United States Department of State
Draft Environmental Impact Statement

For the

KEYSTONE XL OIL PIPELINE PROJECT

Applicant for Presidential Permit:
TransCanada Keystone Pipeline, LP

Elizabeth Orlando, NEPA Contact & Project Manager
United States Department of State
Bureau of Oceans and International Environmental
and Scientific Affairs
Room 2657
Washington, DC 20520
(202) 647-4284

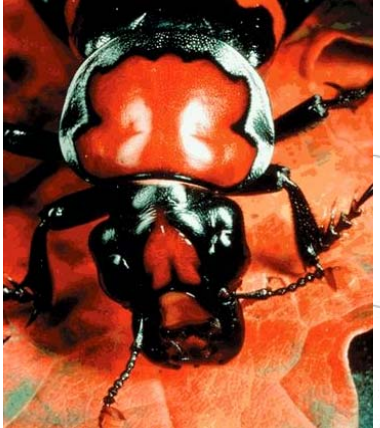
Cooperating Agencies

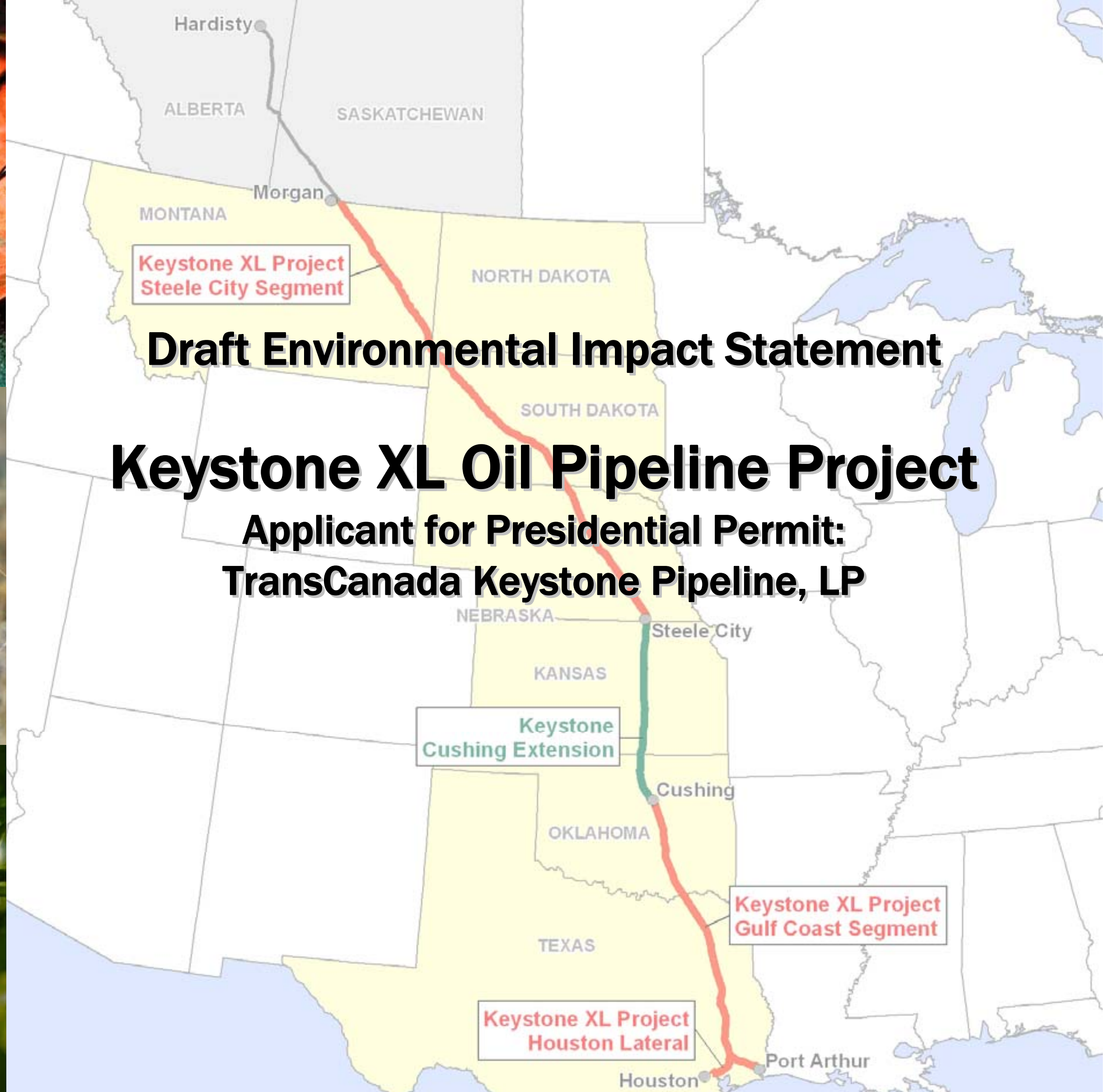
U.S. Army Corps of Engineers (USACE)
U.S. Department of Agriculture – Farm Service Agency (FSA)
U.S. Department of Agriculture – Natural Resource Conservation Service (NRCS)
U.S. Department of Agriculture – Rural Utilities Service (RUS)
U.S. Department of Energy – Western Area Power Administration (Western)
U.S. Department of Interior – Bureau of Land Management (BLM)
U.S. Department of Interior – National Park Service (NPS)
U.S. Department of Interior – U.S. Fish and Wildlife Service (USFWS)
U.S. Department of Transportation – Office of Pipeline Safety (DOT-OPS)
U.S. Environmental Protection Agency (EPA)
Montana Department of Environmental Quality (MDEQ)

Assisting Agencies

U.S. Department of Interior – Bureau of Reclamation (Reclamation)
Filmore, Greely, Holt, Merrick, Nance, Saline, and Wheeler counties, Nebraska
Lower Big Blue Natural Resources and Upper Elkhorn Natural Resources districts, Nebraska

April 16, 2010





Draft Environmental Impact Statement

Keystone XL Oil Pipeline Project

Applicant for Presidential Permit:
TransCanada Keystone Pipeline, LP

Elizabeth Orlando, Esq.
United States Department of State
Bureau of Oceans and International
Environmental and Scientific Affairs, Room 2657A
Washington, DC 20520

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Seattle, WA 98119
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Library Locations for Paper Copy and CD Version of the Keystone XL Draft Environmental Impact Statement in the Government Documents Section

MONTANA

Dodson Branch Library
121 2nd St. East
Dodson, MT 59524
(406) 284-3341

Phillips County Library
10 S. 4th St. East
Malta, MT 59524
(406) 542-2407

Saco Branch Library
201B Taylor St
Saco, MT 59261
(406) 654-2407

Glasgow City County Library
408 3rd Ave South
Glasgow, MT 59230
(406) 228-2731

Opheim Community Library
100 Rock St.
Opheim, MT 59250
(406) 762-3213

George McCone Memorial County Library
1101 C Ave, Circle, MT 59215
(406) 485-2350

Glendive Public Library
200 S Kendrick
Glendive, MT 59330
(406) 377-3633

Richey Public Library
223 S Main St
Richey, MT 59259
(406) 773-5585

Prairie County Library
309 Garfield Ave
Terry, MT 59349
(406) 635-5546

Fallon County Library
6 W Fallon Ave
Baker, MT 59313
(406) 778-7160

Sheridan County Library
100 W Laurel Ave
Plentywood, MT 59254
(406) 765-2317

SOUTH DAKOTA

Northwest Regional Library
410 Ramsland St
Buffalo, SD 57720
(605) 375-3835

Belle Fourche Public Library
905 5th Ave
Belle Fourche, SD 57717
(605) 892-4407

Newel Public Library
208 Girard St
Newel, SD 57760
(605) 456-2179

Bison Public Library
309 1st Ave
Bison, SD 57620
(605) 224-7252

Lemmon Public Library
303 1st Ave W
Lemmon, SD 57638
(605) 374-5611

Faith Public Library
204 West Fifth St
Faith, SD 57626
(605) 976-2262

Sturgis Public Library
1040 Second St
Sturgis, SD 57785
(605) 347-2624

Hill City Public Library
324 Main Street
Hill City, SD 57745
(605) 574-4529

Keystone Town Library
1101 Madill St
Keystone, SD 57751
(605) 666-4499

Rapid City Public Library
610 Quincy St
Rapid City, SD 57701
(605) 394-6139

General Beadle Elementary School and Library
10 Van Buren St
Rapid City, SD 57701
(605) 845-3797

Haakon County Public Library
140 S Howard Avenue
Philip, SD 57567
(605) 859-2442

Midland Community Library
401 Russell St
Midland, SD 57552
(605) 843-2158

Rawlins Municipal Library
1000 E Church St
Pierre, SD 57501
(605) 773-7421

South Dakota State Library
800 Governors Dr
Pierre, SD 57501
(605) 773-3131

Presho Public Library
108 N Main St
Presho, SD 57568
(605) 895-2443

Kennebec Public Library
203 S Main St
Kennebec, SD 57544
(605) 869-2207

Colome Branch Library
Main Street
Colome, SD 57528
(605) 842-1547

Wall Community Library
407 Main St
Wall, SD 57790
(605) 279-2929

Tripp County Library
442 Monroe St
Winner, SD 57580
(605) 842-0330

NEBRASKA

Keya Paha County Library
Turbine Ave and S Main
Springview, NE 68778
(402) 497-2626

Rock County Public Library
400 State St.
Bassett, NE 68714
(402) 684-3800

Atkinson Public Library
210 W State St
Atkinson, NE 68713
(402) 925-2855

O'Neill Public Library
601 E Douglas St
O'Neill, NE 68763
(402) 336-3110

Elgin Public Library
503 S Second St
Elgin, NE 68636
(402) 843-2460

Ewing Public Library
202 E Nebraska St
Ewing, NE 68735
(402) 626-7348

Garfield County Library
217 G St
Burwell, NE 68823
(308) 346-4711

Spalding Public Library
141 St Joseph St
Spalding, NE 68665
(308) 428-2545

Greeley Public Library
117 S Galloway St
Greeley, NE 68842
(308) 428-4010

Scotia Public Library
Scotia and Greeley Ave
Scotia, NE 68875
(308) 245-3350

Wolbach Public Library
406 Center Ave
Wolbach, NE 68882
(308) 246-5278

Albion Public Library
437 S 3rd St
Albion, NE 68620
(402) 395-2021

Cedars Rapids Public Library
423 W. Main St
Cedars Rapids, NE 68627
(308) 358-0603

Petersburg Public Library
103 S 2nd St
Petersburg, NE 68652
(402) 386-5755

Saint Edward Public Library
307 Beaver St
St Edwards, NE 68660
(402) 678-2204

Primrose Public Library
229 Commercial St
Primrose, NE 68655
(308) 396-1414

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NEBRASKA Cont.

Fullerton Public Library
903 Broadway St
Fullerton, NE 68638
(308) 536-2382

Genoa Public Library
421 Willard Ave
Genoa, NE 68640
(402) 993-2943

Clarks Public Library
101 W Amity St
Clarks, NE 68628
(308) 548-2864

Palmer Public Library
202 W Commercial St
Palmer, NE 68864
(308) 894-5305

Silver Creek Public Library
309 Vine St
Silver Creek, NE 68663
(308) 773-2594

Central City Public Library
1604 15th Ave
Central City, NE 68826
(308) 946-2512

Giltner Public Library
4020 N Commercial Ave
Giltner, NE 68841
(402) 849-2290

Alice M. Farr Library
1603 L St
Aurora, NE 68818
(402) 694-2272

Kilgore Memorial Library
520 Nebraska Ave
York, NE 68467
(402) 363-2620

Gresham Public Library
424 Elm St.
Gresham, NE 68367

Exeter Public Library
202 S Exeter Ave
Exeter, NE 68351
(402) 266-3031

Fairmont Public Library
600 F St
Fairmont, NE 68354
(402) 268-6081

Geneva Public Library
1043 G. St
Geneva, NE 68361
(402) 759-3416

Milligan Public Library
424 Main St
Milligan, NE 68406
(402) 629-4302

Virgil Biegert Public Library
214 N Market St
Shickley, NE 68436
(402) 627-3365

Sutton Public Library
201 S Saunders Ave #1
Sutton, NE 68979
(402) 773-5259

DeWitt Public Library
208 W Fillmore Ave
DeWitt, NE 68341
(402) 683-2145

Crete Public Library
305 E 13th St
Crete, NE 68333
(402) 826-3809

Dorchester Public Library
609 ½ Washington Ave
Dorchester, NE 68343
(402) 946-3891

Dvoracek Memorial Library
419 W 3rd St
Wilber, NE 68465
(402) 821-2832

Gilbert Public Library
628 Second St
Friend, NE 68359
(402) 947-5081

Struckman-Baatz Library
104 N West Ave
Western, NE 68464
(402) 433-2177

Perkins Library
1014 Boswell Ave
Crete, NE 68333
(402) 826-3809

Tobias Public Library
101 Main Street
Tobias, NE 68453

Daykin Public Library
201 Mary Ave
Daykin, NE 68338
(402) 446-7295

Fairbury Public Library
601 7th St
Fairbury, NE 68352
(402) 729-2843

Stuart Township Library
209 N Main St
Stuart, NE 68780
(402) 924-3242

Plymouth Public Library
103 N Jefferson Ave
Plymouth, NE 68454
(402) 656-4335

KANSAS

Washington Library
116 E 2nd St
Washington, KS 66968
(913) 325-2114

Clifton City Library
104 E. Parallel Street
Clifton, KS 66508
(913) 455-2222

Marysville Public Library
1009 Broadway
Marysville, KS 66508
(785) 562-2491

Seneca Free Library
606 Main
Seneca, KS 66538
(913) 336-2377

Morrill Free Public Library
431 Oregon St
Hiawatha, KS 66434
(913) 742-3831

Library District 1
105 N Main St
Troy, KS 66087
(785) 985-2597

Wakefield Public Library
205 3rd St
Wakefield, KS 67487
(913) 461-5510

Hope Community Library
216 N Main
Hope, KS 67451
(785) 366-7219

Potwin Public Library
110 N Randall
Potwin, KS 67123
(316) 752-3607

Douglass Public Library
319 S Forrest St
Douglass, KS 67039
(316) 746-2200

Derby Public Library
611 Mulberry Road
Derby, KS 67037
(316) 788-0760

Arkansas City Library
120 E 5th Ave
Arkansas City, KS 67005
(620) 442-1280

Oxford Public Library
115 S Sumner St
Oxford, KS 67119
(620) 455-2221

Burns Public Library
104 N Washington Ave
Burns, KS 66840
(620) 726-5232

Chapman Pubic Library
402 N Marshall
Chapman, KS 67431
(913) 922-6548

Clay Center Carnegie Library
706 6th St
Clay Center, KS 67432
(913) 632-3889

Bradford Memorial Library
611 S Washington
El Dorado, KS 67042
(316) 321-3363

Enterprise Public Library
123 S Factory
Enterprise, KS 67441
(913) 934-2351

Florence Public Library
324 Main St
Florence, KS 66851
(316) 878-4649

Herrington Public Library
102 S Broadway
Herington, KS 67449
(785) 442-3078

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KANSAS Cont.

Marion City Library
101 Library St
Marion, KS 66861
(316) 382-2442

OKLAHOMA

Perry Carnegie Library
302 N 7th St
Perry, OK 73077
(405) 336-4721

Fairfax Public Library
158 E Elm St
Fairfax, OK 74637
(918) 642-5535

Pawnee Public Library
653 Illinois St
Pawnee, OK 74058
(918) 762-2138

Bristow Public Library
111 W 7th Ave
Bristow, OK 74010
(918) 367-6562

Hugh Warren Memorial Library
124 S Rennie
Ada, OK 74820
(405) 436-8124

Alva Public Library
504 7th St
Alva, OK 73717
(405) 327-1833

JW Martin Library
709 Oklahoma Blvd
Alva, OK 73717
(580) 327-1700

Cushing Public Library
215 North Steele Ave
Cushing, OK 74023
(918) 225-4188

Drumright Public Library
104 E Broadway
Drumright, OK 74030
(918) 352-2228

Robert L Williams Public Library
323 W Beech St
Durant, OK 74701
(405) 924-3486

Newkirk Public Library
116 N Maple Ave
Newkirk, OK 74647
(580) 362-3934

Thomas-White Memorial Library
129 S Main
Perkins, OK 74509
(405) 547-5185

Ponca City Library
515 E Grand Ave
Ponce City, OK 64501
(405) 767-0345

Haynie Public Library
1705 W Main St, 4308 NBU
Prague, OK 74864
(405) 567-4013

Seminole Public Library
424 N Main
Seminole, OK 74868
(405) 382-4221

Stillwater Public Library
1107 S Duck
Stillwater, OK 74074
(405) 372-3633

Stroud Public Library
301 West Seventh
Stroud, OK 74079
(918) 968-2567

TEXAS

Lee College Library
511 S Whiting St
Baytown, TX 77520
(281) 425-6379

Sterling Municipal Library
Mary Elizabeth Wilbanks Ave
Baytown, TX 77701
(281) 427-7331

Beaumont Public Library
801 Pearl
Beaumont, TX 77701
(409) 838-6606

Jefferson County Library
7933 Viterbo Road – Suite 7
Beaumont, TX 77705
(409) 727-2735

R C Miller Library
1605 Dowlen Road
Beaumont, TX 77706
(409) 866-9487

Mary and John Gray Library
4400 M.L. King Pkwy
Beaumont, TX 77705
(409) 880-8118

Willard Library
3590 E Lucas
Beaumont, TX 77708
(409) 892-4988

Jones Public Library
307 W Houson St
Dayton, TX 77535
(936) 258-7060

Allen Memorial Public Library
201 N Beaulah St
Hawkins, TX 75765
(903) 769-2241

Stratford Branch Library
509 Stratford
Highlands, TX 77562
(281) 426-3521

Liberty Municipal Library
1710 Sam Houston Ave
Liberty, TX 77575
(936) 336-8901

Sam Houston Regional Library & Research Center
650 FM 1011 Rd
Liberty, TX 77575
(936) 336-8821

Murphy Memorial Library
601 W Church
Livingston, TX 77351
(936) 327-4252

Kurth Memorial Library
706 S Raguet
Lufkin, TX 75904
(936) 630-0561

West Chambers Branch Library
10616 Eagle Dr
Mont Belvieu, TX 77580
(281) 576-2243

Franklin County Library
100 E Main Street
Mt Vernon, TX 75457
(903) 537-4916

Nacogdoches Public Library
1112 N St
Nacogdoches, TX 75961
(936) 559-2970

Paris Public Library
326 Main St
Paris, TX 75460
(903) 785-8531

Shepherd Public Library
30 N Liberty St
Shepherd, TX 77371
(936) 628-3515

Sulpher Springs Public Library
611 North Davis St
Sulphur Springs, TX 75482
(903) 885-4926

Tyler Public Library
201 S College Ave
Tyler, TX 75702
(903) 593-7323

Gilbreath Memorial Library
916 N Main
Winnsboro, TX 75494
(903) 342-6866

Keystone XL DEIS Public Comment Meeting Schedule

Date and Time	Location	Meeting Venue and Address
Monday, May 3 7:00 – 9:00 p.m.	Durant, Oklahoma	Holiday Inn Express Hotel 613 University Pl, Durant, OK 74701
Tuesday, May 4 7:00 – 9:00 p.m.	Stroud, Oklahoma	Best Western Stroud Motor Lodge 1200 N 8th Ave, Stroud, OK 74079
Wednesday, May 5 7:00 – 9:00 p.m.	El Dorado, Kansas	Holiday Inn Express Hotel 3100 El Dorado Ave, El Dorado, KS 67042
Thursday, May 6 7:00 – 9:00 p.m.	Fairbury, Nebraska	Rock Island Railroad Depot 910 Second St., Fairbury, NE 68352
Monday, May 10 7:00 – 9:00 p.m.	York, Nebraska	York Auditorium 211 E. 7th Street, York, NE 68467
Tuesday, May 11 7:00 – 9:00 p.m.	Atkinson, Nebraska	Atkinson Community Center 206 W. 5th Street, Atkinson, NE 68713
Wednesday, May 12 7:00 – 9:00 p.m.	Murdo, Nebraska	Triple H Restaurant (Interstate 90, exit 192) 601 5 Street, Murdo, SD 57559
Thursday, May 13 12:00 – 2:00 p.m.	Faith, South Dakota	Community Legion Hall Main Street, Faith, SD 57626
Thursday, May 13 7:00 – 9:00 p.m.	Buffalo, South Dakota	Harding County Memorial Recreation Center 204 Hodge Street, Buffalo, SD 57720
Monday, May 17 7:00 – 9:00 p.m.	Beaumont, Texas	American Legion Hall #817 3430 W. Cardinal Drive, Beaumont, TX 77705
Tuesday, May 18 7:00 – 9:00 p.m.	Liberty, Texas	VFW Hall 1520 N Main St., Liberty, TX 77575
Wednesday, May 19 7:00 – 9:00 p.m.	Livingston, Texas	Livingston Junior High School 1801 Highway 59 Loop N., Livingston, TX 77351
Thursday, May 20 7:00 – 9:00 p.m.	Tyler, Texas	Ramada Hotel and Conference Center 3310 Troup Highway SE Loop 323 & Hwy 110 North, Tyler, TX 75701
Monday, May 17 7:00 – 9:00 p.m.	Malta, Montana	Great Northern Hotel 2 South 1st Street East, Malta, MT 59538
Tuesday, May 18 12:00 – 2:00 p.m.	Glasgow, Montana	Cottonwood Inn and Suites Highway 2 East, Glasgow, MT 59230
Tuesday, May 18 7:00 – 9:00 p.m.	Terry, Montana	Terry High School 215 East Park, Terry, MT 59349
Wednesday, May 19 12:00 – 2:00 p.m.	Circle, Montana	Schmidt Super Value 105 10th Street, Circle, MT 59215
Wednesday, May 19 7:00 – 9:00 p.m.	Glendive, Montana	Dawson Community College 300 College Drive, Glendive, MT 59330
Thursday, May 20 12:00 – 2:00 p.m.	Baker, Montana	Thee Garage and Steakhouse 19 West Montana Ave., Baker, MT 59313

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ABBREVIATIONS AND ACRONYMS

°C	degrees Celsius
°F	degrees Fahrenheit
$\mu g/m^3$	micrograms per cubic meter
µS/cm	microSiemens per centimeter; a measure of conductivity
ACHP	Advisory Council on Historic Preservation
AEUB	Alberta Energy and Utilities Board
AGS	Armor grip suspension
AIRFA	American Indian Religious Freedom Act of 1978
amsl	above mean sea level
ANSI	American National Standards Institute
AOPL	Association of Oil Pipelines
APC	area of probable concern
APE	area of potential effects
APHIS	Animal and Plant Health Inspection Service
API	American Petroleum Institute
APLIC	Avian Power Line Interaction Committee
AQCR	Air Quality Control Regions
ARG	American Resources Group, Ltd.
ARM	Administrative Rules Montana
ARPA	Archeological Resources Protection Act
ASME	American Society of Mechanical Engineers
ASRD	Alberta Sustainable Resource Development
BACT	best available control technology
bbl	barrel
BEPC	Basin Electric Power Cooperative
bgs	below ground surface
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	best management practice
bpd	barrels per day
C&SD	Conservation and Survey Division
CAA	Clean Air Act
CAPP	Canadian Association of Petroleum Producers
CEAA	Canadian Environmental Assessment Act

ABBREVIATIONS AND ACRONYMS (CONTINUED)

CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CMR Plan	Construction, Mitigation, and Reclamation Plan
CNRL	Canadian Natural Resources Limited
CO	carbon monoxide
CO_2	carbon dioxide
CREP	Conservation Reserve Enhancement Program
CRA	corrosion-resistant alloy
CRP	Conservation Reserve Program
CSA	Canadian Standards Association
CWA	Clean Water Act
CWS	Canadian Wildlife Service
CZMA	Coastal Zone Management Act of 1972
dBA	decibels on the A-weighted scale
DEQ	Department of Environmental Quality
DNRC	Department of Natural Resources and Conservation
DOS	Department of State
DPHHS	Department of Public Health and Human Services
EA	Environmental Analysis
EFH	essential fish habitat
EIA	Energy Information Administration
EIS	Environmental Impact Statement
EMF	Electro magnetic field
EO	Executive Order
ERCB	Energy Resources Conservation Board
ERP	Emergency Response Plan
ESA	Endangered Species Act
ESRI	Environmental Systems Research Institute
FBE	fusion-bonded epoxy
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FHA	Federal Highway Administration
FLPMA	Federal Land Policy and Management Act

ABBREVIATIONS AND ACRONYMS (CONTINUED)

FR	Federal Register
FWCA	Fish and Wildlife Coordination Act
GAP	National Gap Analysis Program
GEP	good engineering practice
GHG	green house gas(es)
GIS	Geographic Information System
GLO	General Land Office
GPA	Game Production Area
gpm	gallons per minute
H_2	hydrogen gas
HAP	hazardous air pollutant
HCA	high consequence area
HDD	horizontal directional drill
HSI	Habitat Suitability Index
HPRCC	High Plains Regional Climate Center
IFR	internal floating roof
IMP	integrity management plan
IPL	Institute of Public Law
KDHE	Kansas Department of Health and Environment
Keystone	TransCanada Keystone Pipeline, LP
KGS	Kansas Geological Survey
kPa	kilopascal
KSDA	Kansas Department of Agriculture
Ksi	pounds per square inch
kV	kilovolt
Ldn	day-night sound level
LEPC	Local Emergency Planning Committee
LNG	liquefied natural gas
LPG	liquefied petroleum gas
LULC	land use and land cover
MACT	Maximum Achievable Control Technology
MAOP	maximum allowable operating pressure
MBTA	Migratory Bird Treaty Act
MCA	Montana Code Annotated

ABBREVIATIONS AND ACRONYMS (CONTINUED)

MDEQ	Montana Department of Environmental Quality
MEPA	Montana Environmental Policy Act
MFSA	Major Facilities Siting Act
MFWP	Montana Fish, Wildlife, and Parks
mg/l	milligrams per liter
MGWPCS	Montana Ground Water Pollution Control System
MLA	Mineral Leasing Act
MLV	mainline valve
MNHP	Montana Natural Heritage Program
MPDES	Montana Pollutant Discharge Elimination System
MSGWG	Montana Sage Grouse Work Group
MUID	Map Unit Identification
MVA	million volt amperes
mya	million years ago
NAAQS	National Ambient Air Quality Standards
NAC	Nebraska Administrative Code
NACE	National Association of Corrosion Engineers
NAGPRA	Native America Graves Protection and Repatriation Act
NASS	National Agricultural Statistical Service
NAUS	National Atlas of the United States
NDA	Nebraska Department of Agriculture
NHD	National Hydrography Dataset
NDT	non-destructive testing
NEAAQS	Nebraska Ambient Air Quality Standards
NEB	National Energy Board (Canada)
NEBA	National Energy Board Act (Canada)
NEDEQ or NDEQ	Nebraska Department of Environmental Quality
NEDNR	Nebraska Department of Natural Resources
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NFIP	National Flood Insurance Program
NGPC	Nebraska Game and Parks Commission
NGPD	Nebraska Game and Parks Department
NHP	Natural Heritage Program

ABBREVIATIONS AND ACRONYMS (CONTINUED)

NHPA	National Historic Preservation Act of 1986
NLCD	National Land Cover Database
NMFS	National Marine Fisheries Service
NNSR	Nonattainment New Source Review
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Association
NOGCC	Nebraska Gas and Oil Conservation Commission
NOI	Notice of Intent
NO_X	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRC	National Response Center
NRCS	Natural Resources Conservation Service
NRD	Natural Resources District
NRHP	National Register of Historic Places
NRI	National Rivers Inventory
NSA	noise sensitive areas
NSPS	New Source Performance Standards
NSR	New Source Review
NVCS	National Vegetation Classification System
NWI	National Wetland Inventory
NWP	nationwide permits
NWR	National Wildlife Refuge
NWSRS	Nebraska Wild and Scenic River System
O_2	oxygen gas
O_3	ozone
OAFF	Oklahoma Agriculture Food and Forestry
OCC	Operations Control Center
ODWC	Oklahoma Department of Wildlife Conservation
ONHI	Oklahoma Natural Heritage Inventory
OPS	Office of Pipeline Safety
OSHA	Occupational Safety and Health Administration
PADD	Petroleum Administration for Defense District
PEM	palustrine emergent wetland

ABBREVIATIONS AND ACRONYMS (CONTINUED)

PFO	palustrine forested wetland
PFYC	Potential Fossil Yield Classification
PHMSA	Pipeline Hazardous Material Safety Administration
PIP	Preliminary Information Package
PMP	Pipeline Maintenance Program
POD	Plan of Development
ppb	parts per billion
ppm	parts per million
ppmw	parts per million by weight
Project	Keystone XL Project
PSD	prevention of significant deterioration
psi	pounds per square inch
psia	pounds per square inch absolute
psig	pounds per square inch gauge
PSS	palustrine scrub shrub wetland
PWMB	Piney Woods Mitigation Bank
PWS	Public Water and Sewer
Reclamation	Bureau of Reclamation
RFI	radio frequency interference
RMPs	Resource Management Plans
ROW	right-of-way
RSA	regional study area
RWBC	Rainwater Basin Complex
SAL	State Archaeological Landmark
SARC	State Archaeological Research Center
SCADA	Supervisory Control and Data Acquisition
SDCL	South Dakota Common Law
SDCWCS	South Dakota Comprehensive Wildlife Conservation Service
SDDENR	South Dakota Department of Environment and Natural Resources
SDGFP	South Dakota Game, Fish, and Parks
SDNHD	South Dakota Natural Heritage Database
SDPUC	South Dakota Public Utilities Commission
SDGS	South Dakota Geological Survey
SGSK	State Geological Survey of Kansas

ABBREVIATIONS AND ACRONYMS (CONTINUED)

SHPO	State Historic Preservation Office(er)
SIP	State Implementation Plan
SMYS	specified minimum yield strength
SO_2	sulfur dioxide
SPAF	Special Permit Analysis and Findings
SPCC	Spill Prevention, Control, and Countermeasure
SSURGO	Soil Survey Geographic database
SWCA	SWCA Environmental Consultants
SWPA	Source Water Protection Area
SWPPP	Stormwater Pollution Prevention Plan
THC	Texas Historical Commission
TARL	Texas Archaeological Research Laboratory
TBD	To Be Determined
TCEQ	Texas Commission on Environmental Quality
TCP	traditional cultural properties
TDS	total dissolved solids
TERP	Texas Emissions Reduction Plan
THC	Texas Historical Commission
THPO	Tribal Historic Preservation Officer
TMDL	total maximum daily load
TNC	transient non-community
TOPS	Texas Offshore Port System
TPWD	Texas Parks and Wildlife Department
tpy	tons per year
TRB	Transportation Research Board
TSS	total suspended solids
TWAs	temporary workspace areas
TxLED	Texas Low Emission Diesel
TXNDD	Texas Natural Diversity Database
UPS	uninterrupted power supply
US	United States
USA	unusually sensitive area
USACE	US Army Corps of Engineers
USC	United States Code

ABBREVIATIONS AND ACRONYMS (CONTINUED)

USCG	US Coast Guard
USDA	US Department of Agriculture
USDA SCS	US Department of Agriculture-Soil Conservation Service
USDOT	US Department of Transportation
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
VEC	valued ecosystem component
VOC	volatile organic compounds
VOL	volatile organic liquid
VRM	visual resource management
WCS	Western Canadian Select
WCSB	Western Canadian Sedimentary Basin
Western	Western Area Power Administration
WHPA	wellhead protection areas
WHMA	wildlife habitat management area
WMA	wildlife management area
WRCC	Western Regional Climate Center
WRP	Wetland Reserve Program
WRPA	water resource protection areas
WSA	wilderness study area

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ES.0 EXECUTIVE SUMMARY

ES.1 INTRODUCTION

TransCanada Keystone Pipeline, LP (Keystone) has applied to the U.S. Department of State (DOS) for a Presidential Permit for the proposed construction, connection, operation, and maintenance of a pipeline and associated facilities at the United States border for importation of crude oil from Canada. DOS receives and considers applications for Presidential Permits for such oil pipeline border crossings and associated facilities pursuant to the President's constitutional authority over foreign relations, and as Commander-in-Chief, which authority the President delegated to DOS in Executive Order (EO) 13337, as amended (69 Federal Register [FR] 25299). DOS's jurisdiction to issue a Presidential Permit for the border crossing and the associated facilities at the border.

DOS, as the lead agency for the environmental impact statement (EIS), discussed the appropriate level of participation required with other federal agencies that will be required to issue permits associated with the proposed Keystone XL Pipeline Project (Project). The following federal agencies and one state agency have elected to participate as cooperating agencies in the process:

- U.S. Environmental Protection Agency (EPA)
- U.S. Department of the Interior, Bureau of Land Management (BLM)
- U.S. Department of the Interior, National Park Service (NPS)
- U.S. Department of the Interior, U.S. Fish and Wildlife Service (USFWS)
- U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS)
- U.S. Department of Agriculture, Farm Service Agency (FSA)
- U.S. Department of Agriculture, Rural Utilities Service (RUS)
- U.S. Army Corps of Engineers (USACE)
- U.S. Department of Energy, Western Area Power Administration (Western)
- U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration (PHMSA), Office of Pipeline Safety (OPS)
- Montana Department of Environmental Quality (MDEQ)

The U.S. Department of Interior, Bureau of Reclamation (Reclamation) has agreed to provide technical assistance to DOS in the environmental review process. Reclamation has responsibilities for federal water supplies in the West. The proposed pipeline would cross beneath one of Reclamation's canals in South Dakota.

Certain county governments in Nebraska have agreed to be assisting agencies, and as such would work with DOS to ensure that the EIS incorporates local planning processes and/or laws. These counties are: Fillmore, Greely, Holt, Merrick, Nance, Saline, and Wheeler. In Nebraska, the Lower Big Blue Natural Resources district and the Upper Elkhorn Natural Resources district have also agreed to be assisting agencies. Various other state and local resource agencies from each of the states crossed by the proposed Project have responsibilities for state and local permit issuance (see Table 1.8-1).

ES.2 PROPOSED ACTION

The Project would consist of approximately 1,380 miles of new 36-inch-diameter pipeline in the U.S. The proposed pipeline would cross the international border between Saskatchewan, Canada and the United States near Morgan, Montana. The Project initially would have the nominal transport capacity of 700,000 barrels per day (bpd) of crude oil, with up to 200,000 bpd delivered to an existing terminal in Cushing, Oklahoma and the remaining amount shipped to existing delivery points in Nederland (near Port Arthur), Texas, and Moore Junction (in Harris County), Texas. By increasing the pumping capacity in the future, the Project could ultimately transport up to 900,000 bpd of crude oil through the proposed pipeline. At that throughput, up to 200,000 bpd would be delivered to the Cushing Oil Terminal and the remainder would be delivered to the existing terminals in Texas.

ES.2.1 Pipeline System

The Project includes three new pipeline segments plus additional pumping capacity on the previously permitted Cushing Extension Segment of the Keystone Pipeline Project (Keystone Cushing Extension):

- Steele City Segment (from Morgan, Montana to Steele City, Nebraska) that connects to the northern end of the previously approved, and currently under construction, Keystone Cushing Extension;
- Gulf Coast Segment (from Cushing, Oklahoma to Nederland, Texas) that connects to the southern end of the Keystone Cushing Extension; and
- Houston Lateral (from the Gulf Coast Segment, in Liberty County, Texas to Moore Junction, in Harris County, Texas).

Table ES.2.1-1 lists the miles of new pipeline by state for the proposed Keystone XL Project.

TABLE ES.2.1-1
Miles of Pipeline by State for the Proposed Project

	MT	SD	NE	OK	TX	Total
Steele City Segment	282.5	314.1	254.1	0.0	0.0	850.7
Gulf Coast Segment	0.0	0.0	0.0	155.4	324.8	480.2
Houston Lateral	0.0	0.0	0.0	0.0	48.6	48.6
Project total	**282.5**	**314.1**	**254.1**	**155.4**	**373.4**	**1,379.5**

The Project components would include 30 new pump stations, 74 mainline valves (MLVs), approximately 50 permanent access roads, one tank farm, and two crude oil delivery sites. Additional access roads, stockpile sites, railroad sidings and construction camps would be required during Project construction.

The pipeline would require a 110-foot wide construction right-of-way (ROW), consisting of a 60-foot temporary easement and a 50-foot permanent easement. In certain sensitive areas, which may include wetlands, cultural sites, shelterbelts, residential areas, or commercial/industrial areas, the construction ROW would be reduced to 85 feet.

ES.2.2 Connected Actions

Pump stations, remotely operated valves and densitometers[1] for the Project would be electrically powered. The necessary electric power lines and associated facility upgrades would be constructed by local electrical service companies to provide power for these facilities. Those companies would be responsible for obtaining the necessary approvals or authorizations from federal, state, and local agencies for such facilities. Although the permitting process for the electrical facilities is an independent process, construction and operation of these facilities are considered connected actions under NEPA and were evaluated as part of the NEPA review process reported in this EIS. Additionally, Western has determined that due to load forecasts associated with proposed pump stations in South Dakota, a new 230-kV transmission line would need to be added to the existing electrical grid system; as a result Western has proposed construction and operation of the 80-mile-long Lower Brule to Witten transmission line. Two potential corridors and several route options within each of those corridors were identified for the transmission line; the potential impacts of construction and operation of the transmission line are generally addressed in this EIS. An additional and separate NEPA environmental assessment of the alternatives for the proposed transmission line will be conducted in the future.

ES.3 PURPOSE AND NEED FOR THE PROPOSED ACTION

The primary purpose of the proposed Project is to transport Western Canadian Sedimentary Basin (WCSB) crude oil from the border with Canada to existing delivery points in Petroleum Administration for Defense District (PADD) III[2] that provide connections to existing refineries in PADD III. An additional purpose of the Project is to supplement WCSB deliveries to the Cushing Oil Terminal in Cushing, Oklahoma, which is in PADD II[3]. Keystone's goal is to initially transport up to 700,000 bpd of crude oil by pipeline from the WCSB to the United States. Up to 500,000 bpd of this volume of crude oil would be transported to delivery points in PADD III and up to 200,000 bpd would be transported to the existing Cushing Oil Terminal. At maximum capacity (achieved with the addition of supplementary pumping power) the Project would have the potential to transport a total of 900,000 bpd of WCSB crude oil to the U.S., with the additional 200,000 bpd transported to delivery points in PADD III. Due to market projections of future fuel demand in PADD III, the applicant does not currently anticipate the need to expand capacity to 900,000 bpd in the near future.

The need for the Project is dictated by:

- Supply of heavy crude oil from the WCSB;
- Demand for heavy crude oil in PADD III;
- Transport of crude oil from the WCSB to PADD III; and
- Future crude oil supply and demand scenarios with and without the proposed Project.

ES.4 PUBLIC INVOLVEMENT PROCESS

On January 28, 2009, DOS issued a Notice of Intent (NOI) to prepare an EIS. The NOI informed the public about the proposed action, announced plans for scoping meetings, invited public participation in the scoping process, and solicited public comments for consideration in establishing the scope and content of the EIS. The NOI was published in the Federal Register and distributed to affected landowners, federal

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[1] Densitometers measure the batch density of the crude oil to allow operators to track individual crude oil shipments.

[2] PADD III (Gulf Coast) consists of the states of Alabama, Mississippi, Louisiana, Arkansas, Texas, and New Mexico.

[3] PADD II (MidWest) consists of 15 states from Oklahoma north to Wisconsin and east to Ohio.

agencies, Indian tribes, state agencies, municipalities and counties, elected officials, non-governmental organizations, the media, and other interested individuals. DOS held 20 separate scoping meetings in the vicinity of the proposed Project to provide opportunity for public comment on the scope of the EIS. Meetings were held in Beaumont, Liberty, Livingston, and Tyler, Texas; Durant and Ponca City, Oklahoma; El Dorado and Clay Center, Kansas; York and Atkinson, Nebraska; Murdo, Faith, and Buffalo, South Dakota; Baker, Terry, Circle, Plentywood, Glendive Glasgow, and Malta, Montana. The scoping period was originally planned to extend from January 28 to March 16, 2009. Weather conditions in South Dakota precluded holding the scoping meetings on this schedule, and an amended NOI published on March 23, 2009 extended the scoping period until April 15, 2009 to provide time to reschedule two South Dakota scoping meetings.

DOS received verbal, written, and electronic comments during the scoping comment period. All verbal scoping comments formally presented at the meetings were recorded and transcribed. Additional written scoping comments were received on comment forms provided to the public at the meetings and in letters.

ES.5 ALTERNATIVES CONSIDERED

The following alternatives were assessed by DOS:

- No Action Alternative − the proposed Project would not be built;
- System Alternatives − use of other pipeline systems or other methods of providing crude oil supplies to the U.S. Gulf Coast market;
- Major Route Alternatives − other pipeline routes for transporting crude oil from the U.S./Canada border near Morgan, Montana to the Port Arthur and the east Houston areas of Texas; and
- Alternative Routes for the Electrical Transmission Line − preliminary alternative routings for the proposed 230-kV transmission line in South Dakota that is needed to ensure power system stability given the loads required for providing electrical power to the pump stations in South Dakota.

In addition, MDEQ evaluated alternatives and variations in Montana as part of its analysis of Keystone's application for a Certificate of Compliance under the state's Major Facility Siting Act (MFSA). MDEQ also evaluated the alternatives and variations in accordance with the requirements of the Montana Environmental Policy Act (MEPA) as reported in Appendix I of the EIS.

ES.5.1 No Action Alternative

Under the No Action Alternative, the Project would not be constructed and would not require issuance of a DOS Presidential Permit. The increasing demand for crude oil in the U.S. cannot be entirely met by efforts to conserve use of refined petroleum products or the increased use of renewable energy. As crude oil demand increases, the overall domestic supplies of crude oil are declining. At the same time, only a small volume of WCSB crude oil can be shipped to PADD III through a single pipeline, and a substantial portion of the oil imported from outside of North America originates in countries with decreasing or undependable oil supplies. Under the No Action Alternative, it is likely that other projects would be proposed to meet the increased demand. Although it is not possible to identify the specific impacts of such projects, it is likely that they would be similar in nature to those of the proposed Project and either smaller, greater than, or equal to the magnitude of impacts of the proposed Project.

Under the No Action Alternative, the U.S. would not receive a reliable and cost efficient source of crude oil from the WSCB region and would remain dependent upon unstable foreign oil supplies from the Mideast, Africa, Mexico, and South America. Further, the WCSB crude oil would likely be shipped to countries outside of North America, which would require new infrastructure that would result in environmental impacts at least as great as those of the proposed Project. In addition, the transport of crude oil by tanker and other means such as truck and rail would likely result in greater GHG emissions than those that would occur as a result of the proposed Project. Finally, the No Action Alternative would not meet the purpose and need of the proposed Project.

ES.5.2 System Alternatives

System alternatives to the proposed Project would make use of other existing, modified, or proposed pipeline systems as well as non-pipeline systems - to meet the purpose and need of the proposed Project.

ES.5.2.1 Existing Pipeline Systems

There is currently only one existing pipeline system that extends from the Midwest to the Gulf region. The ExxonMobil Pegasus pipeline is a system that transports crude oil from Patoka, Illinois to Nederland, Texas. Since the committed pipeline capacity is 50,000 bpd and the total capacity is 66,000 bpd, Pegasus is considering an expansion of up to 30,000 bpd to PADD III as early as 2009. Even with the proposed expansion, the Exxon Pegasus proposal would not meet the service capacity needs of the PADD III market.

ES.5.2.2 New Pipeline System Alternatives

Four alternative new proposed pipeline system alternatives were analyzed: The Altex Pipeline System; The Chinook-Maple Leaf Pipeline System; Trailbreaker Transportation System; and the Enbridge – BP Delivery System all of which at this time are speculative. None of the proposed system alternatives would provide the delivery capacity of the proposed Project and none could provide WCSB crude oil to PADD III in the same timeframe as the proposed Project. Therefore, none of the system alternatives considered can meet the Project purpose and need and none of them offer a significant environmental advantage.

ES.5.2.3 Alternative Modes of Transportation

Surface crude oil delivery transportation modes from the U.S./Canada border near Morgan, Montana to the Port Arthur and the east Houston areas of Texas were considered as an alternative to the proposed Project. Modes considered include delivery by truck, railroad cars, and barges. Truck transportation would not be a practical way to meet the Project's purpose and need since crude oil transport equivalent to that of the proposed Project would require 4,000 trucks per day. There is not an existing direct rail line from Morgan, Montana, to Port Arthur, Texas and the east Houston areas of Texas. Barging the oil would not be feasible due to the lack of a large waterway system between Morgan, Montana, and the PADD III area capable of supporting barge traffic.

The alternative modes considered would be less safe, would require construction of substantially more infrastructure, have greater atmospheric emissions (including GHG), and/or pose greater safety hazards than the proposed Project. Therefore, none of the alternative modes of transportation have been evaluated further.

ES.5.3 Pipeline Route Alternatives

DOS identified alternatives to the proposed Project for the Steele City Segment (SCS), the Gulf Coast Segment (GCS), and the Houston Lateral (HL). In addition DOS considered an alternative that would avoid using the Cushing Extension.

ES.5.3.1 Steele City Segment Alternatives

For the Steele City Segment, five alternatives were considered: Express-Platte Alternative; SCS Alternative A; SCS Alternative A1A; SCS Alternative B (the proposed Project); and Baker Alternative. The initial assessment of the Steele City Segment Alternatives indicates that the alternatives considered do not offer an environmental advantage over the Applicant's proposed route (Alternative SCS-B), and are eliminated from further consideration.

ES.5.3.2 Alternative to Using the Cushing Extension

One alternative was identified that would avoid using the Cushing Extension, the Western Alternative. The Western Alternative does not offer an environmental advantage over the proposed Project and was eliminated from further analysis.

ES.5.3.3 Gulf Coast Segment Alternatives

Two geographical alternatives were assessed for the Gulf Coast Segment: Gulf Coast Segment (GCS)-A (proposed Project) and GCS-B. While GSC-A would cross more wetlands as compared to GCS-B, it would affect less overall agricultural land, developed land, and crosses less streams/rivers. GCS-A was therefore determined to be the environmentally preferred alternative and GCS-B was eliminated from further analysis.

ES.5.3.4 Houston Lateral Alternatives

Alternatives identified for the Houston Lateral include Alternative HL-A (the proposed Project) and Alternative HL-B. Alternative HL-A, the environmentally preferred alternative is the shorter route and would require fewer miles of new pipeline and would have a lesser area of impact. Alternative HL-B does not offer an environmental advantage over the Alternative HL-A, and was eliminated from further analysis.

ES.5.3.5 Summary of Pipeline Route Alternatives Analysis

Based on the assessment of alternatives conducted, DOS determined that none of the identified alternatives offered an environmental advantage over the Applicant's preferred route. Therefore, the DOS preferred route consists of the following alternatives by segment:

- Steele City Segment Alternative B (SCS-B);
- Gulf Coast Segment Alternative A (GCS-A); and
- Houston Lateral Alternative A (HL-A).

ES.5.4 Alternative 230-kV Electrical Transmission Line Routes

The 230-kV Lower Brule to Witten transmission line would be needed to ensure transmission system reliability with the expected load demands at full pipeline operational capacity in southern South Dakota. Western and Basin Electric Power Cooperative (BEPC) have identified two alternative transmission corridors (Alternative Corridors A and B) for the Project and have identified five alternative routes in Corridor A and four alternative routes in Corridor B. The corridors extend from the Big Bend Dam and include the site of a proposed new substation at Lower Brule and the existing Witten Substation.

The transmission line would transfer electricity from the proposed Lower Brule Substation near Big Bend Dam in Lyman County, to an existing substation near Witten in Tripp County. The existing Big Bend-Fort Thompson No. 2, 230-kV transmission line turning structure would be converted to a double-circuit structure. Western would construct 2.1 miles of new double-circuit transmission line south of the dam and construct the new Lower Brule Substation. The new transmission line from the dam would connect to the Lower Brule Substation. Western would own and operate the 2.1 mile transmission line but would transfer ownership and operation of the Lower Brule Substation to BEPC. BEPC would construct and operate the new, 70-mile-long, 230-kV transmission line between the Lower Brule Substation and the existing Witten Substation, which is owned by Rosebud Electric Cooperative. The five alternative routes for the transmission line that were identified within Corridor A and the four alternative routes identified within Corridor B are all between the two substations.

Both of the alternative corridors cross the Lower Brule Reservation, but the Corridor A has a shorter path through the Lower Brule Reservation. The key impacts of the transmission line alternatives are listed in the listed in EIS for comparison purposes. In addition, the impacts of construction and operation of the transmission line alternatives are generally addressed in Section 3.0 the EIS. However, DOS, Western, and the other cooperating agencies do not have sufficient design and construction information to establish an agency preferred alternative for the proposed transmission line project. An additional and separate NEPA environmental review of the alternatives to the proposed transmission line will be conducted after the alternative routes are further defined. The design and environmental review of the proposed 230-kV transmission line are on a different schedule than the pipeline system itself. Regional transmission system reliability concerns are not associated with the initial operation of the proposed pipeline pump stations, but rather with later stages of proposed pipeline operation at higher levels of crude oil throughput.

ES.5.5 Montana Major Facility Siting Act and Montana Environmental Policy Act Environmental Review

Keystone applied to MDEQ for a Certificate of Compliance under MFSA for the portions of the proposed Project in Montana. Prior to issuing a certificate, MDEQ must find and determine the basis of the need for the facility and determine whether or not the facility would serve the public interest, convenience, and necessity. Under the law, it must also identify the route that minimizes adverse environmental impacts and uses public land whenever the use of public lands is as economically practicable as the use of private land to include use of federal lands. As a cooperating agency in the preparation of the EIS, MDEQ considered and eliminated the Project alternatives described above under the federal NEPA process. MDEQ also required Keystone to identify and provide assessments of two additional alternative routes in Montana that increased the use of public lands in comparison to Alternative SCS-B (proposed route). Although both of the new alternatives were eliminated in the initial screening process, portions of one of the alternatives cross more public land as compared to the proposed route segments in those areas. MDEQ identified those portions of the alternative as variations to Alternative SCS-B and evaluated them along with other variations it developed to avoid or minimize impacts to specific resources, to minimize conflicts with existing or proposed residential and agricultural land uses, and in response to requests submitted by concerned landowners.

MDEQ identified and evaluated a total of 19 variations in Montana. Descriptions of the variations and the evaluations are presented in Appendix I along with environmental assessments of Alternative SCS-B in Montana that are specific to the needs of MEPA. MDEQ preliminarily selected 9 variations as preferable to the segments of Alternative SCS-B they would replace. DOS has determined that Alternative SCS-B in Montana (the proposed route) and the variations to Alternative SCS-B selected by MDEQ have been evaluated sufficiently to meet the requirements of NEPA.

ES.6 ENVIRONMENTAL ANALYSIS

As summarized below, DOS evaluated the potential impacts of the Project on geology, soils and sediments, water resources, wetlands, terrestrial vegetation, wildlife, fisheries, threatened and endangered species, land use, socioeconomics, cultural resources, and air quality and noise. In addition, DOS evaluated the potential risks and effects of oil spills and cumulative impacts.

ES.6.1 Geology

ES.6.1.1 Physiography and Surface and Bedrock Geology

The proposed Project would not involve substantial long- or short-term, large scale alteration of topography. Most of the proposed route would be within areas where bedrock is buried by unconsolidated sediments consisting of glacial till, alluvium, colluvium, loess and/or aeolian deposits. In these areas, impacts to bedrock would be expected to be minimal, and limited to areas where bedrock is within 8 feet of the surface. Routine pipeline operation and maintenance activities would not be expected to affect physiography or surface or bedrock geology. During construction, blasting or ripping could be required at locations where shallow bedrock is present within 8 feet of the ground surface. Over the entire proposed Project route, approximately 9 miles would cross areas identified as potential blasting locations and approximately 166 miles would cross areas identified as potential ripping locations.

ES.6.1.2 Paleontological Resources

Fossil potential along the ROW is designated as being very low to very high in Montana, low to high in South Dakota, and not scaled but possible for Nebraska, Oklahoma, and Texas. Rocks underlying the location of two new pump stations in Kansas may be fossiliferous. Potential impacts to paleontological resources during construction includes damage to or destruction of fossils in shallow bedrock areas due to ripping and/or blasting, erosion of fossil beds due to grading, and unauthorized collection of fossils by construction personnel or the public. Keystone is preparing a Paleontological Mitigation Plan prior to beginning construction on federal and state lands. Fossils or other paleontological resources found on private or other non-federal land would only be recovered with approval of the landowner. There is currently an effort among federal land management agencies in Montana such as BLM, USACE, and MDEQ and other agencies to develop a Memorandum of Understanding (MOU) for the identification, evaluation and protection of paleontological resources in the state of Montana; however, the Geology Section of the EIS also describes protocols for these resources for the whole proposed Project route. Routine pipeline operations and maintenance activities are not expected to affect paleontological resources.

ES.6.1.3 Mineral and Fossil Fuel Resources

In the Project area, oil, natural gas, and coal comprise the major energy resources. The proposed route would not cross the well-pads of any active oil and gas wells. Accordingly, extraction of oil and gas resources would not be affected by operation of the proposed pipeline. The proposed pipeline route would not cross any known coal mines therefore coal extraction would not be affected by the Project. Sand, gravel and bentonite are also mined in Montana, South Dakota and Nebraska. Crushed stone, coal (lignite), clay, iron, peat, and sand are other mineral resources present in the Project area. The proposed route would not cross any active surface mines or quarries, construction; however, operation of the Project would limit access to sand, gravel, clay, and stone resources that are within the width of the permanent pipeline ROW. Although not currently planned, if surface mining was proposed for this area in the future, the pipeline could limit access to these resources.

ES.6.1.4 Geologic Hazards

At certain locations along the proposed route, seismic hazards, landsliding, subsidence, or flooding would be possible. Since the proposed pipeline ROW would be located in the relatively flat and stable continental interior, the potential for impacts from geologic hazards is lower than for facilities located in active mountain belts or coastal areas. Based on the evaluation of potential seismic hazards along the proposed ROW, the risk of pipeline rupture from earthquake ground motion would be considered minimal. The proposed route would not cross any known active faults and is located outside of known zones of high seismic hazard. During construction activities, vegetation clearing and alteration of surface-drainage patterns could increase landslide risk. Implementation of temporary erosion control structures would reduce the likelihood of construction-triggered landslides. In addition, Keystone plans to revegetate areas disturbed by construction along the pipeline ROW. There is a risk of subsidence where the proposed route crosses karst formations in Nebraska, Oklahoma, and Texas. Keystone would conduct site-specific studies as necessary to characterize the karst features, and would evaluate and modify construction techniques as necessary in these areas. The overall risk to the pipeline from karst-related subsidence is expected to be minimal.

ES.6.2 Soils and Sediments

Pipeline construction activities, including clearing, grading, trench excavation, backfilling, heavy equipment traffic, and restoration along the construction ROW, could adversely affect soil resources. In addition, the construction of pump stations, access roads, construction camps and the tank farm could also affect soil resources. Potential impacts could include temporary and short-term soil erosion, loss of topsoil, short-term to long-term soil compaction, permanent increases in the proportion of large rocks in the topsoil, and short-term to permanent soil contamination. Pipeline construction also could result in damage to existing tile drainage systems. Keystone has proposed construction procedures that are designed to reduce the likelihood and severity of Project impacts to soils and sediments, and to mitigate where impacts are unavoidable. These include, but are not limited to: segregating and salvaging all topsoil up to a maximum of 12 inches of topsoil from the area disturbed by trenching where practicable and restoring topsoil to its approximate original stratum after backfilling is complete; reducing soil erosion by installing sediment barriers, trench plugs, temporary slope breakers, drainage channels or ditches, and mulching; ripping to relieve soil compaction in particular areas from which topsoil has been removed; and halting construction during wet weather periods, or implementing methods to mitigate impacts when construction activities are conducted in wet conditions.

During the operational phase of the Project, small scale, isolated surface disturbance impacts could occur from pipeline maintenance traffic and incidental repairs. These impacts would be addressed with the affected landowner or land management agency and a mutually agreeable resolution reached.

ES.6.3 Water Resources

ES.6.3.1 Groundwater

Potential impacts to groundwater during construction activities could include: groundwater quality degradation during or after construction resulting from disposal of materials and equipment, or vehicle spills and leaks; temporary increases in total suspended solids (TSS) concentrations where the water table is disturbed during trenching and excavation activities; increased surface water runoff and erosion from clearing vegetation in the ROW; degradation of groundwater quality due to potential blasting; and groundwater withdrawal for hydrostatic testing.

Many of the aquifers present in the subsurface beneath the proposed route are isolated by the presence of glacial till or other confining units, which characteristically inhibits downward migration of water and contaminants into these aquifers. However, shallow or near-surface aquifers are also present beneath the proposed route and may be impacted by construction activities. Additionally, the risk of dewatering shallow groundwater aquifers or reducing groundwater quality through an increase in total suspended solids during construction likely would be temporary, and these aquifers are expected to recover quickly following construction activities. Keystone's blasting plan would include provisions to avoid impacts to groundwater and to incorporate post-blasting testing for surface water and water wells within 150 feet of the centerline to ensure that water resources are not negatively affected by blasting activities. Hydrostatic testing discharge waters would meet all water quality requirements prior to discharge and would therefore not impact groundwater quality. All applicable water withdrawal and discharge permits would be acquired prior to hydrostatic testing. Construction and normal operations therefore are not expected to result in a long-term significant impact on groundwater.

ES.6.3.2 Surface Water

Potential impacts on surface water resources during construction activities would include: temporary increases in TSS concentrations and increased sedimentation during stream crossings; temporary to long term decrease in bank stability and resultant increase in TSS concentrations from bank erosion as vegetation removed from banks during construction is re-establishing; temporary reduced flow in streams and potential other adverse effects during hydrostatic testing activities; and temporary degradation of surface water quality and alteration of aquatic habitat from blasting activities within or adjacent to stream channels.

Keystone would select one of the following construction methods for surface waterbody crossings: dry-cut methods, open cut wet crossings, and horizontal directional drilling (HDD). Thirty-eight crossings have been identified for HDD crossings. The HDD method would avoid any impacts on water bodies. The open cut wet method, involving trenching while water continues to flow, would entail a high risk of temporary siltation to streams and other water bodies. The risks of open-cut wet trenching could be temporary (for the duration of construction) or longer term (where compromised stream bank stability or bank erosion occurs). Dry-cut methods would greatly reduce risks to surface waterbodies but are not feasible for wider streams and would only be used selectively during construction. At all water crossings, Keystone would use buffer strips, drainage diversion structures, sediment barrier installations, and clearing limits to reduce siltation and erosion. Hydrostatic test water would be discharged to the source water at an approved location along the waterway or to an upland area within the same drainage as the source water where it may evaporate or infiltrate. Discharged water would be tested to ensure it meets applicable water quality standards, and discharge rate would be regulated.

ES.6.3.3 Floodplains

Floodplain terraces and low floodplains are found along the Project route. Two pump stations and 10 MLVs would be in the 100-year floodplain as currently proposed, but the effect of those facilities on floodplain function is expected to be minor.

Actions by federal agencies, under EO 11988, must avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplain development including reducing the risk of flood loss, minimizing the impact of floods on human safety, health and welfare, and restoring and preserving the natural and beneficial values served by floodplains. The pipeline would be constructed under river channels with potential for lateral scour. In floodplain areas adjacent to waterbodies, the contours would be restored to as close to previously existing contours as practical and the construction ROW would be revegetated so that after construction, the pipeline would not obstruct flows over designated floodplains.

ES.6.4 Wetlands

Wetland types within the Project area include emergent wetlands, scrub/shrub wetlands, and forested wetlands. The Project would disturb a total of 554 acres of wetlands (not including pipe storage yards, rail sidings, contractor's yards, access roads, or construction camps), primarily forested wetlands (271 acres) and emergent wetlands (262 acres), with minimal shrub/scrub wetlands (21 acres). Additional impacts to wetlands from construction camps and access roads outside of the 110-foot construction right-of-way cannot be assessed until the actual locations for these sites are determined.

Construction of the pipeline would affect wetlands and their functions primarily during and immediately following construction activities, but permanent changes also are possible.

Planned conservation measures (such as installing trench breakers and/or sealing the trench to maintain the original wetland hydrology, where the pipeline trench may drain a wetland; using timber riprap, timber mats, and prefabricated equipment mats; and restoring wetland areas within conservation lands or easements to a level consistent with any additional criteria established by the relevant managing agency) would avoid or minimize most impacts on wetlands associated with construction and operation activities, and would ensure that potential effects would be primarily minor and short term. Impacts to forested wetlands are long-term and would be considered permanent. Keystone would work with each USACE district to determine what kind of compensation would be required for the permanent conversion of forested wetland to herbaceous wetland, and Keystone would continue to work with the USACE to develop a Wetland Mitigation Plan.

ES.6.5 Terrestrial Vegetation

Construction of the pipeline would temporarily impact 11,533 acres of grassland/rangeland and 2,523 acres of upland forest. The permanent ROW would impact 749.1 acres of grassland/rangeland and 175.6 acres of upland forest. Grassland impacts due to pipeline construction are expected to be minimal, and affected vegetative communities generally are expected to reestablish within 2 years. Impacts on upland forest and shrubland would be longer term than those anticipated for grassland, because of the time required for these plant communities to reestablish and reach mature, pre-construction conditions. Keystone would implement measures to reduce impacts to forested uplands and grasslands such as restoring original contours and drainage patterns to the extent practicable after construction; providing and maintaining temporary and permanent erosion control measures on steep slopes or wherever erosion potential is high; and reseeding the reclaimed construction ROW following cleanup and topsoil replacement as closely as possible using seed mixes based on input from the local NRCS and specific seeding requirements as requested by the landowner or the land management agency.

After removal of vegetation cover and disturbance to the soil, reestablishment of vegetation communities could be delayed or prevented by infestations of noxious weeds and invasive plants. Vegetation removal and soil disturbance during construction could create optimal conditions for the establishment of many weeds. Keystone has committed to control the introduction and spread of noxious weeds by implementing construction and restoration procedures in coordination with appropriate local, state, and federal agencies to prevent the spread of noxious weeds, insects and soil borne pests.

There would be temporary and permanent impacts on about 51 miles of Conservation Reserve Program (CRP) land and less than 2 miles of Wetland Reserve Program lands along the proposed pipeline corridor. Successful restoration of native vegetation and CRP fields (defined as 90 percent cover of desirable perennial plants, stable soils, and comparable vegetation community composition) would be expected within 4 to 8 years.

