,000
Valve Sites	2,812
Permanent Access Roads	242,970
Trench Bottom Padding [b]	85,000

[a] Quantities for the pipe yard in North Dakota are not currently known.
[b] Gravel may be replaced with sand or soil.

2.1.4 Aboveground Facilities

The proposed Project would require approximately 190 acres of land for aboveground facilities, including pump stations, delivery facilities, densitometer sites, and intermediate mainline valves (IMLVs). During operations, Keystone would use agricultural herbicides approved by the U.S. Environmental Protection Agency (USEPA) to control the growth of vegetative species on all aboveground sites. See Table 2.1-6 for details regarding aboveground facilities.

Table 2.1-6 Aboveground Facilities

State	Facility	Areas Affected (Acres) Construction	Operation
Montana	Pipeline ROW	3,788.5	1,729.7
	Additional Temporary Workspace Areas	519.1	0.0
	Pipe Yards and Contractor Yards	517.2	0.0
	Construction Camp	242.9	0.0
	Pump Stations and Delivery Facilities [b]	57.5	57.5
	Access Roads	337.2	47.6
	Rail Sidings[a] (Three Sites)	60.0	0.0
	Montana Subtotal	**5,522.4**	**1,834.9**
South Dakota	Pipeline ROW	4,179.5	1,918.6
	Additional Temporary Workspace Areas	463.5	0.0
	Pipe Yards and Contractor Yards	604.2	0.0
	Construction Camp	250.4	0.0
	Pump Stations and Delivery Facilities [b]	57.2	57.2
	Access Roads	223.0	24.3
	Rail Sidings[a] (Three Sites)	60.0	0.0
	South Dakota Subtotal	**5,837.8**	**2,000.1**
North Dakota	Pipeline ROW	0.0	0.0
	Additional Temporary Workspace Areas	0.0	0.0
	Pipe Yards, Contractor Yards, and Rail Sidings (One Site)	56.1	0.0
	Construction Camp	0.0	0.0
	Pump Stations and Delivery Facilities	0.0	0.0
	Access Roads	0.0	0.0
	North Dakota Subtotal	**56.1**	**0.0**
Nebraska	Pipeline ROW	3,631.1	1,660.8
	Additional Temporary Workspace Areas	225.0	0.0
	Pipe Yards, and Contractor Yards	TBD	0.0
	Construction Camp	TBD	0.0
	Pump Stations and Delivery Facilities[b]	58.0	58.0
	Access Roads	70.5	0.0
	Rail Sidings[a]	TBD	0.0
	Nebraska Subtotal	**3,984.6**	**1,718.80**

State	Facility		Areas Affected (Acres) Construction	Operation
Kansas	Pump Stations		15.2	15.2
		Kansas Subtotal	**15.2**	**15.2**
		TOTAL	**15,416.2**	**5,569.1**

Source: exp Energy Services, Inc. 2012a

[a] Rail siding acreage represents 20 acres per site.
[b] Valve station acreages not included as they are located entirely within the permanent pipeline ROW.

2.1.4.1 Pump Stations

Keystone would construct a total of 20 pump stations: six in Montana, seven in South Dakota, five in Nebraska (including an expansion to the existing pump station 26 at Steele City), and two on the existing Keystone Cushing Extension in Kansas. Each pump station would be situated on an approximately 5- to 15-acre site dependent upon the number of pumps present. Each new pump station would consist of three to five pumps driven by approximately 6,500-horsepower electric motors, an electrical equipment shelter, a variable frequency drive equipment shelter, an electrical substation, one sump tank, two MLVs, a communication tower, a small maintenance and office building, and a parking area for station maintenance personnel. The electrical shelter would house the electrical systems and the communication and control equipment. Communication towers at pump stations generally would be approximately 33-ft high, but the antenna height at some pump stations may be greater based on final detailed engineering studies. In no event would antennae exceed a maximum height of 190 ft.

The pipe entering and exiting the pump station sites would be below grade. As required by 49 CFR 195.260, there would be an MLV installed on the entry pipe and on the exit pipe to allow isolation of the pump station equipment in the event of an emergency. The manifold connecting the pipeline to the equipment at each pump station would be aboveground and entirely within the pump station boundaries. Inspection and maintenance personnel would access the pump stations through a gate that would be locked when the pump station is unoccupied.

Keystone would use sodium vapor lighting and/or down shielding at pump stations 21 and 22 within American burying beetle (*Nicrophorus americanus*) habitat.[3] A security fence would be installed around the entire pump station site. The pump stations would operate on locally purchased electric power, with diesel-fired emergency generators, and would be fully automated for unmanned operation. Batteries would be used to maintain uninterrupted power to all communication and specific control equipment in the event of a power outage. Keystone has proposed the pump station locations based on hydraulic analyses of the flow in the pipeline and other relevant variables. Figures 2.1.1-3 through 2.1.1-5 show the proposed locations of the pump stations. Table 2.1-7 lists the locations of the pump stations by milepost.

[3] Potential impacts to National Historic Trails and the Wild and Scenic River portion of the Niobrara River are addressed in Section 4.9.3.4, Visual Resources.

Table 2.1-7 Proposed Project Pump Station Locations

State	Pump Station Name	No. of Pumps Proposed	Approximate Milepost
Montana			
Pump Station 09[a]	Phillips	5	1
Pump Station 10	Valley	5	49
Pump Station 11	Fort Peck	5	99
Pump Station 12	Circle	5	152
Pump Station 13	Prairie	4	203
Pump Station 14	Fallon	5	239
South Dakota			
Pump Station 15	Harding	5	289
Pump Station 16	Buffalo	4	337
Pump Station 17	Faith	5	392
Pump Station 18	Haakon	4	445
Pump Station 19	Murdo	5	501
Pump Station 20	Winner	5	551
Pump Station 21	Colome	5	599
Nebraska			
Pump Station 22	O'Neill	5	654[b]
Pump Station 23	Oakdale	5	708[b]
Pump Station 24	Fullerton	5	765[b]
Pump Station 25	Fairmont	5	819[b]
Pump Station 26	Steele City	5	875
Kansas			
Pump Station 27	Riley	4	50
Pump Station 29	Burns	4	145

Source: exp Energy Services, Inc. 2012a

[a] Pump stations 1 through 8 are in Canada.
[b] Proposed siting location.

2.1.4.2 Pigging Facilities

Keystone would use high-resolution internal line inspection, maintenance, and cleaning tools known as *pigs* during operation of the proposed Project. The proposed Project would be designed to allow full pigging of the entire pipeline with minimal interruption of service. Pig launchers and receivers would be constructed and operated completely within the boundaries of the pump stations (see Figure 2.1.4-1).

2.1.4.3 Densitometer Facilities

Densitometer facilities on the pipeline would be equipped with densitometer/viscometer analyzers that measure the density of the product prior to delivery. Keystone proposes to install and operate two densitometers within the permanent ROW of the proposed Project. The location of the densitometers would be on the upstream side of Pump Stations 13 and 14. Densitometer information would be incorporated into quality and custody metering located at all injection points and delivery points.

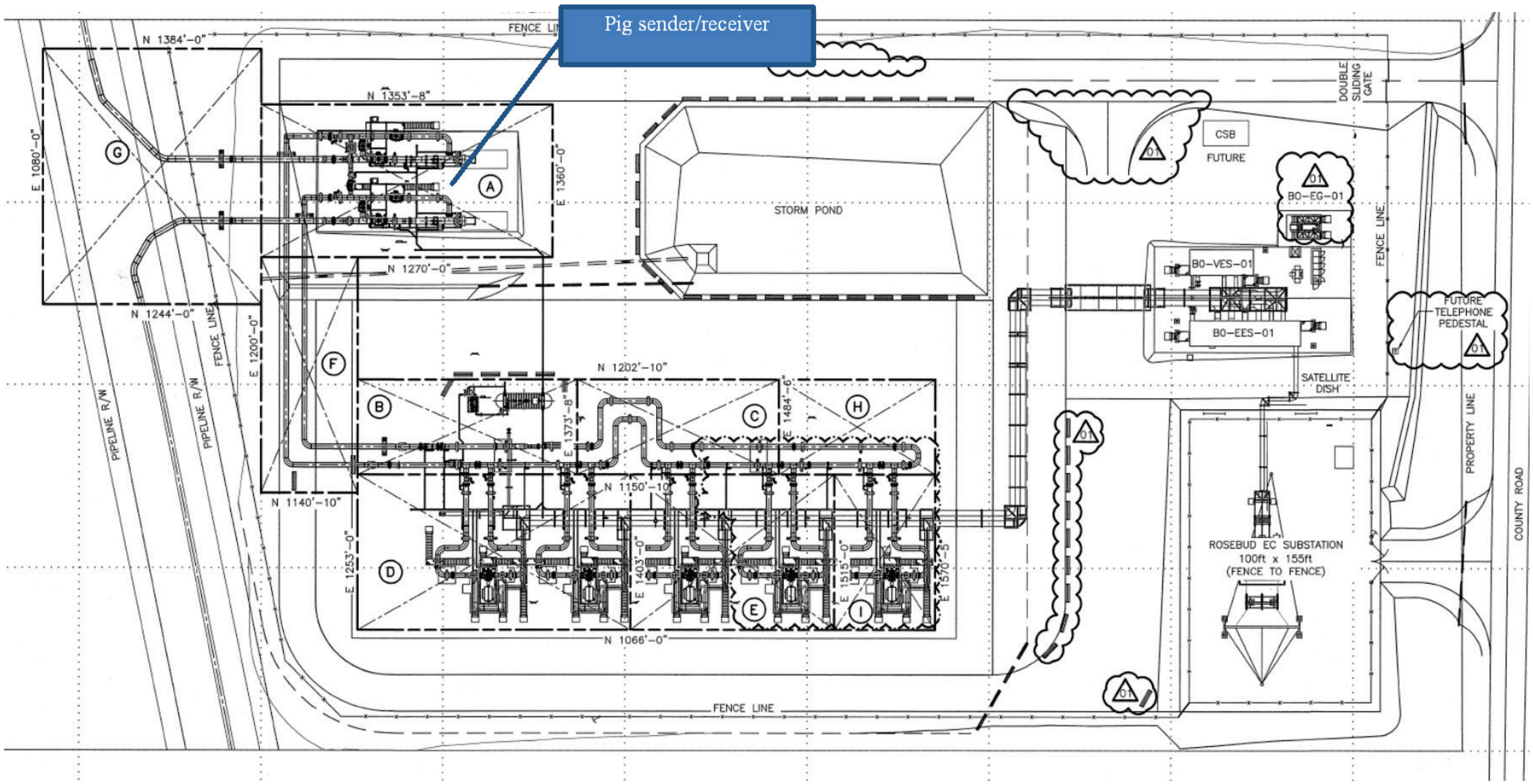


Figure 2.1.4-1 Typical Pump Station with Pigging Facilities

2.1.4.4 Mainline Valves

Keystone would install 55 IMLVs along the proposed route and 1 MLV at each pump station, all of which would be located within the permanent ROW as shown in Table 2.1-8. These IMLVs include both manual and remotely operated mainline block valves as well as check valves.

Table 2.1-8 Intermediate Mainline Valve Locations by State[a]

Type	County	Total MLVs
Montana		**25**
Motor Operated	Phillips	
Check	Valley	
Manual	Valley	
Motor Operated	Valley	
Motor Operated	Valley	
Check	Valley	
Manual	Valley	
Motor Operated	Valley	
Check	Valley	
Manual	Valley	
Motor Operated	Valley	
Check	McCone	
Manual	McCone	
Check	McCone	
Manual	McCone	
Motor Operated	McCone	
Motor Operated	McCone	
Motor Operated	Dawson	
Motor Operated	Dawson	
Motor Operated	Dawson	
Check	Dawson	
Manual	Dawson	
Motor Operated	Fallon	
Motor Operated	Fallon	
Motor Operated	Fallon	
South Dakota		**15**
Motor Operated	Harding	
Check	Harding	
Motor Operated	Harding	
Motor Operated	Harding	
Motor Operated	Perkins	
Motor Operated	Meade	
Motor Operated	Meade	
Motor Operated	Haakon	
Check	Haakon	
Motor Operated	Haakon	
Motor Operated	Haakon	
Motor Operated	Jones	
Motor Operated	Lyman	
Motor Operated	Tripp	
Motor Operated	Tripp	

Type	County	Total MLVs
Nebraska[b]		**4**
Motor Operated	Keya Paha	
Motor Operated	York	
Check	York	
Motor Operated	Jefferson	

Source: exp Energy Services, Inc. 2012a

[a] Acreage for all IMLVs is 0.05.
[b] Nebraska IMLVs include only those on the Final EIS portion of the proposed route. The locations of additional IMLVs on the route modification in Nebraska have yet to be finally determined.

Block valves could block oil flow in both directions and divide up the pipeline into smaller segments that could be isolated to minimize and contain the effects of a line rupture. The block valves could be either manually or remotely operated. Check valves are designed to be held open by flowing oil and to close automatically when oil flow stops or is reversed. Each IMLV would be within a fenced site that would be approximately 40 ft by 50 ft. Inspection and maintenance personnel would access the IMLVs through a gate that would be locked when the IMLV site is unoccupied.

Keystone has located remotely-operated IMLVs at major river crossings, upstream of sensitive waterbodies, at each pump station, and at other locations in response to USEPA suggestions and as required by 49 CFR 195.260, and agreed to in Pipeline Hazardous Material Safety Administration (PHMSA) Special Condition 32 (see Appendix B, Potential Releases and Pipeline Safety). See Sections 4.3, Water Resources, and Section 4.4, Wetlands, for details on potential project impacts at major river crossings and other sensitive areas.

Keystone would be able to operate the valves remotely to isolate a section of pipeline in the event of an emergency to minimize environmental impacts if an accidental leak occurs. MLVs must be capable of closure at all times. Special Condition 32 also requires that the remotely operated valves have remote power backup to ensure communications are maintained during inclement weather. Each motor-operated valve station would include a diesel-fired emergency generator and a 132-gallon diesel fuel tank with secondary containment.

Due to public and agency concerns over sensitive environmental resources, the U.S. Department of State (the Department) in consultation with PHMSA and USEPA determined that Keystone should commission an engineering analysis by an independent consultant that would review the proposed Project risk assessment and proposed valve placement. Additional information on this engineering analysis and potential releases is provided in Section 4.13, Potential Releases.

2.1.5 Ancillary Facilities

2.1.5.1 Additional Temporary Workspace Areas

TWAs would be needed for short durations for some construction staging areas and where special construction techniques are to be used. These areas may include river, wetland, and road/rail crossings; horizontal directional drill (HDD) entry and exit points; steep slopes (>20 percent); and rocky soils. The setback distances of TWAs adjacent to wetland and waterbody features would be established on a site-specific basis, consistent with applicable permit requirements and the appropriate procedures listed in the CMRP (see Appendix G).The dimensions and acreages of typical additional TWAs are listed in Table 2.1-9.

Table 2.1-9 Dimensions and Acreage of Typical Additional Temporary Workspace Areas

Crossing Type	Dimensions of Workspace (length by width in ft at each side of feature crossed)	Acreage of Workspace[a]
Waterbody crossing using HDD	250 x 150, as well as the length of the drill plus 150 x 150 on exit side	1.4
Waterbody crossing ≥ 50-ft wide	300 x 100[b]	0.7
Waterbody crossing < 50-ft wide	150 x 25 on working and spoil sides or 150 x 50 on working side only	0.2
Bored highways and railroads	175 x 25 on working and spoil sides or 175 x 50 on working side only	0.2
Open-cut or bored county or private roads	125 x 25 on working and spoil sides or 125 x 50 on working side only	0.1
Foreign pipeline/utility/other buried feature crossings[c]	125 x 50	0.1
Push-pull wetland crossings	50 ft x length of wetland	Varies
Construction spread mobilization and demobilization	470 x 470	5.1
Stringing truck turnaround areas	200 x 80	0.4

[a] Total for each feature.
[b] At each end of crossing.
[c] Pipeline/utility/other buried features owned/operated by entities other than Keystone

2.1.5.2 Pipe Yards and Contractor Yards

Pipe yards, railroad sidings, and contractor yards would be needed for on-site storage of materials to support an efficient construction process and to reduce time and energy required for transport of materials when construction is in progress. Keystone estimated that 40 pipe yards and 19 contractor yards would be required for the proposed Project (the exact numbers and locations of these facilities required in Nebraska have not yet been determined). Table 2.1-10 provides the locations and acreages of potential pipe yards and contractor yards. Existing public or private roads would be used to access the yards. Pipe yards and contractor yards would be used on a temporary basis and would be reclaimed, as appropriate, upon completion of construction.

Pipe yards would be required at 30- to 80-mile intervals, and contractor yards would be required at approximately 60-mile intervals. Each pipe yard would occupy approximately 30 to 40 acres and would typically be located close to railroad sidings and as close to the proposed route as possible. Typical rail sidings would be 20 acres in size and be at existing rail siding locations. Keystone would not be building any new rail sidings. Keystone would select existing commercial/industrial sites, or sites that were used for construction of other projects, as preferred sites for the pipe yards.

Contractor yards would occupy approximately 30 acres. Suitable sites would need to be level, without structures, and not forested, and also would need to have a minimum of two safe ingress/egress points on all-weather county roads rather than busier state highways for safety reasons. Keystone would comply with all federal, state, and local requirements prior to construction. Where practicable, Keystone would seek out sites that have been previously disturbed. Keystone would work with landowners to obtain a temporary easement for use during the period of construction.

Table 2.1-10 Locations and Acreages of Proposed Pipe Yards, Railroad Sidings, and Contractor Yards

State	County	Type(s) of Yards	Number of Yards	Combined Acreage
Montana	Dawson, McCone, Valley, Fallon	Contractor Yards	5	161.3
	Roosevelt, Sheridan, Prairie	Rail Sidings	3	60.0
	Phillips, Dawson, McCone, Valley, Fallon	Pipe Yards	9	355.9
South Dakota	Tripp, Haakon, Jones	Contractor Yards	7	258.6
	Hughes, Lyman, Pennington	Rail Sidings	3	60.0
	Tripp, Haakon, Jones	Pipe Yard	11	345.6
North Dakota	Bowman	Pipe Yard	1	56.1
Nebraska	TBD	Contractor Yards	TBD	TBD
	TBD	Rail Sidings	TBD	TBD
	TBD	Pipe Yards	TBD	TBD

Source: exp Energy Services, Inc. 2012a

TBD = to be determined

2.1.5.3 Fuel Transfer Stations

Fuel storage sites would be established at approved contractor yards and pipe yards. No other fuel stations would be constructed. Gasoline and diesel fuel would be transported daily by fuel trucks from the fuel transfer station to the construction area for equipment fueling. The total fuel storage capacity would vary from yard to yard, depending on daily fuel requirements. Typically, a 2- to 3-day supply of fuel would be maintained in storage, resulting in a maximum volume of approximately 30,000 gallons of fuel at each storage location. Each fuel storage system would consist of the following:

- Temporary, aboveground, 10,000-gallon skid-mounted tanks and/or 9,500-gallon fuel trailers;
- Rigid steel piping;
- Valves and fittings;
- Dispensing pumps; and
- Secondary containment structures.

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. The proposed Project Spill Prevention, Control, and Countermeasure (SPCC) Plan (see Appendix I) and the CMRP (see Appendix G) specify that secondary containment would be utilized for fuel storage facilities that are not monitored or attended on a full-time basis. Similar to automotive service stations, there would not be secondary containment facilities for fuel trucks that would be transferring fuel to/from the bulk storage tanks, as these would be attended during all fuel transfer operations. As stated in the SPCC Plan, adequate spill cleanup materials and equipment would be available onsite.

Before receiving or off-loading fuel, all trucks and equipment would be grounded to eliminate static electricity potential. The distributor would connect a petroleum-rated hose from the delivery tanker to the fill line at the storage facility. The connection between the delivery tanker and the fill line would consist of a cam-loc connection followed by a block valve, rigid steel piping, tank block valve(s), and check valve(s) just upstream of the connection to the tank. Off-loading of fuel would be accomplished by a transfer pump powered by the delivery vehicles. The transfer pump would be a dispensing pump with petroleum-rated hoses with automatic shut-off nozzles. There would be no use of Stage II vapor recovery nozzles for fuel transfer on the proposed Project. The Stage II requirements contained in the 1990 Clean Air Act Amendments pertain only to ozone nonattainment areas. The proposed Project is not located in an ozone nonattainment area (USEPA 1991). The fuel transfer pump would have an emergency shut-off at the pump and a secondary emergency shut-off at least 100 ft away.

Vehicle maintenance would be performed at the contractor yards or at existing vehicle maintenance and repair shops. As specified in Keystone's CMRP Section 3.0, Spill Prevention and Containment, during vehicle maintenance at the contractor yards, mechanics would place absorbent materials or drip pans under the equipment to prevent petroleum, oil, or other liquids from reaching the ground. In the event that small quantities of soil become contaminated, contractor personnel would recover and place the contaminated soil in 55-gallon drums. This material would ultimately be disposed in accordance with state and federal regulations. All waste from maintenance activities would be disposed of in accordance with all applicable regulations and permits.

2.1.5.4 Construction Camps

Some areas within Montana, South Dakota, and Nebraska do not have sufficient temporary housing in the vicinity of the proposed route for all construction personnel working in those areas. Temporary work camps would be constructed to meet the housing needs of the construction workforce in these remote locations. A total of eight temporary construction camps would be established. It is currently anticipated that four construction camps would be needed in Montana (McCone, Valley [two], and Fallon counties), three camps would be required in South Dakota (Tripp, Harding, and Meade counties), and one camp would be required in Nebraska (Holt county). Figure 2.1.5-1 shows the anticipated location of six of the eight camps. The locations of two camps are unknown at this time (one in Montana and one in Nebraska). The final number and size of camps would be determined based on the time available to complete construction and to meet Keystone's commercial commitments. All construction camps would be permitted, constructed, and operated consistent with applicable county, state, and federal regulations. The relevant regulations that would have to be complied with and the permits required for the construction camps are presented in Table 2.1-11.

