2.0 Proposed Action and Alternatives

2.1 Proposed Action

Keystone proposes to construct and operate a crude oil transmission system from an oil supply hub near Hardisty, Alberta, Canada, to destinations in the US. The Project will have the nominal capacity to deliver up to 900,000 bpd of crude oil.

An overview map of the Project location is provided in **Figure 2.1-1**. **Figures 2.1-2** to **2.1-7** are maps showing the more detailed pipeline route and aboveground facilities locations in each state.

2.1.1 Project Description and Location

The Project will consist of three segments: the Steele City Segment, the Gulf Coast Segment, and the Houston Lateral. From north to south, the Steele City Segment extends from Hardisty, Alberta southeast to Steele City, Nebraska. The Gulf Coast Segment extends from Cushing, Oklahoma south to Nederland, in Jefferson County, Texas. The Houston Lateral extends from the Gulf Coast Segment in Liberty County, Texas southwest to Moore Junction, Harris County, Texas. In total, the Project will consist of approximately 1,707 miles of new, 36-inch-diameter pipeline, consisting of approximately 327 miles in Canada and 1,380 miles within the US. It will interconnect with the northern and southern termini of the previously approved 298-mile-long, 36-inch-diameter Keystone Cushing Extension segment of the Keystone Pipeline Project. Project facilities by State are summarized in **Table 2.1-1**; a table of associated facilities by milepost is included in **Appendix M**.

Table 2.1-1 Project Facilities by State

Segment/State	New Construction Pipeline Miles	Ancillary Facilities
Steele City Segment		
Montana	282.5	6 new pump stations, 14 main line valves (MLVs), 50 access roads
South Dakota	314.1	7 new pump stations, 9 MLVs, 18 access roads
Nebraska	254.1	5 new Pump Stations, 13 MLVs, Steele City Tank Farm, 12 access roads
Keystone Cushing Extension		
Kansas	0	2 new pump stations and no access roads
Gulf Coast Segment		
Oklahoma	155.4	4 new pump stations, 10 MLVs, 93 access roads
Texas	324.8	6 new pump stations, 21 MLVs, 1 delivery site, 245 access roads
Houston Lateral		
Texas – Houston Lateral	48.6	7 MLVs, 1 delivery site, 31 access roads
Total	1,379.5	

2.1.2 Pipeline Construction Overview

In the US, the Project is planned to be constructed as follows:

- 36-inch-diameter Steele City Segment, approximately 851 miles in length, from the US/Canada Border at Morgan, Montana to Steele City, Nebraska, which will be constructed with ten mainline spreads, varying in length between approximately 80 and 94 miles each, in 2011 and 2012.
- 36-inch-diameter Gulf Coast Segment, approximately 480 miles in length, from Cushing, Oklahoma to Nederland, Texas, which will be constructed with 6 mainline spreads, varying in lengths from 47 to 99 miles each, in 2010 and 2011.
- 36-inch-diameter Houston Lateral, approximately 49 miles in length, from Liberty County, Texas to Harris County, Texas, which will be constructed with one main spread, in 2012.

While the majority of the pipeline will be situated in rural areas, the route will traverse more populated areas near Cushing, Oklahoma, as well as Beaumont, Port Arthur, Nederland, Channelview, and Houston, Texas.

2.1.3 Pipeline Design Parameters

Selected design parameters applicable to the proposed pipe are included in **Table 2.1-2**. While X70 is the current design basis, Keystone also is evaluating the use of X80. New steel pipe for the mainline will be mill inspected by an authorized owner's inspector and mill tested to API 5L specification requirements. Use of either grade pipe will meet or exceed federal standards, thereby providing protection of human and environmental resources. An external coating (fusion-bonded epoxy [FBE]) will be applied to the pipeline. Cathodic protection will be provided by impressed current to protect against external corrosion. All pipe will be manufactured, constructed, and operated in accordance with applicable federal, state, and local regulations.

Table 2.1-2 Pipe Design Parameters and Specifications

Pipe/Design Parameters	Specification
Material code	API 5L-PSL2-44th Edition
Material grade thousand pounds of pressure per square inch (ksi) (yield strength)[1]	Grade X70 or X80
Maximum pump station discharge	1,440 pounds per square inch gauge (psig)
Maximum Operating Pressure (MOP)	1,440 psig, 1,600 psig[1]
Minimum hydrostatic test pressure	1.25 x MOP
Corrosion allowance	None
Minimum average joint length (feet)	Nominal 80-foot (double-joint)
Field production welding processes	Mechanized – gas metal; arc welding (GMAW); Manual-shielded metal arc welding (SMAW)
Pipeline design code	49 CFR Part 195
Outside diameter	36 inch
Line pipe wall thickness (0.80 design factor as per 49 CFR 195.106)	0.465 inch (X70) or 0.406 inch (X80)

Table 2.1-2 Pipe Design Parameters and Specifications

Pipe/Design Parameters	Specification
Heavy wall thickness (0.72 design factor) as per 49 CFR 195.106 PHMSA special permit HCAs, highly populated areas, commercially navigable waterways as per 49 CFR Part 195.450 and station valving)	0.515 inch (X70) or 0.453 inch (X80)
Heavy wall thickness (0.72 design factor, 1,600 psig MOP as per 49 CFR 195.106) directly downstream of pump stations at lower elevations as determined by steady state and transient hydraulic analysis.	0.572 inch (X70) or 0.500 inch (X80)
Heavy wall thickness (0.60 design factor per 49 CFR 195.106 for 1,440 psig MOP; 0.67 design factor per 49 CFR 195.106 for 1,600 psig MOP); uncased road, cased railway crossings	0.618 inch (X70) or 0.543 inch (X80)
Heavy wall thickness (0.5 design factor per 49 CFR 195.106 for 1,440 psig MOP and 0.55 design factor per 49 CFR 195.106 for 1,600 psig MOP); uncased railway crossings, horizontal directional drillings (HDDs)	0.748 inch (X70) or 0.650 inch (X80)

[1] The design of the Project pipeline system is based on a maximum 1,440 pounds per square inch gauge (psig) discharge pressure at each pump station. The result is that the MOP of the pipeline between pump stations generally is 1,440 psig. In liquid pipelines, some sections at lower elevations relative to the pump station discharge may be exposed to slightly higher pressures due to the combined station discharge pressure and elevation head, and these sections will have a 1,600 psig MOP.

2.1.4 Ancillary Facilities Summary

In addition to the pipeline, Keystone will install and operate aboveground facilities consisting of 28 new pump stations on the Steele City and Gulf Coast Segments, and two new pump stations on the Keystone Cushing Extension. These pump stations will enable the Project to maintain the pressure required to make crude oil deliveries at desired throughput volumes. Additionally, Keystone will install and operate two delivery facilities, 74 intermediate MLVs, and four densitometer facilities, all of which will be located within the permanent easement. Further, there will be check valves located with the intermediate MLVs downstream of major river crossings. Keystone also will install and operate a tank farm, consisting of three tanks, at Steele City, Nebraska. Metering will be installed and operated at the two delivery sites at Nederland, and Moore Junction, near Houston in Harris County, Texas.

Additional facilities such as power lines required for the pump stations, remotely operated valves, and densitometers will be installed and operated by local power providers and not by Keystone. A summary of impacts associated with the installation of the power lines is contained in Section 7 of this Environmental Report.

2.1.5 Land Requirements

Surface disturbance associated with the construction and operation of the Project is summarized in **Table 2.1-3**. Approximately 23,768 acres of land will be disturbed during the construction of the proposed facilities. After construction, the temporary ROW generally will be restored and returned to its previous land use. After construction is complete, approximately 8,737 acres will be retained as permanent ROW. All disturbed acreage will be restored and returned to its previous aboveground land use after construction, except for approximately 368 acres of permanent ROW, which will not be restored but will serve to provide

Table 2.1-3 Summary of Lands Affected

Facility	Land Affected During Construction[1] (acres)	Land Affected During Operation[2] (acres)
Steele City Segment		
Montana		
Pipeline ROW	3,767	1,712
Additional Temporary Workspace Areas (TWAs)[6]	278	0
Pipe Stockpile Sites, Rail Sidings, and Contractor Yards	521	0
Construction Camps	160	0
Pump Stations/Delivery Facilities	42	42
Access Roads	265	22
Montana Subtotal[3,5]	5,033	1,776
South Dakota		
Pipeline ROW	4,188	1,904
Additional TWAs[6]	255	0
Pipe Stockpile Sites, Rail Sidings, and Contractor Yards	579	0
Construction Camps	160	0.0
Pump Stations/Delivery Facilities	42	42
Access Roads[7]	103	9
South Dakota Subtotal[3,5]	5,327	1,955
Nebraska		
Pipeline ROW	3,388	1,540
Additional TWAs[6]	186	0
Pipe Stockpile Sites, Rail Sidings, and Contractor Yards	525	0
Pump Stations/Delivery Facilities	30	30
Access Roads[7]	56	0
Tank Farm	50	50
Nebraska Subtotal[3,5]	4,235	1,620
Steele City Subtotal[3,5]	14,595	5,351
Keystone Cushing Extension[5]		
Kansas		
Pipeline ROW	0	0
Additional TWAs[6]	0	0
Pipe Stockpile Sites, Rail Sidings, and Contractor Yards	0	0
Pump Stations/Delivery Facilities	12	12
Access Roads[7]	0	0
Kansas Subtotal[3,4,5]	12	12
Keystone Cushing Extension Subtotal[3,4,5]	12	12

Table 2.1-3 Summary of Lands Affected

Facility	Land Affected During Construction[1] (acres)	Land Affected During Operation[2] (acres)
Gulf Coast Segment		
Oklahoma		
Pipeline ROW	2,044	942
Additional TWAs[6]	130	0
Pipe Stockpile Sites, Rail Sidings, and Contractor Yards	465	0
Pump Stations/Delivery Facilities	32	32
Access Roads[7]	103	19
Oklahoma Subtotal[3, 5]	2,774	993
Texas		
Pipeline ROW	4,180	1,965
Additional TWAs[6]	283	0
Pipe Stockpile Sites, Rail Sidings, and Contractor Yards	796	0
Pump Stations/Delivery Facilities	48	48
Access Roads[7]	329	55
Texas Subtotal	5,636	2,068
Houston Lateral		
Texas		
Lateral ROW	652	294
Additional TWAs[6]	32	0
Pipe Stockpile Sites, Rail Sidings, and Contractor Yards	5	0
Access Roads[7]	62	19
Houston Lateral Subtotal[3]	751	313
Gulf Coast and Houston Lateral Subtotal[3]	9,161	3,374
Project Total[3,4, 5, 6]	23,768	8,737

1 Disturbance is based on a total of 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 will be used, or in areas requiring extra width for workspace necessitated by site conditions. Disturbance also includes pipe stockpile sites, contractor yards, rail yards, and construction camps

2 Operational acreage was estimated based on a 50-foot permanent ROW in all areas. All pigging facilities will be located within either pump stations or delivery facility sites. Intermediate MLVs and densitometers will be constructed within the construction easement and operated within the permanently maintained 50-foot ROW. Other MLVs, check valves and block valves, and meters will be located within the area associated with a pump station, delivery site, or permanent ROW. Consequently, the acres of disturbance for these aboveground facilities are captured within the Pipeline ROW and Pump Station/Delivery Facilities categories within the table.

3 Discrepancies in total acreages are due to rounding.

4 Disturbance associated with the Keystone Cushing Extension in this table is for the two new pump stations to be constructed for this Project. For discussion of previously permitted disturbance associated with the construction of the Keystone Cushing Extension see TransCanada (2006).

5 Includes disturbances associated with construction of the Steele City Segment, the Gulf Coast Segment, and the Houston Lateral. This total includes 12 acres associated with construction and operation of new pump stations along the Keystone Cushing Extension.

6 Includes staging areas of approximately 5 acres. Does not include the potential for extended additional TWAs necessary for construction in rough terrain or in unstable soils. These locations are currently undergoing identification and analysis.

7 Access road temporary and permanent disturbance is based on 30-foot width; all non-public roads are conservatively estimated to require upgrades and maintenance during construction.

adequate space for aboveground facilities, including pump stations and valves, for the life of the pipeline. Impacts associated with the construction of two pump stations on the Keystone Cushing Extension include approximately 12 acres of land to be disturbed during construction. This acreage will be retained for permanent aboveground facilities.

Almost all of the land affected by the construction and operation of the Project will be privately owned; BLM holds the majority of the publicly owned lands. A detailed description of land ownership is presented in Chapter 3.0, Table 3.7-1.

2.1.6 Pipeline ROW

The installation of the new 36-inch-diameter pipeline will occur within a 110-foot-wide construction ROW, typically consisting of a 60-foot temporary easement and a 50-foot permanent easement. **Figure 2.1-8** illustrates typical construction in areas not co-located with other ROWs. **Figures 2.1-9** through **2.1-10** illustrate the typical construction ROW and equipment work locations in areas where the pipeline will be co-located with an existing linear feature (**Appendix M**). The construction ROW will be reduced to 85 feet in certain areas, which could include some wetlands, cultural sites, shelterbelts, residential areas, and commercial/industrial areas.

Thirty miles (4 percent) of the Steele City Segment will be co-located within approximately 300 feet of existing pipelines, utilities, or road ROWs. The remainder of the pipeline, 821 miles (96 percent) will not be co-located.

No new pipe will be constructed along the Keystone Cushing Extension as part of the Project.

Three hundred and ninety-three miles (82 percent) of the Gulf Coast Segment will be located within approximately 300 feet of existing pipelines, utilities, or road ROWs. The remainder of the pipeline, 87 miles (18 percent) will not be co-located.

Twenty miles (41percent) of the Houston Lateral will be located within approximately 300 feet of existing pipelines, utilities, or road ROWs. The remainder of the pipeline, 29 miles (59 percent) will not be co-located.

A list of the locations and lengths of co-location with any adjacent linear facilities, by milepost, and identification of the adjacent facility is included in **Appendix M.**

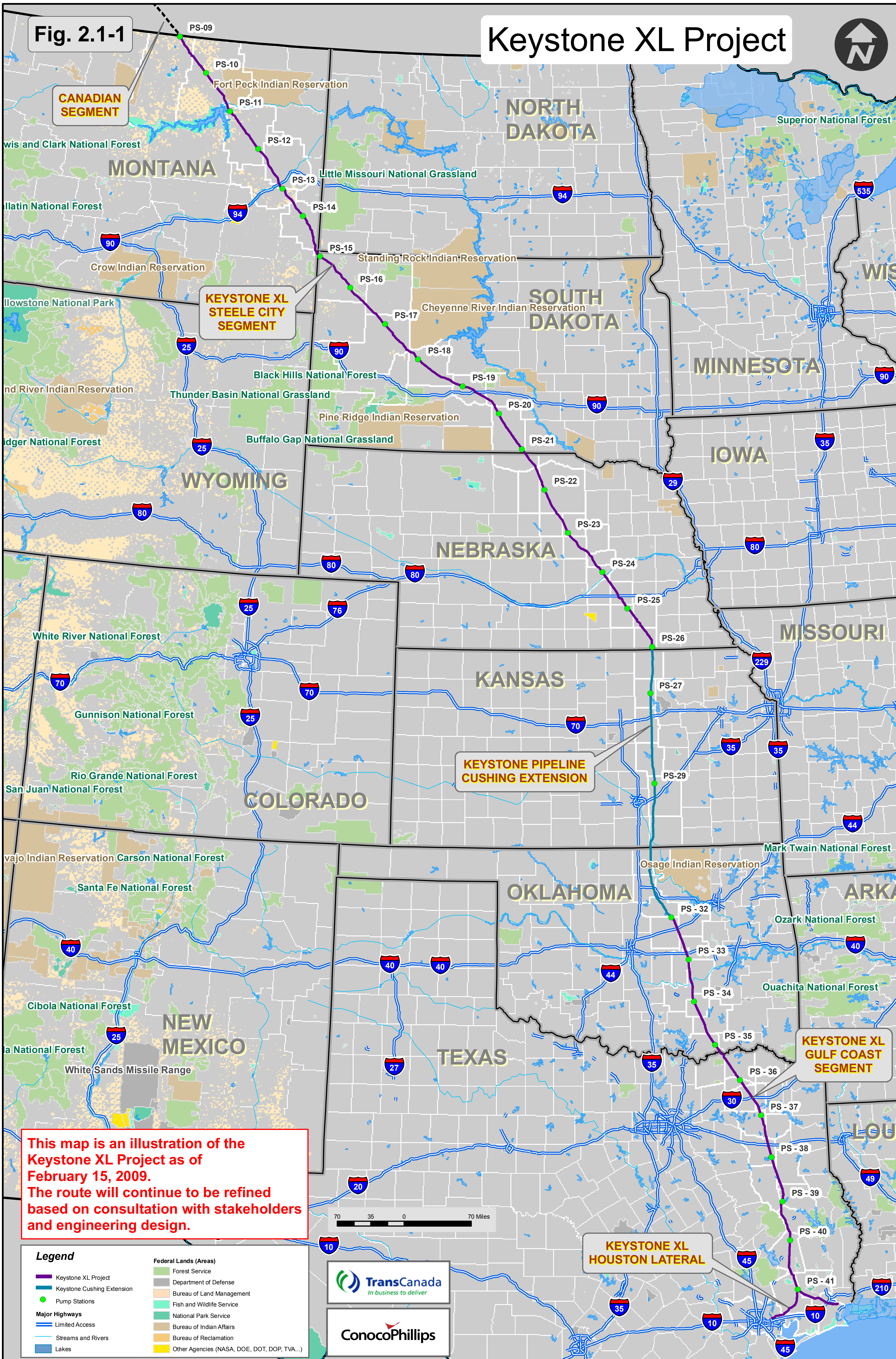
2.1.7 Additional Temporary Workspace Areas

In addition to the typical construction ROW, Keystone has identified typical types of additional TWAs that will be required (**Table 2.1-4**). These include areas requiring special construction techniques (e.g., river, wetland, and road/rail crossings; horizontal directional drill (HDD) entry and exit points; steep slopes; and rocky soils) and construction staging areas. The additional temporary workspace requirements are indicated graphically on the Pipeline route sheets provided in **Appendix A**. These preliminary areas have been used to quantify impacts of the Project. A list of additional TWA locations, by milepost, is included in **Appendix N.**

The location of additional TWAs will be adjusted as the Project continues to be refined. This will involve the adjustment of additional temporary workspace as necessary related to actual wetland and waterbody locations, side-hill cuts, and rough terrain. Keystone will adjust additional TWAs at the prescribed setback distance from wetland and waterbody features unless impractical and as determined on a site-specific basis. As a result, the wetland impact acreage presented is likely overstated.

Fig. 2.1-1

Keystone XL Project



This map is an illustration of the Keystone XL Project as of February 15, 2009.
The route will continue to be refined based on consultation with stakeholders and engineering design.

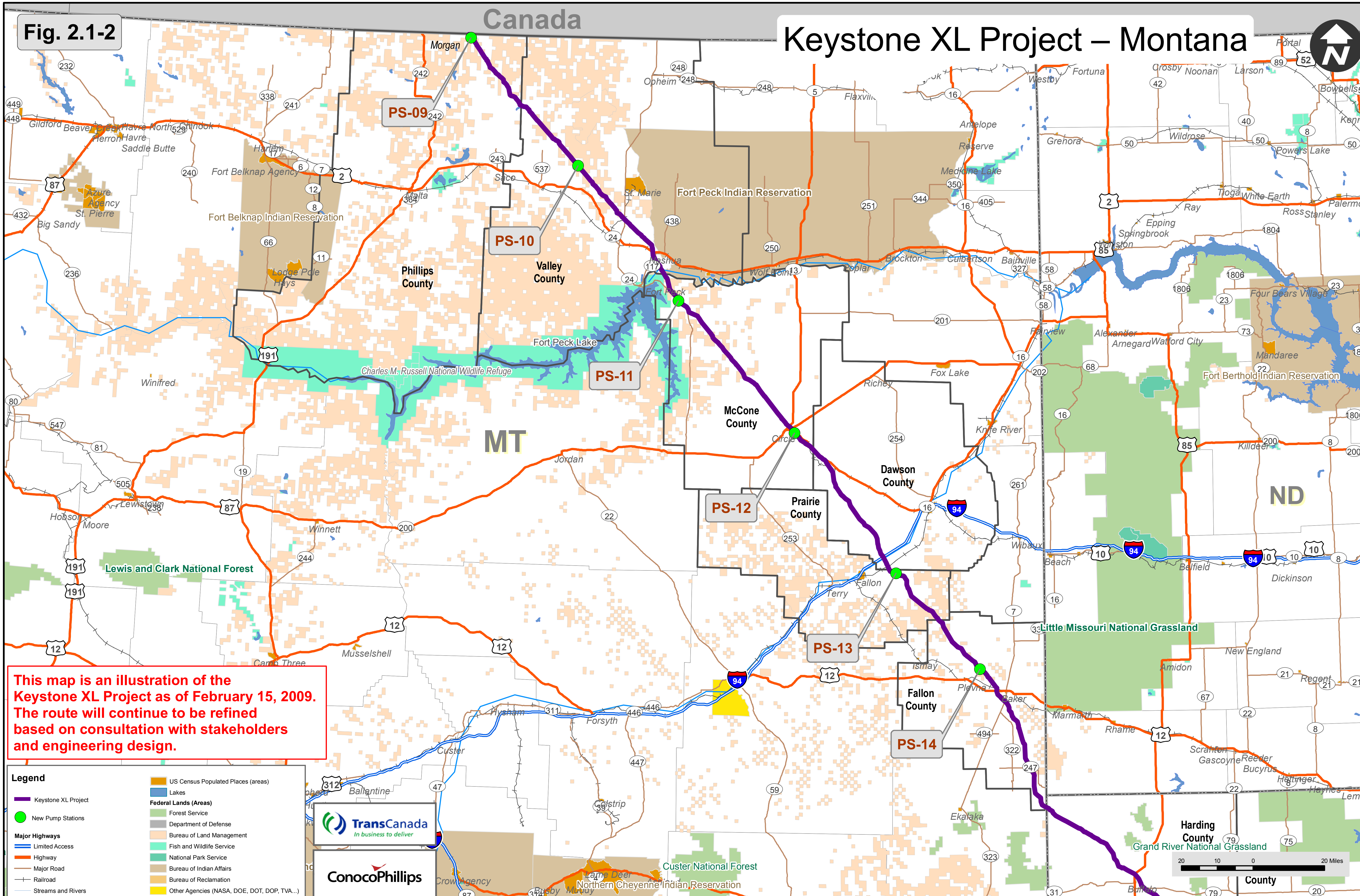


Fig. 2.1-2
Keystone XL Project – Montana
Canada
MT
ND
PS-09
PS-10
PS-11
PS-12
PS-13
PS-14
Phillips County
Valley County
McCone County
Dawson County
Prairie County
Fallon County
Harding County
Fort Peck Indian Reservation
Fort Belknap Indian Reservation
Fort Berthold Indian Reservation
Northern Cheyenne Indian Reservation
Charles M. Russell National Wildlife Refuge
Fort Peck Lake
Lewis and Clark National Forest
Little Missouri National Grassland
Grand River National Grassland
Custer National Forest
Morgan
Circle
Glendive
Baker
This map is an illustration of the Keystone XL Project as of February 15, 2009. The route will continue to be refined based on consultation with stakeholders and engineering design.
Legend
Keystone XL Project
New Pump Stations
Major Highways
Limited Access
Highway
Major Road
Railroad
Streams and Rivers
US Census Populated Places (areas)
Lakes
Federal Lands (Areas)
Forest Service
Department of Defense
Bureau of Land Management
Fish and Wildlife Service
National Park Service
Bureau of Indian Affairs
Bureau of Reclamation
Other Agencies (NASA, DOE, DOT, DOP, TVA...)
20 10 0 20 Miles
TransCanada
In business to deliver
ConocoPhillips

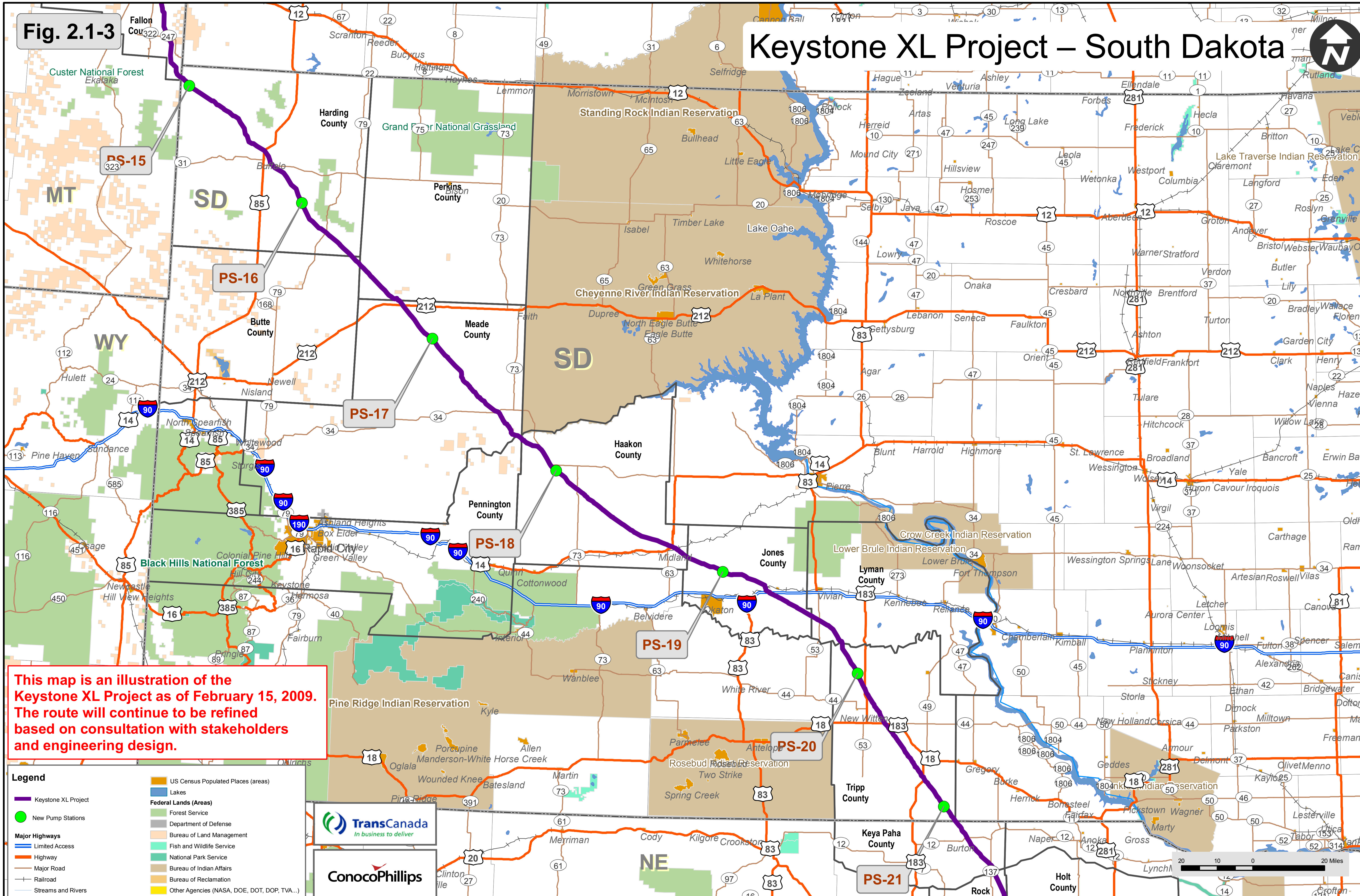


Fig. 2.1-3
Keystone XL Project – South Dakota
PS-15
PS-16
PS-17
PS-18
PS-19
PS-20
PS-21
MT
SD
WY
NE
Harding County
Perkins County
Butte County
Meade County
Pennington County
Haakon County
Jones County
Lyman County
Tripp County
Keya Paha County
Holt County
Custer National Forest
Grand River National Grassland
Black Hills National Forest
Standing Rock Indian Reservation
Cheyenne River Indian Reservation
Crow Creek Indian Reservation
Lower Brule Indian Reservation
Pine Ridge Indian Reservation
Rosebud Indian Reservation
Lake Traverse Indian Reservation
Lake Oahe
This map is an illustration of the Keystone XL Project as of February 15, 2009. The route will continue to be refined based on consultation with stakeholders and engineering design.
Legend
Keystone XL Project
New Pump Stations
Major Highways
Limited Access
Highway
Major Road
Railroad
Streams and Rivers
US Census Populated Places (areas)
Lakes
Federal Lands (Areas)
Forest Service
Department of Defense
Bureau of Land Management
Fish and Wildlife Service
National Park Service
Bureau of Indian Affairs
Bureau of Reclamation
Other Agencies (NASA, DOE, DOT, DOP, TVA...)
TransCanada
In business to deliver
ConocoPhillips
20 10 0 20 Miles