ES.6.6 Wildlife

The Project crosses six states with a diversity of wildlife, including big game animals, small game animals and furbearers, waterfowl and game birds, and many other nongame animals. Wildlife habitats along the Project ROW include croplands, grasslands/rangelands (short-grass prairie, mixed-grass prairie, tall-grass prairie, and shrublands), upland forests and wetlands. These vegetation communities provide foraging, cover, and breeding habitats for wildlife. Construction of the proposed Project would result in loss and alteration of about 22,493 acres of wildlife habitat, including 11,533 acres of grasslands and rangelands, 2,523 acres of forested habitat, and 554 acres of wetland habitats (including 271 acres of forested wetlands).

Pipeline construction can produce short term barriers to wildlife movements. Blasting can cause both short-term disturbance, in the form of increased noise, dust, and vibration, and permanent habitat modification. The severity of the effects of blasting on wildlife would primarily depend on timing and wildlife use of the area surrounding the area to be blasted. Total habitat loss due to pipeline construction would be small in the context of available habitat both because of the linear nature of the Project and because restoration would follow pipeline construction.

Additional potential impacts to wildlife during construction include direct mortality, and stress or avoidance of feeding and/or reduced breeding success due to exposure to noise and from increased human activity.

Normal operation of the pipeline would result in negligible effects on wildlife. Pipeline corridors may be used as travel corridors by coyotes, deer, raccoons, and many other animals. Pipeline produced habitat fragmentation may result in altered wildlife communities. Animals adapted to exploiting edge habitats increase, and animals requiring large contiguous habitats are displaced. Prey species may experience reduced survival or reproduction due to decreased abundance of forage species or reduced cover.

Potential impacts to wildlife from connected actions are direct mortality due to collision with or electrocution by electrical distribution and transmission lines, and reduced survival and reproduction for ground nesting birds due to the creation of perches for raptors in grassland and shrubland habitats. To reduce these impacts, power providers may incorporate standard, safe designs, as outlined in Suggested Practice for Avian Protection on Power Lines (issued by the Avian Power Line Interaction Committee [APLIC] in 2006) into the design of electrical distribution lines in areas of identified avian concern; incorporate standard raptor-proof designs, as outlined in Avian Protection Plan Guidelines (jointly prepared by the APLIC and the USFWS in 2005)into the design of the electrical distribution lines to prevent collision by foraging and migrating raptors; and route electrical distribution lines and the 230-kV electrical transmission line such that they avoid areas with grouse leks, brood-rearing habitat, and wintering habitats that also support wintering raptors.

ES.6.7 Fisheries

The Project would cross a total of 91 perennial streams that support recreational or commercial fisheries (18 in Montana, 10 in South Dakota, 15 in Nebraska, 16 in Oklahoma, and 32 in Texas). Thirty-one of these perennial waterbodies that support recreational or commercial fisheries, would be crossed using HDD technology. All other stream crossings for recreational or commercial fisheries perennial streams would use either the open-cut wet crossing or an open-cut dry crossing methodology. Possible impacts to fisheries could occur through siltation and disturbance of streams crossed by the proposed pipeline and also through water removal for hydrostatic testing and HDD operations.

Stream crossings could potentially increase sedimentation during construction and result in bank erosion until erosion control measures are implemented and the bank stabilizes. Construction of a dry open-cut crossing is the most rapid and least impacting of the open-cut methods, primarily because water is not flowing in the streambed and sediments are not transported downstream. No impacts are expected to fisheries resources from a dry open-cut crossing method. Construction of open-cut wet crossings may result in short-term impacts including direct mortality to fishery and aquatic resources. Sediment released during trenching of the pipeline crossings would be transported by the water flowing through the trench and has the potential to affect downstream aquatic life and habitat through either direct exposure or sediment deposition. Wet open-cut dam and pump crossings have a moderate potential to temporarily affect fishery resources. Dam and pump crossings may block or delay normal fish movements. Short-term delays in movements of spawning migrations could have adverse impacts on fisheries, however, most crossings of streams less than 50 feet would be completed in less than 2 days and potential impacts would be minor.

Successful HDD crossings would avoid direct disturbance to aquatic habitat and stream banks. This method of stream crossing likely would avoid affects to those recreational or commercial fisheries that occur at the river or stream crossings. Drilling fluids and additives used during implementation of a directional drill would be non-toxic to the aquatic environment. A contingency plan to address a frac-out during HDD including preventative and response measures to control the inadvertent release of drilling lubricant would be maintained.

Keystone would be responsible for acquiring all permits required by federal, state and local agencies for procurement of water and for the discharge of water used in hydrostatic testing and HDD drilling. Any water obtained or discharged would be in compliance with permit requirements, including screening and withdrawal rates. Fisheries impacts from water withdrawals would be short term and minor.

ES.6.8 Threatened and Endangered Species

Federally-protected threatened or endangered species and federal candidate species with the potential to occur in the Project area include three mammals, eight birds, one amphibian, six reptiles, four fish, two invertebrates, and five plants. Of these, the Project is expected to have no effect to 14 species, and the Project may affect, but is not likely to adversely affect eight species. There are six additional species to which a findings summary was not applicable. The Project may affect, and is likely to adversely affect one species, the American burying beetle. This determination is based on the location of the Project within the known range and habitat of the American burying beetle and the results from surveys along the Steele City Segment of the Project. Direct impacts to American burying beetles as a result of construction would result in habitat loss, alteration of suitable habitat to unsuitable habitat, increased habitat fragmentation, and the potential mortality to eggs, larvae and adults. Even with trap and relocation efforts along the proposed construction ROW, the proposed Project could result in the potential accidental loss of individuals from construction-related activities. Conservation measures have been proposed to protect this species including setting up a compensatory mitigation plan for potential impacts to the American burying beetle by contributing to habitat conservation.

State-protected species potentially occurring along the Project ROW include three mammals, nine birds, six reptiles, 13 fish and one plant. Many sensitive and protected species are tied to woodland, wetland, or prairie habitats; habitats that historically were converted to agricultural use throughout the Project area. These animals have been identified and designated by federal and state wildlife management agencies as being of conservation concern after review of abundance, population trends, distribution, number of protected sites, degree of threat to survival, suitable habitat trends, degree of knowledge about the species, and its life history. These designations are intended to assist with conservation planning and maintenance of the state's natural heritage.

Keystone has begun formal Section 7 consultation for the American Burying Beetle. Additional species-specific conservation measures have been identified and include: additional surveys for many species to discover the presence of the species themselves, or their nests/dens/habitat; construction timing to occur outside of the breeding/denning/spawning season; and reduce the width of the construction ROW in areas where listed plant populations have been identified, to the extent possible. To reduce impacts from connected actions, Keystone would inform electrical power providers of the requirements for Endangered Species Act consultations with the USFWS for the electrical infrastructure components constructed for electrical distribution lines serving the Project as well as the 230-kV transmission line to prevent impacts to threatened and endangered species. Keystone would also develop a Migratory Bird Conservation Plan in consultation with USFWS to avoid or mitigate potential Project-related impacts to migratory birds.

ES.6.9 Land Use

The majority of land that would be affected by the Project is privately owned (21,333 acres) with nearly equal amounts of federal (579 acres) and state (582 acres) lands. Construction, operation, and maintenance would cause temporary and permanent impacts to land uses such as agriculture, rangeland, forestland, residential and planned development, commercial and industrial land, recreation and special interest areas, and visual resources. Rangeland is the most common land type, accounting for 11,533 acres or 54.3 percent of the total land that would be affected during construction; during operation 698 acres of the 8,613 acres, or 54.5 percent would be permanently impacted by the ROW. Agricultural land accounts for 5,484 acres impacted during construction with 2,011 acres needed for the permanent ROW. Forestland, development, and water and wetlands make up the remaining 2,523; 945; and 747 acres, respectively, which would be affected by construction. During operation of the pipeline 1,071, 465, and 368 acres, of forestland, developed land, and water and wetlands, respectively, would be included in the permanent ROW.

Within the Steele City Segment of the pipeline corridor are 102 tracts of land and which are enrolled in or affected by the CRP. There are no affected parcels in either the Gulf Coast Segment or Houston lateral. Pipeline construction and operation should have no effect on landowners' participation in CRP. FSA would require that landowners, prior to pipeline construction, notify the FSA of the planned construction activities; and commit to restoring their land to its pre-construction condition. In doing so, land owners should not lose their eligibility for participation in the CRP.

Keystone has agreed to compensate landowners for crop and other losses on a case-by-case basis. Keystone also has developed mitigation plans for limiting impacts on soil drainage mechanisms, compaction, irrigation systems, farm access areas, windbreaks and living fences, and CRP lands. After construction, nearly all agricultural land and rangeland along the ROW would be allowed to return to production, and productivity is not expected to be reduced significantly over the long term. Keystone has further sought to minimize impacts on rangelands by developing range-specific mitigation measures.

Keystone would implement procedures to reduce land impacts including: implementing soil protection measures; preventing stoppage or obstruction of irrigation systems except during pipeline installation periods through irrigated areas; minimizing time of installation in irrigated areas; repairing or restoring drain tiles; restoring farm terraces to their pre-construction functions; restoring disturbed areas with custom seed mixes (approved by landowners and land managers) to match the native foliage; providing access to rangeland during construction to the extent practicable; installing temporary fences with gates around construction areas to prevent injury to livestock or workers; and leaving in place hard plugs and installing soft plugs to allow livestock and wildlife to cross the trench safely.

In some cases, construction of the pipeline may cause disrupted or delayed recreational usage of private lands. Keystone would cooperate with local agencies to reduce the conflict between recreational users and pipeline construction. Impacts are expected to be only short term. Noise impacts from pump stations are expected to be minor. Recreational use access would not be affected by pipeline operations within special management areas.

ES.6.10 Socioeconomics

Several types of socioeconomic effects could occur within the region of influence. Temporary effects during construction of the proposed Project could include changes in population levels or local demographics, changes in the demand for housing and public services, disruption of local transportation corridors, increased employment opportunities and related labor income benefits, and increased government revenues associated with sales and payroll taxes. Isolated impacts on individual property owners and economic land use also could occur along the pipeline route. The primary socioeconomic impacts associated with long-term operation of the proposed Project likely would include employment and income benefits resulting from long-term staffing requirements and local operating expenditures, as well as an increased property tax base and associated tax revenues. Long-term impacts could include impacts to property owners if there is any decrease in land value or usefulness as a result of the pipeline. However, tilled agricultural land in most cases would still be useable after construction.

The proposed pipeline has the potential to generate substantial direct and indirect economic benefits for local and regional economies along the pipeline route. During construction, these benefits would be derived from the construction labor requirements of the Project and spending on construction goods and services that would not otherwise have occurred if the line were not built. At the local level, these benefits would be in the form of employment of local labor as part of the construction workforce and related income benefits from wage earnings, construction expenditures made at local businesses, and construction worker spending in the local economy.

A peak workforce of approximately 5,000 to 6,000 personnel would be required to construct the entire Project and it is estimated that 4,500 to 5,100 non-local residents would temporarily move into the region of influence, resulting in short-term population increases during the construction period. Keystone is expected to utilize temporary local construction labor where possible and it is estimated that approximately 10 to 15 percent (50 to 100 people per spread) could be hired from the local work force for each spread, although this may not be possible in rural areas. Non-local construction workers moving into the region of influence would require short-term accommodations such as hotels/motels, recreational vehicle sites, campgrounds and temporary work camps (four camps are anticipated, two in Montana and two in South Dakota).

Portions of the new pipeline and new and upgraded pumping stations are located in areas with minority populations and with families living below the poverty level; however, none over 50 percent. The Project also is located in areas of majority populations and with relatively few families living below the poverty level. The Project is not expected to result in adverse impacts that would fall disproportionately on minority or low-income populations located along the pipeline route. Public participation in assessing the Project is especially important in areas where low-income populations and/or minority populations have the potential to be affected. Public outreach would continue throughout the life of the Project.

ES.6.11 Cultural Resources

The Project area contains cultural resources resulting from human settlement and other activities over the last 10,000 years. These include archaeological sites, special activity areas such as food processing sites, cemeteries, and sites of spiritual and traditional use. Later historic activities expressed on the landscape include mining-related resources, railroads, commercial buildings, domestic residences, and agricultural buildings. Many of these cultural resources are associated with mineral exploration, transportation, settlement, logging, and agricultural production. Lands and resources are very important to Indian tribes for subsistence gathering, for the collection of plants for medicines, for spiritual and ceremonial purposes, and for everyday life.

For the Project, the principal types of impacts on cultural resources that could occur include physical destruction or damage to historic properties caused by pipeline trenching or related excavations or boring; introduction of visual, atmospheric, or audible elements that diminish the integrity of significant historic features by short-term pipeline construction or construction of above ground appurtenant facilities, roads and connected actions; and change of the character of historic properties or of physical features that contribute to significance.

The evaluation of historic properties for the Project will not be completed until full access to all parcels along the proposed corridor is feasible. Additionally, the Project design, including a determination of the final alignment after all route variations are assessed, continues to evolve as a result of the NEPA and Section 106 processes, continuing engineering analysis, and ongoing landowner and land manager negotiations. As a result, DOS and the consulting parties are developing a Programmatic Agreement (PA) to facilitate the Section 106 process. The use of a PA for this Project is consistent with 36 CFR 800.4(b)(2), which provides that when "alternatives under consideration consist of corridors or large land areas, or where access to properties is restricted, the agency official may use a phased process to conduct identification and evaluation efforts." The PA would allow DOS and the consulting parties to continue the identification and evaluation of historic properties pursuant to the provisions in the PA should the Project receive all necessary certifications and permits. The PA would ensure that appropriate consultation procedures are followed and that cultural resources surveys would be completed prior to construction.

Unanticipated Discovery Plans will be prepared for Montana, South Dakota, Nebraska, Kansas, Oklahoma, Texas and the Lower Brule Sioux Reservation. They will be prepared in consultation with the consulting parties for this Project, including the SHPOs of the six states, Indian tribes, as well as state and federal agencies. Keystone would implement these plans, with DOS oversight, in the event that unanticipated cultural materials or human remains are encountered during the construction phase of the Project.

Under Section 106 of the NHPA, the lead federal agency is required to share Project information and consult with consulting parties. This includes Indian tribes, SHPOs, local governments, and applicants for federal permits. For this Project, DOS is consulting with six SHPOs, over 95 Indian tribes, numerous federal and state agencies and local governments, and to seek the views of the public. Government-to-government Section 106 consultation meetings, direct mailings, teleconferencing, direct telephone communications, and email will be used to keep consulting party members informed and to solicit comments on the Project.

Informal discussions with SHPOs and Indian tribes were initiated by Keystone and their consultants in 2008 and 2009 when a number of tribal engagement meetings were conducted in an effort to inform interested Indian tribes of the Project and seek initial comments. DOS recognized its lead federal agency status under Section 106 and its responsibilities to consult directly with the Indian tribes, SHPOs, and agencies in its NOI issued on January 28, 2009 in the FR.

ES.6.12 Air Quality and Noise

Air quality impacts associated with construction of the proposed Project would include fugitive dust and emissions from fossil-fueled construction equipment, open burning, temporary fuel transfer systems, and associated fuel storage tanks, and the tank farm. Air emissions typically would be localized, intermittent, and short term since pipeline construction moves through an area relatively quickly. Emissions would be controlled to the extent required by state and local agencies.

Air quality impacts associated with operation of the proposed Project would include minimal fugitive emissions from crude oil pipeline connections and pumping equipment at the pump stations, minimal emissions from mobile sources, and volatile organic compound (VOC) and (hazardous air pollutant (HAP) emissions from the crude oil storage tank at the Steele City tank farm. All pipeline pumps would be electrically powered. The Project would not cause or contribute to a violation of any federal, state, or local air quality standards. In addition, Project operations would not trigger the requirement for a Clean Air Act Title V operating permit.

The Project would cross five counties that are designated as nonattainment for the federal ozone standard. Liberty, Chambers, and Harris counties are located in the Houston-Galveston-Brazoria 8-hour ozone nonattainment area. Hardin and Jefferson counties are located in the Beaumont-Port Arthur 8-hour ozone nonattainment area. Emissions of ozone precursor compounds (oxides of nitrogen [NOx] and VOCs) would be evaluated against the General Conformity applicability threshold levels and nonattainment area emissions budget. All Project emissions of NOx and VOCs emitted during construction and operation would be evaluated because no emissions would be covered under air permit programs. As pipeline emissions are limited to fugitive emissions from valves and flanges at pump stations and as there are no crude terminals located along the portion of the project within the Beaumont-Port Arthur nonattainment area, the General Conformity Rule does not apply to these operational activities. NOx emissions for both 2011 and 2012 construction in the Houston-Galveston-Brazoria 8-hour ozone nonattainment area would exceed the general conformity threshold of 25 tons per year. Best Management Practices and other mitigation measures would be required to mitigate emissions. However, NOx and VOC emissions for operation in the Houston-Galveston-Brazoria 8-hour ozone nonattainment area would be below the General Conformity significance thresholds of 25 tons per year. Since the operational emissions of NOx and VOC are well below the 25-ton per year threshold, the General Conformity Rule does not apply to these operational activities.

Noise impacts for a pipeline project generally fall into two categories: temporary impacts resulting from operation of construction equipment, and long-term or permanent impacts resulting from operation of the facility. The Project would be constructed in primarily rural agricultural areas. It is estimated that the existing ambient noise level in the Project area is in the range of 40 dBA (rural residential) to 45 dBA (agricultural cropland). There are approximately 142 structures within 25 feet and 1,819 structures within 500 feet of the proposed pipeline centerline for Project. There are approximately 55 residences/homes/mobile homes/cabins within 25 feet and 1,014 residences/home/mobile homes/cabins within 500 feet of the proposed pipeline centerline. There are approximately 91 structures within 0.5 mile of all pump stations for Project. Residential, agricultural, and commercial areas within 500 feet of the ROW would experience short-term inconvenience from the construction equipment noise.

Noise impacts from construction of the Project typically would be localized, intermittent, and short term because construction moves through an area relatively quickly (several hundred feet to 1.5 miles or more per day). Pipeline construction activities in any one area could last from 30 days to 7 weeks. Construction of all pump stations would take approximately 18 to 24 months complete, and construction of the Steele City tank farm would take approximately 15 to 18 months.

Measures to reduce noise impacts would include but are not limited to: limiting the hours during which construction activities with high-decibel noise levels are conducted in residential areas; providing noise mitigation plans to the construction contractors for implementation and enforcement by construction inspectors using portable sound meters; and developing site-specific noise mitigation plans to comply with any specific regulations and obtain any applicable authorizations or variances, if local noise regulations exist.

Noise impacts from operation of the pipeline would be from the pump stations. Material traveling through the buried pipeline would not emit audible noise above the surface or a perceptible level of vibration. Sound levels would attenuate nearly to existing ambient noise levels (40 to 45 dBA) within 2,300 feet of the facility and would be considered minor. There are approximately 91 structures within 0.5 mile (2,640 feet) of all pump stations for the Project. Although noise impacts from the electrically-powered pump stations are projected to be minor, Keystone would perform a noise assessment survey during operations in locations where nearby residents express concerns about pump station noise. Mitigation measures can include construction of berms around the facilities or planting vegetation screens.

ES.6.13 Reliability and Safety

ES.6.13.1 Oil Spill Risk

Transportation of crude oil by pipeline involves risk to the public and the environment in the event of an accident or an unauthorized action, and subsequent release of oil. Releases of crude oil from the Project and appurtenant facilities could occur. Spill frequency can be estimated using historic spill frequencies on other pipelines as determined from existing data bases and as supplemented by considerations of new pipeline system age and technological improvements compared with much older systems. Releases of oil or petroleum products would affect the environment to varying degrees, and would be of concern to all stakeholders. Risk of an oil spill was assessed using failure frequencies derived from the general hazardous liquid pipeline operating history. In addition to onsite fuel facilities, construction of the proposed pipeline would involve tanker trucks that deliver fuel and other fluids to operating equipment along the construction ROW. Tanker and fuel or maintenance truck accidents or fuel storage tank failures would be the most likely sources of larger construction spills.

Spills from the proposed pipeline, associated pump stations, valves, or pigging facilities could occur during Project operation and have the potential to result in larger-volume spills. Spill locations could include the pipeline ROW, pump stations, and construction and contractor staging areas. Although leak detection systems would be in place, some leaks might not be detected by the system. A pinhole leak, for example, could potentially be undetectable for days or weeks. If the proposed pipeline is subsurface within a wetland, the crude oil would float and could be detected during a regular patrol of the Project ROW. Soil impacts from floating oil would likely be minor, although active cleanup of the floating oil would likely produce high impacts to the wetland system.

ES.6.13.2 Impacts of Oil Spills

Crude or refined oil released into the environment (oil spills) may affect natural resources, protected areas, human uses and services, and aesthetics to varying degrees, depending on the cause, size, type, volume, location, season, environmental conditions, and associated response actions. Small oil spills (e.g., intermittent leaks and drips from construction machinery and operating equipment) would be almost certain to occur during construction and operation of the Project. There would be a very limited potential for an operational pipeline spill of sufficient magnitude to significantly affect natural resources and human uses of the environment.

Almost all spills from the proposed pipeline would be crude oil. Based on experience, spills would be more likely to occur in developing areas where excavation activities are common, and at locations where based on soil and other physical conditions the corrosion potential is greatest. The locations of greatest concern for potential oil spills would be in sensitive environmental areas, especially wetlands, flowing streams and rivers, and water intakes for drinking water or commercial/industrial users. Potential impacts to the natural environment from oil spills would include but are not limited to: coating wildlife feathers or fur reducing insulating efficiency , which could result in hypothermia; coating sediments and soils reducing water and gas (e.g., oxygen and carbon dioxide) exchange and affecting subterranean organisms; coating beaches, water surfaces, wetlands, and other resources used by people resulting in offensive odors, visual impacts and soiling of humans, animals, habitats and equipment; toxicological impacts including direct and acute mortality, sub-acute interference with feeding or reproductive capacity, disorientation, narcosis, reduced resistance to disease, tumors, reduction or loss of various sensory perceptions, interference with metabolic, biochemical, and genetic processes, and a host of other acute or chronic effects; contamination of soil and water resources through oil spill containment or clean up actions; minor short to long-term surface water and/or groundwater quality degradation from sporadic equipment and vehicle spills or leaks; and damage to recreational and historic values.

The impact of an oil spill would be heavily influenced by the types of receptors (i.e., habitats, natural resources, and human uses) that might be exposed to the oil. For spills ranging in magnitude from very small to significant, response time and actions by Keystone and its response contractors would likely prevent the oil from reaching sensitive receptors or would contain and clean up the spills before significant environmental impacts occurred. Most spills in this category are likely to occur on construction sites or at operations and maintenance facilities, and would not reach the natural environment. For large spills and very large spills, especially those that reach aquatic habitats, the response time between initiation of the spill event and arrival of the response contractors would influence the magnitude of impacts to the natural environment and human uses. Once the response contractors are at the spill scene, the efficiency, effectiveness, and environmental sensitivity of the response actions (e.g., containment and clean up of oil, and protection of resources and human uses from further oiling) would substantially influence the type and magnitude of additional environmental impacts.

ES.6.13.3 Mitigation Measures

The Project's pipeline system would be designed, constructed, and maintained in a manner that meets or exceeds industry standards and regulatory requirements. The Project would be built within an approved ROW. Signage would be installed at all road, railway, and water crossings, indicating that a pipeline is located in the area, to help prevent third-party damage or impact to the proposed pipeline. Keystone would manage a crossing and encroachment approval system for all other operators. Keystone would ensure safety near its facilities through a combination of programs encompassing engineering design, construction, and operations; public awareness and incident prevention programs; and emergency response programs.

To prevent or mitigate potential oil spills during construction of the proposed pipeline, measures would be implemented at each construction or staging area where fuel, oil, or other liquid hazardous materials are stored, dispensed, or used.

Historically, the most significant risk associated with operating a crude oil pipeline is the potential for third-party excavation damage. Keystone would mitigate this risk by implementing a comprehensive Integrated Public Awareness Program focused on education and awareness. The program would provide awareness and education that encourages use of the state one-call system before people begin excavating. Keystone's operating staff also would complete regular visual inspections of the ROW and monitor activity in the area. Keystone's preventative maintenance, inspection, and repair program would monitor the integrity of the proposed pipeline and make repairs if necessary. Keystone's pipeline maintenance program would include routine visual inspections of the ROW, regular inline (pigging) inspections, and collection of predictive data. Data collected in each year of the program would be fed back into the decision-making process for development of the following year's inspection, maintenance, and repair program. The pipeline system would be monitored 24 hours a day, 365 days per year.

Keystone has developed and implemented Project safeguards after conducting a pipeline threat analysis using the pipeline industry-published list of threats issued by the American Society of Mechanical Engineers (ASME B31.8S) and also using threats identified by PHMSA to determine the applicable threats to the proposed pipeline. Keystone would be required to provide an Emergency Response Plan (ERP) and a Spill Prevention Control and Countermeasure (SPCC) plan prior to receiving authorization from PHMSA OPS to operate the pipeline system. Keystone would utilize a comprehensive Supervisory Control and Data Acquisition (SCADA) system to monitor and control the proposed pipeline. Data provided by the SCADA system would alert the Operations Control Center (OCC) operator to an abnormal operating condition, indicating a possible spill or leak. A back-up communication system also would be available should SCADA communications fail between field locations and the OCC. Additionally, Keystone would perform any other procedures mandated by PHMSA in the event that PHMSA approves a special permit related to maximum operating pressures for the pipeline system.

In summary, the reliability and safety of the Project is expected to be well within industry standards. Further, the low probability of large, catastrophic spill events and the routing of the proposed pipeline to avoid most sensitive areas suggest a low probability of impacts to human and natural resources. Nevertheless, the potential for construction and operation-related spills does exist.

ES.6.14 Cumulative Impacts

As defined in 40 CFR 1508.7, cumulative impacts are the incremental impacts on the environment resulting from adding the proposed action to other past, present, and reasonably foreseeable future actions. Cumulative impacts were assessed by combining the potential environmental impacts of the proposed action with the impacts of projects that have occurred in the past, are currently occurring, or are proposed in the future within the pipeline corridor or in the vicinity of the pipeline ROW.

ES.6.14.1 Past, Present and Reasonably Foreseeable Projects

The Project area includes numerous existing, under construction, and planned linear energy transportation systems, including natural gas pipelines, carbon dioxide (CO_2) pipelines, crude oil pipelines, and electric transmission lines. Additionally, the general Project area supports a major water delivery project and a number of energy development projects, including producing oil and natural gas well fields (with associated collection piping systems), coal mines, and wind power facilities. The potential impacts associated with these projects that are most likely to be cumulatively significant are related to wetlands and waterbodies, vegetation and wildlife, land use, air quality, noise, and socioeconomics.

The operation of existing oil, natural gas, and CO_2 pipeline systems have resulted primarily in alteration of land uses, terrestrial vegetation, and wildlife habitat. Cumulative impacts associated with existing pipelines within the Project area would be primarily related to noise emanating from pump stations (oil pipelines) and compressor stations (natural gas pipelines) and the cumulative increases in the width of ROWs in areas where the proposed Project would be adjacent to existing ROWs. In those areas where the proposed Project is not directly adjacent to existing ROWs, but are located within the Project area, there would be a cumulative change in vegetative resources, wildlife habitat, and land uses associated with ROWs operation. The impacts of existing ROWs in the context of the proposed Project have largely been included in Section 3.0.

No other proposed oil pipelines have been identified within the Project area. However, should additional oil pipelines be constructed within the Project area, they would likely contribute to potential cumulative impacts associated with habitat fragmentation, land use issues and viewshed degradation. Several natural gas and CO_2 pipelines have been proposed in the vicinity of the Project area. Potential cumulative impacts associated with the proposed Bison Pipeline Project and Green Pipeline would be habitat fragmentation, land use issues and viewshed degradation. Further, a potential pipeline that would connect the Bakken Formation and the proposed Project area could potentially result in similar additional cumulative impacts to these resources. Should these or other unidentified pipelines be under construction at the same time as the Project, there may also be impacts to noise and air quality.

Due to advances in engineering, construction methods, and environmental regulation, construction and operation of existing electrical power lines typically encumber additional lands compared to more recent projects; therefore, the impacts from these lines may be greater than a line of similar length and energy capacity constructed in the recent past or future. Planned electrical power distribution and transmission lines that may be constructed in the general Project area includes three proposed power projects. However, of these proposed transmission lines, only the Nebraska Public Power District would be located within the Project corridor. Cumulative impacts which may arise include impacts to avian wildlife and viewshed degradation. In addition, if the construction of future power distribution or transmission lines in the Project corridor overlaps with the proposed Project construction schedule, short-term cumulative impacts associated with noise, dust, and general construction activity could occur those areas where they would be constructed within the proposed project corridor.

Wind resources in the contiguous U.S., specifically in the central plains states, could accommodate as much as 16 times total current demand for electricity in the U.S. There is a high concentration of wind resources in the central plains region extending northward from Texas to the Dakotas, westward to Montana and Wyoming, and eastward to Minnesota and Iowa. Exploitation of these wind resources would require significant extension of the existing power transmission grid. Expansion and upgrading of the grid will be required in any case to meet anticipated future growth in U.S. electricity demand. It is therefore reasonable to assume that there will be upgrades and extensions to the existing electrical power transmission grid to support wind power development within the Project area in the future. The magnitude of impacts from these transmission line extensions would be dependant somewhat upon the extent of new lines required to meet the needs of new and existing wind farms. Likely cumulative impacts from future construction and operation of transmission lines originating from wind farms may include viewshed degradation and disruption to land uses, vegetation, and avian wildlife. Should the construction of future transmission lines occur concurrent with the proposed Project construction schedule within the Project corridor, short-term cumulative impacts associated with noise, dust, and general construction activity could occur.

ES.6.14.2 Greenhouse Gases and Climate Change

Crude oil delivered to PADD II and PADD III refineries by the Project are likely to be replacing heavy crude oil from other less reliable and diminishing sources. Assuming constant demand for refined oil products, the incremental impact of the Project on GHG emissions would be minor. Indirect GHG-related emissions during operation would be associated with electrical generation for the pump stations (approximately 2.6 to 4.4 million tons of CO_2 per year for a proposed initial capacity of 700,000 bpd and a potential capacity of 900,000 bpd, respectively). In addition, refining the quantity of crude oil that would be delivered by the Project would produce an estimated 1.3 to 1.7 million tons of CO_2 per year. This assumes that the entire volume of oil transported by the project would be heavy crude oil. However, since the crude oil delivered by the Project would be replacing similar crude oils from other sources, the incremental impact of these emissions would be minor. Future refinery upgrades and expansions could potentially increase the annual production of GHG in the PADD II and PADD III area. Should such upgrades and expansions occur, generation of GHG could potentially increase. The cumulative impact of increased GHG emissions in this area would depend upon the potential for reductions in GHG emissions elsewhere, consistent with developing regulatory frameworks in the U.S., Canada and worldwide.

The proposed mitigation measures would serve to offset some of the GHG emissions associated with the Project. These measures would include revegetation of the construction work areas, restoration of wetland functions, and compensatory wetland mitigation for wetland impacts. Minimal direct GHG emissions would be associated with operation (e.g., vehicle operation and fugitive emissions), and indirect emissions would be associated with electrical generation for the pump stations and refineries.

The potential impacts of climate change would not be expected to affect the proposed Project. An increase in temperatures may increase wildfires in the Project area. An increased intensity of storm events, should this occur, may result in additional flooding in some areas near the Project, particularly in the Gulf Coast Segment and Houston Lateral should hurricane activity increase as a result of oceanic temperature conditions. The Project would be designed and constructed to be consistent with applicable federal, state, and local standards, and therefore should be resistant to forces associated with reasonably likely climate conditions during the lifetime of the pipeline system. Other effects of climate change, such as air quality degradation, health effects, reduced snow pack, and agricultural issues, would not likely impact the proposed Project.

ES.6.14.3 Extraterritorial Concerns

While the Project analyzed in this draft EIS begins at the international boundary where the pipeline would exit Saskatchewan, Canada and enter the United States through Montana, the origination point of the pipeline system would be in Alberta, Canada. Neither DOS regulations (22 CFR 161.12) nor Executive Order 12114, Environmental Effects Abroad of Major Federal Actions, require this draft EIS to analyze impacts to the environment or activities that occur outside of the United States. As a matter of policy, however, DOS has included information in this draft EIS regarding the environmental analysis conducted in Canada.

The analysis of environmental effects from the proposed Project is occurring on both sides of the international border under the appropriate regulatory authorities, as discussed in Section 1 of this DEIS. In Canada, the Canadian National Energy Board (NEB) conducted that analysis, held public hearings in September 2009, and issued its findings in March 2010.

The NEB completed its analyses in March 2010 and determined that the proposed Project is required in Canada to meet the present and future public convenience and necessity, provided that the NEB terms and conditions outlined in the Project certificate are met, including all commitments made by Keystone during the hearing process.

Cumulative impacts to Canadian resources are limited by available data at this time. However, as both the NEPA and NEB processes proceed, additional information on potential cross international boundary cumulative impacts would likely become available and would be assessed to the degree possible for inclusion in the FEIS. Pertinent NEB documents are provided in Appendix R.

ES.6.15 Conclusions

The information assessed in this draft EIS indicates that the proposed Keystone XL Project would result in limited adverse environmental impacts during both construction and operation, assuming that the Project would be constructed and operated in compliance with:

- All applicable laws and regulations;
- The provisions in Keystone's proposed Construction, Mitigation and Reclamation Plan (Appendix B);

- The environmental specifications and water quality protection requirements mandated by MDEQ for Montana, as part of the Montana Major Facility Siting Act certification process and presented in Attachments 1 and 2 to Appendix I; and
- Other mitigation measures presented in this draft EIS.

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1.0 INTRODUCTION

TransCanada Keystone Pipeline, LP (Keystone) has applied to the U.S. Department of State (DOS) for a Presidential Permit for the proposed construction, connection, operation, and maintenance of a pipeline and associated facilities at the United States border for importation of crude oil from Canada. DOS receives and considers applications for Presidential Permits for such oil pipeline border crossings and associated facilities pursuant to the President's constitutional authority over foreign relations, and as Commander-in-Chief, which authority the President delegated to DOS in Executive Order (EO) 13337, as amended (69 Federal Register [FR] 25299). DOS's jurisdiction to issue a Presidential Permit includes only the border crossing and the associated facilities at the border.

It is the policy of DOS to prepare an environmental impact statement (EIS) in conjunction with the issuance of Presidential Permits when DOS has determined that issuance of a Presidential Permit would qualify as a "major federal action" that may have a "significant impact upon the environment" as those terms are defined in the National Environmental Policy Act of 1969 (NEPA) (42 United States Code [U.S.C] § 4321 et seq.). The principal objectives of this EIS are to:

- Identify and assess potential impacts on the natural and human environment that would result from implementation of the proposed Keystone XL Pipeline Project (Project) in the United States;
- Describe and evaluate reasonable alternatives, including no action, to the Project in the United States that would avoid or minimize adverse effects to the environment;
- Identify the DOS preferred alternative in the final EIS;
- Identify and recommend specific mitigation measures, as necessary, to minimize environmental impacts; and
- Facilitate public, tribal, and agency involvement in identifying significant environmental impacts.

1.1 KEYSTONE XL PROJECT OVERVIEW

Keystone proposes to construct and operate a crude oil pipeline and related facilities to transport Western Canadian Sedimentary Basin (WCSB) crude oil from an oil supply hub near Hardisty, Alberta, Canada to destinations in the south central United States, including an existing oil terminal in Cushing, Oklahoma and existing delivery points in the Port Arthur and east Houston areas of Texas. In total, the Project would consist of approximately 1,707 miles of new, 36-inch-diameter pipeline, with approximately 327 miles of pipeline in Canada and 1,380 miles in the U.S. The proposed pipeline would cross the international border between Saskatchewan, Canada and the United States near Morgan, Montana. The Project initially would have the nominal transport capacity of 700,000 barrels per day (bpd) of crude oil from the oil supply hub near Hardisty, Alberta to an existing terminal in Cushing, Oklahoma (up to 200,000 bpd) and to existing delivery points in Nederland (near Port Arthur), Texas, and Moore Junction (in Harris County), Texas. By increasing the pumping capacity in the future, the Project could ultimately transport up to 900,000 bpd of crude oil. At that throughput, up to 200,000 bpd would be delivered to the Cushing Oil Terminal and the remainder would be delivered to the existing delivery points in Texas.

For purposes of this EIS, the Project consists of three new pipeline segments plus additional pumping capacity on the previously permitted Cushing Extension Segment of the Keystone Pipeline Project (Keystone Cushing Extension), as shown on Figure 1.1-1.

The three new pipeline segments are:

- Steele City Segment (from Morgan, Montana to Steele City, Nebraska) that connects to the northern end of the previously approved, and currently under construction, Keystone Cushing Extension;
- Gulf Coast Segment (from Cushing, Oklahoma to Nederland, Texas) that connects to the southern end of the Keystone Cushing Extension; and
- Houston Lateral (from the Gulf Coast Segment, in Liberty County, Texas to Moore Junction, in Harris County, Texas).

Approximately 1,380 linear miles of pipeline would be located in five states as listed in Table 1.1-1.

TABLE 1.1-1
Miles of New Pipe for the Proposed Project

Segment / State	New Construction Pipeline Miles	Mileposts (From – To)
Steele City Segment		
Montana	282.5	0 – 282.5
South Dakota	314.1	282.5 – 596.6
Nebraska	254.1	596.6 – 850.7
Keystone Cushing Extension		
Kansas	0	N/A
Gulf Coast Segment		
Oklahoma	155.4	0 -155.4
Texas	324.8	155.4 – 480.2
Houston Lateral		
Texas – Houston Lateral	48.6	0 – 48.6
Project Total	**1,379.5**	

Source: Keystone 2008.

The Project components would include 30 new pump stations, 74 mainline valves (MLVs), approximately 50 permanent access roads, one tank farm, and two crude oil delivery sites. Additional access roads, stockpile sites, railroad sidings and construction camps would be required during Project construction. Electric power lines and associated facility upgrades would be constructed, as required, by local power providers to provide power for the new pump stations and to power remotely operated valves and densitometers[1] located along the pipeline route. Local power providers would be responsible for obtaining the necessary approvals or authorizations from federal, state, and local governments for such facilities. Although the permitting process for the electrical facilities is an independent process, construction and operation of these facilities are considered connected actions under NEPA and are

[1] A densitometer is an on-line and continuous device used to measure the density of a flowing stream. In the oil and gas industry, a densitometer is normally used to measure the density of liquid hydrocarbon. The measurement of density is used to determine the quantity of crude oil passing through a meter.

evaluated in this EIS. Additionally, the Western Area Power Administration (Western) has determined that due to load forecasts associated with proposed pump stations in South Dakota, a new 230-kV transmission line approximately 70-mile-long would need to be added to the existing electrical grid system (proposed Lower Brule to Witten transmission line).

The Project would deliver crude oil to the existing terminal in Cushing, Oklahoma and to existing delivery points Nederland (near Port Arthur) and Moore Junction (east Houston area), Texas; those delivery points provide access to a number of other pipeline systems, terminals, and docks. The ultimate delivery location (terminals, pipelines, or docks) would not be contracted by Keystone. While the exact destinations of the oil would be determined based on shipper contracts with the refiners, there are 15 refineries within the proposed delivery area in Texas which would have access to Canadian crude oil delivered by the Project (Purvin & Gertz 2009). These refineries currently handle an estimated 1.4 million bpd of heavy crude oil that is similar to the oil that would be delivered by the Project (Purvin & Gertz 2009).

Any potential expansion of existing refinery capacity would be dependant upon market demand. Based on current market forecasts, PADD (Petroleum Administration for Defense Districts) III[2] has sufficient refining capacity to absorb an additional 500,000 bpd of Canadian crude oil by 2020 without expanding refining capacity (Purvin & Gertz 2009). This assessment is consistent with a report by the Canadian Association of Petroleum Producers (CAPP) 2009 which states that the processing of heavy crude in PADD III is not constrained by refinery capacity. Given these considerations, the EIS provides information on the impacts of refining additional heavy crude oil carried by the pipeline, but does not consider any potential refinery expansions in PADD III as connected actions.

The Project is planned to be placed into service in phases. The Gulf Coast Segment and the Houston Lateral are planned to be in service in 2011, and the Steele City Segment is planned to be in service in 2012.

1.2 PROJECT PURPOSE AND NEED

1.2.1 Purpose of the Proposed Project

The primary purpose of the proposed Project is to transport WCSB crude oil from the border with Canada to existing delivery points in PADD III that provide connections to existing refineries in PADD III. An additional purpose of the Project is to supplement WCSB deliveries to the Cushing Oil Terminal in Cushing, Oklahoma, which is in PADD II. Keystone’s goal is to initially transport up to 700,000 bpd of crude oil by pipeline from the WCSB to the United States. Up to 500,000 bpd of this volume of crude oil would be transported to delivery points in PADD III and up to 200,000 bpd would be transported to the existing Cushing Oil Terminal. At maximum capacity (achieved with the addition of supplementary pumping power) the Project would have the potential to transport a total of 900,000 bpd of WCSB crude oil to the U.S., with the additional 200,000 bpd transported to delivery points in PADD III. Due to market projections of future fuel demand in PADD III, the applicant does not currently anticipate the need to expand capacity to 900,000 bpd in the near future.

[2] PADD III (Gulf Coast) consists of the states of Alabama, Mississippi, Louisiana, Arkansas, Texas, and New Mexico.

1.2.2 Need for the Proposed Project

The following sections address the need for the proposed Project:

- Overview of the Crude Oil Market (Section 1.2.2.1);
- Supply of Heavy Crude Oil from the WCSB (Section 1.2.2.2);
- Demand for Heavy Crude Oil in PADD III (Section 1.2.2.3);
- Transport of Crude Oil from the WCSB to PADD III (Section 1.2.2.4); and
- Future Scenarios (Section 1.2.2.5).

The information provided in the following sections regarding the current and projected supply and demand of crude oil takes into account the economic conditions at the time the EIS was issued. The supply and demand projections are based on the most current projections available in reports prepared by government agencies and other analysts at the time the EIS was issued.

1.2.2.1 Overview of the Crude Oil Market

Owing largely to its availability, energy density, and ease of transport, crude oil is currently the world's most important energy resource. It is traded in a global market that includes crude oils that vary in their points of delivery, densities, sulfur contents, and prices. For example on October 16, 2009 the price of crude oil ranged from $65 per barrel for heavy, sour WCSB crude to over $75 per barrel for light, sweet Colombian crude.

Those prices represent a balance between supply and demand in the global crude oil market. In that market, each oil field can be thought of as a potential supply source. In the past, most crude oil came from fields that produced relatively light crude oil, and while those fields are distributed throughout the world, the leading producers were in Saudi Arabia, the United States, Russia (the former USSR), and Iran. More recently, the world oil market has experienced an increase in the supply of crude oil from unconventional sources. These unconventional oil fields, primarily in Canada and Venezuela, produce a very heavy crude oil which is often referred to as bitumen.[3]

On the demand side of the market, each refinery can be thought of as a crude oil consumer. Each refinery makes decisions as to which crude oil to buy based on the characteristics of the crude (point of delivery, density, sweetness, and price) and the refinery's unique ability to transform the crude oil into a refined petroleum product that can be profitably sold.[4]

Much effort has gone into predicting future conditions in the crude oil market. Individuals, organizations, and countries attempt to forecast supply, demand, and price based on economic trends, governmental regulations, the cost and availability of substitute forms of energy, and many other factors. While those predictions are uncertain, there is a general consensus that the volume of crude oil consumed world wide, as well as the volume consumed domestically, is unlikely to decrease substantially over the next 30 years (EIA 2009b, EIA 2009c), and that the mix of crude oil consumed in the future will include an increased proportion of heavy crude.

[3] For the purposes of this EIS, oil from the WCSB is referred to as heavy crude or bitumen.

[4] The Energy Information Administration (EIA 2009a) reported that crude oil is generally fungible, i.e., one crude oil can be substituted for another. However, many refineries are optimized to refine crude oil with specific qualities, and switching from one crude oil to another can be costly.

1.2.2.2 Supply of Heavy Crude Oil from the WCSB

The WCSB is now widely accepted as having one of the largest crude oil reserves in the world. The Energy Resources Conservation Board (ERCB 2009) and CAPP (2009) estimated that Canada's oil sands contain 170 to 173 billion barrels of proven oil reserves.[5] However, the mere presence of oil in a field does not mean that oil will be produced. For oil to be produced, field operators must be convinced that they can extract and deliver the oil to the marketplace in a profitable manner; i.e., the price per barrel that consumers are willing to pay is high enough for producers to make a profit. Therefore, decisions regarding unconventional crude oil (bitumen) production in the WCSB are affected by the future price of conventional crude oil.

Given this market dynamic, CAPP (2009) reported that "Over the past 12 months [June 2008 to June 2009] the industry has witnessed a dramatic change in oil prices. The benchmark WTI crude oil price dropped from a peak in July 2008 of over $140 per barrel to less than $40 per barrel by years end . . . APP's estimate of industry capital spending for oil sands development was reduced to $10 billion dollars for 2009 compared to $20 billion in 2008. The forecast for market demand growth is also lower than in the previous report, which is in line with the slower forecasted growth in supply."[6] Most industry analysts predict that there will be growth in market demand as the global economy recovers from the recent financial crisis. Consequently, many oil sands projects that were shelved in 2009 have been revived and are set to commence in 2010.

CAPP (2009) projected that heavy crude production in the WCSB will increase from its 2008 level of 0.9 million bpd to between 1.4 and 1.6 million bpd by 2015 and then remain at relatively elevated levels until the end of the projection periods. These projections are largely consistent with (1) the most recent EIA forecast, which also projects that the unconventional oil supply from Canada will become an increasingly important source of global crude supply over time (EIA 2009), and (2) projections made by ERCB (2009), the National Energy Board of Canada (NEB 2009), and Strategy West (2009). At the current and projected rates of annual production, production from the estimated proven reserves in the WCSB could continue into the later part of the 21st century.

Historically, the majority of the WCSB crude oil has been exported to the U.S. In 2008, Canada was the largest exporter of crude oil to the U.S., shipping approximately 1.7 million bpd (70 percent of total production) from western Canada to the U.S. CAPP (2009) predicted that demand from Canadian refineries would increase by only about 0.076 million bpd by 2015; therefore, it is expected that Canada will continue to export the bulk of its crude oil production to the U.S. market.

1.2.2.3 Demand for Heavy Crude Oil in PADD III

The U.S. petroleum industry is divided into five PADDs. Refineries within a PADD tend to have more in common with each other (e.g., pipeline infrastructure and supply streams) than they do with refineries in other PADDs.

The majority of the crude oil transported by the proposed Project would have delivery points at terminals in PADD III, which has 58 refineries in it.[7] Those refineries represent a total refining capacity of approximately 8.4 million bpd and for the past 20 years have run at between 80 and 100 percent of

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[5] Proven oil reserves are those that can be economically extracted given current and projected market conditions.
[6] Crude oil benchmarks are reference points for the various types of oil that are available in the market. The WTI benchmark is West Texas Intermediate crude oil and is the most commonly used benchmark in the U.S.
[7] Only a subset of PADD III refineries (approximately 15) would have direct pipeline access to oil delivered via the proposed Project.

maximum throughput (EIA 2009d). PADD III refineries provide significant volumes of refined petroleum product to both the U.S. East Coast and Midwest via pipeline. For example in 2008, approximately 50 percent of the gasoline consumed on the East Coast and 18 percent of the gasoline consumed in the Midwest was supplied by PADD III refineries.

In 2008, PADD III refineries imported 2.2 million bpd of heavy crude oil from 43 different countries. The top 4 suppliers were Mexico (22 percent), Saudi Arabia (17 percent), Venezuela (17 percent), and Nigeria (11 percent) (CAPP 2009). While the supply of crude oil from Saudi Arabia to the U.S. appears to be fairly stable, the remaining major suppliers each face declining or uncertain production horizons as summarized below.

- Capital expenditures by Mexico's national oil company have been insufficient to offset natural declines in oil field output. As a result, the production of heavy crude from Mexico has been falling; there has been a 250,000-bpd decrease in production of Mexican heavy crude since 2006. In particular, production from the offshore Cantarell field (which produces most of the Maya heavy crude supplied to the U.S.) is falling rapidly (Hook et al 2009, IEA 2008)
- Most of Venezuela's oil production is heavy crude, and over half of the production has been exported to the U.S. (Purvin & Gertz 2009). However, Venezuela is increasingly diversifying its oil customers to lessen its dependence on the United States. As such, exports to the U.S. as a portion of Venezuela's total output have decreased (Alvarez and Hanson 2009).
- Nigeria is Africa's largest oil producer. However, "since December 2005, Nigeria has experienced increased pipeline vandalism, kidnappings and militant takeovers of oil facilities in the Niger Delta…The instability in the Niger Delta has caused significant amounts of shut-in production and several companies declaring *force majeure* on oil shipments. EIA estimates Nigeria's effective oil production capacity to be around 2.7 million barrels per day (bbl/d) but as a result of attacks on oil infrastructure, 2008 monthly oil production ranged between 1.8 million bbl/d and 2.1 million bbl/d. Additional supply disruptions for the year were the result of worker strikes carried out by the Petroleum and Natural Gas Senior Staff Association of Nigeria (PENGASSAN) that shut-in 800,000 bbl/d of ExxonMobil's production for about 10 days in late April/early May" (EIA 2009e).
- Angola, Algeria, and Iraq, which were among the top 15 suppliers of crude oil to the U.S. in 2008 (EIA 2009f), have each experienced armed conflict or significant political unrest within the last 5 years.

These declining and uncertain supply horizons have prompted some PADD III refineries to modify their existing facilities to allow the refinement of heavy crude oil (Gunaseelan and Buehler 2009, Sword 2008). This diversification strategy could increase the reliability of the supply to PADD III and put downward pressure on PADD III crude oil prices provided that sufficient transportation capacity is available for heavy crude oil. Specifically, CAPP (2009) reported that (1) major refinery upgrades representing a total of 365,000 bpd of new capacity are planned at Port Arthur, Texas refineries that would have direct pipeline access to oil transported through the proposed Project, and (2) several PADD III refineries without direct pipeline access (Borger, Texas; Artesia New Mexico; and Garyville, Louisiana) are also planning upgrades to increase bitumen and heavy oil refining capacity. Purvin & Gertz (2009) identified many additional, smaller-scale upgrades designed to increase heavy crude oil refining capacity in PADD III. In addition, there are several PADD III refinery upgrades that have been postponed until the current economic situation is resolved; Shore and Hackworth (2009) reported that there are indications that reduced heavy/light crude oil price differentials and profit margins may be causing some PADD III refinery upgrades to be delayed, including upgrades in St. Charles and Norco, Louisiana.

1.2.2.4 Transport of Crude Oil from the WCSB to PADD III

Two major crude oil pipelines currently transport crude oil from the WCSB directly to U.S. markets: the Enbridge Pipeline System and the Kinder Morgan Express Project. Combined, those pipeline systems have a total capacity of about 2.1 million bpd. Of that total capacity, approximately 63 percent is heavy crude, and in 2008 both pipelines operated at or around 100 percent capacity (CAPP 2009). Two new pipeline systems were recently approved to transport crude oil from the WCSB to areas in the U.S. outside of PADD III: the TransCanada Keystone Oil Pipeline Project (including the Cushing Extension) and the Enbridge Alberta Clipper Pipeline Project. CAPP (2009) and Smith (2009) report that with those pipelines, the transport capacity of crude oil from Canada to the U.S. is sufficient to provide the needs of all areas exclusive of PADD III through 2019. It is not sufficient to supply PADD III through 2019 due to the lack of sufficient transport capacity into this area. CAPP (2009) noted that there is only one pipeline that provides PADD III refineries access to WCSB crude, the ExxonMobil Pegasus Pipeline; that pipeline has a small capacity of only 96,000 bpd (CAPP 2009). Thus, limited pipeline capacity continues to constrain the supply of WCSB crude oil to PADD III (CAPP 2009, Purvin & Gertz 2009), which represents the largest refining capacity in the U.S.

The conclusions of CAPP (2009) and Purvin & Gertz (2009) are consistent with observed marketplace behavior. In September 2008, when shippers were given an opportunity to enter into contractual commitments for Project capacity, several firms executed binding contracts with Keystone for a total of 380,000 bpd of WCSB crude to be transported to PADD III for an average of 18 years. In addition, Valero, a major refinery operator in the Houston area, stated that they expect to be one of the largest recipients of heavy crude from the Project pending regulatory approval (Valero 2008), and Canadian Natural Resources Limited (CNRL) has agreed to supply 100,000 bpd of heavy crude to an unnamed U.S. Gulf Coast refiner (CNRL 2008).

1.2.2.5 Future Scenarios

Outlook without the Proposed Project

The 'production strike price' for WCSB crude is the market price needed to make WCSB crude profitable; i.e., the price needed to make it worth the financial investment to produce that crude. The October 2009 price of benchmark crude oil exceeded the production strike price of $60 to $70 per barrel, and it is expected that benchmark crude oil prices will continue to increase in the long term; the price of crude in the EIA (2009) reference case increases to approximately $130 per barrel by 2030. These benchmark crude oil prices are consistent with the expected increase in WCSB output projected by CAPP (2009), EIA (2009), ERCB (2009), NEB (2009), and Strategy West (2009), and are consistent with the expected high-volume export of WCSB crude oil to the U.S. through the end of the century based on the estimated reserves and the current and projected production levels.

The unusually small price differential between heavy and light crude oil that prevailed in 2009 put pressure on refineries that were heavily dependent upon heavy oils and appears to have resulted in the delay of some heavy oil refinery expansions and upgrades since heavy oils are generally more expensive to refine. However, as of October 2009, the price differentials appeared to be returning to levels that would again support heavy crude oil use, and it is expected that long term market conditions will continue to result in the increased reliance on heavy crude.

If the proposed Project or a similar alternative is not implemented, Canadian crude oil producers would continue to have a limited ability to sell crude to refineries in PADD III; most of the crude would continue to be transported to PADD II. In the proposed Project, only 200,000 additional barrels would be transported to PADD II, and the remaining 500,000 barrels would be used to address demand in PADD III. Without the proposed Project, the limited availability of Canadian crude oil in PADD III would tend to put upward pressure on (1) the price of crude oil shipped from Canada and other sources into PADD III, and (2) the prices of refined products shipped out of PADD III. In addition, constrained access to this large source of oil would tend to increase price volatility and reliance on oil from countries with declining or uncertain production horizons as well as from countries with potential political instabilities or concerns relative to trade relations with the U.S.

Outlook with the Proposed Project

If the proposed Project or a similar alternative is implemented, Canadian crude oil producers would have an increased opportunity to sell crude to the PADD III market. This supply diversification would put downward pressure on the price of crude oil shipped into PADD III and refined products shipped out of PADD III. Increasing development of and access to this large source of oil located in a stable country, with which the U.S. has free trade agreements, would tend to decrease price volatility and reduce the U.S. dependence on oil from countries with uncertain or declining production horizons as well as from countries where political considerations reduce the reliability of beneficial trade relationships with the U.S. In addition, there would be several other advantages to obtaining oil from this source via pipeline to PADD III:

- Reductions in the price of crude oil increase the level of output of the U.S. economy (Leiby 2007). Assuming that environmental externalities associated with crude oil consumption are appropriately addressed through regulation, projects such as the proposed Keystone XL Project, put downward pressure on the price of crude oil and benefit the U.S. economy.
- Oil shocks (unanticipated supply reductions that result in price spikes) reduce the amount of goods and services the U.S. can produce given a fixed amount of other inputs and cause some inputs (e.g., land, labor, and capital) to be under-utilized. In updating studies previously conducted by the Oak Ridge National Laboratory, Leiby (2007) estimated that the likely cost of future oil shocks to the U.S. economy was between $2 and $8 per barrel. Thus, projects which stabilize crude oil supply through diversification and increased access to politically stable regions, such as the proposed Project, benefit the U.S. economy.
- Much of the crude oil imports to PADD III would be supplied along a transportation pathway that would be shorter than that of most other sources. Crude oil supplies in Western Canada represent the closest foreign supply source for PADD III refineries, other than Mexico and Venezuela, and do not require many days or weeks of marine transportation, in contrast to most other suppliers.
- Increasing the PADD III supply of crude oil from Canada would increase supplies from a stable and reliable ally and trading partner of the United States with which we have free trade agreements. It would also increase the supply of crude oil from a major source outside of the Organization of Petroleum Exporting Countries and augment the security of the energy supply.
- Increasing the supply of crude oil to PADD III with Canadian crude would help make up for declining or uncertain supply from several foreign suppliers of crude oil to PADD III.

1.3 AGENCY PARTICIPATION

1.3.1 Federal Lead Agency – U.S. Department of State

For cross-border oil pipelines, DOS is responsible for issuance of Presidential Permits and as such DOS is the lead agency for the Project NEPA environmental review and for the Section 106 of the National Historic Preservation Act (NHPA) process. As the lead agency, DOS is supervising the preparation of the EIS for this Project in accordance with NEPA and the Section 106 process in accordance with the NHPA (16 U.S.C § 470 et seq.). As the lead federal agency, DOS has initiated both informal and formal consultation with the U.S. Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act (ESA) [16 U.S.C § 1536], and to determine the likelihood of effects on listed species.

In addition, as lead agency DOS coordinates compliance with the Coastal Zone Management Act (CZMA) of 1972. Components of the Project are within the coastal zone of Texas. The Texas General Land Office administers the federally approved Texas Coastal Management Program, and will determine if the proposed Project is consistent with the program. This determination will only apply to a portion of both the Gulf Coast Segment and Houston Lateral.

DOS coordinated with the cooperating and assisting agencies to ensure compliance with laws and regulations within their authority as well as to ensure compliance with the following executive orders:

- Executive Order (EO) 11988 – Floodplain Management;
- EO 11990 – Protection of Wetlands;
- EO 12114 – Environmental Effects Abroad of Major Federal Actions;
- EO 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations;
- EO 13007 – Indian Sacred Sites;
- EO 13112 – Invasive Species;
- EO 13175 – Consultation and Coordination with Indian Tribal Governments;
- EO 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds;
- EO 13212 – Actions to Expedite Energy-Related Projects; and
- EO 13337, as amended (69 FR 25299) – governs the DOS issuance of Presidential Permits that authorize construction of pipelines carrying petroleum, petroleum products, and other liquids across U.S. international borders. Within DOS, the Bureau of Economic and Business Affairs, Office of International Energy and Commodity Policy, receives and processes Presidential Permit applications. Upon receipt of a Presidential Permit application for a cross-border pipeline, DOS is required to request the views of the Secretary of Defense, the Attorney General, the Secretary of the Interior, the Secretary of Commerce, the Secretary of Transportation, the Secretary of Energy, the Secretary of Homeland Security, the Administrator of the U.S. Environmental Protection Agency (EPA), and such other government department and agency heads as the Secretary of State deems appropriate. DOS must consider the Project to be in the national interest to issue a Presidential Permit.

1.3.2 Cooperating Agencies

The following agencies have agreed to cooperate in the NEPA process.

1.3.2.1 U.S. Environmental Protection Agency (EPA)

Under Section 402 of the Clean Water Act (CWA) (33 U.S.C §1251 et seq.), EPA has jurisdiction over the discharge of pollutants from a point source into waters of the United States. Administration of permit programs for point-source discharges that require a National Pollutant Discharge Elimination System (NPDES) permit has been delegated to the states affected by the Project. EPA maintains oversight of the delegated authority. Regulated discharges include, but are not limited to, sanitary and domestic wastewater, gravel pit and construction dewatering, hydrostatic test water, and storm water (40 CFR 122).

Under Section 404 of the CWA (33 U.S.C § 1251 et seq.), EPA reviews and comments on U.S. Army Corps of Engineers (USACE) Section 404 permit applications for compliance with the Section 404(b)(1) guidelines and other statutes and authorities within its jurisdiction (40 CFR 230).

Under Section 309 of the CAA (42 U.S.C § 7401 et seq.), EPA has the responsibility to review and comment in writing on the EIS for compliance with Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500–1508).

Under Sections 3001 through 3019 of the Resource Conservation and Recovery Act (RCRA) (42 U.S.C § 3251 et seq.), EPA establishes criteria governing the management of hazardous waste. In accordance with 40 CFR 261.4(b)(5), any hazardous waste generated in conjunction with construction or operation of the Project is subject to the hazardous waste regulations.

The proposed Project is located within EPA Regions 6, 7, and 8. Region 8 is the lead for EPA's involvement as a cooperating agency.

1.3.2.2 U.S. Department of the Interior, Bureau of Land Management (BLM)

BLM has authority to issue right-of-way (ROW) grants for all affected federal lands under the Mineral Leasing Act (MLA) of 1920, as amended (30 U.S.C 181 et seq.) excluding National Park Service (NPS) lands, and the public lands BLM administers under the Federal Land Policy and Management Act (FLPMA) of 1976. BLM will consider the issuance of a new ROW grant and issuance of associated temporary use permits that would apply to BLM-managed lands crossed by the Project, as well as all other federal lands affected. Conformance with land use plans and impacts on resources and programs will be considered in determining whether to issue a ROW grant. BLM staff is participating in agency meetings and assisting Keystone with routing across BLM lands.

BLM's purpose and need in preparing an EIS under NEPA for the proposed Project is to approve, approve with modification, or deny Keystone's application under section 28 of the Mineral Leasing Act of 1920, as amended for a ROW grant to construct, operate and decommission a crude oil pipeline and related facilities on public federal lands in the United States. The proposed ROW action appears consistent with approved BLM land use planning. For the decision to be made, BLM will decide whether or not to grant a ROW across federal lands, and if so, under what terms and conditions.

1.3.2.3 U.S. Department of the Interior, National Park Service (NPS)

NPS provides technical review of the proposal in the vicinity of NPS-administered lands affected by the Project. NPS retains this role despite the BLM authority on U.S. public federal lands since the MLA authorization administered by BLM is not applicable to NPS lands. The applicant proposed route for the Project would cross several National Historic Trails that are managed with the assistance of the NPS. As a result, NPS has become a cooperating agency for the Project.

1.3.2.4 U.S. Department of the Interior, U.S. Fish and Wildlife Service (USFWS)

USFWS is responsible for ensuring compliance with the ESA. Section 7 of the ESA, as amended, states that any project authorized, funded, or conducted by any federal agencies should not "…jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined…to be critical…" (16 U.S.C § 1536[a][2] [1988]). USFWS also reviews project plans and provides comments regarding protection of fish and wildlife resources under the provisions of the Fish and Wildlife Coordination Act (FWCA) (16 U.S.C § 661 et seq.). USFWS is responsible for the implementation of the provisions of the Migratory Bird Treaty Act (16 U.S.C § 703) and the Bald and Golden Eagle Protection Act (16 U.S.C § 688). Easements are protected under the National Wildlife Refuge Systems Administration Act (16 U.S.C § 668dd[c]).