Table 2.1-11 Construction Camp Permits and Regulations

State	Permit or Approval	Agency[b]	Submitted by
Montana	Water Main Certified Checklist	MDEQ	Keystone
	Sewer Main Certified Checklist	MDEQ	Keystone
	NOI and SWPPP	MDEQ	Keystone
	Building Permits	MBCB	Camp Contractor
	Driveway Approach Permit	MDT	Camp Contractor
	Ingress/Egress Permit	Local	Camp Contractor
	Work Camp Establishment Plan Review	DPHHS	Camp Contractor
South Dakota	Application for Permit to Discharge Wastewater	DENR	Keystone
	Notice of Intent	DENR	Keystone
	SWPPP	DENR	Keystone
	Temporary Permit to Use Public Waters	DENR	Keystone
	Ingress/Egress Permit	Local	Camp Contractor
	Food License Application	DOH	Camp Contractor
	Application for Highway Access Permit	SD DOT	Keystone
Nebraska	Public Water Supply & Distribution System[a]	NDEQ	Keystone
	Wastewater Collection & Treatment System[a]	NDEQ	Keystone
	NOI and SWPPP	NDEQ	Keystone
	Food License Application	NDHHS	Camp Contractor
	Building Permits	Local	Camp Contractor
	Ingress/Egress Permit	Local	Camp Contractor
	State Fire Marshal	NE SFM	Camp Contractor

Source: exp Energy Services, Inc. 2012a

[a] Submittal for approval requires the submission of a design report, plans, and specifications certified by a professional engineer.
[b] MDEQ = Montana Department of Environmental Quality, MBCB = Montana Building Code Bureau; MDT = Montana Department of Transportation, DPHHS = Department of Public Health and Human Services; SD DOT = South Dakota Department of Transportation; NDEQ = Nebraska Department of Environmental Quality; NDHHS = Nebraska Department of Health and Human Services; NE SFM = Nebraska State Fire Marshal; SDDENR = South Dakota Department of Environment and Natural Resources; DOH = Department of Health.

Design of Camps

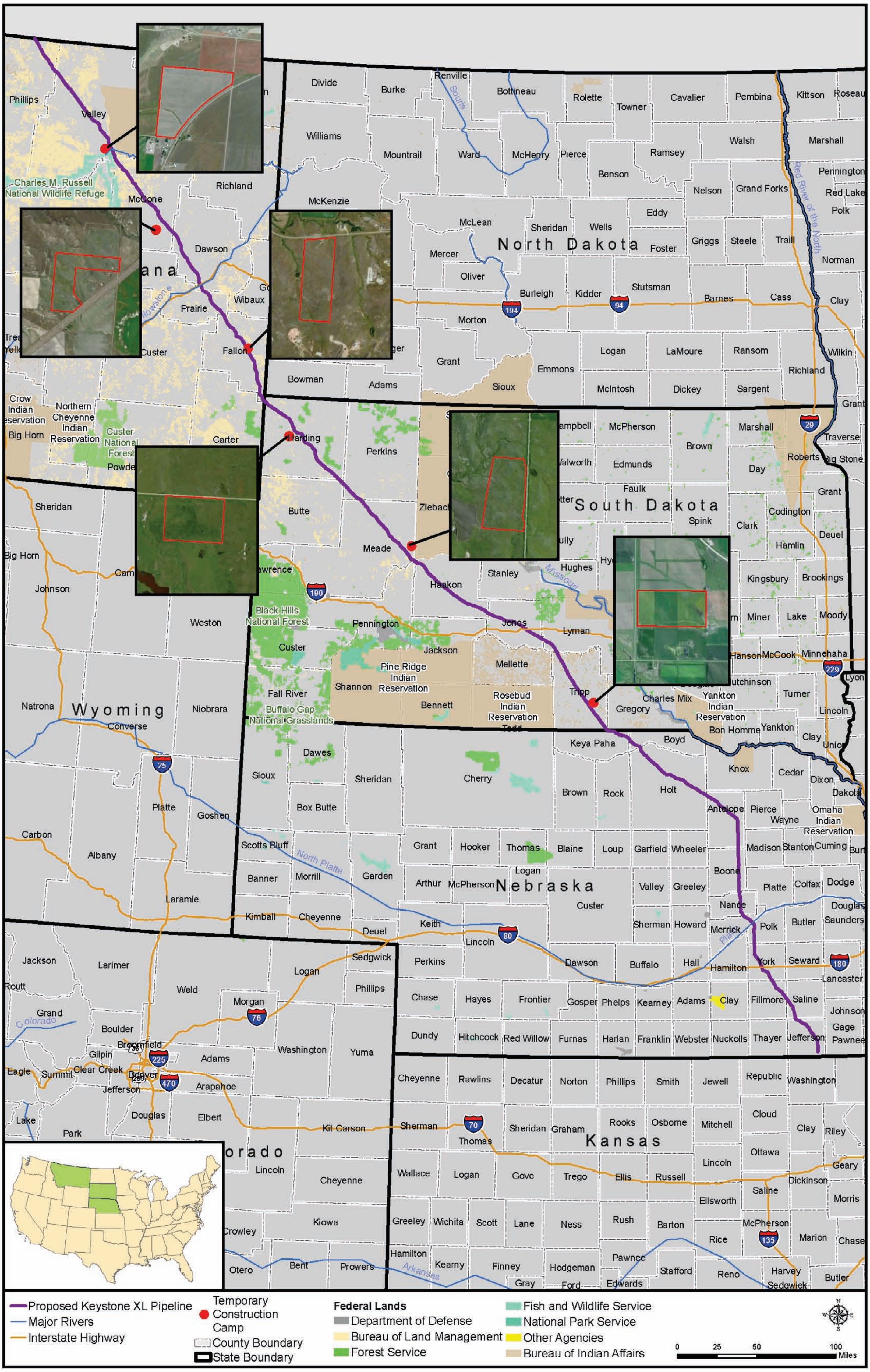
Each construction camp site would be established on an approximately 80-acre site (the sites could range from 50 acres up to 100 acres with the inclusion of a contractor yard). Of that area, 30 acres would be used as a contractor yard, and approximately 50 acres would be used for housing and administration facilities. The camps would be constructed using modular units and would provide the required infrastructure and systems necessary for complete food service, housing and personal needs. Personal needs 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 address first aid needs and to provide routine minor medical services for the workers and staff. The contractor managing the camps would be responsible to comply with federal, state, and local laws on medical waste disposal. There would also be dedicated medical transport vehicles for both the camp sites and for the construction ROW.

The camps' housing facilities would consist of modular, dormitory-like units that house roughly 28 occupants per unit. The units would have heating and air conditioning systems. The camps would be set up with the housing areas clustered together, with both shared and private wash rooms.

Each camp would contain 600 beds and 300 recreational vehicle spots. Keystone conservatively intends to permit each camp for 1,000 residents to allow for those instances where there may be more than 1 person in a recreational vehicle. Potable water would be provided by drilling a well where feasible and allowed. If Keystone cannot get a permit from the state to install a water well, water would be hauled to the camp from the nearest permitted municipal supply, as discussed below.

If an adequate supply cannot be obtained from a well, water would be obtained from municipal sources or trucked to each camp. Siting of the camps near existing municipal water sources would be a key consideration in locations currently experiencing water restrictions or drought conditions. A self-contained wastewater treatment facility would be included in each camp except where it is practicable to use a licensed and permitted publicly owned treatment works. Wastewater treated on site would undergo primary, secondary, and tertiary treatment consisting of solids removal, bioreactor treatment, membrane filtration, and ultraviolet exposure. Final effluent discharge would be consistent with all applicable regulatory requirements. If a publicly owned treatment works is used, Keystone would either pipe or truck wastewater to the treatment facility.

Electricity for the camps would be provided by local utilities from an interconnection to their distribution system. Diesel-fired generators would be used for emergency backup power, with one 400-kilowatt backup emergency generator engine per camp operating for a total of 500 hours (includes hours for normal routine maintenance operations and additional hours factored in for unplanned power interruption events). Keystone would contract with a camp supplier that would provide security 24 hours per day, 7 days per week at each camp. Keystone would work with the supplier to ensure that as many local employees are hired as possible to staff the camps.



Source: Esri 2013, exp Energy Services, Inc. 2012b

Figure 2.1.5-1 Proposed Temporary Construction Camps

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Use of Camps

The camps are planned to service the needs of the proposed Project workforce. As a result, the dormitories do not include facilities for families. Most of the workers would be transported to and from the ROW each day by buses. In addition, there would be individual crews and workers that, due to the nature of their work, would be transported to and from job sites by utility trucks or by welding rigs. There would also be support workers such as mechanics, parts and supply staff, and supervisory personnel that would drive to the ROW in separate vehicles.

Depending upon the final construction schedule, the camps would be operated in standby mode for the winter, decommissioned, or moved. Each camp would have sufficient staff to operate and secure the camp and associated systems during that time period.

Decommissioning of Camps

Decommissioning would be accomplished in two stages. First, all infrastructure systems would be removed and either hauled away for reuse, recycled, or disposed of in accordance with regulatory requirements. Each site would then be restored and reclaimed in accordance with permit requirements and the applicable procedures described in Keystone's CMRP (see Appendix G).

2.1.6 Access Roads

2.1.6.1 Development of Access Roads

Existing public and private roads would be used to provide access to most of the construction ROW. Paved roads would not likely require improvement or maintenance prior to or during construction. However, the road infrastructure would be inspected prior to construction to ensure that the roads, bridges, and cattle guards would be able to withstand oversized vehicle use during construction. Gravel roads and dirt roads may require maintenance during the construction period due to high use. Road improvements such as grading and filling would generally be restricted to the existing road footprint; however, some roads may require widening in some areas.

To the extent Keystone is required to conduct maintenance of any county roads, it would be done pursuant to an agreement with the applicable county. In the event that oversized or overweight loads would be needed to transport construction materials to the proposed Project work sites, Keystone would submit required permit applications to the appropriate state regulatory agencies.

Approximately 150 temporary access roads would be needed to provide adequate access to the construction sites. Private roads and any new temporary access roads would be used and maintained only with permission of the landowner or the appropriate land management agency. There are currently 48 access roads (private roads) along the Nebraska portion of the proposed route, but additional access roads may be needed. Keystone would also construct short, permanent, access roads from public roads to the pump stations, delivery facilities, and IMLVs. Approximately 21 and 18 permanent access roads would be needed in Montana and South Dakota, respectively. The number of permanent access roads in Nebraska is still to be determined.

The final locations of new, permanent, access roads would be determined prior to construction. At a minimum, construction of new permanent access roads would require completion of cultural resources and biological surveys and consultations and approvals of the appropriate State Historic Preservation Office and U.S. Fish and Wildlife Service office. Keystone would comply with all federal, state, and local requirements prior to construction. Maintenance of newly created access roads would be the responsibility of Keystone as described below.

The acreages of access roads are included in the listing of lands affected in Table 2.1-6. Access road temporary and permanent disturbance estimates are based on the 30-foot roadway width required to accommodate oversized vehicles. In developing the acreages of disturbance, all non-public roads were conservatively estimated to require upgrades and maintenance during construction.

2.1.6.2 Roadway Maintenance, Repair, and Safety

Keystone would work with state and local road officials, the pipeline construction contractor, and a third-party road consultant to identify routes to be used for moving materials and equipment between storage and work yards to the pipeline, valve, and pump station construction sites. When these routes are mutually agreed upon, the road consultant would document the existing conditions of roads, including a video record. When construction is completed, the same parties would review the road conditions and Keystone would restore the roads to their preconstruction condition or better, as determined by the appropriate road officials. Keystone would pay for this restoration.

Keystone would also perform a preliminary evaluation to determine the design-rated capacity of bridges anticipated to be used during construction and would inspect all bridges it intends to use prior to construction and confirm that the capacity of the bridges is adequate for the anticipated weights. An alternate route would be used where the bridges are not adequate to handle the maximum weight. Keystone would also inspect cattle guard crossings prior to their use. If they are determined to be inadequate to handle anticipated construction traffic, Keystone may place mats on crossings, establish an alternate crossing, enhance existing structures, or install new infrastructure with the landowner’s approval, dependent upon specific conditions. Keystone would pay for all such actions.

During construction, Keystone and the pipeline contractor would maintain roads used for construction in a condition that is safe for both the public and workforce. Local road officials would be actively engaged in the routine assessment of road conditions.

Keystone would follow all federal, state, and local safety plans and signage as set forth in the various applicable Manuals of Uniform Traffic Control issued by federal, state, or local agencies for streets and highways along the proposed route. This would include compliance with all state and local permits pertaining to road and crossing infrastructure usage.

Keystone would require that each construction contractor submit a road-use plan prior to mobilization, coordinate with the appropriate state and county representatives to develop a mutually acceptable plan, and obtain all necessary road use permits. The road-use plans would identify potential scenarios that may occur during construction based on surrounding land use, known recreational activities, and seasonal influences (such as farming), and would establish measures to reduce or avoid effects to local communities. Keystone would also have inspection personnel monitor road-use activities to ensure that the construction contractors comply with the road-use plans and stipulations of the road.

Some counties in Montana stipulate that a private individual conducting maintenance of a county road becomes liable for the safety of traffic on the road. Where this is required, Keystone has stated it would be done pursuant to an agreement with the applicable county, and such agreements would address potential liability, including appropriate indemnity and insurance provisions. Keystone has the necessary insurance coverage to address such potential liability.

2.1.7 Pipeline System Design and Construction Procedures

Public concern has been expressed about the safety of the proposed Project, the use of industry standards in the design of the proposed Project, and the inspection and monitoring procedures that would be conducted. Prior to construction, Keystone would select, 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 construction. Nebraska, South Dakota, and Montana have laid out specific requirements for this role under their statutes or regulatory processes (NDEQ would assign a public liaison officer and comply with Nebraska Legislative Bill 1161 and Nebraska Revived Statute 57-1501; South Dakota would issue a Public Utilities Commission Permit; and Montana would issue a Major Facility Siting Act Certificate, respectively).

The U.S. Department of Transportation's (USDOT) PHMSA is responsible for protecting the American public and the environment by ensuring the safe and secure movement of hazardous materials to industry and consumers by all transportation modes, including the nation's pipelines. Through PHMSA, USDOT develops and enforces regulations for the safe, reliable, and environmentally sound operation of the nation's 2.3-million-mile pipeline transportation system and the nearly 1 million daily shipments of hazardous materials by land, sea, and air. Within PHMSA, the Office of Pipeline Safety has the safety authority for the nation's natural gas and hazardous liquid pipelines. The proposed Project is included in the latter category.

Keystone would be required to construct, operate, maintain, inspect, and monitor the proposed Project consistent with the PHMSA requirements presented 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. The regulations are designed to prevent crude oil pipeline incidents[4] and to ensure adequate protection for the public. In particular, pipelines that carry gasoline, diesel fuel, crude oil, or other hazardous liquids must implement additional safety measures if they cross a particularly sensitive area such as the source for a municipal drinking water supply.

Additionally, Keystone would comply with a set of Special Conditions developed by PHMSA for the proposed Project (see Appendix B, Potential Releases and Pipeline Safety). These Special Conditions cover four general categories of project activities:

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

- Material requirements;
- Construction requirements;
- Operations and maintenance; and
- Reporting, records retention, and senior-level certification requirements.

The regulations are designed to help prevent crude oil pipeline incidents and to help ensure adequate protection for the public. Section 2.1.7.1, Pipeline Design, presents the major pipeline design considerations of the proposed Project. Nearly all petroleum pipelines in the United States are buried, and Keystone has also proposed to bury the proposed Project pipeline. In comparison to an aboveground pipeline, burying a pipeline reduces the potential for pipeline damage due to vandalism, sabotage, and the effects of other outside forces, such as vehicle collisions. In addition, the above-referenced Special Conditions provide more stringent requirements for many of these design factors.

Keystone prepared a draft CMRP, which is included in Appendix G. That plan describes the construction methods and environmental protection measures that Keystone committed to in order to reduce the potential construction impacts of the proposed Project. The CMRP includes specific techniques or mitigation measures to address sensitive areas such as highly erodible soils, shallow groundwater, and other conditions. If the proposed Project is issued a Presidential Permit, the CMRP would be updated after the Record of Decision is issued to reflect any additional conditions included in the Record of Decision and in other permits issued to Keystone, and to reflect state and local construction considerations.

Prior to pipeline construction, Keystone would prepare an SPCC Plan to avoid or minimize the potential for harmful spills and leaks during construction. A template version of the SPCC Plan submitted by Keystone is included in Appendix I. The intent is that the SPCC Plan will serve as a template for construction contractors, and will be completed with site-specific information prior to construction.

In addition, Keystone would submit a Pipeline Spill Response Plan (PSRP) to PHMSA prior to the initiation of proposed Project operations in accordance with the requirements of 49 CFR 194. The PSRP would describe how spills would be responded to in the event of a leak from the proposed Project resulting from any cause as well as the maximum spill scenario and the procedures that would be in place to deal with the maximum spill. As required by 49 CFR 195.402, Keystone would also prepare and follow a manual of written procedures for conducting normal operations and maintenance activities and handling abnormal operations and emergencies that would include Keystone's Emergency Response Plan (ERP). The PSRP and the ERP are addressed in Section 4.13, Potential Releases. The remainder of this section provides information on the following topics:

- Pipeline Design (Section 2.1.7.1);
- Pipeline Construction Procedures (Section 2.1.7.2); and
- Aboveground and Ancillary Facilities Construction Procedures (Section 2.1.7.3).

Special Pipeline Construction Procedures are provided in Section 2.1.8; Section 2.1.9 provides information on Waterbody Crossings.

2.1.7.1 Pipeline Design

All pipe used for the proposed Project would be required to be in compliance with the pipe design requirements of 49 CFR 195, Subpart C (Design Requirements) and 49 CFR 195.106 (Internal Design Pressure), and the PHMSA Special Conditions. The pipeline would be constructed of high-strength, X70M steel pipe that would be mill-inspected by an authorized owner's inspector and mill-tested to American Petroleum Institute (API) 5L 44th edition[5] specification requirements. If shipped by rail, the shipment would be made in accordance with the API Recommended Practice 5Ll specification latest edition; if shipped by barge or marine transport, the shipment would be in accordance with API Recommended Practice 5LW. Additional details on pipeline safety and project design are presented in the following sections and in Section 4.13, Potential Releases.

The design parameters for steel pipe would be determined in accordance with the following equation (see 49 CFR 195.106—Internal Design Pressure):

$$P=(2*S*t/D)*E*F$$

Where:[6]

P=Internal design pressure in per square inch (kilopascal [kPa])[7] gage

S=Yield strength in pounds per square inch (kPa)

D=Nominal outside diameter of the pipe in inches (millimeter)

t=Nominal wall thickness of the pipe in inches (millimeter)

F=Design factor

E=Seam joint factor

The design factor (F) would be determined as a result of conditions or a combination of conditions such as crossings, fabrications, station piping, and special areas. The design factor of 0.72 would be used for the main line in all areas where normal installation methods and cross country conditions prevail with exceptions to areas as stipulated in PHMSA Special Condition 14 such as pump station and IMLV facilities. A special permit would be required from PHMSA if the pipeline were to operate using a higher design factor. Line pipe for the proposed Project would be double submerged arc welded in accordance with API 5L Steel Pipe, 44th Edition (TC 2012). Key design parameters applicable to the proposed Project pipeline are listed in Table 2.1-12.

[5] The API 5L test standard is used to determine the fracture ductility of metal line pipe. Specimens are cut from sections of pipe, soaked at a prescribed temperature, and tested within 10 seconds.
[6] Units given for both U.S. customary and metric systems.
[7] A common multiple unit of the pascal (1 kPa = 1,000 Pa).

Table 2.1-12 Pipe Design Parameters and Specification

Pipe Design Parameters	Specification
Material code	API 5L-PSL2-44th Edition
Material grade thousand pounds of pressure per square inch (yield strength)[a]	Grade X70M
Maximum pump station discharge	1,308 pounds per square inch gauge (psig)
Maximum Operating Pressure	1,308psig; 1,600 psig[a]
Minimum hydrostatic test pressure	In conformance with Special Conditions 8 and 22, the pipe must be subjected to a mill hydrostatic test pressure of 95% SMYS[b] or greater for 10 seconds and the pre-in service hydrostatic test must be to a pressure producing a hoop stress of a minimum 100% SMYS for mainline pipe and 1.39 times maximum operating pressure for pump stations for 8 continuous hours. The hydrostatic test results from each test must be submitted in electronic format to the applicable PHMSA Director(s) in PHMSA Central.
Joint length (ft)	Maximum 80 ft
Field production welding processes	Mechanized—gas metal arc welding; manual-shielded metal arc welding.
Pipeline design code	49 CFR Part 195
Outside diameter	36 inches
Line pipe wall thickness ()	0.72 design factor as per 49 CFR 195.106
Standard wall thickness – mainline Heavy wall thickness—High Consequence Areas (HCAs) including: high population areas, other populated areas, unusually sensitive areas (including drinking water source and ecologically sensitive areas), MLV sites, and pump station sites.	0.465 inch 0.515 inch
Heavy wall thickness—directly downstream of pump stations at lower elevations as determined by steady state and transient hydraulic analysis[a]	0.572 inch
Heavy wall thickness—uncased road and cased railway crossings	0.618 inch
Heavy wall thickness—uncased railway crossings, HDDs[a]	0.748 inch

Source: TC 2012

[a] The design of the proposed Project pipeline system is based on a maximum 1,308 pounds per square inch gauge (psig) discharge pressure at each pump station. The pump station discharge pressure would be a maximum of 1,308 psig. There would be situations where, due to elevation changes, the hydraulic head created would result in a maximum operating pressure of up to and including 1,600 psig. Suction pressure at the pump stations is generally on the order of 200 psig.
[b] SMYS = specified minimum yield strength.

Keystone has stated that 93 percent of the pipe for the U.S. portion of the proposed Project would be purchased from North American pipe manufacturing facilities and that regardless of the country of origin, it would purchase pipe only from qualified pipe suppliers and trading houses. Qualification includes comprehensive evaluations of manufacturing facilities, extensive technical discussions with the lead quality control and metallurgy personnel, and a clear demonstration that the mills could meet the requirements to produce and test pipe in accordance with Keystone's standards and specifications.[8]

To protect against corrosion, an external coating (fusion-bonded epoxy [FBE]) would be applied to the pipeline and all buried facilities, and cathodic protection (CP) would be applied to the pipeline by impressed current. These measures would be provided in compliance with 49 CFR 195, Subpart H (Corrosion Control) and the requirements of 14 of the PHMSA Special Conditions (see Appendix B, Potential Releases and Pipeline Safety). CP is a technique used to control the corrosion of a metal surface. The simplest method to apply CP is by connecting the metal to be protected with a piece of another more easily corroded *sacrificial metal* to act as the anode of the electrochemical cell. The sacrificial metal then corrodes instead of the protected metal. CP systems are used to protect a wide range of metallic structures in various environments, from fuel pipelines to home water heaters. In the usual application, a galvanic anode (a piece of a more electrochemically *active* metal) is attached to the vulnerable metal surface where it is exposed to the corrosive liquid. Galvanic anodes are designed and selected to have a more *active* voltage (more negative electrochemical potential) than the metal of the target structure (typically steel).