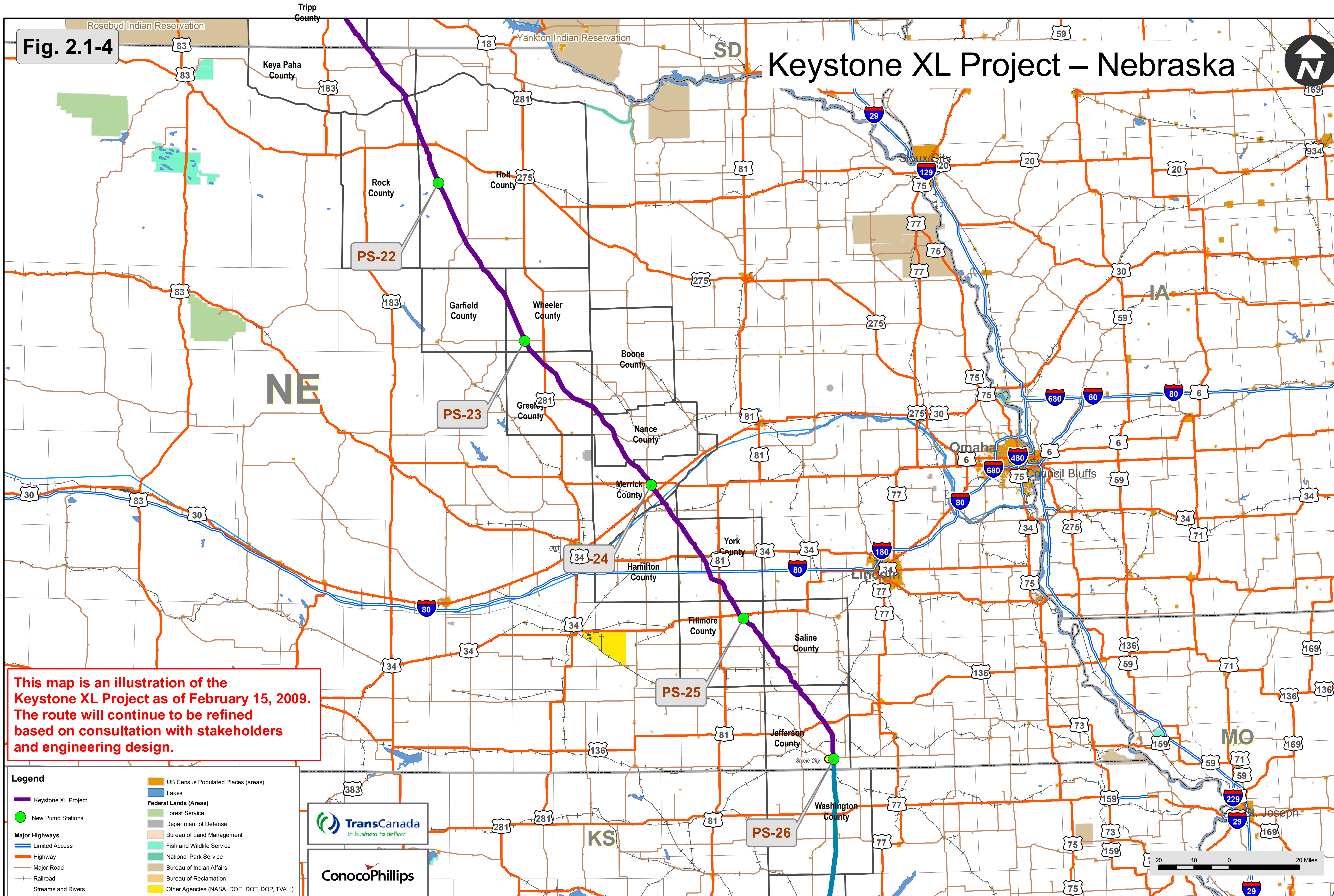


Fig. 2.1-4
Keystone XL Project – Nebraska
This map is an illustration of the Keystone XL Project as of February 15, 2009. The route will continue to be refined based on consultation with stakeholders and engineering design.
PS-22
PS-23
PS-24
PS-25
PS-26
NE
SD
IA
MO
KS
Rosebud Indian Reservation
Yankton Indian Reservation
Tripp County
Keya Paha County
Rock County
Holt County
Garfield County
Wheeler County
Boone County
Greeley County
Nance County
Merrick County
Hamilton County
York County
Fillmore County
Saline County
Jefferson County
Washington County
Steele City
Sioux City
Omaha
Council Bluffs
Lincoln
St. Joseph
Legend
Keystone XL Project
New Pump Stations
Major Highways
Limited Access
Highway
Major Road
Railroad
Streams and Rivers
US Census Populated Places (areas)
Lakes
Federal Lands (Areas)
Forest Service
Department of Defense
Bureau of Land Management
Fish and Wildlife Service
National Park Service
Bureau of Indian Affairs
Bureau of Reclamation
Other Agencies (NASA, DOE, DOT, DOP, TVA...)
TransCanada
In business to deliver
ConocoPhillips
20 10 0 20 Miles

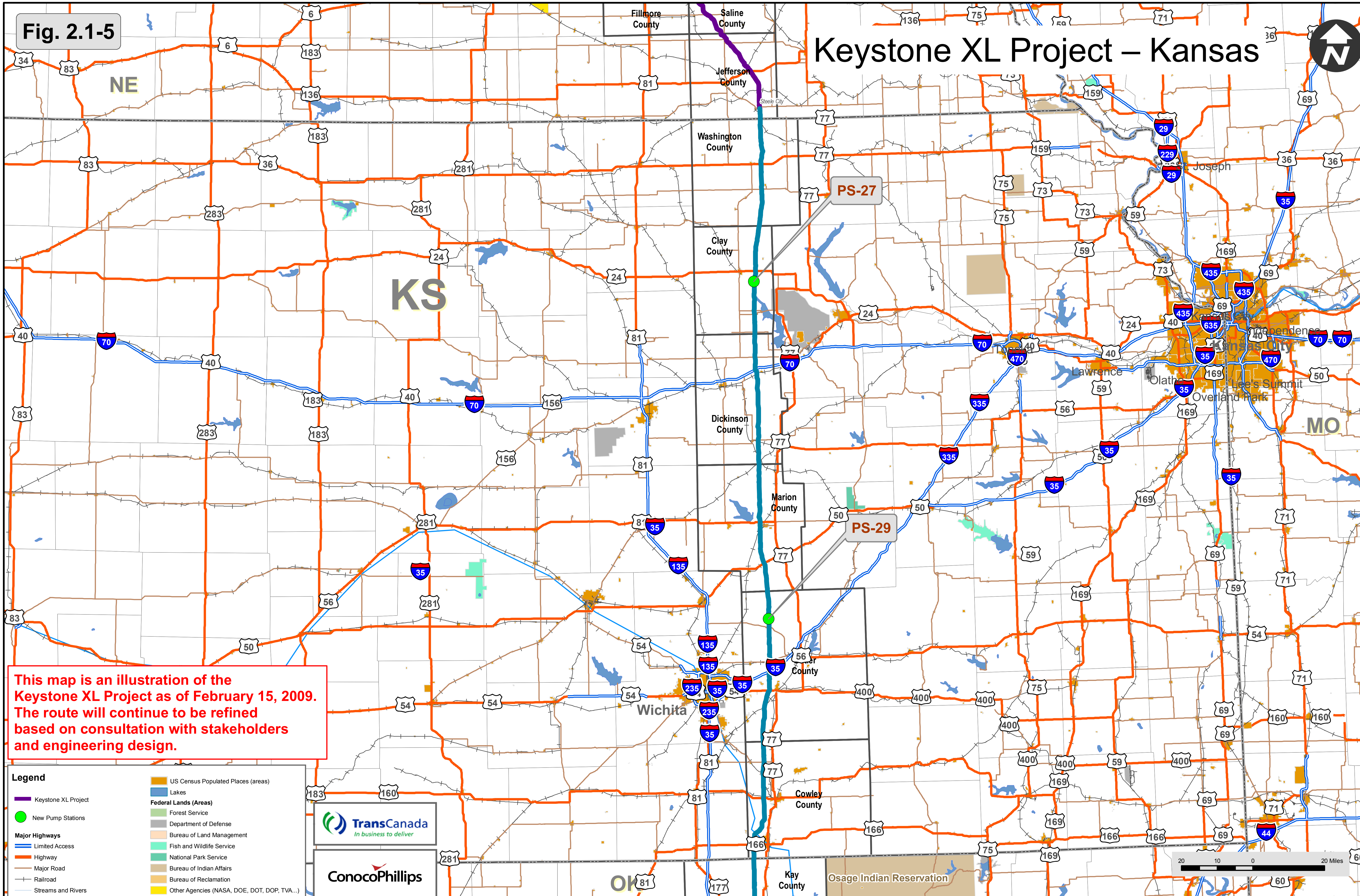


Fig. 2.1-5
Keystone XL Project – Kansas
This map is an illustration of the Keystone XL Project as of February 15, 2009. The route will continue to be refined based on consultation with stakeholders and engineering design.
PS-27
PS-29
NE
KS
MO
OK
Fillmore County
Saline County
Jefferson County
Steele City
Washington County
Clay County
Dickinson County
Marion County
Butler County
Cowley County
Kay County
Osage Indian Reservation
Wichita
Lawrence
Olathe
Overland Park
Lee's Summit
Kansas City
Independence
St. Joseph
Legend
Keystone XL Project
New Pump Stations
Major Highways
Limited Access
Highway
Major Road
Railroad
Streams and Rivers
US Census Populated Places (areas)
Lakes
Federal Lands (Areas)
Forest Service
Department of Defense
Bureau of Land Management
Fish and Wildlife Service
National Park Service
Bureau of Indian Affairs
Bureau of Reclamation
Other Agencies (NASA, DOE, DOT, DOP, TVA...)
TransCanada
In business to deliver
ConocoPhillips
20 10 0 20 Miles

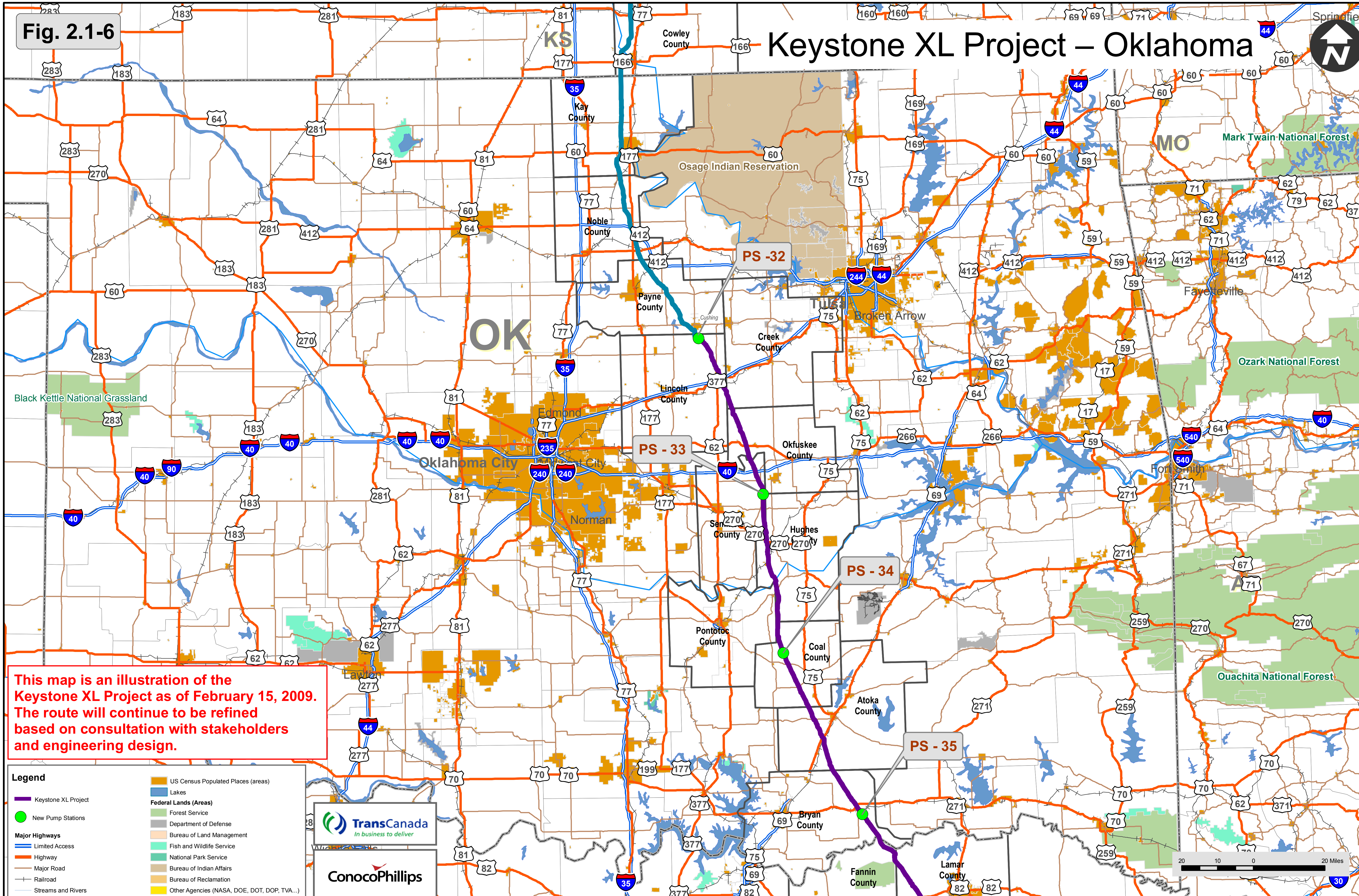


Fig. 2.1-6
Keystone XL Project – Oklahoma
KS
OK
MO
Cowley County
Kay County
Noble County
Payne County
Osage Indian Reservation
Cushing
Creek County
Lincoln County
Okfuskee County
Hughes County
Pontotoc County
Coal County
Atoka County
Bryan County
Fannin County
Lamar County
Tulsa
Broken Arrow
Edmond
Oklahoma City
Norman
Fayetteville
Fort Smith
Springfield
PS -32
PS - 33
PS - 34
PS - 35
Mark Twain National Forest
Ozark National Forest
Ouachita National Forest
Black Kettle National Grassland
This map is an illustration of the
Keystone XL Project as of February 15, 2009.
The route will continue to be refined
based on consultation with stakeholders
and engineering design.
Legend
Keystone XL Project
New Pump Stations
Major Highways
Limited Access
Highway
Major Road
Railroad
Streams and Rivers
US Census Populated Places (areas)
Lakes
Federal Lands (Areas)
Forest Service
Department of Defense
Bureau of Land Management
Fish and Wildlife Service
National Park Service
Bureau of Indian Affairs
Bureau of Reclamation
Other Agencies (NASA, DOE, DOT, DOP, TVA...)
TransCanada
In business to deliver
ConocoPhillips
20 10 0 20 Miles

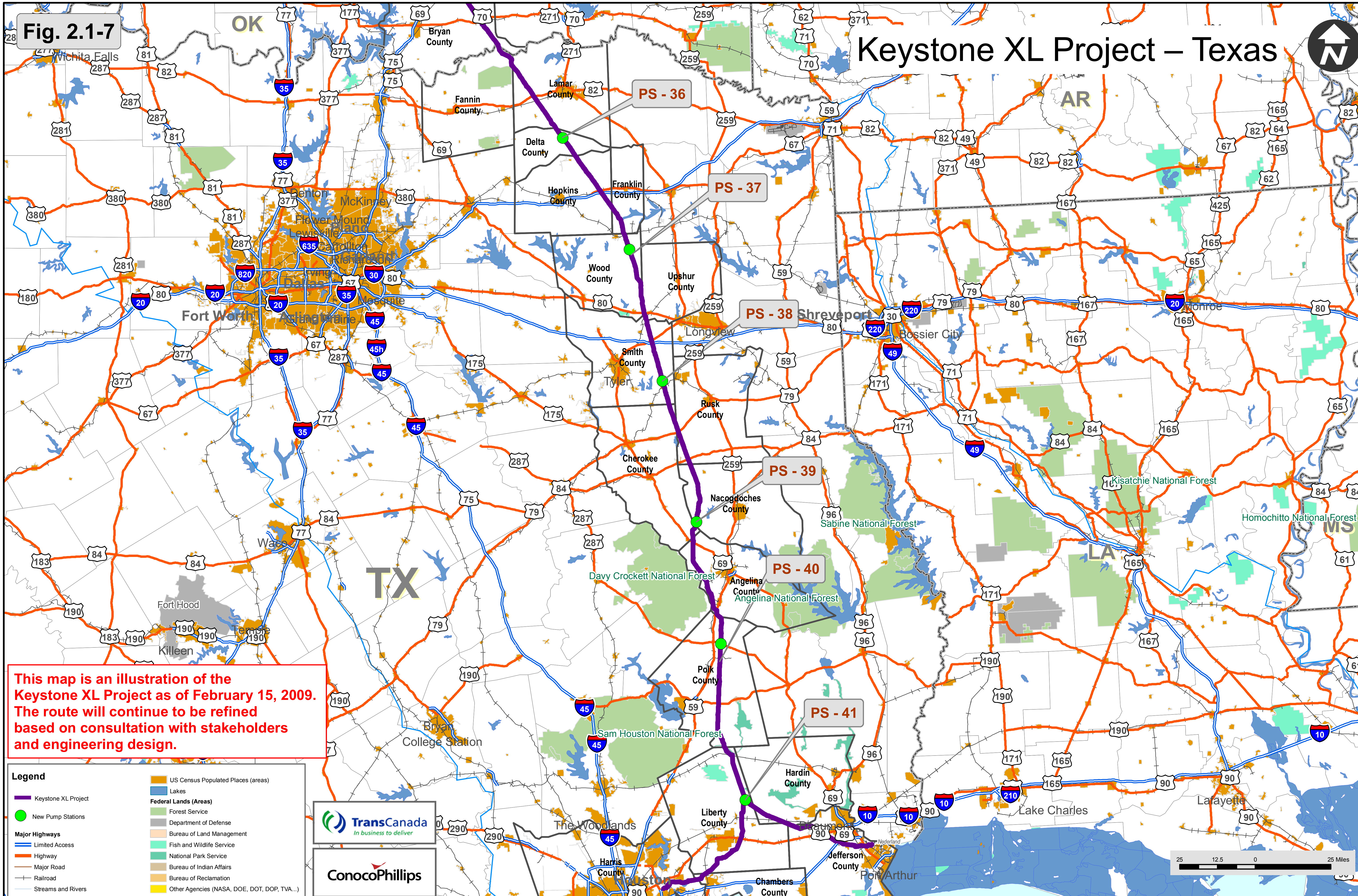
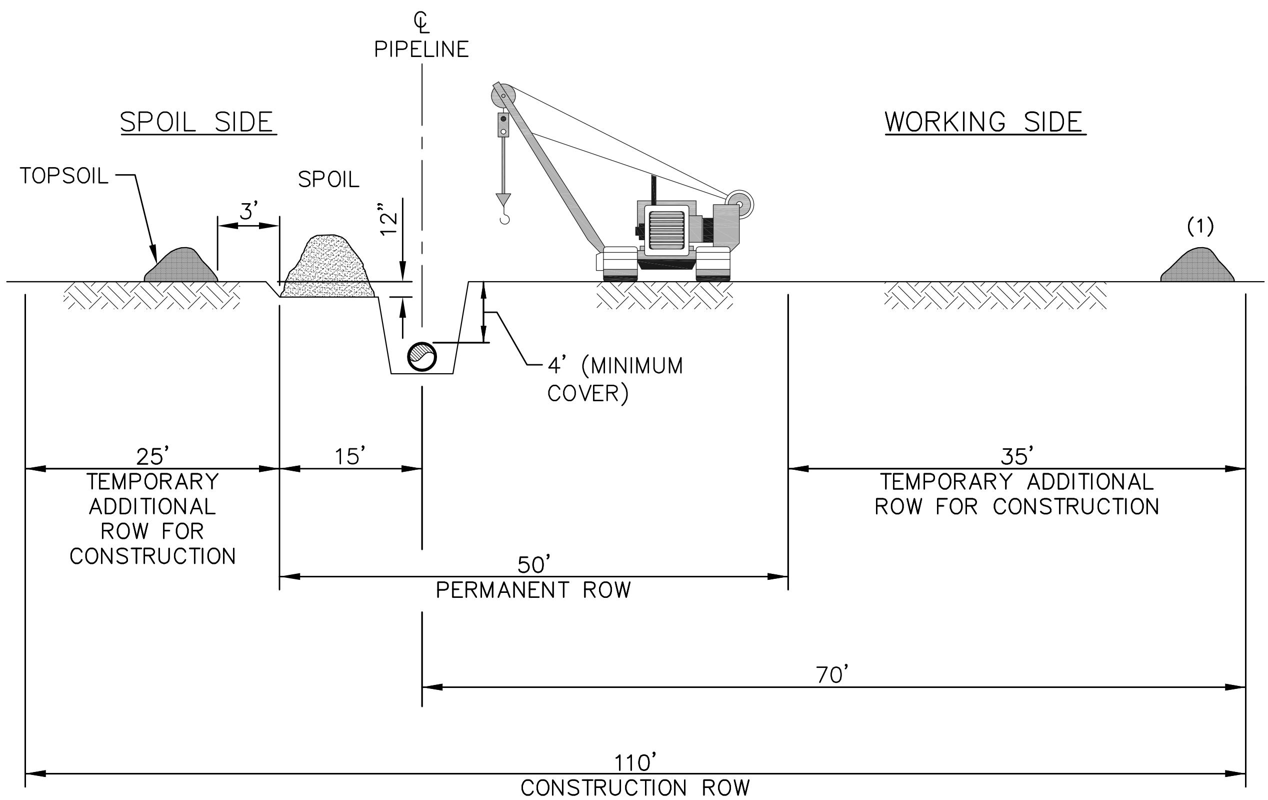


Fig. 2.1-7
Keystone XL Project – Texas
PS - 36
PS - 37
PS - 38
PS - 39
PS - 40
PS - 41
OK
AR
TX
LA
MS
Bryan County
Lamar County
Fannin County
Delta County
Hopkins County
Franklin County
Wood County
Upshur County
Smith County
Rusk County
Cherokee County
Nacogdoches County
Angelina County
Polk County
Hardin County
Liberty County
Jefferson County
Harris County
Chambers County
Wichita Falls
Denton
McKinney
Flower Mound
Plano
Lewisville
Carrollton
Richardson
Irving
Dallas
Mesquite
Fort Worth
Arlington
Grand Prairie
Longview
Tyler
Shreveport
Bossier City
Monroe
Waco
Fort Hood
Killeen
Temple
Bryan
College Station
The Woodlands
Houston
Baytown
Beaumont
Port Arthur
Nederland
Lake Charles
Lafayette
Davy Crockett National Forest
Angelina National Forest
Sabine National Forest
Sam Houston National Forest
Kisatchie National Forest
Homochitto National Forest
This map is an illustration of the Keystone XL Project as of February 15, 2009. The route will continue to be refined based on consultation with stakeholders and engineering design.
Legend
Keystone XL Project
New Pump Stations
Major Highways
Limited Access
Highway
Major Road
Railroad
Streams and Rivers
US Census Populated Places (areas)
Lakes
Federal Lands (Areas)
Forest Service
Department of Defense
Bureau of Land Management
Fish and Wildlife Service
National Park Service
Bureau of Indian Affairs
Bureau of Reclamation
Other Agencies (NASA, DOE, DOT, DOP, TVA...)
TransCanada
In business to deliver
ConocoPhillips
25 12.5 0 25 Miles



(1) ALTERNATE TOPSOIL PLACEMENT LOCATIONS

REVISIONS		
1	11.05.08	REMOVED TOPSOIL NEAR TRENCH
2	05.29.09	REVISED DIMENSIONS & TOPSOIL LOCATION

G:\2000DraftingandGIS\CADFiles\Drawings\ER\Constr_ROW_Details_Sect2_REV2.dwg 5/29/2009 12:11:02 PM CDT

TransCanada
In business to deliver

KEYSTONE XL PROJECT

PREPARED BY:
TROW ENGINEERING CONSULTANTS, INC.
7505 NW Tiffany Springs Pkwy., Suite 400
Northpointe Circle I
Kansas City, MO 64153
Phone: 1-816-801-7063
Fax: 1-816-801-7048
Trow

ORIGINATOR: JOE A. NELSON (NAME) 9/08/08 (DATE)

CHECKED BY: TW

APPROVED BY: SS

FIGURE 2.1-8

FIA # 1399

CHAINAGE:

DISCIPLINE # 03

TITLE: TYPICAL 110' CONSTRUCTION RIGHT-OF-WAY (36" PIPELINE) WITH TOPSOIL REMOVAL ONLY OVER TRENCH LINE

SCALE: N.T.S.