1.3.2.5 U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS)

NRCS administers the Wetlands Reserve Program (WRP) (16 U.S.C § 3837 et seq.), under which it purchases conservation easements and provides cost share to landowners for the purposes of restoring and protecting wetlands. Under the WRP, the United States may purchase 30-year or permanent easements. Land eligibility for the WRP is based on NRCS's determination that the land is farmed or converted wetland, that enrollment maximizes wildlife benefits and wetland values, and that the likelihood of successful restoration merits inclusion into the program. Lands under WRP easement are subject to development and other use restrictions in order to ensure protection of wetland and wildlife conservation values. The proposed Project route would cross land restricted by at least one WRP easement. NRCS also administers the Emergency Watershed Protection Program (Floodplain Easements) and the Healthy Forests Reserve Program, and shares management of the Grasslands Reserve Program with the Farm Service Agency (FSA). The Project may involve lands included in these other NRCS land conservation programs. NRCS is also responsible for the Farmland Protection Policy Act (7 CFR Part 658), including protection of prime and unique agricultural lands. The Project would traverse prime farmland and potentially prime farmland.

1.3.2.6 U.S. Department of Agriculture, Farm Service Agency (FSA)

The Farm Service Agency (FSA) is a unit of the U.S. Department of Agriculture (USDA) and administers several land conservation programs, including the Conservation Reserve Program (CRP), the Conservation Reserve Enhancement Program (CREP), the Farmable Wetlands Program, and the Grasslands Reserve Program. These programs provide annual rental payments and cost-share assistance to establish long-term resource conservation measures on eligible farmland. The terms of rental agreements are from 10 to 30 years, during which most agricultural uses of the affected lands are prohibited. The Grasslands Reserve Program is managed jointly with NRCS and includes provisions for rental agreements up to 30 years, 30-year-easements, and permanent easements. The Project involves lands included in FSA land conservation programs.

1.3.2.7 U.S. Department of Agriculture, Rural Utilities Service (RUS)

RUS is an agency that administers the U.S. Department of Agriculture's Rural Development Utilities Programs. These programs include the provision of loans and loan guarantees to electric utilities and other entities to serve customers in rural areas, through the construction or expansion of generation, transmission and distribution facilities. Applications for financing have been or may be submitted to RUS by several rural electric cooperatives to enable the cooperatives' provision of electricity to pump stations that would serve the Project. RUS is responsible for NEPA compliance for facilities proposed by the cooperatives to provide these services including, but not limited to, transmission lines.

1.3.2.8 U.S. Army Corps of Engineers (USACE)

Under Section 404 of the CWA, USACE has the authority to issue or deny permits for placement of dredge or fill material in the waters of the United States, including adjacent wetlands. Under Section 10 of the Rivers and Harbors Act (33 U.S.C § 403), USACE regulates work and placement of structures in, on, over, or under navigable waters of the United States.

1.3.2.9 Western Area Power Administration (Western)

Western is a federal power-marketing agency within the U.S. Department of Energy (DOE) that sells and delivers federal electric power to municipalities, public utilities, federal and state agencies, and Native American tribes in 15 western and central states. A portion of the proposed Project is located within Western's Upper Great Plains Region, which operates and maintains nearly 90 substations and more than 8,000 miles of federal transmission lines in Minnesota, South Dakota, North Dakota, Montana, Nebraska, and Iowa.

Western has received requests from customers on its network for unplanned network load delivery points to serve unplanned load growth associated with the Project in Montana and South Dakota. Western is the network balancing authority. To accommodate these requests, the transmission system grid would require modification of existing electrical grid facilities, including installation of a new electric substation and construction of new transmission lines. According to DOE's NEPA Implementing Procedures (10 CFR Part 1021), these actions require environmental review.

The joint system engineering studies determined that power demands for pump stations in South Dakota at full Project flow capacity (900,000 bpd) would require that the existing area power grid be expanded to include a new 230-kV transmission line (the Lower Brule to Witten transmission line), modification of an existing substation (Witten), construction of a new switchyard/substation (Lower Brule), and construction of new double-circuit transmission line (from Big Bend to Lower Brule). These actions are considered connected actions to the Project since they would be needed as a direct result of the Project.

In responding to the need for agency action, Western must abide by the following:

- Address Interconnection Requests: Western's *General Guidelines for Interconnection* establishes a process for addressing applications for interconnection. The process dictates that Western respond to the applications as presented by the network customers.

- Protect Transmission System Reliability and Service to Existing Customers. Western's purpose and need is to ensure that existing reliability and service is not degraded. Western's *General Guidelines for Interconnection* provides for transmission and system studies to ensure that system reliability and service to existing customers is not adversely affected. If the existing power system cannot accommodate an applicant's request without modifications or upgrades, the applicant may be responsible for funding the necessary work unless the changes would provide overall system benefits.

Western is consulting with DOS to ensure cultural resources potentially affected by any Western transmission lines are taken into account. Western will also be a signator to the Programmatic Agreement consistent with Section 106 of the NHPA.

1.3.2.10 U.S. Department of Transportation (DOT), Pipeline and Hazardous Materials Safety Administration (PHMSA), Office of Pipeline Safety (OPS)

OPS administers DOT's national regulatory program to assure the safe transportation of natural gas, petroleum, and other hazardous liquids by pipeline. The regulations for Transportation of Hazardous Liquids by Pipeline are presented in 49 CFR Part 195. Keystone has requested a Special Permit to construct the Project with the following modification of the design requirements in 49 CFR 195:

- Keystone requested a Special Permit from OPS on October 10, 2008, to design, construct, and operate the Keystone XL Pipeline Project using a 0.80-design factor in certain areas. Crude oil and other similar pipelines traditionally operate under a 0.72 design factor.
- The OPS special permit would be a federal agency action subject to the requirements of NEPA. OPS is conducting an environmental assessment to determine whether issuing the Special Permit would significantly impact the environmental and the likelihood of a pipeline spill or failure compared to not issuing the permit. OPS is also acting as a cooperating agency to accomplish their NEPA requirements through this EIS and is providing technical expertise to DOS in the assessment of the Project and in determination of appropriate mitigating measures.
- If the Special Permit is approved, OPS would impose conditions to ensure that there would be at least the equivalent level of safety in the Special Permit areas as would occur with meeting the design requirement of 49 CFR 195.

1.3.2.11 Montana Department of Environmental Quality (MDEQ)

MDEQ is the lead agency for compliance with the State of Montana Environmental Policy Act (MEPA). This EIS will not only address the requirements for NEPA environmental analysis, but also the requirements for MEPA environmental analysis. Additionally, Keystone is required to obtain a Certificate of Compliance (Certificate) from MDEQ under the Montana Major Facility Siting Act (MFSA) before the Project may begin construction or acquire easements through the eminent domain process. MDEQ must also consider issuance of permits under the Montana Water Quality Act, including turbidity authorizations for in-stream construction activities and Section 401 certification under the CWA. MDEQ's issuance of a Certificate must be based on substantive findings pursuant to Section 75-20-301(1), Montana Code Annotated (MCA) and Administrative Rules of Montana (ARM), Sections 17.20.1604 and 17.20.1607. Issuance of the Certificate would be a state action for which MDEQ is required to prepare an EIS under MEPA.

1.3.3 Assisting Agencies and Other State Agencies

The U.S. Department of Interior, Bureau of Reclamation (Reclamation) has agreed to provide technical assistance to DOS in the environmental review process. Reclamation has responsibilities for federal water supplies in the West. The proposed pipeline would go beneath one of Reclamation's canals in South Dakota.

The following county governments in Nebraska will assist DOS to address their concerns regarding local planning processes and/or laws: Fillmore, Greely, Holt, Merrick, Nance, Saline, and Wheeler. The Lower Big Blue Natural Resources and Upper Elkhorn Natural Resources districts, Nebraska have also agreed to be assisting agencies.

In addition to these assisting agencies, various other state and local resource agencies from each of the states crossed by the proposed Project have responsibilities for state and local permit issuance. The permits required by the various state and local jurisdictions crossed by the proposed corridor are discussed in Section 1.6.

1.4 INDIAN TRIBE CONSULTATION

In its Notice of Intent to prepare an EIS for the Project (NOI), DOS also presented its intent to conduct a parallel Section 106 consultation under the National Historic Preservation Act (NHPA). DOS and BLM initially contacted potentially affected Indian tribes to determine whether the tribes were interested in reviewing the proposed Project under NEPA and whether they were interested in participating in consultation under Section 106. As the lead federal agency for the Project, DOS is engaging in consultation with identified consulting parties, including federal agencies, state agencies, State Historic Preservation Officers (SHPOs), the Advisory Council on Historic Preservation (ACHP), and interested federally recognized Indian tribes (70 FR 71194) within the Project Area. Tribes potentially affected by the undertaking were invited to become consulting parties under Section 106 of the NHPA regulations. Consultation was initiated on May 12, 2009 and includes the ongoing development of a Programmatic Agreement (PA) between the consulting parties that would guide the continuing compliance with Section 106 should the Project receive all necessary permits and proceed to construction. Consultation to date has included two consultation meetings in Rapid City, South Dakota; one consultation meeting in Billings, Montana; two consultation meetings in Oklahoma City, Oklahoma, one consultation meeting in Dallas, Texas; and a webinar for all consulting parties to discuss comments on drafts of the proposed PA. DOS recognizes its responsibility for government-to-government consultation with federally recognized tribes, and is engaging in such consultation as requested by appropriate tribal officials.

1.5 SHPO CONSULTATION

Consultation with the SHPOs was initiated on April 21, 2009. Consultation to date has included consultation meetings in Lincoln, Nebraska, Helena, Montana, Pierre, South Dakota, and Austin, Texas.

1.6 ENVIRONMENTAL REVIEW OF CANADIAN PORTION OF THE KEYSTONE XL PROJECT

As a matter of policy, in addition to its environmental analysis of the Project in the United States, DOS monitors and obtains information from the ongoing environmental analysis of the Project in Canada. In so doing, DOS is guided by *EO 12114 – Environmental Effects Abroad of Major Federal Actions* which stipulates the procedures and other actions to be taken by federal agencies with respect to the environment outside of the United States. The Canadian government is conducting its own environmental review of the portion of the Project in Canada. As a result, and consistent with EO 12114, DOS is not preparing any environmental analysis of the impacts of the pipeline in Canada.

The Canadian environmental analysis process began on July 18, 2008 when Keystone submitted a Preliminary Information Package (PIP) regarding the proposed Keystone XL Pipeline to Canada's National Energy Board (NEB). Upon receipt of the PIP, the NEB issued a Federal Coordination Notice that formally initiated an environmental assessment process pursuant to the Canadian Environmental Assessment Act (CEAA). In early 2009 Keystone submitted an application to NEB for a Certificate of Public Convenience and Necessity for the proposed Project pursuant to Section 52 of the National Energy Board Act (NEBA). Since that time the NEB has solicited comments from provincial governments and agencies and other potential intervening parties in the process. NEB held hearings on the Project application from September 15 through September 18, 2009 and information discussed in those hearings informs, where appropriate, various portions of this document. DOS continues to monitor the results of these hearings and the continuing environmental assessment of the Canadian portion of the proposed Project by the NEB.

1.7 SCOPING AND EIS COMMENT PROCESS

1.7.1 Scoping

On January 28, 2009, DOS issued an NOI to prepare an EIS to address reasonably foreseeable impacts from the proposed action and alternatives, and to conduct a parallel consultation process under Section 106 of NHPA.

The NOI informed the public about the proposed action, announced plans for scoping meetings, invited public participation in the scoping process, and solicited public comments for consideration in establishing the scope and content of the EIS. The NOI was published in the Federal Register and distributed to the following stakeholders:

- Landowners along the proposed route;
- Federal, state, and local agencies;
- Municipalities and counties;
- Native American Tribes;
- Elected officials;
- Non-governmental organizations;
- Media; and
- Interested individuals.

The scoping period was originally planned to extend from January 28 to March 16, 2009. Weather conditions in South Dakota precluded holding the scoping meetings on this schedule, and an amended NOI published on March 23, 2009 extended the scoping period until April 15, 2009 to provide time to allow rescheduling of two South Dakota scoping meetings.

DOS held 20 separate scoping meetings in the vicinity of the proposed route to give the public the opportunity to provide comments regarding the scope of the EIS. The dates and locations of the meetings are listed below, along with the attendance at each meeting (in parentheses).

February 9 – Beaumont, Texas (10)

February 10 – Liberty, Texas (15)

February 11 – Livingston, Texas (15)

February 12 – Tyler, Texas (60)

February 17 – Durant, Oklahoma (34)

February 18 – Ponca City, Oklahoma (12)

February 19 – El Dorado, Kansas (10)

February 19 – Clay Center, Kansas (20)

February 23 – York, Nebraska (62)

February 23 – Baker, Montana (39)

February 24 – Atkinson, Nebraska (65)

February 24 – Terry, Montana (30)

February 25 – Murdo, South Dakota (46)

February 25 – Circle, Montana (100)

February 25 – Plentywood, Montana (7)

February 25 – Glendive, Montana (45)

February 26 – Glasgow, Montana (53)

February 26 – Malta, Montana (32)

April 8 – Faith, South Dakota (12)

April 8 – Buffalo, South Dakota (31)

DOS received verbal, written, and electronic comments during the scoping comment period. All verbal comments formally presented at the meetings were recorded and transcribed. Additional written comments were received on comment forms provided to the public at the meetings and in letters submitted to DOS. A summary of public comments related to the scope of the EIS scope is presented in Table 1.7.1-1 along with the section in this EIS that addresses the concern. Additional details on the scoping comments are provided in Appendix A (Scoping Summary Report).

TABLE 1.7.1-1
Comments Received on Environmental Issues during the Public Scoping Process for the Proposed Project

Issue	Comment	Section Where Comment/Issue Addressed in EIS:
Purpose and Need	Purpose and economics of this project needs to be explained, including forecasts for Canadian sand oil production and U.S. crude oil demand and evaluate the Project in the context of overall U.S. oil production, transportation, storage and refining. How much supply comes from which nations and what is the stability of those sources? Describe commercial terms for commitments to the Project. Indicate how long the oil supply for the pipeline is projected to last at the throughput volumes planned for the Project.	1.2
Project Description	Pipeline installation methods should minimize impacts to the surrounding environment. Effects of installation, maintenance, operation, life expectancy, and removal of the pipeline.	2.0
Alternatives	Process to select alternatives, evaluation of a no-action alternative, route adjustments, route selection, routes that avoid sensitive areas and risks to homes and farming operations, use of other methods of transportation, shipping refined products instead of a crude oil pipeline, renewable energy sources, collocation with other ROWs.	4.0
Geology	Seismicity in the Brockton-Froid fault zone. Lower portion of the Niobrara River is underlain by Pierre shale, which is a very week rock prone to fracturing and slumping.	3.1
Soils and Sediments	Methods to reduce erosion, repair of erosion channels, sediment control, topsoil segregation during construction and replacement of topsoil after construction and abandonment, restoring right-of-way land to previous state, pipeline effects on soil temperature, effects of frost/moisture on bring rocks to the soil surface, construction related erosion impacts on sand dunes.	3.2
Water Resources	Impacts on public and private water sources, water supply contingencies in the event of a spill, stream channel erosion, impacts to reservoirs, availability of hydrostatic testing water. The EIS should provide a clear description of aquatic resources that may be impacted.	3.3
Wetlands	Identification of potentially impacted wetlands, impact and mitigation measures, replacement or restoration of loss wetlands, and avoidance of wetland drainage as a result of trenching.	3.4
Vegetation	Impacts and mitigation to native vegetation along pipeline ROW, revegetation measures, impact to tree shelter belts, spread of invasive weeds, effects to rare plant communities.	3.5
Fish, wildlife, and threatened and endangered species	Impacts to fisheries, potential impacts and mitigation to threatened and endangered species, fragmentation of habitat, off-site mitigation to compensate for impacts, and effects of power lines on avian collision.	3.6, 3.7 and 3.8
Land Use	Restrictions of land use over pipeline and cost of reclamation to agriculture land. Protection measure to protect landowner's ability to graze cattle, run equipment, and to be free of noxious weeds.	3.9
Recreation and Special Interest Areas	Impacts to state parks, National Historic Trails, and National Scenic Rivers; impacts to boating, tubing and other	3.9

TABLE 1.7.1-1 Comments Received on Environmental Issues during the Public Scoping Process for the Proposed Project		
Issue	**Comment**	**Section Where Comment/Issue Addressed in EIS:**
	activities; and degradation of recreational opportunities.	
Visual Resources	Visual impacts of above-ground facilities, use of “Standard Environmental colors”, impacts of fuel spills and visible sediment plumes in rivers and lakes, impacts on historic landscapes and National wild and scenic rivers.	3.9
Socioeconomics	Impacts to property values, impacts on property taxes, and Project-related tax revenues to municipalities and counties associated with the pipeline.	3.10
Transportation and Traffic	Impacts to county and private roads, methods used to cross roadways, and restoration of damaged roads.	3.10
Cultural Resources	Impacts to archaeological sites, paleontological resources, prehistoric and historic sites, and historic landscapes; route should visually inspect for historic properties; route should avoid any significant cultural resource on public land as well as hunting and subsistence areas. Potential major adverse impacts to cultural resources associated with El Camino Real de los Tejas in Nacogdoches County, Texas.	3.11
Air Resources	Air emissions and air pollution abatement from pump stations, and air quality impacts of refining tar sands.	3.12
Noise	Effects of pump station operational noise on humans and cattle, impacts due to construction noise, and effects of pipeline vibrations on nearby structures and cattle.	3.12
Reliability and Safety	Local county input to Emergency Response Plan; training for local responders; protection from vandalism, terrorist activities and fire risk; ROW security; safety of pipeline crossings; spill contamination and cleanup procedures; maximum potential spill volumes; state-of-the art leak detection, and detection of small leaks in particular; monitoring of pressure; automatic shut-down procedures; corrosive nature of Canadian tar sands; pipeline integrity; compensation to landowners affected by spills; spill clean up and restoration plans; TransCanada’s operational experience and safety record; water supply contamination due to oil spills; and impacts of spills on animals and humans.	3.13
Cumulative Impacts	Impacts from building another pipeline on properties that may already have up to four other pipelines running through them; impact of mining, making, refining and using tar sands oil; impacts from activities such as new roads, gas or oil wells, power lines, wind farms, coal mines, etc.; and the impacts of adding additional volumes of crude oil to Wood River and Cushing terminals.	3.14

1.8 PERMITS, APPROVALS, AND REGULATORY REQUIREMENTS

The assisting federal, tribal, state, and local agencies with jurisdiction over various aspects of the Project participated in the EIS process by providing direct input to DOS or through the EIS review and comment process (see Sections 1.3.3 and 1.3.4).

Table 1.8-1 lists the permits, licenses, approvals, and consultation requirements for federal, state and local agencies.

TABLE 1.8-1
Permits, Licenses, Approvals, and Consultation Requirements for the Proposed Project

Agency	Permit or Consultation/Authority	Agency Action
Federal		
U.S. Department of State (DOS)	Presidential Permit, Executive Order 13337 of April 30, 2004 (69 Fed. Reg. 25299, et seq.)	Considers approval of cross-border facilities; lead federal agency under NEPA
	Section 106 (NHPA)	Supervises and coordinates compliance with Section 106 of NHPA and consultation with interested Tribal agencies
Bureau of Land Management (BLM)	ROW Grant(s) under the Federal Land Policy and Management Act of 1976 as amended (FLPMA) and Temporary Use Permit under Section 28 (MLA)	Considers approval of ROW grant and temporary use permits for the portions of the Project that would encroach on public lands
	Archeological Resources Protection Act (ARPA) Permit	Considers issuance of cultural resource use permit to survey, excavate or remove cultural resources on federal lands
	Notice to Proceed	Following issuance of a ROW grant and approval of the Project's POD, considers the issuance of a Notice to Proceed with Project development and mitigation activities for federal lands
	Section 106 (NHPA)	Responsible for compliance with Section 106 of NHPA and consultation with interested Tribal agencies
U.S. Corps of Engineers (USACE) – Omaha, Tulsa, Fort Worth, and Galveston Districts	Section 404, CWA	Considers issuance of Section 404 permits for the placement of dredge or fill material in Waters of the U.S., including wetlands
	Section 10 Permit (Rivers and Harbors Act of 1899)	Considers issuance of Section 10 permits for pipeline crossings of navigable waters
	Section 106 (NHPA)	Responsible for compliance with Section 106 of NHPA and consultation with interested Tribal agencies
U.S. Fish and Wildlife Service (USFWS)	ESA Section 7 Consultation, Biological Opinion	Considers lead agency findings of an impact of federally-listed or proposed species; provide Biological Opinion if the Project is likely to adversely affect federally-listed or proposed species or their habitats
U.S. Bureau of Reclamation (Reclamation)	ROW Grant and Temporary Use Permit under Section 28 of the MLA	Determines if ROW grant issued under MLA by BLM is in compliance with Reclamation standards

TABLE 1.8-1 Permits, Licenses, Approvals, and Consultation Requirements for the Proposed Project		
Agency	**Permit or Consultation/Authority**	**Agency Action**
	Section 106 (NHPA)	Responsible for compliance with Section 106 of NHPA and consultation with interested Tribal agencies
Federal Highway Administration (FHA)	Crossing Permit	Considers issuance of permits for the crossing of federally funded highways
Office of Pipeline Safety (OPS)	49 CFR Part 195 (typically submitted closer to the construction phase after all other permits approved)	Reviews and approves IMP for HCAs prior to installation
	49 CFR Part 194 (typically submitted closer to the construction phase after all other permits approved)	Reviews and approves ERP prior to installation
	Special Permit (currently under review)	Authorizes the design, construction and operation of the Project using a 0.80 design factor in non-HCAs; imposes conditions to ensure at a minimum an equivalent level of safety
U.S. Environmental Protection Agency (EPA), Regions VI, VII, VIII	Section 401, CWA, Water Quality Certification	Considers approval of water use and crossing permits for non-jurisdictional waters (implemented through each state's Water Quality Certification Program)
	Section 402, CWA, National Pollutant Discharge Elimination System (NPDES)	Reviews and issues NPDES permit for the discharge of hydrostatic test water (implemented through each state's Water Quality Certification Program, where required)
U.S. Department of Agriculture – Natural Resources Conservation Service (NRCS)	Section 106 (NHPA)	Responsible for compliance with Section 106 of NHPA and consultation with interested Tribal agencies
U.S. Department of Agriculture – Farm Service Agency (FSA)	Section 106 (NHPA)	Responsible for compliance with Section 106 of NHPA and consultation with interested Tribal agencies
U.S. Department of Agriculture – Rural Utilities Services (RUS)	Section 106 (NHPA)	Responsible for compliance with Section 106 of NHPA and consultation with interested Tribal agencies
Western Area Power Administration (Western)	Section 106 (NHPA)	Responsible for compliance with Section 106 of NHPA and consultation with interested Tribal agencies
Advisory Council on Historic Preservation (ACHP)	Consultation	Advises federal agencies during the Section 106 consultation process; signator to the Programmatic Agreement
U.S. Department of Treasury – Bureau of Alcohol, Tobacco, and Firearms	Treasury Department Order No. 120-1 (former No. 221), effective 1 July 1972	Considers issuance of permit to purchase, store, and use explosives should blasting be required
Montana*		
Montana State Historic Preservation Office (SHPO)–Montana Historical Society**	Section 106 consultation regarding NRHP eligibility of cultural resources and potential Project effects on historic properties, Compliance with Montana State Antiquities Act	Reviews and comments on activities potentially affecting cultural resources
Montana Department of Environmental Quality (MDEQ)	Certificate of Compliance under MFSA	Considers issuance of a certificate of compliance under MFSA for construction and operation of the proposed facility.

TABLE 1.8-1 Permits, Licenses, Approvals, and Consultation Requirements for the Proposed Project		
Agency	**Permit or Consultation/Authority**	**Agency Action**
MDEQ – Permitting and Compliance Division – Water Protection Bureau	Montana Ground Water Pollution Control System (MGWPCS) and Nondegredation Review (three levels of water protection based on water classification, i.e., outstanding resource waters etc.), Standard 318 (Permitting conditions for Pipeline Crossings at Watercourses – short term turbidity)	Considers issuance of permit for stream and wetland crossings; provides Section 401 certification consults for Section 404 process
	Montana Pollutant Discharge Elimination System (MPDES)	Considers issuance of permit for hydrostatic test water discharge into surface water, trench dewatering, and stormwater discharge
MDEQ – Permitting and Compliance Division – Waste and Underground Tank Management Bureau	Septic Tank, Cesspool, and Privy Cleaner New License Application Form (for work camps)	Reviews and licenses Cesspool, Septic Tank and Privy Cleaners, inspects disposal sites for septic tank, grease trap and sump wastes
MDEQ – Permitting and Compliance Division – Air Resources Bureau	Air Quality Permit Application for Portable Sources; Air Quality Permit Application for Stationary Sources	Considers issuance of air quality permit(s) for work camps dependant on source of power such as portable diesel generator or use of non-electrical equipment is used during construction or operation of the pipeline (i.e., diesel powered pumps during hydrostatic testing)
MDEQ – Permitting and Compliance Division – Public Water Supply Bureau	Water and Wastewater Operator Certification (for work camps)	Reviews and licenses operators of certain public drinking water and wastewater treatment facilities; issues approval to construct, alter or extend public water or sewer systems (including hauling, storage and distribution of water)
Montana Department of Natural Resources and Conservation (DNRC) – Water Resources Division (General)	Water Appropriation Permit (Beneficial Water use Permit) and/or Water Wells Drilling/ Alteration	Considers issuance of permit for water use for hydrostatic testing or waters for dust control
Montana DNRC Trust Land Management Division	Navigable Rivers/Land use License/Easement	Consults on and considers issuance of permit for projects in, on, over, and under navigable waters
Department of Transportation – Glendive District	State and Highway Crossing Permit for pipeline and access roads that encroach state highway ROW, with traffic control based on the Manual on Uniform Traffic Control Devices	Considers issuance of permits for crossings of state highways
Department of Transportation – Helena Motor Carrier Services (MCS) Division Office	Oversize/Overweight Load Permits, where required	Considers issuance of permit for oversize/overweight loads on state maintained roadways
Montana Public Service Commission	Grant Common Carrier Status	Considers whether or not an applicant qualifies as a common carrier under Montana Annotated Code (MAC) 69-13-101; if a common carrier, the commission would supervise and regulate operations under MCA Title 69 allowing Keystone to cross state highways and state streams.

TABLE 1.8-1
Permits, Licenses, Approvals, and Consultation Requirements for the Proposed Project

Agency	Permit or Consultation/Authority	Agency Action
County Road Departments	Crossing Permits	Considers issuance of permits for crossing of state highways
County Floodplain Departments	County Floodplain permitting	Considers issuance of permits and review of work in floodplains
County and Local Authorities	Pump Station Zoning Approvals, where required	Reviews under county approval process
	Special or Conditional Use Permits, where required	Reviews under county approval process (Note: These permits are not required after a Certificate of Compliance under MFSA is issued)
County Weed Control Boards	Approval of reclamation plan	Considers approval of a reclamation/weed control plan (Note: These approvals still required after Certificate of Compliance under MFSA is issued)
South Dakota*		
South Dakota Historical Society**	Consultation under Section 106, NHPA	Reviews and comments on activities potentially affecting cultural resources
South Dakota Public Utilities Commission (SDPUC)	Energy Conversion and Transmission Facilities Act	Considers issuance of permit for a pipeline and appurtenant facilities
Department of Environment and Natural Resources, Surface Water Quality Program	Section 401, CWA, Water Quality Certification	Considers issuance of permit for stream and wetland crossings; consult for Section 404 process
	Hydrostatic Testing/Dewatering & Temporary Water Use Permit (SDG070000)	Considers issuance of General Permit regulating hydrostatic test water discharge, construction dewatering to waters of the state, and Temporary Water use Permit
Department of Game, Fish, and Parks	Consultation	Consults regarding natural resources
Department of Transportation	Crossing Permits	Considers issuance of permits for crossing of state highways
County Road Departments	Crossing Permits	Considers issuance of permits for crossing of county roads
County and Local Authorities	Pump Station Zoning Approvals, where required	Reviews under county approval process
	Special or Conditional Use Permits, where required	Reviews under county approval process
Nebraska		
Nebraska State Historic Preservation Office (SHPO) **	Consultation under Section 106, NHPA	Reviews and comments on activities potentially affecting cultural resources
DEQ, Division of Water Resources	Section 401, CWA, Water Quality Certification	Considers issuance of permit for stream and wetland crossings; consult for Section 404 process
	Excavation Dewatering and Hydrostatic Testing Permit Form NEG6720000 Dewatering Form NEG6721000 Relocation	Considers issuance of permit regulating hydrostatic test water discharge and construction dewatering to waters of the state
Department of Environmental Quality (DEQ), Division of Air Quality	Nebraska Administrative Code Title 129, Construction Permit.	Considers issuance of permit for construction of proposed tank farm at Steele City

TABLE 1.8-1 Permits, Licenses, Approvals, and Consultation Requirements for the Proposed Project		
Agency	**Permit or Consultation/Authority**	**Agency Action**
Department of Natural Resources	Water Appropriations – Groundwater and Surface Water	Considers issuance of permit to use Public Waters (for hydrostatic test water or dust control)
Game and Parks Commission	Consultation	Consults regarding natural resources
Department of Transportation	Crossing Permits	Considers issuance of permits for crossing of state highways
County Road Departments	Crossing Permits	Considers issuance of permits for crossing of county roads
County and Local Authorities	Pump Station Zoning Approvals, where required	Reviews under county approval process
	Special or Conditional Use Permits, where required	Reviews under county approval process
Kansas		
Department of Health and Environment, Bureau of Water	Hydrostatic Testing Permit (if applicable)	For pump station piping, may be below permitting thresholds
	Water Withdrawal Permit (if applicable)	For pump station piping, may be below permitting thresholds
Department of Wildlife and Parks	Non-game and Endangered Species Action Permit (if applicable)	Reviews of new pump station locations
SHPO**	Historical Resources Review (if applicable)	Reviews of new pump station locations
County and Local Authorities	Pump Station Zoning Approvals, where required	Reviews under county approval process
Oklahoma		
Oklahoma State Historical Society**	Consultation under Section 106, NHPA	Reviews and comments on activities potentially affecting cultural resources
Oklahoma Archaeological Survey (OAS)	Consultation	Reviews and comments on activities potentially affecting archaeological sites
DEQ, Division of Water Resources	Section 401, CWA, Water Quality Certification.	Considers issuance of permit for stream and wetland crossings; consults for Section 404 process; Critical Water Resources.
	Excavation Dewatering and Hydrostatic Testing Permit (OKG270000)	Considers issuance of permit regulating hydrostatic test water discharge and construction dewatering to waters of the state
Department of Wildlife Conservation	Consultation	Consults regarding natural resources
Department of Transportation	Crossing Permits	Considers issuance of permits for crossing of state highways
County Road Departments	Crossing Permits	Considers issuance of permits for crossing of county roads
County and Local Authorities	Pump Station Zoning Approvals, where required	Reviews under county approval process
	Special or Conditional Use Permits, where required	Reviews under county approval process
Texas		
SHPO**	Consultation under Section 106, NHPA	Reviews and comments on activities potentially affecting cultural resources

TABLE 1.8-1
Permits, Licenses, Approvals, and Consultation Requirements for the Proposed Project

Agency	Permit or Consultation/Authority	Agency Action
Texas Commission on Environmental Quality (TCEQ)	Section 401, CWA, Water Quality Certification.	Consults for Section 404 process; permit regulating hydrostatic test water discharge, and construction dewatering to waters of the state
	General Conformity Determination	Determines conformity of the federal action to the State Implementation Plan (SIP)
Parks and Wildlife Department	Consultation 31 TAC 69 - Marl, Sand, and Gravel Permits	Consults regarding natural resources, considers issuance of stream crossing permits
Texas General Land Office	Coastal Zone Management Program	Considers issuance of Coastal Zone Consistency Determination
	State owned lands	Considers approval of easement grants for ROW cover state-owned lands
Railroad Commission of Texas	State lead on oil and gas projects; Excavation Dewatering and Hydrostatic Testing Permit	Considers issuance of permit to operate the pipeline; considers issuance of permit regulating hydrostatic test water discharge and construction dewatering to waters of the state
Department of Transportation	Crossing Permits	Considers issuance of permits for crossing of state highways
County Road Departments	Crossing Permits	Considers issuance of permits for crossing of county roads
County and Local Authorities	Pump Station Zoning Approvals, where required	Reviews under county approval process
	Special or Conditional Use Permits, where required	Reviews under county approval process
Jefferson County Drainage District	Crossing Permits	Considers issuance of permits for crossing of drainage canals
Lower Neches Valley Authority	Crossing Permits	Considers issuance of permits for crossing of drainage canals
Note: All permits are considered attainable and consistent with existing land use plans based on consultation with the above agencies.		

*Permits associated with construction camps are discussed in Section 2.2.7.4.

**The SHPO has the opportunity to review federal agency decisions under Section 106, but it is not a legal obligation.

Source: Keystone 2009c.

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2.0 PROJECT DESCRIPTION

2.1 OVERVIEW OF PIPELINE SYSTEM

The proposed Project consists of three new pipeline segments, plus additional pumping capacity on the Cushing Extension Segment of the first Keystone Pipeline Project (Keystone Cushing Extension), as outlined in Table 2.1-1 below and shown on Figure 1.1-1. The three new pipeline segments are the Steele City Segment (from Morgan, Montana to Steele City, Nebraska), the Gulf Coast Segment (from Cushing, Oklahoma to Nederland, Texas) and the Houston Lateral (from the Gulf Coast Segment, in Liberty County, Texas to Moore Junction, Texas).

TABLE 2.1-1
Miles of Pipe by State

Segment / State	New Construction Pipeline Miles	Mileposts (From – To)
Steele City Segment		
Montana	282.5	0 – 282.5
South Dakota	314.1	282.5 – 596.6
Nebraska	254.1	596.6 – 850.7
Keystone Cushing Extension		
Kansas	0	N/A
Gulf Coast Segment		
Oklahoma	155.4	0 -155.4
Texas	324.8	155.4 – 480.2
Houston Lateral		
Texas – Houston Lateral	48.6	0 – 48.6
Project Total	**1,379.5**	

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.
Source: Keystone 2008.

In total, the Project would consist of approximately 1,380 miles of new, 36-inch diameter pipeline within the U.S. It would interconnect with the northern and southern ends of the previously approved 298-mile-long, 36-inch diameter Keystone Cushing Extension segment of the Keystone Pipeline Project.

Figures 2.1-1 to 2.1-6 are maps showing the applicant's planned pipeline route through each state. Major highways, waterways and towns are presented on these maps, along with the proposed pipeline route and associated pump station locations.

The proposed Project would have an initial capacity to deliver up to 700,000 barrels per day (bpd) of Western Canadian Sedimentary Basin (WCSB) crude oil from the proposed Canada-U.S. border crossing to existing oil terminals in Nederland near Port Arthur and Moore Junction in Houston, Texas. Existing binding commitments for the Project amount to 380,000 bpd of crude oil and as demand for Canadian oil increases, the pipeline would increase its load, up to its initial capacity of 700,000 bpd. The Project could ultimately transport up to 900,000 bpd of crude oil through the proposed pipeline by adding additional pumping capacity if warranted by future market demand.

The Project requires 30 new pump stations, 74 intermediate mainline valves (MLVs) of which 24 are check valves located downstream of major river crossings, approximately 50 permanent access roads and approximately 400 temporary access roads, one tank farm and two crude oil delivery sites. These facilities are shown in Table 2.1-2 and are described in more detail in Section 2.2.

TABLE 2.1-2
Ancillary Facilities by State[1]

Segment / State	Ancillary Facilities
Steele City Segment	
Montana	6 new Pump Stations 14 Intermediate MLVs 50 Access Roads
South Dakota	7 new Pump Stations 9 MLVs 18 Access Roads
Nebraska	5 new Pump Stations 13 Intermediate MLVs Steele City tank farm 12 Access Roads
Kansas Keystone Cushing Extension	
Kansas	2 new Pump Stations No Access Roads
Gulf Coast Segment	
Oklahoma	4 new Pump Stations 10 Intermediate MLVs 93 Access Roads
Texas	6 new Pump Stations 21 Intermediate MLVs 1 Delivery Site 245 Access Roads
Houston Lateral	
Texas – Houston Lateral	7 Intermediate MLVs 1 Delivery Site 31 Access Roads

Source: Keystone 2008.

2.1.1 Steele City Segment

A total of 851 miles of new pipeline would be constructed for the Steele City Segment. Thirty miles (4 percent) of the proposed new pipeline would be located within approximately 300 feet of currently existing pipelines, utilities, or road rights-of-way (ROW). The remaining 821 miles (96 percent) of the proposed pipeline would be situated in new ROW. Additionally, Keystone proposes to construct one tank farm on an approximate 50-acre site at Steele City, Nebraska, and 18 new pump stations, each situated on

[1] Transmission lines are considered connected actions and are discussed in Section 2.3.

a 5-acre site. New electrical transmission power lines with voltage of between 69 kV to 240 kV would be constructed and operated by local power providers to service pump stations and a tank farm along the proposed Project route. These are discussed as connected actions in Section 2.5.

Lands affected during the construction phase of the Steele City Segment amount to approximately 14,595 acres. Of this acreage, approximately 5,351 acres would be permanently altered for use during the operational phase of Project.

2.1.2 Cushing Extension (New Pump Stations)

Two new pump stations would be constructed in Kansas along the previously permitted Keystone Pipeline's Cushing Extension. These pump stations would enable the proposed Project to maintain the pressure required to make crude oil deliveries at desired throughput volumes. The two new pump stations would disturb approximately 12 acres of land during both the construction and operational phases of the Project.

2.1.3 Gulf Coast Segment and Houston Lateral

A total of 480 miles of new pipeline is required for the Gulf Coast Segment of the proposed Project. Of these, 393 miles (82 percent) would be located within approximately 300 feet of existing pipelines, utilities, or road ROWs. The remaining 87 miles (18 percent) of the pipeline would be situated in new ROW. The Houston Lateral comprises 49 miles of new pipeline, 20 miles (41 percent) of which would be located within approximately 300 feet of existing pipelines, utilities, or road ROWs. The remaining 29 miles (59 percent) would be situated in new ROW.

Approximately 9,161 acres of land would be affected during construction of the Gulf Coast and Houston Lateral segments combined. Of this, 3,374 acres would be affected during Project operation.

Ten new pump stations would be constructed on the Gulf Coast Segment, each situated on a 5-acre site. Keystone would also install two delivery facilities along the proposed Project route, one at Nederland and one at Moore Junction, Texas.

2.1.4 Land and Borrow Material Requirements

2.1.4.1 Land Requirements

The pipeline would require a 110-foot wide construction ROW, consisting of a 60-foot temporary easement and a 50-foot permanent easement. In certain sensitive areas, which may include wetlands, cultural sites, shelterbelts, residential areas, or commercial/industrial areas, the construction ROW would be reduced to 85 feet.

Figure 2.1.4-1 illustrates typical construction in locations that would not parallel an existing pipeline corridor or other linear facility. Figures 2.1.4-2 and 2.1.4-3 illustrate the typical construction ROW and equipment work locations in areas where the pipeline would parallel an existing linear feature.

Approximately 23,768 acres of land would be disturbed during the construction of the proposed facilities. Surface disturbance associated with construction and operation of the proposed Project is summarized in Table 2.1.4-1.

After construction, the temporary ROW (15,031 acres) would be restored consistent with federal and state regulations as applicable and the easement agreements negotiated between Keystone and individual landowners or land managers. The permanent ROW for the pipeline amounts to approximately 8,749 acres, of which 373 acres would be dedicated to space required for pump stations, valves, and other aboveground facilities for the life of the Project. The permanent ROW would be restored consistent with federal and state regulations as applicable, given the need for access to the ROW for the life of the Project to support surface and aerial inspections and any repairs or maintenance as necessary.

TABLE 2.1.4-1
Summary of Lands Affected by the Proposed Action

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[6]	278	0
Pipe Storage Sites, Rail Sidings, and Contractor Yards	521	0
Construction Camps	160	0
Pump Stations[8]	42	42
Access Roads	265	22
Montana Subtotal[3, 5]	**5,033**	**1,776**
South Dakota		
Pipeline ROW	4,188	1,904
Additional Temporary Workspace Areas[6]	255	0
Pipe Storage Sites, Rail Sidings, and Contractor Yards	579	0
Construction Camps	160	0
Pump Stations[8]	42	42
Access Roads[7]	103	9
South Dakota Subtotal[3,5]	**5,327**	**1,955**
Nebraska		
Pipeline ROW	3,388	1,540
Additional Temporary Workspace Areas[6]	186	0
Pipe Storage Sites, Rail Sidings, and Contractor Yards	525	0
Pump Stations[8]	42	42
Access Roads[7]	56	0
Tank Farm	50	50
Nebraska Subtotal[3,5]	**4,247**	**1,632**
Steele City Subtotal[3,5]	**14,607**	**5,363**
Keystone Cushing Extension		
Kansas		
Pipeline ROW	0	0
Additional Temporary Workspace Areas[6]	0	0

TABLE 2.1.4-1 Summary of Lands Affected by the Proposed Action		
Facility	**Land Affected During Construction[1] (acres)**	**Land Affected During Operation[2] (acres)**
Pipe Storage Sites, Rail Sidings, and Contractor Yards	0	0
Pump Stations[8]	12	12
Access Roads[7]	0	0
Kansas Subtotal [3,4,5]	**12**	**12**
Keystone Cushing Extension Subtotal[3,4,5]	**12**	**12**
Gulf Coast Segment		
Oklahoma		
Pipeline ROW	2,044	942
Additional Temporary Workspace Areas[6]	130	0
Pipe Storage Sites, Rail Sidings, and Contractor Yards	465	0
Pump Stations[8]	32	32
Access Roads[7]	103	19
Oklahoma Subtotal[3, 5]	2,774	993
Texas		
Pipeline ROW	4,180	1,965
Additional Temporary Workspace Areas[6]	283	0
Pipe Storage Sites, Rail Sidings, and Contractor Yards	796	0
Pump Stations[8]/Delivery Facilities	48	48
Access Roads[7]	329	55
Texas Subtotal	**5,636**	**2,068**
Houston Lateral		
Lateral ROW	652	294
Additional Temporary Workspace Areas[6]	32	0
Pipe Storage 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]	23,780	8,749

[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 would be used, or in areas requiring extra width for workspace necessitated by site conditions. Disturbance also includes pipe storage 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 would be located within either pump stations or delivery facility sites. Intermediate MLVs and densitometers would be constructed within the construction easement and operated within the permanently maintained 50-foot ROW. Other MLVs, check valves and block valves, and meters would 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 Temporary Workspace Areas 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.

[8] This does not include the associated transmission lines required for pump stations. For information on these, please refer to Table 2.3.1-1.

Source: Keystone 2009c.

2.1.4.2 Borrow Material Requirements

Borrow material would be required for temporary sites (such as storage sites, contractor yards, temporary access roads and access pads at ROW road crossings); to stabilize the land for permanent facilities (including pump stations, valve sites, and permanent access roads); and for padding the pipeline trench bottom as needed. Table 2.1.4-2 shows the amount of borrow material that would be required in each state.

TABLE 2.1.4-2
Borrow Material Requirements by State

State	Cubic Yards
Montana	206,536
South Dakota	193,268
Nebraska	162,097
Kansas[1]	9,260
Oklahoma	123,002
Texas[2]	372,042
TOTAL	1,066,205

[1] Two Keystone XL pump stations.
[2] Includes Houston Lateral.

Pipe storage sites and contractor yards would require some gravel placement. All borrow material would 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 would be required for each pipe storage site. For the proposed 39 storage sites, a total of approximately 273,000 cubic yards of gravel would be required. In addition, an estimated 4,600 cubic yards of gravel would be required for each contractor yard. For the 28 contractor yards proposed, a total of approximately 130,000 cubic yards of gravel would be needed. Surveys of pipe storage sites, railroad sidings and contractor yards would be completed prior to construction.

Approximately 400 temporary access roads for construction would be needed, requiring approximately 37,500 cubic yards of gravel for access pads and culverts. Access pads would be placed at ROW crossings of public and private roads, requiring a total of about 88,000 cubic yards of gravel. Approximately 1,590 such road crossings are proposed.

Gravel would be used to stabilize the land for permanent facilities, including pump stations, valve sites, and permanent access roads. Approximately 6 inches of gravel would typically be used at pump stations. Approximately 150,000 cubic yards of gravel would be required for the 30 proposed pump stations. Approximately 6 inches of gravel would typically be used at valve sites. Approximately 1,650 cubic yards of gravel would thus be required for the 74 proposed valve sites. Fifty permanent access roads to Project facilities are proposed, requiring approximately 244,000 cubic yards of gravel in total. The trench bottom would be filled with padding material such as sand or gravel, to protect the pipeline coating. An estimated 85,000 cubic yards of padding material would be required in total.

Table 2.1.4-3 summarizes the borrow material required for each facility type.

TABLE 2.1.4-3
Borrow Material Requirements by Facility Type

Facility Type	Gravel Requirements (cubic yards)
Pipe Storage Site	271,434
Contractor Yard	129,630
Temporary Access Roads	37,683
Access Pads for Road Crossings	88,333
Pump Stations	138,889
Valve Sites	1,644
Permanent Access Roads	301,492
Trench Bottom Padding*	85,000
Steele City Tank Farm	12,100
TOTAL	1,066,205

*Gravel may be replaced with sand or soil.
Source: Keystone 2009c.

2.2 ABOVEGROUND FACILITIES

The proposed Project would require approximately 373 acres of land for aboveground facilities, including pump stations, delivery facilities, densitometer sites, intermediate MLVs, and the tank farm. Gravel would be used to stabilize the land for permanent facilities, including pump stations, valve sites, the tank farm, and permanent access roads. During operations, Keystone would use standard agricultural herbicides to control the growth of vegetative species on all facility sites.

2.2.1 Pump Stations

Pump stations located along the route would serve to transport the oil through the pipeline. A total of 30 new pump stations, each situated on an approximately 5 to10 acre permanent site, would be constructed; 18 would be in the Steele City Segment, 10 in the Gulf Coast Segment, and 2 in the previously permitted Keystone Cushing Extension in Kansas (Table 2.1.4-1). Pump stations would be placed along the pipeline at locations necessary to maintain adequate flow. Figures 1.1-1 and 2.1-1 to 2.1-6 show the location of the pump stations.

Each new pump station would consist of up to six pumps driven by electric motors, an electrical building, an electrical substation, two sump tanks, a remotely operated intermediate MLV, a communication tower, a small maintenance building, and a parking area for station maintenance personnel. Stations would operate on locally purchased electric power and would be fully automated for unmanned operation.

The pump stations would have an uninterruptible power supply (UPS) for all communication and specific control equipment in the case of a power failure. No backup generators at pump stations are planned and, therefore, no fuel storage tanks would be located at pump stations. Communication towers at pump stations generally would be approximately 33 feet in height, but antenna height at select pump stations may be taller as determined upon completion of a detailed engineering study. In no event would antennae exceed a maximum height of 190 feet.

The pipe entering and exiting the pump station sites would be located below grade. The pipe manifolding connected with the pump stations would be aboveground.

2.2.2 Mainline Valves

Keystone proposes to construct 74 intermediate MLV sites along the new pipeline ROW and at each pump station. When not located at a pump station, intermediate MLVs would be sectionalizing block valves (valves that divide up the pipeline into smaller segments that can be isolated in order to minimize and contain the effects of a line rupture) constructed within a fenced 30-foot by 40-foot site located on the permanent easement.

Remotely operated intermediate MLVs would be located at pump stations, at major river crossings, upstream of sensitive waterbodies and at other locations. 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. The remotely operated valves have sufficient backup power to maintain communication readings in the event of power loss. Proposed intermediate MLV locations were determined by the locations of pump stations, hydraulic profile considerations, DOT regulations, and environmental and safety concerns. Table 2.2.2-1 provides the locations of intermediate MLVs.

TABLE 2.2.2-1
Intermediate Mainline Valve Locations

Mainline Valve ID	Approximate Milepost	Associated Facilities	Land Ownership	Land Use
Steele City Segment				
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

TABLE 2.2.2-1 Intermediate Mainline Valve Locations				
Mainline Valve ID	**Approximate Milepost**	**Associated Facilities**	**Land Ownership**	**Land Use**
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
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

TABLE 2.2.2-1 Intermediate Mainline Valve Locations				
Mainline Valve ID	**Approximate Milepost**	**Associated Facilities**	**Land Ownership**	**Land Use**
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]
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 would attempt to relocate these valves out of wetlands.

Source: Keystone 2009c.

2.2.3 Pigging Facilities

The Project would utilize high-resolution internal line inspection, maintenance, and cleaning tools known as “pigs”. The Project would be designed to permit full pigging capabilities of the entire length of the pipeline, with minimal interruption of service. Pig launchers and/or receivers would be constructed and operated completely within the boundaries of the pump stations or delivery facilities (see Figures 2.2.3-1 and 2.2.3-2).

2.2.4 Densitometer Facilities

Densitometer facilities on the proposed pipeline would be equipped with densitometer/viscometer analyzers which measure the density of the product prior to delivery. Densitometer information would be incorporated into quality and custody metering located at all injection points into Keystone and at all delivery points.

Keystone proposes to install and operate four densitometer facilities located within the permanent easement: one upstream of each of the two delivery points; one upstream of the Steele City tank terminal; and one upstream of pump station 41 in order to detect batches destined for the Houston Lateral. The locations of densitometer sites are shown Table 2.2.4-1.

TABLE 2.2.4-1
Densitometer Locations

Facility	Location (County, State)	Milepost (MP)
Steele City Segment – Nebraska		
Densitometer	Saline County, NE	824.47
Gulf Coast Segment – Texas		
Densitometer	Liberty County, TX	425.91
Densitometer	Jefferson County, TX	468.03
Densitometer	Harris County, TX	41.94

Source: Keystone 2008.

2.2.5 Delivery Sites

Two crude oil delivery facilities would be installed along the proposed Project route, one at Nederland and one at Moore Junction, Texas. The delivery facilities would include pressure regulating, sampling, crude oil measurement equipment, a densitometer, a pig receiver and one quality assurance building. Metering would be installed and operated at the two delivery sites. The delivery facilities would operate on locally provided power.

2.2.6 Tank Farm

Keystone proposes to construct one tank farm on an approximately 50-acre site near the junction of the Project with the Keystone Cushing Extension in Steele City, Nebraska. The site for the tank farm would be co-located with pump station 26.

The tank farm would 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 would operate on locally purchased electricity and would be fully automated for unmanned operation.

2.2.7 Ancillary Facilities

2.2.7.1 Additional Temporary Workspace Areas

Additional temporary workspace areas would be needed for areas requiring construction staging areas and special construction techniques such as for river, wetland, and road/rail crossings; horizontal directional drill (HDD) entry and exit points; steep slopes (20 to 60 percent); and rocky soils. Temporary workspace areas would be located at the prescribed setback distance from wetland and waterbody features as determined on a site-specific basis. The location of additional temporary workspace areas would be adjusted as the Project continues to be refined.

Dimensions and acreage of typical additional temporary workspace areas are shown in Table 2.2.7-1.

TABLE 2.2.7-1
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

Source: Keystone 2009c.

2.2.7.2 Pipe Storage Sites, Railroad Sidings and Contractor Yards

Extra workspace areas away from the construction ROW would be required during construction of the Project for use as pipe storage sites, railroad sidings and contractor yards. Pipe storage sites would be required at 30-mile to 80-mile intervals and contractor yards would be required at approximately 60-mile intervals. It is estimated that 40 pipe storage yards and 19 contractor yards would be required for the proposed Project. Table 2.2.7-2 provides the locations and acreage of potential pipe storage yards and contractor yards.

TABLE 2.2.7-2
Locations and Acreage of Potential Pipe Storage 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

TABLE 2.2.7-2 Locations and Acreage of Potential Pipe Storage Sites, Railroad Sidings, and Contractors Yards		
State/Type of Yard	**Counties**	**Combined Acreage[1]**
Pipe Storage Sites (9)	Phillips, Valley (2), McCone (2), Dawson (2), Fallon (2)	269
South Dakota		
Contractor Yards (5)	Gregory, Haakon, Harding, Meade, Jones	151
Railroad Siding (5)[2]	Butte, Pennington (2), Stanley, Hutchinson	100
Pipe Storage 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 Storage Sites (9)	Keya Paha, Holt, Wheeler, Greeley, Nance, Hamilton, Fillmore, Jefferson (2)	274
Kansas		
Contractor Yards	None	0
Pipe Storage Sites	None	0
Oklahoma		
Contractor Yards (1)	Hughes	27
Railroad Siding (3)[2]	Grady, Pittsburg, Pottawatomie	110
Pipe Storage 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 Storage 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.

Source: Keystone 2009c.

Pipe storage sites along the pipeline route would occupy approximately 30 acres and would typically be located in proximity to railroad sidings. Contractor yards would also occupy approximately 30 acres and would reduce equipment transportation requirements during construction. Existing commercial/industrial sites or sites that were previously used for construction would be preferred for these sites.

Existing public or private roads would be used to access each yard. Both pipe storage sites and contractor yards would be used on a temporary basis and would be reclaimed, as appropriate, upon completion of construction.

2.2.7.3 Fuel Transfer Stations

Fuel storage would be established at approved contractor yards and pipe storage sites. No separate fuel stations would be constructed. Fuel would be transported daily by fuel trucks from the yards to the construction area for equipment fueling.

The fuel storage system would consist of:

- Temporary aboveground 10,000 to 20,000 gallon skid-mounted tanks and/or 9,500 gallon fuel trailers;
- Rigid steel piping;
- Valves and fittings;
- Dispensing pumps; and
- Secondary containment structures.

The fuel storage system would be contained within a secondary containment structure providing 110 percent containment volume of the storage tanks or trailers. Containment structures would consist of sandbags or earthen berms with a chemically resistant membrane liner. Typical diesel and gasoline fuel storage systems are shown in Figures 2.2.7-1 and 2.2.7-2.

The total storage capacity would vary from yard to yard, depending on daily fuel requirements. Typically, a two to three day supply of fuel would be maintained in storage, resulting in approximately 30,000 gallons in storage volume at each fuel storage location.

Prior to the receiving or off-loading of fuel, the trucks and equipment would be grounded to eliminate static electricity potential. The distributor would connect a petroleum-rated hose from the delivery tanker to the fill line at the fill truck connection. The fill truck connection and fill line would consist of a cam-loc connection followed by a block valve, rigid steel piping, tank block valve(s) and check valve(s) just upstream of the connection to the tank. Off-loading of fuel would be accomplished by a transfer pump powered by the delivery vehicles power take-off. For dispensing gasoline and on-road diesel, the transfer pump would be a dispensing pump with petroleum-rated hoses with automatic shut-off nozzles. The fuel transfer pump would be equipped with an emergency shut-off at the pump and a secondary emergency shut-off at least 100 feet away.

Vehicle maintenance would be performed at the contractor's yard or at local vehicle maintenance repair shops.

2.2.7.4 Construction Camps

Areas within Montana and South Dakota lack adequate temporary housing in the proposed Project vicinity, as further discussed in Section 3.10. Additional temporary housing would be installed in these remote locations to provide accommodations for workers during the construction phase of the Project. It is anticipated that four temporary construction camps would be needed. These camps would be located in the general vicinity of Nashua and Baker, Montana, and Union Center and Winner, South Dakota. These locations would be permitted, constructed, and operated in compliance with applicable county, state, and federal regulations. The regulations and permits required for construction camps are summarized in Table 2.2.7-3.

TABLE 2.2.7-3 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 (e.g. if the site is less than 20 acres), 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. Air Quality Permits, Title 17, Chapter 8, Subchapter 7. Air Quality Permits would be required for sources that have potential emissions that exceed 25 tpy unless exemptions exist and are met for temporary non-road engines.
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 would be required for waste water discharge.
South Dakota Administrative Rules	Air Quality Permit, Chapters 74:36:04-05. The diesel-fired generator engines and emergency back-up generators at each camp in South Dakota would require a minor operating permit, unless exemptions exist and are met for temporary nonroad engines.
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.

Source: Keystone 2009c.

Each construction camp site would need approximately 80 acres of land, of which 30 acres would be used as a contractor yard, and 50 acres for housing and administration.

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

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

2.2.7.5 Access Roads

The proposed Project would use existing public and private roads to provide access to most of the construction ROW. Paved roads would not likely require improvement or maintenance prior to or during construction. However, the road infrastructure would be inspected prior to construction to ensure that the roads, bridges and cattle guards would be able to withstand oversized vehicle use during construction. Gravel roads and dirt roads may require maintenance during the construction period due to high use. Road improvements such as blading and filling would be restricted to the existing road footprint. To the extent Keystone is required to conduct maintenance of any county roads, it would be done pursuant to an agreement with the applicable county. In the event that oversized or overweight loads would be needed to transport construction materials to the Project work spreads, Keystone would submit required permit applications to the appropriate state regulatory agencies.

Construction of some temporary roads would be required in addition to upgrading of existing roads. Approximately 400 temporary access roads are needed to provide adequate access to the construction sites. Private roads and any new temporary access roads would be used and maintained only with permission of the landowner or land management agency. Some short, permanent access roads from public roads to the proposed tank farm, pump stations, delivery facilities, and intermediate MLVs would also be necessary. Approximately 50 permanent access roads would be needed.

Prior to construction, the location of new permanent access roads would be finalized. At a minimum, construction of new permanent access roads would require completion of cultural resources and biological surveys, along with the appropriate SHPO and USFWS consultations and approvals. Other state and local permits also could be required prior to construction. Maintenance of newly created access roads would be the responsibility of Keystone.

The areas of disturbance for access roads are included in the summary of lands affected, in Table 2.1.4-1. Access road temporary and permanent disturbance estimates are based on 30-foot roadway width required to accommodate oversized vehicles. All non-public roads are conservatively estimated to require upgrades and maintenance during construction.

2.3 PIPELINE SYSTEM DESIGN AND CONSTRUCTION PROCEDURES

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

Keystone has also prepared a draft Construction Mitigation and Reclamation (CMR) Plan (Appendix B) that details the construction methods and environmental protection measures committed to by Keystone to reduce Project construction impacts.

An additional USDOT/PHMSA/OPS requirement that would be met prior to federal government approval of pipeline construction would be the preparation a Spill Prevention, Control, and Countermeasure (SPCC) Plan to avoid or minimize the potential for harmful spills and leaks during construction of the proposed pipeline system. In addition, the preparation of an Emergency Response Plan (ERP) would also be required prior to pipeline operation. A draft version of the SPCC submitted by Keystone is included as Appendix C.

2.3.1 Pipeline Design Parameters

The pipeline would be constructed of high-strength steel pipe and mill-inspected by an authorized owner's inspector and mill-tested to API 5L (American Petroleum Institute [API] 5L[1]) specification requirements. Table 2.3.1-1 outlines the selected design parameters applicable to the proposed pipe. The current design is based on grade X70 pipe, but Keystone is also evaluating the use of X80. Use of either grade pipe would meet or exceed federal standards (49 CFR 195.106). An external coating (Fusion-Bonded Epoxy, or FBE) would be applied to the pipeline and all buried facilities. Cathodic protection would be provided by impressed current to protect against external corrosion. As per 49 CFR Part 195, the pipeline would be required to have cathodic protection (CP) systems in conjunction with external coatings to mitigate against soil side corrosion. For this Project, the primary impressed current CP systems would be rectifiers coupled to semi-deep vertical anode beds at every pump station, as well as rectifiers coupled to deep-well anode beds at selected intermediate mainline valve sites. The rectifiers would be variable output transformers which would convert incoming AC power to DC voltage and current to provide the necessary current density to the CP design structures. The rectifiers would have a negative cable connection to the design structure and a positive cable connection to the anode beds. The anode beds would consist of high silicon cast iron anodes backfilled with a highly conductive coke powder to allow for an expected anode minimum life of 20 years. During operations, the CP system would be monitored and remediation performed to prolong the anode bed and systems. The semi-deep anode beds would be 12-inch diameter vertical holes spaced at 15 feet apart with a bottom hole depth of approximately 45 feet. The deep-well anode bed would be a single 12-inch diameter vertical hole with a bottom hole depth of approximately 300 feet. All pipe would be manufactured, constructed, and operated in accordance with applicable federal, state and local regulations.

TABLE 2.3.1-1
Pipe Design Parameters and Specification

Pipe Design Parameters	Specification
Material code	API 5L-PSL2-44th Edition
Material grade thousand pounds of pressure per square inch (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

[1] The American Petroleum Institute (API) 5L test standard is used to determine the fracture ductility of metal line pipe. Specimens are cut from sections of pipe, soaked at a prescribed temperature and tested within 10 seconds.

TABLE 2.3.1-1 Pipe Design Parameters and Specification	
Pipe Design Parameters	**Specification**
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)
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 proposed Project pipeline system is based on a maximum 1,440 pounds per square inch gauge (psig) discharge pressure at each pump station. The pump station discharge pressure would be a maximum of 1,440 psig. There would be situations where, due to elevation changes, the hydraulic head created would result in a MOP up to and including 1,600 psig. Suction pressure at the pump stations is generally on the order of 200 psig.

Source: Keystone 2009c, Keystone 2009f.

Additionally, Keystone filed an application with PHMSA, to design, construct and operate the proposed Project using a design factor and operating stress level of 80 percent of the steel pipe's specified minimum yield strength (SMYS) in certain areas in lieu of the otherwise applicable 72 percent of SMYS. Keystone's application for a special permit includes additional measures to ensure pipeline safety including over 50 conditions for the design and operation of the pipeline. PHMSA included those conditions in its approval of a similar permit in connection with the Keystone Pipeline Project, saying that those measures "provide a level of safety equal to, or greater than, that which would be provided if the pipelines were operated under existing regulations."

2.3.2 Planned Pipeline Construction Procedures

Once engineering surveys of the ROW centerline and additional temporary workspace areas have been finalized, and the acquisition of ROW easements and any necessary acquisitions of property in fee have been completed, construction would begin.

The pipeline would be constructed in 17 spreads, beginning with the Gulf Coast Segment in 2010, then the Houston Lateral in 2012 and finishing with the completion of the Steele City Segment in 2012. Figure 2.3.2-1 shows the location and timing of each spread. The Steele City Segment pipeline would be 36-inches in diameter and approximately 851 miles in length. The pipeline would be constructed in 2011 and 2012 in 10 mainline spreads between approximately 80 and 94 miles in length. The Gulf Coast Segment pipeline would be 36-inches in diameter and approximately 480 miles in length. The pipeline would be constructed in 2010 and 2011 in six mainline spreads from 47 to 99 miles in length. The 36 inch diameter Houston Lateral would be approximately 49 miles in length and would be constructed in one mainline spread in 2012,

Pipeline construction would generally proceed as a moving assembly line composed of specific activities including surveying and staking of the ROW, clearing and grading, pipe stringing, bending, trenching, welding, installing, backfilling, hydrostatic testing, and cleanup, as outlined in the subsections below and illustrated in Figure 2.3.2-2. In addition, special construction techniques would be used for specific site conditions such as rugged terrain, waterbodies, wetlands, paved roads, highways, and railroads. These non-standard pipeline construction procedures are described in more detail in Section 2.3.3.