Pipelines are routinely protected by a coating supplemented with CP. A CP system for a pipeline would consist of a direct current (DC) power source, which is often an alternating current powered rectifier and an anode, or array of anodes, buried in the ground (the anode groundbed). A rectifier is an electrical device that converts alternating current, which periodically reverses direction, to DC, which flows in only one direction. The process is known as rectification. Rectifiers are often found serving as components of DC power supplies and high-voltage DC power transmission systems. The primary impressed current (i.e., direct current supplied by an external power source) CP systems would be rectifiers coupled to semi-deep vertical anode beds at each pump station, as well as rectifiers coupled to deep-well anode beds at selected IMLV sites. 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 ft apart with a bottom hole depth of approximately 45 ft. The deep-well anode bed would be a single 12-inch-diameter vertical hole with a bottom hole depth of approximately 300 ft.

[8] Keystone would use TransCanada Pipelines' pipe specifications for the proposed Project where those specifications exceed federal regulations and the PHMSA Special Conditions.

2.1.7.2 Pipeline Construction Procedures

Keystone is a limited partnership, organized under the laws of the State of Delaware. Keystone is the entity that would be responsible for construction of the pipeline if approved. To construct, operate, and maintain the proposed Project, Keystone would need the rights to easements along the entire proposed route. Keystone is responsible for acquiring easement rights from landowners along the route in each state. Easement agreements would list the conditions that both the landowner and Keystone agree to, 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 non-renewable or other resources, and restoration of any unavoidable damage to personal property during construction. The Department expects Keystone to negotiate fairly, honestly, and respectfully with landowners when they negotiate an easement. However, those negotiations and final agreements are private business concerns between the landowners and Keystone.

If Keystone obtains all necessary permits and approvals and an easement negotiation cannot be completed in a manner suitable to both parties, Keystone will use state eminent domain laws to obtain easements needed for pipeline construction, maintenance, and operation. State laws dictate under what circumstances eminent domain may be used and define the eminent domain process within the state. The level of compensation would be determined according to applicable state law. State or local trespass and access laws are applicable along the entire route and therefore along each easement negotiated by Keystone and the landowner or obtained by Keystone through the eminent domain process. The Department has no legal authority over negotiating easement agreements and has no legal status to enforce the conditions of an easement agreement. A landowner who considers Keystone to be out of compliance with an easement agreement would need to discuss the matter with Keystone or local law enforcement officials, or initiate legal consultation.

Once engineering surveys of the ROW centerline and additional TWAs have been finalized, and the acquisition of ROW easements and any necessary acquisitions of property-in-fee have been completed, construction would begin. As proposed, the pipeline would be constructed in 10 spreads (or sequences) of approximately 46 to 122 miles long (see Table 2.1-13). Final spread configurations and the final construction schedule may result in the use of more or fewer spreads than those listed in Table 2.1-13. Figure 2.1.7-1 depicts the approximate location of each spread.

Table 2.1-13 Pipeline Construction Spreads Associated with the Proposed Project

State	Approximate Miles by State	County	Spread Number	Approximate Location (Milepost)	Approximate Length of Construction Spread (Miles)
Montana	285	Phillips, Valley	Spread 1	0-90	90
		Valley, McCone	Spread 2	90-152	61.5
		McCone, Dawson	Spread 3	152-198	46.2
		Dawson, Prairie, Fallon	Spread 4	198-289	91
South Dakota	316	Harding			
		Harding, Butte, Perkins, Meade	Spread 5	289-411	122.1
		Meade, Pennington	Spread 6	411-500	89.7
		Haakon, Jones			
		Jones, Lyman, Tripp	Spread 7	500-599	98.4
		Tripp	Spread 8	599-692	92.9
Nebraska	274	Keya Paha, Boyd, Holt, Antelope			
		Antelope, Boone, Nance, Merrick, Polk	Spread 9	692-776	83.9
		Polk, York, Fillmore, Saline, Jefferson	Spread 10	776-875	99.7

Source: exp Energy Services, Inc. 2012a

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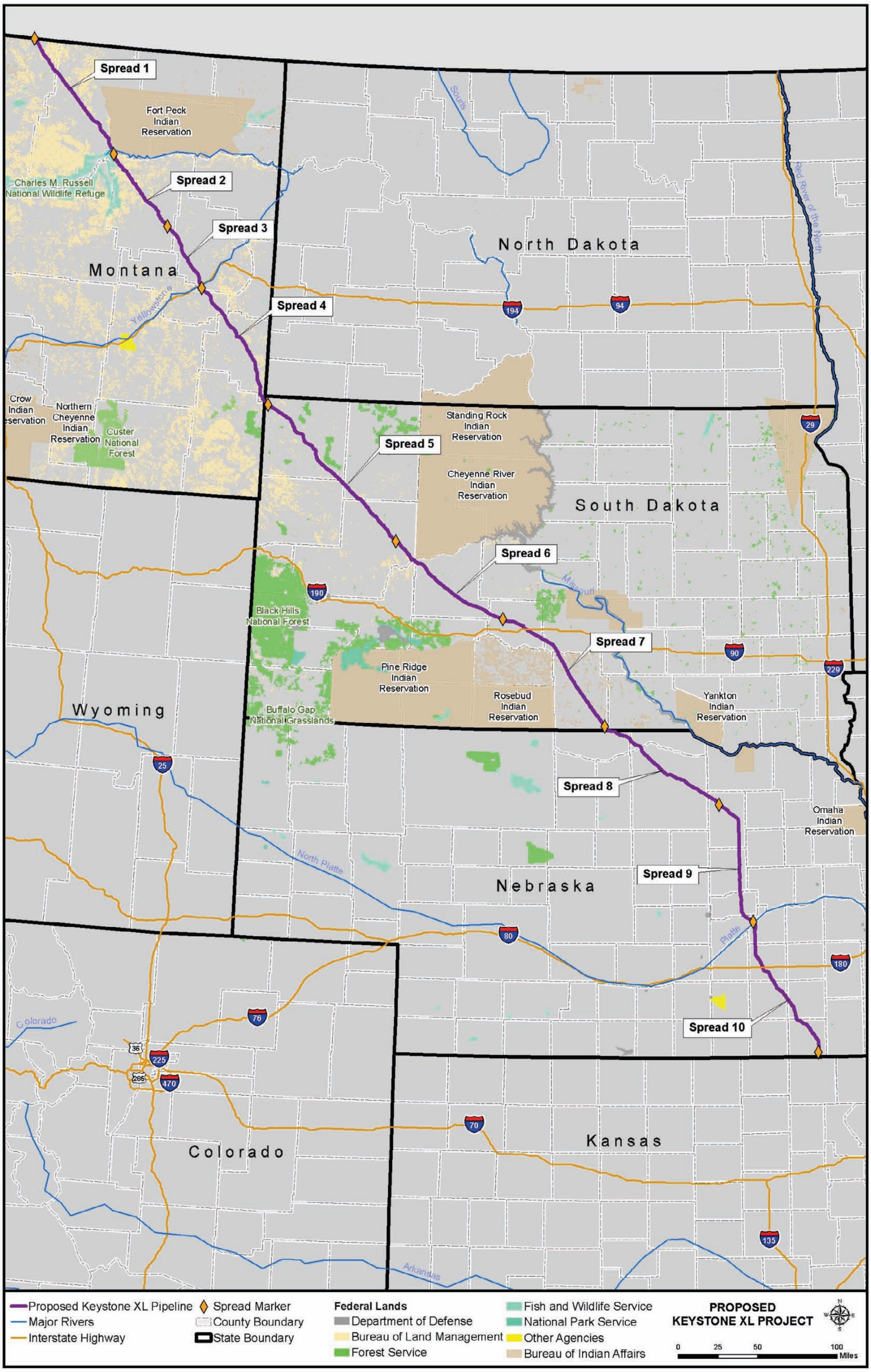

Source: Esri 2013, exp Energy Services, Inc. 2012b

Figure 2.1.7-1 Construction Spreads

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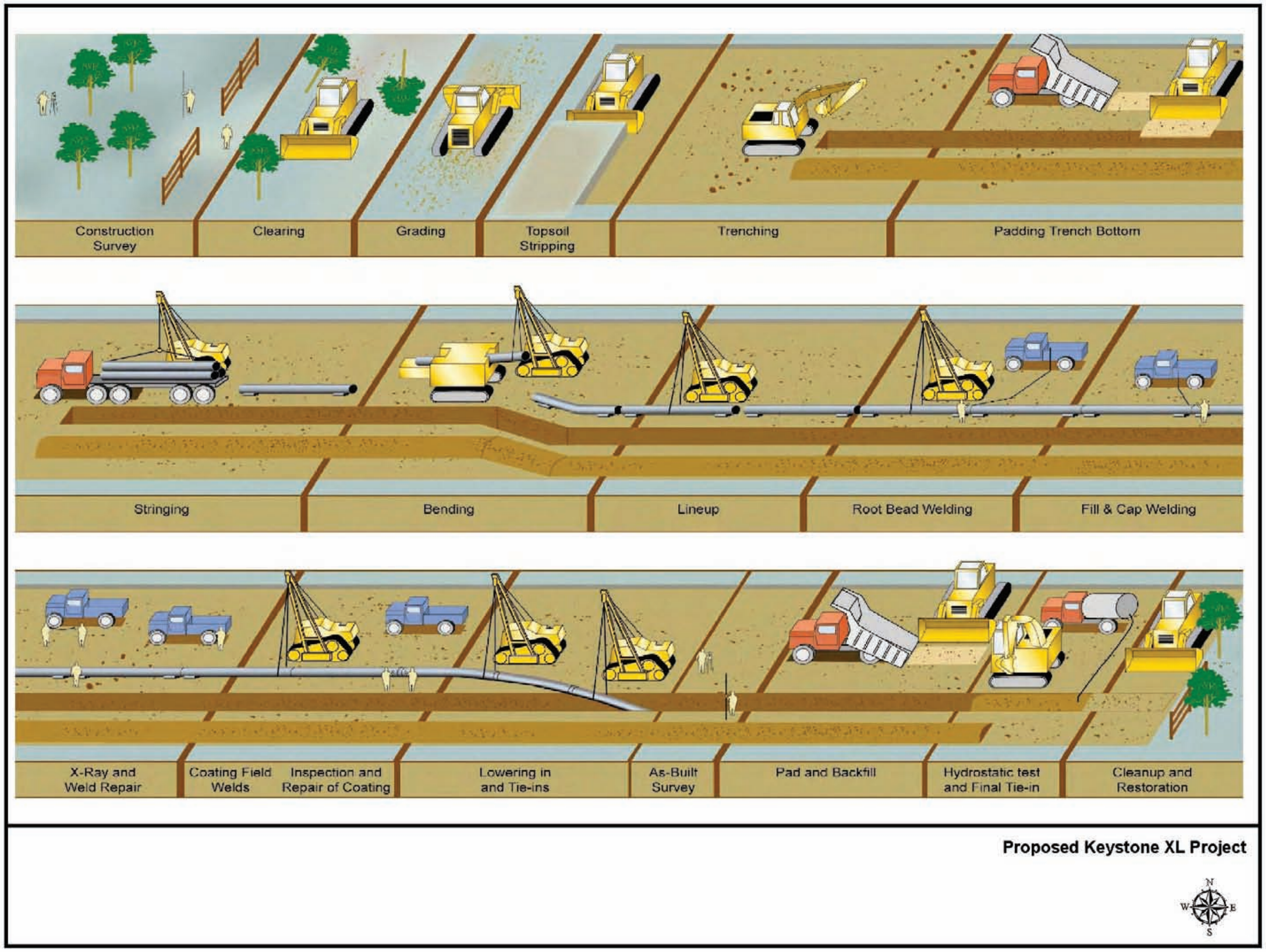
Pipeline Construction Sequence

Figure 2.1.7-2 shows a typical pipeline construction sequence. The design and construction of the pipeline would incorporate each of these steps. Additionally, the proposed Project would include additional construction for access roads, construction work camps, and temporary workspace facilities. All aspects of proposed Project construction are addressed in the remaining sections of this section.

Standard pipeline construction is composed of specific activities, including survey and staking of the ROW, clearing and grading, pipe stringing, bending, trenching, welding, lowering in, backfilling, hydrostatic testing, and cleanup. In addition to standard pipeline construction methods, special construction techniques would be used where warranted by site-specific conditions. These special techniques would be used when constructing across rugged terrain, sensitive areas, waterbodies, wetlands, paved roads, highways, and railroads (see Section 2.1.8, Special Pipeline Construction Procedures).

Construction would be planned to continue into the early winter months for as long as possible without the use of special winter construction techniques. However, as stated in the CMRP (Appendix G), if the proposed Project is authorized and winter construction is necessary to meet construction deadlines, Keystone would consult with the relevant federal, state, and local regulatory agencies to determine what changes may be necessary in permits issued, what additional permits may be required, and to identify the procedures that would have to be incorporated into construction to avoid or minimize environmental impacts. Winter construction plans would be finalized based on those consultations and permit requirements. Normal construction activities would be conducted during daylight hours, with the following exceptions:

- Completion of critical tie-ins on the ROW may occur after daylight hours. Completion requires tie-in welds, non-destructive testing, and sufficient backfill to stabilize the ditch.
- HDD operations may be conducted after daylight hours, if determined by the contractor to be necessary to complete a certain location. In some cases, the HDD may occur continuously until the work is completed and may last 24 hours or longer. Such operations may include drilling and pull-back operations (i.e., the activity of pulling the pipe back into the drilled hole), depending upon the site and weather conditions, permit requirements, schedule, crew availability, and other factors. Prior to construction, Keystone would notify local residences of the upcoming HDD activities. HDD activities would be conducted consistent with any applicable local noise ordinances.
- It may be necessary, in some locations, for hydrostatic testing operations to operate continuously for a period of 24 hours or longer. While not anticipated in typical construction, certain work may be required after the end of daylight hours due to weather conditions, for safety, or for other proposed Project requirements.



Source: exp Energy Services, Inc. 2012a

Figure 2.1.7-2 Typical Pipeline Construction Sequence

A list of typical equipment to be used during construction is presented in Table 2.1-14. Actual equipment used would depend on the construction activity and specific equipment owned or leased by the construction contractors selected.

Table 2.1-14 Minimum Equipment Required for Selected Construction Activities

Activity	Minimum Equipment
Clearing and grading	6 D8 dozers 1 - 330 trackhoe (thumb and hoe pack) 6 - 345 trackhoes 2 D8 with ripper attachment 1 - 140 motor grader
Trenching	6 - 345 trackhoes 1 - 345 trackhoe with hammer 4 ditching machines
Stringing, bending, and welding	2 - 345 trackhoes vacuum fitted (1 at pipe yard, 1 at ROW) 1 - D7 tow cat 15 string trucks 2 bending machines 10 - 572 side booms 10 - 583 side booms 6 - automatic welding machines with end-facing machine 8 ultrasonic testing units 1 NDE unit 2 heat rings 4 coating rings 3 sleds with generators
Lowering-in and backfilling	3 - 345 trackhoes (1 equipped with long neck) 5 - 583 side booms 2 padding machines 3 D8 dozers
Tie-ins to the mainline (six tie-in crews per spread; equipment listed if for each crew)	4 welding rigs 7 - 572 side booms 2 ultrasonic testing units 2 heat rings 2 coating rings 1 sled with generators 2 - 345 trackhoes (1 equipped with shaker bucket) 2 - 583 side booms 1 D8 dozer
Cleanup and restoration	6 D8 dozers 3 - 345 backhoes 2 tractors with mulcher spreaders (seed and reclamation)
Equipment deployed for each spread	100 pickup trucks 2 water trucks 2 fuel trucks 7 equipment low-boys 7 flatbed trucks 5 - 2-ton boom trucks

Surveying and Staking

Before construction begins, the construction ROW boundaries and any additional TWAs would be marked to identify the limits of the approved work area. The locations of approved access roads and existing utility lines would be flagged. Wetland boundaries and other environmentally sensitive areas would be marked or fenced for protection. A survey crew would stake the centerline of the trench and any buried utilities along the ROW.

Some landowner fences would be crossed or paralleled by the construction ROW, requiring fence cutting and modifications (see Section 2.1.8.7, Fences and Grazing, for actions to restore the fences after construction is complete).

Clearing, Grading, and Trenching

Temporary erosion control measures such as silt fences or straw bales would be installed prior to vegetation removal along slopes leading to wetlands and riparian areas, as appropriate. A fencing crew would install these erosion control silt fences and straw bales. The work area would be cleared of vegetation, including crops and obstacles such as trees, logs, brush, or rocks.

Grading would be performed where necessary to provide a reasonably level work surface or where required by landowners or land managers. Where the ground is relatively flat and does not require grading, rootstock would be left in the ground. More extensive grading would be required in steep slope areas to safely construct the pipeline. Where grading occurs and topsoil is present, topsoil would be removed from the entire area to be graded and stored separately from the subsoil.

A clearing crew would follow the fencing crew and would clear the work area of vegetation (including crops) and obstacles (e.g., trees, logs, brush, rocks). Standard agricultural implements would be used on agricultural lands and standard machinery used in timber clearing would be used in forested lands. The amount of top soil stripping would be determined in consultation with the landowner (based on agricultural use) and the Natural Resources Conservation Service. Full ROW stripping for forested lands would be avoided where practicable. In areas of rocky soils or bedrock, tractor-mounted mechanical rippers or rock trenchers would fracture the rock prior to excavation.

In areas where topsoil segregation would be required, topsoil would be removed up to a maximum depth of 12 inches and segregated. In most areas where soil would be removed from only the trench, topsoil would be piled on the near side of the trench and subsoil on the far side of the trench. A *triple lift* method would be used in certain areas of saline/sodic soils with limited reclamation potential to minimize impacts to agricultural production. This method would involve stockpiling three different soil horizons, including the topsoil horizon. This separation of topsoil from subsoil would allow for proper restoration of the soil during the backfilling process. Where soil is removed from both the trench and the spoil side, topsoil would be stored on the near side of the construction ROW edge, and the subsoil on the spoil side of the trench. In addition, the spoil piles would be spaced to accommodate storm water runoff. Typical soil separation methods are illustrated in Appendix G, CMRP.

Trenching may be carried out before or after stringing, bending, and welding depending upon several factors such as soil characteristics, water table, presence of drain tiles, and weather conditions at the time of construction. Trench excavation would typically be to depths of between 7 and 8 ft, with a trench width of approximately 4 to 5 ft. In most areas, there would be a minimum of 4 ft of cover over the pipeline after backfilling. The depth of burial would be consistent with PHMSA Special Condition 19: the pipeline should be constructed with soil cover at a minimum depth of 48 inches in all areas, except in consolidated rock; the minimum depth required in consolidated rock areas is 36 inches.

In addition, the depth of burial at waterbodies, ditches, drainages, and other similar features would be 60 inches, except in rocky areas where the minimum burial depth would be 36 to 48 inches. Where major waterbodies are crossed using the HDD method, the depth from the streambed to the top of the pipe would be substantially greater than 60 inches. Depths of cover over the pipe along the proposed route in areas of normal excavation and in rocky excavation areas are listed in Table 2.1-15.

Table 2.1-15 Minimum Pipeline Cover

	Depth Below Ground Surface (inches)	
Location	**Normal Excavation**	**Rock Excavation**
Most areas	48	42
All waterbodies	60	42
Dry creeks, ditches, drains, washes, gullies, etc.	60	42
Drainage ditches at public roads and railroads	60	48

Special Condition 19 also requires that Keystone maintain the following depths of cover after construction is completed:

- A depth of cover of 48 inches in cultivated areas where possible and a depth of 42 inches in all other areas
- In cultivated areas where conditions prevent maintaining 48 inches of cover, additional protective measures must be used to alert the public and excavators to the presence of the pipeline; the additional measures include the following:
  - Placing warning tape and additional line-of-sight pipeline markers along the affected pipeline segment; and
  - In areas where threats from chisel plowing (i.e., use of curved shanks to penetrate and stir the soil without inverting a soil layer; used in conservation tillage methods) or other activities are threats to the pipeline, the top of the pipeline must be installed and maintained at least 1 foot below the deepest penetration above the pipeline, not to be less than 42 inches of cover.

Generally, as the crews on each construction spread are synchronized with the welding crews for efficiency, the amount of time the trench is left open is minimized to the extent possible.

In rangeland areas used for grazing, construction activities potentially could hinder the movement of livestock if the livestock cannot be relocated temporarily by the owner. Construction activities may also hinder the movement of wildlife. To minimize the impact on livestock and wildlife movements during construction, Keystone would leave hard plugs (short lengths of unexcavated trench) or install soft plugs (areas where the trench is excavated and replaced with minimal compaction) to allow livestock and wildlife to cross the trench safely.

Soft plugs would be constructed with a ramp on each side to provide an avenue of escape for animals that may fall into the trench.

Pipe Stringing, Bending, and Welding

Prior to or following trenching, sections of externally coated pipe approximately 80-ft long (also referred to as *joints*) would be transported by truck over public roads and along authorized private access roads to the ROW and placed or “strung” along the ROW. After the pipe sections are strung along the trench and before joints are welded together, individual sections of the pipe would be bent to conform to the contours of the trench by a track-mounted, hydraulic pipe-bending machine. For larger bend angles, fabricated bends may be used.

After the pipe sections are bent, the pipeline joints would be lined up and held in position until welding. The joints would be welded together to create long “strings” that would be placed on temporary supports. All welds would be inspected using non-destructive radiographic, ultrasonic, or other methods that provide an equivalent or better level of safety than those required in 49 CFR Part 195. All aspects of welding, including reporting, would be conducted consistent with the requirements of 49 CFR 195.228 and PHMSA Special Conditions 4, 5, 6, 12, 18, and 20 (see Appendix B, Potential Releases and Pipeline Safety). Welds that do not meet established specifications would be repaired or removed and replaced. Once the welds are approved, a protective epoxy coating would be applied to the welded joints to inhibit corrosion. The pipeline would then be electronically inspected for faults or voids in the epoxy coating and visually inspected for any faults, scratches, or other coating defects. Damage to the coating would be repaired before the pipeline is lowered into the trench.

Lowering In, Backfilling, and Hydrostatic Testing

Prior to lowering the pipe into the trench, the trench would be cleared of rocks and debris that might damage the pipe or the pipe coating. If water has entered the trench, dewatering may be required prior to installation. Discharge of water from dewatering would be accomplished in accordance with applicable discharge permits. On sloped terrain, trench breakers (e.g., stacked sand bags or foam) would be installed in the trench at specified intervals to prevent subsurface water movement along the pipeline.