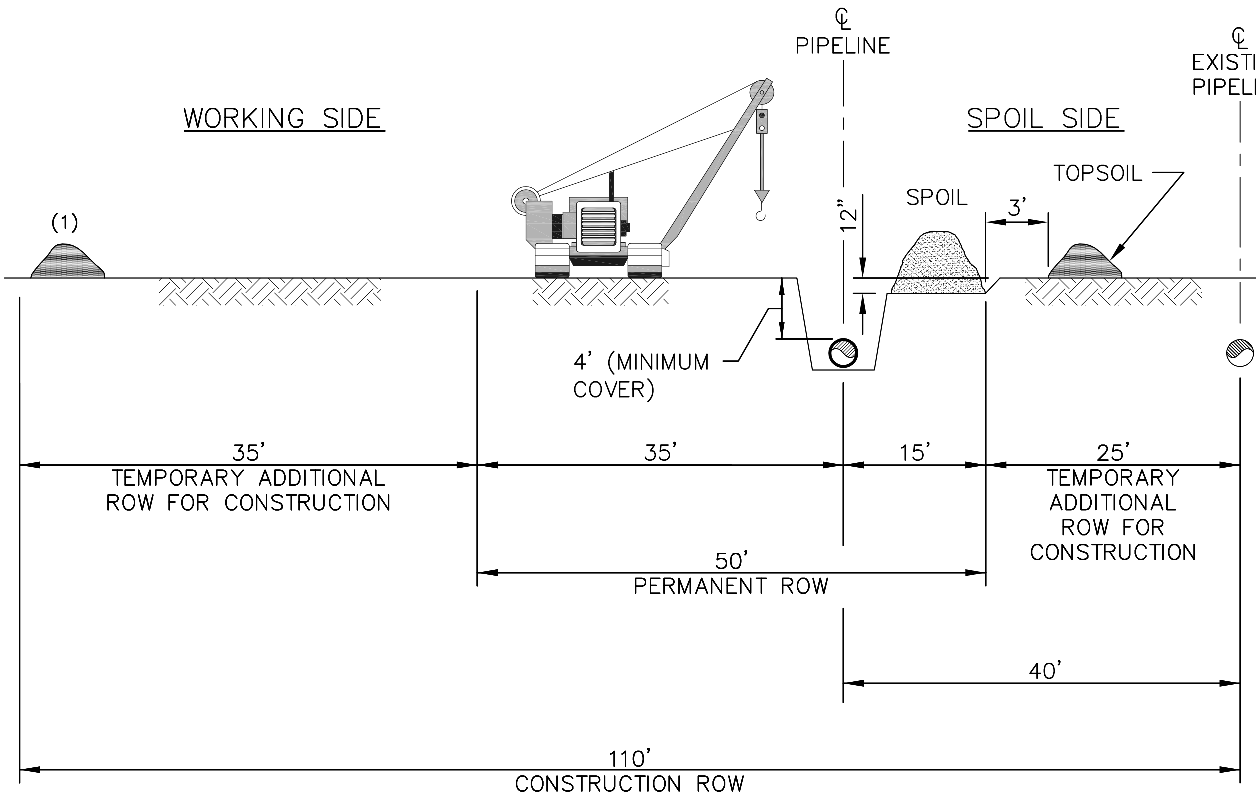
DWG No: 1399-03-ML-03-458

REV: 2

LAST PLOT DATE: Fri, 12 Jun 2009 - 4:27pm

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

PLOTTED SIZE: ANSI A (8.5x11)



(1) ALTERNATE TOPSOIL PLACEMENT LOCATIONS

REVISIONS		
1	11.05.08	REMOVED TOPSOIL NEAR TRENCH; MODIFIED TITLE
2	05.29.09	REVISED DIMENSIONS & TOPSOIL LOCATION

G:\2000DraftingandGIS\CADFiles\Drawings\ER\Constr_ROW_Details_Sect2_REV2.dwg 5/29/2009 12:11:02 PM CDT

TransCanada
In business to deliver

KEYSTONE XL PROJECT

PREPARED BY:
TROW ENGINEERING CONSULTANTS, INC.
7505 NW Tiffany Springs Pkwy., Suite 400
Northpointe Circle I
Kansas City, MO 64153
Phone: 1-816-801-7063
Fax: 1-816-801-7048
Trow

ORIGINATOR: JOE A. NELSON (NAME) 9/08/08 (DATE)

CHECKED BY: TW

APPROVED BY: SS

FIGURE 2.1-9

FIA # 1399 | CHAINAGE: | DISCIPLINE # 03

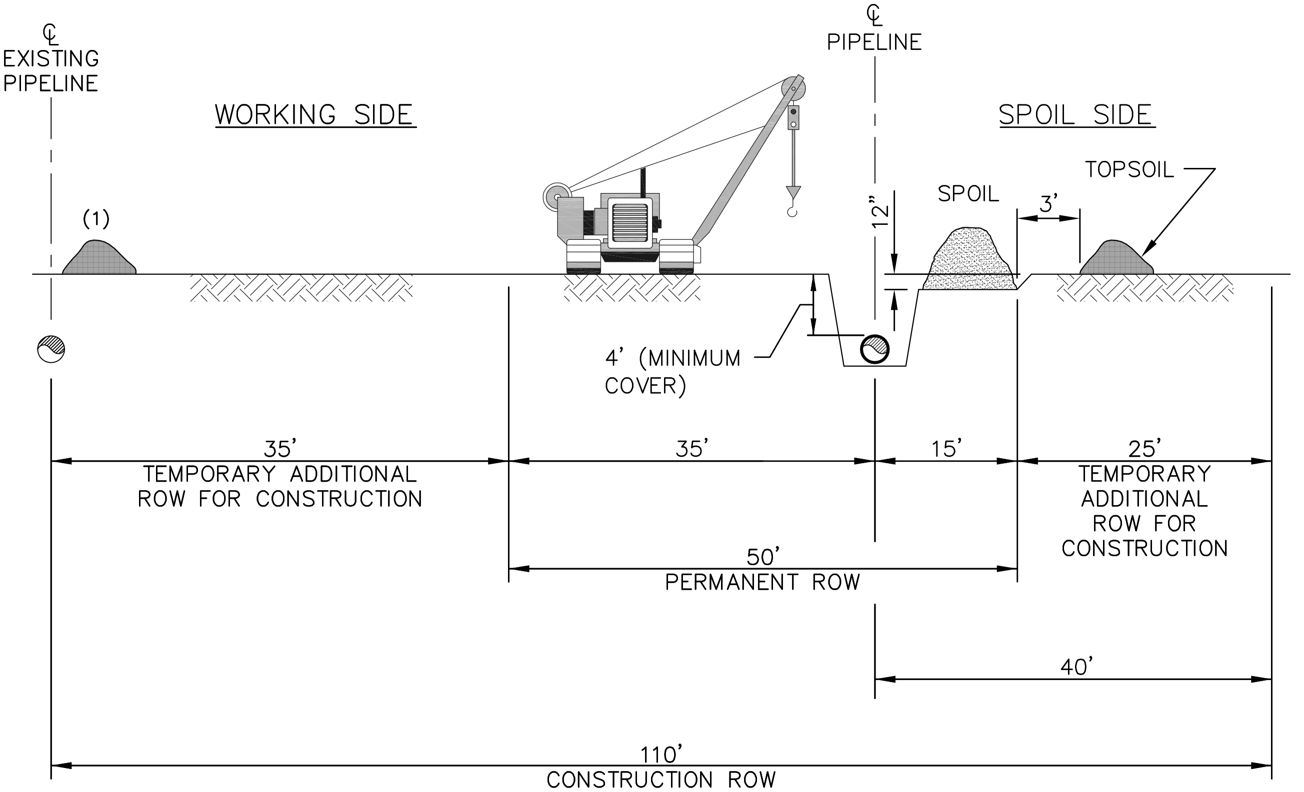
TITLE

TYPICAL 110' CONSTRUCTION RIGHT-OF-WAY (36" PIPELINE) SPOIL SIDE ADJACENT AND CO-LOCATION TO EXISTING PIPELINE

SCALE N.T.S. | DWG No 1399-03-ML-03-460 | REV 2

LAST PLOT DATE: Fri, 12 Jun 2009 - 4:28pm

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS   PLOTTED SIZE: ANSI A (8.5x11)



(1) ALTERNATE TOPSOIL PLACEMENT LOCATIONS

REVISIONS		
1	11.05.08	REMOVED TOPSOIL NEAR TRENCH; MODIFIED TITLE
2	05.29.09	REVISED DIMENSIONS & TOPSOIL LOCATION

G:\2000DraftingandGIS\CADFiles\Drawings\ER\Constr_ROW_Details_Sect2_REV2.dwg 5/29/2009 12:11:02 PM CDT

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PREPARED BY:
TROW ENGINEERING CONSULTANTS, INC.
7505 NW Tiffany Springs Pkwy., Suite 400
Northpointe Circle I
Kansas City, MO 64153
Phone: 1-816-801-7063
Fax: 1-816-801-7048
Trow

ORIGINATOR: JOE A. NELSON (NAME) 9/08/08 (DATE)

CHECKED BY: TW

APPROVED BY: SS

FIGURE 2.1-10

FIA # 1399 | CHAINAGE: | DISCIPLINE # 03

TITLE: TYPICAL 110' CONSTRUCTION RIGHT-OF-WAY (36" PIPELINE) WORKING SIDE ADJACENT AND CO-LOCATION TO EXISTING PIPELINE

SCALE: N.T.S. | DWG No 1399-03-ML-03-462 | REV 2

LAST PLOT DATE: Fri, 12 Jun 2009 - 4:29pm

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS PLOTTED SIZE: ANSI A (8.5x11)

Table 2.1-4 Dimensions and Acreage of Typical Additional Temporary Workspace Areas

Feature	Dimensions (length by width in feet at each side of crossing)	Acreage
Waterbodies traversed via HDD	250 x 150, as well as the length of the drill plus 150 x 150 on exit side	1.4
Waterbodies > 50 feet wide	300 x 100	0.7
Waterbodies < 50 feet 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	125 x 50	0.1
Push-pull wetland crossings	50 feet x length of wetland	Varies
Construction spread mobilization and demobilization	470 x 470	5.1
Stringing truck turnaround areas	200 x 80	0.4

2.1.8 Pipe Stockpile Sites, Railroad Sidings, and Contractor Yards

Extra workspace areas off of the construction ROW will be required during the construction of the Project to serve as pipe storage sites, railroad sidings, and contractor yards. Keystone has identified potential pipe stockpile sites and contractor yards summarized in **Table 2.1-5**. Pipe stockpile sites along the pipeline route typically have been identified in proximity to railroad sidings. Contractor yards will reduce worker transportation requirements during construction; the size of yards is included in **Appendix N** and shown on maps in **Appendices A** and **C**. To the extent practical, Keystone proposes to use existing commercial/industrial sites or sites that previously were used for construction. Existing public or private roads will be used to access each yard. Both pipe stockpile sites and contractor yards will be used on a temporary basis and will be restored, as appropriate, upon completion of construction.

Table 2.1-5 Locations and Acreage of Potential Pipe Stockpile Sites, Railroad Sidings, and Contractors Yards

State/Type of Yard	Counties	Combined Acreage[1]
Montana		
Contractor Yards (5)	Dawson, Fallon, McCone, Valley (2)	152
Railroad Siding (5)[2]	Valley, Fallon, Roosevelt, Dawson (2)	100
Pipe Stockpile Sites (9)	Phillips, Valley (2), McCone (2), Dawson (2), Fallon (2)	269

Table 2.1-5 Locations and Acreage of Potential Pipe Stockpile Sites, Railroad Sidings, and Contractors Yards

State/Type of Yard	Counties	Combined Acreage[1]
South Dakota		
Contractor Yards (5)	Gregory, Haakon, Harding, Meade, Jones	151
Railroad Siding (5)[2]	Butte, Pennington (2), Stanley, Hutchinson	100
Pipe Stockpile Sites (11)	Harding (3), Meade (2), Haakon (2), Jones (2), Tripp (2)	328
Nebraska		
Contractor Yards (7)	Gage, Holt (2), York, Jefferson, Merrick, Greeley	191
Railroad Siding (3)[2]	Merrick, York, Jefferson	60
Pipe Stockpile Sites (9)	Keya Paha, Holt, Wheeler, Greeley, Nance, Hamilton, Fillmore, Jefferson (2)	274
Kansas		
Contractor Yards	None	0
Pipe Stockpile Sites	None	0
Oklahoma		
Contractor Yards (1)	Hughes	27
Railroad Siding (3)[2]	Grady, Pittsburg, Pottawatomie	110
Pipe Stockpile Sites (3)	Lincoln, Grady, Bryan	328
Texas		
Contractor Yards (10)	Liberty, Lamar (2), Angelina (2), Houston, Nacogdoches, Jefferson, Titus, Rusk	154
Railroad Sidings (5)[2]	Lamar, Angelina, Hardin, Titus (2)	28
Pipe Stockpile Sites (7)	Smith, Orange, Jefferson, Fannin, Lamar, Polk (2)	619

[1] Land use of these sites is currently under evaluation. The final acreage may be reduced to avoid biological or cultural resources, if any are identified.

[2] Estimated size and location.

Pipe stockpile sites and contractor yards will require some gravel placement. All gravel will be obtained from an existing, previously permitted commercial source located as close to the pipe or contractor yard as possible. An estimated 7,000 cubic yards of gravel will be required for each pipe stockpile site. The current plan identifies 39 stockpile sites requiring placement of approximately 273,000 cubic yards of gravel. An estimated 4,600 cubic yards of gravel will be required for each contractor yard. The current plan identifies 28 contractor yards requiring placement of approximately 130,000 cubic yards of gravel. Survey of pipe stockpile sites, railroad sidings, and contractor yards will be completed prior to construction.

Fuel storage will be established at approved contractor yards (see **Table 2.1-5**). Fuel will be transported from those yards by fuel trucks to the construction area for equipment fueling, which will be done daily. No separate fuel stations will be constructed. Typical diesel and gasoline fuel storage systems are shown in **Figures 2.1-11** and **2.1-12.**

The fuel storage system will typically consist of temporary aboveground 10,000- to 20,000-gallon skid mounted on-road and off-road diesel tanks and/or 9,500-gallon gasoline fuel trailers, rigid steel piping, valves and fittings, dispensing pumps and secondary containment structures. The total storage capacity, design, and orientation of the system will vary from yard to yard, depending on daily fuel requirements. Normally, a two to three day supply of fuel is maintained in storage, resulting in approximately 30,000 gallons in storage volume at each fuel storage location.

The fuel storage system will be contained within a secondary containment structure providing 110 percent containment volume of the storage tanks or trailers. Containment structures will typically consist of sandbags or earth berms lined with a chemical resistant membrane liner.

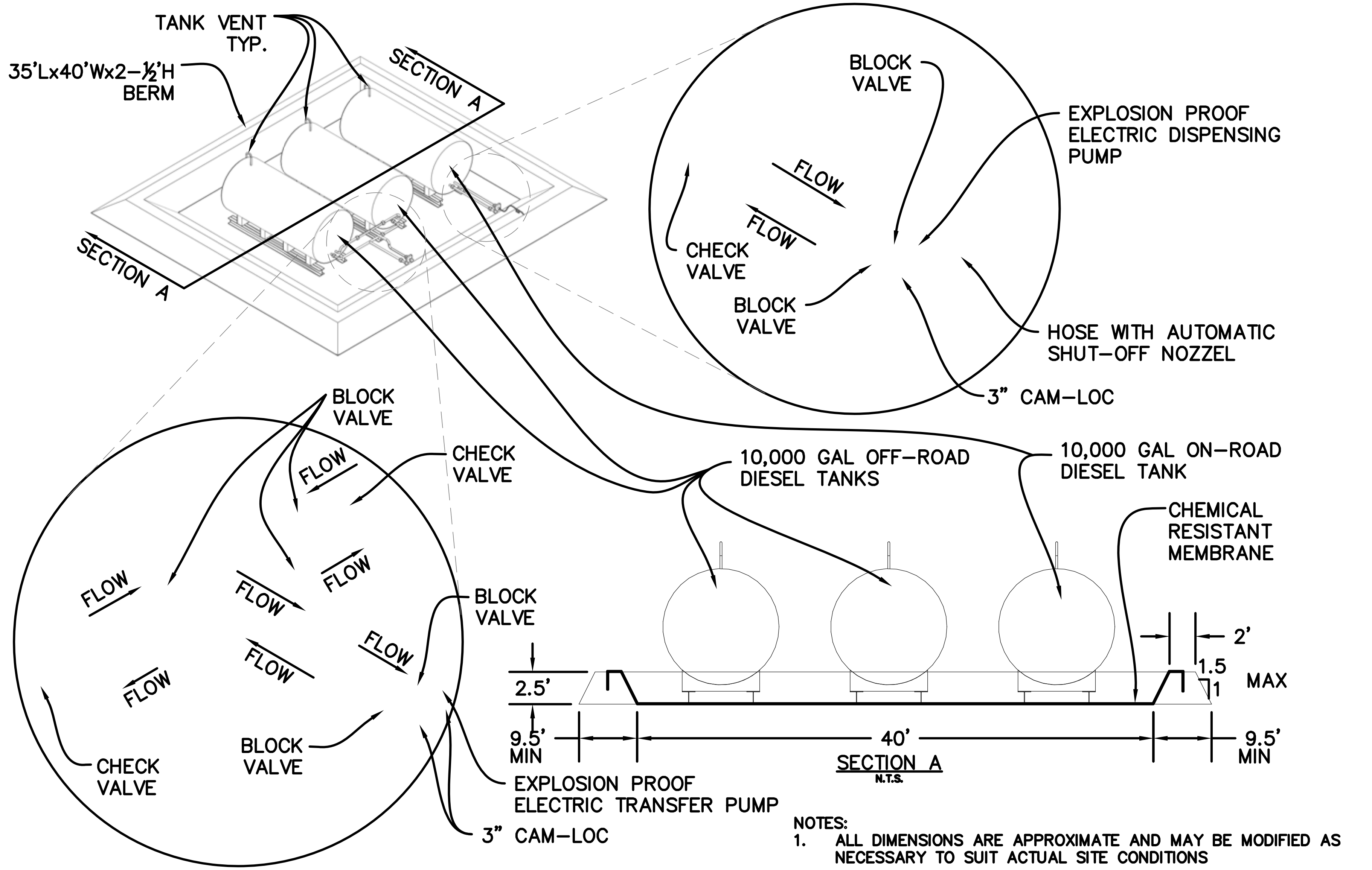
Prior to the receiving or offloading of fuels, the trucks and equipment will be grounded to eliminate any electric potential. The distributor will typically connect a petroleum rated hose from the delivery tanker to the fill line at the fill truck connection. The fill truck connection and fill line will 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 is typically accomplished by a transfer pump powered by the delivery vehicles power take off.

For loading of off-road diesel to fuel distribution trucks, the truck will typically connect a petroleum rated hose between the trucks' tank and the withdraw truck connection. The withdraw truck connection and withdraw line will consist of rigid steel piping from the tank, through a block valve(s) to an electric explosion proof fuel transfer pump. Downstream of the fuel transfer pump will be a cam-loc connection. The fuel transfer pump will be equipped with an emergency shut-off at the pump and a secondary emergency shut-off at least 100 feet from the pump.

For dispensing gasoline and on-road diesel, the transfer pump will typically be a dispensing pump with petroleum rated hoses with automatic shut-off nozzles. Typically, all storage tanks or trailers, rigid steel piping, valves and fittings and fuel transfer or dispensing pumps will be contained within a secondary containment structure providing 110 percent containment volume of the storage tanks or trailers. Containment structures will typically consist of sandbags or earth berms lined with a chemical-resistant membrane liner.

2.1.9 Construction Camps

Some portions of the Project in Montana and South Dakota lack adequate temporary housing, as further discussed in Section 3.10. In these remote locations, the construction phase of the Project will require the installation of additional temporary housing for workers. Keystone currently anticipates the need for four temporary construction camps, to be located in the general vicinity of Nashua and Baker, Montana, and close to Union Center and Winner, South Dakota. These locations will be permitted, constructed, and operated in compliance with applicable county, state, and federal regulations. **Table 2.1-6** summarizes the regulations and permits required for construction camps.



NOTES:
1. ALL DIMENSIONS ARE APPROXIMATE AND MAY BE MODIFIED AS NECESSARY TO SUIT ACTUAL SITE CONDITIONS

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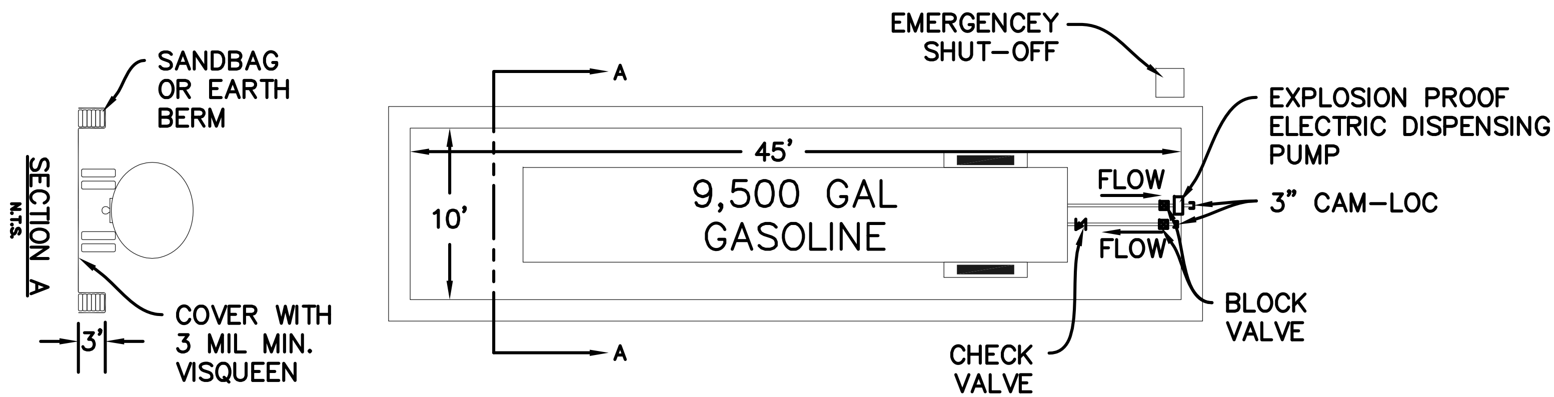
PREPARED BY:
TROW ENGINEERING CONSULTANTS, INC.
7505 NW Tiffany Springs Pkwy., Suite 400
Northpointe Circle I
Kansas City, MO 64153
Phone: 1-816-801-7063
Fax: 1-816-801-7048
Trow

ORIGINATOR: C. BUSH (NAME)	06.12.09 (DATE)	
CHECKED BY: TW	APPROVED BY: SS	

FIGURE 2.1-11

FIA # 1399	CHAINAGE:	DISCIPLINE # 00
TITLE: TYPICAL DIESEL FUEL TANK ARRANGEMENT DETAIL		
SCALE: N.T.S.	DWG No: 1399-00-ML-00-703	REV



1. TANK WILL BE APPROXIMATELY 9,500 GALLONS
2. CONTAINMENT DIMENSIONS ARE 10'x35' AND WILL PROVIDE 110% FOR VOLUMES BEING STORED
3. SHUT-OFF SWITCH WILL BE LOCATED AT EACH PUMP WITH AN EMERGENCY SWITCH OUTSIDE OF EACH BERM. A SECONDARY SHUT-OFF SWITCH WILL BE LOCATED REMOTELY IN THE WAREHOUSE OFFICE OVER 100' AWAY. SIGNS WILL INDICATE EMERGENCY SHUT-OFF INFORMATION.
4. THE PUMPS WILL BE LOCATED APPROXIMATELY 5' AWAY FROM THE TANKS AND PETROLEUM RATED HOSES WILL BE INSTALLED WITH AUTOMATIC SHUT-OFF NOZZLES.
5. THE PRODUCT TO BE DISPENSED WILL BE GASOLINE AND OR DIESEL TO BE CONSUMED BY ON-ROAD VEHICLES
6. IT SHOULD BE NOTED THAT THESE INSTALLATIONS ARE TEMPORARY AND WILL MEET THE REQUIREMENTS AND STANDARDS OF ALL FEDERAL, STATE AND LOCAL AGENCIES.
7. ALL DIMENSIONS ARE APPROXIMATE AND MAY BE MODIFIED AS NECESSARY TO SUIT ACTUAL SITE CONDITIONS

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PREPARED BY:
TROW ENGINEERING CONSULTANTS, INC.
7505 NW Tiffany Springs Pkwy., Suite 400
Northpointe Circle I
Kansas City, MO 64153
Phone: 1-816-801-7063
Fax: 1-816-801-7048

Trow

ORIGINATOR:		FIGURE 2.1-12		
C. BUSH (NAME)	06.12.09 (DATE)	FIA # 1399	CHAINAGE:	DISCIPLINE # 00
CHECKED BY: TW	APPROVED BY: SS	TITLE: TYPICAL GASOLINE TANK ARRANGEMENT DETAIL		
		SCALE: N.T.S.	DWG No: 1399-00-ML-00-702	REV

LAST PLOT DATE:
Mon, 15 Jun 2009 - 3:49pm

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Table 2.1-6 Construction Camp Permits and Regulations

Agency/State	Permit/Discussion
Montana	
Montana DEQ	Public water and sewer (PWS) laws, Title 75, chapter 6, part 1, MCA. Rules at Administrative Rules of Montana (ARM) 17.38 101, and Department Circulars incorporated by reference. Require plan and spec review before construction of a public water or sewer system. Circulars contain design requirements. Requires water quality monitoring of water supply. Sanitation in subdivisions laws, Title 76, Chapter 4, MCA. Rules at ARM Title 17, Chapter 36. If applicable, requirements would be the same as the PWS laws and Circulars for water supply and wastewater. Would require additional review of stormwater systems and solid waste management. (Probably not applicable unless created "permanent" multiple spaces for mobile homes or RVs. 76-4-102(16), MCA.) Water Quality Act Discharge Permits, Title 75, Chapter 5, MCA. Rules at ARM Title 17, Chapter 30. Groundwater discharge permit would be required if a wastewater drain field had a design capacity over 5,000 gpd. ARM 17.30.1022.
Department of Public Health and Human Services (DPHHS)	Work Camp licensing laws, Title 50, Chapter 52, MCA. Rules at ARM Title 37, Chapter 111, Subchapter 6. Regulations regarding water, sewer, solid waste, and food service. Incorporates DEQ PWS requirements but has additional water and sewer provisions. Administered by DPHHS, Public Health and Safety Division, Communicable Disease Control and Prevention Bureau, Food and Consumer Safety Section.
Counties	Permit required for wastewater systems, Regulations adopted under Section 50-2-116(1)(k), MCA. Adopting state minimum standards promulgated by Board of Environmental Review at ARM Title 17, chapter 36, Subchapter 9. Generally follow state laws for subdivisions, PWS, DEQ-4. Work camp permit required in some counties.
South Dakota	
South Dakota Department of Environment and Natural Resources Office of Drinking Water and Waste Water	Permit required for a Transient Non-community (TNC) PWS. There also are sampling requirements for a TNC PWS. A NPDES Permit will be required for waste water discharge.
Counties	An approach permit and a building permit may be necessary in some counties. A wide load permit is necessary for transport of modulars to camps.

Construction camp sites will be approximately 80 acres each in size, of which 30 acres will be used as a contractor yard and 50 acres will be used as the actual camp site. Specific locations for construction camp sites are provided in **Appendices A** and **C**.

Each camp will be designed to house approximately 600 people. The temporary housing will consist of prefabricated, modular, dormitory-style units that include heat and air conditioning systems. Camps will include sleeping areas with shared and private wash rooms, recreation facilities, telecommunications/media rooms, kitchen/dining facilities, laundry facilities, security unit, and an infirmary unit.

Where feasible, potable water will be provided by drilling a well. If adequate supply cannot be obtained from the well, water will be provided by municipal sources or trucked to each camp. A wastewater treatment facility will be included in each camp. Electricity for the camps will be generated on site through diesel-fired generators or it will be provided by local utilities from an interconnection to their distribution system.

2.1.10 Access Roads

The Project will use public and existing private roads to provide access to most of the construction ROW. The location and lengths of these roads are included in **Appendices A, C**, and **O**. Acreages of access roads are provided in **Table 2.1-3**. Paved roads are not likely to require improvement or maintenance prior to or during construction. Gravel roads and dirt roads may require maintenance during the construction period due to high use. Road improvements such as blading and filling will be restricted to the existing road footprint. Private roads and any new temporary access roads will be used and maintained only with permission of the landowner or land management agency.

Access pads will be placed at ROW crossings of public and private roads, requiring a total of about 88,000 cubic yards of gravel. There are approximately 1,590 such road crossings.

There will be approximately 400 temporary access roads for construction, which will require approximately 37,500 cubic yards of gravel for access pads and culverts.

There will be 50 permanent access roads to Project facilities, requiring approximately 244,000 cubic yards of gravel.

Keystone will construct short, permanent access roads from public roads to the proposed tank farm, pump stations, delivery facilities, and intermediate MLVs. The estimated acres of disturbance associated with the new proposed permanent access roads are included in the Aboveground Facility discussion (Section 2.1.10). Prior to construction, Keystone will finalize the location of new permanent access roads along with any temporary access roads. At a minimum, construction of new permanent access roads will require completion of cultural resources and biological surveys, along with the appropriate SHPO and USFWS consultations and approvals. Other state and local permits also may be required prior to construction. In the future, maintenance of newly created access roads will be the responsibility of Keystone.

2.1.11 Aboveground Facilities

The Project will require approximately 368 acres of land along the Project segments for aboveground facilities, including pump stations, delivery facilities, densitometer sites, intermediate MLVs, and the tank farm. Gravel will be used to stabilize the land for permanent facilities, including pump stations, valve sites, and permanent access roads.

2.1.11.1 Pump Stations

A total of 30 new pump stations, each situated on approximately 5- to 10-acre sites, will be constructed; 18 will be on the Steele City Segment, 10 on the Gulf Coast Segment, and 2 on the Keystone Cushing Extension in

Kansas (**Table 2.1-1**). Specific locations for pump stations are shown in **Appendix A**. Each new pump station will consist of up to five pumps driven by electric motors, an electrical building, an electrical substation, two sump tanks, a remotely operated MLV, a communication tower, a small maintenance building, and a parking area for station maintenance personnel. Stations will operate on locally purchased electric power and will be fully automated for unmanned operation. The pump stations will have a uninterruptable power supply (UPS) for all communication and specific controls equipment in the case of a power failure. No back up generators at pump stations are planned and, therefore, no fuel storage tanks will be located at pump stations. Communication towers at pump stations generally will be approximately 33 feet in height. However, antenna height at select pump stations, as determined upon completion of a detailed engineering study, may be taller, but in no event will exceed a maximum height of 190 feet. The pipe entering and exiting the pump station sites will be located below grade. The pipe manifolding connected with the pump stations will be aboveground. **Figures 2.1-13** and **2.1-14** show typical pump station configurations. Information related to power lines providing power to the pump stations is contained in Section 7 of this Environmental Report.

Typically, approximately six inches of gravel will be used on pump stations. A typical 5- to 10-acre pump station will require between 4,000 to 8,000 cubic yards of gravel. Approximately 150,000 cubic yards of gravel will be required for the 30 pump stations.