On the Steele City Segment, construction is planned to continue into the winter months for as long as the weather permits. On the Gulf Coast Segment and the Houston Lateral, construction is planned for the winter months and the prevailing climate should not require the use of winter construction techniques.

Typical construction equipment to be used for each construction activity per spread, and an estimate of the minimum equipment needs are summarized in Table 2.3.2-1. Actual equipment used would depend upon the construction activity and specific equipment owned by selected contractors.

TABLE 2.3.2-1
Minimum Equipment Required for 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

TABLE 2.3.2-1
Minimum Equipment Required for Construction Activities

Activity	Minimum Equipment
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; • 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)

Source: Keystone 2009c.

In addition to the equipment listed in Table 2.3.2-1, the following resources would typically 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 would be conducted during daylight hours, with the following exceptions:

- Completion of critical tie-ins on the ROW would 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.

2.3.2.1 Surveying and Staking

Before construction begins, the construction ROW boundaries and any additional temporary workspace areas would be marked. This would outline the limits of the approved work area. The location of approved access roads and existing utility lines would be flagged. Landowner fences would be braced and cut, and if livestock is present, temporary gates and fences would be installed. Wetland boundaries and other environmentally sensitive areas would be marked or fenced for protection. A survey crew would stake the centerline of the proposed trench and any buried utilities along the ROW.

2.3.2.2 Clearing and Grading

Prior to vegetation removal along slopes leading to wetlands and riparian areas, temporary erosion control measures such as silt fences or straw bales would be installed. The work area would be cleared of vegetation including crops and obstacles such as trees, logs, brush, or rocks.

Grading would be performed where necessary to provide a reasonably level work surface. Where the ground is relatively flat and does not require grading, rootstock would be left in the ground. More extensive grading would be required in steep slope areas to prevent excessive bending of the pipe.

2.3.2.3 Trenching

Trench excavation would typically be to depths of between 7 to 8 feet with a trench width of approximately 4 to 5 feet. With a pipeline external diameter of 36 inches, there would be approximately 4 feet of cover over the pipeline after backfilling, in most cases. By USDOT regulation a minimum cover depth of 30 inches is required except in rocky areas where cover depth can be reduced to approximately 18 inches. In areas of consolidated rock, Keystone proposes a minimum depth of cover of 36 inches, and in all other areas, the depth of cover would be a minimum of 48 inches. Table 2.3.2-2 provides the depth of cover that would be used in particular locations.

TABLE 2.3.2-2
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

Source: Keystone 2009c.

Trenching may be carried out before or after bending and welding, depending upon several factors including soil characteristics, water table, presence of drain tiles, and weather conditions at the time of construction.

In areas of rocky soils or bedrock, tractor-mounted mechanical rippers or rock trenchers would fracture the rock prior to excavation. Blasting with explosives would be required where mechanical equipment cannot break up or loosen the bedrock. The bottom of the trench would then be padded with borrow material such as sand or gravel, and excavated rock would be used to backfill the trench to the top of the existing bedrock profile. Blasting is described in more detail in Section 2.3.3.8.

The actual depth of topsoil would be removed from the trench up to a maximum depth of 12 inches and segregated. Topsoil would be separated from subsoil in three different methods:

- Trench area topsoil separation – When soil is removed from only the trench, topsoil would be piled on the near-side of the trench and subsoil on the far side of the trench. This separation would allow for proper restoration of the soil during the backfilling process.
- Trench and spoil side topsoil separation – When soil is removed from both the trench and the spoil side, topsoil would be stored on the near-side of the construction ROW edge, and the subsoil on the spoil-side of the trench.
- ROW grading topsoil separation – ROW grading may occur to provide a level working surface, where it is beneficial from a construction standpoint, or where required by landowners or land managers. Where grading occurs and there is a need to separate topsoil from subsoil, topsoil would be removed from the entire area to be graded and stored separately from the subsoil.

These arrangements for separating topsoil reduce the potential for mixing of subsoil and topsoil. In addition, the spoil piles would be spaced to accommodate storm water runoff. Figures 2.1.4-1 to 2.1.4-3 illustrate these options.

On agricultural land, rocks that are exposed on the surface due to construction activity would be removed from the ROW prior to and after topsoil replacement. Rock removal would also occur in rangeland to ensure that the productive capability of the land is maintained. In some landscapes, thin soils overlay bedrock, or exposed bedrock exists at the surface. In these cases, rock would be replaced to the extent practicable. Clearing of rocks could be carried out either manually or with a mechanical rock picker and topsoil would be preserved. Rocks that are similar in size to those occurring in the undisturbed landscape would be left in place to the extent practicable. Rock removed from the ROW would be either hauled away for disposal in appropriate facilities or placed in a location acceptable to the landowner.

2.3.2.4 Pipe Stringing, Bending, and Welding

Pipe stringing, bending, and welding would be done either prior to, or following trenching. Sections of externally coated pipe approximately 80 feet long (also referred to as “joints”) would be transported by truck to the ROW and placed along the ROW. Individual sections of the pipe would then be bent to conform to the contours of the trench using a track-mounted, hydraulic pipe-bending machine. For larger bend angles, fabricated bends may be used.

After the pipe sections are bent, the pipeline joints would be lined up and held in position until welding. The joints would be welded together into long strings and placed on temporary supports. All welds would be inspected using non-destructive radiographic, ultrasonic, or other USDOT approved methods. Welds that do not meet established specifications would be repaired or removed and replaced. Once the welds are approved, a protective epoxy coating would be applied to the welded joints to inhibit corrosion.

The pipeline would then be electronically inspected or "jeeped" for faults or holidays (holes) in the epoxy coating and visually inspected for any faults, scratches, or other coating defects. Damage to the coating would be repaired before the pipeline is lowered into the trench.

In rangeland areas used for grazing, construction activities can hinder the movement of livestock if the animals cannot be temporarily relocated by the owner. Construction activities may also hinder the movement of wildlife. To reduce impacts to livestock and wildlife movements during construction, Keystone would leave hard plugs (short lengths of unexcavated trench) or install soft plugs (areas where the trench is excavated and replaced with minimal compaction) to allow livestock and wildlife to cross the trench safely. Soft plugs would be constructed with a ramp on each side to facilitate egress from the trench for animals that may fall into the trench. Generally the work carried out on each construction spread would be synchronized with the welding activities to minimize the amount of open trench, to the extent possible.

2.3.2.5 Installing and Backfilling

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

Where rock occurs within the trench perimeter, abrasion resistant coatings or rock shields would be used to protect the pipe prior to installation. In some cases sand or gravel padding material may be used to protect the pipeline from damage during installation. In no case would topsoil be used as a padding material. The pipeline would then be lowered into the trench and the trench would be backfilled using the excavated material. Topsoil would be returned to its original position after subsoil is backfilled in the trench.

2.3.2.6 Hydrostatic Testing

The pipeline would be hydrostatically tested in sections of approximately 30 to 50 miles. Hydrostatic testing provides assurance that the system is capable of withstanding the maximum operating pressure. The hydrostatic test would be conducted in accordance with 49 CFR Part 195. The process is as follows:

- Isolate the pipe segment with test manifolds;
- Fill the segment with water;
- Pressurize the segment to a minimum of 1.25 times the maximum operating pressure (MOP) at the high point elevation of each test section; and
- Maintain that pressure for a period of eight hours.

Fabricated assemblies could be tested prior to installation in the trench for a period of four hours.

The pipeline would be hydrostatically tested after backfilling and all construction work that would directly affect the pipe is complete. If leaks are found, they would be repaired and the section of pipe retested until specifications are met.

Water for hydrostatic testing would be obtained from rivers and streams crossed by the pipeline and in accordance with federal, state, and local regulations. This water would then be transferred to another pipe segment for subsequent hydrostatic testing. Alternately, the water would be discharged after it is tested to ensure compliance with the NPDES discharge permit requirements and treated if necessary.

Hydrostatic test water would be discharged either to the source waterbody after testing to ensure that discharge water meets the requirements of the applicable NPDES discharge permit, or it would be discharged to a suitable upland area within the same water basin as the source waterbody. To reduce the velocity of the discharge to upland areas, energy dissipating devices would be employed. Energy dissipation devices that are consistent with Best Management Practices (BMP) protocols include:

- Splash Pup – A splash pup consists of a piece of large diameter pipe (usually over 20-inch outside diameter) of variable length with both ends partially blocked that is welded perpendicularly to the discharge pipe. As the discharge hits against the inside wall of the pup, the velocity is rapidly reduced and the water is allowed to flow out either end. A variation of the splash pup concept, commonly called a diffuser, incorporates the same design, but with capped ends and numerous holes punched in the pup to diffuse the energy.
- Splash Plate – The splash plate is a quarter section of 36-inch pipe welded to a flat plate and attached to the end of a 6-inch discharge pipe. The velocity is reduced by directing the discharge stream into the air as it exits the pipe. This device is also effective for most overland discharge.
- Plastic Liner – In areas where highly erodible soils exist or in any low flow drainage channel, it is a common practice to use layers of visqueen (or any of the new construction fabrics currently available) to line the receiving channel for a short distance. One anchoring method may consist of a small load of rocks to keep the fabric in place during the discharge. Additional methods, such as the use of plastic sheeting or other material to prevent scour would be used as necessary to prevent excessive sedimentation during dewatering.
- Straw Bale Dewatering Structure – Straw bale dewatering structures are designed to dissipate and remove sediment from the water being discharged. Straw bale structures could be used for on land discharge of wash water and hydrostatic test water and in combination with other energy dissipating devices for high volume discharges. A dewatering filter bags may be used as an alternative to straw bale dewatering structures.

Hydrostatic test water would not be discharged into state-designated exceptional value waters, waterbodies which provide habitat for federally-listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate federal, state, and local permitting agencies grant written permission. To avoid impacts from introduced species, no inter-basin transfers (discharge) of hydrostatic test water would occur. Water would be disposed of using good engineering judgment so that all federal, state, and local environmental standards are met. Dewatering lines would be of sufficient strength and would be securely supported and tied down at the discharge end to prevent whipping during discharge.

2.3.2.7 Pipe Geometry Inspection, Final Tie-ins, and Commissioning

Prior to final tie-ins, the pipeline would be inspected using an electronic caliper (geometry) pig to ensure the pipeline does not have any dents or other deformations that might hinder effective operation of the pipeline. Following successful hydrostatic testing, test manifolds would be removed and the final pipeline tie-ins would be welded and inspected.

After the final tie-ins are complete and inspected, the pipeline would be cleaned and dewatered and the pipeline would be commissioned through the verification of proper installation and functionality of the pipeline and appurtenant systems, including control and communication equipment.

2.3.2.8 Cleanup and Restoration

Cleanup would include the removal of construction debris, final contouring, and the installation of erosion control features. The cleanup process would begin after backfilling as soon as possible given weather conditions. Final cleanup would be completed in approximately 20 days after the completion of backfilling assuming appropriate weather conditions prevail. Removed construction debris would be disposed in appropriate disposal facilities.

Reseeding of the ROW would occur as soon as possible after completion of cleanup, thus stabilizing soil profiles rapidly. Work would also include revegetation and restoration of native vegetation where appropriate. Procedures would depend on weather and soil conditions and would follow recommended rates and seed mixes provided by the landowner, the land management agency, or the Natural Resources Conservation Service (NRCS).

Access to the permanent easement would be restricted using gates, boulders, or other barriers to minimize unauthorized access by all-terrain vehicles, if requested by the landowner. Also, pipeline markers would be provided for identification of the pipeline location for safety purposes, in accordance with the requirements of the DOT Regulations at 49 CFR Section 195.410 (Line Markers), which would be maintained during pipeline operation, including the following:

- Pipeline markers would be installed on both sides of all highways, roads, road ROWs, railroads and waterbody crossings;
- Pipeline markers would be made from industrial strength materials to withstand abrasion from wind and damage from cattle;
- Pipeline markers would be installed at all fences;
- Pipeline markers would be installed along the ROW to provide line-of-sight marking of the pipeline, providing it is practical to do so and consistent with the type of land use, such that it does not hinder the use of the property by the landowner. Pipeline markers would be installed at all angle points, and at intermediate points, where practical, so that from any marker, the adjacent marker in either direction would be visible;
- Consideration would be given to installing additional markers, except where they would interfere with land use (i.e., farming);
- Aerial markers showing identifying numbers would be installed at each station, mainline valve, and mainline check valve site; and
- Signs would be installed and maintained on the perimeter fence at each mainline valve and pump stations where the pipeline enters and exits the fenced area.

Markers would identify the owner of the pipeline and convey emergency contact information. Special markers providing information and guidance to aerial patrol pilots also would be installed.

2.3.2.9 Post-Construction Reclamation Monitoring and Response

Reclamation on the ROW would be inspected after the first growing season to determine the success of revegetation and noxious weed control. Erosion would be repaired and areas that were unsuccessfully re-established would be revegetated by Keystone or by compensation of the landowner to reseed as necessary. For further information on re-vegetation and weed control, please refer to the CMR Plan, attached as Appendix B. Landowners would be informed of all work anticipated during monitoring.

2.3.3 Special Construction Procedures

Special construction techniques would 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.

2.3.3.1 Road, Highway, and Railroad Crossings

Construction across paved roads, highways, and railroads would be in accordance with the requirements of the appropriate road and railroad crossing permits and approvals. In general, all major paved roads, all primary gravel roads, highways, and railroads would be crossed by boring beneath the road or railroad, as shown in Figure 2.3.3-1. Boring would result in minimal or no disruption to traffic at road or railroad crossings. Each boring would take one to two days for most roads and railroads, and 10 days for long crossings such as interstate or four-lane highways.

Initially, a pit would be excavated on each side of the feature, then boring equipment would be placed into the pit and a hole would be bored under the road at least equal to the diameter of the pipe. Then, a prefabricated pipe section would be pulled through the borehole. For long crossings, sections would be welded onto the pipe string just before being pulled through the borehole.

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

2.3.3.2 Pipeline, Utility, and Other Buried Feature Crossings

Keystone and its pipeline contractors would comply with DOT regulations, utility agreements, and industry BMPs with respect to utility crossing and separation specifications. One-call notification would be made for all utility crossings so respective utilities would be identified accordingly. Similarly, private landowners would be notified of forthcoming construction activities so that buried features such as stock watering systems could be avoided or replaced. Prior to construction, each rancher with a stock watering system would be asked to provide the location of any waterlines in the construction area. The location of these waterlines would be documented and some waterlines would be lowered prior to construction. In the case of existing buried oil or gas pipelines, the owner of the facility would be asked to provide the locations of any pipes in the construction area. Metallic pipelines would be located by a line locating crew prior to construction.

Unless otherwise specified in a crossing agreement, the contractor would excavate to allow installation of the pipeline across the existing pipeline or utility with a minimum clearance of 12 inches. The clearance would be filled with sandbags or suitable fill material to maintain the clearance. Backfill of the crossing would be compacted in lifts to ensure continuous support of the existing utility.

For some crossings, the owner of the utility or buried feature may require the facility to be excavated and exposed by their own employees prior to the Keystone contractor getting to the location. In those cases, Keystone would work with owners to complete work to the satisfaction of the owner.

Where the owner of the utility does not require pre-excavation, generally, the pipeline contractor would locate and expose the utility before conducting machine excavation.

2.3.3.3 Steep Terrain

Where the proposed pipeline route would traverse steep slopes, they would be graded to reduce slope angles, thus allowing safer operation of construction equipment and reducing the degree of required pipe bending. In areas where the pipeline route crosses side slopes, cut and fill grading would potentially be employed to obtain a safe working terrace. Prior to cut and fill grading on steep terrain, topsoil would be stripped from the ROW and stockpiled. If feasible given soil and slope conditions, soil from the high side of the ROW would be excavated and moved to the low side, thus creating a safer and more level working surface. After the pipeline installation, soil from the low side of the ROW would be returned to the high side and the contour of the slope would be restored to its pre-construction condition to the degree practicable.

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

Seed would then be applied to steep slopes and the ROW would be mulched with hay or non-brittle straw, or protected with erosion control geofabrics. Where appropriate to avoid animal entanglement, geofabric mesh size would be 2-inches or greater. Sediment barriers would be maintained across the ROW until permanent vegetation is established. Additional temporary workspaces may be required for storage of graded material and/or topsoil during construction.

2.3.3.4 Unstable Soils

Special construction techniques and environmental protection measures would be applied to areas with unstable soils, such as those within the Sand Hills region of South Dakota and Nebraska, and to areas with high potential for landslides, erosion, and mass wasting. Construction in these areas could require extended temporary workspace areas.

Topsoil piles would be protected from erosion through matting, mulching, watering or tackifying to the extent practicable. Photodegradable matting would be applied on steep slopes or areas prone to extreme wind exposure such as north- or west-facing slopes and ridge tops. Biodegradable pins would be used in place of metal staples to hold the matting in place.

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

2.3.3.5 Perennial Waterbody Crossings

A total of 341 perennial waterbodies would be crossed during the construction of the proposed Project. One of four techniques would be used to cross perennial waterbodies: the open-cut wet method, the dry flume method, the dry dam-and-pump method, or, HDD, as described below. For each perennial waterbody crossing, a site specific engineering and geomorphologic analysis would determine the best method to use to avoid and reduce aquatic impacts. The actual crossing method employed at an individual perennial stream would depend on permit conditions from USACE and other relevant regulatory agencies, as well as additional conditions that may be imposed by landowners or land managers at the crossing location. See Appendices D and E for Site Specific Waterbody Crossing Plans and Waterbody Crossing Tables.

Open-Cut Crossing Method

Keystone's preferred crossing method would be the open-cut crossing method. This method would involve trenching through the waterbody while water continues to flow through the construction work area. Backhoes operating from one or both banks would excavate the trench within the streambed. In wider rivers, in-stream operation of equipment could be necessary. Trench spoil excavated from the streambed generally would be placed at least 10 feet away from the water's edge unless stream width exceeds the reach of the excavation equipment. Sediment barriers would be installed where necessary to prevent excavated spoil from entering the water. Hard or soft trench plugs would be placed to prevent the flow of water into the upland portions of the trench. Before construction, temporary bridges (e.g., subsoil fill over culverts, timber mats supported by flumes, railcar flatbeds, flexi-float apparatus) would be installed across all perennial waterbodies to allow construction equipment to cross with reduced disturbance. Clearing crews would be allowed one pass through the waterbodies prior to temporary bridge construction. All other construction equipment would be required to use the bridges.

Pipe segments for the crossing would be welded and positioned adjacent to the waterbody. When crossing saturated wetlands with flowing waterbodies using the open-cut method, the pipe coating would be covered with reinforced concrete or concrete weights to provide negative buoyancy. The need for negative buoyancy would be determined by detailed design and site considerations at the time of construction.

After the trench is excavated, the pipeline segment would be carried, pushed, or pulled across the waterbody and positioned in the trench. The trench would then be backfilled with native material or with imported material if required by applicable permits. Following backfilling, the banks would be restored and stabilized.

Dry Flume Method

The proposed Project would utilize the dry flume method where technically feasible on selected environmentally sensitive waterbodies. The dry flume crossing method involves diverting the flow of water across the trenching area through one or more flume pipes placed in the waterbody. Trenching, pipe installation, and backfilling would be done while water flow is maintained for all but a short reach of the waterbody at the actual crossing location. Once backfilling is completed, the stream banks would be restored and stabilized and the flume pipes would be removed.

Dry Dam-and-Pump Method

The proposed Project would potentially use the dry dam-and-pump method where practical on selected environmentally sensitive waterbodies. The dam-and-pump method is similar to the dry flume method except that pumps and hoses would be used instead of flumes to move water around the construction work area. As with the dry flume method, trenching, pipe installation, and backfilling would be done while water flow is maintained for all but a short reach of the waterbody at the actual crossing location. Once backfilling is completed, the stream banks would be restored and stabilized and the pump hoses would be removed.

Horizontal Directional Drilling Method

The HDD method of construction would be used at 38 waterbody crossings for the proposed Project, as shown in Table 2.3.3-1. The HDD method could also be used to bore beneath terrestrial areas that contain special resources that require avoidance.

Waterbodies Keystone has considered for HDD 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 and railroads, and sensitive environmental resource areas. Additional HDD crossings could be planned as a result of resource agency, landowner, or land manager concerns. The HDD method involves drilling a pilot hole under the waterbody and banks, then enlarging the hole through successive ream borings with progressively larger bits until the hole is large enough to accommodate a pre-welded segment of pipe. Throughout the process of drilling and enlarging the hole, a water-bentonite slurry would be circulated to 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 would be staged and welded along the construction work area on the opposite side of the waterbody and then pulled through the drilled hole. Depending on the angle of approach of the pipeline alignment to the water crossing, a "false ROW" could be needed to be cleared on the drill rig side of the crossing to allow drill rig placement at the appropriate angle to the waterbody. Ideally, use of the HDD method results in reduced impact to the banks, bed, and/or water quality of the waterbody being crossed. Keystone has created Site Specific Waterbody Crossing Plans (Appendix D) that detail procedures at each HDD water crossing to reduce potential risks.

TABLE 2.3.3-1
Waterbodies Crossed Using the Horizontal Directional Drill 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

TABLE 2.3.3-1 Waterbodies Crossed Using the Horizontal Directional Drill Method		
Waterbody	**Number of Crossings**	**Approximate Milepost(s)**
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
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

Source: Keystone 2009c.

2.3.3.6 Intermittent Waterbody Crossings

Approximately 621 intermittent waterbodies would be crossed by the proposed Project (Appendix E). In the event that these intermittent waterbodies are dry or stagnant at the time of crossing, conventional upland cross-country construction techniques would be used. The pipeline would be installed with the open-cut wet crossing method if water is flowing at the time of installation. The specific method used for each crossing would be based on site-specific analyses of conditions at the time of installation so that the method selected would result in lower levels of environmental impact.

Required additional temporary workspace areas would 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. This distance is what a standard backhoe can reach and would prevent the need for additional equipment to relay the soil a further distance from the trench. For construction access, temporary bridges, including subsoil fill over culverts, timber mats supported by flumes, railcar flatbeds, and flexi-float apparatus would be installed across waterbodies. Clearing crews would be allowed one pass through the waterbodies prior to temporary bridge construction. All other construction equipment would be required to use the bridges.

To minimize the potential for sediment runoff during clearing, sediment barriers such as silt fence and staked straw bales would be installed and maintained on drainages across the ROW adjacent to waterbodies and within additional temporary workspace areas. Silt fences and straw bales located across the working side of the ROW would be removed during the day when vehicle traffic is present and would be replaced each night. Drivable berms would potentially be installed across the ROW instead of silt fences or straw bales.

After pipeline installation, stream banks would be restored to preconstruction contours or to a stable configuration. Stream banks would be seeded with native grasses for stabilization, and mulched or covered with erosion control fabric. Where willows or other shrubs are found at the crossing site, revegetation efforts could include planting of willow sprigs or other methods to establish a stable stream bank. Steep bank erosion control measures would be installed as necessary in accordance with permit requirements, including rock riprap, gabion baskets (rock enclosed in wire bins), log walls, vegetated geogrids, willow cuttings, or alternative wood-based structures where required by regulatory authorities. Banks would be temporarily stabilized within 24 hours of completing in-stream construction. Sediment barriers, such as silt fences, straw bales or drivable berms, would be maintained across the ROW at all stream or other waterbody approaches until permanent vegetation becomes established. Temporary equipment bridges would be removed following construction.

Equipment refueling and lubricating at waterbodies would take place in upland areas 100 feet or more from the water. In the event that equipment refueling and lubricating becomes necessary within 100 feet of a wetland or waterbody, the SPCC Plan would be adhered to relative to the handling of fuel and other hazardous materials.

2.3.3.7 Wetland Crossings

Pipeline construction across wetlands would be similar to typical conventional upland cross-country construction procedures, with modifications to reduce the potential for affects to wetland hydrology and soil structure. The wetland crossing methods used would depend largely on the stability of the soils at the location at time of construction. In some areas where wetlands overlie rocky soil, the pipe would be padded with rock-free soil or sand before backfilling with native bedrock and soil.

Clearing of vegetation in wetlands would be limited to flush-cutting of trees and shrubs and their subsequent removal from wetland areas. Stump removal, grading, topsoil segregation, and excavation would be limited to the area immediately over the trench line. During clearing, sediment barriers, such as silt fences and staked straw bales, would be installed and maintained on slopes adjacent to saturated wetlands and within additional temporary workspace areas as necessary to reduce sediment runoff. Tall growing vegetation would be allowed to regrow in riparian areas in the temporary ROW, but not in the permanent ROW.

For unsaturated soils able to support construction equipment without equipment mats, construction would occur in a manner similar to conventional upland cross-country construction techniques. Topsoil would be segregated over the trench line.

Push-Pull Technique

Where wetland soils are saturated or inundated, the pipeline could be installed using the push-pull technique. The push-pull installation process would involve stringing and welding the pipeline outside of the wetland. Excavating and backfilling the trench would be done using a backhoe supported by equipment mats or timber riprap. Trench breakers would be installed where necessary to prevent the subsurface drainage of water from wetlands. The pipeline segment would be installed in the wetland by equipping it with floats and pushing or pulling it across the water-filled trench. After the pipeline is floated into place, the floats would be removed and the pipeline would sink into place. Most pipes installed in saturated wetlands would be coated with concrete or installed with set-on weights to provide negative buoyancy. Where topsoil has been segregated from subsoil, the subsoil would be backfilled first followed by the topsoil. Restoration of contours would be accomplished during backfilling because little or no grading would occur in wetlands.

Construction equipment working in saturated wetlands would be limited to that area essential for clearing the ROW, excavating the trench, welding 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 would be allowed to travel through wetlands only if the ground is firm enough or has been stabilized to avoid rutting. Additional temporary workspace areas would be required on both sides of particularly wide saturated wetlands to stage construction, weld the pipeline, and store materials. These additional temporary workspace areas would be located in upland areas a minimum of 10 feet from the wetland edge. This distance is what a standard backhoe can reach and would prevent the need for additional equipment to make multiple trips to and from the wetland to ferry the soil a further distance away.

Equipment mats, timber riprap, gravel fill, geotextile fabric, and straw mats would 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 would be removed. Topsoil would be replaced to the original ground level leaving no crown over the trench line and any excess spoil would be removed from the wetland.

Where wetlands are located at the base of slopes, permanent slope breakers would be constructed across the ROW in upland areas adjacent to the wetland boundary. Temporary sediment barriers would be installed where necessary until revegetation of adjacent upland areas is successful. Once revegetation is successful, sediment barriers would be removed from the ROW and disposed of properly. Final locations requiring weighted pipe for negative buoyancy would be determined by detailed design and site conditions at the time of construction.

2.3.3.8 Blasting and Ripping

Blasting could be required where the bedrock type within 84 inches (7 feet) of the surface is lithic or very strongly cemented rock. Blasting would involve the use of explosives to break up the hard rock. Blasting could be required in areas where consolidated shallow bedrock or boulders cannot be removed by conventional excavation methods and could be needed to clear the ROW and to fracture rock within the ditch. In areas where the bedrock type within 84 inches (7 feet) of the surface is expected to be dense or highly stratified, ripping could be required. Ripping would involve tearing up the rock with mechanical excavators. Table 2.3.3-2 shows the location of areas where blasting could be required.

TABLE 2.3.3-2
Blasting Locations

MP		Length	Bedrock Type	Hardness	Depth to Layer Top (inches)
From	To				
Steele City Segment					
848.18	848.19	54	Lithic Bedrock	Moderately cemented	31
848.27	848.37	525	Lithic Bedrock	Moderately cemented	31
848.75	848.88	683	Lithic Bedrock	Moderately cemented	31
848.95	849.03	428	Lithic Bedrock	Moderately cemented	31
Gulf Coast Segment					
18.59	18.63	227	Lithic Bedrock	Very strongly cemented	25
18.77	18.79	95	Lithic Bedrock	Very strongly cemented	25
20.79	20.91	632	Lithic Bedrock	Very strongly cemented	25
59.23	59.30	395	Lithic Bedrock	Very strongly cemented	28
59.80	59.86	348	Lithic Bedrock	Very strongly cemented	28
61.67	61.90	1196	Lithic Bedrock	Very strongly cemented	28
61.95	61.98	162	Lithic Bedrock	Very strongly cemented	28
62.05	62.32	1410	Lithic Bedrock	Very strongly cemented	28
63.82	63.95	684	Lithic Bedrock	Very strongly cemented	28
65.00	65.10	530	Lithic Bedrock	Very strongly cemented	28
65.32	65.36	184	Lithic Bedrock	Very strongly cemented	28
65.46	65.53	361	Lithic Bedrock	Very strongly cemented	28
65.58	65.68	590	Lithic Bedrock	Very strongly cemented	28
65.74	65.80	326	Lithic Bedrock	Very strongly cemented	28
67.63	67.68	277	Lithic Bedrock	Very strongly cemented	28
67.93	68.00	352	Lithic Bedrock	Very strongly cemented	28
70.68	70.86	1005	Lithic Bedrock	Very strongly cemented	28
71.07	71.18	565	Lithic Bedrock	Very strongly cemented	28
71.85	72.07	1162	Lithic Bedrock	Very strongly cemented	28
72.14	72.16	58	Lithic Bedrock	Very strongly cemented	28
72.27	72.33	324	Lithic Bedrock	Very strongly cemented	28
72.43	72.54	578	Lithic Bedrock	Very strongly cemented	28
72.73	72.77	201	Lithic Bedrock	Very strongly cemented	28
73.01	73.21	1084	Lithic Bedrock	Very strongly cemented	28
73.65	74.00	1826	Lithic Bedrock	Very strongly cemented	28
74.15	74.23	398	Lithic Bedrock	Very strongly cemented	28
74.23	74.29	351	Lithic Bedrock	Very strongly cemented	38
74.98	75.01	161	Lithic Bedrock	Very strongly cemented	38
75.01	75.30	1550	Lithic Bedrock	Very strongly cemented	28
76.05	76.17	652	Lithic Bedrock	Very strongly cemented	28

TABLE 2.3.3-2
Blasting Locations

MP					
From	To	Length	Bedrock Type	Hardness	Depth to Layer Top (inches)
76.64	76.64	45	Lithic Bedrock	Very strongly cemented	28
81.32	82.44	5915	Lithic Bedrock	Very strongly cemented	28
82.63	83.05	2220	Lithic Bedrock	Very strongly cemented	28
83.52	83.59	405	Lithic Bedrock	Very strongly cemented	28
84.53	84.68	789	Lithic Bedrock	Very strongly cemented	38
84.76	84.79	152	Lithic Bedrock	Very strongly cemented	38
84.89	84.92	134	Lithic Bedrock	Very strongly cemented	28
84.92	84.96	207	Lithic Bedrock	Very strongly cemented	38
85.04	85.04	7	Lithic Bedrock	Very strongly cemented	38
85.33	85.38	286	Lithic Bedrock	Very strongly cemented	38
85.38	85.42	208	Lithic Bedrock	Very strongly cemented	28
85.58	85.60	109	Lithic Bedrock	Very strongly cemented	28
85.14	86.34	1062	Lithic Bedrock	Very strongly cemented	28
90.18	90.39	1102	Lithic Bedrock	Very strongly cemented	79
90.49	90.68	1053	Lithic Bedrock	Very strongly cemented	79
90.68	90.73	224	Lithic Bedrock	Very strongly cemented	84
91.13	91.26	699	Lithic Bedrock	Very strongly cemented	84
91.79	91.91	623	Lithic Bedrock	Very strongly cemented	84
92.10	92.21	577	Lithic Bedrock	Very strongly cemented	71
93.92	94.03	583	Lithic Bedrock	Very strongly cemented	79
94.03	94.10	375	Lithic Bedrock	Very strongly cemented	71
95.76	95.91	769	Lithic Bedrock	Very strongly cemented	79
97.29	97.35	347	Lithic Bedrock	Very strongly cemented	84
99.80	99.81	53	Lithic Bedrock	Very strongly cemented	79
100.11	100.19	408	Lithic Bedrock	Very strongly cemented	79
101.37	101.48	572	Lithic Bedrock	Very strongly cemented	79
104.09	104.18	482	Lithic Bedrock	Very strongly cemented	84
106.18	106.22	258	Lithic Bedrock	Very strongly cemented	79
107.41	107.44	182	Lithic Bedrock	Very strongly cemented	79
107.66	107.79	700	Lithic Bedrock	Very strongly cemented	79
109.15	109.17	127	Lithic Bedrock	Very strongly cemented	84
109.46	109.68	1159	Lithic Bedrock	Very strongly cemented	79
131.37	131.58	1628	Lithic Bedrock	Very strongly cemented	46
131.87	131.90	126	Lithic Bedrock	Very strongly cemented	36
132.06	132.16	516	Lithic Bedrock	Very strongly cemented	36
132.24	132.26	100	Lithic Bedrock	Very strongly cemented	36

TABLE 2.3.3-2 Blasting Locations					
MP					
From	To	Length	Bedrock Type	Hardness	Depth to Layer Top (inches)
132.27	132.30	159	Lithic Bedrock	Very strongly cemented	41
134.62	134.72	545	Lithic Bedrock	Very strongly cemented	66
136.34	136.56	1194	Lithic Bedrock	Very strongly cemented	41
137.54	137.66	665	Lithic Bedrock	Very strongly cemented	66

Source: Keystone 2009c.

Extreme care would be taken to avoid damage to underground structures, cables, conduits, pipelines, and underground watercourses or springs. Adequate notice would be given to adjacent landowners or tenants in advance of blasting in order to prevent any risk of accidents or undue disturbances and to protect property and livestock. Blasting activity would be performed during daylight hours and in compliance with federal, state and local codes and ordinances and manufacturers' prescribed safety procedures and industry practices.

Each blasting location would be cleared and cleaned up before and after all blasting operations. Blasting mats or subsoil would be piled over the trench line to prevent rock from being blown outside the construction ROW. The drilling pattern would be set in a manner to achieve smaller rock fragmentation (maximum 1 foot in diameter) in order to use as much as possible of the blasted rock as backfill material.

2.3.3.9 Residential and Commercial Construction

Areas containing buildings within 25 feet and 500 feet of the construction ROW are summarized in Table 2.3.3-3. Additional details on these structures (e.g., residences, schools, etc.) are provided in Section 3.9 Land Use. Prior to construction, site-specific construction plans to address the potential impacts of construction on residential and commercial structures would be developed.

Additional construction and environmental protection measures are identified in the CMR Plan, provided as Appendix B.

TABLE 2.3.3-3 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	Phillips	4	15
	Valley	1	34
	McCone	4	30
	Dawson	1	26
	Prairie	0	10
	Fallon	6	57
South Dakota	Harding	3	20
	Perkins	0	1

TABLE 2.3.3-3
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
	Meade	5	37
	Haakon	3	33
	Jones	0	9
	Lyman	0	10
	Tripp	1	15
Nebraska	Keya Paha	2	8
	Rock	1	2
	Holt	0	23
	Garfield	0	5
	Wheeler	1	7
	Greeley	4	12
	Boone	0	2
	Nance	0	15
	Merrick	0	22
	Hamilton	1	7
	York	4	58
	Fillmore	1	25
	Saline	0	14
	Jefferson	16	229
Kansas	NA	0	0
Gulf Coast Segment			
Oklahoma	Lincoln	3	61
	Creek	3	46
	Okfuskee	1	33
	Seminole	9	54
	Hughes	2	36
	Atoka	4	32
	Bryan	2	23
Texas	Lamar	1	33
	Delta	1	21
	Hopkins	5	41
	Franklin	5	26
	Wood	4	83
	Upshur	1	18
	Smith	15	158
	Cherokee	0	15

TABLE 2.3.3-3 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**
	Rusk	8	24
	Nacogdoches	8	74
	Angelina	0	15
	Polk	0	41
	Liberty	7	49
	Hardin	5	78
	Jefferson	16	229
Houston Lateral			
Texas	Liberty	5	78
	Chambers	0	2
	Harris	4	18

Source: Keystone 2009e.

2.3.3.10 Fences and Grazing

Some fences would be crossed or paralleled by the construction ROW, requiring cutting and modifications. Each fence would be braced and secured before cutting to prevent the fence from weakening or slacking. Openings created in the fences would be temporarily closed when construction crews leave the area to contain livestock. In addition, gaps through natural livestock barriers would be fenced according to landowners' or land managers'requirements.

All existing fencing and grazing structures, such as fences, gates, irrigation ditches, cattle guards, and reservoirs would be maintained during construction and repaired to pre-construction conditions or better upon completion of construction activities.

2.3.4 Aboveground and Ancillary Facilities Construction Procedures

2.3.4.1 Pump Station Construction

Construction activities at each of the new pump stations would follow a standard sequence of activities. Initially, the sites for the pump stations would be cleared of vegetation and graded as necessary to create a level working surface for the movement of construction vehicles and to prepare the area for building foundations. The foundations for the electrical building and support buildings would be installed and soil would be stripped from the construction footprint. Each pump station would include one electrical building and one support building. The electrical building would include electrical systems, communication, and control equipment. The second building would house a small office. The structures to support the pumps and/or associated facilities would then be erected. This would involve installing a block valve into the mainline along with two side block valves; one to the suction piping of the pumps and one from the discharge piping of the pumps.

The crude oil piping, both aboveground and below ground, would be installed and pressure tested using the methods employed for the main pipeline. After successful testing, the piping would be tied into the main pipeline. Piping installed below grade would be coated for corrosion protection prior to backfilling.

In addition, all below grade facilities would be protected by a cathodic protection system. Pumps, controls, and safety devices would be checked and tested to ensure proper system operation and activation of safety mechanisms before being put into service.

Construction activities and the storage of building materials would be confined to the pump station construction sites. Figures 2.2.3-1 and 2.2.3-2 illustrate typical plot plans for pump stations. After hydrostatic testing, final grading would occur around each pump station and security fences would be installed.

2.3.4.2 Tank Farm Construction

The tank farm site would be co-located with pump station 26 at Steele City, Nebraska. The tank farm site would be cleared and graded to create a level work surface for the tanks. Topsoil from the site would be stored adjacent to the site area. The tank structures would be welded steel tanks with internal floating roofs. They would be installed inside an impervious bermed area which would act as secondary containment. The piping in the tank farm area would be both above and below ground. The tanks and associated piping would 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 would 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 would be connected with the pipeline system. Each tank would have a separate water screen and fire suppression system supplied by an on-site fire water supply pond. A separate larger pond would be installed to manage storm water and mitigate any potential contamination from the site. Figure 2.3.4-1 shows the general arrangement of the Steele City Tank Farm. After the completion of startup and testing, the tank farm would be final graded and a permanent security fence would be installed.

2.3.4.3 Mainline Valves, Pigging and Densitometer Facilities, and Delivery Sites

MLV construction would occur during mainline pipeline construction. To facilitate year-round access, the MLVs would be located as near as practicable to existing public roads and within the permanent ROW. If necessary, new access roads would be constructed into the fenced MLV sites.

The co-located crude oil delivery, pigging, and densitometer facilities would be totally enclosed within the adjacent pump station or tank farm. The construction sequence would include clearing and grading followed by trenching, piping installation, building fabrication, fencing, cleanup, and site restoration.

2.3.5 Construction Schedule and Workforce

According to Keystone's current proposed schedule, construction of the Gulf Coast Segment would begin in 2010, while the Steele City Segment would commence in 2011 and the Houston Lateral would begin in 2012. Construction of the two new pump stations along the Keystone Cushing Extension would coincide with construction of the remainder of the proposed Project.

The Project would be constructed in 17 spreads, as shown in Table 2.3.5-1 with 10 spreads in the Steele City Segment, six spreads in the Gulf Coast Segment, and the Houston Lateral constructed in one spread. All spreads within the same segment would be constructed simultaneously.

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

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

Using this as a basis for determining the duration of construction activities on the ROW, Table 2.3.5-2 shows the time requirements for various spread lengths. Construction in areas with greater congestion, higher population, industrial areas, or areas requiring other special construction procedures could result in a slower rate of progress.

TABLE 2.3.5-1
Pipeline Construction Spreads Associated with the Proposed 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
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, Crockett, Texas

TABLE 2.3.5-1
Pipeline Construction Spreads Associated with the Proposed Project

Spread Number	Location	Approximate Length of Construction Spread (miles)	Base(s) for Construction[1]
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 would 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 proposed Project starts at 0.0 at the northernmost point of each Segment, and increases in the direction of oil flow.

Source: Keystone 2009c.

TABLE 2.3.5-2
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)

Source: Keystone 2009c.

In addition, approximately one month for contractor mobilization before the work is started and one month after the work is finished for contractor demobilization should be factored into the overall construction schedule. It is anticipated that 500 to 600 construction and inspection personnel would be required for each spread, except for the Houston Lateral, which would require approximately 250 workers. Each spread would require six to eight months to complete. Tank farm construction would involve approximately 30 to 40 construction personnel over a period of 15 to 18 months, concurrent with construction of the Steele City Segment. Construction of new pump stations would require 20 to 30 additional workers at each site. Construction of all pump stations would be completed in 18 to 24 months. The Gulf Coast Segment and Houston Lateral are planned to be in service in 2011 and the Steele City Segment is planned to be in service in 2012.

A peak workforce of approximately 5,000 to 6,000 personnel would be required to construct the entire Project. These construction personnel would consist of Keystone employees, contractor employees, construction inspection staff and environmental inspection staff. Keystone would attempt to hire temporary construction staff from the local population through its construction contractors and subcontractors. Assuming that qualified personnel are available, approximately 10 to 15 percent (50 to 100 people per spread) could be hired from the local work force for each spread, although this may not be possible in rural areas. All workers would be well trained and certified for their specific field of work (i.e., welding).

2.3.6 Construction Conditions Imposed by PHMSA

PHMSA is the federal agency responsible for assuring the safe operations and maintenance of oil pipeline systems. PHMSA would require compliance with a set of conditions prior to granting Keystone permission to operate the Project. The conditions that PHMSA has determined would apply to the pipeline as of the publication of the DEIS are presented in this section (see below sections 2.3.6.1 – 2.3.6.4). Some of these conditions may duplicate construction and operations protocols already committed to by Keystone.

2.3.6.1 Construction Operator Qualifications

Keystone must have and follow an Operator Qualification (OQ) Program for construction tasks that can affect pipeline integrity. The Construction OQ program must comply with 49 CFR § 195.501 and must be followed throughout the construction process for the qualification of individuals performing tasks on the special permit segment areas.

If the performance of a construction task associated with implementing the alternative MOP as part of the special permit can affect the integrity of the pipeline segment, the operator must treat that task as a "covered task", notwithstanding the definition in § 195.501(b), and implement the requirements of Subpart G as appropriate. Keystone shall have qualification records available for each individual performing covered tasks during and after the construction of the pipeline, whether company or contract employee.

A construction quality assurance plan, to ensure quality standards and controls of the pipeline, must be followed throughout the construction phase with respect to the following: pipe inspection, hauling and stringing, field bending, welding, non-destructive examination of girth welds, applying and testing field applied coating, lowering of the pipeline into the ditch, padding and backfilling, and hydrostatic testing. These tasks can affect the integrity of the pipeline segment and must be treated as covered tasks. Likewise, other task performed directly on the pipe affecting its integrity, but not listed here, are to be considered covered tasks when determined by the operator.

Other tasks that can affect pipeline integrity which must be treated as covered tasks include, but are not limited to, surveying, locating foreign lines, one call notifications, ditching/excavation, alternating current (AC) interference mitigation, cathodic protection (CP) system surveys and installation, directional drills, anomaly evaluations and repairs, right-of-way clean up, and quality assurance monitoring.

All girth welds must be inspected, repaired and non-destructively examined in accordance with §§ 195.228, 195.230 and 195.234. The NDE examiner must have all required and current certifications.

2.3.6.2 Soil Cover

The soil cover must be maintained at a minimum depth of 48 inches in all areas except consolidated rock. The minimum depth in consolidated rock areas is 36 inches. In areas where conditions prevent the maintenance of 48 inches of cover, Keystone must employ additional protective measures to alert the public and excavators to the presence of the pipeline. The additional measures shall include:

a) *Placing warning tape and additional pipeline markers along the affected pipeline segment.*

b) *In areas where threats from chisel plowing or other activities are threats to the pipeline, the top of the pipeline must be installed and maintained at least one foot below the deepest penetration above the pipeline.*

If a routine patrol or other observed conditions indicates the possible loss of cover over the pipeline, Keystone must perform a depth of cover study and replace cover as necessary to meet the minimum depth of cover requirements specified herein. If replacing cover is not practical, Keystone must submit to the appropriate Directors, PHMSA Central, Western, and Southwest Regions, alternate plans to assure safety in these areas within 60 days of the depth of cover finding.

2.3.6.3 Hydrostatic Testing

The pre-in service hydrostatic test must be to a pressure producing a hoop stress of a minimum 100 percent Specified Minimum Yield Strength (SMYS) and 1.25 times Maximum Operating Pressure (MOP) for 8 continuous hours in areas to operate up to 80 percent SMYS. The hydrostatic test results from each test must be submitted to the applicable Director(s), PHMSA Central, Western and Southwest Regions after completion of each pipeline in electronic format.

Assessment of Test Failures: Any pipe failure occurring during the pre-in service hydrostatic test must undergo a root cause failure analysis to include a metallurgical examination of the failed pipe. The results of this examination must preclude a systemic pipeline material issue and the results must be reported to PHMSA headquarters and the applicable Director(s), PHMSA Central, Western, and Southwest Regions within 60 days of the failure and prior to operating at the alternative MOP.

2.3.6.4 Geometry Tool Run

For initial construction and the initial geometry tool run, any dent with a depth greater than 2 percent of the nominal pipe diameter must be removed unless the dent is repaired by a method that reliable engineering tests and analyses show can permanently restore the serviceability of the pipe. For the purposes of this condition, a "dent" is a depression that produces a gross disturbance in the curvature of the pipe wall without reducing the pipe wall thickness. The depth of the dent is measured as the gap between the lowest point of the dent and the prolongation of the original contour of the pipe.

2.3.6.5 Deformation Tool Run, Evaluation, and Remediation

Keystone must conduct a pipe expansion survey prior to operating at the alternative MOP in accordance with the following:

a) *A deformation tool run would be required prior to operating above 72 percent SMYS at the alternative MOP and the results of the tool findings must be reviewed to ensure no low or variable yield strength pipe joints are located in the pipeline. The deformation tool must have sensors that can detect expanded pipe at a minimum of 8 percent expansion, and with a sensing tolerance of 1 percent.*

b) *Pipe joints found to have low yield strength would require removal from the pipeline prior to operating above 72 percent SMYS.*

All expanded pipe above 0.75 percent diameter (0.27-inch) for 36-inch pipe must be noted on the deformation tool report. A remediation plan must be prepared by Keystone for all pipe expanded above 0.75 percent diameter that may have low yield strength pipe based upon industry research or a Keystone assessment plan of known expanded pipe. The results of this deformation tool survey and remediation plan must be analyzed and submitted to the appropriate Director(s), PHMSA Central, Western, and Southwest Regions 60 days prior to operating at the alternative MOP.

2.3.6.6 Line Markers

Keystone must employ line-of-sight markings on the pipeline in the special permit segment(s) except in agricultural areas or large water crossings such as lakes where line of sight signage is not practical. The marking of pipelines is also subject to Federal Energy Regulatory Commission orders or environmental permits and local restrictions. Additional markers must be placed along the pipeline in areas where the pipeline is buried less than 48 inches.

2.4 OPERATIONS AND MAINTENANCE

The proposed Project's facilities would be maintained in accordance with 49 CFR Parts 194 and 195 and other applicable federal and state regulations.

An annual Pipeline Maintenance Program (PMP) would be implemented by Keystone to ensure the integrity of the pipeline. The PMP would include valve maintenance, periodic inline inspections, and cathodic protection readings to ensure facilities are reliable and in service. Data collected in each year of the program would be fed back into the decision-making process for the development of the following year's program. In addition, the pipeline would be monitored 24 hours a day, 365 days a year from the Operations Control Center (OCC) using leak detection systems and SCADA. During operations, a Project-specific ERP would be in place to manage a variety of events. Operation and maintenance of the pipeline system would typically be accomplished by Keystone personnel. The permanent operational pipeline workforce would comprise about 20 U.S. employees, strategically located along the length of the pipeline in the U.S.

2.4.1 Normal Operations and Routine Maintenance

The preparation of manuals and procedures for conducting normal operations and maintenance activities would comply with the CFR, and the pipeline would be regularly inspected via aerial and ground surveillance at a frequency consistent with 49 CFR Part 195. These surveillance activities are in place to provide prompt identification of possible encroachments or nearby construction activities, ROW erosion, exposed pipe or any other conditions that could result in damage to the pipeline. MLVs at pump stations fall under the inspection requirements as well as the intermediate MLVs. The DOT regulation at 49 CFR Section 195.420(b) requires inspection at intervals not to exceed 7.5 months but at least twice each calendar year. Landowners would be encouraged to report any pipeline integrity concerns to Keystone or to the USDOT/OPS. In addition, aerial surveillance of the pipeline ROW would be carried out at least 26 times a year.

Federal regulations require that pipeline operators identify areas along the proposed pipeline corridor that would be considered High Consequence Areas (HCAs). While some of these areas need to be defined through sophisticated risk modeling, in general they are specific locales where the release of fluid from a hazardous liquid pipeline could produce significant adverse consequences (e.g., navigable waterways, high population areas, etc.). Prior to receipt of an operating permit from OPS, Keystone would need to identify the HCAs along the proposed route. Population changes along the route would be monitored throughout pipeline operation and any additional HCAs identified as necessary. All operation and maintenance work would be performed in accordance with OPS requirements. Woody vegetation along the permanent easement would be cleared periodically in order to maintain accessibility for pipeline integrity surveys. Mechanical mowing or cutting would be carried out from time to time as needed along the permanent easement for normal vegetation maintenance. Cultivated crops would be allowed to grow in the permanent easement but any established trees would be removed from the permanent ROW in all areas. In areas where the pipeline would have been installed via HDD, trees would be cleared as required on a site specific basis.

Existing permanent erosion control devices would be monitored to identify any areas requiring repair. The remainder of the ROW would be monitored to identify areas where additional erosion control devices would be necessary to prevent future degradation. The ROW would be monitored to identify any areas where soil productivity has been degraded as a result of pipeline construction. In these areas, reclamation measures would be implemented to rectify the problems.

The Project OCC would be manned by experienced and highly trained personnel 24 hours per day, every day of the year and would be located in Calgary, Canada. In addition, a fully redundant backup OCC would be constructed, operated and maintained, also in Canada. Primary and backup communications systems would provide real-time information from the pump stations to field personnel. The control center would have highly sophisticated pipeline monitoring systems including a leak detection system capable of identifying abnormal conditions and initiating visual and audible alarms. Automatic shut down systems would be initiated if a valve starts to shut and all pumps upstream would start to turn off automatically. All other pipeline situations would require human response.

SCADA facilities would be located in the OCC. At all pump stations and delivery facilities there would be communication software that sends data back to the OCC. The pipeline SCADA system would allow the OCC to remotely read intermediate MLV positions, tank levels and delivery flow and total volume. The OCC personnel would also be able to start and stop pump stations and open and close MLVs. SCADA systems are discussed in more detail in Section 2.4.2.1.

2.4.2 Abnormal Operations

Abnormal operating procedures would be implemented in accordance with 49 CFR Section 195.402(d). Aerial surveillance of the pipeline ROW would be carried out at least 26 times a year.

Multiple overlapping and redundant systems would be implemented, including:

- Quality Assurance (QA) program for pipe manufacture and pipe coating;
- FBE coating;
- Cathodic protection;
- Non-destructive testing of 100 percent of the girth welds;
- Hydrostatic testing producing a hoop stress of a minimum 100 percent SMYS and 1.25 times MOP for 8 continuous hours in areas that would operate up to 80 percent SMYS (should PHMSA grant the special permit required to exceed 72 percent SMYS);
- Periodic internal cleaning and high-resolution in-line inspection;
- Depth of cover exceeding federal standards;

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

Software associated with the SCADA monitoring system and volumetric balancing would be utilized to assist in leak detection during pipeline operations. If pressure indications change, the pipeline controller would immediately evaluate the situation. If a leak is suspected, the ERP would be initiated, as described in Section 2.4.2.2. In the event of a pipeline segment shutdown due to a suspected leak, operation of the affected segment would not be resumed until the cause of the alarm (e.g., false alarm by instrumentation, or leak) is identified and repaired. In the case of a reportable leak, DOT approval would be required to resume operation of the affected segment.

The preparation of manuals and procedures for responding to abnormal operations would comply with the CFR, including 49 CFR Part 195.402. The manual would include procedures to provide safety when operating design limits have been exceeded. This includes investigating and correcting the cause of unintended closure of valves or shutdowns, increases or decreases in pressure or flow rate outside normal operating limits, loss of communications, operation of any safety device, and any other malfunction of a component, deviation from normal operation, or personnel error which could cause a hazard to persons or property. Procedures would also include checking variations from normal operation after abnormal operation has ended at sufficient critical locations in the system to:

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

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

2.4.2.1 SCADA and Leak Detection

SCADA facilities would be used to remotely monitor and control the pipeline system. This would include a redundant fully functional backup system available for service at all times. Automatic features would be installed as integral components within the SCADA system to ensure operation within prescribed pressure limits. Additional automatic features would be installed at the local pump station level and would provide pipeline pressure protection in the event communications with the SCADA host are interrupted.

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

In the event of a leak, the operator would shut down operating pumping units and close the isolation valves. It would take approximately 9 minutes to complete the emergency shut-down procedure (shut down operating pumping units) and an additional 3 minutes to close the isolation valves.

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

2.4.2.2 Emergency Response Procedures

Site-specific ERPs would be prepared for the system, which would be submitted to and approved by the OPS and PHMSA prior to operation. A comprehensive ERP for the first Keystone Pipeline Project has been reviewed and approved by PHMSA. The ERP contains several elements, procedures, notifications, and technical information that are directly applicable to the Project. The Keystone ERP is comprehensive, and forms the basis for preparing the site-specific information for the Project ERP. Once the specific route is finalized, field work would commence in collecting relevant information to be incorporated into the Project ERP which would then be submitted to PHMSA for their review and approval.

Several federal regulations define the notification requirements and response actions in the case of a spill, including the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300), the Clean Water Act (CWA), and the Oil Pollution Act. These programs command notification and initiation of response actions in a timeframe and on a scale commensurate with the threats posed.

In the event of a release, several procedures would be implemented to mitigate damage, including a line shut down. Procedures would also include immediate dispatch of a first responder to verify the release and secure the site. Simultaneously, an Incident Command System would be implemented and internal and external notifications would take place. The National Response Center (NRC) would be notified if the release meets one of the prescribed criteria. Keystone and the NRC would also notify other regional and local emergency response agencies as quickly as possible. All of this information would be included in the Project ERP. In addition, response equipment would also be procured and strategically positioned along the route, staff would be trained in spill response and Incident Command System, and emergency services and public officials would be educated on all aspects of the proposed Project and their role in the unlikely event of a release. In the unlikely event of a spill, Keystone and its contractors would be responsible for recovery and cleanup.

In the event of a suspected leak or if a leak is reported to the OCC, there would be an emergency pipeline shutdown. This would involve stopping all operating pumping units at all pump stations. The on-call response designate would respond to and verify an incident. Once the OCC notifies the individual and an assessment of the probability and risk is established, field personnel could elect to dispatch other resources as soon as practical. Response efforts would first be directed to preventing or limiting any further contamination of the waterway, once any concerns with respect to health and safety of the responders have been addressed.

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

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

Emergency response equipment would be strategically situated along the pipeline route. Types of emergency response equipment include pick-up trucks, one-ton trucks and vans; vacuum trucks; work and safety boats; containment boom; skimmers; pumps, hoses, fittings and valves; generators and extension cords; air compressors; floodlights; communications equipment including cell phones, two way radios and satellite phones; containment tanks and rubber bladders; expendable supplies including absorbent booms and pads; assorted hand and power tools including shovels, manure forks, sledge hammers, rakes, hand saws, wire cutters, cable cutters, bolt cutters, pliers and chain saws; ropes, chains, screw anchors, clevis pins and other boom connection devices; personnel protective equipment (PPE) including rubber gloves, chest and hip waders and H2S, O2, LEL and benzene detection equipment; and wind socks, signage, air horns, flashlights, megaphones and fluorescent safety vests. Emergency response equipment would be maintained and tested in accordance with manufacturers recommendations.

Additional equipment including helicopters, fixed wing aircraft, all-terrain vehicles (ATVs), snowmobiles, backhoes, dump trucks, watercraft, bull dozers, and front-end loaders could also be accessed depending upon site-specific circumstances. Other types, numbers and locations of equipment would be determined upon conclusion of the pipeline detailed design and the completion of the Project ERP.

A fire associated with a spill is relatively rare. Only about 4 percent of reportable liquid spills are ignited (OPS 2005). In the event of a fire, local emergency responders would execute the roles listed above and firefighters would take actions to prevent the crude oil fire from spreading to residential areas.

2.4.2.3 Remediation

Corrective remedial actions would be dictated by federal, state, and local regulations and enforced by the USEPA, OPS and appropriate state and/or local agencies. Required remedial actions may be large or small, dependant upon a number or factors including 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. A large remediation action may include the excavation and removal of contaminated soil, for example, or could involve allowing the contaminated soil to recover through natural attenuation or environmental fate processes such as evaporation and biodegradation.

The appropriate remedial measures would be implemented to meet federal, state, and local standards designed to ensure protection of human health and environmental quality.

2.4.3 Operations and Maintenance Conditions Imposed by PHMSA

2.4.3.1 Overpressure Conditions

The pipeline should be equipped with field devices aimed at limiting overpressure conditions. Remotely actuated valves should be fitted with devices that would stop the transit (intentional or uncommanded) of the mainline valve should an overpressure condition occur or an impending overpressure condition is expected. Sufficient pressure sensors, on both the upstream and downside side of valves, must be installed to ensure that an overpressure situation did not occur. Also, sufficient pressure sensors shall be installed along the pipeline to conduct real time hydraulic modeling, and if needed to conduct a surge analysis to determine pipeline segments that may have experienced an overpressure condition. PHMSA is imposing conditions on overpressure protection control per the following:

a) Overpressure Protection Control: Mainline pipeline overpressure protection must be limited to a maximum of 110 percent MOP consistent with § 195.406(b). A surge analysis showing how the pipeline special permit segment(s) would be operated to be consistent with these conditions is required prior to operating at the alternative MOP. The surge analysis and operational procedures must be provided to the appropriate Directors, PHMSA Central, Western, and Southwestern Regions at least 60 days prior to implementation of the alternate MOP.

b) If a measured or calculated MOP exceedance occurs, the pipeline shall be patrolled prior to restart.

2.4.3.2 SCADA

Scan rate shall be fast enough to minimize overpressure conditions (overpressure control system), provide very responsive abnormal operation indications to controllers and detect small leaks within technology limitations.

Must meet the requirements of regulations developed as a result of the findings of the National Transportation Safety Board, Supervisory Control and Data Acquisition (SCADA) in Liquid Pipelines, Safety Study, NTSB/SS-05/02 specifically including:

a) Operator displays shall adhere to guidance provided in API Recommended Practice 1165, Recommended Practice for Pipeline SCADA Displays. This shall be implemented and performed at any location on the Keystone XL system where a SCADA system is used and where an individual is assigned the responsibility to monitor and respond to SCADA information (tanks terminals or facilities also).

b) Operators must have a policy for the review/audit of alarms for false alarm reduction and near miss or lessons learned criteria. This alarm review shall be implemented and performed at any location on the Keystone XL system where a SCADA system is used and where an individual(s) is assigned the responsibility to monitor and respond to alarm information (tanks terminals or facilities also).

c) *SCADA controller training shall include simulator for controller recognition of abnormal operating conditions, in particular leak events. A generic simulator or simulation shall not be allowed by itself as a means to meet this requirement. A full simulator (console screens respond and react as actual console screens) shall be required and used for training of abnormal operating conditions (AOCs) wherever possible.*

d) *Have a plan for fatigue management.*

e) *Install computer-based leak detection system on all lines unless an engineering analysis determines that such a system is not necessary.*

Develop and implement shift change procedures for controllers that are scientifically based, sets appropriate work and rest schedules, and consider circadian rhythms and human sleep and rest requirements in-line with guidance provided by NTSB recommendation P-99-12 issued June 1, 1999.

Verify point-to-point display screens and SCADA system inputs before placing the line in service. This shall be implemented and performed at any location on the Keystone XL system where a SCADA system is used and where an individual(s) is assigned the responsibility to monitor and respond to alarm information (tanks terminals or facilities also).

a) *Implement individual controller log-in provisions.*

b) *Establish and maintain a secure operating control room environment.*

c) *Establish and maintain the ability to make modifications and test these modifications in an off-line mode. The special permit segments must have controls in-place and be functionally tested in an off-line mode prior to any changes being implemented after the line is in service and prior to beginning the line fill stage.*

d) *Provide SCADA computer process load information tracking.*

Mainline valves located on either side of pipeline segment containing an HCA where personnel response time to the valve exceeds one hour must be remotely controlled by the Supervisory Control and Data Acquisition (SCADA) system. The SCADA system must be capable of closing the valve and monitoring the valve position, upstream pressure and downstream pressure. If Keystone does not install remote controlled valves on the XL system, Keystone must document on a yearly basis, not to exceed 15 months that personnel response time to these valves would not take over one hour. Remote power backup is required to ensure communications are maintained during inclement weather.

2.5 CONNECTED ACTIONS

DOS has identified several actions separate from the proposed Keystone XL Project that are not part of the Presidential Permit application submitted by Keystone and determined that the following projects are connected actions for the purposes of this NEPA review:

- Electrical distribution lines and substations associated with the proposed pump stations; and
- The Lower Brule to Witten 230-kV electrical transmission line.

Preliminary information on the design, construction, and operation of these projects is presented below. Although the permit applications for these projects would be reviewed and acted on by other agencies, the potential impacts of these projects have been analyzed based on currently available information and are addressed in Section 3.0 of this EIS.

The cooperating agencies are not aware of any planned refinery upgrades or new refinery construction that would directly result from the Project.