In some cases sand or gravel padding material may be placed in the bottom of the trench to protect the pipeline from damage during installation. In no case would topsoil be used as a padding material. In areas of rocky soils or bedrock, the bottom of the trench would be padded with borrow material such as sand or gravel. Where rock occurs within the trench perimeter, abrasion resistant coatings or rock shields would be used to protect the pipe prior to installation.

The pipeline would be lowered into the trench and the trench would first be backfilled using the excavated subsoil material. In rocky areas, excavated rock would be used to backfill the trench to the top of the existing bedrock profile. After the initial backfilling, topsoil would be returned to its original position over the trench.

In addition to hydrostatic testing at the pipe mills, the pipeline would be cleaned and hydrostatically tested prior to putting the pipe into service and after backfilling and all construction work that could directly affect the pipe is complete. The testing would be conducted in pipeline sections approximately 30 to 50 miles long. Hydrostatic testing would provide indications that the system is capable of withstanding the maximum operating pressure and would be conducted in accordance with the regulatory requirements of 49 CFR Part 195, Subpart E (Pressure Testing) and the stipulations in PHMSA Special Conditions 5, 20, 22, and 23 (see Appendix B, Potential Releases and Pipeline Safety). The process would be conducted as follows:

- Isolate the pipe section being tested with test manifolds;
- Fill the section with water;
- Pressurize the section to a pressure that would produce a hoop stress (i.e., stress in the tangential direction of the pipe) of a minimum of 100 percent of the specified minimum yield strength for the mainline pipe and 1.39 times the maximum operating pressure for pump stations; and
- Maintain that pressure for a period of 8 hours. Fabricated assemblies may be tested prior to installation in the trench for a period of 4 hours.

Water for hydrostatic testing would generally be obtained from rivers, streams, irrigation wells, and municipal sources in close proximity to the pipeline and in accordance with federal, state, and local regulations. Keystone would use farm irrigation wells as permitted by the landowner and state.

Intakes would be screened to prevent entrainment of fish, and intake and discharge locations would be determined with construction contractors. Generally the pipeline would be hydrostatically tested after backfilling and all construction work that would directly affect the pipe is complete. If leaks are found, they would be repaired and the section of pipe retested until specifications are met. There are no chemicals added to the test water. After use during hydrotesting, the water is generally the same quality as its source water because there are no additives added to the water. Water used for the testing would then be returned to the source or transferred to another pipe segment for subsequent hydrostatic testing. After hydrostatic testing, the water would be tested and discharged in compliance with the National Pollutant Discharge Elimination System discharge permit requirements. To reduce the velocity of the discharge to upland areas, energy dissipating devices would be employed. Energy dissipation devices that are consistent with best management practice protocols include:

- Splash Pup—A splash pup consists of a piece of large diameter pipe (usually over 20-inch outside diameter) of variable length with both ends partially blocked. The splash pup would be welded perpendicularly to the discharge pipe. As the discharge hits against the inside wall of the pup, the velocity would be rapidly reduced and the water allowed to flow out either end. A variation of the splash pup design, commonly called a diffuser, has capped ends and many holes punched in the pup to diffuse the energy.
- Splash Plate—A splash plate is a quarter section of 36-inch pipe welded to a flat plate and attached to the end of a 6-inch-diameter discharge pipe. The velocity would be reduced by directing the discharge stream into the air as it exits the pipe. This device would also be effective for most overland discharge.

- Plastic Liner—In areas where highly erodible soils exist or in any low-flow drainage channel, it is a common practice to use layers of construction fabric to line the receiving channel for a short distance. A small load of rocks may be used to keep the fabric in place during the discharge. Additional methods, such as the use of plastic sheeting or other material to prevent scour would be used as necessary to prevent excessive sedimentation during dewatering.
- Straw Bale Dewatering Structure—Straw bale dewatering structures are designed to dissipate and remove sediment from the water being discharged. Straw bale structures could be used alone for on-land discharge of hydrostatic test water or in combination with other energy dissipating devices for high-volume discharges. Dewatering filter bags may be used as alternatives to straw bale dewatering structures.

Hydrostatic test water would not be discharged into state-designated exceptional value waters, waterbodies that provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate federal, state, or local permitting agencies grant written permission. To avoid impacts from introduced species, no inter-basin transfers (discharge) of hydrostatic test water would occur without specific permitting approval to discharge into an alternative water basin. Discharge lines would be securely supported and tied down at the discharge end to prevent whipping during discharge. Hydrostatic testing is discussed further in the CMRP (Appendix G).

Pipe Geometry Inspection, Final Tie-ins, and Commissioning

After hydrostatic testing is complete, the pipeline would be dewatered and inspected using an electronic caliper (geometry) pig to check for dents or other deformations and where appropriate, pipe sections would be replaced in accordance with the requirements of 49 CFR 195 and the Special Conditions in Appendix B, Potential Releases and Pipeline Safety. The final pipeline tie-ins would then be welded and inspected.

After the final tie-ins are completed and inspected, the pipeline would be cleaned and dewatered, and then commissioned through verification of proper installation and function of the pipeline and appurtenant systems, including control and communication equipment, based on the requirements of 49 CFR 195 and the relevant PHMSA Special Conditions. In the final step, the pipeline would be prepared for service by filling the line with crude oil.

Cleanup and Restoration

Cleanup would include removal of construction debris, final contouring, and installation of permanent erosion control features. The cleanup process would begin as soon as possible after backfilling, but the timing would be dependent on weather conditions. Preliminary cleanup would be completed within approximately 20 days after the completion of backfilling assuming appropriate weather conditions prevail (approximately 10 days in residential areas). Removed construction debris would be disposed in existing, permitted disposal facilities in accordance with relevant federal, state, and local regulations.

Reseeding of the ROW would occur as soon as possible after completion of cleanup to stabilize soil. 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 the Natural Resources Conservation Service. Access to the permanent easement would be restricted using gates, boulders, or other barriers to minimize unauthorized access by all-terrain vehicles, if requested by the landowner. All existing fencing and grazing structures, such as fences, gates, irrigation ditches, cattle guards, and reservoirs would be repaired to preconstruction conditions or better upon completion of construction activities.

Pipeline markers would be installed at road and railroad crossings and other locations (as required by 49 CFR 195) to show the location of the pipeline. Markers would identify the owner of the pipeline and convey emergency contact information. Special markers providing information and guidance to aerial patrol pilots also would be installed. Pipeline markers would be provided for identification of the pipeline location for safety purposes in accordance with the requirements of 49 CFR 195.410 (Line Markers) and PHMSA Special Condition 40 (see Appendix B, Potential Releases and Pipeline Safety), including the following:

- Pipeline markers would be installed on both sides of all highways, roads, road ROWs, railroads, and waterbody crossings and in areas where the pipeline is buried less than 48 inches.
- Pipeline markers would be made from industrial strength materials to withstand abrasion from wind and damage from livestock or wildlife.
- Warning signs would be installed at all fences.
- Pipeline markers would be installed along the ROW to provide line-of-sight marking of the pipeline, providing it is practical to do so and consistent with the type of land use, such that it does not hinder the use of the property by the landowner. Pipeline markers would be installed at all angle points, and at intermediate points, where practical, so that from any marker, the adjacent marker in either direction would be visible.
- Consideration would be given to installing additional markers, except where they would interfere with land use (e.g., farming).
- 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 enters and exits the fenced area.

The markers would be maintained during the operating life of the proposed Project.

Post-Construction Reclamation Monitoring and Response

The ROW would be inspected after the first growing season to determine the success of revegetation and noxious weed control. Eroded areas would be repaired and areas that were unsuccessfully re-established would be revegetated by Keystone or Keystone would compensate the landowner for reseeding. Section 3.5, Terrestrial Vegetation, and the CMRP (see Appendix G) provide information on revegetation and weed control procedures that Keystone would incorporate into the proposed Project.

2.1.7.3 Aboveground and Ancillary Facilities Construction Procedures

Pump Station Construction

Construction at each new pump station and pigging facility would begin with installing sediment control measures, clearing vegetation, and removing topsoil. After that, the site would be graded as necessary to create a level working surface for the movement of construction vehicles and to prepare the area for building foundations. Each pump station would include one electrical equipment shelter (EES), and a variable frequency drive equipment shelter. The EES would include electrical systems, communication, and control equipment. Foundations would be installed for the EES and the pump equipment shelter. The structures to support the pumps, manifolds, pig receiving and pig launching equipment (where present), densitometers (where present), and associated facilities would then be erected. This would include installation of two MLVs: one would be installed on the suction piping of the pumps and one would be installed on the discharge piping of the pumps as required by 49 CFR 195.260.

The pump station piping, both aboveground and below ground, would be installed and pressure-tested using methods similar to those used for the main pipeline. After successful testing, the pump station piping would be tied into the main pipeline. Piping installed below grade would be coated for corrosion protection as required by 49 CFR 195 Subpart H (Corrosion Control) and the applicable PHMSA special conditions. In addition, all below-grade facilities would be protected by a CP system as required by Subpart H and the applicable PHMSA special conditions. 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 hydrostatic testing of the below-grade equipment, the site would be graded and surfaced with gravel and a security fence would be installed around the entire perimeter of each site. Construction activities and storage of construction materials would be confined to each pump station site. Figure 2.1.4-1 (provided previously) shows a typical pump station with pigging facilities. Figure 2.1.7-3 shows a typical pump station without pigging facilities.

Mainline Valves and Delivery Sites

MLV construction would occur during mainline pipeline construction. IMLV construction would be carried out concurrently with the construction of the pipeline. Wherever practical, IMLVs would be located near public roads to allow year-round access. If necessary, permanent access roads or approaches would be constructed to each fenced MLV site. The construction sequence would consist of clearing and grading followed by trenching, valve installation, fencing, cleanup, and site restoration.

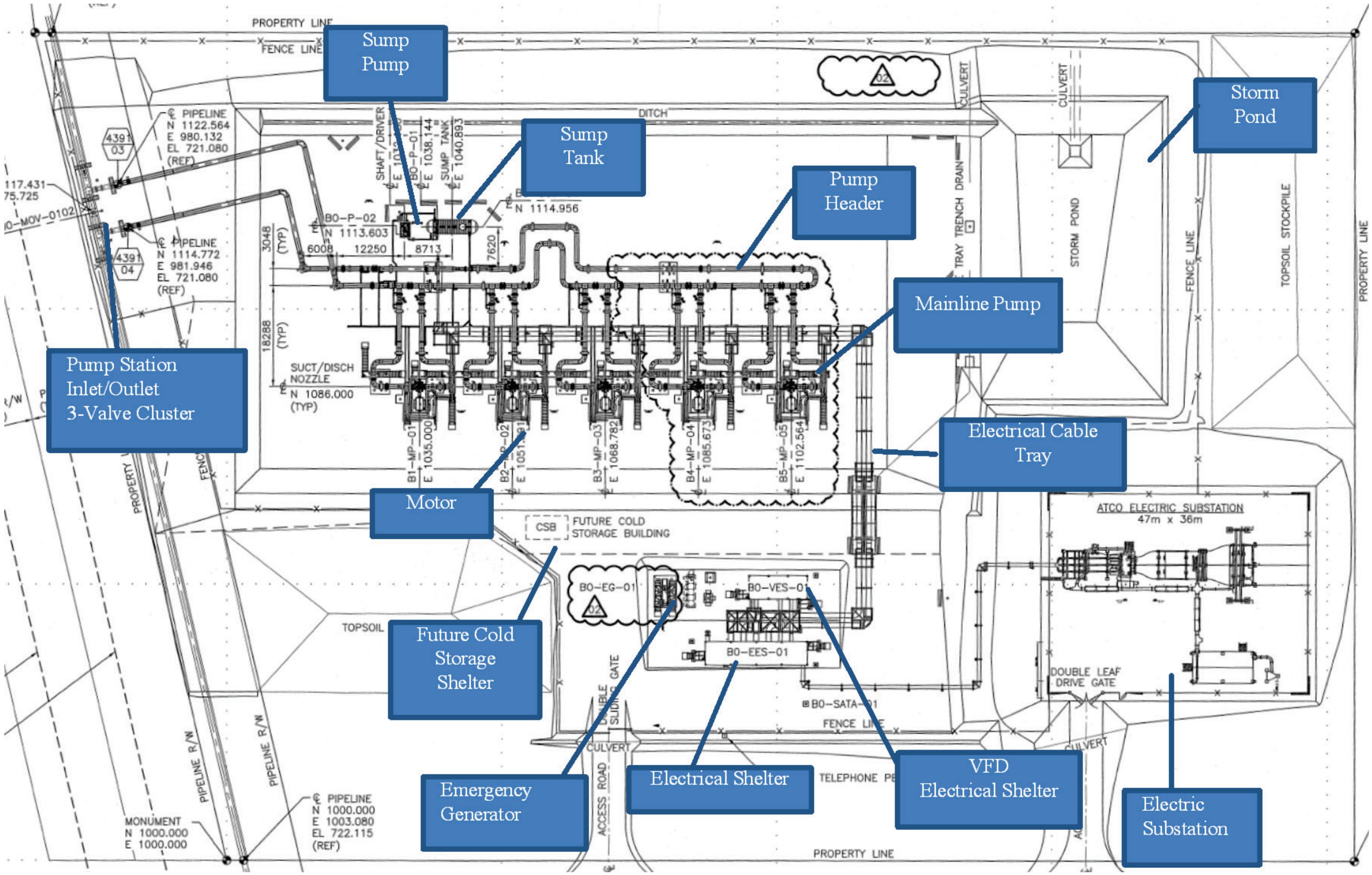


Figure 2.1.7-3 Pump Facility without Pigging Facilities

2.1.8 Special Pipeline Construction Procedures

Special construction techniques would be used when crossing roads, highways, and railroads; pipeline, utility, and other buried feature crossings; steep terrain; unstable soils; perennial waterbodies; wetlands; areas that require ripping; and residential and commercial areas. These special techniques are described below. Special techniques for wetland and waterway crossings are described in Section 2.1.9, Waterbody Crossings. Further discussion of impacts and mitigation measures for sensitive areas is provided in Appendix G, CMRP, and Section 4.4.4, Additional Mitigation.

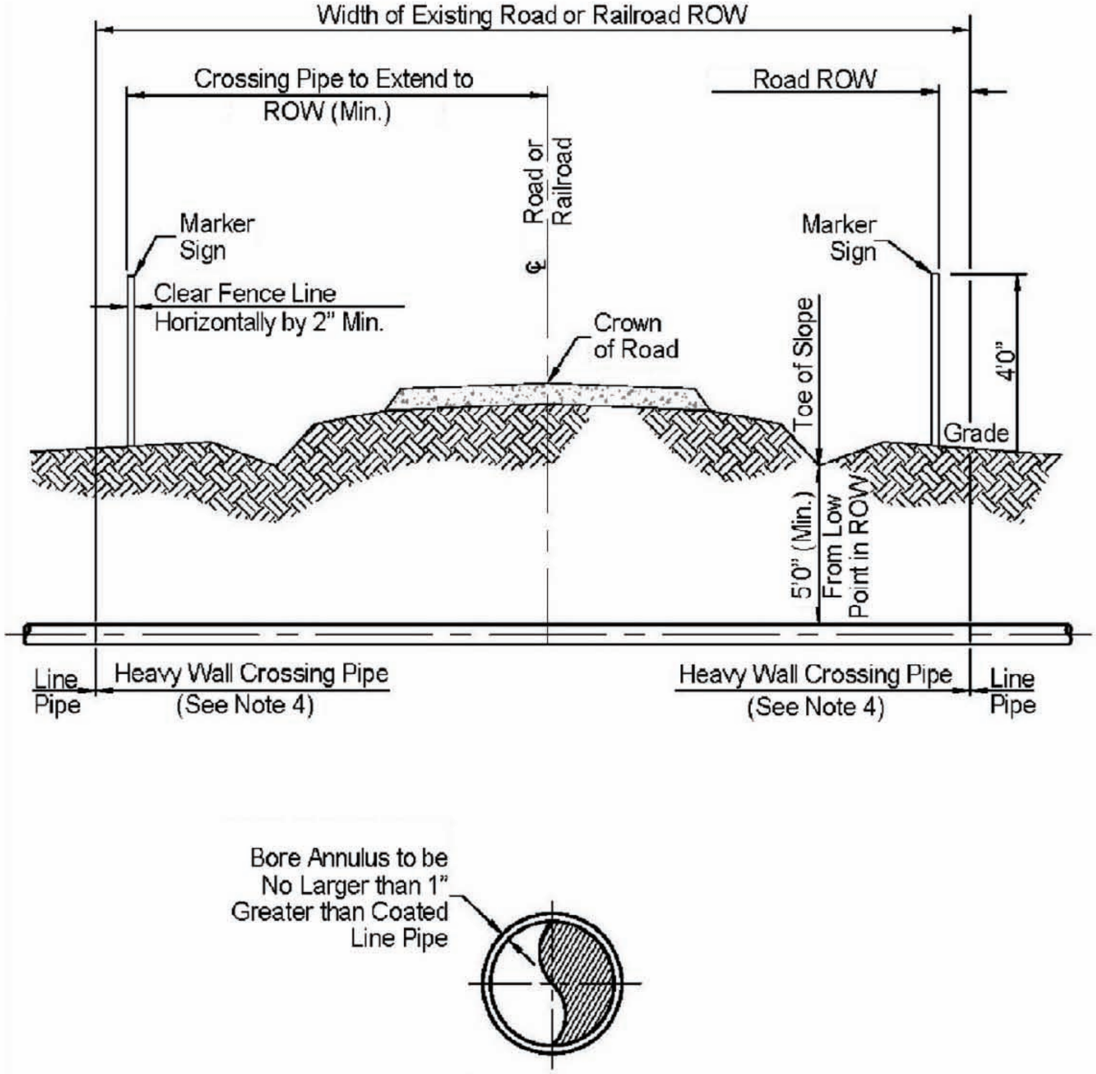
2.1.8.1 Road, Highway, and Railroad Crossings

Construction across paved roads, highways, and railroads would be in accordance with the requirements of the appropriate road and railroad crossing permits and approvals. In general, all major paved roads, all primary gravel roads, all highways, and all railroads would be crossed by boring beneath the road or railroad, as shown in Figure 2.1.8-1.

The key difference between boring and the HDD method is that in boring, the crossing pipe would be straight with no vertical or horizontal bends within the road ROW. The HDD method is used to bore beneath wetlands or terrestrial areas that contain special resources that require avoidance. The pipe is bent to avoid these areas. Additional details on the use of HDD are provided in Section 2.1.9.2, Horizontal Directional Drilling Method, and in Appendix G, CMRP.

Boring would result in minimal or no disruption to traffic at road or railroad crossings. Each boring would take 1 to 2 days for most roads and railroads, and 10 days for long crossings such as interstates or four-lane highways. Initially, a pit would be excavated on each side of the feature. Boring equipment would then be placed in the pit and a hole would be bored under the road; the hole would have a diameter at least equal to the diameter of the pipe, and the hole would be drilled far enough below the road surface to comply with local and state requirements. A prefabricated pipe section would be pulled through the borehole. For long crossings, sections would be welded onto the pipe string before being pulled through the borehole.

If permitted by local regulators and landowners, smaller gravel roads and driveways would likely be crossed using an open-cut method that would typically take between 1 and 2 days to complete. This would require temporary road closures and establishment of detours for traffic. If no reasonable detour is feasible, trenching would be staged such that at least one lane of traffic would be kept open at any point in time. Keystone would post signs at these open-cut crossings and would implement traffic control plans to reduce traffic disturbance and protect public safety.



1. Crossing would be in accordance with applicable permit.
2. Road crossing pipe would extend at minimum to ROW line unless otherwise specified.
3. The type and minimum required length of pipe for crossings of roads would be as specified on alignment sheets.
4. Pipe for bored crossings to include abrasion-resistant coating.
5. Pipeline marker and test stations to be installed on ROW line next to fence if possible.
6. The crossing pipe would be straight with no vertical or horizontal bends within road ROW.

Proposed Keystone XL Project

Figure 2.1.8-1 Uncased Road—Railroad Crossing Bore Detail

2.1.8.2 Pipeline, Utility, and Other Buried Feature Crossings

Keystone and its pipeline contractors would comply with USDOT regulations, utility agreements, and industry best management practices with respect to utility crossing and separation specifications. To the extent practicable, Keystone would avoid relocating existing electric transmission lines and would use existing distribution lines. Where line relocation cannot be avoided, Keystone would coordinate with the local public power district to temporarily or permanently relocate lines. One-call notification would be made for all utility crossings to identify utilities. Similarly, private landowners would be notified of planned construction activities so that buried features, such as irrigation systems and other waterlines, could be avoided or replaced. Prior to construction, each rancher with a stock watering or irrigation system or other waterlines would be asked to provide the location of any waterlines in the construction area. In the case of existing buried oil or gas pipelines, the owner of the facility would be asked to provide information on the locations of pipes in the construction area. Metallic pipelines would be physically located by a line locating crew prior to excavation.

Unless otherwise specified in a crossing agreement, the contractor would excavate to allow installation of the proposed Project pipeline across the existing pipeline or utility with a minimum clearance of 12 inches. The clearance distance would be filled with sandbags or suitable fill material to maintain the clearance. Backfill of the crossing would be compacted in lifts to ensure continuous support of the existing utility. The U.S. Bureau of Reclamation has specific pipeline crossing requirements for hazardous material carriers such as oil or gas pipelines. The criteria requires that pipelines be designed with an additional 50 percent working pressure factor or use secondary containment (casing pipe); that a block valve or check valve might be required on each side of the canal being crossed; that a final hazardous material spill contingency plan and an emergency response plan must be approved prior to the start of construction; and that a monitor program and/or SCADA system could be required. See Appendix D, Waterbody Crossing Tables and Required Crossing Criteria for Reclamation Facilities, for additional details.

For some crossings, the owner of the utility or buried feature may require the facility to be excavated and exposed by their own employees prior to the Keystone contractor getting to the location. In those cases, Keystone would work with owners to complete work to the satisfaction of the owner. Where the owner of the utility does not require pre-excavation, generally, the pipeline contractor would locate and expose the utility before excavating the trench.

2.1.8.3 Steep Terrain

Steep slopes traversed by the proposed route would be graded to reduce slope angles, thus allowing safer operation of construction equipment and reducing the degree of pipe bending required. In areas where the pipeline route crosses side slopes, cut-and-fill grading may be employed to obtain a safe working terrace. Keystone would install the pipeline to maintain the required depth of cover of 48 inches in cultivated areas and 42 inches in all other areas, including on side slope cuts and perpendicular slope crossings, except in bedrock areas where the minimum depth would be 36 inches.