2.1.11.2 Tank Farm

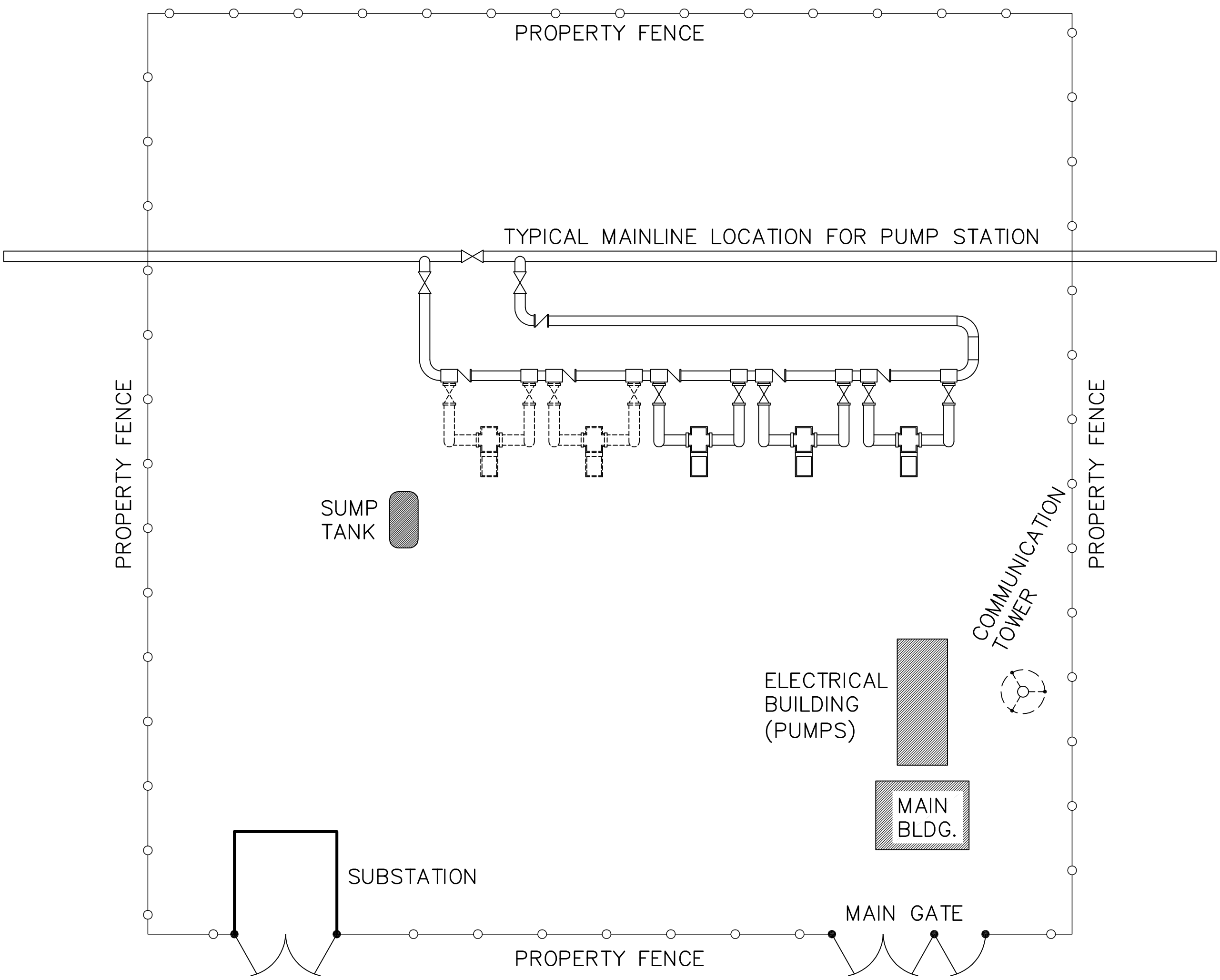
Keystone will construct one tank farm on an approximate 50-acre site. The tank farm will consist of three 350,000-barrel tanks to be used operationally for the management of oil movement through the system, as well as four booster pumps, one sump tank, two ultrasonic meters, pig launchers and receivers, two buildings, and parking for maintenance personnel. The tank farm will operate on locally purchased electricity and will be fully automated for unmanned operation.

2.1.11.3 Other Aboveground Facilities

Keystone will install two delivery facilities along the Project route, one at Nederland and one at Moore Junction, Texas (**Table 2.1-1**). The delivery facilities will include pressure regulating, sampling, crude oil measurement equipment, a densitometer, a pig receiver, and one quality assurance building.

Keystone will construct 74 intermediate MLV sites along the new pipeline ROW. Intermediate MLVs will be sectionalizing block valves generally constructed within a fenced 30-foot by 40-foot site located on the permanent easement. Remotely operated intermediate MLVs will be located at major river crossings and upstream of sensitive waterbodies and at intermediate locations. Additional remotely operated MLVs will be located at pump stations, as described in Section 2.1.10.1. These remotely operated valves can be activated to shut down the pipeline in the event of an emergency to minimize environmental impacts in the unlikely event of a spill. Currently anticipated locations of intermediate MLVs are included in **Table 2.1-7**. The actual spacing intervals between the MLVs and intermediate MLVs will be based upon the location of the pump stations, waterbodies wider than 100 feet, sensitive environmental resources, and other hydraulic profile considerations.

Typically, approximately 6 inches of gravel will be used on valve sites. Approximately 1,650 cubic yards of gravel will be required for the 74 valve sites.



NOTES:

1. SITE CONTAINS A DRIVEWAY FROM GATE TO GATE.
2. FENCED AREA WILL CONTAIN A MINIMUM OF 4" THICK GRAVEL PAD.

REVISIONS	
1	REMOVED SEPTIC TANK; RENUMBERED FIG.
2	ADDED NOTES & ASSIGNED TCPL DRAWING #
3	ADDED COMMUNICATION TOWER
4	ADDED PUMP

G:\2000DraftingandGIS\CADFiles\Drawings\ER\FIGURES_2.1-13_2.1-14_REV4.dwg 6/30/2009 10:28:11 AM CDT

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PREPARED BY:
TROW ENGINEERING CONSULTANTS, INC.
7505 NW Tiffany Springs Pkwy., Suite 400
Northpointe Circle I
Kansas City, MO 64153
Phone: 1-816-801-7063
Fax: 1-816-801-7048
Trow

ORIGINATOR: JOE A. NELSON (NAME) 9/08/08 (DATE)

CHECKED BY: TW
APPROVED BY: SS

FIGURE 2.1-13

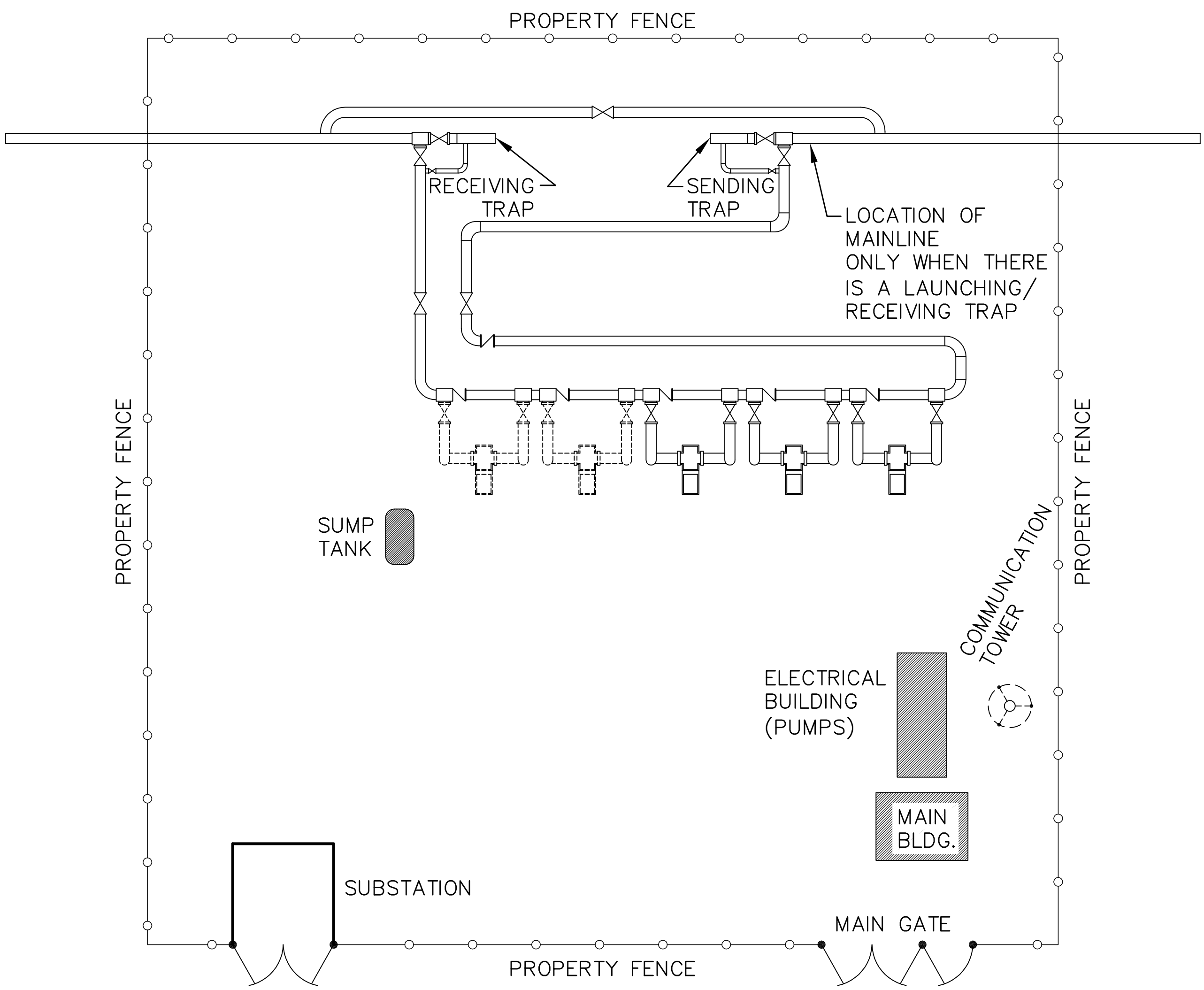
FIA # 1399 | CHAINAGE: | DISCIPLINE # 01

TITLE: TYPICAL PUMP STATION WITHOUT PIGGING FACILITIES

SCALE N.T.S. | DWG No 1399-01-10-03-700 | REV 4

LAST PLOT DATE: Tue, 30 Jun 2009 - 10:31am

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS   PLOTTED SIZE: ANSI A (8.5x11)



NOTES:

1. SITE CONTAINS A DRIVEWAY FROM GATE TO GATE.
2. FENCED AREA WILL CONTAIN A MINIMUM OF 4" THICK GRAVEL PAD.

REVISIONS	
1	REMOVED SEPTIC TANK; RENUMBERED FIG.
2	ADDED NOTES & ASSIGNED TCPL DRAWING #
3	ADDED COMMUNICATION TOWER
4	ADDED PUMP

G:\2000DraftingandGIS\CADFiles\Drawings\ER\FIGURES_2.1-13_2.1-14_REV4.dwg 6/30/2009 10:28:11 AM CDT

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PREPARED BY:
TROW ENGINEERING CONSULTANTS, INC.
7505 NW Tiffany Springs Pkwy., Suite 400
Northpointe Circle I
Kansas City, MO 64153
Phone: 1-816-801-7063
Fax: 1-816-801-7048
Trow

ORIGINATOR: JOE A. NELSON (NAME) 9/08/08 (DATE)

CHECKED BY: TW | APPROVED BY: SS

FIGURE 2.1-14

FIA # 1399 | CHAINAGE: | DISCIPLINE # 01

TITLE: TYPICAL PUMP STATION WITH PIGGING FACILITIES

SCALE N.T.S. | DWG No 1399-01-10-03-701 | REV 4

LAST PLOT DATE: Tue, 30 Jun 2009 - 10:32am

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS PLOTTED SIZE: ANSI A (8.5x11)

Table 2.1-7 Intermediate Main Line Valve Locations

Main Line Valve ID	Approximate Milepost	Associated Facilities	Land Ownership	Land Use
MLV-01	20.27	Motor Operated Valve Site	Private	Grassland/Rangeland
CK-MLV-02	28.14	Check and Manual Valve Site	Private	Agricultural/Cropland
MLV-03	63.51	Motor Operated Valve Site	Private	Grassland/Rangeland
CK-MLV-04	71.68	Check and Manual Valve Site	Private	Agricultural/Cropland
MLV-05	81.21	Motor Operated Valve Site	Private	Agricultural/Cropland
CK-MLV-06	83.82	Check and Manual Valve Site	Private	Agricultural/Cropland
CK-MLV-07	90.83	Check and Manual Valve site	BLM	Grassland/ Rangeland
MLV-08	122.83	Motor Operated Valve Site	Private	Agricultural/Cropland
MLV-09	177.67	Motor Operated Valve Site	Private	Grassland/Rangeland
MLV-10	194.06	Motor Operated Valve Site	Private	Agricultural/Cropland
CK-MLV-11	203.21	Check and Manual Valve Site	Private	Agricultural/Cropland
MLV-12	227.43	Motor Operated Valve Site	Private	Agricultural/Cropland
MLV-13	244.72	Motor Operated Valve Site	Private	Agricultural/Cropland
MLV-14	264.99	Motor Operated Valve Site	Private	Grassland/Rangeland
MLV-15	288.13	Motor Operated Valve Site	Private	Grassland/Rangeland
CK-MLV-16	298.64	Check and Manual Valve Site	Private	Agricultural/Cropland
MLV-17	361.25	Motor Operated Valve Site	Private	Grassland/Rangeland
MLV-18	415.46	Motor Operated Valve Site	Private	Grassland/Rangeland
CK-MLV-19	431.48	Check and Manual Valve Site	Private	Grassland/Rangeland
MLV-20	470.33	Motor Operated Valve Site	Private	Agricultural/Cropland
MLV-21	520.00	Motor Operated Valve Site	Private	Agricultural/Cropland
MLV-22	535.01	Motor Operated Valve Site	Private	Grassland/Rangeland
MLV-23	568.96	Motor Operated Valve Site	Private	Grassland/Rangeland
MLV-24	596.66	Motor Operated Valve Site	Private	Grassland/Rangeland
CK-MLV-25	600.55	Check and Manual Valve Site	Private	Grassland/Rangeland
MLV-26	614.91	Motor Operated Valve Site	Private	Grassland/Rangeland
CK-MLV-27	617.23	Check and Manual Valve Site	Private	Grassland/Rangeland
MLV-27A	634.66	Motor Operated Valve Site	Private	Agricultural/Cropland
MLV-28	660.95	Motor Operated Valve Site	Private	Grassland/Rangeland
MLV-29	717.21	Motor Operated Valve Site	State Hwy 56	Grassland/Rangeland
MLV-30	735.82	Motor Operated Valve Site	Private	Agricultural/Cropland
CK-MLV-31	746.60	Check and Manual Valve Site	Private	Agricultural/Cropland
CK-MLV-32	764.08	Check and Manual Valve site	Private	Agricultural/Cropland
MLV-33	772.78	Motor Operated Valve Site	Private	Pivot/Cropland

Table 2.1-7 Intermediate Main Line Valve Locations

Main Line Valve ID	Approximate Milepost	Associated Facilities	Land Ownership	Land Use
CK-MLV-34	789.40	Check and Manual Valve Site	Private	Agricultural/Cropland
MLV-35	819.84	Motor Operated Valve Site	Private	Grassland/Rangeland
Gulf Coast Segment				
MLV-105	21.06	Motor Operated Valve Site	Private	Forest
CK-MLV-110	24.19	Check and Manual Valve Site	Private	Grassland/Rangeland
MLV-115	38.43	Motor Operated Valve Site	Private	Wetland[1]
CK-MLV-120	39.04	Check and Manual Valve Site	Private	Grassland/Rangeland
MLV-125	66.72	Motor Operated Valve Site	Private	Grassland/Rangeland
MLV-130	73.25	Motor Operated Valve Site	Private	Grassland/Rangeland
CK-MLV-135	75.65	Check and Manual Valve Site	Private	Grassland/Rangeland
MLV-140	125.63	Motor Operated Valve Site	Private	Forest
CK-MLV-145	128.17	Check and Manual Valve Site	Private	Forest
MLV-150	152.76	Motor Operated Valve Site	Private	Grassland/Rangeland
CK-MLV-155	161.94	Check and Manual Valve Site	Private	Agricultural/Cropland
MLV-160	188.22	Motor Operated Valve Site	Private	Agricultural/Cropland
CK-MLV-165	191.64	Check & Manual Valve Site	Private	Grassland/Rangeland
MLV-170	199.89	Motor Operated Valve Site	Private	Grassland/Rangeland
CK-MLV-175	202.05	Check and Manual Valve Site	Private	Grassland/Rangeland
MLV-180	225.54	Motor Operated Valve Site	Private	Grassland/Rangeland
MLV-185	232.76	Motor Operated Valve Site	Private	Agricultural/Rangeland
MLV-190	261.38	Motor Operated Valve Site	Private	Forest
CK-MLV-195	266.62	Check and Manual Valve Site	Private	Forest
MLV-200	276.59	Motor Operated Valve Site	Private	Forest
CK-MLV-205	282.80	Check and Manual Valve Site	Private	Grassland/Rangeland
MLV-210	313.30	Motor Operated Valve Site	Private	Grassland/Rangeland
MLV-215	364.39	Motor Operated Valve Site	Private	Grassland/Rangeland
CK-MLV-220	369.59	Check and Manual Valve Site	Private	Grassland/Rangeland
MLV-225	404.24	Motor Operated Valve Site	Private	Forest
MLV-230	417.53	Motor Operated Valve Site	Private	Grassland/Rangeland
MLV-235	427.27	Motor Operated Valve Site	Private	Wetland[1]
MLV-240	432.66	Motor Operated Valve Site	Private	Forest
MLV-245	442.52	Motor Operated Valve Site	Private	Grassland/Rangeland
MLV-250	458.33	Motor Operated Valve Site	Private	Grassland/Rangeland
MLV-255	469.68	Motor Operated Valve Site	Private	Wetland[1]

Table 2.1-7 Intermediate Main Line Valve Locations

Main Line Valve ID	Approximate Milepost	Associated Facilities	Land Ownership	Land Use
Houston Lateral				
MLV-300	9.75	Motor Operated Valve Site	Private	Grassland/Wetland[1]
MLV-305	21.75	Motor Operated Valve Site	Private	Forested
CK-MLV-310	23.39	Check and Manual Valve Site	Private	Grassland/Rangeland
MLV-315	32.63	Motor Operated Valve Site	Private	Grassland/Rangeland
MLV-320	42.92	Motor Operated Valve Site	Private	Forested
CK-MLV-325	44.38	Motor Operated Valve Site	Private	Grassland/Rangeland
MLV-330	48.57	Motor Operated Valve Site	Private	Grassland/Rangeland

[1] Keystone is examining the location of these intermediate MLVs based on recent surveys that identified the location as wetland. Keystone will attempt to relocate these valves out of wetlands.

Note: Mileposting for each Segment of the Project starts at 0.0 at the northernmost point of each Segment and increase in the direction of oil flow.

The Project will be designed to permit pigging of the entire length of the pipeline with minimal interruption of service. Pig launchers and/or receivers will be constructed and operated completely within the boundaries of the pump stations or delivery facilities. Launchers and receivers will allow pigging of the pipeline with high-resolution internal line inspection tools and maintenance cleaning pigs.

2.1.12 Construction Procedures

The proposed facilities will be designed, constructed, tested, and operated in accordance with all applicable requirements included in the USDOT regulations at 49 CFR Part 195, *Transportation of Hazardous Liquids by Pipeline*, and other applicable federal and state regulations. These regulations are intended to ensure adequate protection for the public and to prevent crude oil pipeline accidents. Among other design standards, 49 CFR Part 195 specifies pipeline material and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion.

To manage construction impacts, Keystone will implement its Construction Mitigation and Reclamation Plan (**Appendix I**). This plan contains construction and mitigation procedures that will be used throughout the Project. Subsections address specific environmental conditions. Procedures to restore impacts to permanent ROW are described in the CMRP.

The Project's Spill Prevention, Control, and Countermeasure (SPCC) Plan will be implemented to avoid or minimize the potential for harmful spills and leaks during construction. The plan describes spill prevention practices, emergency response procedures, emergency and personnel protection equipment, release notification procedures, and cleanup procedures. A template for the SPCC Plan is provided in **Appendix Y**. A final SPCC Plan will be prepared once the construction contractors have been selected.

Mitigation and other measures contained in this Environmental Report will apply to the basic design and construction specifications applicable to lands disturbed by the Project. This approach will enable construction to proceed with a single set of specifications, irrespective of the ownership status (federal versus non-federal) of the land being crossed. On private lands, these requirements may be modified slightly to accommodate specific landowner requests or preferences or state-specific conditions.

2.1.12.1 General Pipeline Construction Procedures

Before starting construction at a specific site, Keystone will finalize engineering surveys of the ROW centerline and additional TWAs and complete the acquisition of ROW easements and any necessary acquisitions of property in fee.

Pipeline construction generally proceeds as a moving assembly line as shown in **Figure 2.1-15** and summarized below. Keystone currently plans to construct the pipeline in 17 spreads. 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, Keystone will use special construction techniques where warranted by site-specific conditions. These special techniques will be used when constructing across rugged terrain, waterbodies, wetlands, paved roads, highways, and railroads (Section 2.1.11.2).

An approximate quantity of the typical construction equipment to be used per spread, and an estimate of the minimum equipment needs is summarized in **Table 2.1-8**. Actual equipment used will depend upon the construction activity and specific equipment owned by selected contractors.

Table 2.1-8 Minimum Equipment Required for Selected Construction Activities

Activity	Minimum Equipment
Clearing and grading	• six D8 dozers; • one 330 backhoe (thumb and hoe pack); • two 345 backhoes; • two D8 ripper dozers; • one 140 motor grader; and • two environmental crews per spread for installing silt fence and hay bale structures, as required
Trenching	• six 345 backhoes; • one 345 backhoe with pecker hammer; and • two ditching machines
Stringing, bending, and welding	• two 345 backhoes vacuum fitted – one at pipe yard, one at ROW; • one D7 dozer; • fifteen string trucks; • two bending machines; • thirteen 572 side booms; • one automatic welding machine with end-facing machine; • one welding shack; • eight ultrasonic testing units; • one hand scanner; • one sled; • two heat rings; • two coating rings; and • one sled with generators
Lowering in and backfilling	• three 345 backhoes (1 equipped with long neck); • five 583 side booms; • two padding machines; and • three D8 dozers
Tie-ins to the mainline	Three tie-in crews per spread. Each crew requires: • two welding machines; • welding shacks; • seven 572 side booms;

Table 2.1-8 Minimum Equipment Required for Selected Construction Activities

Activity	Minimum Equipment
	• eight ultrasonic testing units; • hand scanner; • sled; • two heat rings; • two coating rings; • sled with generators • two 345 backhoes (1 equipped with shaker bucket); • one 583 side boom; and • one D8 dozer
Cleanup and restoration	• six D8 dozers; • three 345 backhoes; and • two tractors with mulcher spreaders (seed and reclamation)

In addition to the equipment listed above, the following resources typically will be deployed on each spread:

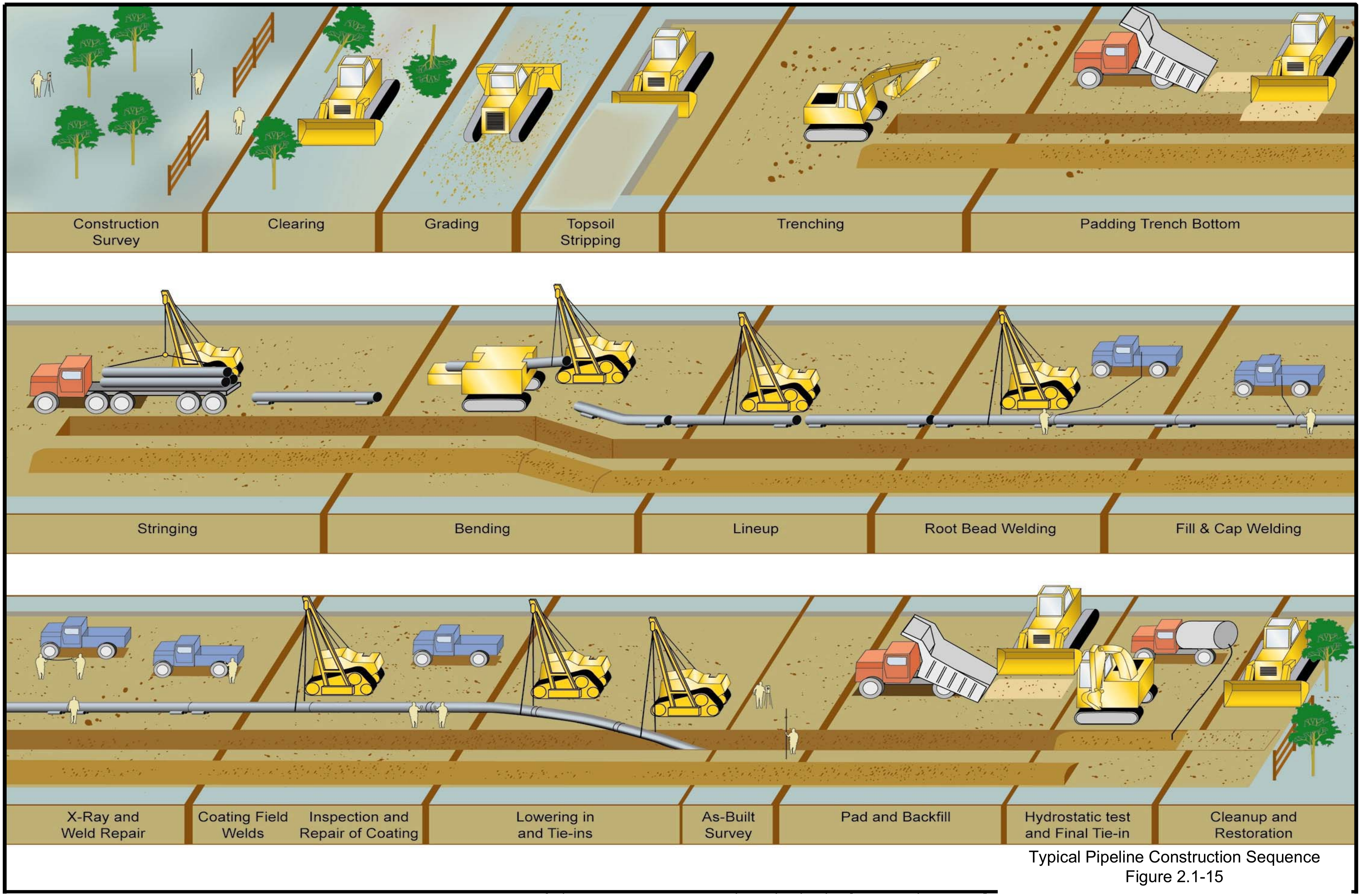
- 450 to 500 construction personnel;
- 50 inspection personnel;
- 100 pickups, 2 water trucks, 2 fuel trucks;
- 7 equipment low-boys;
- 7 flat beds; and
- Five 2-ton bob tails.

Normal construction activities will be conducted during daylight hours, with the following exceptions.

- Completion of critical tie-ins on the ROW will likely 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, that work may be required continuously until the work is completed; this may last one or more 24-hour days. Such operations may include drilling and pull-back operation, depending upon the site and weather conditions, permit requirements, schedule, crew availability, and other factors.
- While not anticipated in typical operations, certain work may be required after the end of daylight hours due to weather conditions, for safety, or for other project requirements.

<u>Survey and Staking</u>

Before construction begins at any given location, the limits of the approved work area (i.e., the construction ROW boundaries and any additional TWAs) will be marked and the location of approved access roads and existing utility lines will be flagged. Landowner fences will be braced and cut and temporary gates and fences will be installed to contain livestock, if present. Wetland boundaries and other environmentally sensitive areas also will be marked or fenced for protection at this time. Before the pipeline trench is excavated, a survey crew will stake the centerline of the proposed trench and any buried utilities along the ROW.



Typical Pipeline Construction Sequence
Figure 2.1-15

Clearing and Grading

A clearing crew will follow the fencing crew and will clear the work area of vegetation (including crops) and obstacles (e.g., trees, logs, brush, rocks). Temporary erosion control measures such as silt fence or straw bales will be installed prior to vegetation removal along slopes leading to wetlands and riparian areas. Grading will be conducted where necessary to provide a reasonably level work surface. Where the ground is relatively flat and does not require grading, rootstock will be left in the ground. More extensive grading will be required in steep side slopes or vertical areas and where necessary to prevent excessive bending of the pipe.