2.5.1 Aboveground Facilities

2.5.1.1 Power Distribution Lines and Substations

Electrical power for the Project would be obtained from local power providers. These power providers would construct necessary substations and transformers and would either use existing service lines or construct new service lines to deliver the power to the specified point of use. The electrical power providers would be responsible for obtaining any necessary approvals or authorizations from federal, state, and local governments, except in those instances in Montana where new service lines less than 10 miles in length would be constructed. Under Montana regulations, these distribution lines would be considered “associated facilities” connected with the overall pipeline system. Where this occurs, the review and approval of the new lines would occur as part of the review and approval of the Project MFSA application.

New electrical transmission power lines with voltage of 69 kV or greater would be constructed to service pump stations and a tank farm along the proposed Project route. Proposed new electrical transmission power lines to service pump stations are mostly 115-kV transmission lines, with a proposed transmission structure consisting of a single pole, horizontal post insulator design. Table 2.5.1-1 summarizes the electrical power supply requirements for the pump stations and tank farm and Figures 2.1-1 to 2.1-6 show the location of these distribution lines.

TABLE 2.5.1-1
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	NorVal Electric Cooperative
PS-11	98.0	20/27/33	230	12.0	McCone Electric Cooperative or Norval Electric Cooperative[2]
PS-12	148.6	20/27/33	115	3.3	McCone Electric Cooperative

TABLE 2.5.1-1 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**
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
Gulf Coast Segment					
Oklahoma					

TABLE 2.5.1-1 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**
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 proposed Project start starts at 0.0 at the northernmost point of each segment and increases in the direction of oil flow.

Source: Keystone 2009c.

Each pump station would have a substation integrated into the general pump station layout. In some cases (pump stations 36 and 41), Keystone would share pump station land with the local utility for the installation of their substation. Sharing of substation land at the pump station allows the utility to provide a second transformer to provide service to the rural customers in the area.

The exact location of each substation would vary because power supply lines access each pump station from different alignments. Each substation footprint would be approximately 1 to 1.5 acres and is included in the total land size of each pump station. Substation actual size is dictated by specific design and size requirements of the local power supply company, the capacity of the power supply lines connected to each specific pump station, and associated equipment. Figures 2.2.3-1 and 2.2.3-2 show the substation and typical pump station layouts.

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

Preliminary routing for new electrical transmission power lines was identified in consultation with each utility company. Where practicable, these preliminary power line routes have been positioned along existing county roads, section lines, or field edges, to minimize interference with adjacent agricultural lands. These routes are subject to change as pumping station supply requirements are further reviewed with power providers and in some cases, as a result of environmental review of the routes.

Electromagnetic induction can occur from power lines, which can cause noise, radio, and television interference. This potential interference would be mitigated by siting the power line away from residences (500 feet minimum, if possible) and by routing the power line to reduce parallel metallic interferences.

Power line Radio Frequency Interference (RFI) is usually caused by sparking (arcs). Typically this is caused by loose hardware. The power provider design uses spring washers to keep hardware tight. Conductor supports use specialized clamps to keep the conductor and support clamps with a firm contact between the two entities at all times, to mitigate arcing sources. Defective lightning arrestors could also contribute to RFI. The power providers would use a static conductor at the top of the pole to mitigate lightning-caused flashovers. Lightning arrestors would be limited to the stations where major equipment is located.

The radio communication systems at the proposed Project facilities would operate on specific frequencies licensed by the Federal Communications Commission (FCC). This would reduce the risk of any interference with radio, television or any other communication system in the area.

2.5.1.2 Lower Brule to Witten 230-kV Transmission Line

After receipt of the power requirements for the proposed Project pump stations in South Dakota, Western Area Power Administration (Western) conducted a joint system engineering study to determine system reliability under the proposed loads at full Project electrical energy consumption. The joint system engineering studies determined that a 230-kV transmission line originating from the Fort Thompson/Big Bend area and running south to the existing Witten Substation would be required to support voltage requirements for pump stations 20 and 21 in the Witten area when the Project is operating at maximum capacity.

To address this requirement Western proposes to modify the existing Big Bend-Fort Thompson No. 2, 230-kV transmission line turning structure, located on the south side of the dam, to a double-circuit structure. Western would then construct approximately 2.1 miles of new double-circuit transmission line south to a new substation, tentatively named Lower Brule Substation, which would also be constructed by Western. The new switchyard/substation would be a 3-breaker ring bus configuration, expandable to a breaker and a half configuration. The new 2.1-mile-long double-circuit 230-kV transmission line would be owned, constructed, and operated by Western. After construction, the ownership of the Lower Brule

Substation would be transferred to the Basin Electric Power Cooperative (BEPC) which would then own and operate it. Western would complete design of the new substation and double-circuit transmission line in 2012 and would begin construction in the spring of 2013.

BEPC proposes to construct and operate a new 230-kV transmission line from the proposed new Lower Brule Substation to the existing Witten Substation owned by Rosebud Electric Cooperative. The new Lower Brule Substation and approximately 70-mile-long Lower Brule to Witten 230-kV transmission line would assure future electric power requirements at pump stations 20 and 21 would be met without degrading system reliability when the Project is operating at maximum capacity. The new Lower Brule to Witten 230-kV transmission line would be built, owned, and operated by BEPC. The Witten Substation would also need to be expanded to accommodate the new switching equipment associated with the Lower Brule to Witten 230-kV transmission line.

The proposed substation and transmission line projects would be in Lyman and Tripp counties in south-central South Dakota. The Big Bend Dam is in Lyman County, close to the city of Fort Thompson. The Witten Substation is in Tripp County near the city of Witten.

As described in Section 4.4 of the EIS, Western and BEPC have identified two alternative corridors for the proposed Lower Brule to Witten transmission line project, and there are nine route options within each corridor between the Lower Brule and Witten substations.

2.5.2 Design and Construction Procedures

2.5.2.1 Pump Station Power Distribution Lines and Substations

Local utilities would supply electricity and communications to the pump stations and the tank farm. Table 2.5.1-1 summarizes new electrical power and distribution line requirements for these facilities.

All power lines and substations would be installed and operated by local power providers. These electrical power providers would therefore be responsible for ROW acquisition, ROW clearing, construction, site restoration, cleanup, and obtaining any necessary approvals or authorizations from federal, state, and local governments.

Construction of electrical power lines would involve the following:

- ROW Acquisition/Easements: The electric power provider would obtain any necessary easements.

- ROW Clearing: Limited clearing would be required along existing roads in native and improved grasslands and croplands. Tree trimming may be employed in certain locations, however, it may be necessary to remove some trees to provide adequate clearance between the conductors and underlying vegetation.

- Power Line Construction: Power line poles and associated structures would be delivered on flatbed trucks. Radial arm diggers would typically be used to excavate the required holes. The poles would be either wood or steel and would be directly embedded into the holes in the ground. A mobile crane or picker truck may be needed to install the poles. Anchors may be required at angles and dead ends.

  After the power line poles are in place, conductors (wires) would be strung between them. Pulling or reeling areas would be needed for installation of the conductor wires which would be attached to the poles using porcelain or fiberglass insulators.

- Restoration: After completion of power line construction, the disturbed areas would be restored. All litter and other remaining materials would be removed from the construction areas and disposed of properly. Preconstruction contours would be restored as closely as possible and reseeding would follow landowner requirements.

In addition to the above construction process, detailed power line construction procedures would be developed by each power provider to address site specific conditions.

2.5.2.2 Lower Brule to Witten 230-kV Transmission Line

The proposed transmission line would be constructed within a 125-foot ROW. The specific structure type has not been determined. Single- and two-pole structures would be evaluated.

All substation and switchyard work, including the placement of concrete foundations, erecting support structures, construction of control buildings, and the installation of electrical equipment would take place within secured areas. The proposed substation site at Lower Brule and the expansion area at Witten would be cleared and leveled. Aggregate would be spread throughout undeveloped areas within the substation sites. Topsoil would be segregated from underlying soils and redistributed on disturbed areas outside the substation security fences. Soil erosion would be minimized during construction using BMPs. Substation components would be hauled to the site on local highways and roads and off-loaded using cranes and similar equipment. Concrete and aggregate from local sources would be hauled to the site via trucks.

A SCADA system would interconnect the substations. Hardwire system communications would utilize fiber optics within the Optical Overhead Ground Wire between the substations. Microwave communications equipment would be installed for SCADA redundancy and to facilitate voice and data communications by field personnel. Additional communications facilities may also be needed.

The impacts of construction and operation of the transmission line alternatives are generally addressed in Section 3.0 the EIS. However, DOS, Western, and the other cooperating agencies do not have sufficient design and construction information to establish an agency preferred alternative for the proposed transmission line project. An additional and separate NEPA environmental review of the alternatives to the proposed transmission line will be conducted after the alternative routes are further defined. The design and environmental review of the proposed 230-kV transmission line are on a different schedule than the pipeline system itself. Regional transmission system reliability concerns are not associated with the initial operation of the proposed pipeline pump stations, but rather with later stages of proposed pipeline operation at higher levels of crude oil throughput.

2.6 FUTURE PLANS AND ABANDONMENT

2.6.1 Future Plans

As proposed, the Project would initially have a nominal transport capacity of approximately 700,000 bpd of crude oil. By increasing the capacity of the pump stations in the future, Keystone could transport up to 900,000 bpd of crude oil through the pipeline. Should Keystone decide to increase pumping capacity to 900,000 bpd at a later date, the necessary pump station upgrades would be implemented in accordance with then-applicable permits, approvals, codes, and regulations.

Montana and North Dakota oil producers are reportedly seeking at least one pipeline connection (an "on-ramp") to the Keystone XL Project along the proposed route in southeastern Montana to transport crude oil produced from the Williston Basin. Such a connection could only occur if one or more producers in the Williston Basin agreed to design, construct, and operate the necessary infrastructure to deliver crude oil from the Williston Basin oil fields to the point of interconnection with the Keystone XL system. As a common carrier in Montana, Keystone has stated it would consider such a connection and that crude oil from the producers would have to be injected into the pipeline in batches of at least 200,000 barrels. The only modifications required for the Keystone XL Project would be a pipeline connection at an existing pump station as well as the installation of two new block valves and new two check valves at the pump station. The remaining infrastructure would be constructed and operated by the crude oil producers.

The infrastructure necessary for the transport of crude oil from the Williston Basin to the Keystone XL Project would include at a minimum the necessary oil field gathering systems, tankage, delivery pipeline, pump stations, and likely a batch tank farm at the point of interconnection. As of the date of issuance of this EIS the possibility of such a connection was at the conceptual stage and no producers had committed to the development of the required infrastructure. If a connection between the Project pipeline is pursued further, proposals to construct and operate such a facility would be submitted to the appropriate federal, state, and local agencies for review, including reviews of potential environmental impacts. The proposed facilities would be subject to approvals by federal, state, and local agencies having jurisdiction at that time, and if approved, would be implemented in accordance with then-applicable permits, approvals, codes, and regulations. Potential impacts of such a connection are addressed in general terms in Section 3.14 (Cumulative Impacts).

2.6.2 Abandonment

The proposed Project is expected to operate for 50 years or more. At this time, Keystone has not submitted plans for abandonment of the facilities at the end of the Project's operational life. Abandonment plans would be submitted to the appropriate agencies for review and approval prior to abandonment of the Project facilities. Abandonment plans would be subject to approvals by local, state, and federal agencies having jurisdiction at that time and abandonment would be implemented in accordance with then-applicable permits, approvals, codes, and regulations

2.7 REFERENCES

49 CFR Part 194: Response Plans for Onshore Oil Pipelines

49 CFR Part 195: Transportation of Hazardous Liquids by Pipeline

49 CFR Section 195.410 Line Markers

40 CFR Part 300: Protection of Environment

40 CFR Part 112: Oil Pollution Prevention

49 USC Part 60118: Compliance and waivers

74 FR 4296 Request for Special Permit

Keystone (TransCanada Keystone Pipeline, LP). 2008. Keystone XL Project Environmental Report (ER). November 2008. Document No. 10623-006. Submitted to the U.S. Department of State and the Bureau of land Management by Keystone.

Keystone. 2009a. Response to United States Department of State Data Request 1.0. May 1, 2009. Submitted to U.S. Department of State by TransCanada Keystone Pipeline, L.P.

Keystone. 2009b. Response to United States Department of State Data Request 2.0. June 25, 2009. Submitted to U.S. Department of State by TransCanada Keystone Pipeline, L.P.

Keystone. 2009c. Supplemental Filing to ER. July 6, 2009. Document No.: 10623-006. Submitted to U.S. Department of State and Bureau of Land Management by TransCanada Keystone Pipeline, L.P.

Keystone. 2009d. General Conformity Determination (Document No. 10623-006-120A). July 2009.

Keystone. 2009e. Email response to data discrepancies in Supplemental Filing to ER. July 31, 2009.

Keystone. 2009f. Response to data request 3.0, November 3, 2009.

Office of Pipeline Safety (OPS). 2005. *Hazardous Liquid Accident Data – 1986 to January 2002 and Hazardous Liquid Accident Data – Pre 1986*. Available online at: www.///http://ops.dot.gov/stats/IA98.htm.

Pipeline and Hazardous Materials Safety Administration (PHMSA). 2009. PDEIS Comment Response Letter dated October 2, 2009.

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3.0 ENVIRONMENTAL ANALYSIS

The environmental consequences of constructing and operating the proposed Keystone XL Pipeline Project (Project) would vary in duration and significance. Four levels of impact duration were considered: temporary, short term, long term, and permanent. Temporary impacts generally occur during construction, with the resources returning to pre-construction conditions almost immediately afterward. Short-term impacts could continue for approximately 3 years following construction. Impacts were considered long term if the resources would require more than 3 years to recover. Permanent impacts would occur as a result of activities that modify resources to the extent that they would not return to pre-construction conditions during the life of the proposed Project, such as with construction of aboveground structures. An impact resulting in a substantial adverse change in the environment would be considered significant.

This section discusses the affected environment, construction and operations impacts, and mitigation for each affected resource. Keystone has indicated that it would implement certain measures to reduce environmental impacts. These measures have been evaluated and additional measures that might be necessary to further reduce impacts are recommended.

Conclusions in this EIS are based on the analysis of environmental impacts and the following assumptions:

- Keystone would comply with all applicable laws and regulations;
- The proposed facilities would be constructed as described in Section 2.0 of this EIS;
- Keystone would implement the mitigation measures identified in its Environmental Report (Keystone, 2008) and supplemental filings to DOS;
- Keystone would implement the environmental specifications and water quality protection requirements mandated by MDEQ for Montana as part of the MFSA certification process and presented in Attachments 1 and 2 to Appendix I; and
- Keystone would implement the additional mitigation measures presented in this EIS.

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3.1 GEOLOGY

3.1.1 Physiography and Surface and Bedrock Geology

3.1.1.1 Affected Environment

Project Route

Montana

The proposed route enters Morgan, Montana along Montana's northern border with Saskatchewan and traverses the state along a south-southeasterly corridor that extends to the southeast corner of the state. The route traverses the Great Plains physiographic province (Fenneman 1928) and is characterized by badlands, buttes, mesas, and includes the Black Hills mountain range. The route crosses the Glaciated Missouri Plateau and the Unglaciated Missouri Plateau. The glaciated section to the north is covered in glacial deposits and represents the furthest southern extent of the last ice age. In the vicinity of Circle, Montana, the proposed pipeline enters the Unglaciated Missouri Plateau. Surface elevations average around 3,000 feet above mean sea level (amsl). The route would cross six EPA Level IV Ecoregions, each with a distinct physiography (Omernik 2009). Regional physiographic characteristics are presented in detail within Montana in Table 3.1.1-1.

Surficial geological materials are composed of Quaternary alluvium, colluvium, and glacial till that consist of sand, gravel, and clay. Bedrock consists of Tertiary (Fort Union Formation) and Late Cretaceous-aged rocks (Hell Creek/Fox Hills Formation, Bearpaw Formation/Pierre Shale, Judith River Formation, and Claggett Shale). The Fort Union Formation (approximately 138 miles crossed between MP 105 and MP 286) consists primarily of sandstone, siltstone, mudstone, carbonaceous shale, and lignite. The proposed route crosses the Ludlow, Tongue River, Lebo, and Tullock members of this Formation. The Tongue River and Tullock members also contain thin coal beds. The Hell Creek/Fox Hills Formation (approximately 56 miles crossed between MP 91 and MP 116; and between MP 245 and MP 273) forms badland topography and consists of shale, mudstone, and lenticular coal beds. The Bearpaw/Pierre Shale (approximately 43 miles crossed between MP 31and MP 90) consists of bentonitic mudstone and shale, the Judith River Formation (approximately 16 miles crossed between MP 1 and MP 45) consists of sandstone, siltstone, mudstone, shale, and coal, while the Claggett Shale (MP 39 to MP 41) consists of shale and siltstone with beds of bentonite. Geology beneath the Steele City Segment is presented in Figure 3.1.1-1.

South Dakota

The proposed route enters South Dakota in the northwestern corner of the state. The route continues in a generally straight fashion in a southeastern direction south of Pierre in the southwest quarter of the state, exiting South Dakota in southeast Tripp County. The proposed route is located in the Unglaciated Missouri Plateau in the Great Plains physiographic province. Surface elevations range from 3,000 feet amsl in northwest South Dakota to 1,800 feet amsl in the White River Valley. The route would cross eight EPA Level IV Ecoregions, each with a distinct physiography (Bryce et al. 1996). Regional physiographic characteristics are presented in detail within South Dakota in Table 3.1.1-2.

Surficial geological materials are composed of Quaternary alluvium, colluvium, alluvial terraces, and aeolian deposits. The majority of bedrock in South Dakota consist of Upper Cretaceous rocks (Hell Creek/Fox Hills Formation, Pierre Shale), while Tertiary-aged (Ogallala Group and Ludlow Member of the Fort Union Formation) are present beneath the southern portion of the proposed route in South

Dakota. The Hell Creek/Fox Hills Formation (MP 285 to MP 418) forms badland topography and consists of shale, mudstone, and lenticular coal beds. The Pierre Shale occurs sporadically through the route in South Dakota and consists of bentonitic mudstone and shale. The Ogallala Group (MP 521 to 593) consists of well to poorly consolidated sandstone and conglomerate with occasional bentonite layers. The Ludlow Member of the Fort Union Formation (approximately 3 miles crossed between MP 283 and 376) consists primarily of sandstone, siltstone, mudstone, carbonaceous shale and lignite. Geology beneath the Steele City Segment is presented in Figure 3.1.1-1.

Several major structural features would be crossed by the proposed pipeline route in South Dakota. The Williston Basin covers northeast Montana, the majority of North Dakota, northwest South Dakota, and extends into Canada (Peterson and MacCary 1987). Regionally, the Williston Basin is a structural basin that contains approximately 15,000 feet of sedimentary bedrock. South of the Williston Basin, the Sioux Arch is a buried ridge that extends east to west from Minnesota through southeast South Dakota (Gries 1996). South of the White River, the proposed route would cross into the Salina Basin, a sedimentary basin that underlies southern South Dakota and the majority of eastern Nebraska.

Nebraska

The proposed route enters Nebraska in northern Keya Paha County and continues in a southeastern direction across the state. The pipeline route in Nebraska joins the Cushing Extension pipeline route in Steele City in southeastern Jefferson County. The majority of the proposed route in Nebraska lies in the High Plains portion of the Great Plains Physiographic Province. In northern Nebraska, the Unglaciated Missouri Plateau underlies the pipeline route, while the southern portion of the route lies in the Plains Border Region. Surface elevations range from 2,200 feet amsl in Northern Nebraska to 1,400 at the Kansas state line. The route would cross nine EPA Level IV Ecoregions, each with a distinct physiography (Chapman et al. 2001). Regional physiographic characteristics are presented in detail within Nebraska in Table 3.1.1-3.

The majority of the state is covered by Quaternary deposits along with glacial till, loess, and the Sand Hills. Glacial till is present in southeast Nebraska, south of the Loup River to the Kansas state line. Loess is present from the town of Greeley to the Loup River. Between Stuart and Greeley, the proposed route would cross the eastern extent of the Sand Hills. The Sand Hills are composed mainly of well-sorted sands that are present in dunes and sand sheets and are stabilized by existing vegetation.

The underlying bedrock consists of Tertiary-aged Ogallala Group (approximately 135 miles crossed between MP 597 and MP 745) and Cretaceous sedimentary rocks (Pierre Shale, Niobrara Formation, Carlisle Shale, Greenhorn Limestone and Graneros Shale, and Dakota Group). The Niobrara Formation (approximately 28 miles crossed between MP 738 and MP 777), Carlisle Shale (approximately 34 miles crossed between MP 759 and MP 819), and Greenhorn Limestone and Graneros Shale (approximately 14 miles crossed between MP 797 to MP 823) contain varying amounts of limestone which potentially contain karst formations, causing surface subsidence. The Pierre Shale (MP 599 to MP 605 and MP 614 to MP 617) is exposed in Northern Nebraska and is composed of fissile clay shale, claystone, shaly sandstone, and sandy shale. This formation is prone to slumping and is especially weak where layers of volcanic ash are present. The Dakota Group (approximately 33 miles crossed between MP 798 to MP 851) consists of sandstone and shale. Geology beneath the Steele City Segment is presented in Figure 3.1.1-1.

Kansas

In Kansas, two new pump stations would be constructed along the Cushing Extension of the previously permitted Keystone pipeline (ENTRIX 2008). These pump stations (PS-27 and PS-29) are located in

Clay and Butler counties at Cushing Extension MP 49 and MP 145, respectively. These pump stations are located in the Flint Hills Ecoregion and contain outcrops of Permian sedimentary rocks. Elevations in this area range from 1,150 to 1,400 feet amsl. Surficial materials in the vicinity of the Clay County pump station include thick deposits of loess (greater than 30 feet) (Frye and Leonard 1952). In the vicinity of the Butler County pump station, surficial deposits consist of alluvium, colluvium, and cherty gravels in upland areas (KGS 1999). Karst is not present in either of these locations (Davies et al. 1984).

Oklahoma

In Oklahoma, the proposed Gulf Coast Segment pipeline route connects to the southern terminus of the Cushing Extension of the previously permitted Keystone pipeline (ENTRIX 2008). The segment begins at the border between Payne and Lincoln counties and continues in a south-southeastern direction, where the proposed route enters Texas in southeast Bryan County. The proposed pipeline segment in Oklahoma is present in the Central Lowland physiographic province beginning in Cushing to northern Atoka County, where the Gulf Coastal Plains physiographic province begins and continues into Texas. Surface elevations range from 900 feet amsl in central Oklahoma to 450 at the Texas state line. The route would cross six EPA Level IV Ecoregions, each with a distinct physiography (Woods et al. 2005). Regional physiographic characteristics are presented in detail within Oklahoma in Table 3.1.1-4.

Upper Paleozoic (Permian) rock lies beneath the proposed route beginning at Cushing to MP 121. These rocks consist of alternating beds of sandstone, shale, and occasional limestone formed under both marine and non-marine conditions. In southeast Oklahoma, non-marine river and flood plain sands, silts, and clays are present (Johnson 1996). Beneath these surface sediments lie Cretaceous sedimentary rocks. Geology beneath the Gulf Coast Segment is presented in Figure 3.1.1-2.

Texas

The proposed Gulf Coast Segment pipeline route enters Texas in northeast Bannin County and continues in a south to southeast direction. In Liberty County, at the junction with the Houston Lateral, the Gulf Coast Segment continues in an east to southeast direction and terminates in Port Arthur. The Houston Lateral begins in Liberty County and continues in a west to southwest direction, ending in central Harris County. The proposed pipeline route is present in the Gulf Coastal Plains physiographical province, which includes the Coastal Prairies, Interior Coastal Plains, and the Blackland Prairies subprovinces. Surface elevations range from 450 feet amsl in northern Texas to near seal level at the conclusion of the proposed pipeline route. The route would cross 11 EPA Level IV Ecoregions, each with a distinct physiography (Griffith et al. 2004). Regional physiographic characteristics are presented in detail within Texas in Table 3.1.1-5 (Gulf Coast Segment) and Table 3.1.1-6 (Houston Lateral).

In northern Texas along the proposed route, the Blackland Prairie is characterized by black, sandy, calcareous soil originating from the underlying glauconitic sands and clays. The topography is undulating with few bedrock outcroppings (Wermund 2008). The Interior Coastal Plains subprovince is characterized by low-relief bands of eroded shale and sandy ridges. Eocene sandstone bedrock is present where exposed by rivers (Spearing 1991). The Coastal Prairies subprovince in southern Texas is underlain by young deltaic sands, silts, and clays that have eroded to a relatively flat landscape and are present as a grassland (Wermund 2008). Geology beneath the Gulf Coast Segment and Houston Lateral is presented in Figure 3.1.1-2.

TABLE 3.1.1-1
Physiographic Characteristics of Ecoregions Crossed in Montana by the Project – Steele City Segment

MP Range	Physiographic Description	Elevation Range (ft AMSL)	Local Relief (ft)	Surface Geology	Bedrock Geology
Northwestern Glaciated Plains – Cherry Patch Moraines[a]					
0 - 8	Glaciated, undulating to strongly sloping topography containing bouldery knolls, gravelly ridges, kettle lakes, and wetlands. Prominent end moraine.	2,300 - 3,600	50 - 375	Quaternary drift.	Cretaceous Claggett Formation, Judith River Formation.
Northwestern Glaciated Plains – Glaciated Northern Grasslands[a]					
8 - 90, 109 - 116	Glaciated, dissected, rolling to strongly rolling drift plains.	1,990 - 4,000	50 - 600	Quaternary glacial drift deposits.	Cretaceous Bearpaw Shale, Judith River Formation, Claggett Formation, Hell Creek Formation, Fox Hills Formation, Tongue River Member of Fort Union Formation, and Flaxville Gravels.
Northwestern Great Plains – River Breaks[a]					
90 - 104, 192 - 197	Unglaciated, rugged, very highly dissected terrain adjacent to rivers.	1,900 - 3,450	200 - 500	Erodible, clayey soils; gravelly soils on slopes.	Tongue River, Lebo, Slope, and Tullock members of the Tertiary Fort Union Formation, Hell Creek Formation, Fox Hills Sandstone, and Pierre Shale.
Northwestern Great Plains – Central Grassland[a]					
104 - 109, 116 - 133, 198 - 282	Unglaciated, dissected rolling plains containing buttes. Areas of gravel, clinker, and salt flats. Streams are intermittent.	2,200 - 5,000	125 - 600	Quaternary terrace deposits and alluvium along channels.	Tertiary Fort Union, Hell Creek Formation, Pierre Shale.
Northwestern Great Plains – Missouri Plateau[a]					
133 - 192	Unglaciated rolling hills and gravel covered benches. Some areas are subject to wind erosion.	2,000 - 3,550	50 - 500	Quaternary terrace deposits.	Tongue River and Slope members of the Tertiary Fort Union Formation, Tertiary Flaxville Gravels.
Northwestern Great Plains – Sagebrush Steppe[a]					
282 - 282.3	Unglaciated, level to rolling plains. Landscape contains buttes, badlands, scoria mounds and salt pans.	2,300 - 4,200	50 - 600	Quaternary alluvium along channels. Upper Cretaceous sandstone and shale.	Colorado Group, Pierre Shale, Hell Creek Formation, Fox Hills Sandstone, and Fort Union Formation.

[a] EPA Level III-IV Ecoregion name.
Source: Omernik 2009.

TABLE 3.1.1-2
Physiographic Characteristics of Ecoregions Crossed in South Dakota by the Project – Steele City Segment

MP Range	Physiographic Description	Elevation Range (ft AMSL)	Local Relief (ft)	Surface Geology	Bedrock Geology
Northwestern Great Plains – Sagebrush Steppe[a]					
282 - 337	Unglaciated, level to rolling plains. Landscape contains buttes, badlands, scoria mounds and salt pans.	3,000 - 3,475	50 - 350	Quaternary alluvium along channels. Upper Cretaceous sandstone and shale.	Hell Creek Formation and Pierre Shale.
Northwestern Great Plains – Moreau Prairie[a]					
337 - 386	Unglaciated, level to rolling plains. Landscape contains buttes, badlands, and salt pans.	2,100 - 3,200	120 - 250	Upper Cretaceous sandstone and shale.	Hell Creek Formation.
Northwestern Great Plains – Missouri Plateau[a]					
386 - 415	Unglaciated, moderately dissected level to rolling plains. Contains sandstone buttes.	1,750 - 3,300	50 - 500	Tertiary sandstone, shale, and coal.	Ludlow member of Fort Union Formation, Fox Hills Formation.
Northwestern Great Plains – Subhumid Pierre Shale Plains[a]					
415 - 417, 430 - 432, 432 - 478, 487 - 493, 494 - 535, 545 - 570	Unglaciated, undulating plain. Terrain contains incised, steep-sided stream channels.	1,700 - 2,800	50 - 500	Cretaceous shale.	Pierre Shale.
Northwestern Great Plains – River Breaks[a]					
417 - 430, 431 - 432, 478 - 487, 493 - 494, 535 - 546	Unglaciated, highly dissected hills and uplands. Ecoregion borders major rivers and alluvial plains.	1,300 - 2,700	200 - 500	Cretaceous shale.	Pierre Shale.
Northwestern Great Plains – Keya Paha Tablelands[a]					
570 - 575	Unglaciated, level to rolling sandy plains. Topography is dissected near streams.	2,250 - 3,600	20 - 800	Aeolian and alluvial sand and silt.	Ogallala Formation.
Northwestern Glaciated Plains – Ponca Plains[a]					
575 - 589	Unglaciated , level to gently rolling plains. Topography formed by stream drainage (preglacial).	1,900 - 2,350	80 - 140	Miocene soft sandstone and cretaceous shale.	Pierre Shale.
Northwestern Glaciated Plains – Southern River Breaks[a]					
589 - 597	Lightly glaciated dissected hills and canyons. Topography contains slopes of high relief bordering major rivers and alluvial plains.	1,250 - 2,000	250 - 700	Cretaceous shale.	Pierre Shale.

[a] EPA Level III-IV Ecoregion name.
Source: Bryce et al. 1996.

TABLE 3.1.1-3
Physiographic Characteristics of Ecoregions Crossed in Nebraska by the Project – Steele City Segment

MP Range	Physiographic Description	Elevation Range (ft AMSL)	Local Relief (ft)	Surface Geology	Bedrock Geology
Northwestern Glaciated Plains – Southern River Breaks[a]					
597 - 600	Dissected hills and canyons. Topography contains slopes of high relief bordering major rivers and alluvial plains.	1,400 - 2,000	250 - 500	Cretaceous shale.	Pierre Shale.
Northwestern Great Plains – Keya Paha Tablelands[a]					
600 - 613	Unglaciated, level to rolling sandy plains. Topography is dissected near streams; contains isolated gravelly buttes.	1,900 - 2,400	20 - 400	Aeolian and alluvial sand and silt.	Ogallala Sandstone.
Northwestern Great Plains – Niobrara River Breaks[a]					
613 - 617	Unglaciated, dissected canyons. Contains slopes of high relief adjacent to river.	1,700 - 2,700	200 - 600	Sandy residuum.	Miocene soft sandstone over Pierre Shale.
Nebraska Sand Hills – Wet Meadow and Marsh Plain[a]					
617 - 664	Flat, sandy plain with numerous marshes and wetlands.	1,900 - 2,400	10 - 50	Aeolian sand dunes and sand sheets, alluvial silt, sand and gravel.	Ogallala Sandstone.
Nebraska Sand Hills – Sand Hills[a]					
664 - 708	Sand sheets and extensive fields of sand dunes.	2,200 - 3,900	50 - 400	Aeolian sand dunes and alluvial silt, sand and gravel.	Ogallala Sandstone.
Central Great Plains – Central Nebraska Loess Plains[a]					
708 - 738	Rolling dissected plains with deep layer of loess. Contains perennial and intermittent streams.	1,600 - 3,100	50 - 275	Calcareous loess, alluvial sand, gravel, and lacustrine sand and silt.	Ogallala Sandstone.
Central Great Plains – Platte River Valley[a]					
738 - 758	Flat, wide alluvial valley. Contains shallow, interlacing streams on a sandy bed.	1,300 - 2,900	2 - 75	Alluvial, sand, silt, clay, and gravel deposits.	Quaternary and Tertiary unconsolidated sand and gravel.
Central Great Plains – Rainwater Basin Plains[a]					
758 - 847	Flat to gently rolling loess covered plains. Historical rainwater basins and wetlands.	1,300 - 2,400	5 - 100	Loess and mixed loess and sandy alluvium.	Ogallala Sandstone, Niobrara Formation, and Carlisle Shale.
Central Great Plains – Smoky Hills[a]					
847 - 851	Undulating to hilly dissected plain with broad belt of low hills formed by dissection of Cretaceous rock layers.	1,200 - 1,800	100 - 250	Sandstone and shale, loamy colluvium, chalky limestone, and thin loess.	Cretaceous sandstone of Dakota Group.

[a] EPA Level III-IV Ecoregion name.
Source: Chapman et al. 2001.

TABLE 3.1.1-4 Physiographic Characteristics of Ecoregions Crossed in Oklahoma by the Project – Gulf Coast Segment					
MP Range	**Physiographic Description**	**Elevation Range (ft AMSL)**	**Local Relief (ft)**	**Surface Geology**	**Bedrock Geology**
Central Great Plains – Cross Timbers Transition[a]					
0 - 16	Rough Plains that is sometimes broken. Topography contains incised streams.	750 -1,950	30 - 300	Quaternary alluvium, terrace deposits, and residuum.	Permian and Pennsylvanian sandstone and shale, limestone and mudstone conglomerate.
Cross Timbers – Northern Cross Timbers[a]					
16 - 78	Rolling hills, cuestas, ridges, and ledges. Contains shallow streams with sandy substrates and sometimes deep pools, riffles, and bedrock, cobble, or gravel substrates.	600 - 1,3 00	100 - 350	Uplands contain Quaternary clayey silt to silty clay residuum. Valleys contain Quaternary alluvium. Rock outcrops are common.	Pennsylvanian and Permian sandstone, shale, and limestone.
Arkansas Valley – Lower Canadian Hills[a]					
78 - 119	Hill and valley topography in structural Arkoma Basin with scattered ridges and ponds. Streams contain pools and have substrated composed of cobbles, gravel, and sand.	500 - 1,000	50 - 300	Quaternary terrace deposits, alluvium, and sandy to silty clay loam residuum.	Pennsylvanian shale and sandstone.
South Central Plains – Cretaceous Dissected Uplands[a]					
119 - 138, 139 - 155	Level to hilly, dissected uplands and low cuestas. Large streams are deep and slow moving and have muddy or sandy bottoms. Smaller streams contain gravel, cobble and boulder substrates.	310 – 700	Less than 50 - 200	Quaternary alluvium in valleys. Uplands contain poorly consolidated, calcareous sands, clays, gravels, and limestone.	Calcareous sands, clays, gravels, and limestone.
Cross Timbers – Eastern Cross Timbers[a]					
138 - 139	Rolling hills, cuestas, long narrow ridges with few strongly dissected areas. Stream substrates consist of quartz sand.	640 - 1,100	100 - 200	Uplands are composed of Quaternary sand, gravel, silt, and clay residuum. Valleys consist of Quaternary alluvium.	Cretaceous sand, shale, clay, sandstone, calcareous shale, and limestone.
South Central Plains – Red River Bottomlands[a]					
154.9 - 155.3	Broad, level floodplains and low terraces. Topography contains oxbow lakes, meander scars, back swamps, and natural levees.	300 – 530	10 - 50	Holocene alluvium.	Holocene alluvium.

[a] EPA Level III-IV Ecoregion name.

Source: Woods et al. 2005.

TABLE 3.1.1-5 Physiographic Characteristics of Ecoregions Crossed in Texas by the Project – Gulf Coast Segment					
MP Range	**Physiographic Description**	**Elevation Range (ft AMSL)**	**Local Relief (ft)**	**Surface Geology**	**Bedrock Geology**
South Central Plains – Red River Bottomlands[a]					
155 - 160	Broad, level floodplains and low terraces. Topography contains oxbow lakes, meander scars, back swamps, and natural levees.	300 - 530	10 - 50	Holocene alluvium.	Holocene alluvium.
South Central Plains – Pleistocene Fluvial Terraces[a]					
160 - 163	Broad flats and gently sloping stream terraces.	310 - 400	10 - 50	Terrace deposits.	Terrace deposits.
East Central Texas Plains – Northern Post Oak Savanna[a]					
163 - 172, 198 - 202, 203 - 205, 206 - 212, 217 - 227	Level and gently rolling topography.	300 - 800	10 - 50	Fine textured loam soils.	Eocene and Paleocene Formations and Cretaceous Formations in northern extent.
Texas Blackland Prairies – Northern Blackland Prairie[a]					
172 - 198	Rolling to nearly level plains.	300 - 800	10 - 50	Fine-textured, dark, calcareous soils.	Interbedded chalks, marls, limestones, and Cretaceous shales.
East Central Texas Plains – Floodplains and Low Terraces[a]					
202 - 203, 212 - 214	Wider floodplains of major streams.	300 - 800	10 - 50	Floodplain and low terrace deposits.	Halocene deposits.
East Central Texas Plains – Northern Prairie Outliers[a]					
205 - 206, 214 - 217	Land cover is mostly pasture, with some cropland.	300 - 800	10 - 50	Paleocene and Eocene formations south of the Sulfur River.	Cretaceous sediments north of the Sulfur River; Paleocene and Eocene formations south of the Sulfur River.
South Central Plains – Tertiary Uplands[a]					
227 - 261, 263 - 332	Rolling topography, gently to moderately sloping.	290 - 390	10 - 50	Tertiary deposits, mainly Eocene sediments.	Tertiary deposits, mainly Eocene sediments.
South Central Plains – Floodplains and Low Terraces[a]					
261 - 262, 262 - 263, 333 - 336, 347 - 348, 352 - 353, 359 - 361, 364 - 366, 366 - 370	Alluvial floodplains and low terraces.	290 - 390	10 - 50	Clayey and loamy soils.	Halocene deposits.

TABLE 3.1.1-5 Physiographic Characteristics of Ecoregions Crossed in Texas by the Project – Gulf Coast Segment					
MP Range	**Physiographic Description**	**Elevation Range (ft AMSL)**	**Local Relief (ft)**	**Surface Geology**	**Bedrock Geology**
South Central Plains – Southern Tertiary Uplands[a]					
332 - 333, 336 - 347, 348 - 352, 353 - 359, 361 - 364, 365.8 - 366.2, 370 - 408	Consists of longleaf pine range north of Flatwoods EcoRegion. Forested topography is hilly and dissected.	290 - 390	10 - 50	Tertiary sediments.	Tertiary sediments.
South Central Plains – Flatwoods[a]					
408 - 452, 456 - 457	Topography is flat to gently sloping. Streams are low gradient and sluggish.	290 - 390	10 - 50	Pleistocene sediments.	Pleistocene sediments.
Western Gulf Coastal Plain – Northern Humid Gulf Coastal Prairies[a]					
452 - 456, 457 - 480	Gently sloping coastal plain.	0 – 400	10 - 50	Fine-textured clay to sandy clay loam soils.	Quaternary deltaic sands, silts, and clays.

[a] EPA Level III-IV Ecoregion name.
Source: Griffith et al. 2004.

TABLE 3.1.1-6 Physiographic Characteristics of Ecoregions Crossed in Texas by the Project – Houston Lateral					
Milepost Range	**Physiographic Description**	**Elevation Range (feet above mean sea level)**	**Local Relief (feet)**	**Surface Geology**	**Bedrock Geology**
South Central Plains – Flatwoods[a]					
0 -3, 15.9 - 16.4	Topography is flat to gently sloping. Streams are low gradient and sluggish.	290 - 390	10 - 50	Pleistocene sediments.	Pleistocene sediments.
Western Gulf Coastal Plain – Northern Humid Gulf Coastal Prairies[a]					
3 - 16, 23 - 49	Gently sloping coastal plain.	0 - 400	10 - 50	Fine-textured clay to sandy clay loam soils.	Quaternary deltaic sands, silts, and clays.
South Central Plains – Floodplains and Low Terraces[a]					
16 - 23	Alluvial floodplains and low terraces.	290 - 390	10 - 50	Clayey and loamy soils.	Halocene deposits.

[a] EPA Level III-IV Ecoregion name.
Source: Griffith et al. 2004.

3.1.1.2 Potential Impacts and Mitigation

Construction Impacts

The proposed Project would not involve substantial long- or short-term, large scale alteration of topography. Most of the proposed route would be within areas where bedrock is buried by unconsolidated sediments consisting of glacial till, alluvium, colluvium, loess and/or aeolian deposits. In these areas, impacts to bedrock would be expected to be minimal, and limited to areas where bedrock is within 8 feet of the surface. Trench excavation would typically be to depths of between seven to eight feet. Potential impacts to surface sediments and topography due to accelerated erosion or soil compaction are described in Section 3.2.

During construction, blasting could be required at locations where shallow bedrock (lithic or very strongly cemented rock) is present within 8 feet of the ground surface. Rock ripping could be necessary where dense material, paralithic bedrock, abrupt textural change, or strongly contrasting textural stratification is present within 8 feet of the ground surface. Over the entire proposed Project route, approximately 9 miles would cross areas identified as potential blasting locations and approximately 166 miles would cross areas identified as potential ripping locations. Table 3.1.1-7 and Table 3.1.1-8 summarize the approximate locations of expected blasting and ripping operations respectively, by state, county, and approximate milepost.

TABLE 3.1.1-7 Potential Blasting Locations for the Project			
MP Range	**State**	**County**	**Total Length (miles)**
Steele City Segment			
848.2 – 849.0	NE	Jefferson	0.32 miles
Steele City Segment Subtotal			0.32 miles
Gulf Coast Segment			
18.6 – 18.8	OK	Creek	0.06 miles
20.8 – 20.9	OK	Creek	0.12 miles
59.2 – 59.9	OK	Hughes	0.14 miles
61.7 – 62.3	OK	Hughes	0.52 miles
63.8 – 76.7	OK	Hughes	2.51 miles
81.3 – 92.2	OK	Hughes/Coal	2.99 miles
93.9 – 94.1	OK	Coal	0.18 miles
95.8 – 95.9	OK	Coal	0.15 miles
97.3 – 97.4	OK	Coal	0.07 miles
99.8 – 101.5	OK	Coal	0.2 miles
104.1 – 109.7	OK	Coal	0.55 miles
131.3 – 137.7	OK	Atoka/Bryan	0.93 miles
Gulf Coast Segment Subtotal			8.42 miles
Houston Lateral			
None	-	-	0 miles
Houston Lateral Subtotal			0 miles
Keystone XL Project Total			**8.74 miles**

Source: Keystone 2009a.

TABLE 3.1.1-8 Potential Ripping Locations for the Project			
MP Range	**State**	**County**	**Length (miles)**
Steele City Segment			
11.0 – 19.7	MT	Phillips	1.72 miles
26.0 – 82.4	MT	Valley	4.33 miles
90.0 – 155.5	MT	McCone	17.59 miles
156.0 – 196.4	MT	Dawson	8.81 miles
197.5 – 217.6	MT	Prairie	2.70 miles
218.1 – 282.2	MT	Fallon	17.99 miles
282.2 – 352.4	SD	Harding	4.68 miles
354.4 – 355.0	SD	Butte	0.44 miles
357.3 – 372.4	SD	Perkins	1.22 miles

TABLE 3.1.1-8 Potential Ripping Locations for the Project			
MP Range	**State**	**County**	**Length (miles)**
372.5 – 423.0	SD	Meade	8.43 miles
426.0 – 483.8	SD	Haakon	18.28 miles
484.7 – 521.8	SD	Jones	26.18 miles
529.3 – 536.3	SD	Lyman	2.41 miles
537.4 – 596.7	SD	Tripp	15.57 miles
596.7 – 614.0	NE	Keya Paha	1.62 miles
616.1 – 616.3	NE	Rock	0.15 miles
848.2 – 849.3	NE	Jefferson	0.48 miles
Steele City Segment Subtotal			132.6 miles
Gulf Coast Segment			
1.1 – 17.4	OK	Lincoln	4.33 miles
19.0 – 21.9	OK	Creek	1.53 miles
24.1 – 38.8	OK	Okfuskee	6.83 miles
39.4 – 61.1	OK	Seminole	5.82 miles
61.5 – 85.8	OK	Hughes	1.27 miles
89.7 – 111.5	OK	Coal	2.84 miles
113.8 – 116.6	OK	Atoka	0.78 miles
143.2 – 143.3	OK	Bryan	0.10 miles
180.6 – 181.9	TX	Lamar	1.14 miles
202.4 – 206.0	TX	Hopkins	0.97 miles
224.3 – 233.3	TX	Franklin	1.77 miles
233.4 – 249.0	TX	Wood	1.68 miles
264.3 – 264.7	TX	Smith	0.34 miles
441.5 – 445.2	TX	Hardin	0.57 miles
Gulf Coast Segment Subtotal			29.97 miles
Houston Lateral			
15.2 – 49.21	TX	Liberty	3.17 miles
51.2 – 52.1	TX	Chambers	0.29 miles
Houston Lateral Subtotal			3.46 miles
Project Total			**166.03 miles**

Source: Keystone 2009a.

Operations Impacts

Routine pipeline operation and maintenance activities would not be expected to affect physiography or surface or bedrock geology. Potential impacts to surface sediments and topography due to accelerated erosion or soil compaction are described in Section 3.2.

3.1.2 Paleontological Resources

3.1.2.1 Affected Environment

The potential for fossil or other paleontological resources to be unearthed during pipeline construction was evaluated along the proposed pipeline route. Field surveys were conducted along the proposed route on federal lands in Montana and South Dakota; for the remainder of the route, a review of published literature was conducted. Fossil potential is designated from very low to very high in Montana, low to high in South Dakota, and not scaled for Nebraska, Oklahoma, and Texas.

Formations in Montana that contain a high or very high fossil potential include: Ludlow Member of the Fort Union Formation (occurs sporadically between MP 200.9 to MP 282.5) for mammals; the Tongue River Member of the Fort Union Formation (MP 129.0 to MP 200.9; MP 203.6 to MP 240.7) for plants; mammals, and mollusks; the Lebo Member of the Fort Union Formation (sporadically between MP 119.7 to MP 129.0) for mammals; the Tullock Member of the Fort Union Formation (sporadically between MP 105.4 to MP 128.0) for invertebrates and vertebrates; the Hell Creek Formation (sporadically between MP 91.5 to MP 114.9) for plants, vertebrates, and invertebrates; and the Judith River Formation (sporadically between MP 1.1 to MP 45.1) for vertebrates.

Formations in South Dakota that contain a high fossil potential include the Ludlow Member of the Fort Union Formation (MP 282.5 to 284.7) for mammals, plants, and invertebrates, and the Hell Creek Formation (MP 284.7 to 387.1) for reptiles (including dinosaurs) and mammals.

Formations in Nebraska that contain fossil potential include: the Tertiary Ogallala Group (occurs sporadically from MP 595 to 744) for horses, rhinoceroses, proboscideans, mammoths, and other ruminants; the upper Cretaceous Pierre Shale, Niobrara, Carlisle, Greenhorn Limestone and Graneros Shale Formations (sporadically between MP 595 to MP 823) for ammonites, gastropods, bivalves, mosasaurs, fish, bivalves, sea turtles, and sharks; and the lower Cretacous Dakota Group (occurs sporadically from MP 798 to MP 850) for flowering plants.

In Kansas, where two new pump stations are proposed, Permian sedimentary rocks may contain fossils of shark and invertebrates including corals, brachiopods, ammonoids, and gastropods (KGS, 2005). Surficial unconsolidated deposits have the potential to contain large vertebrate fossils such as mammoths, mastodons, camels, and saber-toothed tigers; and invertebrates such as mollusks (Paleontology Portal, 2003).

In Oklahoma, Permian rocks in Payne and Lincoln counties may contain invertebrates. Carboniferous rocks in Creek, Okfuskee, Seminole, Hughes, and Coal counties may contain invertebrates, plants, and fish. Cretaceous rocks in Atoka and Bryan counties may contain fish, reptiles (including dinosaur), and invertebrates.

In Texas, Cretaceous rocks in Fannin, Lamar, and Delta counties may contain invertebrate and fish fossils. Tertiary rocks in Hopkins, Franklin, Smith, Rusk, Upshur, Nacogdoches, Cherokee, Wood, Angelina, and Polk counties may contain invertebrates, reptiles, fish, mammals, and plant fossils. Quaternary rocks in Liberty, Jefferson, Chambers, and Harris counties may contain land mammals, birds, and reptiles.

3.1.2.2 Potential Impacts and Mitigation

Construction Impacts

Potential impacts to paleontological resources during construction includes damage to or destruction of fossils due to excavation activities and/or blasting, erosion of fossil beds due to grading, and unauthorized collection of fossils by construction personnel or the public.

Because there is potential for discovery of fossils during trench excavation and pipeline installation activities, Keystone would prepare a Paleontological Mitigation Plan prior to beginning construction on federal and certain state and local government lands. Fossils or other paleontological resources found on private land would only be recovered with approval of the landowner, and therefore, may be unavailable for scientific study. Additionally, prior to initiation of excavation and pipeline installation, Keystone would consult with the appropriate regulatory agencies in each state on the requirements for the Paleontological Mitigation Plan for federal, certain state and local government lands. There is currently an effort led by MDEQ and other agencies to develop a Memorandum of Understanding (MOU) in Montana for the identification, evaluation and protection of paleontological resources. This MOU will be completed prior to the FEIS.

The BLM uses the Potential Fossil Yield Classification System (PFYC) for identifying fossil potential on federal lands based on the potential of occurrence of significant paleontological resources in a geologic unit, and the associated risk for impacts to the resource based on federal management actions. The PFYC along with BLM field survey and monitoring procedures helps minimize impacts from construction activities to important paleontological resources. Keystone shall provide a paleontological monitor for each construction spread in Montana and South Dakota that includes an area assigned moderate to high probability (3-5) based on the PFYC. The paleontological monitor must satisfy the qualifications established by the BLM required for permit approval on federal lands.

Paleontological resources identified on Federal lands are managed and protected under the Paleontological Resources Preservation Act (PRSA) as part of the Omnibus Public Land Management Act of 2009. This law requires the Secretaries of the Interior and Agriculture to manage and protect paleontological resources on lands under their jurisdiction using scientific principles and expertise. The Act affirms the authority for many of the policies the Federal land managing agencies already have in place such as issuing permits for collecting paleontological resources, curation of paleontological resources, and confidentiality of locality data. The statute also establishes criminal and civil penalties for fossil theft and vandalism on Federal lands.

The states of Montana and South Dakota have enacted legislation to manage and protect paleontological resources on state-managed lands. In Montana, the Montana Antiquities Act, as amended (1995), requires the Department of Natural Resources and Conservation (DNRC) and other state agencies to avoid or mitigate damage to important paleontological resources (when feasible) on state trust lands. The Montana Department of Fish, Wildlife and Parks have written rules for implementing the State Antiquities Act. The SHPO also issues antiquities permits for the collection of paleontological resources on state owned lands.

In Montana, Keystone is required to obtain a certificate of compliance authorizing construction of the proposed pipeline from the Montana Department of Environmental Quality (MDEQ). Issuance of the certificate of compliance is a state action for which MDEQ is required to comply with the Montana Environmental Policy Act (MEPA). MDEQ is the lead agency for compliance with the MEPA.

As a conditional requirement for the issuance of the certificate of compliance, Keystone is required to implement mitigation actions when significant paleontological resources are inadvertently discovered on lands under the jurisdiction of the State of Montana or a federal agency and on private land during the construction period of the proposed pipeline. The requirements are set forth in the document entitled *Conditional Requirements for the Treatment of Inadvertently Discovered Significant Paleontological Resources for the Keystone XL Pipeline* (and the proposed Paleontological Treatment Plan). The requirements are designed to minimize and mitigate the adverse effects of pipeline construction activities on significant paleontological materials.

In South Dakota, a permit is required from the Commissioner of School and Public Lands to survey, excavate or remove paleontological resources from state lands. The Commissioner also determines the repository or curation facility for paleontological collections from state lands.

In Nebraska, the State Department of Roads has contracted with the University of Nebraska Museum for a highway salvage paleontologist to identify and collect important paleontological resources that may be impacted by the maintenance and construction of federal highways and roads. While directed to investigate paleontological resources on federally funded road projects, the salvage operations are also conducted on state and county road projects.

Kansas and Oklahoma have no state regulations concerning the management and protection of paleontological resources on state lands. In Texas, there are no state regulations concerning the management and protection of paleontological resources on state lands except on lands administered by state forests and state parks.

Operations Impacts

Routine pipeline operations and maintenance activities are not expected to affect paleontological resources. However, collection of these resources for scientific or other purposes would not be possible within the permanent ROW during project operations.

3.1.3 Mineral and Fossil Fuel Resources

3.1.3.1 Affected Environment

Montana

In the Project area, oil, natural gas, and coal comprise the major energy resources (Montana Bureau of Mines and Geology 1963). Sand, gravel and bentonite are also mined (Montana Bureau of Mines and Geology/USGS 2004). The proposed route would cross few oil and gas producing areas. There are 23 oil and gas producing wells within one-quarter mile (1,320 feet) of the proposed ROW (Appendix F).

The proposed pipeline route does not cross any coal (lignite) mines. Historically, bentonite has been mined and processed in the area southeast of Glasgow and south of the proposed pipeline route; however, bentonite is not currently being mined and processed in the project area (Montana Bureau of Mines and Geology/USGS 2004).

Aggregate mining of sand and gravel deposits is also conducted in the region; although the proposed pipeline route would not cross any aggregate mines.

South Dakota

In the Project area, sand, gravel, oil, gas, and coal comprise the major energy resources (South Dakota Geological Survey/USGS 2005). A gravel pit is present approximately 0.5 mile from the proposed route, northeast of MP 552. The proposed pipeline route would traverse the Buffalo Field, an oil and gas producing area in Hardin County. Fifteen oil and gas producing wells are located within one-quarter mile of the proposed ROW (Appendix F).

The proposed pipeline route would not cross any known coal mines. The proposed route would cross approximately 2 miles of coal-bearing formations (Fort Union Formation and Hell Creek Formation), but potential for mining of these formations is low.

Nebraska

There is no known active oil, natural gas, coal, or mineral mining operations along the proposed pipeline route in Nebraska. The main mineral resource in the Project area is aggregate (sand and gravel) used for road and building construction, and concrete. Along the northern portion of the route, sandstone has been quarried for road construction. In southern Nebraska, near the proposed route, shales and clays have been mined for producing bricks. Near Tobias in Salina County, limestone has been mined for agricultural lime.

Kansas

Mineral resources in the area of the proposed two new pump stations include sand, gravel, and crushed stone (USGS 2004); however, construction of the two new pump stations would not affect current mining operations.

Oklahoma

Oil and natural gas represent important natural resources in the area of the proposed pipeline route in Oklahoma. Along the Gulf Coast Segment in Oklahoma there are 364 oil and gas wells within one-quarter mile of the proposed pipeline route (Appendix F). Sand, gravel, and crushed stone are also mined along the proposed route in Okfuskee, Seminole, Hughes, Clay, Coal, Atoka, and Bryan counties (Johnson 1998, USGS 2004). Coal resources are present in eastern Oklahoma. The proposed ROW would cross areas of documented coal resources in Coal County in southeastern Oklahoma (Johnson 1998).

Texas

Along the Gulf Coast Segment in Texas, there are 276 oil and gas wells within one-quarter mile of the proposed pipeline route (Appendix F). Crushed stone, coal (lignite), clay, iron, peat, and sand are other mineral resources present in the project area (Garner 2008).

Along the proposed Houston Lateral in Texas, there are 48 oil and gas wells within one-quarter mile of the proposed pipeline route (Appendix F). Clay, sand, and gravel are also present in the project area (Garner 2008).

3.1.3.2 Potential Impacts and Mitigation

Although the proposed route would not cross any active surface mines or quarries, construction and operation of the Project would limit access to sand, gravel, clay, and stone resources that are within the width of the permanent pipeline ROW. As summarized above, the proposed route would cross deposits of sand, gravel, clay, and stone; however, the acreage of deposits covered by the proposed ROW is minimal when compared to the amounts available for extraction throughout the project area. As summarized in Section 2.1.4.2, approximately 1,066,205 cubic yards of gravel and other borrow materials would be utilized for temporary sites such as storage sites, contractor yards, temporary access roads, and to stabilize the land for permanent facilities including pump stations, mainline valves, permanent access roads, and the pipeline trench bottom. Borrow materials would be obtained from an existing, previously permitted commercial source located as close to the pipeline or contractor yard as possible.

The proposed route would cross underlying coal bearing formations in South Dakota and in Coal County, Oklahoma. Although not currently planned, if surface mining was proposed for this area in the future, the pipeline could limit access to these resources.

While there are numerous oil and gas wells within one-quarter mile of the proposed ROW in Oklahoma and Texas, the proposed route would not cross the well-pads of any active oil and gas wells. Accordingly, extraction of oil and gas resources would not be affected by operation of the proposed pipeline.

3.1.4 Geologic Hazards

3.1.4.1 Affected Environment

At certain locations along the proposed route, seismic hazards, landsliding, subsidence, or flooding would be possible. Since the proposed pipeline ROW would be located in the relatively flat and stable continental interior, the potential for impacts from geologic hazards is lower than for facilities located in active mountain belts or coastal areas. Table 3.1.4-1 summarizes by state the miles of proposed pipeline that would cross areas of potential geologic hazards.

TABLE 3.1.4-1
Summary of Geological Hazard Areas for the Project (miles)

State	High Seismic Hazard[a]	Flood	Landslide	Subsidence
Montana	0	22	102	0
South Dakota	0	23	202	0
Nebraska	0	10	18	30
Oklahoma	0	51	7	9
Texas	0	89	30	12
Keystone XL Project Total	**0**	**175**	**360**	**51**

[a] Peak ground acceleration with 2 percent probability of exceedance in 50 years >0.5 g.
Source: Keystone 2009a.

Seismic Hazards

Seismic hazards include faults, seismicity, and ground motion hazards. Collectively, these three phenomena are associated with seismic hazard risk. Faults are defined as a fracture along which blocks of earth materials on either side of the fault have moved relative to each other. An active fault is one in which movement has demonstrated to have taken place within the last 10,000 years (USGS 2008b). Seismicity refers to the intensity and the geographic and historical distribution of earthquakes. Ground motion hazards are defined as movement of the earth's surface as a result of earthquakes (USGS 2008a). Figure 3.1.4-1 presents the earthquake hazard rank map which shows earthquake hazard risk along the proposed Project route. The map indicates that there is low seismic hazard risk along the entire proposed route.

Minor faults are present in the vicinity of the proposed pipeline route. In Montana, the Brockton-Froid Fault is mapped in the Weldon-Brockton fault zone approximately 50 miles east of the proposed route in Roosevelt County, just north of Culbertson, Montana (Wheeler 1999). Based on exploration and field data, there is no indication that this is an active fault (Wheeler 1999). No other information regarding historic earthquakes in the Weldon-Brockton fault zone was identified.

Historic earthquake activity in the vicinity of the proposed pipeline was reviewed using USGS's National Earthquake Information Center on-line database search. Records were available from 1973 to the present time.

Eastern Montana historically contains little earthquake activity. From 1973 to 2007, 14 earthquakes have been recorded with magnitudes 4.1 or less in the eastern half of Montana (USGS 2008b).

In South Dakota, 30 earthquakes have been recorded since 1973, with magnitudes 4.2 or less (USGS 2008b); however, none of these earthquakes occurred along or adjacent to the proposed route (Keystone 2008).

In eastern Nebraska, 11 earthquakes have been recorded since 1973, with magnitudes ranging from 2.8 to 4.3 (USGS 2008b). These earthquakes are believed to be associated with either the Humboldt fault zone or deep seated faults in the Salinas Basin (Keystone 2008). There are no active surficial faults along the proposed route (Crone and Wheeler 2000, USGS 2006).

In Oklahoma, approximately 50 minor earthquakes occur each year. The majority of these earthquakes range in magnitude from 1.8 to 2.5, and would not be expected to damage the buried pipeline. In general, earthquake activity in Oklahoma in the vicinity of the pipeline occurs north of the Ouachita Mountains in the Arkoma Basin.

In Texas, surface faults have been mapped in the project area. There is little evidence of ground movement along these faults and as such, they pose very minimal risk to the pipeline (Crone and Wheeler 2000). Epicenter maps show only sparse, low magnitude seismicity (USGS 2008a).

Landslides

Landslide potential is greatest where steep slopes are present adjacent to stream and river crossings. Landslides may cause increased soil erosion where underlying soils are exposed and may also cause increased input of sediment and/or in-stream turbidity in adjacent water bodies, if present. Landslides typically occur on steep terrain during conditions of partial or total soil saturation, or during seismic-induced ground shaking. Given the low likelihood of significant seismically-induced ground shaking along the proposed pipeline corridor, earthquake induced landslide potential is very minor. Stream erosion, undercutting or undermining topography during the construction of roads or other structures also can cause instability leading to increased landslide potential. The majority of the proposed pipeline route is not located in landslide-prone terrain. However, the proposed route does cross areas of high landslide potential due to other factors, as presented in Table 3.1.4-2.

In addition to steep terrain, certain formations are susceptible to increased landslide potential due to the makeup of the soil and/or geological materials. Along the Steele City Segment, the Claggett, Bearpaw, Pierre Shale, Fort Union shales, and Hell Creek Formation may contain appreciable amounts of bentonite. Bentonite is soft, plastic, light colored clay that expands when exposed to water and may cause soil and/or geologic formations to become unstable. Cretaceous and Tertiary rocks in the Missouri River Plateau have the potential for slumping due to high clay content. Along the proposed route, potentially unstable soils or geologic formations is present at the Missouri River, Willow Creek, Keya Paha River, and Niobrara River crossings.

In the Gulf Coast Segment, landslide potential is highest where shale formations weather to clayey colluviums and is highest in areas where slopes exceed a 2:1 gradient (Luza & Johnson 2005). The Houston Lateral does not contain any areas of high risk for landslides.

TABLE 3.1.4-2
Areas with High Landslide Potential Crossed by the Project

Area	Start (MP)	End (MP)	Length (miles)
Steele City Segment			
Montana	0.0	101.6	101.6
South Dakota	308.0	313.3	5.3
	354.9	370.2	15.2
	388.5	425.7	37.3
	425.7	569.7	144.0
Nebraska	595.6	607.1	11.5
	614.3	620.8	6.5
	848.7	850.3	1.6
Steele City Segment Subtotal			*323.0*
Gulf Coast Segment			
Oklahoma	134.6	141.8	7.1
Texas	162.1	167.4	5.3
	182.1	203.6	21.5
	260.4	260.7	0.3
	260.8	261.9	1.1
	475.8	478.2	2.4
Gulf Coast Segment Subtotal			*37.7*
Houston Lateral			
None	-	-	0
Houston Lateral Subtotal			*0*
Keystone XL Project Total			**360.7**

Source: PHMSA-NPMS http://www.npms.phmsa.dot.gov/ (adapted from Response to U.S. Department of State Data Request 1).