Prior to cut-and-fill grading on steep terrain, topsoil would be stripped from the ROW and stockpiled. If soil and slope conditions permit, soil from the high side of the ROW would be excavated and moved to the low side to create a safer and more level working surface. After pipeline installation, soil from the low side of the ROW would be returned to the high side and the contour of the slope would be restored to its pre-construction condition to the degree practicable.

Temporary sediment barriers, such as silt fences and straw bales, would be installed where appropriate to prevent erosion and siltation of wetlands, waterbodies, or other environmentally sensitive areas. During grading, temporary slope breakers consisting of mounded and compacted soil would be installed across the ROW. In the cleanup phase, permanent slope breakers would be installed where appropriate. Section 4.5 of the CMRP (Appendix G) presents additional information on the use of sediment barriers and slope breakers.

After regrading and installation of erosion control devices, seed would be applied to steep slopes and mulch consisting of hay or non-brittle straw would be placed on the ROW, or the ROW would be protected with erosion control geofabrics. MDEQ requires that geofabric mesh size be 2 inches or greater to avoid animal entanglement. This requirement does not apply in other states; erosion control devices would be installed in compliance with each state's regulatory requirements. Sediment barriers would be maintained across the ROW until permanent vegetation is established. Additional temporary workspaces may be required for storage of graded material and/or topsoil during construction.

2.1.8.4 Unstable Soils

Special construction techniques and environmental protection measures would be applied to areas with unstable soils and to areas with high potential for landslides, erosion, and mass wasting. Mass wasting, sometimes called mass movement, is the downward movement by gravity of rock, regolith (loose, weathered rock), and/or soil on the sloped top layers of the Earth's surface. Landslides are a type of mass wasting. They are sudden, fast movements of a cohesive mass of soil, rock, or regolith. Construction in these areas could require additional temporary workspace areas.

Topsoil piles would be protected from erosion through matting, mulching, watering, or tackifying (making slightly sticky by applying resin adhesives) to the extent practicable. Photodegradable matting would be placed 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.

Reseeding would be carried out using native seed mixes that are certified noxious-weed-free. Land imprinting may be employed to create impressions in the soil to reduce erosion, improve moisture retention, and create micro-sites for seed germination. Keystone would work with landowners to evaluate fencing the ROW from livestock, or alternatively, to provide compensation if a pasture needs to be rested until vegetation can become established.

2.1.8.5 Ripping

In areas where bedrock is within 84 inches (7 ft) of the surface and is expected to be dense or highly stratified, ripping could be required. Ripping would involve tearing up the rock with mechanical excavators. During ripping, Keystone would take extreme care to avoid damage to underground structures, cables, conduits, pipelines, and underground watercourses.

Keystone anticipates that some blasting would be required. If blasting is necessary, Keystone would prepare and file a blasting plan with the appropriate agencies.

2.1.8.6 Construction near Structures

Keystone would prepare site-specific construction plans to address the potential impacts of construction on residential and commercial structures near the construction ROW. Areas containing buildings within 25 ft and 500 ft of the construction ROW are listed in Table 2.1-16. Information on the types of structures present is provided in Section 3.9, Land Use, Recreation, and Visual Resources. Additional construction and environmental protection measures for structures near the construction ROW are described in the CMRP (Appendix G).

Table 2.1-16 Structures Located Within 25 Feet and 500 Feet of the Construction ROW

State	County	Structures Within 25 Feet of Construction ROW (Number)	Structures Within 500 Feet of Construction ROW (Number)
Montana	Phillips	1	4
	Valley	1	12
	McCone	0	10
	Dawson	0	15
	Prairie	0	1
	Fallon	0	8
South Dakota	Harding	1	14
	Butte	0	0
	Perkins	0	0
	Meade	2	5
	Pennington	0	0
	Haakon	2	22
	Jones	0	5
	Lyman	0	3
	Tripp	0	23
Nebraska	Keya Paha	0	4
	Boyd	0	0
	Holt	0	31
	Antelope	3	60
	Boone	2	63
	Nance	0	26
	Merrick	0	15
	Polk	0	28
	York	0	36
	Fillmore	1	17
	Saline	0	17
	Jefferson	1	21

2.1.8.7 Fences and Grazing

Fences would be crossed or paralleled by the construction ROW. Before cutting any fence for pipeline construction, each fence would be braced and secured to prevent the slacking of the fence. To prevent the passage of livestock, the opening in the fence would be closed temporarily when construction crews are not in the area. All existing fencing and grazing structures, such as fences, gates, irrigation ditches, cattle guards, and reservoirs would be repaired to preconstruction conditions or better upon completion of construction activities. If gaps in natural barriers used for livestock control are created by pipeline construction, the gaps would be fenced according to the landowner’s requirements. All existing improvements, such as fences, gates, irrigation ditches, cattle guards, and reservoirs would be maintained during construction and repaired to preconstruction conditions or better upon completion of construction activities.

2.1.9 Waterbody Crossings

In the final design phase of the proposed Project, perennial waterbody crossings would be assessed by qualified personnel (e.g., a water resources engineer) with respect to the potential for channel aggradation or degradation and lateral channel migration. The level of assessment for each crossing would vary based on the professional judgment of the qualified design personnel. The pipeline would be installed as necessary to address any hazards identified by the assessment. The pipeline would be installed at the design crossing depth for at least 15 ft beyond the design lateral migration zone, as determined by qualified personnel. The crossing design also would specify the appropriate stabilization and restoration measures.

The actual crossing method employed at a perennial stream would depend on permit conditions from U.S. Army Corps of Engineers (USACE) and other relevant regulatory agencies, as well as additional conditions that may be imposed by landowners or land managers at the crossing location. Where the HDD method is not used for major waterbody crossings or for waterbody crossings where important fisheries resources could be impacted, a site-specific plan addressing proposed additional construction and impact reduction procedures would be developed (see CMRP, Appendix G). Prior to commencing any stream-crossing construction activities, at a minimum, permits would be required under Section 404 of the Clean Water Act through USACE, and Section 401 Water Quality Certification, per state regulations. In order to limit unnecessary impacts, these agencies could require measures such as requiring all the non-HDD crossings to be constructed during dry conditions. Additional information on the types of crossing methods proposed for use on the proposed Project is presented in the subsections below.

In addition to the proposed pipeline crossings of waterbodies, there would be temporary equipment bridges installed across many waterways. Prior to the start of clearing along each pipeline construction spread, temporary bridges (e.g., subsoil fill over culverts, timber mats supported by flumes, railcar flatbeds, or flexi-float apparatus) would be installed across all perennial waterbodies to allow construction equipment to cross with reduced disturbance.. Construction equipment would be required to use the bridges. Waterbodies would be crossed using one of four different open-cut methods or the HDD method. These waterbody crossing methods are described below.

2.1.9.1 Open-Cut Crossing Methods

For most waterbodies to be crossed by the proposed Project, one of the open-cut methods listed below would be used:

- Non-flowing open-cut crossing method (for waterbodies that do not have a perceptible flow at the time of construction);
- Flowing open-cut crossing method;
- Dry-flume open-cut method; or
- Dry dam-and-pump open-cut method.

The trenching, pipeline installation, and backfilling methods used for these types of crossings would be similar to the crossing methods described above.

Non-Flowing Open-Cut Crossing Method

The non-flowing open-cut method would be used for all waterbodies with no visible flow at the time of construction. In the event that intermittent waterbodies are dry or have non-moving water at the time of crossing, Keystone would install the pipeline using this method. Detail 11 of the CMRP (Appendix G) is an illustration of a typical open-cut crossing method for non-flowing waterbodies.

Flowing Open-Cut Crossing Method

If there is flow at the time of construction, the flowing open-cut method would be used and the trench would be excavated through flowing water. If an intermittent waterbody is flowing when crossed, Keystone would install the pipeline using this method, except in Montana where this approach is prohibited by MDEQ due to regulatory requirements. There are two approaches that would be used instead in Montana: the dry-flume open-cut method, or the dry dam-and-pump open-cut method (both described below).

In the flowing open-cut method, backhoes operating from one or both banks would excavate the trench within the streambed while water continues to flow through the construction work area (see Detail 12 of Appendix G, CMRP). In wider rivers, in-stream operation of equipment may be necessary. Keystone would trench through the channel, lower in a pipe that is weighted for negative buoyancy (i.e., counteracting buoyancy), then backfill. The need for negative buoyancy would be determined by detailed design and site-specific considerations at the time of construction. Material excavated from the trench generally would be placed at least 10 ft away from the water's edge unless stream width exceeds the reach of the excavation equipment. Sediment barriers would be installed where necessary to prevent excavated spoil from entering the water. Hard or soft trench plugs would be placed to prevent the flow of water into the upland portions of the trench. After installation, the grade would be restored to pre-construction condition, topsoil would be replaced (unless saturated conditions exist), and permanent erosion control devices would be installed.

For this crossing type, pipe segments for each crossing would be welded and positioned adjacent to the waterbody. After the trench is excavated, the pipeline segment would be carried, pushed, or pulled across the waterbody and positioned in the trench at a depth of at least 60 inches below the streambed. The trench would be backfilled with native material or with imported material if required by permits.

Keystone would minimize the time of in-stream construction to reduce impacts to waterbody channel and banks. For minor waterbodies (<10-ft wide at the water's edge), the trenching and backfill of the crossing would typically require no more than 24 hours; intermediate waterbodies (10- to 100-ft wide) would typically require no more than 48 hours. Major waterbodies (>100-ft-wide) would be crossed as quickly as possible. It is possible that the time required to accomplish the crossings of major waterbodies could exceed 48 hours.

Dry-Flume Open-Cut Method

Keystone would use the dry-flume method on selected environmentally sensitive waterbodies where technically feasible. To the extent practicable, non-flowing open cut crossings would be the preferred crossing method. The dry-flume method is used for sensitive, relatively narrow waterbodies free of large rocks and bedrock at the trench line and with a relatively straight channel across the construction ROW. Use of this method involves installing dams upstream and downstream of the construction area and installing one or more pipes (flumes) that would extend along the course of the waterbody and through both dams. Stream flow would be carried through the construction area by the flume pipe(s).

Keystone would install flumes with sufficient capacity to transport the maximum flows that could be generated seasonally within the waterbody. The flumes, typically 40- to 60-ft long, would be installed before trenching and aligned to prevent impounding of water upstream of the construction area or to prevent back-erosion downstream.

The upstream and downstream ends of the flumes would be incorporated into dams made of sandbags and plastic sheeting (or equivalent material). Upstream dams would be installed first and would funnel stream flow into the flumes. Downstream dams then would be constructed to prevent water from flowing back into the area to be trenched. The flumes would remain in place during pipeline installation, backfilling, and streambank restoration.

Prior to trenching, the area between the dams typically would be dewatered. Backhoes working from one or both banks, or from within the isolated waterbody bed, would excavate the trench across the waterbody and under the flume pipes. Discharge of water from dewatering would be accomplished in accordance with applicable discharge permits. Excavated material would be stockpiled on the upland construction ROW at least 10 ft from the water’s edge or in the extra workspaces. Sediment containment devices, such as silt fences and straw bales, would be installed to contain the excavated material and minimize the potential for sediment to migrate into the waterbody.

After the trench is excavated to the proper depth, a prefabricated section of pipe would be positioned and lowered into the trench. The trench then would be backfilled with the excavated material from the stream unless otherwise specified in stream crossing permits. Prior to removing the dams and flume pipes and restoring stream flow, water that accumulated in the construction area would be pumped into a straw bale structure or similar dewatering device, and the bottom contours of the streambed and the streambanks would be restored as close as practical to pre-construction contours.

Dry Dam-and-Pump Open-Cut Method

As an alternative to the dry-flume crossing method, Keystone could use the dry dam-and-pump method on selected environmentally sensitive waterbodies where practical. The dry dam-and-pump method is similar to the dry-flume method except that pumps and hoses would be used instead of flumes to move water around the construction work area. When using this method, Keystone would initiate pumping while the dams are being installed to prevent interruption of stream flows. 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 pump capacity would be greater than the anticipated flow of the waterbody being crossed. As with the dry-flume method, trenching, pipe installation, and backfilling would be done while water flow is maintained for all but a short reach of the waterbody at the actual crossing location. Once backfilling is completed, the stream banks would be restored and stabilized and the pump hoses would be removed.

2.1.9.2 Horizontal Directional Drilling Method

Waterbodies that Keystone has considered for HDD include commercially navigable waterbodies, waterbodies wider than 100 ft, waterbodies with terrain features that prohibit open crossing methods, waterbodies adjacent to features such as roads and railroads, and sensitive environmental resource areas. As currently proposed, the HDD crossing method would be used at the waterbody crossings listed in Table 2.1-17.

Table 2.1-17 Waterbodies Crossed Using the Horizontal Directional Drilling Method

Waterbody	Number of Crossings	Approximate Milepost
Frenchman River	1	25.3
Milk River	1	83.4
Missouri River	1	89.7
Yellowstone River	1	198.1
Little Missouri River	1	295.0
Cheyenne River	1	430.1
Bridger Creek	1	433.6
Bad River	1	486.0
White River	1	541.3
Keya Paha River	1	618.1
Niobrara River	1	626.1
Elk Horn River	1	713.3
Loup River	1	761.7
Platte River	1	775.1

Source: exp Energy Services, Inc. 2012a

The HDD method could also be used to bore beneath terrestrial areas that contain special resources that require avoidance. Additional HDD crossings could be incorporated into the proposed Project as a result of resource agency, landowner, or land manager concerns, as well as due to construction-related issues.

The HDD method involves drilling a pilot hole under the waterbody and banks, then enlarging the hole through successive ream borings with progressively larger bits until the hole is large enough to accommodate a pre-welded segment of pipe. Throughout the process of drilling and enlarging the hole, a water-bentonite slurry would be circulated to lubricate the drilling tools, remove drill cuttings, and provide stability to the drilled holes. 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 waterbody and then pulled through the drilled hole.

The welded drill string would be hydrostatically tested for 4 hours prior to being pulled into place. Depending on the angle of approach of the pipeline alignment to the water crossing, a “false ROW” may need to be cleared on the pull back side to allow pipe placement at the appropriate angle to the waterbody. Keystone has created Site-Specific Waterbody Crossing Plans (Appendix G, CMRP) that describe the procedures to be used at each perennial waterbody crossed using the HDD method. Keystone would use industry standard procedures to ensure pipe and coating integrity are maintained during HDD installations.

During HDD operations, the hole that is reamed to allow the pipeline to be pulled through is much larger than the pipe diameter (approximately a 42-inch-diameter hole or larger for the 36-inch-diameter pipe). As noted above, bentonite drilling mud would be used to reduce friction and provide lubrication and buoyancy for the pipe during the pull back, assuring minimal contact with the walls of the drill hole.[9] An abrasion-resistant overcoat would be applied to the FBE coating on the pipe joints designated for HDDs. This overcoat prevents damage to the corrosion resistant FBE coating as the pipe is pulled through the bored hole. After installation, Keystone would conduct CP and in-line inspection surveys to determine if any damage may have resulted to the pipe coating during the construction process.

Most leaks of HDD drilling fluids occur near the entry and exit locations for the drill and are quickly contained and cleaned up. There is a potential for HDD frac-outs (accidental releases of pressurized drilling mud from the borehole) to occur during construction. A frac-out could release bentonite drilling mud into the aquatic environment. Bentonite is non-toxic; the released drilling mud would disperse in flowing water or eventually settle in standing water. Frac-outs that may release drilling fluids into aquatic environments are difficult to contain primarily because bentonite readily disperses in flowing water and quickly settles in standing water. Further discussion of frac-outs is presented in Section 4.3, Water Resources; Section 4.4, Wetlands; Section 4.7, Fisheries; and Section 4.8, Threatened and Endangered Species and Species of Conservation Concern.

2.1.9.3 Wetland Crossings

Construction across wetlands would be similar to typical conventional upland cross-country construction, with modifications to reduce the potential for effects to wetland hydrology and soil structure. The wetland crossing methods used would depend largely on the stability of the soils at the crossing location at the time of construction. The 110-foot pipeline construction corridor width would be reduced to 85 ft for wetlands in Montana and Nebraska, and 75 ft for wetlands in South Dakota, unless conditions require a wider construction corridor. In instances where the wetland is supersaturated or inundated, the corridor ROW may be increased to ensure safe construction conditions. The permanent ROW would be 50 ft in all three states.

If wetland soils are not excessively saturated at the time of construction and could support construction equipment without equipment mats, construction would occur in a manner similar to conventional upland cross-country construction techniques. Low ground pressure equipment or conventional equipment supported by pre-fabricated matting would be used in all wetlands. Where wetlands are located at the base of slopes, permanent slope breakers would be constructed across the ROW in upland areas adjacent to the wetland boundary. Temporary sediment barriers would be installed where necessary until revegetation of adjacent upland areas is successful. Additional TWAs would be required on both sides of saturated or inundated wetlands to stage construction, fabricate the pipeline, and store materials. These additional TWAs would be located in upland areas a minimum of 10 ft from the wetland edge. More information is located in the Site-Specific Waterbody Crossing Plans located in the CMRP (Appendix G) with recommended modifications to the CMRP provided in Section 4.4.4, Additional Mitigation.

[9] See Section 4.3, Water Resources.

Clearing of vegetation in wetlands within the construction corridor would be limited to trees and shrubs, which would be cut flush with the surface of the ground, leaving the root stock in place, and removed from the wetland. Scrub-shrub and forested communities would be allowed to regenerate outside of the mowed operations ROW, and in areas where HDD was used to span open water areas. To avoid excessive disruption of wetland soils and the native seed and rootstock within the wetland soils, stump removal, grading, topsoil segregation, and excavation would be limited to the area immediately over the trench line to the maximum extent practicable. Trench breakers would be installed where necessary to prevent the subsurface drainage of water from wetlands. Trench width may vary in some wetlands to provide an even, safe work area, which depends upon topography, soil moisture content, and groundwater levels. Steep topography may require additional disturbance to create an even safe work area. Saturated soils usually require a wider trench in order to maintain a safe ditch and to avoid unstable trench walls. During clearing, sediment barriers, such as silt fence and staked straw bales, would be installed and maintained on down slopes adjacent to all wetlands and within additional TWAs, as necessary, to minimize the potential for sediment runoff.

Construction equipment working in all wetlands would be limited to the area essential for clearing the ROW, excavating the trench, fabricating and installing the pipeline, backfilling the trench, and restoring the ROW. Where wetland soils are supersaturated or inundated, the pipeline could be installed using the push-pull technique. The push-pull installation process 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. 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 saturated wetlands would be coated with concrete or installed with set-on weights to provide negative buoyancy. The criteria used to determine pipe selection are based on site-specific conditions, ease of implementation, and practicality of implementing the installation method.

Following installation of the pipeline, subsoils (clays and gravel/cobbles) would be backfilled first followed by the topsoil. Restoration of contours would be accomplished during backfilling. No grading would occur in wetlands and the soil surface would be roughed to enhance seed germination. Soil strata would be restored above the pipeline to replicate original conditions. Topsoil would be replaced to the original ground level leaving no crown over the trench line. Excess excavated material would be removed from the wetland and spread along the upland ROW, placed in a location as requested by a landowner, or disposed of at an existing authorized landfill. Equipment mats, gravel fill, geotextile fabric, and straw mats would be removed from wetlands after backfilling except in the travel lane to allow continued, controlled access through the wetland until the completion of construction. Once revegetation is successful, sediment barriers would be removed from the ROW and disposed of at an existing authorized landfill. In wetlands where no standing water is present, the construction ROW would be seeded to supplement regenerated growth from root stock from original excavation of soils, in accordance with the recommendations of the USACE, local soil conservation authorities, or land management agencies.

2.1.10 Construction Schedule, Workforce, and Environmental Inspection

2.1.10.1 Schedule and Workforce

Construction of the proposed Project would begin if Keystone obtains all necessary permits, approvals, and authorizations. Keystone anticipates that the proposed Project would be placed into service approximately 2 years after receiving such authorizations. As currently planned, the proposed Project would be constructed using 10 spreads of approximately 46 to 122 miles long (see Table 2.1-13). Final spread configurations and the final construction schedule may result in the use of more or fewer spreads than those indicated.

Keystone anticipates a peak workforce of approximately 5,000 to 6,000 construction personnel. These personnel would consist of Keystone employees, contractor employees, construction inspection staff, and environmental inspection staff. All workers would be trained and certified, as appropriate, for their specific field of work (e.g., welders would be qualified as required by 49 CFR 195.222 and PHMSA Special Condition 18).

Keystone, through its construction contractors and subcontractors, would attempt to hire temporary construction staff from the local population. Assuming that qualified personnel are available, approximately 10 percent (90 to 130 people per spread) could be hired from the local workforce for each spread, although this may not be possible in rural areas or areas with low unemployment.

Cross-country pipeline construction would typically proceed at a pace of approximately 20 constructed miles per calendar month per spread. Construction would occur in the following approximate sequence:

- Two to three weeks (14 to 21 calendar days) of work on the ROW prior to the start of production welding. Activities would include clearing, grading, stringing, and ditching.
- Production welding at an average rate of 1.25 miles of pipe welded per working day over a 6-day work week (over 7 calendar days), resulting in completion of an average of about 7.5 miles of pipeline per week.
- Seven weeks (49 calendar days) of additional work after completion of production welding. Activities would include nondestructive testing, field joint coating, pipe installation, tie-ins, backfill, ROW clean-up, hydrostatic testing, reseeding, and other ROW reclamation work.

Those time periods and rates of progress were used as the basis for determining the duration of construction activities on the ROW presented in Table 2.1-18 for various spread lengths. Construction in areas with greater congestion or higher population, in industrial areas, or in areas requiring other special construction procedures could result in a slower rate of progress. In addition, approximately 1 month would be required for contractor mobilization before the work is started and 1 month would be required for contractor demobilization after the work is finished.

Table 2.1-18 Representative Cross-Country Construction Times Based on Estimates of Schedule

Spread Length	Pre-welding	Welding Time	Post-welding and Clean-up	Total Duration
80 miles	21 days	75 days	49 days	145 days (21 weeks)
90 miles	21 days	84 days	49 days	154 days (22 weeks)
100 miles	21 days	94 days	49 days	164 days (24 weeks)
120 miles	21 days	112 days	49 days	182 days (26 weeks)

2.1.10.2 Environmental Inspection

Keystone would use environmental inspectors on each construction spread. The environmental inspectors would review the proposed Project activities daily for compliance with state, federal, and local regulatory requirements and would have the authority to stop specific tasks. The inspectors would also be able to order corrective action in the event that construction activities violate the provisions of the CMRP, landowner requirements, or any applicable permit requirements.