Trenching

The trench will be excavated to a depth that provides sufficient cover over the pipeline after backfilling. Typically, the trench will be seven to eight feet deep and four to five feet wide in stable soils. In most areas, the USDOT requires a minimum of 30 inches of cover and as little as 18 inches in rocky areas. To reduce the risk of third party damage Keystone will exceed the federal depth of cover requirements in most areas. In all areas, except areas of consolidated rock, the depth-of-cover for the pipeline will be a minimum of 48 inches (**Table 2.1-9**). In areas of consolidated rock, the minimum depth of cover will be 36 inches. Trenching may precede bending and welding or may follow based on several factors including soil characteristics, water table, presence of drain tiles, and weather conditions at the time of construction.

Table 2.1-9 Minimum Pipeline Cover

Location	Normal Excavation (inches)	Rock Excavation (inches)
Most areas	48	36
All waterbodies	60	36
Dry creeks, ditches, drains, washes, gullies, etc.	60	36
Drainage ditches at public roads and railroads	60	48

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

When rock or rocky formations are encountered, tractor-mounted mechanical rippers or rock trenchers will be used to fracture the rock prior to excavation. In areas where mechanical equipment can not break up or loosen the bedrock, blasting (use of explosives) will be required (Section 2.1.11.2). After the pipeline is padded, excavated rock will be used to backfill the trench to the top of the existing bedrock profile.

In agricultural land, rocks that are exposed on the surface due to construction activity will be removed from the ROW prior to and after topsoil replacement to an equivalent quantity, size, and distribution of rocks as that on adjacent, undisturbed lands. Clearing of rocks may be carried out with a mechanical rock picker or by manual means, provided that preservation of topsoil is assured. Rock removed from the ROW will be hauled off the landowner's premises or disposed of on the landowner's premises at a location that is mutually acceptable to the landowner and to Keystone.

Topsoil segregation will be based on site-specific circumstances and one of the following mitigating measures will be implemented. Topsoil will be separated from subsoil over the trench, over the trench and spoil side, or full width of ROW. Keystone may also conduct full ROW topsoil stripping in other areas where it is beneficial from a construction stand-point, or where required by landowners or land managers. When soil is removed from only the trench, topsoil will be piled on the near side of the trench and subsoil on the far side of the trench. This will allow for proper restoration of the soil during the backfilling process (see **Figures 2.1-8** through **2.1-10**). When soil is removed from both the trench and the spoil side, topsoil will be stored on the edge of the near side of the construction ROW and the subsoil on the spoil side of the trench. In areas where the ROW will be graded to provide a level working surface and where there is another need to separate topsoil from subsoil, topsoil will be removed from the entire area to be graded and stored separately from the subsoil.

Topsoil will be piled such that the mixing of subsoil and topsoil will not occur. Gaps will be left between the spoil piles to prevent storm water runoff from backing up or flooding.

Pipe Stringing, Bending, and Welding

Prior to or following trenching, sections of externally coated pipe approximately 80 feet long (also referred to as "joints") will 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 will 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 joints will be welded together into long strings and placed on temporary supports. During welding the pipeline joints will be lined up and held in position until securely joined. Keystone will non-destructively inspect 100 percent of the welds using radiographic, ultrasonic, or other USDOT approved method. Welds that do not meet established specifications will be repaired or removed. Once the welds are approved, a protective epoxy coating will be applied to the welded joints. The pipeline will then be electronically inspected or "jeeped" for faults or holidays in the epoxy coating and visually inspected for any faults, scratches, or other coating defects. Damage to the coating will be repaired before the pipeline is lowered into the trench.

In rangeland areas used for grazing, construction activities potentially can 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 will 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 will be constructed with a ramp on each side to provide an avenue of escape for animals that may fall into the trench.

Lowering in and Backfilling

Before the pipeline is lowered into the trench, the trench will be inspected to be sure it is free of livestock or wildlife, as well as rock and other debris that could damage the pipe or its protective coating. In areas where water has accumulated, dewatering may be necessary to permit inspection of the bottom of the trench. The pipeline then will be lowered into the trench. On sloped terrain, trench breakers (e.g., stacked sand bags or foam) will be installed in the trench at specified intervals to prevent subsurface water movement along the pipeline. The trench will then be backfilled using the excavated material. In rocky areas, the pipeline will be protected with an abrasion-resistant coating or rock shield (fabric or screen that is wrapped around the pipe to protect the pipe and its coating from damage by rocks, stones, and roots). Alternatively, the trench bottom will be filled with padding material (e.g., sand, soil, or gravel) to protect the pipeline. An estimated 85,000 cubic yards of padding material will be required. No topsoil will be used as padding material. Topsoil will be returned to its original horizon after subsoil is backfilled in the trench.

Hydrostatic Testing

The pipeline will be hydrostatically tested in sections of approximately 30 miles (with a maximum 50 miles) to ensure the system is capable of withstanding the operating pressure for which it is designed. This process involves isolating the pipe segment with test manifolds, filling the segment with water, pressurizing the segment to a pressure a minimum of 1.25 times the MOP at the high point elevation of each test section, and maintaining that pressure for a period of eight hours. Fabricated assemblies may be tested prior to installation in the trench for a period of four hours. The hydrostatic test will be conducted in accordance with 49 CFR Part 195.

Keystone proposes to obtain water for hydrostatic testing from rivers and streams crossed by the pipeline and in accordance with federal, state, and local regulations. Generally the pipeline will be hydrostatically tested after backfilling and all construction work that will directly affect the pipe is complete. If leaks are found, they will be repaired and the section of pipe retested until specifications are met. Water used for the testing will then be transferred to another pipe segment for subsequent hydrostatic testing. Alternately, the water will be tested to ensure compliance with the NPDES discharge permit requirements, treated if necessary, and discharged. Hydrostatic testing is discussed further in Section 4.2.4.1 of this Environmental Report and in the CMRP.

Pipe Geometry Inspection

The pipeline will be inspected prior to final tie-ins utilizing an electronic caliper (geometry) pig to ensure the pipeline does not have any dents, bulging, or ovality that might be detrimental to the operation of the pipeline.

Final Tie-ins

Following successful hydrostatic testing, test manifolds will be removed and the final pipeline tie-in welds will be made and inspected.

Commissioning

After the final tie-ins are complete and inspected, the pipeline will be cleaned and dewatered. Commissioning involves verifying that equipment has been installed properly and is working, that controls and communications systems are functional, and that the pipeline is ready for service. In the final step, the pipeline is prepared for service by filling the line with crude oil.

Cleanup and Restoration

During cleanup, construction debris on the ROW will be disposed of and work areas will be final graded. Preconstruction contours will be restored as closely as possible. Segregated topsoil will be spread over the surface of the ROW and permanent erosion controls will be installed. After backfilling, final cleanup will begin as soon as weather and site conditions permit. Every reasonable effort will be made to complete final cleanup (including final grading and installation of erosion control devices) within approximately 20 days after backfilling the trench (approximately 10 days in residential areas), subject to weather and seasonal constraints. Construction debris will be cleaned up and taken to an appropriate disposal facility.

After permanent erosion control devices are installed and final grading complete, all disturbed work areas except annually cultivated fields will be seeded as soon as possible. Seeding is intended to stabilize the soil, revegetate areas disturbed by construction, and restore native vegetation. Timing of the reseeding efforts will depend upon weather and soil conditions and will be subject to the prescribed rates and seed mixes specified by the landowner, land management agency, or Natural Resources Conservation Service (NRCS) recommendations. On agricultural lands, seeding will be conducted only as agreed upon with the landowner.

Keystone will restrict access to the permanent easement using gates, boulders, or other barriers to minimize unauthorized access by all-terrain vehicles in wooded areas if requested by the landowner. Pipeline markers will be installed at road and railroad crossings and other locations (as required by 49 CFR Part 195) to show the location of the pipeline. Markers will identify the owner of the pipeline and convey emergency contact information. Special markers providing information and guidance to aerial patrol pilots also will be installed.

2.1.12.2 Special Construction Procedures

In addition to standard pipeline construction methods, Keystone will use special construction techniques where warranted by site-specific conditions. These special techniques will be used when crossing roads, highways and railroads; steep terrain; unstable soils; waterbodies; wetlands; areas that require blasting; and residential and commercial areas. These special techniques are described below.

Road, Highway, and Railroad Crossings

Construction across paved roads, highways, and railroads will be in accordance with the requirements of the road and railroad crossing permits and approvals obtained by Keystone. In general, all major paved roads, all primary gravel roads, highways, and railroads will be crossed by boring beneath the road or railroad. **Figure 2.1-16** illustrates a typical bored road or railroad crossing. Boring requires the excavation of a pit on each side of the feature, the placement of boring equipment in the pit, and boring a hole under the road at least equal to the diameter of the pipe. Once the hole is bored, a prefabricated pipe section will be pulled through the borehole. For long crossings, sections can be welded onto the pipe string just before being pulled through the borehole. Boring will result in minimal or no disruption to traffic at road or railroad crossings. Each boring will be expected to take 1 to 2 days for most roads and railroads and 10 days for long crossings such as interstate or four-lane highways.

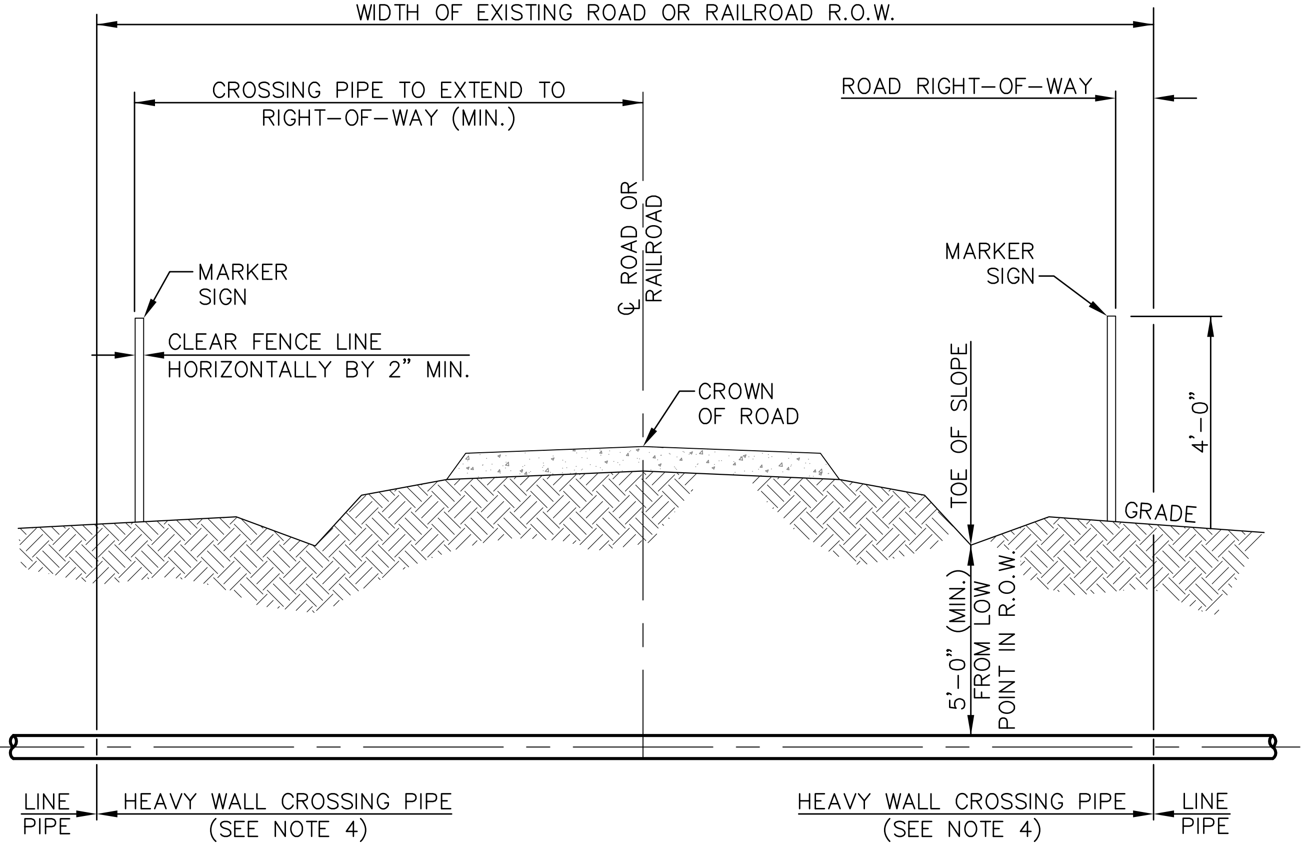
Most smaller, unpaved roads and driveways will be crossed using the open-cut method where permitted by local authorities or private owners. The open-cut method will require temporary closure of the road to traffic and establishment of detours. If no reasonable detour is feasible, at least one lane of traffic will be kept open, except during brief periods when it is essential to close the road to install the pipeline. Most open-cut road crossings can be finished and the road resurfaced in 1 or 2 days. Keystone will take measures, such as posting signs at open-cut road crossings to ensure safety and minimize traffic disruptions and prepare traffic control plans in accordance with the applicable regulations as necessary.

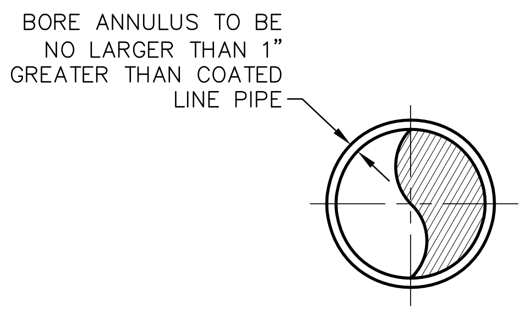
Steep Terrain

Additional grading may be required in areas where the proposed pipeline route will cross steep slopes. Steep slopes often need to be graded down to a gentler slope for safe operation of construction equipment and to accommodate pipe-bending limitations. In such areas, the slopes will be excavated prior to pipeline installation and reconstructed to a stable condition.

In areas where the pipeline route crosses laterally along the side of a slope, cut and fill grading may be required to obtain a safe, flat work terrace. Topsoil will be stripped from the entire ROW and stockpiled prior to cut and fill grading on steep terrain. Generally on steep slopes, soil from the high side of the ROW will be excavated and moved to the low side of the ROW to create a safe and level work terrace. After the pipeline is installed, the soil from the low side of the ROW will be returned to the high side and the slope’s contour will be restored as near as practicable to preconstruction condition. Topsoil from the stockpile will be spread over the surface, erosion control features installed, and seeding implemented.

In steep terrain, temporary sediment barriers such as silt fence and straw bales will be installed during clearing to prevent the movement of disturbed soil into wetland, waterbody, or other environmentally sensitive areas.





NOTES:

1. CROSSINGS SHALL BE IN ACCORDANCE WITH APPLICABLE PERMIT.
2. ROAD CROSSING PIPE SHALL EXTEND AT MINIMUM TO RIGHT-OF-WAY LINE UNLESS OTHERWISE SPECIFIED.
3. THE TYPE AND MINIMUM REQUIRED LENGTH OF PIPE FOR CROSSINGS OF ROADS SHALL BE AS SPECIFIED ON ALIGNMENT SHEETS.
4. PIPE FOR BORED CROSSINGS TO INCLUDE ABRASION-RESISTANT (ARB) COATING.
5. PIPELINE MARKER AND TEST STATIONS TO BE INSTALLED ON RIGHT-OF-WAY LINE NEXT TO FENCE IF POSSIBLE.
6. THE CROSSING PIPE SHALL BE STRAIGHT WITH NO VERTICAL OR HORIZONTAL BENDS WITHIN ROAD RIGHT-OF-WAY.

REVISIONS	
1	Updated drawing notes
2	REVISED DWG. NUMBER

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KEYSTONE XL PROJECT

PREPARED BY:
TROW ENGINEERING CONSULTANTS, INC.
7505 NW Tiffany Springs Pkwy., Suite 400
Northpointe Circle I
Kansas City, MO 64153
Phone: 1-816-801-7063
Fax: 1-816-801-7048
Trow

ORIGINATOR: JOE A. NELSON (NAME) 11/04/08 (DATE)

CHECKED BY: TW | APPROVED BY: SS

FIGURE 2.1-16

FIA # 1399 | CHAINAGE: | DISCIPLINE # 03

TITLE: TYPICAL UNCASED ROAD/RAILROAD CROSSING BORE DETAIL

SCALE N.T.S. | DWG No 1399-03-ML-03-463 | REV 2

LAST PLOT DATE: Mon, 15 Jun 2009 - 3:49pm

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Temporary slope breakers consisting of mounded and compacted soil will be installed across the ROW during grading and permanent slope breakers will be installed during cleanup. Following construction, seed will be applied to steep slopes and the ROW will be mulched with hay or non-brittle straw or covered with erosion control fabric. Sediment barriers will be maintained across the ROW until permanent vegetation is established. Additional temporary workspace may be required for storage of graded material and/or topsoil during construction.

Unstable Soils

Construction in unstable soils, such as those within the sand hills region of South Dakota and Nebraska, will be in accordance with measures outlined in the CMRP. Construction in these areas could require extended TWAs. Keystone will apply special construction and mitigation techniques to areas with high potential for landslides, erosion-prone locations, and blowouts. To facilitate reclamation, Keystone could implement measures such as the use of photodegradable mats and livestock controls.

Waterbody Crossings - Perennial

Approximately 280 perennial waterbodies will be crossed during the construction of the Project. A list of waterbodies crossed by the Project is included in **Appendix E**. Perennial waterbodies will be crossed using one of four techniques: the open-cut wet method (Keystone's preferred method), dry flume method, dry dam-and-pump method, or HDD. Each method is described below.

Keystone's preferred crossing method will be to use the open-cut crossing method. The open-cut method involves trenching through the waterbody while water continues to flow through the construction work area (Appendix I, Details 11 and 12). Pipe segments for the crossing will be fabricated adjacent to the waterbody. Generally, backhoes operating from one or both banks will excavate the trench within the streambed. In wider rivers, in-stream operation of equipment may be necessary. Hard or soft trench plugs will be placed to prevent the flow of water into the upland portions of the trench. Trench spoil excavated from the streambed generally will be placed at least 10 feet away from the water's edge unless stream width is great enough to require placement in the stream bed. Sediment barriers will be installed where necessary to control sediment and to prevent excavated spoil from entering the water. After the trench is dug, the prefabricated pipeline segment will be carried, pushed, or pulled across the waterbody and positioned in the trench. When crossing saturated wetlands with flowing waterbodies using the open-cut method, the pipe coating will be covered with reinforced concrete or concrete weights to provide negative buoyancy. The locations where the use of weighted pipe for negative buoyancy will be considered are listed by milepost in **Appendix P**. The need for weighted pipe will be determined by detailed design and site conditions at the time of construction. The trench will then be backfilled with native material or with imported material if required by applicable permits. Following backfilling, the banks will be restored and stabilized.

The Project will utilize dry flume or dry dam-and-pump methods (**Appendix I,** Details 13 and 14) where technically feasible on environmentally sensitive waterbodies as warranted by resource-specific sensitivities. The flume crossing method involves diverting the flow of water across the trenching area through one or more flume pipes placed in the waterbody. The dam-and-pump method is similar to the flume method except that pumps and hoses will be used instead of flumes to move water around the construction work area. In both methods, trenching, pipe installation, and backfilling are done while water flow is maintained for all but a short reach of the waterbody at the actual crossing. Once backfilling is completed, the stream banks are restored and stabilized and the flume or pump hoses are removed.

Keystone plans to use the HDD method of construction for 38 waterbody crossings (**Table 2.1-10**) on the Project. Site-specific plans are included in **Appendix D** of this Supplemental Environmental Report. The HDD method involves drilling a pilot hole under the waterbody and banks, then enlarging the hole through successive reamings until the hole is large enough to accommodate a prefabricated segment of pipe. Throughout the process of drilling and enlarging the hole, slurry consisting mainly of water and bentonite clay will be circulated to power and lubricate the drilling tools, remove drill cuttings, and provide stability to the drilled holes. Pipe sections long enough to span the entire crossing will be staged and welded along the construction work area on the opposite side of the waterbody and then pulled through the drilled hole. Ideally, use of the HDD method results in no impact on the banks, bed, or water quality of the waterbody being crossed (**Appendix I**, Detail 15).

Table 2.1-10 Waterbodies Crossed Using the Horizontal Directional Drilling Method

Waterbody	Number of Crossings	Approximate Milepost(s)
Steele City Segment		
Milk River	1	82.7
Missouri River	1	89.0
Yellowstone River	1	196.0
Little Missouri River	1	292.1
Cheyenne River	1	425.9
White River	1	536.9
Keya Paha River	1	599.8
Niobrara River	1	615.3
Cedar River	1	696.5
Loup River	1	739.8
Platte River	1	755.4
Gulf Coast Segment		
Deep Fork	1	22.1
North Canadian River	1	38.7
Little River	1	70.5
Canadian River	1	74.2
Clear Boggy Creek	1	126.7
Red River	1	155.3
Bois D'Arc Creek	1	1.6
North Sulphur River	1	190.2
South Sulphur River	1	201.2
White Oak Creek	1	212.3
Big Cyprus Creek	1	227.6
Small Lake	1	254.1
Big Sandy Creek	1	256.1
Sabine River	1	262.7
East Fork of Angelina River	1	312.3

Table 2.1-10 Waterbodies Crossed Using the Horizontal Directional Drilling Method

Waterbody	Number of Crossings	Approximate Milepost(s)
Angelina River	1	333.3
Neches River	1	367.3
Menard Creek	1	413.8
Neches Valley Canal Authority	1	459.7
Lower Neches Valley Canal Authority	1	459.9
Willow Marsh Bayou	1	457.0
Hillebrandt Bayou	1	470.9
Port Arthur Canal and Entergy Corridor	1	478.2
Houston Lateral		
Trinity Creek Marsh	1	17.7
Trinity River	1	22.8
Cedar Bayou	1	35.6
San Jacinto River	1	43.3

Waterbodies considered for directional drill include commercially navigable waterbodies, waterbodies wider than 100 feet, waterbodies with terrain features that prohibit open crossing methods, waterbodies adjacent to features such as roads, railroads that would complicate construction by an open crossing method, and sensitive environmental resource areas that could be avoided by HDD.

Approximately 618 intermittent waterbodies will be crossed by the Project. In the event these intermittent waterbodies are dry or have non-moving water at the time of crossing, Keystone proposes to use conventional upland cross-country construction techniques. If an intermittent waterbody is flowing when crossed, Keystone will install the pipeline using the open-cut wet crossing method discussed previously. When crossing waterbodies, Keystone will adhere to the guidelines outlined in Keystone's CMRP located in **Appendix I** and the requirements of its waterbody crossing permits.

Additional TWAs will be required on both sides of all waterbodies to stage construction, fabricate the pipeline, and store materials. These workspaces will be located at least 10 feet away from the water's edge, except where the adjacent upland consists of actively cultivated or rotated cropland or other disturbed land. Before construction, temporary bridges (e.g., subsoil fill over culverts, timber mats supported by flumes, railcar flatbeds, flexi-float apparatus) will be installed across all perennial waterbodies to allow construction equipment to cross. Construction equipment will be required to use the bridges, except the clearing crew, which will be allowed one pass through the waterbodies before the bridges are installed.

During clearing, sediment barriers such as silt fence and staked straw bales will be installed and maintained on drainages across the ROW adjacent to waterbodies and within additional TWAs to minimize the potential for sediment runoff. Silt fence and straw bales located across the working side of the ROW will be removed during the day when vehicle traffic is present and will be replaced each night. Alternatively, drivable berms could be installed and maintained across the ROW in lieu of a silt fence or straw bales.

In general, equipment refueling and lubricating at waterbodies will take place in upland areas that are 100 feet or more from the water. When circumstances dictate that equipment refueling and lubricating will be necessary in or near waterbodies, Keystone will follow its SPCC Plan to address the handling of fuel and other hazardous materials.

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

Wetland Crossings

Data from wetland delineation field surveys, aerial photography, and National Wetland Inventory (NWI) mapping were used to identify wetlands crossed by the proposed pipeline. Pipeline construction across wetlands will be similar to typical conventional upland cross-country construction procedures, with several modifications where necessary to reduce the potential for pipeline construction to affect wetland hydrology and soil structure.

The wetland crossing method used will depend largely on the stability of the soils at the time of construction. If wetland soils are not excessively saturated at the time of construction and can support construction equipment without equipment mats, construction will occur in a manner similar to conventional upland cross-country construction techniques (**Appendix I**, Detail 8). Topsoil will be segregated over the trench line. In most saturated soils, topsoil segregation will not be possible. Additional TWAs will be required on both sides of particularly wide saturated wetlands to stage construction, fabricate the pipeline, and store materials. These additional TWAs will be located in upland areas a minimum of 10 feet from the wetland edge.

Construction equipment working in saturated wetlands will be limited to that area essential for clearing the ROW, excavating the trench, fabricating and installing the pipeline, backfilling the trench, and restoring the ROW. In areas where there is no reasonable access to the ROW except through wetlands, non-essential equipment will be allowed to travel through wetlands only if the ground is firm enough or has been stabilized to avoid rutting.

Clearing of vegetation in wetlands will be limited to trees and shrubs, which will be cut flush with the surface of the ground and removed from the wetland. To avoid excessive disruption of wetland soils and the native seed and rootstock within the wetland soils, stump removal, grading, topsoil segregation, and excavation will be limited to the area immediately over the trench line. During clearing, sediment barriers, such as silt fence and staked straw bales, will be installed and maintained on down slopes adjacent to saturated wetlands and within additional TWAs as necessary to minimize the potential for sediment runoff.

Where wetland soils are saturated or inundated, the pipeline can be installed using the push-pull technique. The push-pull technique involves 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 prefabricated pipeline is 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 are removed and the pipeline sinks into place. Most pipe installed in saturated wetlands will be coated with concrete or installed with set-on weights to provide negative buoyancy. The anticipated locations where concrete coating or concrete weights will be used are provided **Appendix P** (buoyancy). Final locations requiring weighted pipe for negative buoyancy will be determined by detailed design and site conditions at the time of construction. A list of wetlands crossed by the Project is included in **Appendix E**. Because little or no grading will occur in wetlands, restoration of contours will be accomplished during backfilling. Prior to backfilling, trench breakers will be installed where necessary to prevent the subsurface drainage of water from wetlands. Where topsoil has been segregated from subsoil, the subsoil will be backfilled first followed by the topsoil. Topsoil will be replaced to the original ground level leaving no crown over the trench line. In some areas where wetlands overlie rocky soil, the pipe will be padded with rock-free soil or sand before backfilling with native bedrock and soil. Equipment mats, timber riprap, gravel fill, geotextile fabric, and straw mats will be removed from wetlands following backfilling except in the travel lane to allow continued, but controlled, access through the wetland until the completion of construction. Upon the completion of construction, these materials will be removed.

Where wetlands are located at the base of slopes, permanent slope breakers will be constructed across the ROW in upland areas adjacent to the wetland boundary. Temporary sediment barriers will be installed where necessary until revegetation of adjacent upland areas is successful. Once revegetation is successful, sediment barriers will be removed from the ROW and disposed of properly.

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

Blasting

Blasting may be required in areas where consolidated shallow bedrock or boulders cannot be removed by conventional excavation methods. The areas likely to require blasting and/or ripping are provided in **Appendix K, Table K-8**. Blasting is likely to be required where the bedrock type expected to be present within 84 inches (7 feet) of the surface is lithic or very strongly cemented rock. Ripping is likely to be required where the bedrock type expected to be present within 84 inches (7 feet) of the surface is dense material, paralithic bedrock, abrupt textural change, nitric, or strongly contrasting textural stratification.

If blasting is required to clear the ROW and to fracture rock within the ditch, strict safety precautions will be followed. Keystone will exercise extreme care to avoid damage to underground structures, cables, conduits, pipelines, and underground watercourses or springs. To protect property and livestock, Keystone will provide adequate notice to adjacent landowners or tenants in advance of blasting. Blasting activity will be performed during daylight hours and in compliance with federal, state, and local codes and ordinances and manufacturers' prescribed safety procedures and industry practices.

Residential and Commercial Construction

Keystone used aerial photography dated February 2008 and field survey data to identify areas containing structures within 25 feet and 500 feet of the construction ROW structures. These areas are summarized in **Table 2.1-11**. Prior to construction, Keystone will verify the proximity of structures to the pipeline and determine if the structures are occupied residences or businesses. Keystone will develop site-specific construction plans to mitigate the impacts of construction on residential and commercial structures within 25 feet of the construction ROW. For locations of structures by milepost, see **Appendix Q**.