Subsidence

Subsidence hazards along the proposed pipeline route would most likely be associated with the presence of karst features, such as sinkholes and fissures. Keystone reviewed national karst maps to determine areas of potential karst terrain (i.e., areas where limestone bedrock is near the surface) along the proposed pipeline route (US National Atlas 2009). These areas are summarized in Table 3.1.4-3. Because national-scale karst maps may not incorporate the most recent field data or be of sufficient resolution to determine local subsidence risk due to karst features, prior to construction, Keystone would consult with the respective state geological survey departments to identify the most up-to-date sources of data on karst-related subsidence hazards along the proposed route.

TABLE 3.1.4-3
Karst Areas Crossed by the Project

Location	Start (MP)	End (MP)	Length (miles)
Steele City Segment [a]			
Nance and Merrick Counties, Nebraska	739.7	750.7	11.0
Hamilton and York Counties, Nebraska	757.3	776.1	18.8
Steele City Segment Subtotal			*29.8*
Gulf Coast Segment [b]			
Atoka and Bryan Counties, Oklahoma	125.1	134.0	8.9
Lamar County, Texas	177.5	184.7	7.2
Delta County, Texas	190.6	195.0	4.4
Gulf Coast Segment Subtotal			*20.5*
Houston Lateral			
None	-	-	0
Houston Lateral Subtotal			*0*
Keystone XL Project Total			**50.3**

[a] Type: Fissures, tubes and caves generally less than 1,000 feet (300 meters long; 50 feet (15 meters) or less vertical extent; in gently dipping to flat-lying beds of carbonate rock beneath an overburden of noncarbonate material 10 to 200 feet (3 to 60 meters) thick.

[b] Type: Fissures, tubes, and caves generally less than 1,000 feet (300 meters) long, 50 feet (15 meters) or less vertical extent, in gently dipping to flat-lying beds of carbonate rock.

Source: US National Atlas (adapted from Response to U.S. Department of State Data Request 1).

In Nebraska, potential karst features are present in the Niobrara Formation; however, these potential hazards are considered minimal since approximately 50 feet of sediment typically covers this formation. In southeastern Oklahoma and Texas, the proposed route crosses potential karst features present in flat-lying carbonate rock.

Floods

In active channel crossings, flooding can cause lateral and vertical scour that can expose and damage the pipeline. At 38 major river crossings, Keystone plans to use horizontal directional drilling (HDD). At the other crossings, the pipeline would be buried under at least 5 feet of cover for at least 15 feet on either side of the bank-full width. An assessment of hazards and potential environmental impacts related to Keystone's proposed stream crossing procedures can be found in Section 3.3.

3.1.4.2 Potential Impacts and Mitigation

Seismic

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

In accordance with federal regulations (49 CFR 195), Keystone would conduct an internal inspection of the pipeline if an earthquake, landslide, or soil liquefaction event were suspected of causing abnormal pipeline movement or rupture. If damage to the pipeline was evident, the pipeline would be inspected and repaired as necessary.

Landslides

During construction activities, vegetation clearing and alteration of surface-drainage patterns could increase landslide risk. Implementation of temporary erosion control structures would reduce the likelihood of construction-triggered landslides. In addition, Keystone plans to revegetate areas disturbed by construction along the pipeline ROW.

Revegetation would also help reduce the risk of landslides during the operational phase of the project. The proposed pipeline would be designed and constructed in accordance with 49 CFR, Parts 192 and 193. These specifications require that pipeline facilities are designed and constructed in a manner to provide adequate protection from washouts, floods, unstable soils, landslides, or other hazards that may cause the pipeline facilities to move or sustain abnormal loads. Proposed pipeline installation techniques, especially padding and use of rock-free backfill, are designed to effectively insulate the pipeline from minor earth movements.

To reduce landslide risk, Keystone would employ erosion and sediment control and reclamation procedures described in Section 4.11 of its CMR Plan (Appendix B). These procedures are expected to limit the potential for erosion, and maintain slope stability after the construction phase. Additionally, the potential for landslide activity would be monitored during pipeline operation through aerial and ground patrols and through landowner awareness programs designed to encourage reporting from local landowners. Keystone would implement TransCanada's Integrated Public Awareness (IPA) Plan. TransCanada's IPA Plan is consistent with the recommendations of API RP-1162 (Public Awareness Programs for Pipeline Operators). The plan includes the distribution of educational materials to inform landowners of potential threats and information on how to identify threats to the pipeline including the potential for landslides. Landowners would be able to report potential threats to the integrity of the pipeline and other emergencies using TransCanada's toll-free telephone number (Keystone 2008).

Subsidence

There is a risk of subsidence where the proposed route crosses karst formations in Nebraska, Oklahoma, and Texas. Table 3.1.4-3 shows the locations by milepost where karst may be present. Keystone would conduct site-specific studies as necessary to characterize the karst features, and would evaluate and modify construction techniques as necessary in these areas. The overall risk to the pipeline from karst-related subsidence is expected to be minimal.

Floods

There is a risk of pipeline exposure due to lateral or vertical scour at water crossings and during floods. An assessment of potential environmental impacts and protection measures related to Keystone's proposed stream crossing procedures can be found in Section 3.3 and for Montana in Appendix I.

3.1.5 Connected Actions

The construction and operation of electrical distribution lines and substations associated with the proposed pump stations, and the Lower Brule to Witten 230-kV electrical transmission line would have negligible effects on geological resources.

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3.2 SOILS AND SEDIMENTS

3.2.1 Affected Environment

Soil characteristics present in the proposed Project area are identified and evaluated using information from the NRCS Soil Survey Geographic (SSURGO) database (available online at http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx). The evaluation focused on soil characteristics of particular interest to the proposed pipeline construction. The following soil characteristics were evaluated:

- Highly erodible soils—prone to high rates of erosion when exposed to wind or water by removal of vegetation.
- Prime farmland soils—have combinations of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if they are treated and managed according to acceptable farming methods. Undeveloped land with high crop production potential may be classified as prime farmland.
- Hydric soils— “formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part.” (Federal Register, July 13, 1994). These soils, under normal conditions are saturated for a sufficient period of time during the growing season to support the growth of hydrophytic vegetation (USDA 2006).
- Compaction-prone soils—clay loam or finer textures in somewhat poor to very poor drainage classes.
- Stony/rocky soils—have a cobbly, stony, bouldery, gravelly, or shaly modifier to the textural class; or are comprised of more than 5 percent stones larger than 3 inches in the surface layer.
- Shallow-bedrock soils—typically defined as soils that have bedrock within 60 inches of the soil surface. However, for the purpose of this Project, shallow-bedrock soils are defined as those containing bedrock within 80 inches of the surface, because trenching typically would be done to that depth.
- Drought-prone soils—include coarse-textured soils (sandy loams and coarser) that are moderately well to excessively drained.

Table 3.2.1-1 and Table 3.2.1-2 provide summaries of approximate miles of pipeline ROW by state that would cross soils exhibiting these characteristics. The tables include the approximate acreage (including proposed pump station locations) of soils containing these characteristics that would be disturbed by the Project. More detail is provided in Appendix G, including a table listing soil associations from the SSURGO database by milepost along the proposed route (Keystone 2008).

TABLE 3.2.1-1
Approximate Miles of Soil Characteristics Crossed by the Project

State	Total Miles Affected[a]	Highly Erodible	Prime Farmland	Hydric	Compaction-Prone	Stony/ Rocky	Shallow Bedrock	Drought-prone
Montana	282.5	111.5	68.9	1.4	232.1	37.0	4.6	22.7
South Dakota	314.1	124.1	106.1	5.2	252.1	9.2	1.2	66.2
Nebraska	254.1	161.3	104.7	20.8	120.9	13.2	0.3	76.7
Kansas	0	0	0	0	0	0	0	0
Oklahoma	155.4	41.7	69.0	5.8	127.8	35.6	14.0	22.8
Texas	373.4	120.9	168.6	72.8	309.8	7.5	54.7	49.1
Project Total	**1,379.5**	**559.5**	**517.3**	**106.0**	**1,042.7**	**102.5**	**74.8**	**237.5**

[a] Total miles affected include non-sensitive soils and other substrate.
Source: Keystone 2009c; rounded to nearest whole mile.

TABLE 3.2.1-2
Approximate Acreage of Soil Characteristics Crossed by the Project[a]

State	Approximate Acres Affected[a]	Highly Erodible	Prime Farmland	Hydric	Compaction-Prone	Stony/ Rocky	Shallow Bedrock	Drought-prone
Montana	4,087	1,597	1,294	20	3,698	533	29	482
South Dakota	4,485	1,754	1,935	75	4,369	131	23	1,557
Nebraska	3,604	1,929	518	305	482	197	7	390
Kansas	12	0	10	0	14	0	2	14
Oklahoma	2,206	548	434	1,789	906	317	503	1,511
Texas	5,163	1,210	2,304	2,290	3,463	366	474	2,054
Project Total	**19,557**	**7,074**	**6,495**	**4,479**	**12,981**	**1,544**	**1,038**	**6,008**

[a] The approximate acreages in this table should not be considered definitive. For most current estimates of total acreages impacted by state see Table 2.1.4-1.
Source: Keystone 2009a; rounded to nearest whole acre.

3.2.1.1 Montana

The proposed Project route in northern Montana is located within the Northern Great Plains Spring Wheat Land Resource Region (USDA 2006). This region is characterized by glacially deposited till and lacustrine deposits. Soil profiles typically contain thick, dark topsoils that may contain bentonite (smectitic mineralogy). Soils are generally very deep, well-drained, and loamy or clayey. Small areas of alluvial deposits are present along rivers and drainageways and shale is exposed in some uplands. In northern Montana, soils generally are formed in glacial till. From McCone County to Fallon County along the proposed pipeline route (east central Montana), soils are formed on eroded plateaus and terraces. These soils are shallow to very deep, well-drained, and clayey or loamy. Some soils in this area have high bentonite contents and have saline or sodic chemical properties.

In east central Montana, the proposed pipeline route lies within the Western Great Plains Range and Irrigated Land Resource Region (USDA 2006). This region consists of an elevated piedmont plain that is dissected by rivers and that contains steep sided buttes and badlands. Soil types vary from deep organic soils to shallow soils with thin topsoil thickness.

In Montana, prime farmland soils occupy approximately 24 percent of the pipeline route. The average freeze free period is between 120 and 165 days.

3.2.1.2 South Dakota

The proposed Project route in South Dakota is located within the Western Great Plains Range and Irrigated Land Resource Region (USDA 2006). In northwestern South Dakota, soils are shallow to very deep, well-drained, and loamy or clayey. To the southeast through Meade County, soils are shallow to very deep, somewhat excessively drained to moderately well-drained and loamy or clayey. In southern South Dakota from Hakkon to Tripp County, areas of smectitic clays are present that have shrink-swell potential and may cause significant problems for roads and structural foundations. From central Tripp County to the stateline, these clayey soils contain thick, dark, organically enriched layers of topsoil.

Beginning at MP 572, transitional aeolian sandy soils are present prior to entering the Sand Hills region in Nebraska. The Sand Hills region soils generally consist of aeolian sands, sandy alluvium, and lesser amounts of loess and glacial outwash. In southern Tripp County to the state line, soils grade into deep sandy deposits that are similar to the Sand Hills region soils in Nebraska.

In South Dakota, prime farmland soils occupy approximately 33 percent of the pipeline route. The average freeze free period is between 135 and 165 days.

3.2.1.3 Nebraska

The proposed Project route in northern Nebraska is located within the Western Great Plains Range and Irrigated Land Resource Region, and the remainder of Nebraska is located in the Central Great Plains Winter Wheat and Range Land Resource Region (USDA 2006). This region is characterized by a nearly level to gently rolling fluvial plain. Soils are similar to those in the Western Great Plains Range and Irrigated Region with warmer temperatures. Soils in Keya Paha County (northern Nebraska) are similar to those found in southern South Dakota. From Rock County to Greeley County, soils are generally sandy, very deep, excessively drained to somewhat poorly drained. From central to southern Nebraska, soils consist of deep loess deposits that are more susceptible to erosion. Soils in Hamilton County and extending to the state line contain thick, dark, organically-enriched layers of topsoil.

In northern and central Nebraska the pipeline route enters portions of the Sand Hills region from MP 595 to MP 707 (Figure 3.2.1-1) in Keya Paha, Rock, Holt, Garfield, Wheeler, Greeley, and Merrick counties. This region consists of a prairie landscape that supports livestock grazing, wildlife habitat, and recreation. Soils in the Sand Hills region consist of aeolian well sorted sands, sandy alluvium, and lesser amounts of loess and glacial outwash. The soils are generally very deep, excessively drained to somewhat poorly drained. Depressions and drainage areas are present. Wind-blown rolling to hilly sand dunes are common and are stabilized by vegetation. Where vegetation has been removed, severe wind erosion is common and is often referred to as a 'blowout'. In the Sand Hills region, a higher percentage (55 percent) of highly erodible soils is designated as erodible by wind due to the nature of the sandy soils in this region of the Project. In the southern portion of the Sand Hills Region (Garfield, Wheeler, and Greeley counties), approximately 24 miles of Valentine soils are present that consist of very deep, dry, rapidly permeable dune deposits; these soils contain severe wind erosion hazards.

In Nebraska, prime farmland soils occupy approximately 41 percent of the pipeline route. The average freeze free period is between 160 and 180 days.

3.2.1.4 Kansas

Construction planned in Kansas as part of the Project comprises two new pump stations and appurtenant facilities, including transmission lines and access roads located in Clay and Butler counties at MP 899 and MP 994, respectively. Shallow soils of the Hedville series are present in these areas. These soils are loamy and were developed from the erosion of weathered non-calcareous sandstone. In Kansas, the average freeze free period is between 170 and 190 days.

3.2.1.5 Oklahoma

The proposed Project route in northern Oklahoma is located within the Central Great Plains Winter Wheat and Range Land Resource Region and the Southwestern Prairies Cotton and Forage Region (USDA 2006). The Southwestern Prairies Cotton and Forage Region consists of gently rolling to hilly uplands dissected by numerous streams. From Lincoln County to Seminole County, soils contain siliceous mineralogy and may contain bentonite. Soils range from shallow to very deep, somewhat excessively drained to somewhat poorly drained, and are typically loamy or clayey. Soils formed in alluvium on stream terraces, residuum on hills, and colluvium on footslopes. From southern Hughes County through Atoka County, soils have smectitic, carbonatic, or mixed mineralogy and were formed from limestone residuum. Soils in the southern portion of Oklahoma are generally deep to very deep, well-drained to moderately well-drained, and loamy or clayey.

In Oklahoma, prime farmland soils occupy approximately 43 percent of the pipeline route. The average freeze free period is between 245 and 290 days.

3.2.1.6 Texas

The proposed Gulf Coast segment in Texas is located within the Southwestern Prairies Cotton and Forage Region, the South Atlantic and Gulf Coast Slope Cash Crops, Forest, and Livestock Region and the Atlantic and Gulf Coast Lowland Forest and Crop Region (USDA 2006). The Houston Lateral is located in the Atlantic and Gulf Coast Lowland Forest and Crop Region.

Soils in the Southwestern Prairies Cotton and Forage Region from Fannin County to Franklin County generally consist of deep, black, fertile clay weathered from chalks and marls.

The South Atlantic and Gulf Coast Slope Cash Crops, Forest, and Livestock Region is comprised of smooth marine terraces and hilly piedmont areas. Soils are generally very deep, well-drained to poorly drained, and loamy or clayey. Soils have a siliceous, smectitic, or mixed mineralogy.

The Atlantic and Gulf Coast Lowland Forest and Crop Region is characterized by coastal lowlands, coastal plains, and the Mississippi River Delta. Soils in this region are formed in alluvium on flood plains, in depressions, and on terraces and are sandy and sometimes indurated. Soils have a siliceous, smectitic, or mixed mineralogy and consist of young deltaic sands, silts, and clays.

In Texas, prime farmland soils occupy approximately 52 percent of the pipeline route. The average freeze free period is 270 days.

3.2.2 Potential Impacts and Mitigation

3.2.2.1 Construction Impacts and Mitigation Measures

Pipeline construction activities, including clearing, grading, trench excavation, backfilling, heavy equipment traffic, and restoration along the construction ROW, could adversely affect soil resources. In addition, the construction of pump stations, access roads, construction camps and the tank farm could also affect soil resources. Potential impacts could include temporary and short-term soil erosion, loss of topsoil, short-term to long-term soil compaction, permanent increases in the proportion of large rocks in the topsoil, and short-term to permanent soil contamination. Pipeline construction also could result in damage to existing tile drainage systems. Special considerations and measures would also be undertaken in the Sand Hills region, described in detail, below.

In its Construction Mitigation and Reclamation (CMR) Plan (see Appendix B), Keystone has proposed construction procedures that are designed to reduce the likelihood and severity of Project impacts, and to mitigate where impacts are unavoidable. Potential Project impacts on soils are assessed assuming these construction procedures and applicant proposed environmental protection measures would be implemented.

Soil Erosion

Prior to construction, clearing of the temporary and permanent ROW would remove protective vegetative cover and could potentially increase soil erosion. Soil erosion could also occur during open cut trenching and during spoil storage, particularly where the soil is placed within a streambed. Where soils are exposed close to waterbodies, soil erosion and mobilization to receiving water bodies could impact water quality through increased turbidity or if potentially hazardous substances (such as pesticides or herbicides) are present in the eroded material. To accommodate potential discoveries of contaminated soils, contaminated soil discovery procedures would be developed in consultation with relevant agencies and these procedures would be added to the CMR Plan. If hydrocarbon contaminated soils are encountered during trench excavation, the state agency responsible for emergency response and site remediation would be contacted immediately and a remediation plan of action would be developed in consultation with that agency. Depending upon the level of contamination found, affected soil may be replaced in the trench, land farmed, or removed to an approved landfill for disposal.

Erosion may result in loss of valuable topsoil from its original location through wind and/or water erosion. A small portion of the Project would encounter droughty soils. Droughty soils would be prone to wind erosion during construction and would be more difficult to successfully stabilize and revegetate following construction. Approximately 31 percent of the overall Project acreage would be constructed where the soils are characterized as highly erodible by either wind or water. Overall, the majority (69 percent) of 'highly erodible' soils are designated as erodible by water.

In Section 4.5 of its CMR Plan, Keystone has proposed construction methods to reduce soil erosion. These methods include installation of sediment barriers (silt fencing, straw or hay bales, sand bags), trench plugs, temporary slope breakers, drainage channels or ditches, and mulching. These erosion control measures would be implemented wherever soil is exposed, steep slopes are present, or wherever erosion potential is high. To enforce these methods, an Environmental Inspector (EI) would be assigned to each construction spread. The EI would have the authority to stop work and/or order corrective action in the event that construction activities violate the measures outlined in the CMR Plan, landowner requirements, or any applicable permit. Specifically, the EI would inspect temporary erosion control measures on a daily basis in areas of active construction or equipment operation, on a weekly basis in areas without active construction or equipment operation, and within 24 hours of continuous rainfall greater than 0.5 inch. Construction activities would be shut down during the winter months on the Steele City Segment to prevent the need for winter construction techniques. The repair of any ineffective erosion control measures would be completed within 24 hours of detection, where possible. If substantial precipitation or snowmelt events create erosion channels in areas where soil is exposed, additional sediment control measures would be implemented. Potential erosion control measures are described in Section 4.5 of the CMR Plan.

Compaction

On land with soils that are compaction prone, soil compaction may result from the movement of heavy construction vehicles along the construction ROW and additional temporary workspace areas, and on temporary access roads. The degree of compaction is dependant on the moisture content and texture of the soil at the time of construction and compaction would be most severe where heavy equipment operates on moist to wet soils with high clay contents. Detrimental compaction also can occur on soils if multiple passes are made by heavy equipment. If soils are moist or wet where trenchline only topsoil trenching can occur, topsoil would likely adhere to tires and/or tracked vehicles and be carried away. Compaction control measures are described in Section 4.5 of the CMR Plan and include ripping to relieve compaction in particular areas from which topsoil has been removed.

Prime Farmland Soils

Approximately 6,495 acres of prime farmland soils would be directly impacted by construction of the proposed pipeline (see Table 3.2.1-2 for a breakdown by state). Within the ROW, the existing structure of prime farmland soils may be degraded by construction. Grading and equipment traffic could compact soil, reducing porosity and percolation rates, which can result in increased runoff potential. As detailed in Section 4.0 of the CMR Plan, Keystone has proposed construction methods that are designed to reduce these impacts. The top 12 inches of topsoil would be removed and segregated during excavation activities. Stripped topsoil would be stockpiled in a windrow along the edge of the ROW. The work would be conducted to minimize the potential for mixing topsoil and subsoil. Topsoil would not be used to fill low lying areas and would not be used to construct ramps at road or waterbody crossings. Additional methodology detailed in the CMR Plan include ripping to relieve compaction in all areas from which topsoil has been removed, removing all excess rocks exposed due to construction activity, and adding soil amendments to topsoil as warranted by conditions and agreed to by landowners and/or federal or tribal entities. Additional mitigation measures to be employed on pasture and range lands are summarized in Section 4.12 of the CMR Plan.

Keystone is negotiating easement agreements with landowners and agencies that would require Keystone to restore the productivity of the ROW and provide compensation for demonstrated losses from decreased productivity resulting from pipeline operations.

Range and Pasture Land

On range, pastures and other areas not suitable for farming, construction and maintenance activities may lead to localized soil compaction in soils listed as hydric or compaction prone. This compaction could lead to slower or less successful vegetation reestablishment following construction. Keystone is negotiating easement agreements with landowners and agencies that would require Keystone to restore the productivity of the ROW and provide compensation for demonstrated losses from decreased productivity resulting from pipeline operations. Additional environmental protection measures to be employed on pasture and range lands are summarized in Section 4.12 of the CMR Plan.

Wet Weather Conditions

All soil types could be further impacted by erosion during major or continuous precipitation events. Soils identified as compaction-prone are subject to rutting and displacement as a result of movement of construction vehicles. When saturated, these soils may be particularly sensitive to rutting. Rutting may cause reduced aeration and infiltration of the soil and may cause surface water pooling or water diversion, which increases localized soil erosion.

Stockpiled topsoil and trench spoils could cause water to pond during precipitation events. Despite the protection measures described below, it is possible that precipitation events may cause unavoidable soil erosion by water. Keystone would minimize the potential for these impacts by scheduling construction during drier months of the year. Table 3.2.2-1 below presents the average precipitation per month for selected locations (one in each state) along the proposed pipeline.

TABLE 3.2.2-1
Monthly Average Total Precipitation in the Vicinity of the Project (inches)

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Circle, Montana Location[1]	0.4	0.3	0.6	1.3	2.0	2.6	1.9	1.3	1.3	0.8	0.4	0.4	13.4
Midland, South Dakota Location[2]	0.3	0.4	1.1	1.6	2.8	3.1	2.2	1.7	1.4	1.1	0.5	0.3	16.4
Lincoln, Nebraska Location[3]	0.7	0.9	2.1	2.9	4.3	3.6	3.4	3.4	3.0	1.9	1.5	0.8	28.4
Marion Lake, Kansas Location[4]	0.7	0.9	2.4	3.0	4.6	4.9	3.8	3.8	3.2	2.8	1.7	1.0	33.0
Keystone Cushing, Oklahoma Location[5]	1.2	1.9	3.2	3.7	5.8	4.4	2.9	2.7	40.7	3.4	2.9	1.9	38.2
Beaumont/Port Arthur Texas Location[6]	5.7	3.4	3.8	3.8	5.8	6.6	5.2	4.8	6.1	4.7	4.7	5.2	59.9
Houston, Texas Location[7]	6.7	1.3	8.8	4.8	9.6	5.6	10.0	7.2	6.3	1.8	4.4	1.6	5.9

[1] Source: Western Regional Climate Center (WRCC), Circle, Montana, Station 241758, http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?mt1758

[2] Source: High Plains Regional Climate Center (HPRCC), Midland, South Dakota, Station 395506, http://hprcc1.unl.edu/cgi-bin/cli_perl_lib/cliMAIN.pl?sd5506

[3] Source: High Plains Regional Climate Center (HPRCC), Lincoln WSO Airport, Nebraska, Station 254795, http://hprcc1.unl.edu/cgi-bin/cli_perl_lib/cliMAIN.pl?ne4795

[4] Source: High Plains Regional Climate Center (HPRCC), Marion Lake, Kansas, Station 145039, http://hprcc1.unl.edu/cgi-bin/cli_perl_lib/cliMAIN.pl?ks5039

[5] Source: National Oceanic and Atmospheric Association (NOAA), Cushing, Oklahoma, Station CUS02, http://www.srh.noaa.gov/oun/climate/getnorm.php?id=cuso2

[6] Source: National Oceanic and Atmospheric Association (NOAA), Beaumont, Texas, http://www.srh.noaa.gov/lch/climate/coop/KBPT.htm

[7] Source: National Oceanic and Atmospheric Association (NOAA), Houston, Texas, http://www.srh.noaa.gov/hgx/climate/reviews/010308pns.txt

Note: T = Trace amounts

Source: Keystone 2009c.

Section 2.18 of Keystone's CMR Plan describes methodology to determine when to restrict or stop work for wet weather and summarizes methods to mitigate impacts when construction activities are conducted in wet conditions. As described in the CMR Plan, work shall be restricted or suspended during wet conditions when potential rutting could cause mixing of topsoil and subsoil, excessive buildup of mud or soil on tires, increased ponding of surface water in the work area, and the potential for severe compaction. During excessive wet conditions, protection measures that may be implemented include limiting work to areas that have adequately drained soils or have sufficient vegetation cover to prevent mixture of topsoil with subsoil, installing geotextile material or construction mats in saturated areas, or using low-impact construction techniques such as using low-ground weight or wide-track equipment. Additionally, a "stop work" directive would be implemented when recommended by the EI.

Construction in Rocky Soils

In areas where rocky soil or shallow bedrock is present, pipeline backfill activities could result in concentration of large clasts near the surface. As detailed in Section 4.11 of the CMR Plan, specific construction methods would be utilized to ensure that disturbed areas are returned to conditions consistent with pre-construction use and capability. These methods include topsoil removal, segregation and redistribution during backfilling, and off-site removal of excess rocks and rock fragments. The size threshold for rock removal would be consistent to that which is found in adjacent undisturbed areas off the ROW. As stated in the CMR Plan, this effort would result in an equivalent quantity, size and distribution of rocks to that found on adjacent lands. In areas where blasting is required, procedures would be followed as described in Section 4.7 of the CMR Plan. Specifically, the drilling pattern, in preparation for blasting, would be conducted in a manner so that smaller rock fragmentation (maximum 1 feet in diameter) would be achieved. This would enable increased use of blasted rock as backfill material after the pipe has been padded in accordance with Project specifications.

Soils Drained by Drain Tile Systems

Construction of the proposed pipeline would, in places, necessitate disruption of existing drain tile systems. In Section 5.0 of its CMR Plan, Keystone and its contractors have committed to identifying and avoiding or, where necessary, repairing or replacing drainage tiles that could be damaged by pipeline construction (Keystone 2008, CMR Plan Sec 5.4). Adherence to these procedures should eliminate or compensate for any long-term impacts to drain tile function, however, temporary impacts to the drain tile system would be experienced during construction and existing soils could become saturated during wet weather conditions or during periods of continuous precipitation. Wet weather measures are described above. Keystone's easement agreements with landowners, agencies and/or tribal entities would require Keystone to provide compensation for any demonstrated losses, including flooding that could occur because of temporary disruption of drain tile systems.

Sand Hills Region

The Sand Hills region contains soils that are especially sensitive to wind erosion. Specific construction, reclamation, and post-construction activities that would be employed are described Section 4.15 in the CMR Plan and in the Project brochure *Pipeline Construction in Sand Hills Native Rangelands* prepared for the DOS (Appendix H). Keystone recognizes that these native rangelands create unique challenges for restoration and reclamation. During Project scoping and in preparation of the documents mentioned above, Keystone engaged in discussions with regional experts from the University of Nebraska, University of South Dakota, the Natural Resources Conservation Service (NRCS), and Nebraska state road department.

To mitigate potential impacts related to severe erosion, the following Best Management Practices (BMPs) would be incorporated during the construction phase in the Sand Hills region (Keystone 2009c).

- Minor re-routes would be incorporated to locate the right of way in areas of increased soil moisture (decreased erosion potential), while avoiding wetlands wherever possible.
- Specific training would be provided for construction crews prior to working in the Sand Hills region.
- Keystone would prepare an Access Control Plan to be incorporated while work is being conducted in the Sand Hills region. The plan would detail specific timing to conduct construction activities, ways to reduce traffic volume during construction, restriction of equipment and vehicle types, and measures to address site specific issues.
- Disturbance of fragile soils and native vegetation would be avoided to the extent practicable.
- Topsoil would be segregated from subsoil, consistent with Project BMPs.
- Following pipeline installation, revegetation of the ROW would be completed using native seed adapted to the Sand Hills region.
- Straw or native prairie hay would be crimped into the exposed soil to prevent wind erosion. Annual cover crops could also be used for vegetative cover.
- Straw wattles would be used where appropriate to provide erosion control instead of slope breakers that are composed of soil.
- Photodegradable matting would be used on steep slopes or other areas that are prone to high wind exposure such as ridgetops or north and west facing slopes. Biodegradable pins would be used to hold the matting in place.
- If necessary, fencing would be incorporated to keep livestock from grazing on vegetation within the ROW to hasten vegetation re-establishment.
- Reclamation and revegetation on the ROW would be monitored for several years. Areas of failure would be repaired.

The above described BMPs and protection measures are also described in Section 4.15 in the CMR Plan.

In addition to the measures that Keystone has committed to use to protect soil resources during construction, the following potential mitigation measures have been suggested by regulatory agencies:

- The creation of a site specific erosion control and revegetation plan for agency approval prior to the start of construction (MDEQ).
- Ripping of subsoils on range and pasture lands if requested by the landowner or land management agency (MDEQ).

Potential Spills and Leaks

Construction impacts and mitigation resulting from fuel or lubricating oil leaks or spills during construction are addressed in Section 3.13.

3.2.2.2 Operations Impacts and Mitigation

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

Soil Erosion

Operational maintenance of cleared areas could lead to minor increases in soil erosion by wind or water, however these impacts would be very localized in nature. These impacts are expected to be minor. If necessary, localized soil erosion would be mitigated using measures outlined in Section 4.5 of its CMR Plan (Appendix B). BMPs may include installation of sediment barriers (silt fencing, straw or hay bales, sand bags, etc.), trench plugs, temporary slope breakers, drainage channels or ditches, and mulching. These erosion control measures would be implemented wherever soil is exposed, steep slopes are present, or wherever erosion potential is high (Keystone 2008, CMR Plan Sec 4.5).

Compaction

Maintenance activities could lead to localized compaction due to vehicular traffic during maintenance operations. These impacts are expected to be minor. Although not anticipated, Keystone recognizes its responsibility to restore agricultural productivity and maintain productivity of range and pasture land soils on the ROW. In the event that agricultural productivity is impaired by vehicular compaction, Keystone would compensate landowners for demonstrated losses associated with decreased productivity resulting from pipeline operation (Keystone 2008, CMR Plan Sec 4.11).

Soil Productivity

The ROW would be monitored to identify any areas where soil productivity has been degraded as a result of pipeline construction. Reclamation measures would be implemented to rectify any such concerns, as outlined in the CMR Plan (Appendix B).

Differential Settling

Although Keystone has committed to returning the ROW to its pre-construction topography, some differential settling could occur. Once construction is complete, Keystone would inspect the ROW to identify areas of erosion or settling in the first year after construction. Keystone would monitor erosion and settling through aerial patrols, which are part of Keystone’s Integrity Management Plan, and through landowner reporting. Landowner reporting would be facilitated through use of Keystone’s toll-free telephone number, which would be made available to all landowners on the ROW (Appendix B).

Soil Temperature Impacts

Due to the relatively high temperature of the oil in the pipeline, increased pipeline operation temperatures may cause a very localized increase in soil temperatures and a decrease in soil moisture content. Keystone conducted a detailed analysis of the effects of pipeline operations on winter and summer soil temperatures in six locations along the proposed route (one in each state), based on operating volumes of 900,000 bpd (Keystone 2009c).

The study concluded that the pipeline does have some effect on the surrounding soil temperature, however, these effects occur primarily at the pipeline depth. Near-surface soil temperatures are influenced mainly by climate, with minimal effects from pipeline operations. Direct temperature effects on vegetation are expected to be minimal and vary seasonally. Potential positive vegetation responses may include accelerated seeding emergence and increased production directly above the pipeline. Potential negative vegetation responses may include decreased water availability and decreased production directly above the pipeline. In conclusion, Keystone does not anticipate any significant overall effect to crops and vegetation associated with heat generated from the operating pipeline. If negative impacts to agricultural productivity did occur, these impacts would be addressed by Keystone's easement agreements. Keystone would be required to restore the productivity of the ROW and/or compensate landowners for demonstrated losses associated with decreased productivity resulting from pipeline operation.

In addition to the measures that Keystone has committed to use to protect soil resources during operation, the following potential mitigation measures have been suggested by regulatory agencies:

- Conduct ground patrols to detect and repair any differential settling or subsidence holes that develop over the life of the Project (MDEQ).

Potential Spills and Leaks

Operational impacts and mitigation resulting from leaks or spills during operations are addressed in Section 3.13.

3.2.3 Connected Actions

The construction and operation of electrical distribution lines and substations associated with the proposed pump stations, and the Lower Brule to Witten 230-kV electrical transmission line would have negligible effects on soil resources.

3.2.4 References

Keystone (TransCanada Keystone Pipeline, LP). 2008. Keystone XL Project Environmental Report (ER). November 2008. Document No. 10623-006. Submitted to the U.S. Department of State and the Bureau of land Management by Keystone.

Keystone. 2009a. Response to United States Department of State Data Request 1.0. May 1, 2009. Submitted to U.S. Department of State by TransCanada Keystone Pipeline, L.P.

Keystone. 2009b. Response to United States Department of State Data Request 2.0. June 25, 2009. Submitted to U.S. Department of State by TransCanada Keystone Pipeline, L.P.

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United States Department of Agriculture (USDA). 1932. Natural Resources Conservation Service Web Soil Survey. Retrieved August 5, 2008: http://websoilsurvey.nrcs.usda.gov/app

United States Department of Agriculture, Natural Resources Conservation Service. 2006. *Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin.* U.S. Department of Agriculture Handbook 296.

3.3 WATER RESOURCES

Groundwater and surface water resources that could be potentially impacted by the proposed Project are described in this section. These potentially impacted water resources adjacent to the proposed pipeline route include major aquifers, wells, streams and rivers that would be crossed, and reservoirs and large lakes downstream of these crossings. In addition to their description, an evaluation of potential impacts to water resources from the construction and operation of the pipeline and mitigating measures to minimize impacts is provided.

3.3.1 Environmental Setting

3.3.1.1 Groundwater

Major aquifers and wells in the vicinity of the proposed Project route are described in the following sections by state. Available water quality information for the aquifers described in each state is presented in Table 3.3.1-1. Literature (Libmeyer 1985, Swenson and Drum 1955, Smith et al 2000, La Rique 1966, Whitehead 1996, Rich 2005, Hammond 1994, Cripe and Barari 1978, Newport and Krieger 1959, Stanton and Qi 2006, Ryder 1996, Carr and Marcher 1977, Ryder and Ardis 2002) indicates that, in general, water from these aquifers is not contaminated. Table 3.3.1-2 lists the locations beneath the proposed right-of-way (ROW) where water-bearing zones are expected to be present at less than 50 feet below ground surface (bgs). In addition to the locations presented in Table 3.3.1-2, all floodplains with flowing rivers are likely to have water-bearing zones less than 50 feet bgs.

TABLE 3.3.1-1
Groundwater Quality of Select Subsurface Aquifers

Aquifer	State	County	TDS (mg/L)	Other Water Quality Information
Judith River Formation[1]	MT	Phillips, Valley	500-10,000	Sodium chloride rich in Valley County
Missouri River Alluvium[2]	MT	Valley	800-2,700	NA
Hells Creek/Fox Hills[2]	MT	McCone	500-1,800	Sodium bicarbonate rich
Fox Hills[3]	MT	Dawson, Prairie, Fallon	500-2,500	Sodium bicarbonate rich
Fort Union[3]	MT	McCone, Dawson, Prairie, Fallon	500-5,000	Sodium bicarbonate rich
Yellowstone R. Alluvium[4]	MT	Dawson, Prairie, Fallon	1,000-1,500	Calcium bicarbonate rich
Hells Creek/Fox Hills[5]	SD	Harding, Perkins, Meade	1,000-3,000	Sodium bicarbonate rich
Ogallala [5,6]	SD	Tripp	<500	Sodium bicarbonate rich
Pleistocene River Terrace[7]	SD	Tripp	30-4,000	NA
White River Alluvium[8]	SD	Tripp	287-688	Sodium bicarbonate rich
Ogallala[9]	NE	Keya Paha	100-250	NA
Sand Hills aquifer[10]	NE	Rock-Greely	<500	NA
North Canadian River Alluvium and Terrace[11]	OK	Seminole	<500	Calcium bicarbonate rich
Red River Alluvium[11]	OK	Bryan	1,000-2,000	
Central Oklahoma[12]	OK	Lincoln	<500 (in upper 200 ft)	Calcium magnesium bicarbonate
Ada-Vamoosa[11]	OK	Osage-Pontotoc	<500	Sodium chloride; Sulfate
Arbuckle-Simpson[11]	OK	Coal-Pontotac	<500	Calcium bicarbonate rich
Trinity-Antlers[11]	OK/TX	Bryan, Atoka, Fannin	300-1,500	NA
Texas Coastal Uplands[13]	TX	Hopkins-Angelina	500-1,000	NA

TDS: total dissolved solids

mg/L: milligrams per liter

[1] Libmeyer 1985, [2] Swenson and Drum 1955, [3] Smith et al. 2000, [4] La Rique 1966, [5] Whitehead 1996, [6] Rich 2005, [7] Hammond 1994, [8] Cripe and Barari 1978, [9] Newport and Krieger 1959, [10] Stanton and Qi 2006, [11] Ryder 1996, [12] Carr and Marcher 1977, [13] Ryder and Ardis 2002.

TABLE 3.3.1-2 **Water-Bearing Zones Less Than 50 Feet below Ground Surface beneath the Proposed ROW for the Project**			
State/County	**Approximate Milepost or Range**	**Approximate Depth to Groundwater (feet bgs)[1]**	**Formation/Aquifer**
Steele City Segment			
Montana			
Phillips	2	8	Cretaceous Bearpaw Shale
Phillips	6	0	Cretaceous Bearpaw Shale
Valley	25-26	<50	Frenchman Creek alluvium
Valley	27	0-45	Late-Cretaceous Judith River Formation
Valley	38-41	0-9	Rock Creek glacial/allluvial sediments
Valley	47	6	Late-Cretaceous Judith River Formation
Valley	55-57	40-43	Late-Cretaceous Bearpaw Shale and Bugg Creek alluvium
Valley	66-72	7-63	Cherry Creek glacial/alluvial sediments
Valley	77-85	10-40	Porcupine Creek and Milk River alluvium
Valley	88	7-22	Milk River/Missouri River alluvial sediments
McCone	94	15	Late-Cretaceous Fox Hills Formation
McCone	99	26	Late-Cretaceous Hells Creek Formation
McCone	109	0	Late-Cretaceous Hells Creek Formation
McCone	119	20-30	Fort Union sands and Flying Creek alluvium
McCone	122-123	<50	Figure Eight Creek alluvium
McCone	133-153	10-45	Fort Union sands; Redwater River alluvium; Buffalo Creek alluvium; glacial drift
Dawson	159-160	10-50	Fort Union sands
Dawson	166-180	10-45	Clear Creek alluvium
Dawson	186-195	4-38	Clear Creek alluvium; Yellowstone River alluvium
Prairie	201-205	0-15	Cabin Creek alluvium
Prairie	209-214	18-40	Alluvium of merging creeks
Fallon	227	<50	Dry Fork alluvium
Fallon	231-234	0	Glacial drift/alluvium
Fallon	235-238	18-45	River alluvium of Dry Creek and its tributaries
Fallon	242-250	5-26	Sandstone Creek and Butte Creek alluvium
Fallon	257-262	0-37	Hidden Water Creek; Little Beaver Creek alluvium
Fallon	264-272	0	Creek alluvium
Fallon	275-279	0	Coal Bank Creek alluvium
Fallon	281-282	<50	Box Elder Creek alluvium
South Dakota			
Harding	289-290	<50	Shaw Creek alluvium
Harding	291-292	<50	Missouri River alluvium

TABLE 3.3.1-2 Water-Bearing Zones Less Than 50 Feet below Ground Surface beneath the Proposed ROW for the Project			
State/County	**Approximate Milepost or Range**	**Approximate Depth to Groundwater (feet bgs)[1]**	**Formation/Aquifer**
Harding	298-301	<50	Various creeks -alluvium
Harding	304-306	<50	Ione Creek alluvium
Harding	317-319	15-40	South Fork of Grand River alluvium
Harding	322-324	<50	Buffalo Creek/Clarks Fork Creek alluvium
Harding	329	<50	Squaw Creek alluvium
Harding	339	20	Red Creek alluvium
Harding	351-355	<50	Moreau Creek alluvium
Meade	380-387	15-45	Tertiary or alluvial
Meade	390-394	25	Tertiary or alluvial
Meade	399	18	Sulphur Creek alluvium
Meade	403-404	14-44	Spring Creek alluvium
Meade	407-408	14	Red Owl Creek alluvium
Meade	411	3	Sampson Creek alluvium
Meade	425	5	Cheyenne River alluvium
Pennington	432-437	<50	Alluvial
Pennington	442	12	Alluvial
Haakon	475	37	Alluvial
Haakon	478-481	14-25	Bad Creek alluvium
Jones	518-519	6	Alluvial
Lyman	535-536	6	White Creek alluvium
Tripp	539	23	Tertiary Ogallala
Tripp	561-564	3-9	Tertiary Ogallala
Tripp	570 -595	6-25	Tertiary Ogallala
Nebraska			
Keya Paha	597-600	<50	Keya Paha River alluvium
Keya Paha	603-616	<50	Sandhills Dune Sand and Tertiary Ogallala aquifer
Keya Paha	613-614	<50	Niobrara River alluvium
Holt/Garfield/Rock	624-675	<50	Sandhills Dune Sand with flowing wells, groundwater seeps, and shallow lakes
Wheeler	692-697	<50	Cedar River alluvium
Nance	726-729	<50	South Branch Timber River alluvium
Nance/Merrick	737-757	26-55	Platte River floodplain alluvium
York	778-779	<50	Beaver Creek alluvium
York	788-789	26-90	West Fork of Big Blue River alluvium
Fillmore/Saline	807-822	<50	South Fork of Turkey Creek alluvium
Jefferson	834-836	22-50	South Fork of Swan Creek alluvium

TABLE 3.3.1-2
Water-Bearing Zones Less Than 50 Feet below Ground Surface beneath the Proposed ROW for the Project

State/County	Approximate Milepost or Range	Approximate Depth to Groundwater (feet bgs)[1]	Formation/Aquifer
Jefferson	847	<50	Tributary to Big Creek alluvium
Gulf Coast Segment			
Oklahoma			
Lincoln	1-4	0	Wildhorse River alluvium
Lincoln	19-20	0	Uchee Creek alluvium
Okfuskee	22-25	0	Deep Creek alluvium
Okfuskee	28-29	0	Unnamed creek alluvium
Okfuskee	30-31	0	Unnamed creek alluvium
Okfuskee	33	40	Very High Groundwater sensitivity area
Okfuskee	38-39	47	North Canadian River - Very High Groundwater Sensitivity Area
Okfuskee	43-45	0	Sand Creek alluvium
Okfuskee	47-48	0	Little Wewoka Creek alluvium
Hughes	50-51	0	Wewoka Creek alluvium
Hughes	58-61	0	Wewoka Creek alluvium
Hughes	66-68	0	Bird Creek -Very High Groundwater sensitivity area
Hughes	70-71	0	Little River alluvium
Hughes	74-76	0	Canadian River alluvium
Coal	87-88	0	Muddy River alluvium
Atoka	127-130	0	Boggy Creek alluvium
Bryan	133-134	0	Unnamed creek alluvium
Bryan	145	0	Whitegrass Creek alluvium
Bryan	155-156	0	Red River alluvium
Texas			
Fannin	156-161	<50	Red River alluvium
Lamar	170	<50	Sanders Creek alluvium
Lamar	172	<50	Maxey Creek alluvium
Lamar	187-191	<50	North Sulfur Creek alluvium
Lamar	201-202	<50	South Sulfur Creek alluvium
Hopkins	212-213	<50	Oak Creek alluvium
Hopkins	216-217	<50	Stous Creek alluvium
Franklin	227-228	<50	Unnamed creek alluvium
Wood	256-257	<50	Big Sand Creek alluvium
Upshur	260-263	<50	Sabine Creek alluvium
Cherokee	297-301	<50	Striker Creek alluvium

TABLE 3.3.1-2 Water-Bearing Zones Less Than 50 Feet below Ground Surface beneath the Proposed ROW for the Project			
State/County	**Approximate Milepost or Range**	**Approximate Depth to Groundwater (feet bgs)[1]**	**Formation/Aquifer**
Rusk	308-313	<50	East Fork Angelina Creek alluvium
Nacogdoches	330-336	<50	Angelina Creek floodplain alluvium
Trinity	345-346	<50	Neches River alluvium
Trinity	350-353	<50	Neches River alluvium
Polk	360-369	<50	Neches River alluvium
Polk	374-375	<50	Bear Creek alluvium
Polk	380	<50	Unnamed creek alluvium
Polk	400-406	<50	Turkey Creek alluvium
Liberty	412-431	<50	Middle Pleistocene sand/silt along Trinity River
Liberty	432-446	<50	Willow Creek/Pine Creek floodplain alluvium
Jefferson	448-480	<50	Late Pleistocene mud/silt in floodplains of various rivers that coalesce.
Houston Lateral			
Texas			
Jefferson	1-18	<50	Late Pleistocene clay/mud in Trinity River floodplain.
Jefferson	19-23	<50	Floodplain of Trinity River
Jefferson	24-42	<50	Late Pleistocene clay/mud/silt
Jefferson	43-45	<50	San Jacinto River floodplain
Jefferson	46-48	<50	Late Pleistocene clay/mud.

[1] bgs = below ground surface; based on available well data.

Keystone 2009.

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.

Montana

Aquifers

The proposed pipeline route is present in the Great Plains physiographic province in Montana (Thornbury 1965). Regionally, aquifers beneath the proposed route are part of the Northern Great Plains aquifer system (Whitehead 1996). In Montana, aquifers consist of unconsolidated alluvial and/or glacial aquifers, lower Tertiary-aged aquifers, and upper Cretaceous-aged aquifers. Groundwater resources along alternate pipeline routes considered in Montana are described in Appendix I.

In northern Montana, in Phillips and Valley counties, glacial till is present up to 100 feet thick. The till is relatively impermeable and acts as a confining layer above the Cretaceous-aged Judith River Formation and Clagett Formation (Whitehead 1996). The Judith River Formation water table is present at approximately 150 to 500 feet bgs. Wells typically yield 5 to 20 gallons per minute (gpm). Additionally, the glacial till contains local permeable zones of coarse glacial outwash less than 50 feet bgs that provide irrigation water. Most groundwater use in Valley County comes from shallow alluvial aquifers along major river drainages such as the Milk River and Missouri River (Whitehead 1996).

In McCone County, the proposed route crosses the upper-Cretaceous Hells Creek/Fox Hills aquifer and the lower Tertiary Fort Union aquifer. Permeable sandstones of the Hells Creek/Fox Hills aquifer yield 5 to 20 gpm; most wells are drilled to depths of 150 to 500 feet bgs (Whitehead 1996). The lower Tertiary Fort Union aquifer consists of interbedded sandstones, mudstones, shale, and coal seams. Water-bearing zones are found in the sandstone layers. The aquifer is confined in most areas. Well yields are typically 15 to 25 gpm; most wells are drilled to depths of 50 to 300 feet bgs (Libmeyer 1985); water depths typically range from 100 to 150 feet bgs (Swenson and Drum 1955).

Beneath the proposed route in Dawson, Prairie, and Fallon counties lies the Lower Yellowstone aquifer system which contains groundwater in the lower Tertiary Fort Union Formation. In this area, the Fort Union Formation is a shallow bedrock aquifer that is used as a groundwater resource in these three counties. The Yellowstone River contains abundant alluvial material along its banks which contain shallow aquifers that are often used for water supply. Well yields in the shallow aquifers along the Yellowstone River range from 50 to 500 gpm (LaRique 1966). Additionally, shallow alluvial aquifers are also present at stream crossings including Clear Creek, Cracker Box/Timber Creek, Cabin Creek, Sandstone Creek, and Butte Creek.

The proposed pipeline project route does not cross any sole-source aquifers in Montana, as designated by EPA Region 8 (EPA 2009).

Wells

No public water supply (PWS) wells or source water protection areas (SWPA) are located within 1 mile of the centerline of the pipeline in Montana (Keystone 2008). A total of eight private water wells are located within approximately 100 feet of the proposed pipeline route within McCone, Dawson, Prairie, and Fallon counties (Keystone 2008).

South Dakota

Aquifers

Similar to Montana, the proposed pipeline route is present in the Great Plains physiographic province in South Dakota (Thornbury 1965). Regionally, aquifers beneath the proposed route are part of the Northern Great Plains aquifer system (Whitehead 1996).

The proposed route crosses the upper-Cretaceous Fox Hills and Hells Creek aquifers (portion of the Northern Great Plains aquifer system) in Harding, Perkins, and Meade counties. The town of Bison uses groundwater from the Fox Hills aquifer for its water supply. These municipal wells are 565 to 867 feet deep and yield up to 50 gpm (Steece 1981). Shallow alluvial aquifers are also present at stream crossings including Little Missouri River, South Fork Grand River, Clarks Fork Creek, Moreau River, Sulphur Creek, Red Owl Creek, and Cheyenne River.

In Haakon, Jones, and Lyman counties major water-producing aquifers are not present. The proposed route is underlain by the upper-Cretaceous Pierre Shale which is not an aquifer. The floodplains of the Bad River and the White River contain shallow alluvial aquifers that are used for water supply.

In southern South Dakota, the proposed route is underlain by the northern portion of the High Plains aquifer and contains Tertiary-aged aquifers and Pleistocene-aged river terrace aquifers (Whitehead 1996).

Tertiary-aged aquifers include the Ogallala, Arikaree, and White River aquifers. The Valentine Formation of the Ogallala aquifer is the water-bearing unit; depth to ground water is typically 10 to 70 feet bgs (Hammond 1994) with wells yielding 250 to 750 gpm. The Arikaree aquifer contains similar properties to the Ogallala, while the White River aquifer has limited yield.

The proposed pipeline route does not cross any sole-source aquifers in South Dakota, as designated by EPA Region 8 (EPA 2009).

Wells

One PWS well (associated with the Colome SWPA) is identified within 1 mile of the centerline of the pipeline in Tripp County (Keystone 2008). This PWS wells is screened at relatively shallow depth (reportedly less than 54 feet bgs) within the Tertiary Ogallala aquifer. The Project would pass through the Colome SWPA in Tripp County. No private water wells are located within approximately 100 feet of the proposed pipeline route in South Dakota (Keystone 2008).

Nebraska

Aquifers

The proposed route would cross the underlying Northern High Plains aquifer. The Northern High Plains aquifer supplies 78 percent of the public water supply and 83 percent of irrigation water in Nebraska (Emmons and Bowman 1999). Five main members of the aquifer would be crossed by the proposed route. Shallow alluvial aquifers are also crossed by the proposed pipeline route.

In Keya Paha County (northern Nebraska), the proposed route crosses the Tertiary-aged Brule aquifer and the Ogallala aquifer. The Brule aquifer does not yield appreciable water, however the Ogallala aquifer in this area is a major source of water. Wells yield 100 to 250 gpm (Newport and Krieger 1959). Alluvial aquifers are also present at the Keya Paha River and the Niobrara River. The Niobrara River is used as a source of irrigation and municipal water supply (Keystone 2008).

From Rock through Greely counties, the project route is underlain by the Sand Hills and Ogallala aquifers. The Sand Hills aquifer typically has a shallow water table less then 30 feet bgs and is therefore a potential concern (Stanton and Qi 2006). Alluvial aquifers are also present along the Elkhorn River and its tributaries and the Cedar River (Keystone 2008).

Beneath Nance, Merrick, and Hamilton counties, the project route leaves the Sand Hills aquifer and is again underlain by the Ogallala aquifer to the Loup River. From the Loup River to the Platte River, the project route is underlain by the Platte River Valley aquifer system. Shallow aquifers crossed by the proposed Project include the alluvial aquifer of the South Branch Timber Creek, the alluvial aquifer of the Loup River (used for irrigation and domestic water supply), and the alluvial aquifer of the Platte River Valley (used for irrigation, domestic, and municipal water supply) (Keystone 2008).

South of the Platte River, the proposed route crosses the Eastern Nebraska glacial drift aquifer, used for irrigation, domestic, and municipal water supply. Hordville's public water supply comes from wells screened within this aquifer from 160 to 262 feet bgs (Keech 1962).

From York to Jefferson counties, the proposed route crosses the Quaternary glacial drift aquifer of eastern Nebraska (Stanton and Qi 2006). The depth to groundwater is on average 80 feet bgs. Additionally, the project route crosses alluvial aquifers along Beaver Creek, the West Fork of the Big Blue River, and the alluvial floodplain of the South Fork Turkey Creek.

The proposed pipeline route does not cross any sole-source aquifers in Nebraska, as designated by EPA Region 7 (EPA 2009).

Wells

Eight PWS wells are present within 1 mile of the centerline of the proposed route in Hamilton, York, Filmore, Saline, and Jefferson counties (Keystone 2008). The proposed route would not however pass through any identified PWS wellhead protection areas. SWPAs within 1 mile of the Project include those for the towns of Ericson, Hordville, McCool Junction, Exeter, Steele City and the Rock Creek State Park. Additional SWPAs within 1 mile of the Project include those mapped in Hamilton County near Milepost (MP) 772 and York County near MP 781 and 783. A total of 29 private water wells are located within approximately 100 feet of the proposed pipeline route within Greeley, Merrick, Hamilton, York, Fillmore, and Jefferson counties (Keystone 2008).

Kansas

Construction planned in Kansas as part of the proposed Project comprises two new pump stations and appurtenant facilities, such as access roads located in Clay and Butler counties at MP 899 and MP 994, respectively. There are no expected impacts to groundwater resources associated with these activities in Kansas.

Oklahoma

Aquifers

The majority of water supply in eastern Oklahoma comes from shallow alluvial and terrace aquifers (Ryder 1996). Alluvial aquifers are located within the floodplains of major rivers and terrace aquifers are present in historical floodplain terraces. Alluvial aquifers contain a shallow unconfined water table while terrace aquifers typically contain a water table depth of 30 to 50 bgs (Ryder 1996). Major rivers and floodplains that contain these aquifers include the North Canadian River and Red River at the state’s southern border. Well yields for these aquifers are up to 500 gpm (Ryder 1996).

Deeper bedrock aquifers include the Central Oklahoma (sometimes referred to as the Garber-Wellington aquifer), the Ada-Vamoosa aquifer, and the Trinity or Antlers aquifer. The Central Oklahoma aquifer consists of confined and unconfined formations. Well yields range from 70 to 475 gpm (Carr and Marchur 1977) and well depths can be as shallow as 20 feet bgs but are also screened at depths up to 1,000 feet bgs. This aquifer lies adjacent to the west of the proposed route in central Oklahoma. The Ada-Vamoosa aquifer is present beneath the proposed route from Osage to Pontotoc counties and is composed of sandstone and interbedded shale. Wells typically yield 25 to 150 gpm and are used for domestic supply (Ryder 1996). The Trinity-Antlers aquifer is located beneath the Red River at the state line between Oklahoma and Texas. In Atoka County, the aquifer is present in Cretaceous-aged sandstone and is unconfined; the aquifer is confined beneath Bryan County to the state border. Water is used for domestic, irrigation, commercial and public water supply (Ryder 1996).

Although the proposed pipeline route does not cross any sole-source aquifers in Oklahoma, the route would pass to the east of the Arbuckle-Simpson aquifer, a designated sole-source aquifer by EPA Region 6 (EPA 2009). The Arbuckle-Simpson aquifer underlies the Arbuckle Mountains and Arbuckle Plains in south central Oklahoma and is composed of sandstone and interbedded shale (Ryder 1996). Water is present to depths up to 3,000 feet bgs and wells typically yield 100 to 500 gpm.

Wells

Within 1 mile of the proposed pipeline route in Hughes, Coal, and Bryan counties, 28 PWS wells are present (Keystone 2008). The number of private water wells located within 100 feet of the proposed pipeline route in Oklahoma is unknown.

Texas

Aquifers

Three principal aquifers are present beneath the Project route, including the Trinity aquifer located south of the Red River at the state line, the Texas Coastal Uplands aquifer system from Hopkins County to the Neches River in Angelina County, and the Texas Coastal Lowlands aquifer system from Polk to Jefferson counties (Ryder 1996). These aquifer systems are composed of multiple aquifers that are described below.

The Trinity aquifer consists of Cretaceous-aged sandstone, siltsone, clay, conglomerate, shale, and limestone. Wells yield 50 to 500 gpm and wells are typically 50 to 800 feet deep (Ryder 1996). Water is used for domestic and agricultural use.

The Texas Coastal Uplands aquifer system consists of two main aquifers: the Paleocene/Eocene Carrizo-Wilcox aquifer and the Eocene Claiborne aquifer, which is situated above the Carrizo Wilcox aquifer. Both aquifers consist of sand, silt, gravel, and clay and are used extensively for agricultural irrigation, domestic, municipal, and industrial water supply (Keystone 2008).

From Polk County to the southern extent of the proposed route, the ROW is present above the Texas Coastal Lowlands aquifer system. The three main aquifers in this system are the Miocene Jasper aquifer, overlain by the late Tertiary Evangeline, which is overlain by the Quaternary Chicot aquifer (Ryder 1996). The Evangeline and Chicot aquifers are used extensively for water supply in this area.

The proposed pipeline route does not cross any sole-source aquifers in Texas, as designated by EPA Region 6 (EPA 2009).

Wells

Within 1 mile of the proposed Gulf Coast Segment pipeline route in Lamar, Wood, Smith, Rusk, Nacogdoches, Angelina, Polk, and Liberty counties, 53 PWS wells are present. Within 1 mile of the proposed Houston Lateral pipeline route, 145 PWS wells are present in Liberty and Harris counties (Keystone 2008). The Project would pass within 1 mile of 36 SWPAs in Texas. A total of three private water wells are located within approximately 100 feet of the proposed pipeline route within Smith and Chambers counties.

3.3.1.2 Surface Water

Surface water resources that would be crossed by the proposed Project are located within three water resource regions (Seaber et al. 1994):

- Missouri River Region (Montana, South Dakota, Nebraska, and northern Kansas);
- Arkansas-White-Red Rivers Region (southern Kansas, Oklahoma, and northern Texas); and
- Texas-Gulf Rivers Region (Texas).

Stream and river crossings are described below by state. Additionally, reservoirs and larger lakes that are present within 10 miles downstream of these crossings are listed in Appendix E. Levees, water control structures, and flood protection structures along the proposed route are also presented in Appendix E.

Montana

Waterbodies Crossed

As presented in Appendix E, 389 waterbody crossings would occur in Montana along the proposed Project route. Of the 389 crossings 20 are perennial streams, 107 are intermittent streams, 243 are ephemeral streams, 15 are canals, and 4 are reservoirs. Based on stream width, adjacent topography, adjacent infrastructure, and sensitive environmental areas, Keystone proposes that three rivers in Montana would be crossed using the horizontal directional drill (HDD) method. These rivers include:

- Milk River in Valley County (approximately 100 feet wide, MP 83);
- Missouri River in Valley and McCone counties (approximately 1,000 feet wide, MP 89); and
- Yellowstone River in Dawson County (approximately 780 feet wide, MP 196).

The remaining 386 waterbodies would be crossed using one of several non-HDD methods described in the Construction, Mitigation, and Reclamation (CMR) Plan (Appendix B). The crossing method for each waterbody would be depicted on construction drawings but would ultimately be determined based on site-specific conditions at the time of crossing. Surface water resources along alternate pipeline routes considered in Montana are described in Appendix I. Several route variations have been suggested to either reduce impacts at a crossing or to address landowner concerns. These are also summarized in Appendix I of the DEIS.

Sensitive or Protected Waterbodies

The following streams and rivers that would be crossed by the proposed Project route in Montana contain state water quality designations or use designations (Appendix E). These waterbodies include:

- Dunham Coulee and Corral Coulee, in Phillips County
- Missouri River, Frenchman Creek, East Fork Cache Creek, Hay Coulee, Rock Creek, Willow Creek, Lime Creek, Brush Fork, Bear Creek, Unger Coulee, Buggy Creek, Alkali Coulee, Wire Grass Coulee, Spring Creek, Mooney Coulee, Cherry Creek, Spring Coulee, East Fork Cherry Creek, Lindeke Coulee, Espeil Coulee, and Milk River in Valley County
- West Fork Lost Creek, Lost Creek, Shade Creek, Jorgensen Coulee, Cheer Creek, Bear Creek, South Fork Shade Creek, Flying V Creek, Figure Eight Creek, Middle Fork Prairie Elk Creek, East Fork Prairie Elk Creek, Lone Tree Creek, Tributary to West Fork Lost Creek, Redwater Creek, and Buffalo Springs Creek in McCone County
- Cottonwood Creek, Berry Creek, Hay Creek, Upper Seven Mile Creek, Clear Creek, Cracker Box Creek, Side Channel Yellowstone River, and Yellowstone River in Dawson County
- Cabin Creek, West Fork Hay Creek, and Hay Creek in Prairie County
- Dry Fork Creek, Pennel Creek, Sandstone Creek, Red Butte Creek, Hidden Water Creek, Little Beaver Creek, Soda Creek, North Fork Coal Bank Creek, South Fork Coal Bank Creek, and Boxelder Creek in Fallon County

Several of these waterbodies would be crossed more than once. The waterbodies crossed by the Project that have state water quality classification are presented in Table 3.3.1.2-1.

TABLE 3.3.1.2-1
Sensitive or Protected Waterbodies in Montana Crossed More than Once

Waterbody Name	Type	Number of Crossings
Corral Coulee	Intermittent/Ephemeral*	5
Cheer Creek	Ephemeral	2
Bear Creek	Ephemeral	2
Shade Creek	Intermittent	3
Flying V Creek	Intermittent/Ephemeral*	2
Buffalo Springs Creek	Perennial/Intermittent*	3
Cabin Creek	Perennial	2
Dry Fork Creek	Perennial/Ephemeral*	5
Soda Creek	Intermittent	2

*In some cases, the stream type may change between crossings.