2.1.11 Operations and Maintenance

The proposed Project would be operated, maintained, monitored, and inspected in accordance with 49 CFR 194 and 195 and other applicable federal and state regulations. Keystone has also agreed to incorporate PHMSA Project-specific special conditions that address proposed Project operation, inspection, and monitoring (see Appendix B, Potential Releases and Pipeline Safety). The operational requirements of 49 CFR 195 and the PHMSA Project-specific Special Conditions related to operation of the proposed Project (see Appendix B, Potential Releases and Pipeline Safety) would be included in the proposed Project operations, maintenance, and emergencies manual that would be required by 49 CFR 195.402, and they would also be incorporated into Keystone's existing Operations Control Center (OCC) in Calgary, Canada. The remainder of this section addresses normal operation, routine maintenance, and abnormal operations.

2.1.11.1 Normal Operations and Routine Maintenance

Keystone would prepare the manuals and written procedures for conducting normal operations, maintenance, inspection, and monitoring activities as required by the PHMSA regulations, particularly as required by 49 CFR 195.402 and in the applicable PHMSA Project-specific special conditions (see Appendix B, Potential Releases and Pipeline Safety). This would include development and implementation of an annual Pipeline Maintenance Program to ensure the integrity of the pipeline. The Pipeline Maintenance Program would include valve maintenance, periodic inline inspections, and CP readings to ensure facilities are reliable and in service. Data collected in each year of the program would be incorporated into the decision-making process for the development of the following year's program. The proposed Project OCC would be manned by experienced and highly trained personnel 24 hours per day, every day of the year in Calgary, Canada. In addition, a fully redundant backup OCC has been constructed and is also being operated and maintained in Canada. Primary and backup communications systems would provide real-time information from the pump stations to field personnel. The control center would have highly sophisticated pipeline monitoring systems including a leak detection system capable of identifying abnormal conditions and initiating visible and audible alarms. Automatic shut-down systems would be initiated if a valve starts to shut and all pumps upstream would turn off automatically. All other pipeline situations would require human response.

The proposed Project would include a supervisory control and data acquisition (SCADA) system to constantly monitor the pipeline system. The SCADA system would be installed and operated in accordance with the requirements of 49 CFR 195 and PHMSA Project-specific special conditions 24 through 31 (see Appendix B, Potential Releases and Pipeline Safety). SCADA facilities would be located in the OCC and along the pipeline system, and all pump stations and delivery facilities would have communication software that sends data back to the OCC. The pipeline SCADA system would allow the OCC to remotely read IMLV positions, tank levels, and delivery flow and total volume. The OCC personnel would also be able to start and stop pump stations and open and close MLVs. SCADA systems are further discussed in Sections 2.1.11.1, Normal Operations and Routine Maintenance, and 4.13, Potential Releases.

The pipeline will run at elevated temperatures that are higher than ambient temperatures. According to the National Academy of Sciences Transportation Research Board Special Report 311 (Transportation Research Board 2013), diluted bitumen and other heavy crude oils have similar densities and viscosities and flow through pipelines at similar rates and within comparable temperatures and pressures ranges.

The pipeline ROW would be inspected via aerial surveillance to provide prompt identification of possible encroachments or nearby construction activities, ROW 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 to exceed 3 weeks as required by 49 CFR 195.412. Landowners would be encouraged to report any pipeline integrity concerns to Keystone or to PHMSA. IMLVs and MLVs at pump stations would also be inspected. As required by 49 CFR 195.420(b), they would be inspected at intervals not to exceed 7.5 months, but at least twice each calendar year.

PHMSA regulations at 49 CFR 195.450 and Special Condition 14 require that pipeline operators identify areas along the proposed pipeline corridor that would be considered High Consequence Areas (HCAs). While some of these areas need to be defined through sophisticated risk modeling, in general they are specific locales where an accidental spill from a hazardous liquid pipeline could produce significant adverse consequences as described in 49 CFR 195.450.

HCAs include navigable waterways, high population areas, and unusually sensitive areas. Keystone would need to identify the HCAs along the proposed route. Population changes along the route would be monitored throughout pipeline operation and any additional HCAs identified as necessary. Keystone would conduct a pipeline integrity management program in HCAs as required by 49 CFR 195.452 (Pipeline Integrity Management in HCAs).

All maintenance work would be performed in accordance with PHMSA requirements, the applicable PHMSA Special Conditions, and the stipulations in environmental permits issued for the proposed Project. Woody vegetation along the permanent easement would be cleared periodically in order 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. Cultivated crops would be allowed to grow in the permanent easement, but trees would be removed from the permanent ROW except in areas using the HDD method, where trees would be cleared on a site-specific basis. Permanent erosion control devices would be monitored to identify any areas requiring 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 be monitored to identify any areas where soil productivity has been degraded as a result of pipeline construction. In these areas, reclamation measures would be implemented to rectify the problems.

Operation and maintenance of the proposed pipeline system would typically be accomplished by Keystone personnel. The permanent operational pipeline workforce would be about 50 employees, comprising 35 Keystone employees plus 15 contract workers.

2.1.11.2 Abnormal Operations

Keystone would implement Abnormal Operating Procedures in accordance with 49 CFR Section 195.402(d). Those procedures would be developed and documented in a manual as required by 49 CFR 195.402. The manual would include procedures to provide safety when operating design limits have been exceeded. That would include investigating and correcting the cause of unintended closure of valves or shutdowns, increases or decreases in pressure or flow rate outside normal operating limits, loss of communications, operation of any safety device, and any other malfunction of a component, deviation from normal operation, or personnel error which could cause a hazard to persons or property. Procedures would also include checking variations from normal operation after abnormal operation has ended (i.e., checking at sufficient critical locations in the system to accomplish the following):

- Assure continued integrity and safe operation;
- Identify variations from normal operation of pressure and flow equipment and controls;
- Notify responsible operator personnel when notice of an abnormal operation is received;
- Review periodically the response of operator personnel to determine the effectiveness of the procedures controlling abnormal operation; and
- Take corrective action where deficiencies are found.

The operations manager on duty would be responsible for executing abnormal operating procedures in the event of any unusual situation.

Pipeline Integrity, Supervisory Control and Data Acquisition, and Leak Detection

The following overlapping and redundant integrity systems and measures would be incorporated into the proposed Project:

- Quality Assurance program for pipe manufacture and pipe coating;
- FBE coating;
- CP;
- Non-destructive testing of 100 percent of the girth welds;
- Hydrostatic testing;
- Periodic internal cleaning and high-resolution in-line inspection;
- Depth of cover exceeding federal standards;
- Periodic aerial surveillance;

- Public awareness program;
- SCADA system; and
- An OCC with complete redundant backup, providing monitoring of the pipeline every 5 seconds, 24 hours per day, every day of the year.

SCADA facilities would be used to remotely monitor and control the pipeline system. This would include a redundant fully functional backup OCC available for service at all times. Automatic features would be installed as integral components within the SCADA system to ensure operation within prescribed pressure limits. Additional automatic features would be installed at the local pump station level and would provide pipeline pressure protection in the event communications with the SCADA host are interrupted. Software associated with the SCADA monitoring system and volumetric balancing would be used to assist in leak detection during pipeline operations. If pressure indications change, the pipeline controller would immediately evaluate the situation. If a leak is suspected, the ERP would be initiated, as described below. If there is a pipeline segment shutdown due to a suspected leak, operation of the affected segment would not be resumed until the cause of the alarm (e.g., false alarm by instrumentation, or a leak) is identified and repaired. In the case of a reportable leak, PHMSA approval would be required to resume operation of the affected segment. A number of complementary leak detection methods and systems would be available within the OCC and would be linked to the SCADA system.

Remote monitoring would consist primarily of monitoring pressure and flow data received from pump stations and valve sites that would be fed back to the OCC by the SCADA system. Software-based volume balance systems would monitor receipt and delivery volumes and would detect leaks down to approximately 5 percent of pipeline flow rate. Computational Pipeline Monitoring or model-based leak detection systems would separate the pipeline system into smaller segments and would monitor each segment on a mass balance basis. These systems would detect leaks down to a level of approximately 1.5 to 2 percent of the pipeline flow rate. Computer-based, non-real time, accumulated gain/loss volume trending would assist in identifying low rate or seepage leaks below the 1.5 to 2 percent by volume detection thresholds. If any of the software-based leak detection methods indicates that a predetermined loss threshold has been exceeded, an alarm would be sent through SCADA and the Controller would take corrective action. The SCADA system would continuously poll all data on the pipeline at an interval of approximately 5 seconds.

If an accidental leak were to occur, the operator would shut down operating pumping units and close the isolation valves. Once shutdown activities are initiated, it would take approximately 9 minutes to complete the emergency shut-down procedure (shut down operating pumping units) and an additional 3 minutes to close the isolation valves.

In addition to the SCADA and complementary leak detection systems, direct observation methods, including aerial patrols, ground patrols and public and landowner awareness programs, would be implemented to encourage and facilitate the reporting of suspected leaks and events that could suggest a threat to the integrity of the pipeline.

Keystone has committed to keep abreast of the latest developments in external leak detection technologies (above and beyond those already proposed to be implemented, as described) that could be installed along the pipeline at sensitive locations. In Nebraska, Keystone would report to, and discuss with, the Nebraska Department of Environmental Quality (NDEQ) the status of innovation in such pipeline leak detection equipment and the methods on or before January 1, 2014, and at such additional times thereafter until 2024 as the NDEQ shall specifically request, but in no case more frequently than once every 3 years. Keystone's South Dakota Public Utilities Commission Order contains a requirement to monitor leak detection technology developments and to report to the Public Utilities Commission. There is no comparable requirement in Montana, but Keystone has stated their willingness to adopt a similar requirement in that state.

Emergency Response Procedures

PHMSA requires that pipeline operators prepare and abide by both the PSRP and the ERP for responding to emergencies on their systems. 49 CFR 194 requires that pipeline operators have response plans that ensure resources are available to remove, mitigate, or prevent a discharge from an oil pipeline that could cause substantial or significant harm to the environment, including a worst case discharge. As stated in 49 CFR 194.7(a), a pipeline operator "may not handle, store, or transport oil unless the operator has submitted a response plan meeting requirements of this part," and as stated in 49 CFR 194.7(b), operators must also operate onshore pipeline facilities in accordance with the approved response plan. In addition, 49 CFR 194.107 requires that the response plan include "procedures and a list of resources for responding, to the maximum extent practicable, to a worst case discharge, and to a substantial threat of such a discharge."

Keystone would determine the optimal location of spill response equipment, taking into account response times to sensitive areas and receptors. These spill response locations would be reflected in the ERP that would be submitted to PHMSA for review and approval.

Keystone would submit a PSRP to PHMSA prior to initiation of proposed Project operations in accordance with the requirements of 49 CFR 194. The PSRP would describe how spills would be responded to in the event of a release from the proposed Project resulting from any cause (e.g., corrosion, third-party damage, natural hazards, materials defects, hydraulic surge). The plan would address 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 operations could proceed, thus allowing PHMSA time to review the document in light of as-built Project conditions and to require incorporation of any changes required by PHMSA to ensure system safety prior to PHMSA issuing final approval.

As required by 49 CFR 195.402, Keystone would also prepare and follow a manual of written procedures for conducting normal operations and maintenance activities and handling abnormal operations and emergencies. This manual would be reviewed by PHMSA at intervals not exceeding 15 months, but at least once each calendar year, and appropriate changes would be made as necessary to ensure that the manual is effective. This manual would be prepared before initial operations of the proposed Project and appropriate sections would be kept at locations where operations and maintenance activities are conducted. The emergency section of this operations and maintenance plan would be prepared by Keystone in a separate document that Keystone refers to as the ERP.

While USEPA has authority under the Clean Water Act and Oil Pollution Act of 1990 with respect to regulation of onshore non-transportation related facilities, and USEPA requires the development and submittal of a Facility Response Plan for any such facility, none of the facilities or activities associated with the proposed Project would be subject to the USEPA regulatory authority, as discussed below. Keystone would therefore be required to develop a PSRP for review and approval by PHMSA and an ERP for review by PHMSA for the proposed Project. PHMSA may request USEPA and U.S. Coast Guard consultation on the response elements of the PSRP. Based on a PHMSA advisory bulletin issued on November 3, 2010, Keystone would be required to share the ERP with local emergency responders in relevant jurisdictions along the proposed Project corridor. The bulletin notes that operators of gas and hazardous liquid pipeline facilities must make their pipeline ERPs available to local emergency response officials.

While the draft PSRP and the draft ERP for the proposed Project are not yet available, Keystone prepared similar plans for the existing Keystone Pipeline Project. These plans for the proposed Project would have the same general approach as those plans but would have many specific differences, such as the names and contact information for responders along the proposed Project route.

There have been concerns raised about the possibility of a spill from the proposed Project that would be comparable to the Kalamazoo spill in Marshall, Michigan. There are a number of reasons, discussed below, that this is not anticipated. Nevertheless, Keystone has indicated they would be prepared to respond to a spill of a similar magnitude and extent of the Marshall, Michigan, incident. Further, the lessons learned from the incident would be incorporated into Keystone's emergency management procedures.

Environmentally, the lessons learned from the Marshall, Michigan, dilbit spill behavior and related response implications include the following:

- The total volume of dilbit released to a river would not float on water indefinitely and dilbit characteristics, water temperature, and particulate load in the water could result in much of the oil being submerged in the water column.
- Submerged oil could be suspended in the water column, suspended just above the river bed, or intermixed with sediment and trapped in the river bed and shoreline.
- Submerged oil in a flowing water environment introduces additional recovery challenges for responders.
- Response action planning and response equipment to contain and recover submerged oil should be considered.
- Dilbit intermixed with sediment and trapped in the river bed and shoreline may result in a persistent source of oil and dissolved components such as benzene, polycyclic aromatic hydrocarbons, and heavy metals that could be slowly released back to the water column and transported down current.
- Dilbit intermixed with sediment could persist for years.

The pipeline involved in the Marshall, Michigan, incident was constructed in 1969. Pipeline standards have evolved and new technologies have resulted in improvements in pipeline safety performance. Pipelines are now constructed with higher quality steel that is stronger and has better fracture resistant properties and helps reduce the impacts of external forces, such as flooding and excavation damage. Improvements in external pipeline coatings, the use of cathodic protection, and mandatory in-line inspection tools have resulted in significant reductions in corrosion-related incidents. TransCanada has not experienced a corrosion-related failure on any of its pipelines that utilize modern FBE coatings. Federal pipeline regulations have evolved over time and pipeline operators are now required to actively manage their pipelines to reduce the possibility of incidents. Operating procedures and leak detection capabilities have improved to more quickly detect leaks, thereby minimizing the amount of crude oil released and reducing subsequent impacts.

Keystone would incorporate lessons learned throughout the life of the project in the following ways:

- PHMSA Advisory Bulletins: These items are incorporated in the applicable phase of the Project (e.g., design, construction, or operations) through modification of the Project's specific design requirements or construction scope of work, or incorporation into Keystone's Integrity Management Plan or Operations Manual.
- National Transportation Safety Board (NTSB) Accident Reports: Keystone reviews these draft and final reports for pertinent findings and incorporates them into design basis or procedures, if applicable.
- Industry Publications: Keystone has representation on all major Standards and Association Committees and incorporates the appropriate feedback into specification revisions for its pipeline assets, including Keystone, as appropriate through the Company's Engineering Standards group.
- PHMSA Special Conditions 25c and 43: These are examples of where NTSB accident reports and PHMSA advisory bulletins are incorporated into the proposed Project.

Keystone has reviewed the NTSB 2012 Marshall, Michigan Accident Report including the conditions that led to operational failures on the pipeline that resulted in the spill. Keystone has stated they would include lessons learned from this spill, including the following:

- Get big quick: timeliness of a tactical response to an oil spill into water is imperative. While Keystone has stated that it already uses this philosophy, the Kalamazoo spill reinforced this need to respond with as many resources as possible as quickly as possible. To that end, Keystone would strategically store equipment and employ personnel and contractors along the length of the pipeline to ensure a maximum 6-hour response time.
- Pre-qualify a large contractor network: Contractors would be used to supplement any response Keystone would make to an oil spill. By ensuring a large pool of trained/skilled contractors along the length of the pipeline have been pre-qualified and contracted with Keystone, the response time would be minimized and resources (equipment and personnel) available are maximized.
- Emergency response planning details need to include source containment: source containment plans including strategies and tactics would be included in the overarching ERP.

- Equipment resources required for sunken and submerged oil: Keystone would further identify equipment resources required to respond to sunken and submerged oil and ensure personnel are appropriately trained on the equipment. A primary strategy for oil spill response would still be to contain and recover as much oil as possible as quickly as possible to prevent oil from weathering and therefore potentially becoming submerged and sinking. In addition, Keystone already owns and practices the use of containment devices that would prevent downstream migration of submerged and sunken oil such as dams. This type of equipment would be further identified and procured for the proposed Project.

Keystone would also implement its own company standards and the PHMSA Special Conditions, which include operational requirements. In addition to company-specific standards that meet or exceed federal pipeline safety standards (e.g., typical burial depth of 4 ft of cover rather than the standard 3 ft depth of cover), incorporation of the PHMSA Special Conditions would result in a project that would have a degree of safety over other previously constructed domestic oil pipeline systems and a degree of safety along the entire length of the pipeline system similar to that which is required for HCAs. Further, the effect of applying the PHMSA Special Conditions is expected to have a sizable reduction in spill frequency (McSweeney et al. 2013). Both the company's internal standard and the PHMSA Special Conditions are intended to reduce the likelihood of a spill as well as the impact if a spill occurred.

Pipeline conditions along the proposed Project would be continuously monitored 24 hours a day, 7 days a week. The proposed Project would have over 16,000 sensors along its length and multiple, overlapping state-of-the-art leak detection systems.

While flood conditions are not a leading cause of pipeline failures, they could be a threat to pipeline integrity in certain locations. Under federal regulations (49 CFR Part 195), Keystone's Integrity Management Program is required to monitor and reduce risks from various threats, such as outside forces due to flooding. Keystone has evaluated stream crossings to identify those locations where stream scour could affect pipeline integrity. Where there is potential for significant stream scour, Keystone has increased burial depth so stream scour does not pose a threat to pipeline integrity. Additionally, under Special Condition 19, Keystone is required to maintain depth of cover for the life of the Project.

The publicly available portion of the Draft Keystone Oil Pipeline System ERP for the southern portion of the Keystone pipeline is included as Appendix I (parts of the ERP and the PSRP are considered confidential by PHMSA and the U.S. Department of Homeland Security). As described in Section 4.13, Potential Releases, the existing Keystone Oil Pipeline Project documents would be used as templates for the plans for the proposed Project. Project-specific information would be inserted into the plans as it becomes available. In addition, response equipment, including equipment and materials designated for containment and recovery of submerged oil, would be procured and strategically positioned along the route, staff would be trained in spill response and the Incident Command System, and emergency services and public officials would be educated on all aspects of the proposed Project and what their roles would be if an accidental leak were to occur. If a spill were to occur, Keystone and its contractors would be responsible for recovery and cleanup. PHMSA would require a certification from Keystone that necessary emergency response equipment is available in the event of an unplanned spill prior to providing Keystone with an authorization to begin operating the proposed Project.

The specific locations of Keystone's emergency responders and equipment would be determined upon conclusion of the pipeline detailed design, and described in the PSRP and ERP. Company emergency responders would be placed consistent with industry practice and with applicable regulations, including 49 CFR Parts 194 and 195. The response time to transfer additional resources to a potential leak site would follow an escalating tier system, with initial emergency responders capable of reaching all locations within 6 hours in the event of a spill for high volume areas; the spill response for all other areas is 12 hours. Typically, emergency responders would be based in closer proximity to the following areas:

- Commercially navigable waterways and other water crossings;
- Populated and urbanized areas; and
- Unusually sensitive areas, including drinking water locations, ecological, historical, and archaeological resources.

Keystone has informed the Department that it has contacted first responders along the mainline route as part of its stakeholder outreach program in advance of going into service. On an annual basis, at minimum, awareness information materials are delivered to local level emergency service agencies including fire, police, 911, county emergency managers, and Tribal agencies along the Keystone route. This includes operator information such as pipeline location, product awareness, how to recognize the signs of a leak, how to contact Keystone, and guidelines on how to respond. Keystone regularly partners with the communities in which it operates and supports emergency responder development. This has included donations of fire truck rigging, rope rescue equipment, trailers, and air bag kits. In select cases, Keystone would collaborate with dedicated hazmat teams to determine additional emergency response tactics they may undertake. Additional details can be found in Section 4.13, Potential Releases.

Types of emergency response equipment situated along the pipeline route would include project-owned and contractor-owned equipment such as pick-up trucks, one-ton trucks and vans; vacuum trucks; work and safety boats; containment boom; skimmers; pumps, hoses, fittings and valves; generators and extension cords; air compressors; floodlights; communications equipment including cell phones, two way radios, and satellite phones; containment tanks and rubber bladders; expendable supplies including absorbent booms and pads; assorted hand and power tools including shovels, manure forks, sledge hammers, rakes, hand saws, wire cutters, cable cutters, bolt cutters, pliers and chain saws; ropes, chains, screw anchors, clevis pins and other boom connection devices; personnel protective equipment including rubber gloves, chest and hip waders and airborne contaminant detection equipment; and wind socks, signage, air horns, flashlights, megaphones and fluorescent safety vests. Emergency response equipment would be maintained and tested in accordance with manufacturers recommendations. These materials would be stored in a trailer, as applicable, and at secured facilities; the locations would be determined once the system design is complete and the analysis of risk finalized. Additional equipment, including helicopters, fixed-wing aircraft, all-terrain vehicles, snowmobiles, backhoes, dump trucks, watercraft, bull dozers, and front-end loaders could also be accessed depending upon site-specific circumstances. Other types, numbers, and locations of equipment would be determined upon conclusion of the pipeline detailed design and the completion of the PSRP and the ERP for the proposed Project.

Several federal regulations define the notification requirements and response actions in the case of an accidental release, including the 40 CFR Part 300 (National Oil and Hazardous Substances Pollution Contingency Plan), the Clean Water Act, and Oil Pollution Act of 1990.If an accidental spill occurs, Keystone would implement several procedures to mitigate damage, including a line shut down. Other procedures would include immediate dispatch of a first responder to verify the release and secure the site. Simultaneously, an Incident Command System would be implemented and internal and external notifications would take place. The National Response Center would be notified if the spill meets one of the prescribed criteria. Keystone and the National Response Center would also notify other regional and local emergency response agencies as quickly as possible. All of this information would be included in the ERP for the proposed Project.