Table 2.1-11 Structures Located Within 25 Feet and 500 Feet of the Construction ROW

State	County	Milepost (Number of Structures) Within 25 Feet of Construction ROW	Milepost (Number of Structures) Within 500 Feet of Construction ROW
Steele City Segment			
Montana	NA	0	0
South Dakota	NA	0	0
Nebraska	NA	0	0
Kansas	NA	0	0

Table 2.1-11 Structures Located Within 25 Feet and 500 Feet of the Construction ROW

State	County	Milepost (Number of Structures) Within 25 Feet of Construction ROW	Milepost (Number of Structures) Within 500 Feet of Construction ROW
Gulf Coast Segment			
Oklahoma	Lincoln	0	20
	Creek	0	0
	Okfuskee	0	19
	Seminole	0	10
	Hughes	3	23
	Atoka	1	16
	Bryan	1	9
Texas	Lamar	14	16
	Delta	2	13
	Hopkins	1	26
	Franklin	2	24
	Wood	1	57
	Upshur	2	11
	Smith	12	126
	Cherokee	0	6
	Rusk	1	16
	Nacogdoches	0	36
	Angelina	1	2
	Polk	3	47
	Liberty	0	34
	Hardin	0	5
	Jefferson	2	203
Houston Lateral			
Texas	Liberty	0	24
	Chambers	0	1
	Harris	0	15

Note: Mileposting for each Segment of the Project starts at 0.0 at the northernmost point of each Segment and increases in the direction of oil flow.

Fences and Grazing

Fences will be crossed or paralleled by the construction ROW. Before cutting any fence for pipeline construction, each fence will be braced and secured to prevent the slacking of the fence. To prevent the passage of livestock the opening in the fence will be closed temporarily when construction crews leave the area. If gaps in natural barriers used for livestock control are created by pipeline construction, the gaps will be fenced according to the landowner's requirements. All existing improvements, such as fences, gates, irrigation ditches, cattle guards, and reservoirs will be maintained during construction and repaired to preconstruction conditions or better upon completion of construction activities.

2.1.12.3 Aboveground Facility Construction Procedures

Construction activities at each of the new pump stations will follow a standard sequence of activities: clearing and grading, installing foundations for the electrical building and support buildings, and erecting the structures to support the pumps and/or associated facilities. A block valve is installed in the mainline with two side block valves; one to the suction piping of the pumps and one from the discharge piping of the pumps. Construction activities and the storage of building materials will be confined to the pump station construction sites. **Figures 2.1-13** and **2.1-14** illustrate typical plot plans for pump stations.

The sites for the pump stations will be cleared of vegetation and graded as necessary to create a level surface for the movement of construction vehicles and to prepare the area for the building foundations. Foundations will be constructed for the pumps and buildings and soil will be stripped from the construction footprint.

Each pump station will include one electrical building and one support building. The electrical building will include electrical systems, communication, and control equipment. The second building houses a small office. The crude oil piping, both aboveground and below ground, will be installed and pressure tested using methods similar to those used for the main pipeline. After testing is successfully completed, the piping will be tied into the main pipeline. Piping installed below grade will be coated for corrosion protection prior to backfilling. In addition, all below grade facilities will be protected by a cathodic protection system. Before being put into service, pumps, controls, and safety devices will be checked and tested to ensure proper system operation and activation of safety mechanisms.

The site for the tank farm will be co-located with Pump Station 26 at Steele City, Nebraska. The tank farm site will be cleared and graded to create a level work surface for the tanks. Topsoil from the site will be stored adjacent to the site area. The welded steel tank structures with internal floating roofs will be installed inside an impervious bermed area which will act as secondary containment. The piping in the tank farm area will be both above and below ground. The tanks and associated piping will be isolated electrically from the pipeline and protected by their own cathodic protection system. The electrical and control system for the tanks and associated piping will share the facilities required for the adjacent pump station. After successful hydrostatic testing of the tanks and associated piping and commissioning of the control system, the tanks will be connected with the pipeline system. Each tank will have a separate water screen and fire suppression system supplied by a fire water supply pond located on the site. In addition to this pond, a separate larger pond will be installed to manage storm water and mitigate any potential contamination from the site (**Figure 2.1-17**).

Each pump station and the tank farm will require electricity and communication facilities, which will be obtained from local utilities. **Table 2.1-12** summarizes new power and distribution line requirements. In addition, the Western Area Power Administration (WAPA) has determined they need to build an approximately 65-mile-long, 230-kV power line to strengthen the local power grid. Details will be provided once they have been received.

After the completion of startup and testing, the pump station sites and the tank farm will be final graded. A permanent security fence will be installed around each pump station site and the tank farm.

Table 2.1-12 Summary of Power Supply Requirements for Pump Stations and Tank Farm

Pump Station No.	Milepost (0 at US border)	Transformer Size (MVa)[1]	Utility Supply (kV)	Estimated Power Line Lengths (miles)	Power Provider
Steele City Segment					
Montana					
PS-09	1.1	20/27/33	115	62.4	Big Flat Electric Cooperative
PS-10A-1	49.3	20/27/33	115	51.0	Valley Electric Cooperative
PS-11	98.0	20/27/33	115	12.0	McCone Electric Cooperative or Norval Electric Cooperative[2]
PS-12	148.6	20/27/33	115	3.3	McCone Electric Cooperative
PS-13A-2	199.3	20/27/33	115	13.5	Tongue River Electric Cooperative
PS-14A-1	236.8	20/27/33	115	5.2	Montana-Dakota Utilities Company
South Dakota					
PS-15A-2	285.6	20/27/33	115	23.0	Grand Electric Cooperative
PS-16	333.3	20/27/33	115	45.7	Grand Electric Cooperative
PS-17A-2	386.9	20/27/33	115	11.0	Grand Electric Cooperative
PS-18	440.0	20/27/33	115	25.9	West Central Electric Cooperative
PS-19A-3	495.8	20/27/33	115	20.2	West Central Electric Cooperative
PS-20A-2	546.4	20/27/33	115	15.9	Rosebud Electric Cooperative
PS-21A-1	591.7	20/27/33	115	20.1	Rosebud Electric Cooperative
Nebraska					
PS-22	642.1	20/27/33	115	7.4	Nebraska Public Power District
PS-23	694.0	20/27/33	115	23.0	Nebraska Public Power District
PS-24A-1	751.1	20/27/33	115	10.1	Nebraska Public Power District
PS-25A-1	799.7	20/27/33	69	14.3	Nebraska Public Power District
PS-26	850.6	20/27/33	115	13.3	Nebraska Public Power District
Keystone Cushing Extension					
Kansas					
PS-27A-1	49.0*	20/27/33	115	10.2	Clay Center Public Utility
PS-29A-2	144.5*	20/27/33	115	11.2	Westar Energy

Table 2.1-12 Summary of Power Supply Requirements for Pump Stations and Tank Farm

Pump Station No.	Milepost (0 at US border)	Transformer Size (MVa)[1]	Utility Supply (kV)	Estimated Power Line Lengths (miles)	Power Provider
Gulf Coast Segment					
Oklahoma					
PS-32A-1	0.0	17/22/28	138	6.9	Oklahoma Gas and Electric Company
PS-33A-4	49.2	20/27/33	138	0.6	Canadian Valley Electric Cooperative/PSO
PS-34A-1	95.4	20/27/33	138	5.3	People's Electric Cooperative/PSO
PS-35A-1	147.0	20/27/33	138	4.1	Southeastern Electric Cooperative
Texas					
PS-36A-3	194.0	20/27/33	138	7.3	Lamar Electric Cooperative
PS-37A-2	238.0	20/27/33	138	0.1	Wood County Electric Cooperative
PS-38A-3	284.0	20/27/33	138	0.2	Cherokee County Electric Cooperative
PS-39A-1	333.5	20/27/33	138	5.2	Cherokee County Electric Cooperative
PS-40A-4	378.1	20/27/33	138	0.3	Sam Houston Electric Cooperative
PS-41A-1	432.7	20/27/33	240	0.4	Sam Houston Electric Cooperative

[1] MVa = Mega Volt amperes.

[2] Power provider yet to be determined; pending final decision.

* MP 0.0 on the Keystone Cushing Extension is at the Steele City Tank Farm.

Note: Mileposting for each Segment of the Project start starts at 0.0 at the northernmost point of each Segment and increases in the direction of oil flow.

Where delivery and pigging facilities are co-located with a pump station or the tank farm, the delivery and pigging facilities will be located entirely within the facility. Construction activities will include clearing, grading, trenching, installing piping, erecting buildings, fencing the facilities, cleaning up, and restoring the area. The delivery facilities will operate on locally provided power (**Table 2.1-12**).

Intermediate MLV construction will be carried out concurrently with the construction of the pipeline. Wherever practical, intermediate MLVs will be located near public roads to allow year-round access. If necessary, permanent access roads or approaches will be constructed to each fenced MLV site.

Construction Work Force and Schedule

Work Force

Keystone proposes to begin construction of the Gulf Coast Segment in 2010, and the Steele City Segment in 2011, and the Houston Lateral in 2012. The Project is planned to be placed into service in phases. The Gulf Coast Segment is planned to be in-service in 2011. The Steele City Segment and Houston Lateral are planned to be in service in 2012. Construction of new pump stations along the Keystone Cushing Extension will coincide with construction of the Project. Keystone anticipates a peak work force of approximately 5,000 to 6,000 construction personnel. Construction personnel will consist of Keystone employees, contractor employees, construction inspection staff, and environmental inspection staff.

Tank farm construction will involve approximately 30 to 40 construction personnel over a period of 15 to 18 months concurrent with the Steele City Segment construction.

Keystone is planning to build the Project in 17 construction spreads. The spread breakdowns and corresponding base of operations for construction spreads are shown in **Table 2.1-13**. Construction activity will occur simultaneously on spreads within each phased segment of the Project.

Keystone anticipates 500 to 600 construction and inspection personnel associated with each spread, except for the Houston Lateral, which will require approximately 250 workers. Each spread will require 6 to 8 months to complete. Construction of new pump stations will require 20 to 30 additional workers at each site. Construction of all pump stations will be completed in 18 to 24 months.

Keystone, through its construction contractors and subcontractors, will attempt to hire temporary construction staff from the local population. Provided qualified personnel are available, approximately 10 to 15 percent (50 to 100 people per spread) may be hired from the local work force for each spread. This may not be possible in more rural areas.

Table 2.1-13 Pipeline Construction Spreads Associated with the Project

Spread Number	Location	Approximate Length of Construction Spread (miles)	Base(s) for Construction[1]
Steele City Segment			
Spread 1	MP 0 to 81	81	Hinsdale, Montana, and Glasgow, Montana
Spread 2	MP 81 to 163	82	Glasgow, Montana, and Circle, Montana
Spread 3	MP 163 to 247	84	Glendive, Montana, and Baker, Montana
Spread 4	MP 247to 333	86	Buffalo, South Dakota
Spread 5	MP 333 to 415	82	Faith, South Dakota, and Union Center, South Dakota
Spread 6	MP 415 to 500	85	Phillip, South Dakota
Spread 7	MP 500 to 580	80	Murdo, South Dakota, and Winner, South Dakota
Spread 8	MP 580 to 664	84	Fairfax, Nebraska, Stuart, Nebraska, and O'Neill, Nebraska
Spread 9	MP 664 to 758	94	Greeley, Nebraska, and Central City, Nebraska

Table 2.1-13 Pipeline Construction Spreads Associated with the Project

Spread Number	Location	Approximate Length of Construction Spread (miles)	Base(s) for Construction[1]
Spread 10	MP 758 to 851	93	York, Nebraska, Beatrice, Nebraska, and Fairbury, Nebraska
Gulf Coast Segment			
Spread 1	MP 0 to 95	95	Holdenville, Oklahoma
Spread 2	MP 95 to 185	90	Paris, Texas
Spread 3	MP 185 to 284	99	Mt. Pleasant, Texas
Spread 4	MP 284 to 366	82	Henderson, Texas, Nacogdoches, Texas, Crochett, Texas
Spread 5	MP 366 to 433	67	Lufkin, Texas
Spread 6	MP 433 to 480	47	Sour Lake, Texas
Houston Lateral			
Spread 7	MP 0 to 49	49	Sour Lake, Texas, Liberty, Texas, Dayton, Texas

[1] Base(s) of construction for Spreads 1-8 may use construction camps. Camps will be situated in the area between spread breaks for Spreads 1 and 2, for Spreads 3 and 4, for Spreads 5 and 6, and for Spreads 7 and 8.

Note: Mileposting for each Segment of the Project starts at 0.0 at the northernmost point of each Segment, and increases in the direction of oil flow.

Schedule

As an industry rule-of-thumb, cross-country construction progresses at a rate of approximately 20 completed miles per calendar month per spread, which could be used for scheduling purposes. Based on experience, the construction schedule may be estimated as follows:

- 3 weeks (21 calendar days) of work on the ROW prior to the start of production welding. These activities include clearing, grading, stringing, and ditching.
- Production welding, based on an average of 1.25 miles per working day and a 6-day work week (7 calendar days), will be completed at 7.5 miles per week, on average.
- 7 weeks (49 calendar days) of work after completion of production welding. These activities include nondestructive testing, field joint coating, lowering-in, tie-ins, backfill, ROW clean-up, hydrostatic testing, reseeding, and other ROW reclamation work.

Using this as a basis for determining the duration of construction activities on the ROW yields the time requirements shown below for various spread lengths (**Table 2.1-14**). Construction in areas with greater congestion, higher population, industrial areas, or areas requiring other special construction procedures may result in a slower rate of progress.

Table 2.1-14 Resulting Cross-Country Construction Times Based on Estimates of Schedule

Spread Length	Pre-welding	Welding Time	Post-welding and Clean-up	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)

In addition, approximately 1 month for contractor mobilization before the work is started and 1 month after the work is finished for contractor demobilization should be factored into the overall construction schedule.

2.1.12.4 Future Plans and Abandonment

The Project is expected to operate for approximately 50 years. Keystone has not identified plans for abandonment of these facilities at this time. If abandonment of any facility is proposed in the future, abandonment will be implemented in accordance with then-applicable federal and state permits, approvals, codes, and regulations.

2.1.13 Operation and Maintenance

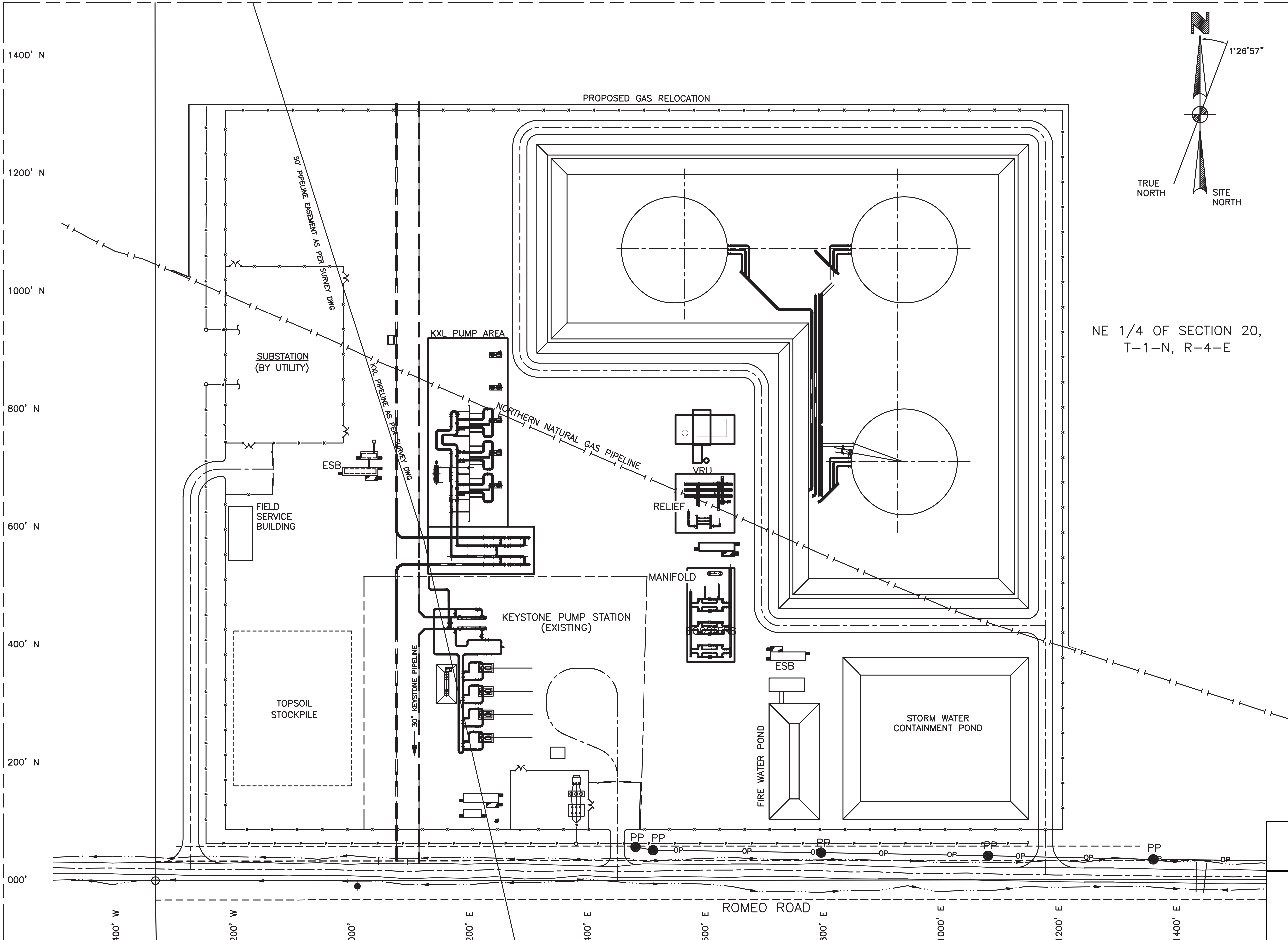
Keystone will operate and maintain the Project's facilities in accordance with 49 CFR Parts 194 and 195 and other applicable federal and state regulations. Operation and maintenance of the pipeline system in most cases will be accomplished by Keystone personnel. Keystone estimates that operation of the pipeline will require 20 employees in the US.

Keystone will have an annual Pipeline Maintenance Program (PMP) to ensure the integrity of the pipeline. The PMP will include valve maintenance, periodic inline inspections, and cathodic protection readings underpinned by a company-wide goal to ensure facilities are reliable and in service. Data collected in each year of the program will be fed back into the decision-making process for the development of the following year's program. In addition, the pipeline will be monitored 24 hours a day, 365 days a year from the Operations Control Center (OCC) using leak detection systems and supervisory control and data acquisition. During operations, Keystone will have a Project-specific ERP in place to manage a variety of events.

2.1.13.1 Normal Operations and Routine Maintenance

The pipeline will be inspected periodically via aerial and ground surveillance as operating conditions permit, but no less frequently than as required by 49 CFR Part 195. These surveillance activities will provide information on possible encroachments and nearby construction activities, erosion, exposed pipe, and other potential concerns that may affect the safety and operation of the pipeline. Evidence of population changes will be monitored and HCAs identified as necessary. Intermediate MLVs and MLVs will be inspected twice annually and the results documented.

In order to maintain accessibility of the permanent easement and to accommodate pipeline integrity surveys, woody vegetation along the pipeline permanent easement will be periodically cleared. Cultivated crops will be allowed to grow in the permanent easement. Trees will be removed from the permanent easement. Keystone will use mechanical mowing or cutting along its permanent easement for normal vegetation maintenance.



TransCanada Keystone XL Project

Figure 2.1-17

Steele City Tank Farm Plot Plan

Trees along the paths of areas where the pipe was installed via HDDs will only be cleared as required on a site specific basis.

Keystone will monitor the ROW to identify any areas where soil productivity has been degraded as a result of pipeline construction and reclamation measures will be implemented to rectify any such concerns. Applicable reclamation measures are outlined in the CMRP (**Appendix I**).

Keystone will implement multiple overlapping and redundant systems, including Quality Assurance program for pipe manufacture and pipe coating, FBE coating, cathodic protection, non-destructive testing of 100 percent of the girth welds, hydrostatic testing to 125 percent of the MOP, periodic internal cleaning and high-resolution in-line inspection, depth of cover exceeding federal standards, periodic aerial surveillance, public awareness program, SCADA system, and a OCC (with complete redundant backup) providing monitoring of the pipeline every 5 seconds, 24 hours a day, every day of the year.

SCADA facilities will be located at all pump stations and delivery facilities. The pipeline SCADA system will allow the OCC to perform the following functions:

- Remote reading of automated MLV positions;
- Remote starting and stopping at pump stations;
- Remote reading of tank levels;
- Remote closing and opening of automated MLVs;
- Remote reading of line pressure and temperature at all automated intermediate valve sites, at all pump stations, and at delivery metering facilities; and
- Remote reading of delivery flow and total flow.

The Project will have an OCC manned by an experienced and highly trained crew 24 hours per day every day of the year. A fully redundant backup OCC will be constructed and available as needed.

Real time information communication systems, including backup systems, will provide up-to-date information from the pump stations to the OCC plus the ability to contact field personnel. The OCC will have highly sophisticated pipeline monitoring systems and multiple leak detection systems as discussed in Section 2.1.12.2.

2.1.13.2 Abnormal Operations

Keystone will comply with the CFR including 49 CFR Section 195.402 with respect to the preparation of manuals and procedures for responding to abnormal operations. Section 195.402(a) requires a pipeline operator to prepare and follow a manual of written procedures for conducting normal operations and maintenance activities and handling abnormal operations and emergencies. Section 195.402(d) (Abnormal Operation) requires the manual to include procedures to provide safety when operating design limits have been exceeded. These include:

- Responding to, investigating, and correcting the cause of:
  - Unintended closure of valves or shutdowns;
  - Increase or decrease 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.

- Checking variations from normal operation after abnormal operation has ended at sufficient critical locations in the system to determine continued integrity and safe operation.
- Correcting variations from normal operation of pressure and flow equipment and controls.
- Notifying responsible operator personnel when notice of an abnormal operation is received.
- Periodically reviewing the response of operator personnel to determine the effectiveness of the procedures controlling abnormal operation and taking corrective action where deficiencies are found.

<u>SCADA and Leak Detection</u>

Keystone will utilize a SCADA system to remotely monitor and control the pipeline system. Highlights of Keystone's SCADA system will include:

- Redundant fully functional backup system available for service at all times;
- Automatic features installed as integral components within the SCADA system to ensure operation within prescribed pressure limits;
- Additional automatic features installed at the local pump station level also will be utilized to provide pipeline pressure protection in the event communications with the SCADA host are interrupted; and
- Pipeline is monitored every 5 seconds, 24 hours a day, every day of the year.

Keystone also will have a number of complimentary leak detection methods and systems available within the OCC. These methods and systems are overlapping in nature and progress in leak detection thresholds. The leak detection methods are as follows:

- Remote monitoring performed by the OCC Operator, which consists primarily of monitoring pressure and flow data received from pump stations and valve sites fed back to the OCC by the Keystone SCADA system. Remote monitoring is typically able to detect leaks down to approximately 25 percent to 30 percent of pipeline flow rate.
- Software based volume balance systems that monitor receipt and delivery volumes. These systems are typically able to detect leaks down to approximately 5 percent of pipeline flow rate.
- Computational Pipeline Monitoring or model based leak detection systems that break the pipeline system into smaller segments and monitor each of these segments on a mass balance basis. These systems are typically capable of detecting leaks down to a level approximately 1.5 percent to 2 percent of pipeline flow rate.
- Computer based, non real time, accumulated gain/loss volume trending to assist in identifying low rate or seepage releases below the 1.5 to 2 percent by volume detection thresholds.
- Direct observation methods, which include aerial patrols, ground patrols and public and landowner awareness programs that are designed to encourage and facilitate the reporting of suspected leaks and events that may suggest a threat to the integrity of the pipeline.

<u>Emergency Response Procedures</u>

Keystone will be required to prepare a site-specific ERP for the system, which will be submitted to and approved by the OPS and PHMSA prior to operation. Keystone has prepared a comprehensive ERP for the

Keystone Pipeline Project, which has been reviewed and approved by PHMSA. Keystone will use that ERP as the basis for preparation of an ERP specific to the Project, incorporating adjustments to reflect Project-specific factors. At that time, Keystone will submit the Keystone XL ERP to PHMSA for approval prior to commencing operations.

Keystone is required to notify immediately the National Response Center (NRC) in the event of a release of crude oil that: (1) violates water quality standards; (2) creates a sheen on water; or (3) causes a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines (40 CFR Part 112). In addition to the NRC, Keystone will make timely notifications to other agencies, including the appropriate local emergency planning committee (LEPC), sheriff's department, the appropriate state agency, the USEPA, and affected landowners.

Under the National Contingency Plan, the USEPA is the lead federal response agency for oil spills occurring on land and in inland waters. The USEPA will evaluate the size and nature of a spill, its potential hazards, the resources needed to contain and clean it up, and the ability of the responsible party or local authorities to handle the incident. The USEPA will monitor all activities to ensure that the spill is being contained and cleaned up appropriately. All spills meeting legally defined criteria (see criteria above per 40 CFR Part 112) must be monitored by the USEPA, even though most spills are small and cleaned up by the responsible party. In the unlikely event of a large spill, Keystone and its contractors will be responsible for recovery and cleanup. The usual role of local emergency responders is to notify community members, direct people away from the hazard area, and address potential impacts to the community such as temporary road closings.

A fire associated with a spill is relatively rare. According to historical data (OPS 2008), only about 4 percent of reportable liquid spills are ignited. In the event of a fire, local emergency responders will execute the roles listed above and firefighters will take actions to prevent the crude oil fire from spreading to residential areas. Local emergency responders typically are trained and able to execute the roles described above without any additional training or specialized equipment. Keystone also will work with emergency response agencies to provide pipeline awareness education and other support.

Remediation

Corrective remedial actions will be dictated by federal regulations and enforced by the USEPA and OPS and the appropriate state agencies. Required remedial actions may range from the excavation and removal of contaminated soil to allowing the contaminated soil to recover through natural environmental fate processes (e.g., evaporation, biodegradation). Decisions concerning remedial methods and extent of the cleanup will account for state-mandated remedial cleanup levels, potential effects to sensitive receptors, volume and extent of the contamination, potential violation of water quality standards, and the magnitude of adverse impacts caused by remedial activities.

In the event of a spill, several federal regulations define the notification requirements and response actions, including the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300), the CWA, and the Oil Pollution Act. At the most fundamental level, these interlocking programs mandate notification and initiation of response actions in a timeframe and on a scale commensurate with the threats posed. The appropriate remedial measures will be implemented to meet federal and state standards designed to ensure protection of human health and environmental quality.

2.2 No Action Alternative

Under the no-action alternative, Keystone would not request approval for, nor construct the proposed Project. If the proposed facilities are not constructed, the short- and long-term impacts identified in this Environmental Report would not occur; however, Keystone will not be able to meet the demonstrated market need within the required timeframe. Moreover, shippers would seek other means to move their product, reduce, or shut down production. It is purely speculative to predict the resulting effects and actions that could be taken by another entity or the shippers as well as any associated direct and indirect environmental impacts. However, it is clear that the demand for crude oil in the US overall and in the area served by the Project is increasing. Thus, not building the proposed facilities could limit some or all of the access to additional crude oil supplies, jeopardizing the benefits to be provided by the Project.

2.3 System Alternatives

The following pipeline system alternatives could potentially provide incremental crude transportation service from Canada to the USGC market. To be considered viable, system alternatives must meet the purpose and need of the Project in terms of general receipt and delivery points, volumes delivered, and timeframes for deliveries.

2.3.1 Alternate Modes of Transportation

Surface transportation of crude oil that the Project pipeline will carry would require daily delivery to final delivery points by either 4,000 trucks or 40 trains with 100 tank cars each. It is not practical to meet the Project's purpose and need using surface transportation. This operation would require massive delivery facilities at the final destinations on the Gulf Coast to orchestrate the transfer of oil from the trucks or trains at the refineries, and also would require large amounts of fuel and personnel to maintain and operate the delivery fleet. Additionally, so many trucks or trains travelling over 1,300 miles daily could require additional infrastructure, and would increase the potential for vehicle accidents and accidental releases. The following is a summary of accident statistics compiled by the Association of Oil Pipe Lines (AOPL) for different transportation methods.

The majority of petroleum products within the US are transported by pipelines. According to the APOL (2004), 66 percent of petroleum and petroleum products are transported by pipelines, 28 percent by water carriers, 4 percent by motor carriers (e.g. tanker trucks), and 2 percent by railroads. Every year, over 12.9 billion barrels of petroleum and petroleum products are transported by interstate pipelines (AOPL 2004).