Impaired or Contaminated Waterbodies

Contamination has been documented in 11 sensitive or protected waterbodies in Montana (Keystone 2008) (Appendix J). Contamination in these waterbodies includes unacceptable levels of at least one of the following parameters: iron, fecal coliform, lead, mercury, phosphorous, total kjeldahl nitrogen (TKN), dissolved oxygen, total dissolved solids, nitrate/nitrite. Impairments in these waterbodies include fish-passage barriers, sedimentation/siltation, alteration in stream-side or littoral vegetative cover, Chlorophyll-a, dissolved oxygen, low flow alteration, and physical substrate habitat alteration.

TABLE 3.3.1.2-2
Impaired or Contaminated Waterbodies in Montana

Waterbody Name	Impairment or Contamination
Frenchman Creek	Alteration in stream-side or littoral vegetative cover; Chlorophyll-a; Low flow alterations
Buggy Creek	Iron
Cherry Creek	Iron
Milk River	Fecal Coliform; Lead; Mercury
Missouri River	Alteration in stream-side or littoral vegetative cover; Other flow regime alterations; Temperature, water
Middle Fork Prairie Elk Creek	Alteration in stream-side or littoral vegetative cover; Phosphorus (Total); Physical substrate habitat alterations; Total Kjehidahl Nitrogen (TKN)
East Fork Prairie Elk Creek	Alteration in stream-side or littoral vegetative cover; Phosphorus (Total); Physical substrate habitat alterations; TKN
Yellowstone River	Fish-passage barrier
Cabin Creek	Oxygen, Dissolved; Sedimentation/Siltation; TKN
Pennel Creek	Total Dissolved Solids
Sandstone Creek	Nitrate/Nitrite (Nitrite + Nitrate as N); TKN

Keystone 2009.

Water Supplies

Along the proposed ROW in Montana, municipal water supplies are largely obtained from groundwater sources and are described in Section 3.3.1.1. The proposed ROW would pass within 1 mile downstream of the Cornwell Reservoir (currently breached) at MP 59 and within 1 mile of the Haynie Reservoir at MP 134. These reservoirs, when functional, are used for irrigation and stock watering.

Major waterbodies and reservoirs located within 10 miles downstream of proposed water crossings include Lester Reservoir, Frenchman Reservoir, Reservoir Number Four, Fort Peck Lake, North Dam, Christenson Reservoir, Lindsay Reservoir, Red Butte Dam, and three unnamed reservoirs. The approximate mileposts of these waterbodies and their associated pipeline stream crossings are presented in Appendix E (Keystone 2009). Wetlands areas are addressed in Section 3.4.

South Dakota

Waterbodies Crossed

As presented in Appendix E, 354 waterbody crossings would occur in South Dakota along the proposed Project route. Of the 354 crossings 14 are perennial streams, 125 are intermittent streams, 206 are ephemeral streams, 4 are natural ponds, and 5 are reservoirs. Based on stream width, adjacent topography, adjacent infrastructure, and sensitive environmental areas, Keystone proposes that three rivers in South Dakota would be crossed using HDD method. These rivers include:

- Little Missouri River in Harding County (approximately 125 feet wide, MP 292);
- Cheyenne River in Meade and Haakon County (approximately 1125 feet wide, MP 426); and
- White River in Lyman County (approximately 500 feet wide, MP 535).

The remaining 352 waterbodies would be crossed using one of several non-HDD methods described in the CMR Plan (Appendix B). The crossing method for each waterbody would be depicted on construction drawings but would ultimately be determined based on site-specific conditions at the time of crossing.

Sensitive or Protected Waterbodies

The following streams and rivers that would be crossed by the proposed Project route in South Dakota contain state water quality designations or use designations (Appendix E). These waterbodies include:

- Little Missouri River, South Fork Grand River, and Clark's Fork Creek in Harding County;
- North Fork Moreau River in Butte County;
- South Fork Moreau River in Perkins County;
- Sulfur Creek, and Red Owl Creek in Meade County;
- Cheyenne River in Pennington County;
- Bad River in Haakon County;
- Williams Creek in Jones County; and

- White River in Lyman County.

In addition, all streams in South Dakota are assigned the beneficial uses of irrigation and fish and wildlife propagation, recreation, and stock watering (SDDENR 2008).

Impaired or Contaminated Waterbodies

Contamination has been documented in five of these sensitive or protected waterbodies in South Dakota (Keystone 2008) (Appendix J). Contamination or impairment in these waterbodies includes unacceptable levels of at least one of the following parameters: total suspended solids (TSS), salinity, specific conductance, and fecal coliform.

TABLE 3.3.1.2-3
Impaired or Contaminated Waterbodies in South Dakota

Waterbody Name	Impairment or Contamination
South Fork Grand River	Total Suspended Solids, Salinity
South Fork Moreau River	Specific Conductance
Cheyenne River	Total Suspended Solids, Fecal Coliform
White River	Total Suspended Solids, Fecal Coliform
Ponca Creek	Total Suspended Solids, Fecal Coliform

Keystone 2009.

Water Supplies

Along the proposed ROW in South Dakota, municipal water supplies are largely obtained from groundwater sources and are described in Section 3.3.1.1. The proposed ROW would pass within 1 mile of the Wilson Lake Reservoir at MP 415.

Major waterbodies and reservoirs located within 10 miles downstream of proposed water crossings include Lake Gardner and five unnamed reservoirs. The approximate mileposts of these waterbodies and their associated pipeline stream crossings are presented in Appendix E (Keystone 2009).

Nebraska

Waterbodies Crossed

As presented in Appendix E, 160 waterbody crossings would occur in Nebraska along the Project route. Of the 160 crossings 20 are perennial streams, 52 are intermittent streams, 75 are ephemeral streams, 9 are canals, 1 is a natural pond, and 3 are reservoirs. Based on stream width, adjacent topography, adjacent infrastructure, and sensitive environmental areas, Keystone proposes that five rivers in Nebraska would be crossed using the HDD method. These rivers include:

- Keya Paha River in Keya Paha County (approximately 125 feet wide, MP 598);
- Niobrara River in Keya Paha and Rock County (approximately 1,300 feet wide, MP 614);
- Cedar River in Wheeler County (approximately 100 feet wide, MP696);
- Loup River in Nance County (approximately 900 feet wide, MP 739); and

- Platte River in Merrick County (approximately 1,000 feet wide, MP 754).

The remaining 156 waterbodies would be crossed using one of several non-HDD methods described in the CMR Plan (Appendix B). The crossing method for each waterbody would be depicted on construction drawings but would ultimately be determined based on site-specific conditions at the time of crossing.

Sensitive or Protected Waterbodies

The following streams and rivers that would be crossed by the proposed Project route in Nebraska contain state water quality designations or use designations (Appendix E). Several of these waterbodies would be crossed more than once. These waterbodies include:

- Keya Paha River, Niobrara River, and Spring Creek in Keya Paha County;
- Ash Creek in Rock County;
- North Branch Elkhorn River, South Fork Elkhorn River, Elkhorn River, Holt Creek, and Dry Creek in Holt County;
- Cedar River in Wheeler County;
- South Branch Timber Creek and Loup River in Nance County;
- Prairie Creek, Side Channel Platte River, and Platte River in Merrick County;
- Big Blue River, Lincoln Creek, Beaver Creek, and West Fork Big Blue River in York County;
- Turkey Creek in Filmore County; and
- South Fork Swan Creek and Cub Creek in Jefferson County.

Impaired or Contaminated Waterbodies

Contamination has been documented in five of these sensitive or protected waterbodies in Nebraska (Keystone 2008) (Appendix J). Contamination or impairment in these waterbodies includes unacceptable levels of at least one of the following parameters: *E. coli*, low dissolved oxygen, and atrazine.

TABLE 3.3.1.2-4
Impaired or Contaminated Waterbodies in Nebraska

Waterbody Name	Impairment or Contamination
Keya Paha River	E. coli
Niobrara River	E. coli
Loup River	E. coli
Prairie Creek	Low Dissolved Oxygen
Big Blue River	Low Dissolved Oxygen, May-June atrazine

Keystone 2009.

Water Supplies

Along the proposed ROW in Nebraska, municipal water supplies are largely obtained from groundwater sources and are described in Section 3.3.1.1 (Keystone 2008).

Major waterbodies and reservoirs located within 10 miles downstream of proposed water crossings include Atkinson Reservoir, Chain Lake, Rush Lake, Sininger Lagoon, County Line Marsh, Cub Creek Reservoir 13-C, Cub Lake Reservoir 14-C, Big Indian Creek Reservoir 10-A, Big Indian Creek Reservoir 8-E, an unnamed lake, and four unnamed reservoirs. The approximate mileposts of these waterbodies and their associated pipeline stream crossings are presented in Appendix E (Keystone 2009).

Kansas

Construction planned in Kansas as part of the proposed Project comprises two new pump stations and appurtenant facilities, including transmission lines and access roads located in Clay and Butler counties at MP 899 and MP 994, respectively. There are no expected impacts to surface water resources associated with these activities in Kansas.

Oklahoma

Waterbodies Crossed

As presented in Appendix E, 368 waterbody crossings would occur in Oklahoma along the proposed Project route. Of the 368 crossings, 83 are perennial streams, 137 are intermittent streams, 136 are ephemeral streams, 8 are seasonal, 1 is an artificial path(an artificial path is any man-made or modified flow path), and 3 are unclassified. Based on stream width, adjacent topography, adjacent infrastructure, and sensitive environmental areas, Keystone proposes that six rivers in Oklahoma would be crossed using the HDD method. These rivers include:

- Deep Fork in Creek County (approximately 125 feet wide, MP 23);
- North Canadian River in Okfuskee and Seminole County (approximately 250 feet wide, MP 39);
- Little River in Hughes County (approximately 110 feet wide, MP 70);
- Canadian River in Hughes County (approximately 700 feet wide, MP 75);
- Clear Boggy Creek in Atoka County (approximately 80 feet wide, MP 127); and
- Red River in Bryan County, OK and Fannin County TX (approximately 750 feet wide, MP 155).

The remaining 362 waterbodies would be crossed using one of several non-HDD methods described in the CMR Plan (Appendix B). The crossing method for each waterbody would be depicted on construction drawings but would ultimately be determined based on site-specific conditions at the time of crossing.

Sensitive or Protected Waterbodies

The following streams and rivers that would be crossed by the proposed Project route in Oklahoma contain state water quality designations or use designations (Appendix E). These waterbodies include:

- Red River in Bryan County;
- Bird Creek and Little River in Hughes County;

- Euchee Creek in Lincoln County;
- Little Hilliby Creek in Okfuskee County; and
- Sand Creek, Wewoka Creek, Little Wewoka Creek, and North Canadian River in Seminole County.

Impaired or Contaminated Waterbodies

Contamination has been documented in six of these sensitive or protected waterbodies in Oklahoma (Keystone 2008) (Appendix J). Contamination in these waterbodies includes unacceptable levels of at least one of the following parameters: chloride, Fish bioassessments, TDS, *Enterococcus* spp, *E. coli*, and lead. Impairments in these waterbodies include turbidity and dissolved oxygen.

TABLE 3.3.1.2-5
Impaired or Contaminated Waterbodies in Oklahoma

Waterbody Name	Impairment or Contamination
Canadian River	Enterococcus Bacteria, Lead, Total Dissolved Solids, Turbidity
Euchee Creek	Eschericihia coli, Enterococcus bacteria, Turbidity
Hilliby Creek	Fish bioassessments
Little River	Enterococcus bacteria, Lead, Turbidity
Little Wewoka Creek	Dissolved Oxygen
Sand Creek	Chloride, Total Dissolved Solids

Keystone 2009.

Water Supplies

Along the proposed ROW in Oklahoma, municipal water supplies are largely obtained from groundwater sources and are described in Section 3.3.1.1 (Keystone 2008).

Major waterbodies and reservoirs located within 10 miles downstream of proposed water crossings include Stroud Lake. The approximate milepost of this waterbody and its associated pipeline stream crossings is presented in Appendix E (Keystone 2009).

Texas

Waterbodies Crossed

As presented in Appendix E, 633 waterbody crossings would occur in Texas along the proposed Gulf Coast Segment route, and 20 waterbody crossings would occur along the proposed Houston Lateral route. Of the 633 crossings on the Gulf Coast Segment, 199 are perennial streams, 198 are intermittent streams, 215 are ephemeral streams, 5 are seasonal, 2 are artificial path (an artificial path is any man-made or modified flow path), 9 are canal/ditch, and 5 are unclassified. Of the 20 crossings on the Houston Lateral, 5 are perennial streams, 2 are intermittent streams, 8 are ephemeral streams, 2 are artificial path (an artificial path is any man-made or modified flow path), and 3 are canal/ditch. Based on stream width, adjacent topography, adjacent infrastructure, and sensitive environmental areas, Keystone proposes that 22 waterbodies in Texas would be crossed using the HDD method. These waterbodies include:

Gulf Coast Segment

- Red River in Bryan County, OK and Fannin County TX (approximately 750 feet wide, MP 155)
- Bois d'Arc Creek in Fannin and Lamar counties (approximately 125 feet wide, MP 161)
- North Sulphur River in Lamar and Delta counties (approximately 350 feet wide, MP 190);
- South Sulphur River in Delta and Hopkins counties (approximately 100 feet wide, MP 201);
- White Oak Creek in Hopkins County (approximately 300 feet wide, MP 212);
- Big Cyprus Creek in Franklin County (approximately 75 feet wide, MP 228);
- Waterbody in Wood County (approximately 250 feet wide, MP 254);
- Big Sandy Creek in Upshur County (approximately 180 feet wide, MP 256);
- Sabine River in Upshur and Smith counties (approximately 175 feet wide, MP 262);
- East Fork Angelina River in Rusk County (approximately 50 feet wide, MP 312);
- Angelina River in Nacogdoches and Cherokee counties (approximately 80 feet wide, MP 333);
- Neches River in Angelina and Polk counties (approximately 150 feet wide, MP 367);
- Menard Creek in Liberty County (approximately 50 feet wide, MP 414);
- Neches Valley Canal Authority (approximately 150 feet wide, MP 459);
- Lower Neches Valley Canal Authority in Jefferson County (approximately 150 feet wide, MP 460);
- Willow Marsh Bayou in Jefferson County (approximately 280 feet wide , MP 467);
- Hillebrandt Bayou in Jefferson County (approximately 490 feet wide, MP 471); and
- Port Arthur Canal and Entergy Corridor in Jefferson County (approximately 1700 feet wide, MP 478).

Houston Lateral Segment

- Trinity Creek Marsh in Liberty County (MP 18);
- Trinity River in Liberty County (MP 23);
- Cedar Bayou in Harris County(MP 36); and
- San Jacinto River in Harris County(MP 43).

The remaining 615 waterbodies on the Gulf Coast Segment and 16 waterbodies on the Houston Lateral would be crossed using one of several non-HDD methods described in the CMR Plan (Appendix B). The crossing method for each waterbody would be depicted on construction drawings but would ultimately be determined based on site-specific conditions at the time of crossing.

Sensitive or Protected Waterbodies

The following streams and rivers that would be crossed by the proposed Project route in Texas contain state water quality designations or use designations (Keystone 2008) (Appendix E). Several of these waterbodies would be crossed more than once. These waterbodies include:

Gulf Coast Segment

- Big Sandy Creek in Wood County;
- Big Sandy Creek in Upshur County;
- Angelina River in Cherokee County;
- Angelina River and East Fork Angelina River in Rusk County;
- Angelina River in Nacogdoches County;
- Pine Island Bayou in Hardin County;
- Neches River, Piney Creek, and Big Sandy Creek in Polk County; and
- Hillebrandt Bayou in Jefferson County.

Impaired or Contaminated Waterbodies

Contamination has been documented in 3 of these sensitive or protected waterbodies in Texas (Keystone 2008) (Appendix J). Contamination in these waterbodies includes unacceptable levels of at least one of the following parameters: bacteria, low dissolved oxygen, and lead.

TABLE 3.3.1.2-6
Impaired or Contaminated Waterbodies in Texas

Waterbody Name	Impairment or Contamination
Angelina River above Sam Rayburn Reservoir	Bacteria
Big Sandy Creek	Bacteria
East Fork Angelina River	Bacteria, Lead
Hillebrandt Bayou	Dissolved Oxygen
Hurricane Creek	Bacteria
Jack Creek	Bacteria
Neches River below Lake Palestine	Bacteria, lead
Pine Island bayou	Dissolved Oxygen
Piney Creek	Bacteria, Dissolved Oxygen
Willow Creek	Dissolved Oxygen
Cedar Bayou above Tidal	Bacteria, Benthic Macroinvertebrates
San Jacinto River above Tidal	Dioxin, PCB's

Keystone 2009.

Water Supplies

Along the proposed ROW in Texas, municipal water supplies are largely obtained from groundwater sources and are described in Section 3.3.1.1.

Major waterbodies and reservoirs located within 10 miles downstream of proposed water crossings for the Gulf Coast Segment and the Houston Lateral include Pat Mayse Lake/WMA, proposed George Parkhouse Reservoir, Lake Cypress Springs, Lake Bob Sandlin, proposed Little Cypress Reservoir, Lake Greenbriar, Prairie Creek Reservoir, Lake Tyler, proposed Lake Columbia, Lake Striker, Drainage in David Crockett National Forest, Fiberboard Lake, Drainage in Big Thicket National Preserve, Drainage in Trinity River National Wildlife Refuge, Daisetta Swamp, drainage in Big Thicket National Preserve, Drainage in J.D. Murphree WMA, Highlands Reservoir, George White Lake, and McCracken Lake. The approximate mileposts of these waterbodies and drainage areas and their associated pipeline stream crossings are presented in Appendix E (Keystone 2009).

3.3.1.3 Floodplains

Floodplains are relatively low, flat areas of land that surround some rivers and streams and convey overflows during flood events. Floodwater energy is dissipated as flows spread out over a floodplain, and significant storage of floodwaters can occur through infiltration and surficial storage in localized depressions on a floodplain. Floodplains form where overbank floodwaters spread out laterally and deposit fine-grained sediments. The combination of rich soils, proximity to water, riparian forests, and the dynamic reworking of sediments during floods creates a diverse landscape with high habitat quality. Floodplains typically support a complex mosaic of wetland, riparian, and woodland habitats that are spatially and temporally dynamic.

Changing climatic and land use patterns in much of the west-central United States has resulted in region-wide incision of many stream systems. Stream systems cutting channels deeper into the surrounding floodplain cause high floodplain terraces to form along valley margins. These floodplain terraces are common along the Project route and receive floodwaters less frequently than the low floodplains adjacent to the streams.

From a policy perspective, the Federal Emergency Management Agency (FEMA) defines a floodplain as being any land area susceptible to being inundated by waters from any source (FEMA 2005). FEMA prepares Flood Insurance Rate Maps that delineate flood hazard areas, such as floodplains, for communities. These maps are used to administer floodplain regulations and to mitigate flood damage. Typically, these maps indicate the locations of 100-year floodplains, which are areas with a 1-percent chance of flooding occurring in any single year.

Executive Order 11988, Floodplain Management, states that actions by federal agencies are to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplain development wherever there is a practicable alternative. Each agency is to provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for:

- Acquiring, managing, and disposing of federal lands, and facilities;
- Providing federally undertaken, financed, or assisted construction and improvements; and
- Conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

Designated floodplains crossed by the proposed route are listed in Table 3.3.1.3-1.

TABLE 3.3.1.3-1 Designated Floodplain Areas Crossed by the Proposed Pipeline Route[1]		
Location	**Approximate Mileposts**	**Watercourse Associated with Floodplain**
Steele City Segment		
Montana		
Valley	81 – 84	Milk River
Valley/McCone	87 – 90	Missouri River
McCone	146 – 147	Redwater River
Dawson	193 – 196	Yellowstone River
South Dakota		
Harding	291 – 292	Little Missouri River
Meade/Pennington	424 – 426	Cheyenne River
Haakon	480 – 482	Bad River
Lyman/Tripp	537 – 539	White River
Nebraska		
Keya Paha	599 – 599	Keya Paha River
Rock	615 – 615	Niobrara River
Nance	738 – 793	Loup River
Merrick	755 – 758	Platte River
Gulf Coast Segment		
Oklahoma		
Creek	19 – 20	Tributary to Deep Fork
Creek	21 – 22	Deep Fork
Creek	22 – 23	Deep Fork
Okfuskee	23 – 23	Deep Fork
Okfuskee	38 – 40	North Canadian River
Seminole	40 – 40	North Canadian River
Seminole	43 – 44	Sand Creek
Seminole	58 – 59	Wewoka Creek
Hughes	60 – 60	Jacobs Creek
Hughes	74 – 74	Canadian River
Hughes	74 – 75	Canadian River
Coal	85 – 88	Muddy Boggy Creek
Atoka	126 – 127	Clear Boggy Creek
Atoka	127 – 128	Clear Boggy Creek
Atoka	131 – 131	Cowpen Creek
Bryan	155 – 155	Red River
Texas		
Fannin	155 – 156	Red River
Fannin	161 – 161	Bois d'Arc Creek

TABLE 3.3.1.3-1
Designated Floodplain Areas Crossed by the Proposed Pipeline Route[1]

Location	Approximate Mileposts	Watercourse Associated with Floodplain
Lamar	165 – 166	Slough Creek
Lamar	170 – 171	Sanders Creek
Lamar	172 – 172	Cottonwood Creek
Lamar	174 – 174	Doss Creek
Lamar	189 – 190	North Sulphur River
Delta	190 – 190	North Sulphur River
Lamar	190 – 190	North Sulphur River
Delta	190 – 192	North Sulphur River
Delta	200 – 201	South Sulphur River
Hopkins	201 – 203	South Sulphur River
Upshur	256 – 256	Big Sandy Creek
Wood	256 – 257	Big Sandy Creek
Upshur	257 – 258	Big Sandy Creek
Upshur	260 – 263	Sabine River
Smith	263 – 263	Sabine River
Smith	268 – 268	Simpson Creek
Smith	268 – 268	Simpson Creek
Nacogdoches	324 – 325	Angelina River
Nacogdoches	333 – 336	Angelina River
Nacogdoches	341 – 341	Red Bayou
Angelina	341 – 341	Red Bayou
Angelina	344 – 344	Watson Branch
Angelina	347 – 348	Neches River
Angelina	350 – 350	Neches River
Angelina	351 – 352	Neches River
Angelina	358 – 358	Neches River
Angelina	359 – 360	Hurricane Creek
Angelina	362 – 362	Neches River
Angelina	362 – 363	Neches River
Angelina	365 – 366	Neches River
Angelina	366 – 367	Neches River
Angelina	367 – 370	Neches River
Polk	373 – 373	Piney Creek
Polk	373 – 373	Piney Creek
Polk	373 – 374	Piney Creek
Polk	375 – 375	Neches River
Polk	376 – 376	Neches River

TABLE 3.3.1.3-1 Designated Floodplain Areas Crossed by the Proposed Pipeline Route[1]		
Location	**Approximate Mileposts**	**Watercourse Associated with Floodplain**
Polk	401 – 402	Menard Creek
Polk	404 – 405	Dry Branch
Polk	414 – 414	Menard Creek
Hardin	446 – 447	Pine Island Bayou
Hardin	447 – 448	Pine Island Bayou
Liberty	448 – 449	Pine Island Bayou
Jefferson	449 – 449	Pine Island Bayou
Jefferson	449 – 449	Pine Island Bayou
Jefferson	451 – 452	Pine Island Bayou
Jefferson	455 – 456	Cotton Creek
Jefferson	462 – 462	North Fork Taylor Bayou
Jefferson	463 – 463	North Fork Taylor Bayou
Jefferson	465 – 466	Willow Marsh Bayou
Jefferson	466 – 466	Willow Marsh Bayou
Jefferson	467 – 470	Willow Marsh Bayou
Jefferson	471 – 471	Willow Marsh Bayou
Jefferson	472 – 472	Willow Marsh Bayou
Jefferson	479 – 479	Neches River

Sources: Interpretation of USGS 1:24,000 Topographic Maps and PHMSA (http://www.npms.phmsa.dot.gov); FEMA 100-year floodplain maps.

Two pump stations along the Gulf Coast route are within the 100-year floodplain. Pump Station 39 at MP 333.6 in Cherokee County, Texas is in the Angelina River floodplain. Pump Station 41 at MP 432.6 in Liberty County, Texas is within the Batiste Creek floodplain.

As proposed, the Project has 10 MLVs in the 100-year floodplain (CK-MLV-175, CK-MLV-220, CK-MLV-325, MLV-115, MLV-190, MLV-240, MLV-255, MLV-305, MLV-320, and MLV-330). The proposed locations are listed in Table 3.3.1.3-2; however Keystone the determination of those valves will be made during final design.

TABLE 3.3.1.3-2 Proposed Mainline Valve Locations within Designated 100-Year Floodplains			
County	**MLV**	**Approximate Milepost**	**Watercourse Associated with Floodplain**
Gulf Coast Segment			
Oklahoma			
Okfuskee	MLV-115	38.43	North Canadian River
Texas			
Hopkins	CK-MLV-175	202.05	South Sulphur River
Upshur	MLV-190	261.38	Sabine River
Polk	CK-MLV-220	369.59	Neches River

TABLE 3.3.1.3-2 Proposed Mainline Valve Locations within Designated 100-Year Floodplains			
County	**MLV**	**Approximate Milepost**	**Watercourse Associated with Floodplain**
Liberty	MLV-240	432.66	Tributary to Batiste Creek
Jefferson	MLV-255	469.68	Willow Marsh Bayou
Houston Lateral			
Texas			
Liberty	MLV-305	21.75	Trinity River
Harris	MLV-320	42.92	San Jacinto River
Harris	CK-MLV-325	44.38	San Jacinto River
Harris	MLV-330	48.57	San Jacinto River

3.3.2 Potential Impacts and Mitigation

3.3.2.1 Groundwater

Construction Impacts

Potential impacts to groundwater during construction activities would include:

- Temporary to long-term surface water quality degradation during or after construction from disposal of materials and equipment;
- Temporary increases in TSS concentrations where the water table is disturbed during trenching and excavation activities (drawdown of the aquifer is possible where dewatering is necessary)
- Increased surface water runoff and erosion from clearing vegetation in the ROW
- Degradation of groundwater quality due to potential blasting

Many of the aquifers present in the subsurface beneath the proposed route are isolated by the presence of glacial till or other confining units, which characteristically inhibits downward migration of water and contaminants into these aquifers. However, shallow or near-surface aquifers are also present beneath the proposed route and may be impacted by construction activities. These shallow or near-surface aquifers are predominately present along alluvial stream valleys.

Construction impacts to groundwater resources associated with spills and leaks are discussed in Section 3.13.

TSS Concentrations

Although there is potential for dewatering of shallow groundwater aquifers and potential changes in groundwater quality (such as increases in TSS concentrations) during trenching and excavation activities, these changes are expected to be temporary. Shallow groundwater aquifers generally recharge quickly because they are receptive to recharge from precipitation and surface water flow.

Runoff, Erosion, and Dust Control

Implementation of measures described in Section 4.5 of Keystone's CMR Plan (Appendix B) would reduce erosion (Section 3.2.2.1) and control surface water runoff during vegetation clearing in the ROW. However infiltration to groundwater will ultimately be reduced due to vegetation clearing in the ROW. Groundwater or surface water resources may be needed to control dust during construction activities.

Blasting

Where required for pipeline construction, blasting has the potential to affect groundwater resources. Keystone would prepare a blasting plan for any locations where blasting would be necessary. Prior to construction, Keystone would file its blasting plan with applicable state or local jurisdictions, where required. Keystone's blasting plan would include provisions to avoid impacts to groundwater and to incorporate post-blasting testing for surface water and water wells within 150 feet of the centerline to ensure that water resources are not negatively affected by blasting activities.

Hydrostatic Testing

Groundwater withdrawal for hydrostatic testing may be necessary at certain locations where surface water sources can not be used. Infiltration of hydrostatic testing waters would temporarily increase local groundwater levels, however the duration of increase would be minimal. Discharge waters will meet all water quality requirements prior to discharge and would therefore not impact groundwater quality. All applicable water withdrawal and discharge permits would be acquired prior to hydrostatic testing.

Operations Impacts

Routine operation and maintenance is not expected to affect groundwater resources.

Operational impacts to groundwater resources associated with spills and leaks are discussed in Section 3.13.

3.3.2.2 Surface Water

Construction Impacts

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

- Temporary increases in TSS concentrations and increased sedimentation during stream crossings;
- Temporary to short-term degradation of aquatic habitat from in-stream construction activities;
- Changes in channel morphology and stability caused by channel and bank modifications;
- Temporary to long term decrease in bank stability and resultant increase in TSS concentrations from bank erosion as vegetation removed from banks during construction is re-establishing;
- Temporary reduced flow in streams and potential other adverse effects during hydrostatic testing activities; and
- Temporary degradation of surface water quality and alteration of aquatic habitat from blasting activities within or adjacent to stream channels.

Construction impacts to surface water resources associated with spills and leaks are discussed in Section 3.13.

Stream Crossings and In-Stream Construction Activities

Depending on the type of stream crossing, one of six construction methods would be used: the non-flowing open-cut method, the flowing open-cut method, the dry flume method, the dry dam-and-pump method, the HDD method, or the horizontal bore crossing method. More detailed descriptions of each crossing method and mitigation measures associated with each method are provided in the CMR Plan (Appendix B) and in the Project Description (Section 2.0). Each stream crossing and chosen method would be shown on construction drawings but may be amended or changed based on site-specific conditions during construction. Open-cut methods would be used at most crossings, unless deemed not feasible due to site conditions during construction or to protect sensitive waterbodies, as determined by the appropriate regulatory authority. At 38 major and sensitive waterbody crossings the HDD method would be used.

Keystone has committed to the use of the general river crossing procedures and mitigations included in the CMR Plan (Appendix B). The CMR Plan would be revised prior to construction to incorporate additional mitigations, as well as any other mitigations or conditions that the U.S. Army Corps of Engineers (USACE) imposes during final permit negotiations. For waterbody crossings where HDD would be used, disturbance to the channel bed and banks is avoided, however mitigating measures may be needed in the instance of a frac-out.

Where the HDD method is not used for major waterbody crossings or for waterbody crossings where important fisheries resources could be impacted, Keystone would develop a site-specific plan addressing proposed additional construction and mitigation procedures (CMR Plan, 7.4). Prior to commencing any stream crossing construction activities, Keystone would be required to obtain a permit under Section 404 of the Clean Water Act (CWA) through the USACE and Section 401 water quality certification as per state regulations and these agencies could require measures to limit unnecessary impacts such as requiring all the non-HDD crossings to be done in the dry if water is present at the time of the crossing.

Construction activities for open-cut wet crossings involve excavation of the channel and banks. Construction equipment and excavated soils would be in direct contact with surface water flow. The degree of impact from construction activities would depend on flow conditions, stream channel conditions, and sediment characteristics. For the types of crossings listed below, Keystone would implement the following measures on a site-specific basis:

- **Contaminated or Impaired Waters.** If required, Keystone would work with the applicable permitting agency to develop specific crossing and sediment handling procedures and provide the DOS with a copy of that consultation.
- **Sensitive/Protected Waterbodies.** Keystone would develop specific construction and crossing methods in conjunction with USACE and U.S. Fish and Wildlife Service (USFWS) consultation. The appropriate method of crossing these waterbodies would be determined by USACE or USFWS, as applicable.
- **Frac-out Plan.** Keystone will develop a plan in consultation with the regulatory agencies to continue the HDD if a frac out occurs with the understanding that the impacts of continuing may be less than reassessing the situation and starting over or using a conventional crossing method on smaller streams such as the Milk River.

Implementation of measures in Section 7.5 through Section 7.11 of Keystone's CMR Plan (Appendix B) and additional conditions from permitting agencies would reduce adverse impacts resulting from open-cut wet crossings. All contractors would be required to follow the identified procedures to limit erosion and other land disturbances. Keystone's CMR Plan describes the use of buffer strips, drainage diversion structures, sediment barrier installations, and clearing limits, as well as procedures for waterbody restoration at crossings. (See Section 2.0 and the CMR Plan for a discussion of Keystone's proposed waterbody crossing methods.)

Following completion of waterbody crossings, waterbody banks would be restored to preconstruction contours, or at least to a stable slope. Banks would be seeded with native vegetation, mulch, or erosion control fabric, where possible. If necessary, additional erosion control measures would be installed in accordance with permit requirements. However, erosion control measures can themselves cause adverse environmental impacts. For example, placement of rock along the bank at a crossing could induce bank failure further downstream. Geomorphic assessment of waterbody crossings could provide significant cost savings and environmental benefits. The implementation of appropriate measures to protect pipeline crossings from channel incision and channel migration can reduce the likelihood of washout-related emergencies, reduce maintenance frequency, limit adverse environmental impacts, and in some cases improve stream conditions.

Therefore, all waterbody crossings should be assessed by qualified personnel in the design phase of the Project with respect to the potential for channel aggradation/degradation and lateral channel migration. The level of assessment for each crossing could vary based on the professional judgment of the qualified design personnel. The pipeline should be installed as necessary to address any hazards identified by the assessment. The pipeline should be installed at the design crossing depth for at least 15 feet beyond the design lateral migration zone, as determined by qualified personnel. The design of the crossings also should include the specification of appropriate stabilization and restoration measures.

In accordance with the CWA, all construction activities would comply with the National Pollutant Discharge Elimination System (NPDES) permit and other applicable permitting. This includes following the procedures in a Stormwater Pollution Prevention Plan.

Hydrostatic Testing

Water used for hydrostatic testing would be obtained from nearby surface water resources. These sources include streams, rivers, and privately owned reservoirs. Keystone has identified 50 potential surface water sources that could supply water for hydrostatic testing along the proposed project route depending on the flows at the time of testing and the sensitivity of the individual waterbodies for other uses. These sources are listed in Table 1 in Section 8.2 of Keystone's CMR Plan (Appendix B). Hydrostatic test manifolds would be located more than 100 feet away from wetlands and riparian areas to the maximum extent possible.

Keystone has committed that the Project would not withdraw hydrostatic test water from any waterbody where such withdrawal would create adverse affects. All surface water resources utilized for hydrostatic testing would be approved by the appropriate permitting agencies prior to initiation of any testing activities. Planned withdrawal rates for each water resource would be evaluated and approved by these agencies prior to testing. No resource would be utilized for hydrostatic testing without receipt of applicable permits. As stated in Keystone's CMR Plan (Appendix B), Keystone would be responsible for obtaining required water analyses prior to any water filling and discharging operations associated with hydrostatic testing.

The water withdrawal methods described in Section 8.0 of Keystone's CMR Plan (Appendix B) would be implemented and followed. These procedures include screening of intake hoses to prevent the entrainment of fish or debris, keeping the hose at least 1 foot off the bottom of the water resource, prohibiting the addition of chemicals into the test water, and avoiding discharging any water that contains visible oil or sheen following testing activities.

Hydrostatic test water would be discharged to the source water at an approved location along the waterway or to an upland area within the same drainage as the source water where it may evaporate or infiltrate. Discharged water would be tested to ensure it meets applicable water quality standards imposed by the discharge permits for the permitted discharge locations. Keystone's CMR Plan incorporates additional measures designed to minimize the impact of hydrostatic test water discharge, including regulation of discharge rate, the use of energy dissipation devices, channel lining, and installation of sediment barriers as necessary (see Appendix B, Section 8.4). Section 3.7 discusses additional mitigation measures necessary to protect fisheries.

Blasting

Where required for pipeline construction, blasting has the potential to affect surface water resources. Keystone would prepare a blasting plan for any locations where blasting would be necessary. Prior to construction, Keystone would file its blasting plan with applicable state or local jurisdictions, where required. Post-blasting testing procedures for surface water resources would be incorporated if required by applicable state or local jurisdictions.

Operations Impacts

Channel migration or streambed degradation could potentially expose the pipeline, resulting in temporary short-term or long-term adverse impacts to water resources, however protective activities such as reburial or bank armoring would be implemented to reduce these impacts. In its CMR Plan (Appendix B), Keystone has committed to a minimum depth of cover of 5 feet below the bottom of all waterbodies, maintained for a distance of at least 15 feet to either side of the edge of the waterbody. General channel incision or localized headcutting could threaten to expose the pipeline during operations. In addition, channel incision could sufficiently increase bank heights to destabilize the slope, ultimately widening the stream. Sedimentation within a channel could also trigger lateral bank erosion, such as the expansion of a channel meander opposite a point bar. Bank erosion rates could exceed several meters per year. Not maintaining an adequate burial depth for pipelines in a zone that extends at least 15 feet (5 meters) beyond either side of the active stream channel may necessitate bank protection measures that would increase both maintenance costs and environmental impacts. Potential bank protection measures could include installing rock, wood, or other materials keyed into the bank to provide protection from further erosion, or regarding the banks to reduce the bank slope. Disturbance associated with these maintenance activities may potentially create additional water quality impacts.

All waterbody crossings would be assessed by qualified personnel in the design phase of the proposed Project with respect to the potential for channel aggradation/degradation and lateral channel migration. The level of assessment for each crossing could vary based on the professional judgment of the qualified design personnel. The pipeline would be installed as determined to be necessary to address any hazards identified by the assessment. The pipeline would be installed at the design crossing depth for at least 15 feet beyond the design lateral migration zone as determined by qualified personnel. The design of the crossings would also include the specification of appropriate stabilization and restoration measures

Operational impacts to surface water resources associated with spills and leaks are discussed in Section 3.13.

In addition to the measures that Keystone has committed to use to protect water resources during operation, the following potential mitigation measures have been suggested by regulatory agencies:

- In Montana, avoid crossing water ponds and/or reservoirs (MDEQ);
- Avoid wet crossings of any stream, lake, reservoir, or pond in the state of Montana (MDEQ); and
- In Montana, any construction equipment and construction-related vehicles crossing a water body should use a crossing location that is within the dewatered reach created by the selected dry crossing construction method (MDEQ).

3.3.2.3 Floodplains

The pipeline would be constructed under river channels with potential for lateral scour. In floodplain areas adjacent to waterbodies, Keystone would restore the contours to as close to previously existing contours as practical and would revegetate the construction ROW in accordance with its CMR Plan (Appendix B). Therefore, after construction the pipeline would not obstruct flows over designated floodplains.

Although two pump stations and 10 MLVs would be in the 100-year floodplain as currently proposed, the effect of those facilities on floodplain function would be minor.

3.3.3 Connected Actions

The construction and operation of electrical distribution lines and substations associated with the proposed pump stations, and the Lower Brule to Witten 230-kV electrical transmission line would have negligible effects on water resources.

3.3.4 References

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3.4 WETLANDS

3.4.1 Environmental Setting

Wetlands are areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of wetland vegetation typically adapted for life in saturated soil conditions (Cowardin et al. 1979). As part of federal regulatory requirements under the Clean Water Act (CWA), inventories of wetlands and other waters of the United States involving field surveys are required along the proposed pipeline ROW and other associated areas of disturbance related to the Project to evaluate the potential for adverse effects to waters of the United States. Information gathered during the inventories will be used to complete notification and permitting requirements under Sections 401 and 404 of the CWA, as managed by U.S. Army Corps of Engineers (USACE) and applicable state agencies under the review of the U.S. Environmental Protection Agency (EPA) with potential veto for projects with unacceptable impacts to wetlands.

Wetland types within the Project area include emergent wetlands, scrub/shrub wetlands, and forested wetlands; and waters include ephemeral, intermittent, and perennial streams and open water (Table 3.4.1-1; Cowardin et al. 1979). Vegetation communities associated with emergent, scrub/shrub and forested wetland types are described in Table 3.5.1-1 for the Project area. Many wetlands in northern Montana and South Dakota are isolated depressional wetlands of the Prairie Potholes region. This formerly glaciated landscape is pockmarked with a large number of potholes that fill with melted snow and rain in spring. The hydrology of prairie pothole marshes varies from temporary to permanent; concentric circle patterns of submerged and floating aquatic plants generally form in the middle of the pothole, with bulrushes and cattails growing closer to shore, and wet sedge marshes next to the upland areas. Isolated depressional wetlands of the Rainwater Basin Complex occur in Nebraska. The Rainwater Basin is a flat or gently rolling topography with a poorly developed surface water drainage system that allows many watersheds to drain into low-lying wetlands. These wetlands are shallow, ephemeral depressions that flood during heavy rainstorms and snowmelt. Much of the Rainwater Basin has been drained and converted to croplands with only about 10 percent of the original area remaining undrained.

Wetlands throughout Montana, South Dakota, Nebraska, Kansas, Oklahoma, and Texas include isolated depressional wetlands, glaciated kettle-hole wetlands, and sinkhole wetlands, as well as isolated floodplain wetlands such as oxbows (naturally caused by changes in river channel configuration or artificially caused by levee construction or other diversions). Montana, South Dakota, Nebraska, Kansas, Oklahoma and northern Texas also contain many wetlands and riparian areas with direct connections to minor and major drainages of the Mississippi River basin; and eastern Texas contains wetlands with connections to Gulf of Mexico drainages. Wetland functions provided by both isolated and connected wetlands include surface water storage (flood control), shoreline stabilization (wave damage protection/shoreline erosion control), stream flow maintenance (maintaining aquatic habitat and aesthetic appreciation opportunities), groundwater recharge (some types replenish water supplies), sediment removal and nutrient cycling (water quality protection), supporting aquatic productivity (fishing, shell fishing, and waterfowl hunting), production of trees (timber harvest), production of herbaceous growth (livestock grazing and haying), production of peaty soils (peat harvest), and provision of plant and wildlife habitat (hunting, trapping, plant/wildlife/nature photography, nature observation, and aesthetics) (EPA 2001).

The Project crosses five USACE districts:

- Steele City Segment: Omaha District (Montana, South Dakota, and Nebraska);

- Cushing Pump Stations: Kansas City District (Kansas);
- Gulf Coast Segment: Tulsa District (Oklahoma), Fort Worth and Galveston districts (Texas); and
- Houston Lateral: Galveston district (Texas).

Each of these districts has slightly different survey and permit requirements. Keystone will continue consultations with the USACE district offices and state resource agencies to develop the specific wetland and waters of the United States information required for permit applications.

Wetland types in the Project area (Table 3.4.1-1) were identified by completing field surveys and reviewing aerial photography. Wetlands and waters of the U.S. were delineated using either field surveys or desktop analysis in accordance with direction provided by the appropriate USACE districts. Wetland data were collected for routine on-site delineations (USACE 1987) where required, following Great Plains regional guidance (USACE 2008b) for the Steele City Segment, and Atlantic and Gulf Coast Plain regional guidance (USACE 2008a) for the Gulf Coast Segment and Houston Lateral. In addition, channel characteristics for drainage crossings, defined bed and bank, and connectivity to navigable waters were evaluated to determine jurisdictional status for all wetland and drainage crossings. Perennial, intermittent, and ephemeral streams were identified at a resolution of about 10 feet.

TABLE 3.4.1-1
Description of Wetland Types in the Keystone XL Project Area

Wetland Type	National Wetland Inventory Code	Description
Palustrine emergent wetland	PEM	Emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants. All water regimes are included except subtidal and irregularly exposed. In areas with relatively stable climatic conditions, emergent wetlands maintain the same appearance year after year. In other areas, such as the prairies of the central United States, violent climatic fluctuations cause them to revert to an open water phase in some years. Emergent wetlands are known by many names, including marsh, meadow, fen, prairie pothole, and slough.
Palustrine forested wetland	PFO	Forested wetlands are characterized by woody vegetation that is 6 meters tall or taller. All water regimes are included except subtidal. Forested wetlands are most common in the eastern United States and in those sections of the West where moisture is relatively abundant, particularly along rivers and in the mountains. Forested wetlands normally possess an overstory of trees, an understory of young trees or shrubs, and a herbaceous layer.
Palustrine scrub-shrub wetland	PSS	Scrub-shrub wetlands include areas dominated by woody vegetation less than 6 meters tall. Vegetation forms found in this wetland include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. All water regimes are included except subtidal. Scrub-shrub wetlands may represent a successional stage leading to a forested wetland or they may be relatively stable communities.

TABLE 3.4.1-1 Description of Wetland Types in the Keystone XL Project Area		
Wetland Type	**National Wetland Inventory Code**	**Description**
Riverine-perennial water	R2	The lower perennial subsystem includes low-gradient rivers and streams (riverine system) where some water flows throughout the year and water velocity is slow. The upper perennial subsystem includes high-gradient rivers and streams where some water flows throughout the year, water velocity is high, and there is little floodplain development. Perennial streams have flowing water year-round during a typical year, the water table is located above the stream bed for most of the year, groundwater is the primary source of water, and runoff is a supplemental source of water.
Riverine-intermittent water, ephemeral water	R4	The intermittent subsystem includes channels where the water flows for only part of the year, when groundwater provides water for stream flow. When water is not flowing, it may remain in isolated pools or surface water may be absent. Runoff is a supplemental source of water. Ephemeral streams have flowing water only during, and for a short duration after, precipitation events in a typical year. Groundwater is not a source of water for the stream.
Open water	OW	Open water habitats are rivers, streams, lakes, and ponds (riverine, lacustrine, and palustrine systems) where, during a year with normal precipitation, standing or flowing water occurs for a sufficient duration to establish an ordinary high-water mark. Aquatic vegetation within the area of standing or flowing water is either non-emergent, sparse, or absent. Vegetated shallows are considered as open waters.

Sources: Cowardin et al. 1979, USACE 2009.

3.4.2 Wetlands of Special Concern or Value

Depressional wetlands of the Prairie Potholes region in Montana and South Dakota support large numbers of migrating and nesting waterfowl, as do depressional wetlands associated with the Rainwater Basin in Nebraska (EPA 2008). USFWS has negotiated wetland easements with private landowners in Montana, and South Dakota for some lands crossed by the Steele City Segment to protect depressional wetlands of the Prairie Potholes region. Wetlands are protected by the USFWS easement under 16 USC 668dd(c). USFWS has also negotiated wetland easements with private landowners in Oklahoma and Texas for some lands crossed by the Gulf Coast Segment. The USFWS' procedure with any cooperating entity such as Keystone is to restore the ponding capability of the wetland(s). If fill material remains in any easement wetland(s) after the pipeline is installed, USFWS will work with Project personnel to remove the fill material from the basin. If a wetland(s) no longer ponds water after the pipeline is installed, USFWS will work with Project personnel to improve soil compaction and water retention capability in that wetland(s). If measures taken to restore the ponding capability of a wetland(s) are unsuccessful, USFWS may require Keystone to locate a similar wetland and execute an exchange for a replacement wetland(s) according to USFWS guidance.

Table 3.4.2-1 summarizes wetlands that would be crossed by the Project that are considered of special concern or value—as indicated by inclusion within conservation areas and reserves, wetland easements, wildlife areas, sensitive landscapes, and sensitive wetland vegetation communities. All wetlands in Montana are generally considered of concern because of their rarity and productivity in this semi-arid environment. A total of 264 miles of conservation lands and sensitive landscapes with an unknown quantity of associated wetlands would be crossed by the Project.

3.4.3 Potential Impacts

Wetlands and waters that would be affected by the proposed Project, are summarized in Tables 3.4.3-1 and 3.4.3-2. The summary does not include acres of disturbance associated with pipe storage yards, rail sidings, contractor's yards, access roads, or construction camps. Acres of disturbance provided in the tables were calculated using the data for miles of wetlands crossed by the project (Keystone 2009c), and the proposed widths for construction and permanent ROWs.

The delineation of jurisdictional and non-jurisdictional wetlands will occur in accordance with directions provided by the appropriate USACE districts prior to the issuance of required permits. Wetland impacts that affect non-jurisdictional wetlands under the CWA Section 404 would not require mitigation. Executive Order 11990 directs Federal agencies, in certain circumstances, to avoid and minimize impacts to wetlands. A table of all wetland and water crossings is located in Keystone (2009c, Appendix E).

Emergent wetlands are the most common wetland type crossed by the Steele City Segment in Montana, South Dakota, and Nebraska (Table 3.4.3-1). Most of the emergent wetlands (71 percent, 80 of 113 acres) are located in Nebraska (Table 3.4.3-1). Other wetland areas that would be disturbed by the Steele City Segment include forested wetlands in Nebraska (2 acres), and scrub-shrub wetlands in Montana and South Dakota (1 acre). Forested wetlands are the most common wetland type crossed by the Gulf Coast Segment and the Houston Lateral in Oklahoma and Texas (Table 3.4.3-1). Most of the forested wetlands (97 percent, 261 of 269 acres) are located in Texas (Table 3.4.3-1). Other wetland areas that would be disturbed by the Gulf Coast Segment and Houston Lateral in Oklahoma and Texas include emergent wetlands (149 acres) and scrub-shrub wetlands (20 acres, Table 3.4.3-1). Most of the wetlands crossed by the Gulf Coast Segment and Houston Lateral (96 percent, 420 of 438 acres) are located in Texas. The Project would disturb a total of 554 acres of wetlands, primarily forested wetlands (271 acres) and emergent wetlands (262 acres) (Table 3.4.3-2).

A portion of the wetlands crossed by the Project ROW has been identified as farmed wetlands, and some wetlands are located within grazed rangelands (Keystone 2009c). At present, three mainline valves (MLVs) would be located within wetland areas: MLV 115, MLV 235, and MLV 255. These locations are under evaluation for final siting to avoid or minimize potential wetland impacts. None of the proposed pump stations would be located within wetlands. Additional impacts to wetlands from construction camps and access roads outside of the 110-foot construction right-of-way cannot be assessed until the actual locations for these sites are determined.

TABLE 3.4.2-1
Wetlands of Special Concern or Value Crossed by the Keystone XL Project

Mileposts	Miles Crossed	Name	Ownership	Wetland Types	Wetlands Crossed
Steele City Segment					
Montana					
49, 70	3.0	Cornwell Ranch Conservation Easement	Montana Department of Fish, Wildlife, and Parks	PEM	1
4.2 – 5.0	0.8	Phillips County USFWS Wetland Easement	Private	None	0
Multiple	33.7	Conservation Reserve Program (CRP) Contract Land	Private	PEM	2
South Dakota					
799	0.7	Wetlands of America Trust, Inc.	Private	None	0
Multiple	10.6	CRP Contract Land	Private	PEM	1
Nebraska					
758.0 – 847.4	89.4	Rainwater Basin Wetlands	Unknown	PEM, PFO	10
616.8 – 707.7	90.9	Sandhills Wetlands	Unknown	PEM	37
Multiple	6.4	CRP Contract Land	Private	PEM	1
Gulf Coast Segment and Houston Lateral					
Oklahoma					
22.1 – 23.3	1.2	Deep Fork Wildlife Management Area	Oklahoma Department of Wildlife Conservation	PSS	1
~130	0.02	Wetland Reserve Program (WRP) Contract Land	Private	PEM	1
Texas					
~165	0.2	WRP Contract Land	Private	None	0
256 – 258	1.6	Water Oak – Willow Oak Community	Unknown	PFO	2
309 – 311	1.6	Water Oak – Willow Oak Community	Unknown	PFO	1
334 – 337	2.2	Water Oak – Willow Oak Community	Unknown	PFO	2
347 – 364	5.5	Water Oak – Willow Oak Community	Unknown	PFO	5

TABLE 3.4.2-1
Wetlands of Special Concern or Value Crossed by the Keystone XL Project

Mileposts	Miles Crossed	Name	Ownership	Wetland Types	Wetlands Crossed
366 – 371	5.0	Piney Woods Mitigation Bank	Private – permitted by USACE	PFO, PEM	5
366 – 370		Water Oak – Willow Oak Community	Unknown	PFO	3
HL 18 – 29	10.3	Water Oak – Willow Oak Community	Unknown	PFO	2

Source: see Appendices E and K, Keystone 2009c, Grell 2009, TPWD 2009.
PEM = Palustrine emergent wetland, PFO = Palustrine forested wetland.

TABLE 3.4.3-1 Wetlands Estimated Impact Summary by State for the Keystone XL Project				
Wetland Classification	**Length of Wetlands Crossed (miles)**	**Wetland Area Affected during Construction (acres)[a]**	**Wetland Area Affected by Operations (acres)[a]**	**Number of Wetland Crossings**
Steele City Segment				
Montana				
Palustrine emergent wetland	1.1	15	6	28
Palustrine forested wetland	0.0	0	0	0
Palustrine scrub-shrub wetland	0.1	1	1	2
Riverine/Open water	3.3	48	20	NA
Montana total	*4.5*	*64*	*27*	*30*
South Dakota				
Palustrine emergent wetland	1.2	18	8	37
Palustrine forested wetland	0.0	0	0	0
Palustrine scrub-shrub wetland	<0.1	0	0	1
Riverine/Open water	3.6	50	21	NA
South Dakota total	4.9	68	29	38
Nebraska				
Palustrine emergent wetland	5.0	80	35	53
Palustrine forested wetland	0.1	2	1	3
Palustrine scrub-shrub wetland	0.0	0	0	0
Riverine/Open water	1.6	23	10	NA
Nebraska total	*6.7*	*105*	*46*	*56*
Gulf Coast Segment and Houston Lateral				
Oklahoma				
Palustrine emergent wetland	0.5	8	5	24
Palustrine forested wetland	0.5	8	5	9
Palustrine scrub-shrub wetland	0.1	2	0	3
Riverine/Open water	1.7	22	11	NA
Oklahoma total	*2.8*	*40*	*21*	*36*
Texas				
Palustrine emergent wetland	11.9	141	73	67
Palustrine forested wetland	22.0	261	137	78
Palustrine scrub-shrub wetland	1.5	18	9	10
Riverine/Open water	4.0	49	25	NA
Texas total	*39.4*	*469*	*244*	*155*

Source: See Appendix E, Keystone 2009c.

Note: NA = Not Applicable

[a] Acres disturbed on a temporary basis (permanent right-of-way width plus temporary workspace) during construction, and acres disturbed (maintained) on a permanent basis during operation of the proposed Project. Wetland areas for emergent and scrub-shrub wetlands disturbed during construction are generally considered temporary with no impact remaining during operations. Does

not include acres of disturbance associated with pipe storage yards, rail sidings, and contractors yards for 1,261 acres in Oklahoma and Texas. Does not include acres of disturbance associated with access roads or construction camps (Keystone 2009c).

TABLE 3.4.3-2
Wetlands Estimated Impact Summary by Segment for the Keystone XL Project

Wetland Classification	Length of Wetlands Crossed (miles)	Wetland Area Affected during Construction (acres) [a]	Wetland Area Affected by Operations (acres) [a]	Number of Crossings
Steele City Segment				
Palustrine emergent wetland	7.3	113	49	118
Palustrine forested wetland	0.1	2	1	3
Palustrine scrub-shrub wetland	0.2	1	1	3
Riverine/Open water	8.5	121	51	NA
Steele City Segment subtotal	*16.1*	*237*	*102*	*124*
Gulf Coast Segment				
Palustrine emergent wetland	8.4	101	54	82
Palustrine forested wetland	19.9	237	126	78
Palustrine scrub-shrub wetland	1.6	20	9	12
Riverine/Open water	5.4	68	34	NA
Gulf Coast Segment subtotal	*35.3*	*426*	*223*	*172*
Houston Lateral				
Palustrine emergent wetland	4.0	48	24	9
Palustrine forested wetland	2.6	32	16	9
Palustrine scrub-shrub wetland	0.0	0	0	1
Riverine/Open water	0.3	3	2	NA
Houston Lateral subtotal	*6.9*	*83*	*42*	*19*
Project				
Palustrine emergent wetland	19.7	262	127	209
Palustrine forested wetland	22.6	271	143	90
Palustrine scrub-shrub wetland	1.8	21	10	16
Riverine/Open water	14.2	192	87	NA
Project total	**58.3**	**746**	**367**	**315**

Source: See Appendix E, Keystone 2009c.

Note: NA = Not Applicable

[a] Acres disturbed on a temporary basis (permanent right-of-way width plus temporary workspace) during construction and acres disturbed (maintained) on a permanent basis during operation of the proposed Project. Wetland areas for emergent and scrub-shrub wetlands disturbed during construction are generally considered temporary with no impact remaining during operations. Areas presented are those within the permanent right-of-way. Does not include acres of disturbance associated with pipe storage yards, rail sidings, and contractors yards for 1,261 acres in Oklahoma and Texas. Does not include acres of disturbance associated with access roads or construction camps (Keystone 2009c).

Construction of the pipeline would affect wetlands and their functions primarily during and immediately following construction activities, but permanent changes also are possible. Wetlands function as natural sponges that trap and slowly release surface water, rain, snow melt, groundwater, and flood waters. Trees, root mats, and other wetland vegetation slow flood waters and distribute them over the floodplain. Wetlands at the margins of lakes, rivers, and streams protect shorelines and stream banks against erosion. Wetland plants hold the soil in place with their roots, absorb the energy of waves, and break up the flow of stream or river currents. This combined water storage and braking can lower flood heights and reduce erosion. The water-holding capacity of wetlands reduces flooding and prevents water logging of crops. Preserving and restoring wetlands, together with other water retention, can help or supplant flood control otherwise provided by expensive dredge operations and levees (EPA 2001).

Potential construction- and operations-related effects include:

- Loss of wetlands due to backfilling or draining;
- Modification in wetland productivity due to modification of surface and subsurface flow patterns;
- Temporary and permanent modification of wetland vegetation community composition and structure from clearing and operational maintenance (clearing temporarily affects the wetland's capacity to buffer flood flows and/or control erosion);
- Wetland soil disturbance (mixing of topsoil with subsoil with altered biological activities and chemical conditions that could affect reestablishment and natural recruitment of native wetland vegetation after restoration);
- Compaction and rutting of wetland soils from movement of heavy machinery and transport of pipe sections, altering natural hydrologic patterns, inhibiting seed germination, or increasing siltation;
- Temporary increase in turbidity and changes in wetland hydrology and water quality;
- Permanent alteration in water-holding capacity due to alteration or breaching of water-retaining substrates in the Prairie Pothole and Rainwater Basin regions;
- Alteration in vegetation productivity and life stage timing due to increased soil temperatures associated with heat input from the pipeline; and
- Alteration in freeze-thaw timing due to increased water temperatures associated with heat input from the pipeline.

Generally, the wetland vegetation community eventually would transition back into a community functionally similar to that of the wetland prior to construction, if pre-construction conditions such as elevation, grade, and soil structure are successfully restored. In emergent wetlands, the herbaceous vegetation would regenerate quickly (typically within 3 to 5 years). In forested and scrub-shrub wetlands, the effects of construction would be extended due to the longer period needed to regenerate a mature forest or shrub community. Following restoration and revegetation, there would be little permanent effects on emergent wetland vegetation because these areas naturally consist of, and would remain as, an herbaceous community. Herbaceous wetland vegetation in the pipeline right-of-way generally would not be mowed or otherwise maintained, although Keystone's CMR Plan (Appendix B) allows for annual maintenance of a 30-foot-wide strip centered over the pipeline. Tree species that typically dominate forested wetlands in the Project area [plains cottonwood (*Populus deltoides*), maple (*Acer* spp.), hickory (*Carya* spp.), oak (*Quercus* spp.), and bald cypress (*Taxodium distichum*)] have regeneration periods of 20 to 50 years. Trees and shrubs would not be allowed to regenerate within the maintained right-of-way except within areas with HDD crossings; therefore, removal of forested and scrub-shrub wetland habitats due to pipeline construction would be long term, and the maintained right-of-way would represent a permanent conversion of forested and scrub-shrub wetlands to herbaceous wetlands. The total acreage of affected forested wetland during construction would be 271 acres, as is the total acreage of scrub-shrub wetland affected during construction (21 acres). Restoration of some forested and scrub-shrub wetlands may be possible; however, long-term effects would remain.

Operation of the Project would cause slight increases in soil temperatures at the soil surface of 4 to 8˚ F primarily during January to May and November to December along the pipeline route in Montana, South Dakota, and Nebraska (Keystone 2009c, Appendix L). Increases in temperatures at the soil surface would be most pronounced directly over the pipeline in the South Dakota portion of the pipeline. Soil surface temperatures over the pipeline route, and year-round soil surface temperatures would remain unchanged in Oklahoma and Texas. Operation of the Project would cause increases in soil temperature 6 inches below the surface of 10 to 15 ˚F with the largest increases during March and April in the Steele City Segment of the Project (Keystone 2009c, Appendix L).

While many plants, especially herbaceous annuals, would not produce root systems that would penetrate much below 6 inches, some plants, notably native prairie grasses, trees, and shrubs, have root systems penetrating well below 6 inches. Soil temperatures closer to the pipeline burial depth of 6 feet may be as much as 40˚ F warmer than the ambient surrounding soil temperatures (Keystone 2009c, Appendix L). In general, increased soil temperatures during early spring would cause early germination and emergence and increased productivity in wetland plant species (Keystone 2009c, Appendix L). Increased soil temperatures also may stimulate root development (Keystone 2009c, Appendix L). Operation of the Project also would cause slight increases in water temperatures where the pipeline crosses through wetlands. Effects would be most pronounced in small ponds and wetlands, as any excess heat would be quickly dissipated in large waterbodies and flowing waters. Small ponded wetlands may remain unfrozen later than surrounding wetlands and may thaw sooner than surrounding wetlands. Early and late migrant waterfowl may be attracted to and concentrated within these areas during spring and fall migrations.

See Section 3.13.for impacts to wetlands relating to spills and leaks.

3.4.4 Mitigation

To minimize potential construction- and operations-related effects, Keystone would implement procedures outlined in the CMR Plan (Appendix B) for wetland crossings. Keystone would minimize impacts and restore wetlands affected by construction activities, to the extent practicable. Pipeline construction through wetlands must comply with USACE Section 404 permit conditions. Keystone would consult with NRCS offices for state specific Conservation Practice Standards (USDA, NRCS, 2009).