In the event of a suspected leak or if a spill is reported to the OCC, after verification there would be an emergency pipeline shutdown. Details on the type of verification to be used, what conditions are reported, and what magnitude release would trigger a shutdown are provided in Appendix I, SPCC and ERP**.** This would involve stopping all operating pumping units at all pump stations. The on-call response designate would respond to and verify an incident. Once the OCC notifies the individual and an assessment of the probability and risk is established, field personnel could dispatch other resources, based on spill size and location, as soon as practical to reduce response time. Response efforts would first be directed to preventing or limiting the spread of oil, in particular to areas that could result in the greater spread of oil (e.g., culverts, ditches) or to areas of health or environmental sensitivity (e.g., neighborhoods, waterways). Concurrently, the health and safety of the responders would be addressed.

Oil spills on the ground surface and some releases below grade potentially could ignite. A review of PHMSA data related to pipeline incidents indicates that most explosions occur in pipelines that are transporting highly flammable, highly volatile hydrocarbons such as natural gas, liquid propane gas, propane, gasoline, naphtha, or similar products. For an ignition to occur, produced vapors must be above the lower flammability limit of the vapor and sufficient oxygen and an ignition source must be present. Within a pipeline, oxygen conditions are too low and an ignition source is not present, so an explosion within the pipeline is unlikely. PHMSA data for onshore oil and hazardous material pipelines indicate that only 6 of 2,706 incidents (0.2 percent) that occurred from 1990 through 2009 were attributed to "fire/explosion as a primary cause." A search of available scientific and engineering literature for reports of crude oil pipeline explosions suggests that: 1) there are very few if any explosions in crude oil pipeline operation that were the result of a failure of the pipeline as a primary cause; and 2) the very few that have occurred are attributable to explosions in ancillary facilities or errors in operations unassociated with crude oil transportation.

An accidental crude oil spill from the pipeline or at a pump station would likely result in some hydrocarbon vapors, but the vapors would not be in confined spaces and therefore would be unlikely to explode. A fire associated with a release from a crude oil pipeline is documented as occurring at a rate of about 1 incident per approximately 540 million barrels of oil transported. In the event of a fire, local emergency responders would execute the roles listed above and more specifically in the PSRP and the ERP, and firefighters would take actions to prevent the crude oil fire from spreading to residential areas.

Remediation

Corrective remedial actions would be dictated by federal, state, and local regulations and enforced by the PHMSA Office of Pipeline Safety as well as appropriate state and/or local agencies. Required remedial actions may be large or small, dependent upon a number of factors including state mandated remedial cleanup levels, potential effects to sensitive receptors, the volume and extent of the contamination, whether or not there is a violation of water quality standards, and the magnitude of adverse impacts caused by remedial activities. A large remediation action could include one or more of a number of approaches (such as excavation of soil, pumping and treating ground water, or natural attenuation). However, the selection of a remedial measure would be in coordination and agreement with the appropriate regulatory agency.

If, during construction, tanks or contamination are found, they would be managed according to federal, state, and/or local regulations. Further, Keystone would make individuals available who are trained in identifying and disposing of hazardous materials during construction.

If there is an accidental release from the proposed Project, Keystone would implement the remedial measures necessary to meet the federal, state, and local standards that are designed to help ensure protection of human health and environmental quality. Additional information on remediation is presented in Section 4.13, Potential Releases.

2.1.12 Connected Actions

As defined by Council on Environmental Quality regulations, connected actions are closely related and therefore should be discussed in the same impact statement. Actions are connected if they meet the following requirements:

- Automatically trigger other actions that may require environmental impact statements;
- Cannot or will not proceed unless other actions are taken previously or simultaneously;
- Are interdependent parts of a larger action and depend on the larger action for their justification.[10]

There are three actions that are separate from the proposed Project, but are being reviewed as connected actions pursuant to NEPA. The three connected actions are the Bakken Marketlink Project, the Big Bend to Witten 230-kilovolt (kV) electric transmission line, and electric distribution lines and substations associated with the proposed pump stations.

Preliminary information on the design, construction, and operation of these projects is presented below. Although the permit applications for these projects would be reviewed and acted on by other agencies, the potential impacts of these projects have been analyzed in the Final Supplemental EIS based on currently available information and are addressed within each resource in Chapter 4, Environmental Consequences. However, in some cases only limited information was available on the design, construction, and operation of the projects. The reviews of permit applications by other agencies would include more detailed environmental reviews of the connected actions.

[10] For more information, see http://ceq.hss.doe.gov/nepa/regs/ceq/1508.htm.

2.1.12.1 Bakken Marketlink Project

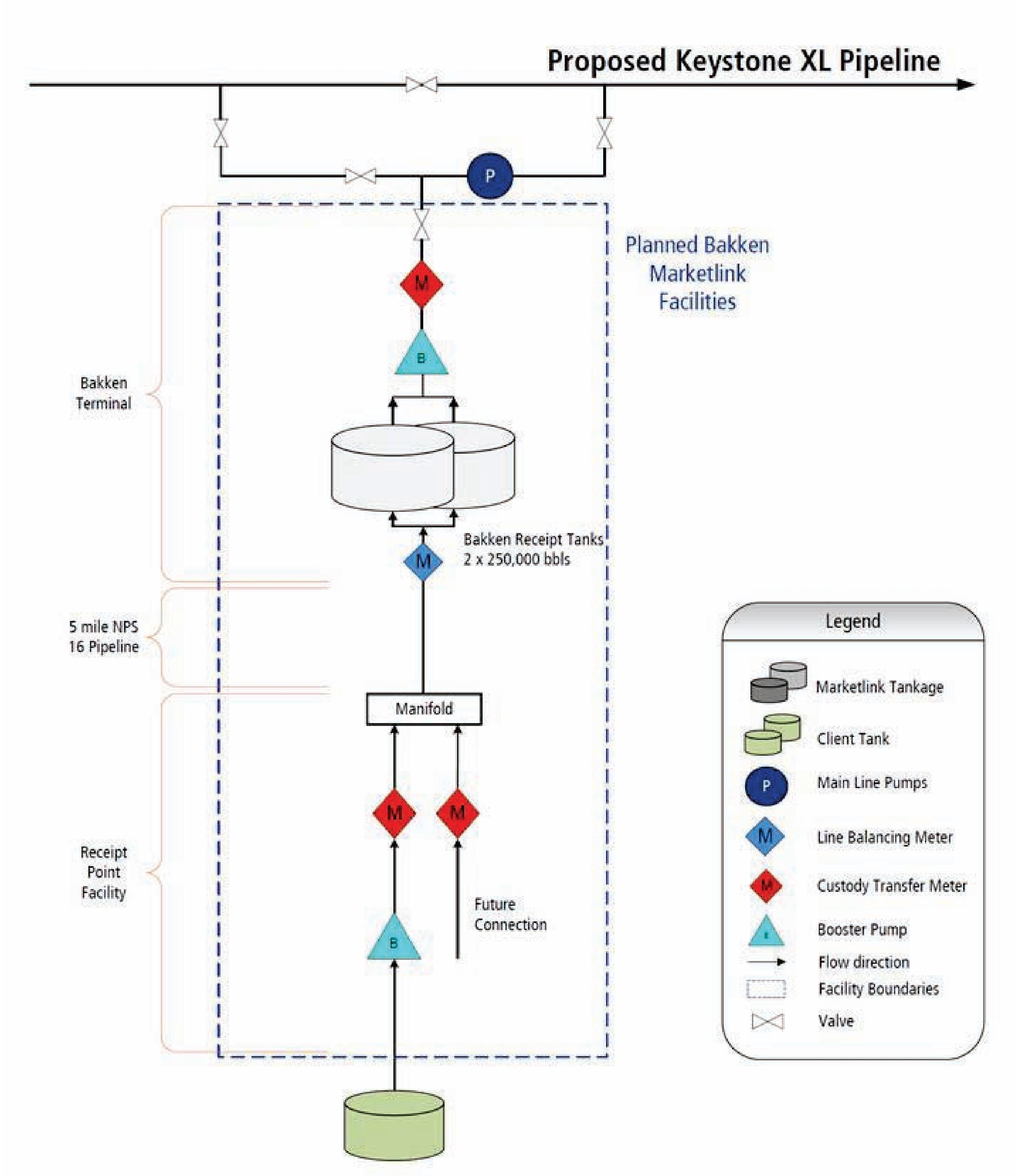
Keystone Marketlink, LLC, a wholly owned subsidiary of TransCanada Pipelines Limited, is proposing to construct and operate the Bakken Marketlink Project. The project would include construction of facilities to provide crude oil transportation service from near Baker, Montana, to Cushing, Oklahoma. Keystone Marketlink, LLC, obtained commitments for transport of approximately 65,000 barrels per day (bpd) of crude oil through the Bakken Marketlink Project. The Bakken Marketlink Project could deliver up to 100,000 bpd to Cushing, Oklahoma depending on ultimate shipper commitments.

The Bakken Marketlink facilities in Montana would consist of 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 (see Figures 2.1.12-1 and 2.1.12-2). Tanks at Baker would be external floating roof tanks. The facilities in Montana would also include a proposed NPS 16 pipeline that would be approximately 5 miles in length, originating south of pump station 14 at a third-party tank farm in Fallon County, and extending to the two accumulation tanks adjacent to the proposed pump station 14 (Figure 2.1.12-3). TransCanada Pipelines Limited held introductory meetings with state and local permitting agencies in 2011, and also held a meeting for potentially affected landowners along the route. Adjustments in the alignment are possible as a result of civil surveys, further landowner discussions, and permitting.

2.1.12.2 Big Bend to Witten 230-kV Transmission Line

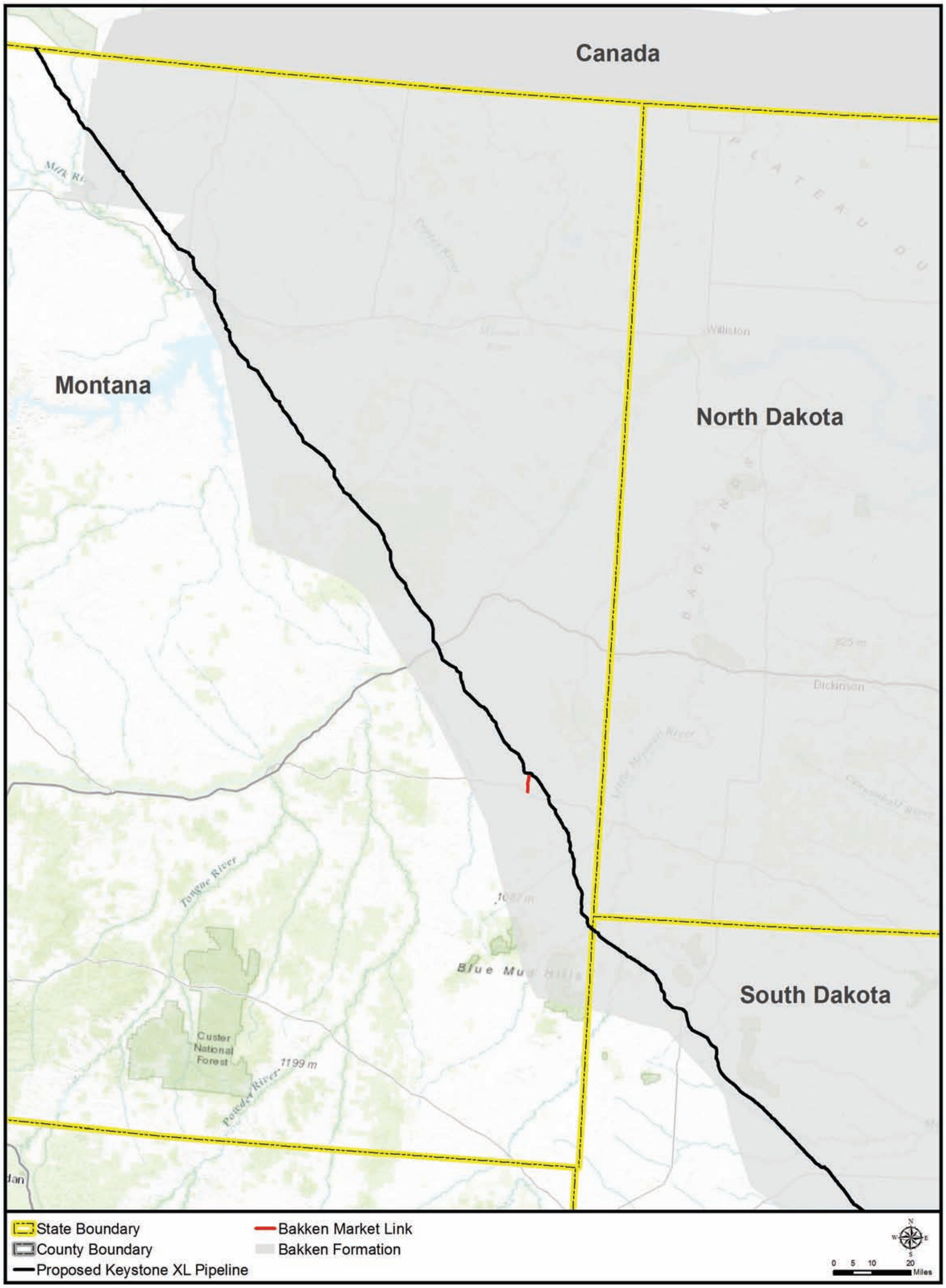
After receipt of information on the power requirements for the proposed pump stations in South Dakota, Western Area Power Administration (Western) conducted a joint system engineering study to determine system reliability under the proposed loads at full Project electrical energy consumption. Engineering studies determined that a 230-kV transmission line would be required to support voltage requirements for pump stations 20 and 21 in the Witten area when the proposed Project is operating at maximum capacity (Figure 2.1.12-4). To address this requirement, Western proposes to replace the existing Big Bend-Fort Thompson No. 2 230-kV Transmission Line Turning Structure located on the south side of the dam, construct a new double circuit 230-kV transmission line for approximately 1 mile south west of the dam, and construct a new Lower Brule Substation. These actions are part of the larger Big Bend to Witten 230-kV Transmission Line Project (i.e., the Lower Brule to Witten Transmission Line).

Basin Electric Power Cooperative (BEPC) is proposing to construct and operate a new single circuit 230-kV transmission line in south-central South Dakota that would extend from a new substation (Lower Brule Substation) south of the Big Bend Dam on Lake Sharpe approximately 74 miles south-southwest to the existing Witten Substation located south of U.S. Highway 18. The approximate 76-mile Big Bend to Witten 230-kV Transmission Project (Project) consists of the aforementioned elements. The new Big Bend to Witten 230 kV transmission line would be built, owned, and operated by BEPC. The Witten Substation would also need to be expanded to accommodate the new switching equipment associated with the Big Bend to Witten 230-kV transmission line (see Appendix J, Basin Electric Big Bend to Witten 230-kV Transmission Project Routing Report).



Source: exp Energy Services, Inc. 2012b

Figure 2.1.12-1 Bakken Marketlink, Baker, MT



Source: exp Energy Services, Inc. 2012b

Figure 2.1.12-2 Location of Bakken Marketlink Project

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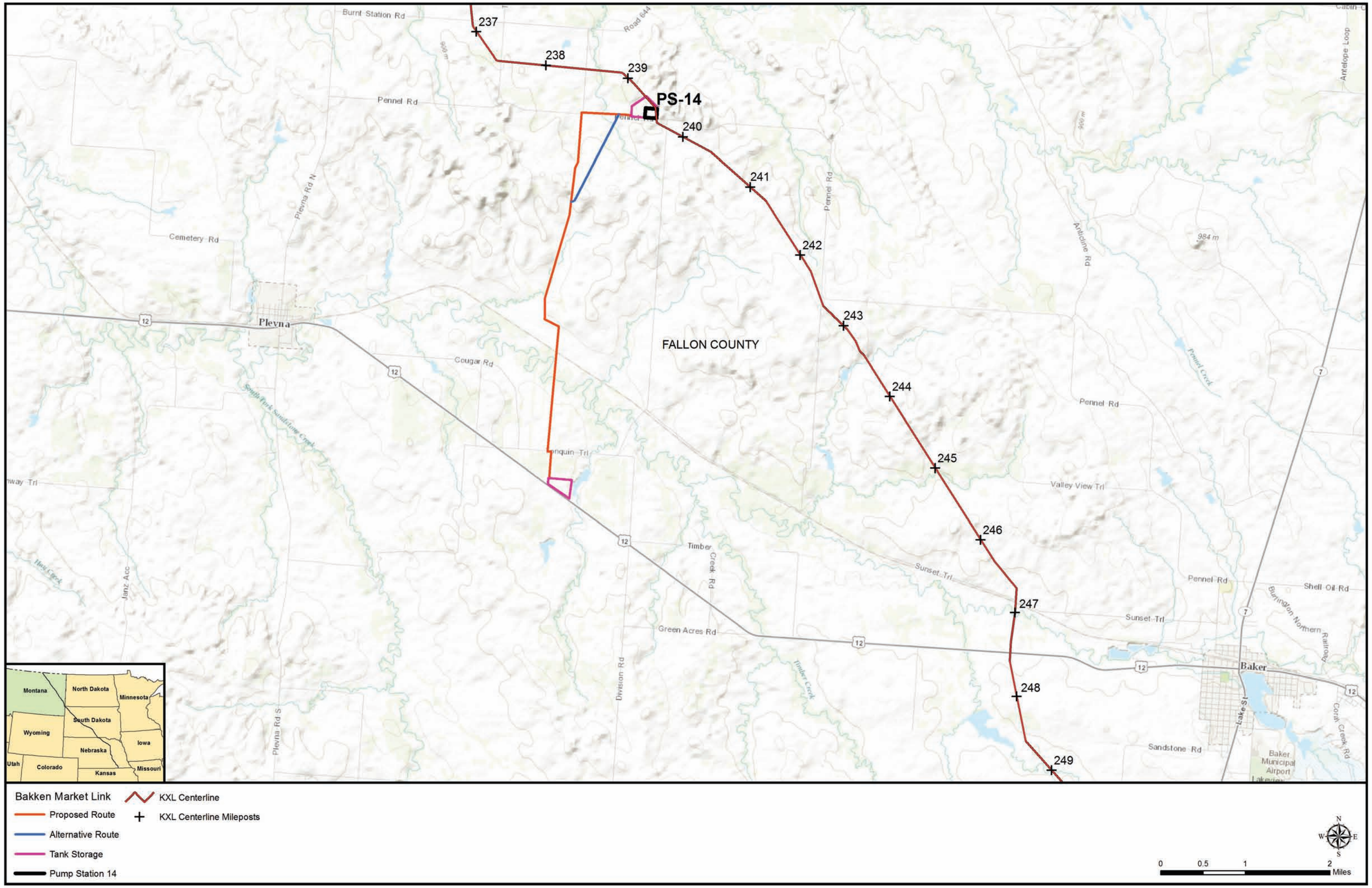

Source: Esri 2013, U.S. Geological Survey 2012

Figure 2.1.12-3 Bakken Marketlink Project Map

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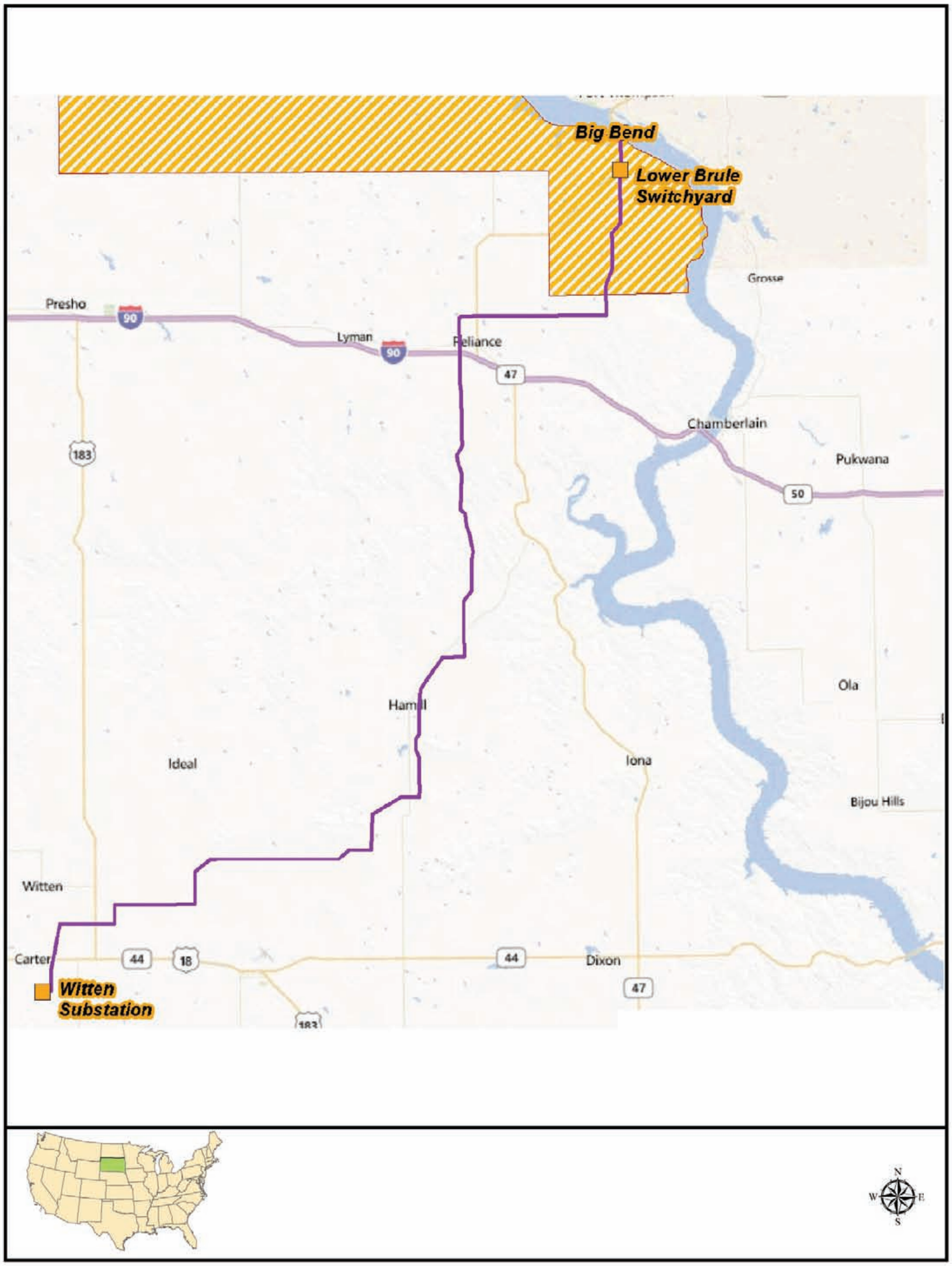

Source: Basin Electric Power Cooperative 2011 (Appendix J, Basin Electric Big Bend to Witten 230-kV Transmission Project Routing Report), Esri 2013

Figure 2.1.12-4 Big Bend to Witten 230-kV Line

The Project is located within Lyman and Tripp counties in south-central South Dakota. Approximately 6 miles of the single-circuit transmission line and all of the double-circuit transmission line, as well as Western's Lower Brule Substation, would be constructed on the Lower Brule Indian Reservation (see Figure 2.1.12-4). The proposed Lower Brule Substation would occupy approximately 16 acres of land. The existing Witten Substation would be expanded immediately to the northeast to accommodate the new 230-kV connection. The new part of the substation would have a separate access road and would be separated by a fence from the existing Witten Substation. Due to the proposed construction on the Lower Brule Indian Reservation, the lead federal agency for the National Historic Preservation Act of 1986 compliance, will be the U.S. Department of Agriculture's Rural Utility Service (RUS). RUS will consult with the Bureau of Indian Affairs to establish the appropriate government-to-government consultation in accordance with Tribal requirements and Bureau of Indian Affairs' tribal consultation policy.