Pipelines operate more safely than other transportation modes as indicated by the number of pipeline accidents per year compared to other modes of transportation (**Table 2.3-1**). AOPL reports that trucking of petroleum is 87 times more likely to result in human fatalities than transportation by pipeline. Similarly, trucking results in fires and/or explosions about 35 times more frequently than for pipelines transporting petroleum (AOPL 2004).

Table 2.3-1 Reported Incident Rates for Alternate methods of Liquids Transport

	Death	Fire/Explosion	Injury
Truck	87	35	2
Rail	3	9	0.1
Barge	0.2	4	4
Tank Ship	4	1	3
Pipeline	1	1	1

Relative rates are calculated based on incidents per ton-miles for each transportation mode (AOPL 2005).

2.3.2 Altex Proposal

Altex was announced in 2005 and consists of a proposed direct, 36-inch, 2,350 mile Greenfield Pipeline System between Fort McMurray, Alberta, and the USGC. The proposed initial capacity is 425,000 bpd of heavy crude with suggested in-service dates as early as 2013 and as late as 2014 (CAPP 2008). The estimated capital cost of the project is $5.3 billion. Altex has been working with shippers to obtain contract volumes, define a route and refine preliminary design (altex-energy.com). To date no commercial commitments or regulatory permit applications have been announced.

2.3.3 KinderMorgan/TEPPCO Chinook/Maple Leaf Proposal

In December 2007, KinderMorgan and TEPPCO announced the proposed Chinook/Maple Leaf pipeline, a direct 36-inch, 2,050 mile pipeline system between Hardisty, Alberta, and the USGC. The proposed pipeline would have capacities of 440,000 bpd between Hardisty and Cushing, and 550,000 bpd between Cushing and the USGC. The most recent stated in-service date for the Project is late 2011 or early 2012 (CAPP 2008). No published capital costs are available; however, it has been stated that the project will cost several billion dollars, but not more than $5 billion (globeandmail.com). KinderMorgan proposes to construct the portion between Hardisty and Cushing (Chinook), while TEPPCO would construct the portion between Cushing and the USGC (Maple Leaf). To date no commercial commitments or regulatory permit applications have been announced.

2.3.4 ExxonMobil/Enbridge Texas Access Proposal

ExxonMobil and Enbridge jointly proposed a 768 mile 30-inch pipeline between Patoka, Illinois, and the USGC, including an 88-mile 24-inch lateral to the East Houston area. The proposed initial capacity of the pipeline is 445,000 bpd with a suggested in-service date as early as mid-2011. The estimated capital cost for the project is stated as $2.6 billion (enbridge.com/usgulfcoast). In December 2007, Exxon and Enbridge announced the commencement of a solicitation for binding shipper commitments. In July 2008, Enbridge announced that the Texas Access proposal will be delayed until 2014 (texasaccesspipeline.com). To date no commercial commitments or regulatory permit applications have been announced.

2.3.5 Enbridge Trailbreaker Proposal

Enbridge's Trailbreaker refers to a proposal to ship crude by pipeline to the northeast US, then transfer crude by ship from the northeastern US to the USGC by as early as mid 2010. The key components of the proposed project are:

- The reversal of Enbridge's Canadian mainline from Sarnia, Ontario, to Montreal, Quebec;
- Expansions to Enbridge's Lakehead pipeline from the Griffith Terminal near Chicago, Illinois, to Sarnia;
- Increasing the capacity on Enbridge's line 7 from Sarnia to Westover, Ontario;
- Reversal of the Portland Pipeline from Montreal to Portland, Maine; and
- Transportation by tanker between Portland and the USGC market.

In late 2008, Portland-Montreal Pipe Line, who currently owns the pipeline transporting products between Portland and Montreal, completed an Open Season process, where oil producing companies were invited to commit to using the reversed pipeline. Through this process they did not receive the level of firm volume commitments required to proceed at this time (http://www.enbridge.com/traibreaker/updates).

The stated potential capacity of the Trailbreaker proposal is 200,000 to 230,000 bpd of heavy crude (enbridge.com/usgulfcoast/trailbreaker). The capital cost for the project is estimated to be $350 million (Bloomberg.com). To date, no commercial commitments or regulatory permit applications have been announced. More recently, CAPP announced that it had decided not to support the proposed Trailbreaker project at this time.

2.3.6 Enbridge/BP Proposal

Enbridge and BP recently announced plans to develop a new delivery system to transport heavy crude oil from Flanagan, Illinois, to Houston and Texas City, Texas with an initial total system capacity of 250,000 bpd by late 2012. The proposed delivery system would connect to Enbridge's Lakehead pipeline system at Flanagan, utilize an existing BP pipeline system between Flanagan and Cushing, Oklahoma and new pipeline construction south of Cushing to connect to markets in Houston and Texas City, Texas. The joint investments of the phased capacity additions are expected to be between $1 billion and $2 billion (bp.com). To date no commercial commitments or regulatory permit applications have been announced.

2.3.7 ExxonMobil Pegasus Pipeline

Pegasus is an ExxonMobil crude oil pipeline currently providing crude oil transportation service between Patoka, Illinois, and Nederland, Texas. The capacity of the pipeline is 66,000 bpd in heavy crude service, of which 50,000 bpd is committed capacity. Pegasus is contemplating a potential incremental expansion of 30,000 bpd in order to increase the shipment of heavy crude to the USGC. The expansion could take place as early as 2009 (Oilgram News 03/09/2007). No information is publicly available regarding the estimated capital cost of the project. To date no commercial commitments or regulatory permit applications have been announced.

2.3.8 System Alternatives Comparison

In comparison to the pipeline alternatives, including the Altex and Chinook/Maple Leaf pipeline proposals, which reflect the more direct routing alternatives, the total length of the Keystone Project at 2,000 miles is shorter, providing shippers advantages in both inventory and transit time from an established crude oil supply hub. Compared to these proposals, the Project has advanced field studies, has commenced the regulatory approval process, and has advanced procurement processes that would allow the Gulf Coast segment to be available for service by 2011 in advance of the proposed Altex Project. While the Chinook/Maple Leaf Project has announced a 2011 or 2012 in-service date, to date no commercial commitments or regulatory permit applications have been announced.

In comparison to the remaining alternatives, the Gulf Coast segment of the Project is proposed to be in service in 2011 with the Steele City segment in-service by 2012, well before 2014 as proposed by Texas Access and in advance of the end of 2012 as proposed in the Enbridge/BP alternative. While the Trailbreaker and Exxon Pegasus proposals have more near-term proposed in-service dates, they are not capable of providing the level of incremental capacity to the USGC as requested by shippers. Notably, the Project already has market support for 380,000 bpd for an average term of 17 years, a demand level which significantly exceeds the proposed capacity of both the Trailbreaker and Pegasus expansion alternatives.

The Project is the only identified alternative that has obtained definitive market support in the form of long-term, binding contractual commitments totaling 380,000 bpd, which enables the Project to proceed with regulatory applications and, upon receipt of the necessary regulatory and environmental approvals, with construction of the pipeline.

Shippers – producers, marketers or refiners – evaluate the merits of various pipeline proposals and ultimately decide which projects to support. Shippers have expressed material interest in the Project and in securing additional crude oil pipeline capacity through binding long-term contract commitments. These binding commitments demonstrate a material endorsement of support for the Project, its economics, proposed route and target market, as well as the need for incremental pipeline capacity and access to Canadian crude supplies as an alternate to existing foreign supplies to the US.

2.4 Pipeline Route Selection

The proposed route for the Project was developed through an iterative, multidisciplinary route selection process. This process involved the systematic identification of objectives, control points, collection of data, review of alternatives, and continual reassessment of these factors as refinement occurred. Additionally, the process unfolded in two distinct phases given modifications to basic Project objectives which had significant impacts on suitable routing alternatives. The process followed by Keystone is described in the following text.

2.4.1 Route Selection and Alternatives Analysis

Several high-level objectives influenced the selection of the proposed Project pipeline route. The location of the source of the crude oil in Canada, the location of planned border crossing facilities into the US (the preferred border crossing location is adjacent to the Northern Border pipeline border crossing at Morgan, Montana), and the delivery points for the crude oil (Cushing, Oklahoma, and the Nederland and Houston Ship Channel areas in Texas) influenced the initial route proposed for the Project.

Data Gathering

Based on these basic objectives, a general geographic region of interest was established. Data was then gathered for this region. These data included the following:

- Recent (2008) high resolution aerial photography, as well as aerial imagery from 2004 and 2005;
- United States Geological Survey (USGS) Topographic Quadrangle Maps;
- Delorme State Atlas and Gazetteers;
- Soil Survey Geographic (SSURGO) Database;
- National Land Cover Database (NLCD 2001);
- Additional GIS layers containing public data obtained from various county, state, and federal government websites; commercial background data provided by ESRI; and internal existing utility data; and
- NWI Database and Mapping.

All data were compiled into a GIS-based constraint data set of the area to support the identification and evaluation of route options.

Constraints and Opportunities

A number of primary and secondary constraints were identified to guide the route selection process. The route should avoid the constraints whenever possible and minimize contact when unavoidable. The constraints include:

Primary

- Co-location;
- Public lands in all states except Montana (federal and state);
- Large waterbodies and water control structures;
- Lands with permitting processes that could affect schedule;
- Extreme terrain;
- Large wetland complexes;

- Urban areas;
- Properties listed on the NHRP; and
- Wildlife refuges and management areas.

Secondary

- Water crossings;
- Wetland crossings;
- Waterfowl production areas;
- Irrigated croplands;
- Bedrock;
- Rural communities;
- Aquifers;
- Extensive forested areas, including commercial forest lands; and
- Residences and associated features such as driveways, outbuildings, and wind breaks.

Opportunities refer to those features which are favorable features for pipeline routing and generally serve to simplify construction and decrease disturbance. These include:

- Existing linear features such as pipelines (preferred), power lines, and roadways;
- Flat or gently rolling terrain;
- Soils which can be readily excavated; and
- Areas lacking forested vegetation.

<u>Definition of Control Points</u>

The following control points served to define the route:

- Preferred US/Canada border crossing near Morgan, Montana;
- The Fort Peck Reservoir, Montana;
- Crossing the Niobrara River at locations not designated as wild and scenic;
- Opportunity to connect with the Keystone Cushing Extension, a portion of the Keystone Pipeline Project;
- Delivery point at Nederland, Texas; and
- Delivery point at Moore Junction, Texas.

<u>Route Alternatives Identification</u>

Based on the above information and objectives, a number of route alternatives and alternative route segments were developed. These routes and route segments met the basic Project objectives and respected the constraints and opportunities to varying degrees.

The following paragraphs provide an overview of the characteristics of each of the major route alternatives and alternative route segments. These alternatives are illustrated on **Figures 2.4-1** through **2.4-4**.

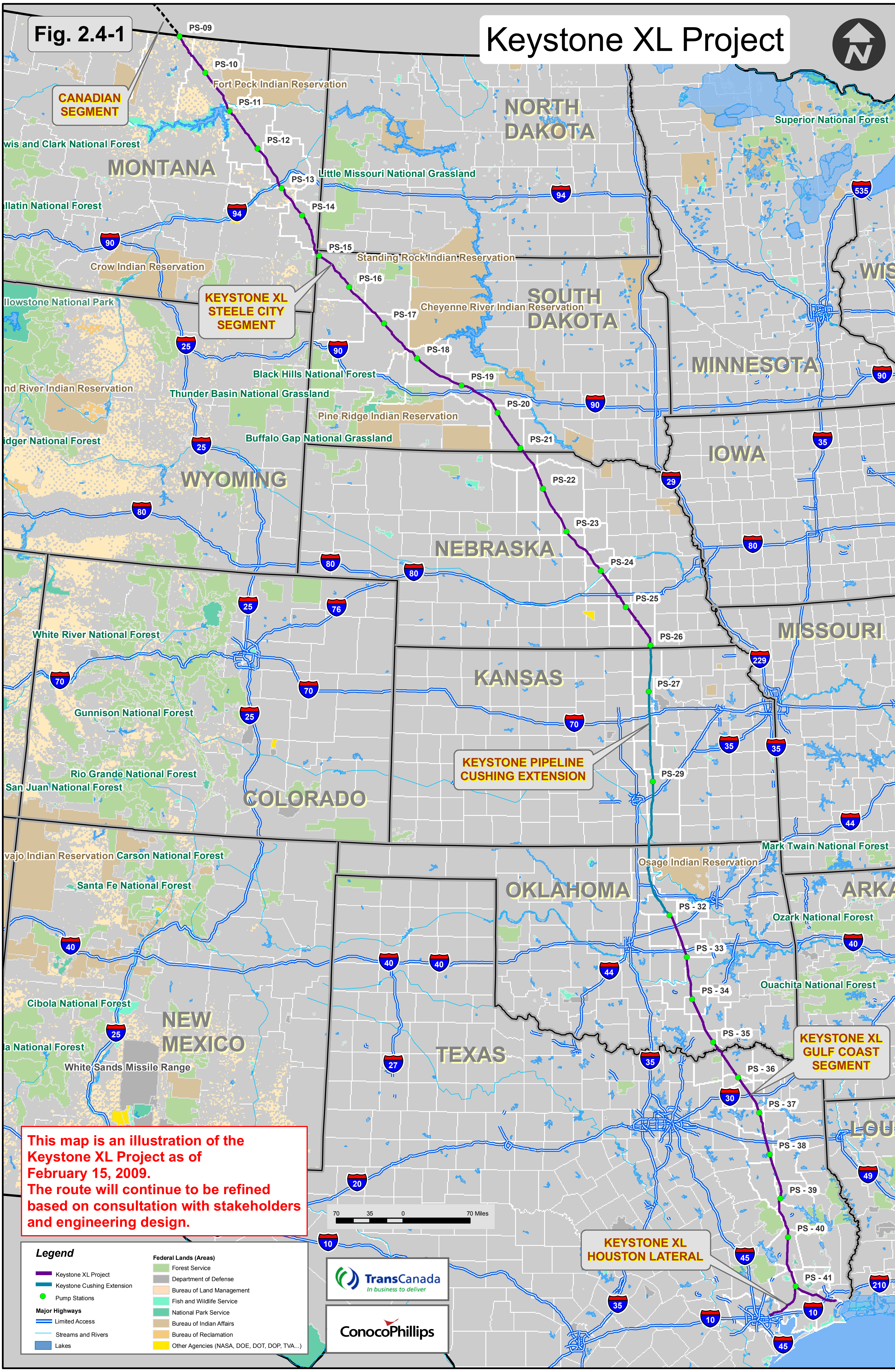


Fig. 2.4-1
Keystone XL Project
CANADIAN SEGMENT
KEYSTONE XL STEELE CITY SEGMENT
KEYSTONE PIPELINE CUSHING EXTENSION
KEYSTONE XL GULF COAST SEGMENT
KEYSTONE XL HOUSTON LATERAL
PS-09
PS-10
PS-11
PS-12
PS-13
PS-14
PS-15
PS-16
PS-17
PS-18
PS-19
PS-20
PS-21
PS-22
PS-23
PS-24
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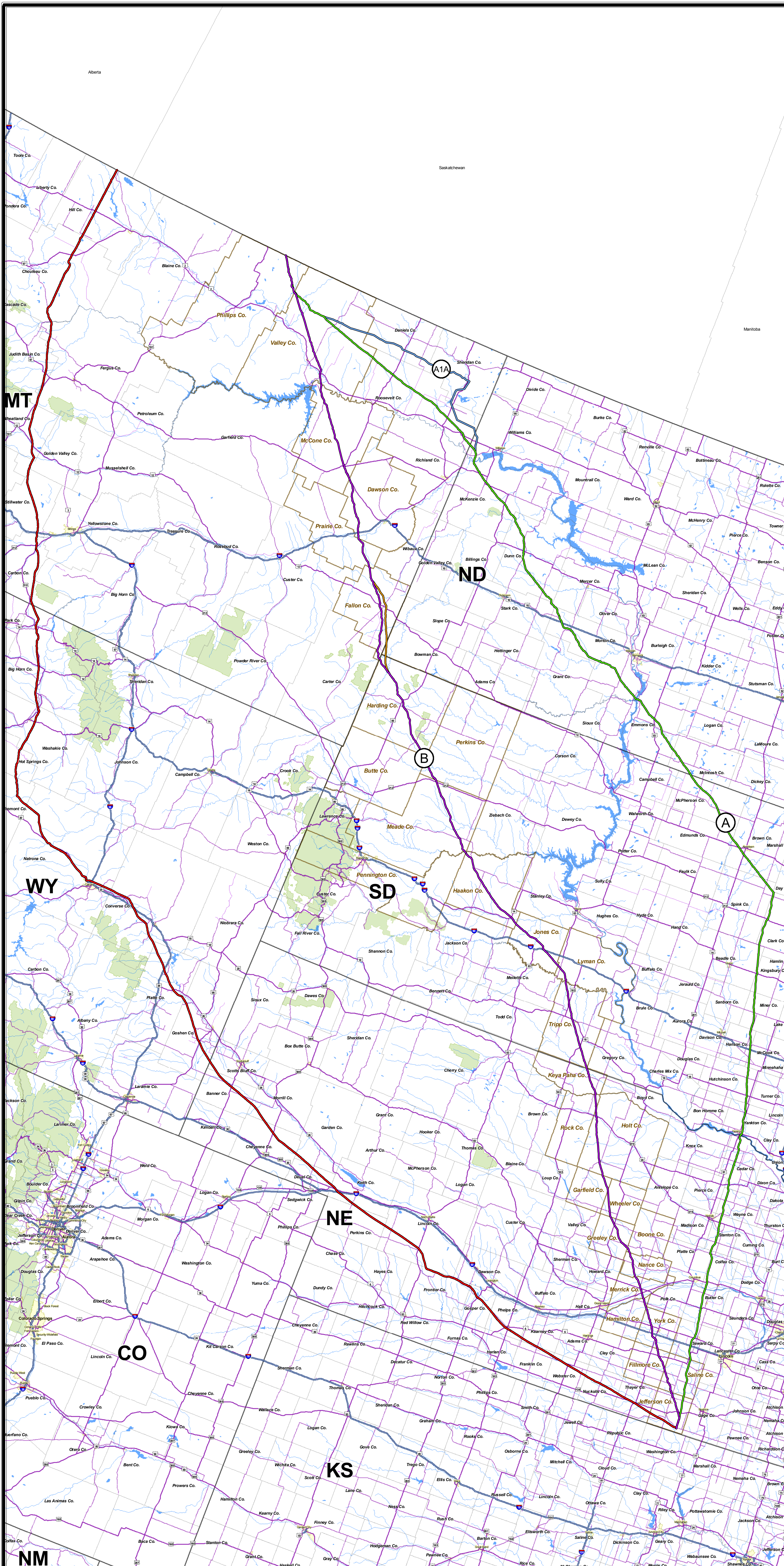
PS-26
PS-27
PS-29
PS - 32
PS - 33
PS - 34
PS - 35
PS - 36
PS - 37
PS - 38
PS - 39
PS - 40
PS - 41
MONTANA
NORTH DAKOTA
SOUTH DAKOTA
MINNESOTA
WYOMING
NEBRASKA
IOWA
COLORADO
KANSAS
MISSOURI
OKLAHOMA
NEW MEXICO
TEXAS
Fort Peck Indian Reservation
Little Missouri National Grassland
Standing Rock Indian Reservation
Cheyenne River Indian Reservation
Crow Indian Reservation
Black Hills National Forest
Thunder Basin National Grassland
Pine Ridge Indian Reservation
Buffalo Gap National Grassland
Superior National Forest
White River National Forest
Gunnison National Forest
Rio Grande National Forest
San Juan National Forest
Santa Fe National Forest
Cibola National Forest
White Sands Missile Range
Osage Indian Reservation
Mark Twain National Forest
Ozark National Forest
Ouachita National Forest
This map is an illustration of the Keystone XL Project as of February 15, 2009.
The route will continue to be refined based on consultation with stakeholders and engineering design.
70 35 0 70 Miles
Legend
Keystone XL Project
Keystone Cushing Extension
Pump Stations
Major Highways
Limited Access
Streams and Rivers
Lakes
Federal Lands (Areas)
Forest Service
Department of Defense
Bureau of Land Management
Fish and Wildlife Service
National Park Service
Bureau of Indian Affairs
Bureau of Reclamation
Other Agencies (NASA, DOE, DOT, DOP, TVA...)
TransCanada
In business to deliver
ConocoPhillips

TransCanada
In business to deliver

KEYSTONE XL PROJECT MORGAN, MT TO STEELE CITY, NE



N W E S

0 30 60 120

1 Inch = 62 Miles

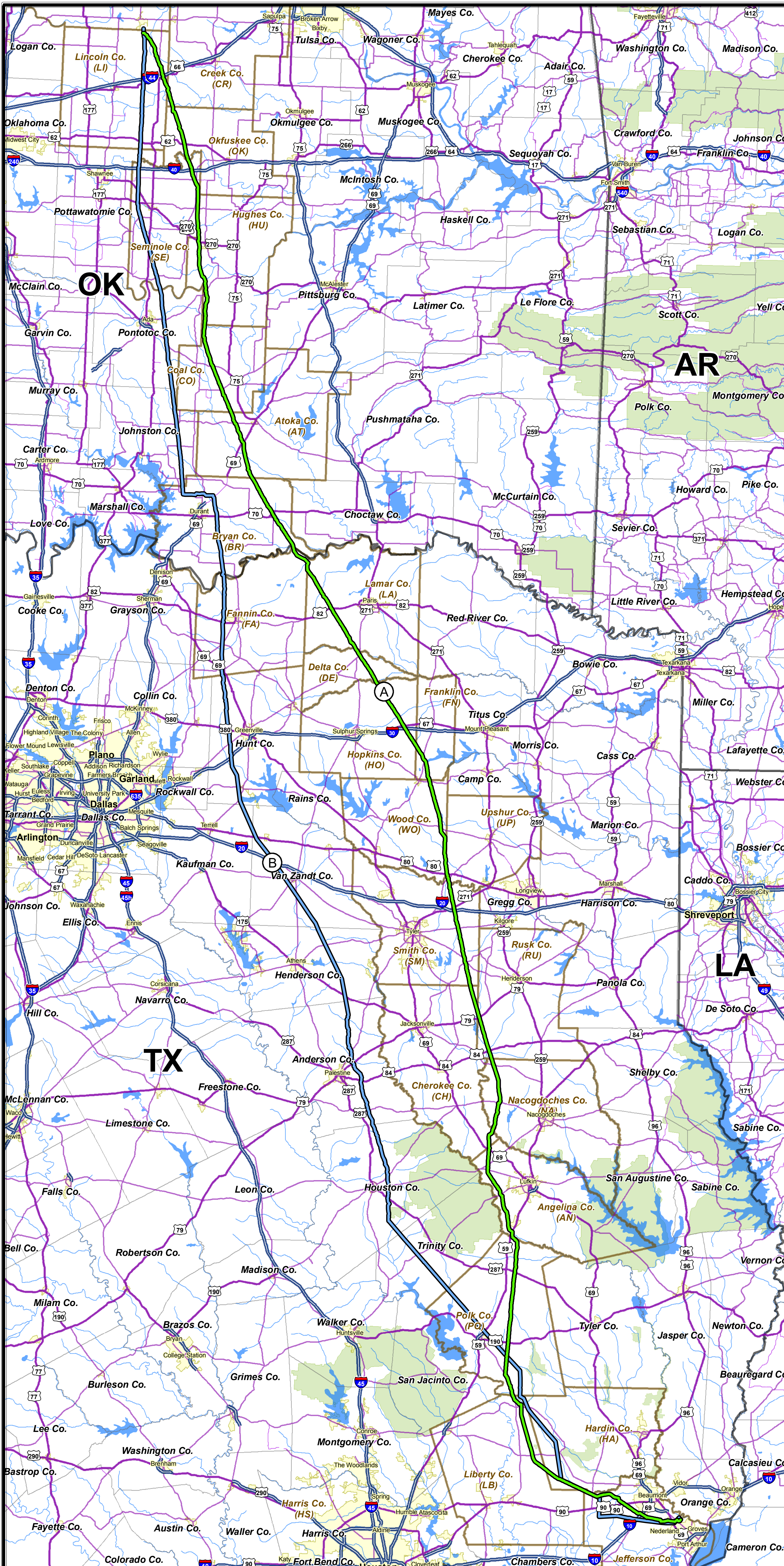
Legend

- Route B (Preferred Route)
- Route A
- Route A1A
- Baker Alternative
- Express-Platte Alternative
- Interstate Highway
- Highway & Major Roads
- Lakes
- Rivers & Streams
- Urban Areas
- National Parks & Forests
- Online County Boundary
- County Boundary
- State Boundary

ConocoPhillips

Figure 2.4.2 Steele City Segment Alternatives

Scale: 1" = 62 Mi	Date: July 6, 2009	
App. By: RG	Dwn. By: GS	Sheet: 2 OF 4



KEYSTONE XL PROJECT GULF COAST SEGMENT

N
W E
S

0 12.5 25 50

1 Inch = 26 Miles

Legend

- Route A (Preferred Route)
- Route B
- Interstate Highway
- Highway & Major Roads
- Lakes
- Rivers & Streams
- National Parks & Forests
- Urban Areas
- Online County Boundary
- County Boundary
- State Boundary

Figure 2.4.3 Gulf Coast Segment Alternatives

Scale: 1" = 26 Mi	Date: July 6, 2009	
App. By: RG	Dwn. By: GS	Sheet: 3 OF 4

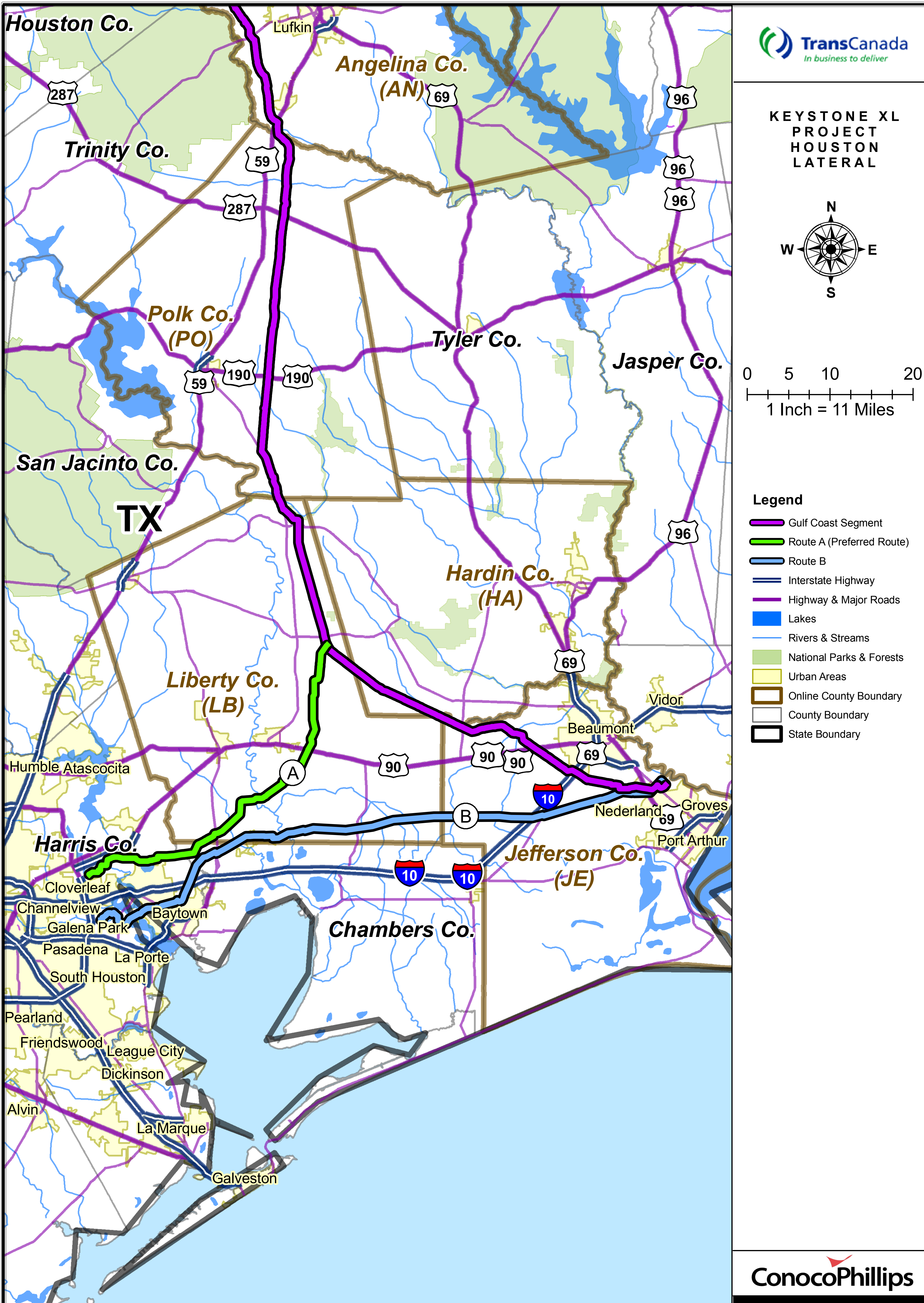


Figure 2.4.4
Houston Lateral Alternatives

Environmental Constraints

The most significant environmental constraints affecting the routing analysis along the Gulf Coast Segment are national and state forests and parks, wildlife habitats, tribal lands, surface rock outcrops, steep ascent/descent slopes, and HCAs. Some of these are:

- Caddo National Grassland;
- Davy Crockett National Forest;
- Angelina National Forest;
- Sam Houston National Forest;
- Big Thicket National Preserve;
- Piney Woods Mitigation Bank;
- Menard Creek Crossing;
- Texas Correctional Facility;
- Entergy Corridor; and
- Expansive forested wetland complexes along the extreme southern portion of the study area.