BEPC has applied to RUS for financing and proposes to construct and operate the Project to meet existing and future electric power requirements in south central South Dakota. BEPC would interconnect the new transmission line to the existing Western transmission system. Under RUS regulations for implementation of NEPA, an Environmental Assessment with scoping is being prepared to assess potential impacts of the proposed action on the human and natural environment.

RUS is responsible for NEPA compliance and related statutes for the proposed Project. Since the Project would be constructed partly on the Lower Brule Indian Reservation, other cooperating agencies may be identified. RUS is the lead agency and Western is participating as the cooperating agency. Figure 2.1.12-4 shows the proposed route and two alternative routes currently under consideration in the Environmental Assessment process.

The proposed Project would transfer power from Western's transmission system near Big Bend Dam to Rosebud Electric Cooperative's Witten Substation, near Witten, South Dakota. It is anticipated that some communication facility additions or enhancements may be necessary for the Project, including communication towers and buildings at the Lower Brule Substation, Witten Substation, and other intermediate sites.

The proposed transmission structures would be steel single-poles and would be designed to support three conductors and an overhead optical ground wire. Tangent structures would be directly embedded into the soil and angle and dead-end structures would be constructed using concrete foundations. No guy wires are proposed. The design criteria for the portion of the line between the Big Bend Dam and the Lower Brule Substation are expected to be similar.

The proposed transmission line would be constructed within a 125-foot-wide ROW. All substation and switchyard work, including the placement of concrete foundations, erecting support structures, construction of control buildings, and the installation of electrical equipment would take place within secured areas. The proposed substation site at Big Bend and the expansion area at Witten would be cleared and leveled. Aggregate would be spread throughout undeveloped areas within the substation sites. Topsoil would be segregated from underlying soils and redistributed on disturbed areas outside the substation security fences. Soil erosion would be minimized during construction using best management practices. Substation components would be hauled to the site on local highways and roads and off-loaded using cranes and similar equipment. Concrete and aggregate from local sources would be hauled to the site by truck.

The potential impacts of construction and operation of the transmission line alternatives are addressed by resource area in multiple sections of Chapter 4, Environmental Consequences. Potential impacts associated with tribal reservation lands are discussed in Section 4.11, Cultural Resources. An additional and separate NEPA environmental review of the alternatives to the proposed transmission line would be conducted by the appropriate federal agency after the alternative routes are further defined. The design and environmental review of the proposed 230-kV transmission line are on a different schedule than the pipeline system itself. Regional transmission system reliability concerns are not associated with the initial operation of the proposed pipeline pump stations, but only for future operation at the maximum throughput volume of 830,000 bpd.

2.1.12.3 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 U.S. length of the pipeline. The private power companies providing the distribution lines are responsible for obtaining the necessary permits, approvals, or authorizations from Federal, state or local governments. These distribution lines range in length from about 0.1-mile to 62 miles in length, average about 13 miles long, and are estimated to extend about 377 miles, combined. The distribution lines to service pipeline pump stations would range in capacity from 69 kV to 240 kV, but the majority would have a capacity of 115 kV. Table 2.1-19 lists the electrical power supply requirements for the pump stations and Figures 2.1.1-3 and 2.1.1-4 depict the locations of the distribution lines. Most of the proposed new electrical distribution lines to service pump stations would be 115-kV lines strung a single-pole and/or H-frame wood poles. The poles would typically be about 60- to 80-ft high with wire span distances of about 250 to 400 ft.

To the extent practicable, Keystone will continue to coordinate with the local public power district to minimize potential impacts to landowners resulting from the construction of the new transmission lines to pump stations. These power providers would construct the necessary substations and transformers and would either use existing service lines or construct new service lines to deliver electrical power to the specified point of use. The electrical power providers would be responsible for obtaining the necessary permits, approvals, or authorizations from federal, state, and local governments, except in those instances in Montana where new service lines less than 10 miles in length would be constructed. Under Montana regulations, these distribution lines are considered “associated facilities” connected with the overall pipeline system. Review and approval under Montana law of the associated facilities occurred as part of the review and approval of Keystone’s Major Facility Siting Act application.

Table 2.1-19 Electrical Power Supply Requirements for Pump Stations

Pump Station No.	Milepost[a]	Transformer Size (Megavolt Amperes)	Kilovolts of Electricity	Estimated Electrical Line Length (miles)	Power Provider
Montana					
PS-09	1.2	20/27/33	115	61.8[b]	Big Flat Electric Cooperative
PS-10	49.3	20/27/33	115	49.1[c]	NorVal Electric Cooperative
PS-11	99.0	20/27/33	230	0.2	NorVal Electric Cooperative
PS-12	151.5	20/27/33	115	3.2	McCone Electric Cooperative
PS-13	203.1	20/27/33	115	15.2	Tongue River Electric Cooperative
PS-14	239.5	20/27/33	115	6.3	Montana-Dakota Utilities Company
South Dakota					
PS-15	288.6	20/27/33	115	24.5	Grand Electric Cooperative
PS-16	337.3	20/27/33	115	40.1	Grand Electric Cooperative
PS-17	391.5	20/27/33	115	10.9	Grand Electric Cooperative
PS-18	444.6	20/27/33	115	25.9	West Central Electric Cooperative
PS-19	500.4	20/27/33	115	20.4	West Central Electric Cooperative
PS-20	550.9	20/27/33	115	17.2	Rosebud Electric Cooperative
PS-21	598.9	20/27/33	115	20.1	Rosebud Electric Cooperative
Nebraska					
PS-22	TBD	20/27/33	115	24	Niobrara Valley Electric
PS-23	TBD	20/27/33	115	36	Loup Valleys Rural PPD
PS-24	TBD	20/27/33	115	9	Southern Power District
PS-25	TBD	20/27/33	69	0.1	Perennial PPD
PS-26	875.3	20/27/33	115	0.5	Norris PPD
Keystone Cushing Extension					
Kansas					
PS-27	49.0*	20/27/33	115	4.6	Clay Center Public Utility
PS-29	144.5*	20/27/33	115	8.9	Westar Energy

[a] Mileposting for each segment of the proposed Project start starts at 0.0 at the northernmost point of each segment and increases in the direction of oil flow.
[b] Extends across approximately 32 miles of federal land.
[c] Extends across approximately 4.8 miles of federal land.

In Montana and South Dakota, the following are Western's actions directly related to commercial electrical service for the proposed Project pump stations:

- Bowdoin Substation, Phillips County, Montana: Pump Station 9 would be served by Big Flat Electric Cooperative (Big Flat). The interconnection point would be at a new Western Area Power Administration (Western) owned and operated substation named Bowdoin on its existing Fort Peck-Havre 161-kV line. The new substation would consist of a Western owned three breaker 230-kV ring bus and 115-kV capacitor banks and associated bays. It would also include two Big Flat owned power transformers, high and low side transformer interrupters, and a 115-kV line bay. Big Flat would construct approximately 55 miles of 115-kV transmission line that would connect the new Bowdoin Substation to the existing Math Substation which would directly serve Pump Station 9. Land acquisition for the new Bowdoin Substation would be by Bureau of Land Management (BLM) withdrawal and would be completed by Keystone.
- Fort Peck Substation, McCone County, Montana: Western would expand its existing Fort Peck substation to serve Norval Electric Cooperative (Norval) who would distribute electrical service to Pump Station 10. The substation expansion would include the construction of a 115-kV breaker bay on the south side of the substation. Land acquisition for the substation expansion would be completed by Western.
- Coal Hill Substation, McCone County, Montana: Western would construct a new 230-kV switching station directly adjacent to Pump Station 11. The new Western owned switchyard would be named Coal Hill, and would be configured in a three breaker ring configuration, with a Norval owned 230/6.9-kV power transformer. Norval would distribute electrical service to Pump Station 11. Keystone would acquire the necessary land and transfer ownership to Western.
- Circle Substation, McCone County, Montana: Western previously converted an existing 115-kV single substation configuration to a main-and-transfer substation configuration to accommodate unplanned load growth unrelated to the proposed Project. At the same time, Western replaced a 115/34.5-kV transformer and installed two 8-MVAR shunt capacitor banks. Western's unrelated substation expansion would accommodate an interconnection point in the 115-kV bus for McCone Electric Cooperative to serve the Pump Station 12 load. No additional land acquisition would be required.
- O'Fallon Substation, Prairie County, Montana: Western would expand their existing O'Fallon Substation and construct a new 115-kV breaker bay to accommodate Tongue River Electrical Cooperative's service to Pump Station 13. Land acquisition for the substation expansion would be completed by Western.
- Philip Substation, Haakon County, South Dakota: Western's Phillip Substation would require an expansion with a new 115-kV bay addition and two 20 MVAR capacitor banks. The expansion would accommodate West Central Electric Cooperative's service to Pump Station 18. A slight yard expansion onto property already owned by Western accommodated a new 230-kV breaker addition unrelated to the proposed Project, and provided enough room to install the new Central Electric Cooperatives facilities. No additional land acquisition would be required.

- Midland Substation, Haakon County, South Dakota: Western's existing Midland Substation would require expansion for a new 115-kV bay to accommodate West Central Electric Cooperatives service to Pump Station19. Construction of this interconnection would require a small yard expansion to the east. Land acquisition for the substation expansion would be completed by Western.
- Gregory Substation, Gregory County, South Dakota: Western would expand its Gregory Substation with a new 115kV switchyard adjacent to the existing and aging facilities. In order to accommodate Rosebud Electric Cooperative's request for serving Pump Station 2, Western would be required to construct a new six-position main-and-transfer sub, including eight 15-kV power circuit breakers, two 10 MVAR capacitor banks, and take-off structures, reposition the existing 115/12.47 power transformer, and install new control building controls and relays. Land acquisition for the substation expansion would be completed by Western.

Locations of four of the five new pump stations in Nebraska have not yet been finalized, and the details regarding the distribution lines have not yet been determined. It is expected that the siting and construction of these lines would be similar to those in Montana and South Dakota.

In each of the states, the pump stations would have a substation integrated into the general pump station layout. The exact location of each substation cannot be identified at this time because the electrical supply lines would access pump stations from different alignments. Each substation footprint would be approximately 1 to 1.5 acres and is included in the total land size of each pump station. The actual size of a substation would be dictated by the specific design and size requirements of the local power supply company, the capacity of the power supply lines connected to each specific pump station, and the associated equipment. Figures 2.1.4-1 and 2.1.7-3 provide typical layouts for substations and pump stations.

Other electrical power requirements, such as power for MLVs, would be supplied from distribution service drops from adjacent distribution power lines with voltage below 69 kV. Each distribution service drop would typically be less than 200-ft long, and would require the installation of one or two poles and a transformer. The electric utility would typically install a pole-mounted transformer within 200 ft of the valve site location. However, in some cases the electric utility would install the transformer on an existing pole, which would be more than 200 ft from the valve site. The decision on where the transformer pole would be located would generally be based on the most economical installation. For example, MLVs north of the Milk River in Montana would be supplied from transformers on poles along small lines that currently supply power to irrigation systems. Upon completion of the new service drops, the electrical power providers would restore the work area as required, in accordance with local permits.

Preliminary routing for new electrical distribution lines was established in consultation with each utility company. Where practicable, these preliminary routes were along existing county roads, section lines, or field edges, to minimize interference with adjacent agricultural lands. The routes are subject to change as pumping station supply requirements are further reviewed with power providers and in some cases, as a result of environmental review of the routes by the agencies with jurisdiction.

Electromagnetic induction is the production of an electric current across a conductor moving through a magnetic field. This is the way that electric motors, generators, and transformers work. Electromagnetic induction could occur from power lines, which could cause noise, radio, and television interference for people living nearby. This potential interference would be mitigated by siting the power line away from residences (500 ft minimum, if possible) and by routing the power line to reduce interferences. Power line interferences could be reduced in a number of ways by the power provider, including spring washers and specialized clamps to keep hardware tight, and using static conductors at the top of the power line poles to stop lightning. The radio communication systems at the proposed Project facilities would operate on specific frequencies licensed by the Federal Communications Commission to reduce the risk of any interference with radio, television, or any other communication system in the area.

Electric cooperatives (co-ops) in Montana obtain electricity from a variety of sources, including coal-fired power plants, hydroelectric plants, and at wind farms in the area. Many co-ops have service agreements with Western, Bonneville Power Administration, PPL Montana, and BEPC, some of which likely results in electrical energy being transported to Montana from many distant and varied sources. This energy flows primarily across transmission lines owned by Western and NorthWestern Energy to delivery points within the co-ops systems. The energy is delivered to the members/consumers through distribution lines, substations, and other related infrastructure.

As a result, it is not possible to identify the specific facilities or the specific sources of energy that would be used to generate the electricity that would be used at the pump stations and MLVs in Montana. Each of the co-ops involved has agreed to provide the necessary power and would likely request the additional power from their current providers. Any increase in power generation at the plants providing that power would have to be conducted in compliance with environmental regulations. If additional nonrenewable resources are needed to generate the additional, the provision of those resources would also have to be accomplished consistent with regulatory requirements.

Westar Energy proposes to build two new 115-kV transmission lines in Clay County, Kansas, as part of Westar's agreement to supply two new interconnection points to the Public Utility Commission of Clay Center's electrical system. The interconnections would also support the operation of the proposed Project.

As indicated previously, all distribution lines and substations would be installed and operated by local power providers. This work would include ROW acquisition, ROW clearing, construction, site restoration, cleanup, and obtaining any necessary permits, approvals, or authorizations from federal, state, and local governments. The proposed distribution lines would require a construction ROW and a permanent ROW. For routes not along a road or pipeline, 50 ft of new ROW would be required and the structures would be placed in the center of that easement. Where the line would be adjacent to roads or the proposed Project, a vertical construction would most likely be used, which would require only 30 ft of new ROW. The remaining 20 ft needed for line clearance would overlap the existing road or pipeline easement. The ROW widths would be 50 ft when not along an existing corridor. Each power provider would develop detailed power line construction procedures to address site specific conditions. In general, construction of the electrical distribution lines would involve the following:

- ROW Acquisition/Easements: The electric power provider would obtain any necessary easements.
- ROW Clearing: Limited clearing would be required along existing roads in native and improved grasslands and croplands. Either tree trimming or tree removal would be conducted to provide adequate clearance between the conductors and underlying vegetation.

- Power Line Construction: Power line poles and associated structures would be delivered on flatbed trucks. Radial arm diggers would typically be used to excavate the required holes. 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.
- Stringing: After the power line poles are in place, conductors (wires) would be strung between them. Pulling or reeling areas would be needed for installation of the conductor wires which would be attached to the poles using porcelain or fiberglass insulators.
- Restoration: After completion of distribution line construction, the disturbed areas would be restored. All litter and other remaining materials would be removed from the construction areas and disposed of in accordance with regulatory requirements. Preconstruction contours would be restored as closely as possible and reseeding would follow landowner requirements.

2.1.13 Proposed Project Decommissioning

2.1.13.1 Proposed Project Life

Keystone used a design life of 50 years to develop the engineering standards for the proposed Project. However, with implementation of the pipeline integrity management plan, the PHMSA Special Conditions developed by PHMSA (see Potential Releases and Pipeline Safety), and an operations and maintenance program as described above, Keystone anticipates that the life of the proposed Project would be much longer. Many other pipeline companies have safely extended the duration of pipeline systems by replacing sections of pipe after finding anomalies and by replacing or upgrading equipment and facilities at pump stations. All analysis was based on a 50 year design life.

2.1.13.2 Decommissioning

PHMSA has requirements that apply to the decommissioning of crude oil pipelines in 49 CFR Section 195.402(c)(10) and in 49 CFR 195.59 and 195.402. These regulations require that for hazardous liquid pipelines, the procedural manuals for operations, maintenance, and emergencies must include procedures for abandonment, including safe disconnection from an operating pipeline system, purging of combustibles, and sealing abandoned facilities left in place to minimize safety 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 contain all reasonably available information related to the facility, including information in the possession of a third party. The report must contain the location, size, date, method of abandonment, and a certification that the facility has been abandoned in accordance with all applicable laws.

TransCanada (the parent company of Keystone) would adopt operating procedures to address these requirements for the proposed Project as they have for previous pipeline projects including the existing Keystone Pipeline. TransCanada 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, subject to applicable regulatory approvals. When a pipeline or a segment of a pipeline is idled or deactivated, the pipe generally is purged of its contents, filed with an inert gas, and left in place with warning signage intact. CP would likely be left functional as would other integrity measures such as periodic inspections under the integrity management plan.

The proposed Project pipeline would traverse approximately 45 miles of federal land under the management and jurisdiction of the BLM. All of the federal land is in the state of Montana. The portion of the proposed Project that would cross BLM-administered land would be subject to the pipeline decommissioning and abandonment requirements stipulated in the BLM ROW grants and permanent easement permits. These requirements are:

- Boundary adjustments in oil and gas would automatically amend the ROW to include that portion of the facility no longer contained within the BLM lease/unit. In the event of an automatic amendment to this right-of way grant, the prior on-lease/unit conditions of approval of the facility would not be affected even though they would now apply to facilities outside of the lease/unit as a result of a boundary adjustment. Rental fees, if appropriate would be recalculated based on the conditions of this grant and the regulations in effect at the time of an automatic amendment.
- Prior to termination of the ROW, the lease holder would contact the authorized officer to arrange a predetermination conference. This conference would be held to review the termination provisions of the grant.
- Prior to termination of the ROW, the lease holder would contact the authorized officer to arrange a joint inspection of the right-of-way. This inspection would be held to agree to an acceptable termination (and rehabilitation) plan. This plan would include, but is not limited to, removal of facilities, drainage structures, or surface material, recontouring, topsoiling, or seeding. The authorized officer would approve the plan in writing prior to the holder’s commencement of any termination activities.

The ROW grant on federal lands under the management of BLM for the proposed Project would have a maximum term not-to-exceed 30 years. For the proposed Project to extend beyond 30 years, the approved ROW grant would require a renewal authorization-certification decision by BLM. While there are no state regulations applicable to pipeline decommissioning in Montana, South Dakota, or Nebraska, environmental specifications developed by Montana Department of Environmental Quality that would address reclamation of areas disturbed during abandonment would be required.

Decommissioning activities would have to be conducted consistent with all applicable regulatory requirements that are in place at the time of decommissioning. Since regulations at the federal, state, and local level change over time, it would be highly speculative to estimate what regulatory framework would apply to the proposed Project decommissioning at the end of the useful life of the proposed Project more than 50 years in the future.

Prior to decommissioning the proposed Project, 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. At that point, Keystone and the issuing agencies would address the environmental impacts of implementation of the decommissioning procedures and identify the mitigation measures required to avoid or minimize impacts.

It is likely that after decommissioning there would be fewer land use restrictions than during operation of the proposed Project since either the ROW would no longer have strict encroachment limitations for protection of the purged pipeline, or the pipeline may have been removed and there would no longer be limitations of use of the former ROW.

As noted above, PHMSA regulations require that hazardous liquids pipelines be purged of combustibles prior to decommissioning. Therefore, the potential for the release of contaminants from the decommissioned pipeline would be negligible.

2.1.14 References

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

exp Energy Services, Inc. 2012a. TransCanada Keystone XL Pipeline Project Supplemental Environmental Report for the Nebraska Reroute. Document Number KXL-TAL-1005-002. Tallahassee, FL. September 5, 2012.

___________. 2012b. TransCanada Keystone XL Pipeline Project Environmental Report. Document Number KXL-TAL-1005-002. Tallahassee, FL. September 7, 2012.

McSweeney, T., B.N. Leis, S. Mawalkar, M.C. Harley, K.R. Rine, and D.M. Sanzone. 2013. Risk Analysis of the Proposed Keystone XL Pipeline Route DRAFT. Battelle Memorial Institute, June 2013.

NDEQ. See Nebraska Department of Environmental Quality.

Nebraska Department of Environmental Quality. 2013. NDEQ-Identified Sand Hills Region: NDEQ Identifies Sandhills Regions to be Avoided in Alternative Pipeline Route. Website: http://www.deq.state.ne.us/Press.nsf/pages/PR122911. Accessed May 30, 2013.

National Transportation Safety Board (NTSB). 2012. Enbridge Incorporated. Hazardous Liquid Pipeline Ruptured and Release. Marshall, Michigan, July 25, 2010. Accident Report. NTSB/PAR-12/01, PB2012-916501. July 10, 2012.

NTSB. See National Transportation Safety Board.

TransCanada Keystone Pipeline LP (TC). 2012. Application to the Department of State for a Presidential Permit. May 4, 2012.

Transportation Research Board. 2013. Special Report 311: Effects of Diluted Bitumen on Crude Oil Transmission Pipelines. Washington D.C.: National Academies Press. Website: http://www.nap.edu/openbook.php?record_id=18381&page=R1. Accessed December 2013.

USEPA. 1991. Technical Guidance – Stage II Vapor Recovery Systems for Control of Vehicle Refueling Emissions at Gasoline Dispensing Facilities. Volume I: Chapters. Office of Air Quality Planning and Standards. EPA-450/3-91-022a. Research Triangle Park, NC: U.S. Environmental Protection Agency. November 1991.

U.S. Geological Survey. 2012 National Hydrography Dataset. Website: ftp://nhdftp.usgs.gov/DataSets/Staged/States/FileGDB/HighResolution/. Accessed September 17, 2012.

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