Avoidance Areas

Routing assessed and selected alternatives around the following land use categories to the extent practical:

- Indian Reservations, Tribal Lands;
- Other publicly owned lands including, USFWS, State Lands, NPS, USACE, US Department of Defense (USDOD), etc.;
- Urban areas and residences and farmsteads;
- Military bases;
- Rural schools and recreational areas;
- Municipal sewage ponds;
- Industrial facilities (e.g., rail yards, warehouses), except when in industrial corridors;
- Cemeteries;
- Oil/natural gas fields; and
- Well heads and irrigation pivot points.

Co-location Areas

To the extent practicable, alternatives were sited to co-locate with the following existing facilities:

- Existing pipelines;
- Existing railways;
- Various existing roadways; and
- Electrical power lines and other utilities.

2.4.2 Steele City Segment Alternatives

Western Alternative

The Western Alternative would enter the US at Morgan, Montana, and run southwest through Montana, South Dakota, Nebraska, Kansas, and Oklahoma to reach the delivery point at Cushing, Oklahoma. The route would then run south to Nederland and Moore Junction. The total length of this route would be 1,110 miles in the US. This route would cross northeast of Fort Peck Reservoir and avoid crossing reaches of the Niobrara River designated wild and scenic.

Most of the northern portion of the Western Alternative, from the US/Canada border to the delivery point at Cushing, would be constructed within new ROW; only the northernmost portion of the alternative would parallel the existing Northern Border Pipeline. South of Cushing to Nederland and Moore Junction, this alternative route would follow multiple ROWs. New pipeline would be constructed for the entire route. This alternative was not analyzed further because it failed to make use of the Cushing Extension thereby resulting in approximately 300 additional miles of Greenfield pipeline construction.

Express Pipeline Alternative

The Express Pipeline Alternative was developed at the request of the Montana DEQ. This alternative would parallel the existing ROW for the Express and Platte Pipeline Systems from Hardisty, Alberta to Steele City, Nebraska. The Express Pipeline runs south from Hardisty through central Montana and into central Wyoming before turning east and ending near Casper, Wyoming. The Platte Pipeline runs southeast from Casper, Wyoming and east across southern Nebraska before intersecting with the Cushing Extension near Steele City, Nebraska.

Populated and Cultivated Areas

After the Express Pipeline Alternative crosses into Montana, the area is predominately agricultural, which is unique to the region that the pipeline traverses. The pipeline crosses the Milk River and a few drainage features south of Highway 2 before entering Chouteau County, and then crosses the Missouri River immediately west of the designated National Wild and Scenic River and Upper Missouri Breaks National Park. Express then continues into Fergus County and in and out of Judith Basin County where the land use remains agricultural; however, there also are a greater number of densely populated areas. Routing parallel to the Express Pipeline through these areas would impose a more significant impact on the local population than routing through more remote terrain.

Difficult Terrain

The Yellowstone River and its tributaries at the border of Carbon County present difficult terrain features to traverse on both sides of the river. Additionally, the pipeline travels through the Pryor Mountain ranges, which can be difficult for construction and reclamation throughout Carbon County.

Differences in Canadian Routing and Existing Infrastructure

The preferred corridor selection was directly influenced by control points in Canada and the US, and the presence of existing linear infrastructure. Concerns included in this analysis were environmental and social costs, as well as cost of overall infrastructure. Because TransCanada also owns the Foothills Pipeline in Canada, ease of negotiations for adjoining ROW within Canada also was considered. Based on this analysis, as well as overall Project length in Canada and the US, a corridor contiguous with the existing Foothills pipeline was identified as the preferred corridor over a corridor contiguous with the Express Pipeline.

Steele City Segment Route A Alternative

The Steele City Segment Route A Alternative is co-located with an existing and proposed pipeline for the entire pipeline route. This alternative enters the US parallel to the Northern Border Pipeline in Phillips County, Montana, running in a southeasterly direction. The route continues to be co-located with the Northern Border Pipeline crossing through the Fort Peck Indian Reservation and then enters North Dakota through Williams County. The route crosses the Missouri River at the Williams-McKenzie County border and again at the Morton-Emmons County border in North Dakota. The route then crosses into McPherson County, South Dakota, continues in a southeasterly direction and crosses the proposed Keystone Pipeline in the northwestern corner of Clark County, South Dakota. The route turns south, co-locating with the proposed Keystone Pipeline through South Dakota, crossing the Missouri River near Yankton, South Dakota. The route enters Cedar County, Nebraska, continuing to co-locate with the Keystone Pipeline until intersecting with the Platte Pipeline in Jefferson County, Nebraska. The route will then interconnect with the proposed Cushing segment of the Keystone Pipeline Project near Steele City.

Wilderness Study Area - Bitter Creek (MP 44 to MP 48)

Under the Federal Land Policy and Management Act, the BLM conducted studies on several tracts of land with the intention of designating certain parcels as "wilderness study areas (WSAs)." One of these properties is the Bitter Creek WSA, which consists of approximately 59,660 acres of land. The area is known to contain a variety of vegetation types and wildlife habitat in the state of Montana. Currently, the BLM manages the protection of WSAs. The BLM will be the primary agency that will determine the possibility and mitigation involved with crossing this WSA.

Tribal Lands – Fort Peck Indian Reservation (MP 58 to MP 146)

Fort Peck Indian Reservation is under the jurisdiction of the Bureau of Indian Affairs (BIA). Obtaining ROW easements across BIA lands can require significantly more time and processing than private or other federally managed lands and would jeopardize the Project schedule.

Steele City Segment Route A1A Alternative

The Steele City Segment Route A1A Alternative is an additional alternative to the Steele City Segment Route Option A. As in the Steele City Segment Route A Alternative, this alternative co-locates with the Northern Border Pipeline along the east-west portion of the route and with the proposed Keystone Pipeline along the north-south segment except in northeastern Montana where the route runs to the north around the Fort Peck Indian Reservation.

The route also crosses the Bitter Creek WSA, then deviates from the Steele City Segment Route Option A in central Valley County, Montana, by continuing to run east just to the north of the Fort Peck Indian Reservation. The route then turns south at the eastern edge of the reservation in Sheridan County, Montana, and runs to the west of the Medicine Lake area through an area identified post-reconnaissance as a wildlife refuge. This area will be discussed later in the report. The route crosses into Roosevelt County, Montana, turning to the southeast and crosses into Williams County, North Dakota. The route joins back with the Steele City Segment Route Option A just north of the Missouri River crossing at the Williams-McKenzie County border in North Dakota and continues to co-locate with the Northern Border Pipeline.

Medicine Lake National Wildlife Refuge (Approximate MP 169)

The Medicine Lake National Wildlife Refuge (NWR) was established in 1935 to provide breeding habitats for migratory birds and other wildlife. The Refuge is managed by the USFWS. It lies within the highly productive prairie pothole region and has relief typical of the glacial drift prairie. Medicine Lake NWR was recognized by the American Bird Conservancy as one of the "Top 100 Globally Important Bird Areas in the US" and was designated as a National Natural Landmark in 1980.

The refuge is home to a diverse array of native prairie and wetland-associated wildlife species. More than 273 species of birds were spotted in the NWR and 125 bird species breed there. The 31,660-acre refuge contains 22 natural and artificial lakes and managed impoundments, along with numerous small wetlands or "potholes" encompassing more than 13,000 wetland acres. NWR uplands consist of gently rolling mixed-grass prairie with a few trees found in riparian areas. The rolling hills and sand dunes around Medicine Lake make up the most extensive sand hill formation in Montana.

NWR grasslands and wetlands are prime breeding areas for waterfowl, with 17 species producing 40,000 offspring annually. It also is an important resting area for migrating birds, including sand hill cranes, Canada geese, white-fronted geese, tundra swans, and many duck species. The American white pelican nesting colony in the refuge is one of the largest in North America, with about 10,000 birds breeding there each summer. Large populations of rare grassland birds such as Baird's sparrows, Sprague's pipits, and chestnut-collared longspurs nest on refuge prairies, attracting birdwatchers from all over the US.

Additionally, some year-round residents include white-tailed and mule deer, coyote, badger, beaver, muskrat, sharp-tailed grouse, and pheasant. Less frequent visitors include moose, elk, and pronghorn. A wolverine was seen in 1998.

The Steele City Route A1A Alternative traverses Diversion Ditch No. 1, a canal that connects the refuge to Big Muddy Creek in Sheridan County, Montana. The field reconnaissance indicates that the ditch is an extension of the refuge, but the surrounding lands are not. The potential impact of this crossing may be minimized or avoided by adjusting the currently proposed alignment, or by using the HDD installation technique across Diversion Ditch No. 1 and/or Lake Creek. Whether or not a pipeline crossing will be allowed at this point is subject to agency discussion and the potential presence of other utility crossings.

Prairie Potholes

Prairie potholes are depressional wetlands (primarily freshwater marshes) often found in the Upper Midwest, especially North Dakota, South Dakota, Wisconsin, and Minnesota, but also in northeastern Montana. This formerly glaciated landscape is pockmarked with an immense number of potholes, which fill with snowmelt and rain in the spring. Some prairie pothole marshes are temporary, while others may be permanent. Here a pattern of rough concentric circles develops. Submerged and floating aquatic plants take over the deeper water in the middle of the pothole while bulrushes and cattails grow closer to shore.

The Upper Midwest is described as being one of the most important wetland regions in the world because of its numerous shallow lakes, marshes, rich soils, and warm summers. The area is home to more than 50 percent of North American migratory waterfowl, with many species dependent on the potholes for breeding and feeding. In addition to supporting waterfowl hunting and birding, prairie potholes also absorb surges of rain, snow melt, and floodwaters, thereby reducing the risk and severity of downstream flooding.

Prairie potholes become more prominent in the eastern portion of the Steele City Route A1A Alternative than other Steele City Segment alternative routes. These wetland types typically increase the construction and mitigation costs of construction.

<u>Steele City Segment Route B (Proposed) Alternative</u>

Steele City Segment Route B Alternative is designed to minimize the miles of newly constructed pipe relative to the Western Alternative by taking advantage of interconnection with existing pipe, as well as providing a shorter route and avoids many of the environmental and regulatory constraints associated with Steele City Alternatives A and A1A. This route option is approximately 851 miles long, and crosses approximately 42 miles of federally managed lands. Steele City Route B Alternative enters the US parallel to the Northern Border Pipeline in Phillips County, Montana, and is co-located with that existing ROW for approximately 21.5 miles within the first 25 miles of the Project.

After Route B diverges from the Northern Border Pipeline, it continues in a more southerly direction to the west of the Fort Peck Indian Reservation, crossing the Missouri River through the narrow gap between the Fort Peck Reservoir and the Fort Peck Indian Reservation. The route then proceeds southeast, crossing into Harding County, South Dakota, and continues in a southeasterly direction to enter Nebraska in Keya Paha County. There it crosses the Niobrara River east of the segment designated as wild and scenic. The route continues southeast, to parallel a short portion of the Keystone Pipeline ROW in the southern portion of Jefferson County. The route then interconnects with the proposed Cushing Extension segment of the Keystone Pipeline Project near Steele City.

Department of Defense Property (Approximate MP 87.3)

The DOD is the underlying owner of a parcel of land on the south and southeastern side of the Missouri River near the confluence with the Milk River. It is a parcel of land that cannot be avoided because the Charles M. Russell NWR lies to the west-southwest and the Fort Peck Indian Reservation lies to the northeast of the proposed crossing. Land in this area appears to be open rangeland with trees and shrubs interspersed on the property. The manager of the land appears to be the BLM.

A crossing of this property will require an easement from the USACE. Because this pipeline will be greater than 24 inches in diameter, Congressional notification will be required. At this time, based on high-level, non-Project specific discussions, it appears granting an easement for the pipeline will be possible.

<u>Steele City Segment Route B with Baker Alternative</u>

The Steele City Segment Route B with Baker Alternative was developed at the request of the Montana DEQ. This alternative includes a 63-mile deviation from Steele City Segment Route B as described previously, paralleling an existing pipeline right-of-way around Baker, Montana, through southwest North Dakota, and rejoining Steele City Segment Route B in northeastern South Dakota.

Water Supplies

The Baker Alternative will route the pipeline through the municipal watershed for the City of Baker, Montana, and potentially will impact Baker Lake.

Constructability

Southeast of Baker, the Baker Alternative crosses an existing oil and gas field, with associated roads, underground gathering lines, and power lines. Special crossing techniques, including HDD will be required. These techniques will offset potential cost savings associated with reducing pipeline length, would increase the potential for damage or injury to workers and the public due to the proximity to wells and underground gathering lines, could potentially interrupt collection of product from the existing wells, and would temporarily interrupt access to those wells where access roads are crossed.

Permitting Issues

The Steele City Segment Route B with Baker Alternative will route the pipeline through North Dakota, which will require additional permitting that could jeopardize the Project schedule.

Table 2.4-1 summarizes the lengths of the alternatives considered for the northern portion of the Project.

Table 2.4-1 Lengths of the Steele City Segment Route Options (Canadian Border to Cushing, Oklahoma)

Steele City Route Alternative	Route and the Corresponding Alternative	Mileage (New Pipe Construction)	Mileage (Connection to Keystone Cushing Extension)
Western Alternative	Western Alternative – direct line to Cushing, Oklahoma	1,110	0
Express Pipeline Alternative	Following the Express Pipeline from Hardisty, Alberta, Canada to Steele City, Nebraska	1,061	298
Route A	Eastern route through Montana, North Dakota, South Dakota, and Nebraska, to connect to the Keystone Cushing Extension at Steele City	920	298
Route A1A	Eastern route through Montana, North Dakota, South Dakota, and Nebraska, to connect to the Keystone Cushing Extension at Steele City, avoiding BIA lands	951	298
Route B	Eastern route through Montana, South Dakota, and Nebraska, to connect to the Keystone Cushing Extension at Steele City	851	298
Route B with Baker Alt	Follow Route B, except at Baker, Montana, to follow an existing pipeline through southwestern North Dakota, to rejoin Alternative B in South Dakota	851	298

Steele City Segment Conclusion and Selected Alternative

The routes discussed above for the Steele City Segment were analyzed using recent aerial photography obtained from the US Department of Agriculture; United States Geological Survey (USGS) topographic quadrangle maps; state gazetteers; Soil Survey Geographic (SSURGO) Database; National Land Cover Database; Geographic Information System (GIS) layers containing public data obtained from various county, state, and federal government websites; commercial background data provided by ESRI; and existing utility data.

These data were utilized to identify potential route options and to accomplish the following:

- Maximize, to the extent feasible, co-location opportunities with other existing pipelines, electric transmission lines, railways, roadways and other utilities;
- Identify preferred topography, land use areas, etc; and
- Identify major constraint areas such as national and state parks and forests, wildlife management areas, wetlands areas, waterbodies, difficult or unstable terrain, high density development, etc.

Subsequently, extensive aerial and ground reconnaissance were conducted across the various alternatives to finalize the routing options. As a result of these analyses and ground reconnaissance efforts, Route B was selected as the preferred alternative for several reasons, including the following:

- Reduced environmental footprint and impacts;
- Reduced landowner impacts;
- Least impact to population centers;
- Less construction through difficult terrain;
- Avoids Bitter Creek WSA and Medicine Lake NWR;
- Less impact to Prairie potholes;
- Avoids disruption of existing oil and gas fields and gathering lines associated with the Baker Alternative;
- Reduced overall construction costs; and
- Reduced overall operating costs.

2.4.3 Gulf Coast Segment

The analysis of Gulf Coast Segment initially included two primary routes and four secondary routes. Based on the control points and opportunities identified for the Project, the routing alternatives concentrated on the most direct route resulting in the alternative considered being routed through Oklahoma and Texas.

Oklahoma

In Oklahoma, the Project start point commences east of Oklahoma City. The Oklahoma area consists of gently rolling topography with east facing escarpments and isolated buttes continuing into southern Oklahoma and gently rolling topography to relatively flat topography with limestone.

The Project area contains several geological faults in Oklahoma (preferred route locations – crossing fault zone at MP 39.5 to MP 41, parallel to fault at MP 48.5 to MP 49.5 and crossing fault zone at MP 86.5 to MP 106.5).

The Project area transverses a zone of increased seismic risk in southern Oklahoma and damage resulting from seismic activity in this zone is expected to be moderate.

Agriculture is a significant land use, with the primary croplands being wheat and forage/hay. Some oat and corn fields are crossed in Oklahoma.

Based on preliminary analysis, the Project crosses improved pasturelands and hayfields with some locations crossed considered tall grass prairie areas.

Route options cross several large rivers along with several large creeks in Oklahoma before crossing into Texas.

The timberland that is crossed in Oklahoma has low commercial value.

Some urban residential impact could occur near towns such as Stroud, Holdenville, and Centrahoma in Oklahoma.

The main crops encountered will be forage or hay, improved pastures, timber, rice and soybeans. Wheat, sod farms, and poultry farms also will be crossed. There are few, if any, landowners participating in the Conservation Reserve Program along the route in Oklahoma.

The majority of lands crossed in Oklahoma are privately owned; and less than one percent of lands crossed are owned by the state or federal government in Oklahoma.

Texas

In Texas, the Project start point commences east of Dallas - Fort Worth. The Project area in Texas consists of gently rolling topography, sand hills, black prairie, and pine barrens to flat-lying coastal prairie. There are occurrences of shallow rock in selected areas (preferred route locations – MP 154 to MP 200, MP 200 to MP 369, and MP 405 to MP 475). These shallow rock areas typically encountered are fragmented and no blasting is anticipated. No special problems are expected with excavation and there may be conditions in localized areas requiring more specialized equipment (blasting, jackhammers, or saws).

In Texas, the Project area contains several geological faults (preferred route locations – Crossing Fault Zone at MP 189 to MP 207, crossing fault zone at MP 296 to MP 308).

The Project area in northeast Texas crosses a zone where minor seismic risk exists and the remainder of east Texas and the Gulf Coast is described as having no seismic risk.

Rice and soybean fields are more prevalent in Texas, with some areas that use flood-and center pivot irrigation.

Based on preliminary analysis, the Project crosses improved pasturelands and hayfields.

Texas route options cross several additional large rivers and several large creeks.

Towns like Tyler/Longview, Lufkin, and the cities of Beaumont/Port Arthur, and Houston were avoided by routing around them.

The main crops encountered will be forage or hay, improved pastures, timber, rice and soybeans with some areas that use flood- and center pivot irrigation. Wheat, sod farms, and poultry farms also will be crossed. There are few, if any, landowners participating in the Conservation Reserve Program (CRP) along the route in Texas. The majority of lands crossed in Texas are privately owned. Less than one percent of lands crossed are owned by the state government in Texas (Deep Fork Wildlife Management Area and the San Jacinto State Battleground).

The proposed Project route will cross the Piney Woods Mitigation Bank (PWMB) at approximate MP 366 to MP 371. The PWMB was established in December 2008 and is the largest mitigation bank in Texas. The PWMB is a privately owned wetlands mitigation bank that has been permitted by the USACE. The PWMB meets the criteria for Mitigation Banks under Federal Guidance for the establishment, use, and operation of mitigation banks and the laws of the State of Texas. The bank was approved following review by an Interagency Review Team, comprised of the USACE, USEPA, USFWS, TPWD, TCEQ, GLO, and the Railroad Commission of Texas.

Gulf Coast Segment Alternatives Descriptions

Two major route options, Gulf Coast Segment Route Options A and B, were analyzed between facilities in Cushing, Oklahoma, and proposed facilities in Nederland, Texas.

Several shorter segments for the Gulf Coast Segment from Nederland were reviewed to determine which would provide the most practical connection to the Houston Ship Channel. An existing 20-inch ARCO products line was considered. A portion of this line could be acquired and utilized as a secondary means of reaching the Houston Ship Channel.

Gulf Coast Segment Route Alternative A

Gulf Coast Segment Route Alternative A was the initial route identified because it follows an existing 30-inch-diameter natural gas pipeline corridor (Texoma) from Cushing to Nederland. Portions of the Texoma line have been sold and are operated by various companies; however the corridor is still intact. This route is the shorter between Cushing and Nederland at approximately 456 miles.

Gulf Coast Segment Route Alternative A was adjusted during feasibility analysis to the west to avoid the developed, urban area and cities associated with Longview, Tyler, and Nacogdoches, Texas, and the Angelina National Forest. Attention also was given to oil and gas activity and abandoned fields.

This route is co-located with four other utility corridors (pipeline and electric transmission) and can be summarized as approximately 93.5 percent co-located with other utility ROWs. This route is approximately 394.9 miles, or 86.6 percent, co-located with existing pipelines and approximately 31.3 miles, or 6.9 percent, co-located with power lines.

There are two greenfield areas approximately 29.8 miles, or 6.5 percent, not co-located, allowing the avoidance of communities of Longview, Tyler, and Nacogdoches, Texas, and the Angelina National Forest.

Alternative A crosses approximately 21 major roads, 485 minor roads, 104 major streams/waterbodies, 131 minor streams/waterbodies, 16 railroads, 49 power lines, 40 pipelines (data is from Pennwell database).

Alternative A is in a less urban area which implies potentially easier construction, fewer landowner issues, and less organized resistance to the pipeline.

Gulf Coast Segment Route Alternative B

Gulf Coast Segment Alternative B is the secondary alternative considered that would connect facilities in Cushing, Oklahoma with facilities in Nederland, Texas. Alternative B is longer between Cushing and Nederland at approximately 486 miles. Alternative B is west of Alternative C and therefore passes closer to Dallas-Ft. Worth metropolitan area. A portion of Alternative B is co-located with the Seaway Pipeline for approximately 190 miles south of Cushing, Oklahoma and was adjusted to avoid Lake Texoma and remain east of Durant, Oklahoma.

Alternative B is co-located with 10 pipeline ROWs and 1 power line, resulting in approximately 97.8 percent co-location with other utility ROWs. Specifically, Alternative B is approximately 458.3 miles, or 94.3 percent, co-located with existing pipelines and approximately 17 miles, or 3.5 percent, co-located with power lines.

There is one greenfield segment, approximately 10.7 miles, or 2.2 percent, not co-located, which is necessary to avoid development and congestion.

Alternative B consists of 24 major roads, 559 minor roads, 94 major streams/waterbodies, 154 minor streams/waterbodies, 24 railroads, 63 power lines and 72 pipelines (data is based on Pennwell information).

Alternative B does involve a potential crossing of the Big Thicket Natural Preserve, a NPS-owned park.

Gulf Coast Segment Route Alternative A and B Comparison

Alternative B crosses less wetland areas than Alternative Option A. Thus constructability might be more favorable and there would be less regulatory obstacles. Conversely, Alternative B would pass closer to the Dallas area, implying greater land costs and potentially organized resistance to the pipeline.

Issues associated with Alternative A included extensive timbered wetlands and overall wetland areas on the southern portion of the route. The southern portion of Alternative B encounters fewer timbered wetlands and fewer wetlands.

The majority of lands crossed by the Alternative A are privately owned. Less than one percent of lands are owned by either the State of Oklahoma or State of Texas.

Gulf Coast Segment Conclusion and Selected Alternative

A combination of Gulf Coast Segment Route Alternatives A and B, with some detailed routing, was determined to provide the most sensible alternative to connect Cushing and Nederland. The combined Gulf Coast Segment Alternatives A and B is now designated as the preferred route alternative for the Gulf Coast Segment and was subsequently surveyed for this Environmental Report.

The preferred route incorporates the advantages of the northern two-thirds of Gulf Coast Segment Alternative A and the southern one-third of Gulf Coast Segment Route Alternative B. The less urban construction to north coupled with the less timbered wetlands to the south should provide the most cost-effective route. The preferred route is 480 miles in length and specifically, consists of 417 miles, or 87 percent, co-located with other ROWs, including 14 different pipelines, power lines, and 1 electric transmission corridor.

Paralleling the Old Texoma Pipeline in the state of Oklahoma and North Texas should benefit the Project. Co-location generally is viewed favorably by landowners. It requires less clearing when crossing timbered tracts. Landowners generally prefer utility easements be in one place on their property.

The Big Thicket National Preserve and associated wetland complexes as previously noted are considered as an environmental constraint for the preferred but were avoided by placing the pipeline into the Texas highway ROW via an HDD.

The preferred route potentially requires no break out tanks from a design standpoint and traverses approximately 35.3 miles of wetland along the entire route from Cushing, Oklahoma to Nederland, Texas.

The preferred route traverses a number of active and inactive oil and gas fields and there may be historical recorded or unrecorded occurrences of contamination, along the initial 100 miles, south of Cushing, Oklahoma. These issues occur less frequently along the remainder of the route to Nederland, Texas.

2.4.3.1 Houston Lateral Alternatives

Houston Lateral Route Alternative A

Houston Lateral Route Alternative A was initially developed as a lateral from the Gulf Coast Segment Route Alternative B to get to the Houston Ship Channel. Alternative A was then refined to facilitate all Gulf Coast alternatives analyzed and resulted in an approximately 75-mile route to the Houston Ship Channel.

Houston Lateral Route Alternative A is co-located with other utilities that consist of 72.7 miles, 96.9 percent, co-located with other utilities (5 pipelines and multiple pipeline/electric transmission corridors). The remaining 2.3 miles, 3.1 percent, would be routed along an existing roadway and railway.

This route consists of 3 major roads, 74 minor roads, 10 major streams/waterbodies, 20 minor streams/waterbodies, 5 railroads, 15 power lines and 89 pipelines.

Houston Lateral Route Alternative A is described as typical pipeline construction; however, the route encounters very heavy congestion on the southwest end. Utilizing this alternative would more than likely necessitate the construction of break out tanks.

Houston Lateral Route Alternative B

Houston Lateral Route Alternative B is described as a southern alternative to reach the Houston Ship Channel and is approximately 77 miles in length. This alternative is 97 percent co-located with other utilities (6 pipeline and 1 combined pipeline and electric transmission corridor) approximately 72.2 miles and the final 2.3 miles, 3 percent, would be routed alongside a roadway and railway.

Houston Lateral Route Alternative B consists of 3 major roads, 91 minor roads, 25 major streams/waterbodies, 20 minor streams/waterbodies, 7 railroads, 158 power lines and 236 pipelines.

Houston Lateral Route Alternative B follows an existing pipeline corridor and would encounter heavy congestion on the beginning and end of the route. This Alternative would involve typical pipeline construction for a majority of the route and no break out tanks would be required. Alternative B would very likely encounter significant regulatory scrutiny based on the potential impacts associated with the coast (Coastal Zone Management) and heavy concentration of wetlands (USACE and Texas Parks and Wildlife Department [TPWD]).

Houston Lateral Preferred Alternative

The preferred Houston Lateral is a combination of the two alternatives discussed above and is approximately 48.6 miles in length and is 45 percent co-located with other ROWs. The preferred Houston Lateral route has several greenfield areas, which total approximately 26.6 miles, in various lengths along the route and consists of 2 major roads, 33 minor roads, 3 major streams/waterbodies, 49 minor streams/waterbodies, 4 railroads, 2 power lines and numerous pipelines.

The preferred route follows existing utility corridors, especially on the western end which aids in routing the pipeline through the areas of heavier population. The route parallels existing pipelines across predominately rice fields and pastures. Due to the high concentration of development, industrial, residential, and commercial, in the Houston Ship Channel area, a corridor system has been developed to accommodate the installation of pipelines and other utilities.