Keystone has committed to the following general measures to protect wetlands in its CMR Plan:

- Avoid placement of aboveground facilities in a wetland, except where the location of such facilities outside of wetlands would preclude compliance with DOT pipeline safety regulations;
- Clearly mark wetland boundaries with signs and/or highly visible flagging during construction and maintain markers until permanent seeding is completed;
- Limit the width of the construction zone to 85 feet through standard wetlands, unless soil conditions require a greater width;
- Locate extra work spaces at least 10 feet away from wetland boundaries, where topographic conditions permit;

- Limit clearing of vegetation between extra work areas and the edge of the wetland to the construction right-of-way and limit the size of extra work areas to the minimum needed to construct the wetland crossing;
- Clear the construction right-of-way, dig the trench, fabricate and install the pipeline, backfill the trench, and restore the construction right-of-way using wide-track or balloon-tire construction equipment and/or conventional equipment operating from timber and slash (riprap) cleared from the right-of-way, timber mats, or prefabricated equipment mats;
- Install and maintain sediment barriers at all saturated wetlands or wetlands with standing water across the entire construction right-of-way upslope of the wetland boundary and where saturated wetlands or wetlands with standing water are adjacent to the construction right-of-way as necessary to prevent sediment flow into the wetland;
- Limit the duration of construction-related disturbance within wetlands to the extent practicable;
- Use no more than two layers of timber riprap to stabilize the construction right-of-way;
- Cut vegetation off at ground level leaving existing root systems in place and remove it from the wetland for disposal;
- Limit pulling of tree stumps and grading activities to directly over the trench line unless safety concerns require the removal of stumps from the working side of the construction right-of-way;
- Segregate and salvage all topsoil up to a maximum of 12 inches of topsoil from the area disturbed by trenching in dry wetlands, where practicable and restore topsoil to its approximate original stratum after backfilling is complete;
- Dewater the trench in a manner to prevent erosion and to prevent heavily silt-laden water from flowing directly into any wetland or waterbody;
- Remove all timber riprap and prefabricated equipment mats upon completion of construction;
- Locate hydrostatic test manifolds outside wetlands and riparian areas to the maximum extent practicable;
- Prohibit storage of hazardous materials, chemicals, fuels, lubricating oils, or perform concrete coating activities within a wetland or within 100 feet of any wetland boundary, if possible;
- Perform all equipment maintenance and repairs in upland locations at least 100 feet from waterbodies and wetlands, if possible;
- Avoid parking equipment overnight within 100 feet of a watercourse or wetland, if possible;
- Prohibit washing equipment in streams or wetlands;
- Install trench breakers and/or seal the trench to maintain the original wetland hydrology, where the pipeline trench may drain a wetland;
- Attempt to refuel all construction equipment in an upland area at least 100 feet from a wetland boundary; and
- Avoid sand blasting in wetlands to the extent practicable, if unavoidable place a tarp or suitable material to collect as much waste shot as possible, clean up all visible wastes, and dispose of collected waste at an approved disposal facility.

Restoration and reclamation procedures for wetland crossings outlined in Keystone's CMR Plan (Appendix B) include:

- Remove all timber riprap, timber mats, and prefabricated equipment mats and other construction debris upon completion of construction;
- Replace topsoil, spread to its original contours with no crown over the trench;
- Remove any excess spoil, stabilize wetland edges and adjacent upland areas using permanent erosion control measures and revegetation;
- For standard wetlands, install a permanent slope breaker and trench breaker at the base of slopes near the boundary between the wetland and adjacent upland areas where necessary to prevent the wetland from draining;
- Apply temporary cover crop at a rate adequate for germination and ground cover using annual ryegrass or oats unless standing water is present (in the absence of detailed revegetation plans or until appropriate seeding season);
- Apply seeding requirements for agricultural lands or as required by the landowner for farmed wetlands;
- No application of fertilizer, lime, or mulch unless required by the appropriate land management or state agency;
- Restore wetland areas within conservation lands or easements to a level consistent with any additional criteria established by the relevant managing agency;
- Complete topographic surveys for USFWS easement wetlands prior to construction through the wetland, restoring final grades to within 0.1 foot of original elevations; and
- Prohibit use of herbicides or pesticides within 100 feet of any wetland (unless allowed by the appropriate land management or state agency).

Various state and federal agencies have expressed concerns and recommendations for compensatory mitigation of jurisdictional wetland losses. The requirements for compensatory mitigation would depend on final USACE decisions on jurisdictional delineations. Recommendations for compensatory mitigation provided to DOS by the agencies include:

- Pre- and post construction monitoring plans should be developed for depressional wetlands of the Prairie Potholes region in Montana and wetlands that no longer pond water after the pipeline is installed should receive additional compaction, replacement, or at the landowner's or managing agency's discretion compensatory payments should be made for drainage of the wetland (MDEQ).
- Keystone should develop a plan to compensate for permanent wetland losses to include:
  - In areas of concern to NPS, any loss or impact to wetlands from pipeline construction should be fully mitigated by replacement or restoration of an equal or greater acreage in the immediate locale of the impact (NPS).
  - Permanent impacts to forested wetlands in Texas should be calculated to include the total width of area where trees would be removed during long-term maintenance including any removal areas beyond the 10-foot wide maintained area. All forested wetland clearing is considered a permanent impact that would require compensatory mitigation (Texas Parks and Wildlife, TPW).
  - In Texas, the wetland mitigation plan should be developed in consultation with TPW, and TPW requests that Keystone address impacts to all wetland types in the wetland mitigation plan and mitigate for these impacts (TPW).

The actual level of required compensation and mitigation would ultimately be determined by:

- USACE regulatory offices with input from EPA, USFWS Ecological Services field offices, and state fish and wildlife agencies; or
- States in their 401 certifications or certificates of compliance.

Implementation of measures in Keystone's CMR Plan (Appendix B) would avoid or minimize most impacts on wetlands associated with construction and operation activities, and would ensure that potential effects would be primarily minor and short term. Impacts to forested wetlands are long-term and would be considered permanent. Keystone would work with each USACE district to determine what kind of compensation would be required for the permanent conversion of forested wetland to herbaceous wetland, and Keystone will continue to work with the USACE to develop a Wetland Mitigation Plan.

3.4.5 Connected Actions

3.4.5.1 Power Distribution Lines and Substations

Power distribution line construction and operation requires clearing of trees and shrubs, and maintaining vegetation under the power lines in a herbaceous state. Power distribution lines and substations constructed to provide power for the Project pump stations could affect wetland resources through:

- Temporary and permanent modification of wetland vegetation community composition and structure from clearing and operational maintenance (clearing temporarily affects the wetland's capacity to buffer flood flows and/or control erosion);
- Compaction and rutting of wetland soils from movement of heavy machinery and transport and installation of transmission structures, altering natural hydrologic patterns, inhibiting seed germination, or increasing siltation; and
- Temporary increase in turbidity and changes in wetland hydrology and water quality.

The primary impacts on wetlands from construction or modification of distribution lines to provide electrical power to pump stations would be cutting, clearing, or removing the existing vegetation within the construction work area and potential invasion by noxious weeds. In general, distribution line construction impacts to wetlands would be minor as most lines would run alongside existing roadways and smaller wetlands could be spanned. Trees in forested wetlands crossed by the distribution line ROW would be removed, and the ROW would be maintained free of woody vegetation. Approximately 6.6 miles of riverine or open water and 3.2 miles of wetlands including: forested wetlands in South Dakota, Nebraska, Kansas, and Oklahoma; emergent wetlands in Montana, South Dakota, Nebraska, and Oklahoma; and scrub-shrub wetlands in Montana, South Dakota, and Oklahoma could be affected during construction and operation of new distribution lines for the Project (Tables 3.4.5-1 and 3.4.5-2).

TABLE 3.4.5-1 Wetlands Estimated Impact Summary by State for Proposed Electric Distribution Lines for the Keystone XL Project			
Vegetation Community Classification	**Length of Wetlands Crossed (miles)**	**Wetland Area Affected during Construction (acres) [a]**	**Wetland Area Affected by Operations (acres) [a]**
Steele City Segment			
Montana			
Palustrine Emergent wetlands	0.5	1.7	1.2
Palustrine Forested wetlands	0.0	0.0	0.0
Palustrine Shrub-scrub wetlands	0.1	0.4	0.2
Riverine/open water	2.5	8.5	5.9
Montana subtotal	*3.1*	*10.6*	*7.3*
South Dakota			
Palustrine Emergent wetlands	0.6	2.3	1.6
Palustrine Forested wetlands	0.2	1.0	3.6
Palustrine Shrub-scrub wetlands	0.1	0.0	0.0
Riverine/open water	2.4	7.4	5.6
South Dakota subtotal	*3.3*	*10.7*	*10.8*
Nebraska			
Palustrine Emergent wetlands	0.2	0.6	0.4
Palustrine Forested wetlands	0.5	1.7	6.0
Palustrine Shrub-scrub wetlands	0.0	0.0	0.0
Riverine/open water	1.0	3.3	2.4
Nebraska subtotal	*1.7*	*5.6*	*8.8*
Cushing Extension Pump Stations			
Kansas			
Emergent wetlands	0.0	0.0	0.0
Forested wetlands	0.4	1.3	4.8
Shrub-scrub wetlands	0.0	0.0	0.0
Riverine/open water	0.3	1.0	0.7
Kansas subtotal	*0.7*	*2.3*	*5.5*
Gulf Coast Segment			
Oklahoma			
Palustrine Emergent wetlands	0.1	0.4	0.2
Palustrine Forested wetlands	0.4	1.4	4.8
Palustrine Shrub-scrub wetlands	0.1	0.3	0.2
Riverine/open water	0.4	1.3	1.0
Oklahoma subtotal	*1.0*	*3.4*	*6.2*
Texas			
Palustrine Emergent wetlands	0.0	0.0	0.0

TABLE 3.4.5-1
Wetlands Estimated Impact Summary by State for Proposed Electric Distribution Lines for the Keystone XL Project

Vegetation Community Classification	Length of Wetlands Crossed (miles)	Wetland Area Affected during Construction (acres) [a]	Wetland Area Affected by Operations (acres) [a]
Palustrine Forested wetlands	0.0	0.0	0.0
Palustrine Shrub-scrub wetlands	0.0	0.0	0.0
Riverine/open water	0.0	0.0	0.0
Texas subtotal	*0.0*	*0.0*	*0.0*

Sources: Keystone 2009c.

[a] Temporary disturbance areas include structure pads, access roads, pulling and tension area, turn around areas, and staging areas. Permanent disturbance areas include forested areas within 80 or 150 foot right-of-way, around pole structures, and crossed by operational access roads.

TABLE 3.4.5-2
Wetlands Estimated Impact Summary for Proposed Electric Distribution Lines for the Keystone XL Project

Vegetation Community Classification	Length of Community Crossed (miles)	Community Area Affected during Construction (acres)[a]	Community Area Affected by Operations (acres)[a]
Steele City Segment			
Palustrine Emergent wetlands	1.3	4.6	3.2
Palustrine Forested wetlands	0.7	2.7	9.6
Palustrine Shrub-scrub wetlands	0.2	0.4	0.2
Riverine/open water	5.9	19.2	13.9
Steele City Segment subtotal	*8.1*	*26.9*	*26.9*
Cushing Extension Pump Stations			
Palustrine Emergent wetlands	0.0	0.0	0.0
Palustrine Forested wetlands	0.4	1.3	4.8
Palustrine Shrub-scrub wetlands	0.0	0.0	0.0
Riverine/open water	0.3	1.0	0.7
Pump Station subtotal	*0.7*	*2.3*	*5.5*
Gulf Coast Segment			
Palustrine Emergent wetlands	0.1	0.4	0.2
Palustrine Forested wetlands	0.4	1.4	4.8
Palustrine Shrub-scrub wetlands	0.1	0.3	0.2
Riverine/open water	0.4	1.3	1.0
Gulf Coast Segment subtotal	*1.0*	*3.4*	*6.2*
Project			
Emergent wetlands	1.4	5.0	3.4
Forested wetlands	1.5	5.4	19.2

TABLE 3.4.5-2 Wetlands Estimated Impact Summary for Proposed Electric Distribution Lines for the Keystone XL Project			
Vegetation Community Classification	**Length of Community Crossed (miles)**	**Community Area Affected during Construction (acres)[a]**	**Community Area Affected by Operations (acres)[a]**
Shrub-scrub wetlands	0.3	0.7	0.4
Riverine/open water	6.6	21.5	15.6
Project total	**9.8**	**32.6**	**38.6**

Sources: Keystone 2009c.

[a] Temporary disturbance areas include structure pads, access roads, pulling and tension area, turn around areas, and staging areas. Permanent disturbance areas include forested areas within 80 or 150 foot right-of-way, around pole structures, and crossed by operational access roads.

Electric service providers would avoid and minimize impacts by spanning wetlands and selecting pole locations away from sensitive habitats (Keystone 2009c).

3.4.5.2 Lower Brule to Witten 230-kV Transmission Line

Upgrades to the power grid in South Dakota to support power requirements for pump stations in South Dakota would include construction of a new 230-kV transmission line and a new substation. As described in Section 4.4 of the EIS, Western and BEPC have identified two alternative corridors (‘A’ and ‘B’) for the proposed Lower Brule to Witten 230-kV transmission line project, and there are several route options within each corridor.

Under alternative corridor A, lengths of wetland communities crossed by five route options for the power grid upgrade presented in Table 3.4.5-3 range from 0.3 to 1.4 miles based on National Wetlands Inventory data (USFWS 2009). The proposed routes also cross between 0.3 and 0.6 miles of riverine and open water habitats.

TABLE 3.4.5-3 Wetlands Estimated Impact Summary for Proposed Lower Brule to Witten 230-kV Transmission Line Corridor A Alternatives for the Proposed Project					
Vegetation Community Classification	**Western (miles)**	**BPC-A (miles)**	**BPC-B (miles)**	**BPC-C (miles)**	**BPC-D (miles)**
Palustrine Emergent Wetlands	1.4	0.3	0.3	0.5	0.7
Palustrine Forested Wetlands	0	0	0	0	0
Palustrine Shrub-scrub Wetlands	0	0	0	0	0
Riverine/Open Water	0.6	0.5	0.4	0.3	0.3
Total	*2.0*	*0.8*	*0.7*	*0.8*	*1.0*

Under alternative corridor B, lengths of wetland communities crossed by four route options for the power grid upgrade presented in Table 3.4.5-4 range from 0.4 to 0.9 miles based on National Wetlands Inventory data (USFWS 2009). The proposed routes also cross between 0.2 and 0.5 miles of riverine and open water habitats.

TABLE 3.4.5-4 Wetlands Estimated Impact Summary for Proposed Lower Brule to Witten 230-kV Transmission Line Corridor B Alternatives for the Proposed Project				
Vegetation Community Classification	**BPC-E (miles)**	**BPC-F (miles)**	**BPC-G (miles)**	**BPC-H (miles)**
Palustrine Emergent Wetlands	0.6	0.9	0.4	0.4
Palustrine Forested Wetlands	0	0	0.1	0.1
Palustrine Shrub-scrub Wetlands	0	0	0	0
Riverine/Open Water	0.5	0.3	0.2	0.2
Total	*1.1*	*1.2*	*0.7*	*0.7*

Construction and operation impacts on wetlands would be the same as for the distribution lines discussed above, however, it is likely that the poles would be larger and that the area disturbed around the installation site would likely be larger. Electric service providers would avoid and minimize impacts by spanning wetlands and selecting pole locations away from sensitive habitats (Keystone 2009c).

3.4.6 References

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3.5 TERRESTRIAL VEGETATION

Vegetative cover is an important component in the classification of ecoregions that reflects differences in ecosystem quality and integrity (EPA 2007). Ecoregions are described through analysis of patterns and composition of geology, physiography, native vegetation, climate, soils, land use, wildlife, and hydrology. Variation in temperatures and precipitation, and differences in soils and parent materials along the northwest to southeast gradient crossed by the proposed Keystone XL Pipeline Project (Project) result in wide variation in vegetation communities. At the northern end of the Project in Montana and South Dakota mixed-grass prairies and sagebrush[1] (*Artemisia* spp.) predominate; which transition to tall grass prairies through Nebraska, Kansas, and Oklahoma to southern piney woods, bald cypress (*Taxodium distichum*) and tupelo (*Nyssa* spp.) swamps at the southern end of the project in Texas. The Project would cross 11 Level III Ecoregions of the United States from northwest to southeast: Northwestern Glaciated Plains (9 percent), Northwestern Great Plains (36 percent), Nebraska Sand Hills (7 percent), Central Great Plains (11 percent), Flint Hills, Cross Timbers (4 percent), Arkansas Valley (3 percent), South Central Plains (20 percent), East Central Texas Plains (4 percent), Texas Blackland Prairies (2 percent), and Western Gulf Coastal Plain (5 percent, Figure 3.5-1, Table 3.5-1). Level IV Ecoregions (EPA 2002, 2007) supported by descriptions of dominant native vegetation communities within each state are presented to describe potential native vegetation cover and generalized landuse (Table 3.5-2, Woods et al. 2002, Bryce et al. 1996, Chapman et al. 2001, Woods et al. 2005, Griffith et al. 2004).

The occurrence of vegetation communities identified as conservation priorities are summarized from the states' Comprehensive Wildlife Conservation Strategies and agency correspondence (MFWP 2005, SDGFP 2006, Schneider et al. 2005, Wasson et al. 2005, ODWC 2005, Bender et al. 2005). Landcover types crossed by the Project were identified and delineated based on review of literature, internet database resources, interpretation of aerial photographs, general observations made during field reconnaissance, and information collected during wetland delineation surveys (Keystone 2008, 2009a, 2009b, 2009c). Generalized landcover types, and areas with native vegetation cover within wildlife areas, preserves, parklands, wetlands and forests crossed by the proposed pipeline ROW, access roads, workspaces, and transmission lines provide the basis for assessing potential impacts to vegetation cover.

TABLE 3.5-1
EPA Level III Ecoregions Crossed by the Project

Ecoregion (Identifier)	Location of Occurrence in the Project Area	Description
Northwestern Glaciated Plains (42)	Montana, South Dakota, and Nebraska	This is a transitional region between the generally more level, moister, more agricultural Northern Glaciated Plains to the east and the generally more irregular, dryer, Northwestern Great Plains to the west and southwest. The western and southwestern boundary roughly coincides with the limits of continental glaciations. This region is pocked by a moderately high concentration of semi-permanent and seasonal wetlands, locally referred to a Prairie Potholes.

[1] Common names of plants are used in this section. Scientific names for plants are used after their initial mention in text or tables following nomenclature in the U.S. Department of Agriculture, Natural Resources conservation Service's PLANTS database (USDA NRCS 2009). Scientific names for noxious weeds are listed in Table 3.5.4-1.

TABLE 3.5-1 EPA Level III Ecoregions Crossed by the Project		
Ecoregion (Identifier)	**Location of Occurrence in the Project Area**	**Description**
Northwestern Great Plains (43)	Montana, South Dakota, and Nebraska	This region includes the Missouri Plateau section of the Great Plains. It is a semiarid rolling plain of shale and sandstone punctuated by occasional buttes. Native grasslands, largely replaced on level ground by spring wheat and alfalfa, persist in rangeland areas on broken topography. Agriculture is restricted by the erratic precipitation and limited opportunities for irrigation.
Nebraska Sand Hills (44)	Nebraska, South Dakota	This is one of the most distinct and homogenous regions in North America and one of the largest areas of grass stabilized sand dunes in the world. The Sand Hills are generally devoid of cropland agriculture, and except for some riparian areas in the north and east, the region is treeless. Much of the region contains numerous lakes and wetlands that lack connecting streams.
Central Great Plains (27)	Nebraska, Kansas, and Oklahoma	This region is slightly lower, receives more precipitation, and is somewhat more irregular than the Western High Plains to the west. Once grasslands, with scattered low trees and shrubs in the south, much of this region has been converted to croplands. The eastern boundary marks the eastern limits of the major winter wheat--growing area of the United States.
Flint Hills (28)	Kansas	This is a region of rolling hills, with relatively narrow steep valleys, composed of shale and cherty limestone with rocky soils. In contrast to surrounding regions that are mostly in cropland, most of the Flint Hills region is grazed. The Flint Hills mark the western edge of the tall-grass prairie and contain the largest remaining intact tall-grass prairie in the Great Plains.
Cross Timbers / Central Oklahoma/Texas Plains (29)	Oklahoma	This is a transition area between the once prairie, now winter wheat growing regions to the west, and the forested low mountains of eastern Oklahoma. The region is not suitable for grain crops such as corn and soybeans that are common to the northeast. Cross Timbers [little bluestem (*Schizachyrium scoparium*) grassland with scattered blackjack oak (*Quercus marilandica*) and post oak (*Q. stellata*) trees] is the native vegetation, and presently rangeland and pastureland are the predominant land covers. Oil extraction has been a major activity in this region for over eighty years.
Arkansas Valley (37)	Oklahoma	This is a region of mostly forested valleys and ridges that is much less irregular than that of the Boston Mountains to the north and the Ouachita Mountains to the south, but is more irregular than the regions to the west and east. About one fourth of the region is grazed and roughly one tenth is cropland.
South Central Plains (35)	Texas	Locally called the “piney woods”, this region of mostly irregular plains was once covered by oak-hickory-pine forests, but is now predominantly loblolly (*Pinus taeda*) and shortleaf pine (*P. echinata*). Only about one sixth of the region is cropland, and about two thirds are forests and woodlands. Lumber and pulpwood production are major economic activities.
East Central Texas Plains (33)	Texas	Also called the Clay Pan Area, this region of irregular plains was originally covered by post oak savanna vegetation, in contrast to the more open prairie-type regions to the north, south and west and the piney woods to the east. The bulk of this region is now used for pasture and range.

TABLE 3.5-1 EPA Level III Ecoregions Crossed by the Project		
Ecoregion (Identifier)	**Location of Occurrence in the Project Area**	**Description**
Texas Blackland Prairies (32)	Texas	This discontinuous region is distinguished from surrounding regions by its fine textured clayey soils and predominantly prairie vegetation. This region contains a higher percent of croplands than adjacent regions, although much of the land has been converted to urban and industrial uses.
Western Gulf Coastal Plain (34)	Texas	The distinguishing characteristics of this region are its relatively flat coastal plain topography and grassland vegetation. Inland from this region the plains are more irregular and have mostly forest or savanna-type vegetation. Largely because of these characteristics, a higher percentage of the land is in cropland compared to bordering regions, although much land has been converted to urban and industrial uses.

Sources: See Appendix M; Classification of Level III Ecoregions is based on EPA (2007); descriptions of the regions are based on EPA (2002).

TABLE 3.5-2
Level IV Ecoregions Crossed by the Project

State Length (miles)	Milepost In	Milepost Out	Level IV (Identifier) (Level III)	Potential Natural Vegetation	Description
Steele City Segment and Cushing Pump Stations					
MT **7.8**	0.0	7.8	Cherry Patch Moraines (42m) (Northwestern Glaciated Plains)	Grama (*Bouteloua* spp.)-needlegrass (*Hesperostipa* spp.)-wheatgrass (*Pascopyrum* spp.); Shrubs limited to moister depressional areas	Undulating to strongly sloping with many seasonal lakes and wetlands. Shortgrass prairie vegetation is native with shrubs restricted to moist depressions. Extensive cereal farming, steep slopes, moraines, gullies and ridges are often grazed.
MT 82.2 7.6 **89.8**	7.8 108.7	90.0 116.3	Glaciated Northern Grasslands (42j) (Northwestern Glaciated Plains)	Grama-needlegrass-wheatgrass	Glaciated, dissected, rolling to strongly rolling drift plain with many seasonal impoundments. Mostly rangeland with some farming on scattered, un-dissected benches and on alluvial, irrigated soils.
MT 14.4 5.6 **20.0**	90.0 191.9	104.4 197.5	River Breaks (43c) (Northwestern Great Plains)	Bottomlands with heavy soils– western wheatgrass (*Pascopyrum smithii*), buffalograss (*Bouteloua dactyloides*); with gravelly soils – threadleaf sedge (*Carex filifolia*) needle and thread (*Hesperostipa comata*). On north facing slopes – junipers (*Juniperus* spp.) and deciduous trees	Unglaciated, very dissected terraces and uplands that descent to the Missouri River system (89.9 to 104.3) and to the Yellowstone River system (191.8 to 197.4). Primarily used for grazing on native grasses with remnant woodlands in draws and on north facing slopes and alluvial flats.
MT 4.4 16.6 84.4 **105.4**	104.4 116.3 197.5	108.8 132.9 281.9	Central Grassland (43n) (Northwestern Great Plains)	Grama-needlegrass-wheatgrass	Unglaciated, rolling plains studded with buttes and badlands dissected by many small, ephemeral or intermittent streams, underlain by fine-grained sedimentary rock. Primarily rangeland, with some irrigated and dry-land farming, and coal mining.
MT **59.0**	132.9	191.9	Missouri Plateau (43a) (Northwestern Great Plains)	Wheatgrass-needlegrass	Primarily unglaciated, treeless, rolling hills and gravel covered benches, less arid soils result in mosaic of rangeland and farmland with spring wheat, hay, barley and oats; in contrast to neighboring regions which are mainly rangelands. Subject to wind erosion.
MT 0.4 SD 55.2 **55.6**	281.9 282.3	282.3 337.4	Sagebrush Steppe (43e) (Northwestern Great Plains)	Little sagebrush (*Artemisia arbuscula*), big sagebrush (*A. tridentata*), with western wheatgrass, green needlegrass (*Nassella viridula*), blue grama (*Bouteloua gracilis*), Sandberg bluegrass (*Poa secunda*), and buffalograss.	Unglaciated, level to rolling plains with occasional buttes, badlands, scoria mounds, and salt pans with thick mats of short-grass prairie and dusky gray sagebrush. Primarily grazing with minimal cultivation.

TABLE 3.5-2
Level IV Ecoregions Crossed by the Project

State Length (miles)	Milepost In	Milepost Out	Level IV (Identifier) (Level III)	Potential Natural Vegetation	Description
SD **49.0**	337.4	386.4	Moreau Prairie (43j) (Northwestern Great Plains)	Western wheatgrass, green needlegrass, blue grama and buffalograss	Unglaciated, level to rolling plains with occasional buttes, badlands, and numerous salt pans on alkaline soils. Mostly cattle and sheep ranching, with occasional dry-land wheat and alfalfa.
SD **29.4**	386.4	415.8	Missouri Plateau (43a) (Northwestern Great Plains	Blue grama, wheatgrass/needlegrass, little bluestem, prairie sandreed (*Calamovilfa longifolia*)	Unglaciated, moderately dissected rolling plains with isolated sandstone buttes. Mosaic of dry-land farming with spring wheat, barley, oats, sunflowers, and alfalfa.
SD 1.2 1.4 46.1 5.9 41.1 <u>24.3</u> **120.0**	 415.9 430.3 432.1 487.0 494.0 545.9	 417.1 431.7 478.2 492.9 535.1 570.2	Subhumid Pierre Shale Plains (43f) (Northwestern Great Plains)	Short grass prairie: western wheatgrass, green needlegrass, blue grama and buffalograss	Unglaciated, undulating to rolling plains with steep-sided, incised streams on shale. Rangeland cattle grazing, dry-land farming winter wheat and alfalfa.
SD 13.3 0.3 8.8 1.2 <u>10.7</u> **34.3**	 417.1 431.7 478.2 492.8 535.1	 430.4 432.0 487.0 494.0 545.8	River Breaks (43c) (Northwestern Great Plains)	Blue grama, western wheatgrass, buffalograss, some bluestem, prairie sandreed. Rocky Mountain juniper (*Juniperus scopulorum*) in draws and on north slopes, scattered cottonwoods (*Populus* spp.) in riparian areas	Unglaciated, highly dissected hills and uplands bordering Cheyenne River, Bad River, and White River and alluvial plains. Mostly rangeland and native grasses, cattle grazing, remnant woodlands in draws and on alluvial flats.
SD **5.1**	570.2	575.3	Keya Paha Tablelands (43i) (Northwestern Great Plains)	Mosaic of Sand Hills transition prairie and gravelly mixed grass prairie: little bluestem, prairie sandreed, threadleaf sedge, and needle and thread.	Unglaciated, level to rolling sandy plains with isolated gravelly buttes, dissected near streams. Rangeland with areas of cropland, alfalfa, winter wheat, millet, and corn.
SD **13.4**	575.3	588.7	Ponca Plains (42g) (Northwestern Glaciated Plains)	Mixed grass prairie - little bluestem, prairie sandreed, green needlegrass and needle and thread	Unglaciated, level to rolling plains. Intensive row crops, soybeans, corn, sunflowers, alfalfa and some grazing.

TABLE 3.5-2
Level IV Ecoregions Crossed by the Project

State Length (miles)	Milepost In	Milepost Out	Level IV (Identifier) (Level III)	Potential Natural Vegetation	Description
SD 8.4 NE 3.0 **11.4**	 588.7 597.1	 597.1 600.1	Southern River Breaks (42h) (Northwestern Glaciated Plains)	Mixed grass prairie: western wheatgrass, little bluestem, sideoats grama (*Bouteloua curtipendula*), green needlegrass on uplands. Deciduous woodland: bur oak (*Quercus macrocarpa*), American basswood (*Tilia americana*), and eastern redcedar (*Juniperus virginiana*) in canyons and northfacing slopes. Plains cottonwood (*Populus deltoides monilifera*), green ash (*Fraxinus pennsylvanica*), peachleaf willow (*Salix amygdaloides*), boxelder (*Acer negundo*), buffaloberry (*Shepherdia* spp.), sumac (*Rhus* spp.).	Lightly glaciated, dissected hills and canyons with high relief bordering Keya Paha River. Mixed grass and woodlands - grazing.
NE **13.2**	600.1	613.3	Keya Paha Tablelands (43i) (Northwestern Great Plains)	Mosaic of Sand Hills transition prairie and gravelly mixed grass prairie: little bluestem, prairie sandreed, threadleaf sedge, and needle and thread.	Unglaciated, level to rolling sandy plains with isolated gravelly buttes, dissected near streams. Rangeland with areas of cropland, alfalfa, winter wheat, millet, and corn.
NE **3.6**	613.3	616.8	Niobrara River Breaks (43r) (Northwestern Great Plains)	Ponderosa pine (*Pinus ponderosa*) woodlands with eastern redcedar south-facing bluffs and canyon slopes. Deciduous woodlands: bur oak, American basswood, green ash, and some paper birch (*Betula papyrifera*) on north-facing bluffs and lower canyon slopes. Plains cottonwoods and eastern redcedar on floodplains and mixed grass and Sand Hills prairies in valley	Unglaciated, dissected canyons with high relief bordering the Niobrara River. Rangeland with scattered cropland in valley bottom. Pine woodlands, deciduous woodlands, floodplain forest and mixed grass and Sand Hills prairies.
NE **46.7**	616.8	663.5	Wet Meadow and Marsh Plain (44c) (Nebraska Sand Hills)	Sand Hills transition mixed grass prairie: prairie sandreed, little bluestem, sand bluestem (*Andropogon hallii*), sun sedge (*Carex inops*), porcupinegrass (*Hesperostipa spartea*), needle and thread, blue grama and hairy grama (*Bouteloua hirsuta*). Wetlands: big bluestem (*Andropogon gerardii*), bluejoint (*Calamagrostis canadensis*), prairie cordgrass (*Spartina pectinata*), and sedges (*Carex* spp.)	Flat, sandy plain with numerous marshes and wetlands. Grassland with a small acreage used for cultivated crops, some irrigation.

TABLE 3.5-2
Level IV Ecoregions Crossed by the Project

State Length (miles)	Milepost In	Milepost Out	Level IV (Identifier) (Level III)	Potential Natural Vegetation	Description
NE **44.2**	663.5	707.7	Sand Hills (44a) (Nebraska Sand Hills)	Sand Hills mixed grass prairie: prairie sandreed, little bluestem, sand bluestem, switchgrass (*Panicum virgatum*), sand lovegrass (*Eragrostis trichodes*), needle and thread, blue grama, and hairy grama.	Sand sheets and dune fields, high water table. Rangeland.
NE **30.4**	707.7	738.1	Central Nebraska Loess Plains (27e) (Central Great Plains)	Mixed grass prairie: big bluestem, little bluestem, sideoats grama, blue grama, and western wheatgrass with eastern redcedar intrusion. Redcedar concentrated in northwest and next to Sand Hills.	Rolling dissected plains with deep loess layer, perennial and intermittent streams. Predominantly rangeland with large areas of cropland in winter wheat, corn, forage crops, and some irrigated agriculture
NE **19.9**	738.1	758.0	Platt River Valley (27g) (Central Great Plains)	Lowland tall grass prairie with areas of wet meadow and marsh. With flood management and reduced river flow, floodplain forests have increased along the Platte River.	Flat, wide, alluvial valley with shallow, interlacing streams on a sandy bed. Extensive cropland, much of which is irrigated, corn, grain sorghum, soybeans, and alfalfa. Some native rangeland and hay lands, many channelized streams and flood control structures.
NE **89.4**	758.0	847.4	Rainwater Basin Plains (27f) (Central Great Plains)	Transitional tall grass prairie to the east and mixed grass prairie in the west dominated by big bluestem, little bluestem, and sideoats grama. Wetlands dominated by western wheatgrass, sedge, spikerush (*Eleocharis* spp.) and slender bulrush (*Schoenoplectus heterochaetus*).	Flat to gently rolling loess-covered plains, historically covered with extensive rainwater basins and wetlands. Extensive cropland, dry land sorghum and winter wheat, irrigated corn, and alfalfa. Most of the basins have been drained for cultivation.
NE **3.3** KS 0.0	847.4 PS 27	850.7	Smokey Hills (27a) (Central Great Plains)	Transition from tall grass prairie in the east to mixed grass prairie in the west. Some floodplain forests along riparian areas.	Undulating to hilly dissected plain, broad belt of low hills formed by dissection of sandstone formations. Cropland with winter wheat, corn in irrigated areas and areas of grassland.
KS 0.0	PS 29		Flint Hills (28) (Flint Hills)	Tall grass prairie: big bluestem, little bluestem, switchgrass, Indiangrass (*Sorghastrum nutans*).	Undulating to rolling hills, cuestas, cherty limestone, and shale outcrops, perennial streams and springs common. Rangeland cattle grazing, limited areas of croplands along river valleys.

TABLE 3.5-2
Level IV Ecoregions Crossed by the Project

State Length (miles)	Milepost In	Milepost Out	Level IV (Identifier) (Level III)	Potential Natural Vegetation	Description
Gulf Coast Segment					
OK **15.7**	0.0	15.7	Cross Timbers Transition (27o) (Central Great Plains)	Mixed grass prairie: little bluestem, sideoats grama, blue grama, Indiangrass. Cross timbers: blackjack oak, post oak, hickory (*Carya* spp.), little bluestem. Tall grass prairie: big bluestem, little bluestem, switchgrass, Indiangrass. Uplands: oak (*Quercus* spp.), hickory, eastern redcedar. Riparian: cottonwood, willow, elm (*Ulmus* spp.), ash, walnut (*Juglans* spp.), pecan (*Carya illinoinensis*).	Rough plains that are sometimes broken, incised stream with rocky or muddy substrates. Mixture of rangeland and cropland, small grains, sorghum, alfalfa, soybeans. Stream banks previously supported hardwood forests. Upland trees increased due to fire suppression, riparian forests and wetlands degraded or lost due to channelization or landuse changes.
OK **62.1**	15.7	77.8	Northern Cross Timbers (29a) (Cross Timbers)	Cross timbers: post oak, blackjack oak, little bluestem. Tall grass prairie: big bluestem, little bluestem, switchgrass, Indiangrass. Mosaic of tall grass prairie and oak-hickory forest. Riparian forest: common hackberry (*Celtis occidentalis*), American elm (*Ulmus americana*), post oak, black walnut (*Juglans nigra*), green ash, willow, American sycamore (*Platanus occidentalis*), cottonwood.	Rolling hills, cuestas, ridges, and ledges. Stream flow annually variable. Scrubby oak forests, oak savannas, riparian forests and prairie openings. Woodland, grassland, rangeland, pastureland and limited croplands. Main crops are small grains, sorghum, hay and soybeans. Fire suppression has allowed the woodlands to expand.
OK **41.0**	77.8	118.7	Lower Canadian Hills (37e) (Arkansas Valley)	Cross timbers, tall grass prairie, mosaic of tall grass prairie and oak-hickory forest, and oak-hickory-pine forest. High terraces mixed deciduous forests: post oak, black oak (*Quercus velutina*), southern red oak (*Q. falcata*), and black hickory (*Carya texana*). Wooded hills and ridges: post oak, blackjack oak, white oak (*Q. alba*), hickory, eastern redcedar, shortleaf pine. Floodplains: eastern cottonwood (*Populus deltoides*), sycamore, oaks, black willow (*Salix nigra*), green ash, pecan, sweetgum (*Liquidambar styraciflua*), black walnut.	Mosaic of hills and valleys in Arkoma Basin, scattered ridges and numerous ponds. Woodland, pastureland, cropland with soybeans, wheat, sorghum, alfalfa, peanuts, and corn, coal strip mines.

TABLE 3.5-2
Level IV Ecoregions Crossed by the Project

State Length (miles)	Milepost In	Milepost Out	Level IV (Identifier) (Level III)	Potential Natural Vegetation	Description
OK 19.1 15.6 **34.7**	 118.7 139.3	 137.8 154.9	Cretaceous Dissected Uplands (35d) (South Central Plains)	Oak-hickory-pine forest. Shortleaf pine more abundant than loblolly pine in natural woodlands. Floodplains: deciduous forest. Moist upland forests: sweetgum, hickory, blackgum (*Nyssa sylvatica*), oak. Drier upland forests: oaks and pines. Floodplain forests American elm, common hackberry, water oak (*Quercus nigra*), southern red oak and green ash.	Level to hilly, dissected uplands and low cuestas underlain by poorly consolidated often calcareous sands, clays, gravels, and limestone. Mostly forests and pastureland, logging, livestock farming, poultry production, some croplands in gently sloping areas, corn, soybeans, hay, small grains, peanuts.
OK **1.5**	 137.8	 139.2	Eastern Cross Timbers (Cross Timbers)	Cross timbers (dominants: post oak, blackjack oak, black hickory, little bluestem) and tall grass prairie (dominants: big bluestem, little bluestem, switchgrass, and Indiangrass). Native bottomlands: pecan, black walnut, American elm and cottonwood.	Rolling hills, cuestas, long narrow ridges and a few strongly dissected areas underlain by sand, shale, clay, sandstone, calcareous shale and limestone. Vegetation diversity, density and growing season typically greater than Northern Cross Timbers. Primarily livestock grazing – grassland, pasture, rangeland and woodland, with some small grains, sorghum, and peanuts. Fire suppression and passive land use have allowed woodlands to expand, small impoundments are common.
OK 0.4 TX 4.9 **5.3**	 154.9 155.3	 155.3 160.2	Red River Bottomlands (35g) (South Central Plains)	Southern floodplain forest: eastern cottonwood, sycamore, hackberry, sweetgum, green ash, pecan, water oak, willow, American elm, southern red oak, and river birch (*Betula nigra*).	Broad, level to nearly level floodplains and low terraces with oxbow lakes, meander scars, backwaters. Mostly cleared and drained for cropland and pastures. Crops soybeans, sorghum, alfalfa, corn, wheat, pecans, cotton. Artificial levees and drainage ditches are common.
TX **2.5**	 160.2	 162.7	Pleistocene Fluvial Terraces (35c) (South Central Plains	Pine-hardwood forests with post oak, Shumard oak (*Quercus shumardii*) and eastern redcedar woods	Terrace deposits along the Red River, broad flats and gently sloping stream terraces mostly forest covered.
TX 9.0 3.1 1.4 5.8 10.0 **29.3**	 162.7 198.4 203.2 206.0 217.1	 171.7 201.5 204.6 211.8 227.1	Northern Post Oak Savanna (33a) (East Central Texas Plains)	Deciduous forest: post oak, blackjack oak, eastern redcedar, black hickory. Prairie openings: little bluestem and other grasses.	Level to gently rolling plains. Improved pasture, some coniferous trees planted loblolly pine

TABLE 3.5-2
Level IV Ecoregions Crossed by the Project

State Length (miles)	Milepost In	Milepost Out	Level IV (Identifier) (Level III)	Potential Natural Vegetation	Description
TX **26.7**	171.7	198.4	Northern Blackland Prairie (32a) (Texas Blackland Prairies)	Mixed grass prairie: little bluestem, big bluestem, Indiangrass, dropseed (*Sporobolus* spp.). Northeast grass communities dominated by Silveus' dropseed (*S. silveanus*), Mead's sedge (*Carex meadii*), bluestems (*Andropogon* spp., *Bothriochloa* spp., *Schizachyrium* spp.), and longspike tridens (*Tridens strictus*) with asters (*Aster* spp.), diamondflowers (*Stenaria nigricans*), prairie clover (*Dalea* spp.), and blackeyed Susan (*Rudbeckia hirta*). Riparian woodlands: bur oak, Shumard oak, sugarberry (*Celtis laevigata*), elm, ash, eastern cottonwood, pecan.	Rolling to nearly level plains underlain by interbedded chalks, marls, limestone, and shales. Most of the prairie has been converted to cropland, non-native pasture, and expanding urban areas.
TX 1.6 1.8 **3.4**	201.5 211.8	203.1 213.6	Floodplains and Low Terraces (33f) (East Central Texas Plains)	Bottomland forests: water oak, post oak, elms, green ash, pecan, willow oak (*Quercus phellos*), hackberry, eastern cottonwoods.	Floodplain and low terrace deposits, wider floodplains of Sulfur River on Holocene deposits. Northern floodplains have more forested cover than cropland and pasture.
TX 1.4 3.5 **4.9**	204.6 213.6	206.0 217.1	Northern Prairie Outliers (33d) (East Central Texas Plains)	Tall grass prairie: little bluestem, big bluestem, Indiangrass, dropseed.	Small disjunct areas historically containing a mosaic of forest and prairie. Fire suppression has allowed invasion of woody vegetation. Mostly pasture with some croplands
TX 33.4 0.0 69.0 **102.4**	227.1 261.6 263.0	260.5 261.6 332.0	Tertiary Uplands (35a) (South Central Plains)	Mixed forest: loblolly pine, shortleaf pine, southern red oak, post oak, white oak, hickory, sweetgum and mixed and tall grasses, Indiangrass, little bluestem, longleaf woodoats (*Chasmanthium sessiliflorum*), panicgrass (*Panicum* spp.); with American beautyberry (*Callicarpa americana*), sumac, greenbrier (*Smilax* spp.) and hawthorn (*Crataegus* spp.) understory. Sandier areas have more bluejack oak (*Quercus incana*), post oak, and stunted pines.	Irregular plains at the western edge of the coniferous forest belt. Rolling uplands, gently to moderately sloping plains. Once covered with a mix of pine and hardwood, much of the region is now in loblolly and shortleaf pine plantations. Pastures, loblolly pine timber forest, lumber and pulpwood production, grazing and poultry production.

TABLE 3.5-2
Level IV Ecoregions Crossed by the Project

State Length (miles)	Milepost In	Milepost Out	Level IV (Identifier) (Level III)	Potential Natural Vegetation	Description
TX 1.1 1.4 3.0 1.4 0.8 1.3 2.2 3.6 **14.8**	 260.5 261.6 333.2 346.9 351.7 359.3 363.6 366.2	 261.6 263.0 336.2 348.3 352.5 360.6 365.8 369.8	Floodplains and Low Terraces (35b) (South Central Plains)	Wetland communities: water oak, willow oak, sweetgum, blackgum, elm, red maple (*Acer rubrum*), southern red oak, swamp chestnut oak (*Quercus michauxii*), loblolly pine. Bald cypress (*Taxodium distichum*) and water tupelo (*Nyssa aquatica*) in semipermanently flooded areas.	Alluvial floodplains and low terraces of the Sabine River, Angelina River, Neches River where there is a distinct vegetation change into bottomland oaks and gum forest. Lumber and pulpwood production.
TX 1.2 10.7 3.4 6.8 3.0 0.4 38.4 **63.9**	 332.0 336.2 348.3 352.5 360.6 365.8 369.7	 333.2 346.9 351.7 359.3 363.6 366.2 408.1	Southern Tertiary Uplands (35e) (South Central Plains)	Longleaf pine (*Pinus palustris*) forests on sand ridges and uplands. Mesic forests: American beech (*Fagus grandifolia*), magnolia-beech loblolly pine (*Magnolia* spp., *Fagus* spp., *Pinus* spp.) forests. Acid bogs: sweetbay (*Magnolia virginiana*), holly (*Ilex* spp.), bayberry (*Morella* spp.), insectivorous plants, orchids (Orchidaceae), rhododendron (*Rhododendron* spp.).	Hilly and dissected longleaf pine range, sand ridges and uplands, open forests, some sandstone outcrops. Seeps in sand hills with acid bog species. More pine than oak-pine forests and pasture, large areas are National Forests.
TX 44.3 0.5 **44.8**	 408.1 456.4	 452.4 456.9	Flatwoods (35f) (South Central Plains)	Upland pine forest: longleaf pine, sweetgum, white oak, southern red oak, willow oak, blackgum and holliy. Wetter, flat areas: pine savannas, small prairies: beech-magnolia communities, swamp chestnut oak, loblolly pine, laurel oak (*Quercus laurifolia*).	Mostly flat to gently sloping, irregular plains at the western edge of the southern coniferous forest belt. Once supported diversity of mixed pine-hardwood forests with mosaic of well-drained and poorly drained communities. Much of the region in loblolly and shortleaf pine plantations about one sixth of the region is cropland, two thirds is forests and woodland. Lumber, pulpwood production.
TX 4.0 23.2 **27.2**	 452.4 456.9	 456.4 480.1	Northern Humid Gulf Coastal Prairies (34a) (Western Gulf Coastal Plain)	Grasslands with clusters of oaks: little bluestem, Indiangrass, brownseed paspalum (*Paspalum plicatulum*), hairawn muhly (*Muhlenbergia capillaris*), switchgrass. Some loblolly pine in northern portion.	Deltaic sands, silts, and clays on gently sloping coastal plain. Flat grasslands, more irregular and with forest or savanna vegetation further inland. Almost all coastal prairies converted to cropland, rangeland, pasture, urban use. Primarily croplands, rice sorghum, cotton and soybeans. Urban and industrial developments.

TABLE 3.5-2
Level IV Ecoregions Crossed by the Project

State Length (miles)	Milepost In	 Out	Level IV (Identifier) (Level III)	Potential Natural Vegetation	Description
Houston Lateral Segment					
TX 3.2 0.5 **3.7**	 0.0 15.9	 3.2 16.4	Flatwoods (35f) (South Central Plains)	Upland pine forest: longleaf pine, sweetgum, white oak, southern red oak, willow oak, blackgum and holly. Wetter, flat areas: pine savannas, small prairies: beech-magnolia communities, swamp chestnut oak, loblolly pine, laurel oak.	Mostly flat to gently sloping, irregular plains at the western edge of the southern coniferous forest belt. Once supported diversity of mixed pine-hardwood forests with mosaic of well-drained and poorly drained communities. Much of the region in loblolly and shortleaf pine plantations about one sixth of the region is cropland, two thirds is forests and woodland. Lumber, pulpwood production.
TX 12.7 26.0 **38.7**	 3.2 22.6	 15.9 48.6	Northern Humid Gulf Coastal Prairies (34a) (Western Gulf Coastal Plain)	Grasslands with clusters of oaks: little bluestem, Indiangrass, brownseed paspalum, hairawn muhly, switchgrass. Some loblolly pine in northern portion.	Deltaic sands, silts, and clays on gently sloping coastal plain. Flat grasslands, more irregular and with forest or savanna vegetation further inland. Almost all coastal prairies converted to cropland, rangeland, pasture, urban use. Primarily croplands, rice sorghum, cotton and soybeans. Urban and industrial developments.
TX **6.2**	 16.4	 22.6	Floodplains and Low Terraces (35b) (South Central Plain)	Wetland communities: water oak, willow oak, sweetgum, blackgum, elm, red maple, southern red oak, swamp chestnut oak, loblolly pine. Bald cypress and water tupelo in semipermanently flooded areas.	Floodplains and low terraces of the lower Trinity River.

Sources: See Appendix M; Level III Ecoregions is based on EPA (2002, 2007); Level IV Ecoregions are based on Woods et al. 2002, Bryce et al. 1996, Chapman et al. 2001, Woods et al. 2005, Griffith et al. 2004. Plant names follow USDA NRCS (2009) PLANTS Database. Mileposts from Keystone 2009c.

3.5.1 General Vegetation Resources

Generalized vegetation cover including prairie, forest, wetland communities and croplands that may occur within landcover classes crossed by the Project is summarized in Table 3.5.1-1. Grassland/rangeland upland forest, palustrine emergent wetland, palustrine shrub/scrub wetlands, palustrine forested wetland, streams, and open water areas support naturally occurring terrestrial and aquatic vegetation. Shrublands are included in the grassland/rangeland landcover class. Residential, commercial, industrial, and special designation areas (e.g., schools, parks, and recreational facilities) primarily include artificially created landscapes with minimal naturally occurring vegetation. Cropland and irrigated cropland primarily include introduced crop species, which provide forage and grain for livestock and human consumption. ROW areas consist of previously disturbed areas associated with pipelines and other utilities that have been restored primarily with native herbaceous and introduced plants.

TABLE 3.5.1-1
Landcover Types with Generalized Plant Communities Crossed by the Project

General and Subclass Designation	General Description	Common Plants	Occurrence along ROW by Route Segment and State						
			Steele City Segment			Cushing Pump Stations	Gulf Coast Segment		Houston Lateral
			MT	SD	NE	KS	OK	TX	TX
Agriculture									
Cropland	• Cultivated land • Row crops • Hayfields	Wheat, barley, oats, sorghum, corn, beans, hay	X	X	X		X	X	X
Irrigated Cropland	Cultivated, center pivot irrigated	Wheat, barley oats, corn, beans, alfalfa	X	X	X	X			
Hay Meadows		Non-native grasslands	X	X	X		X	X	
Urban / Built-Up Areas									
Residential	Suburban and rural residential areas	Ornamental trees, shrubs, windbreaks	X	X	X	X	X	X	X
Commercial	Commercial development areas	Planted vegetation	X	X	X	X	X	X	X
Industrial	• Electric power and gas utility stations • Roads • Landfills • Mines • Wind farms, etc.	Planted and potential native vegetation	X	X	X	X	X	X	X
Right of Way	Roads, Railroads and utility corridors	Mixture of native and non-native grasses and forbs	X	X	X	X	X	X	X
Grasslands / Rangeland									
Tall-Grass Prairie	Grassland community dominated by 3 to 6 foot tall grasses	Big Bluestem, Little Bluestem, Indiangrass			X	X	X		X
Mixed-Grass Prairie	Grassland community dominated by 1 to 2 foot tall grasses	Blue Grama, Needle and Thread, Green Needlegrass, Western Wheatgrass, Little Bluestem, Buffalograss	X	X	X		X		X
Short-Grass Prairie	Grassland community dominated by grasses less than 1 foot tall	Blue Grama, Buffalograss		X	X				

TABLE 3.5.1-1
Landcover Types with Generalized Plant Communities Crossed by the Project

General and Subclass Designation	General Description	Common Plants	Occurrence along ROW by Route Segment and State: Steele City Segment			Cushing Pump Stations	Gulf Coast Segment		Houston Lateral
			MT	SD	NE	KS	OK	TX	TX
Sand Hills Dune Prairie	Grassland community on sand or gravel soils, dominated by sand-adapted grasses	Sand Bluestem, Hairy Grama, Prairie Sandreed, Little Bluestem		X	X				
Non-native Grassland	Pasturelands planted with nonnative cool-season grasses	Smooth Brome (*Bromus inermis*), Crested Wheatgrass (*Agropyron cristatum*) and other seeded pasture grasses	X	X	X		X	X	X
Deciduous Shrubland	Upland or lowland communities dominated by shrubs	Chokecherry (*Prunus virginiana*), Sandbar Willow (*Salix interior*), Silver Buffaloberry (*Shepherdia argentea*), Western Snowberry (*Symphoricarpos occidentalis*)	X				X	X	X
	Sagebrush communities dominated by shrubs	Silver Sagebrush (*Artemisia cana*), Big Sagebrush	X	X					
Conservation Reserve Program	Fallow, mixed native and non-native grasses, forbs and shrubs.	A variety of native and introduced grass species	X	X	X			X	X
Upland Forest									
Deciduous Forest	Forests dominated by a wide variety of mixed native and non-native deciduous trees	Green Ash, Quaking Aspen (*Populus tremuloides*), Bur Oak, Post Oak, Blackjack Oak, American, Hickory, Boxelder, Common Hackberry	X	X	X		X	X	X
Mixed Forest	Forest composed by a wide variety of mixed deciduous and evergreen species, with neither type more than 75 percent of total tree cover.	Juniper, Pine, Green Ash, Quaking Aspen, Bur Oak, Shortleaf Pine, Water, Blackgum, Winged Elm (*Ulmus alata*)	X				X	X	
Riverine / Open Water									
Open Water	Open water, sometimes associated with wetland habitat	Not applicable	X	X	X		X	X	X
Riverine Wetlands	Wetlands contained within a channel	Not applicable						X	X

TABLE 3.5.1-1
Landcover Types with Generalized Plant Communities Crossed by the Project

General and Subclass Designation	General Description	Common Plants	Occurrence along ROW by Route Segment and State: Steele City Segment			Cushing Pump Stations	Gulf Coast Segment		Houston Lateral
			MT	SD	NE	KS	OK	TX	TX
Palustrine Forested									
Riparian or Floodplain Woodland	Temporarily flooded woodland	Green Ash, Eastern Cottonwood, Boxelder, Bur Oak, American Elm , Willow	X	X	X		X		
	Bald Cypress-Water Tupelo Swamp	Bald Cypress, Water Oak, Water Hickory (*Carya aquatica*), Swamp Tupelo (*Nyssa biflora*), Swampprivet (*Forestiera* spp.)					X	X	X
Palustrine Emergent / Scrub-Shrub Wetlands									
Emergent Wetlands	Wetlands dominated by persistent emergent vegetation	Common Spikerush (*Eleocharis palustris*), Rush (*Juncus* spp.), Rice Cutgrass (*Leersia oryzoides*), Bulrush, Bur-reed (*Sparganium* spp.), Cattail (*Typha* spp.), Sedges, Fowl Bluegrass (*Poa palustris*), Foxtail Barley (*Hordeum jubatum*)	X	X	X		X	X	X
Riparian Shrubland	Temporarily flood scrub-shrub community	Sedge, Willow, Bulrush, Western Snowberry, Greasewood (*Sarcobatus vermiculatus*), Winterfat (*Krascheninnikovia lanata*), Fourwing Saltbush (*Atriplex canescens*)	X	X	X				
Aquatic Bed Wetland	Intermittently, temporarily, or permanently flooded wetlands	Saltgrass (*Distichlis spicata*), Knotweed (*Polygonum* spp.), Pondweed (*Potamogeton* spp.)			X				

Source: Keystone 2008, 2009b.

3.5.2 Vegetation Communities of Conservation Concern

Native vegetation communities throughout the Project area are altered by agricultural, urban and industrial development and by changes in ecosystem processes that maintain or reset succession including fire, bison grazing and prairie dogs. Vegetation communities crossed by the Project that have become conservation concerns because of declining abundance, sensitivity to disturbance, and/or reliance of listed or sensitive species on the habitats that they create include: native grasslands, sagebrush grasslands, riparian habitats and bottomland hardwoods, and native forests. Vegetation cover within wetlands, conservation and reserve areas, wildlife production areas, and unique landscapes are areas of concern. The following sections provide brief descriptions of these unique and often rare vegetation communities. Figure 3.5.2-1 illustrates the current distribution of grasslands and prairies, forestlands, and croplands and pasture in the states crossed by the Project.

3.5.2.1 Native Grasslands

Native grasslands or prairies are among the most threatened native vegetation communities in the United States. In the past, grasslands such as the tall-grass prairies, mixed-grass prairies, and short-grass prairies dominated central North America. Across the Project area the influence of fire and grazing, especially by large herds of bison, maintained native grasslands in a relatively treeless condition. With suppression of fires, woody vegetation has encroached upon the prairie landscape in some parts of Great Plains. Prairies have been lost to agriculture, urbanization, and mineral exploration and altered by invasions of non-native plants, fire suppression, establishment of woodlots and shelterbelts, and water developments.

Tall-grass prairie is the wettest of the grasslands composed of sod-forming bunch grasses. Mixed-grass prairies are intergrades between tall-grass and short-grass prairies characterized by the warm-season grasses of the short-grass prairie and the cool and warm-season grasses of the tall-grass prairie. Short-grass prairies are dominated by blue grama and buffalograss - two warm-season grasses that flourish under intensive grazing. Estimated declines in native tall-grass prairie range from 83 to 99 percent, mixed-grass prairie range from 30 to 75 percent, and short-grass prairie ranges from 35 to 79 percent in some of the Great Plains states crossed by the proposed project (Samson et al. 1998). Because of this decline and the importance of these areas as wildlife habitat, conservation of native prairie remnants is a high priority throughout the project area. Many of the sensitive plant species discussed in Section 3.8 that occur along the pipeline ROW occur within native grasslands.

Sand Hills

The Sand Hills is one of the largest grass-stabilized dune regions in the world (Schneider et al. 2005). Dunes are oriented northwest to southeast in alignment with the prevailing winds. Rainwater and snowmelt percolate rapidly through the poorly developed soils and most lakes and wetlands in the area are small, shallow and clustered near stream headwaters where surface drainage is poor (Schneider et al. 2005). Typical grassland communities include: dune prairie with a mixture of sand-adapted grasses; dry valley prairie with taller prairie grasses in wetter areas between dunes; blowout communities with unique plant communities in wind-excavated depressions; and wet meadows (Schneider et al. 2005). Most (95 percent) of the Sand Hills region remains in a relatively natural state maintained as native grasslands for livestock grazing and contains a variety of native plant communities, with nearly 700 native plants and associated high biological diversity (Schneider et al. 2005). The rich flora and fauna supported by the Sand Hills is one of the few remaining examples of a functioning prairie ecosystem. The Project crosses through the Elkhorn Headwaters Unique Landscape in Nebraska (Schneider et al. 2005).

Rainwater Basin

The Rainwater Basin is a complex of wetlands and grasslands on the flat to rolling loess-covered plains of the Rainwater Basin Plains. This complex of playa wetlands formed by wind scour retain water because of impervious clay layers accumulated in the bottoms of the depressions over thousands of years slows water from seeping into the ground (LaGrange, 2005). Surface water drainage is poorly developed, and wetlands fill with precipitation and snowmelt (Schneider et al. 2005). This region supports millions of migratory ducks, geese, and shorebirds. Vegetation communities include mixed grass, tall grass, and saline prairie communities. The Project crosses through the Rainwater Basin-East Unique Landscape in Nebraska (Schneider et al. 2005).

Prairie Dog Towns

Prairie dogs change grassland habitats by digging and maintaining extensive burrow complexes, by selective grazing which changes the associated grasses, and by urination and defecation that change soil nutrients. Vegetation typically associated with active and inactive prairie dog towns include: threeawn (*Aristida* spp.), sixweeks fescue (*Vulpia octoflora*), fetid marigold (*Dyssodia papposa*), curlycup gumweed (*Grindelia squarrosa*), saltgrass (*Distichlis spicata*), prairie junegrass (*Koeleria macrantha*), threadleaf sedge, blue grama, and western wheatgrass (SDGFP 2006).

Sagebrush Grasslands

Mixed shrub and grass habitats characterize large expanses of grasslands throughout Montana and South Dakota. Depending on site moisture communities may include, silver sagebrush in more moist areas, big sagebrush and rabbitbrush (*Chrysothamnus* spp. and *Ericameria* spp.) in drier areas, or greasewood in alkali flats. Large areas of intact native sagebrush grasslands are a conservation priority in Montana and South Dakota. Sagebrush is susceptible to fire and low-lying, xeric big sagebrush communities may have a natural fire return interval of 100 to 200 years depending on topography and exposure, while sagebrush communities on more moist sites may have a natural fire interval of decades (USFWS, 2008). Post-fire reestablishment of sagebrush communities may require 20 to 50 years.

3.5.2.2 Riparian Habitats and Bottomland Hardwoods

Riparian vegetation changes substantially in character from woody draws in the northwest portion of the Project area to bald cypress-tupelo swamps in the southeast. Riparian areas are important as wildlife habitat within the western United States (USFWS, 1997). Riparian areas represent a transition between wetland and upland habitats, generally lack the amount or duration of water present in wetlands, and riparian vegetation may include wetland or upland plants. Riparian habitats identified as conservation priorities in Montana include: woody draws (dry streambed areas dominated by broadleaf riparian communities such as cottonwood-alder-chokecherry-willow communities); shrub riparian communities (alder-chokecherry-dogwood community); graminoid and forb riparian communities (bluejoint reedgrass-cinquefoil-cattails); and mixed riparian communities (mixed grasses and shrubs). Extensive riparian habitats occur near the confluence of the Milk and Missouri rivers, and near the Yellowstone River in Montana. High-priority conservation riparian communities in South Dakota include areas with emergent, scrub-shrub, or forest vegetation in semi-permanent or permanent depressional wetlands and low gradient perennial streams and rivers (SDGFP 2006). The Project crosses through the Keya Paha Watershed, Lower Niobrara River, and Lower Loup River Unique Landscapes in Nebraska with priority cottonwood-willow riparian woodlands. In Oklahoma, priority riparian communities include: oak and hickory bottomland hardwood forests, and small streams and associated riparian forests (ODWC 2005). In Texas, priority riparian communities include bottomland hardwoods and riparian conservation areas (Bender et al. 2005). Specific communities of conservation concern in Texas include the Water Oak – Willow Oak Series community (Brewer 2009).

3.5.2.3 Forest Communities

Native wooded communities were once an integral component of the prairie landscape throughout the Great Plains where they provide foraging, breeding, and refuge habitats for many wildlife species. Prairie woodlands were generally limited in size and distribution by fire to river breaks and protected areas. Many of these communities have been lost due to land conversion to agricultural uses, levee construction, and urban development. At the southern end of the Project in Oklahoma and Texas, native trees develop within the prairies creating savannas and continue increasing in density creating woodlands and forests within the Cross Timbers and South Central Plains or Piney Woods. In the Cross Timbers region, fire suppression has led to expansion of forests. Much of the South Central Plains is used for silviculture. Some forest communities in uplands or outside of riparian areas are priorities for conservation across the Project. In Montana, Aspen Galleries, which occur within grassland openings with aspen or birch; and green ash and cottonwood woodlands are declining in abundance (MFWP 2005). No forested habitats are considered high conservation priorities within the Great Plains Steppe region of South Dakota (SDGFP 2006). Within the biologically unique landscapes identified in Nebraska several forest communities are identified as conservation priorities including: Keya Paha Watershed (oak woodland); Middle Niobrara River (bur oak-basswood-ironwood forest, oak woodland, and ponderosa pine woodland); and Lower Loup River (oak woodland) (Schneider et al. 2005). Forest community conservation priorities within the Cross Timbers Region of Oklahoma include: oak and hickory bottomland hardwood forest, post oak/blackjack oak/hickory woodlands and forest, and post oak/blackjack oak shrubland. Forest community conservation priorities by ecoregion in Texas include: Post Oak Savanna (mesic hardwood woodlands and bottomland hardwoods); Piney Woods (longleaf pine forests and savanna and East Texas hardwood upland and slope forests) (Bender et al. 2005).

3.5.2.4 Traditionally Used Native Plants

Native Americans have traditionally used many native plants for food, construction materials, forage for livestock, fuel, medicine, and spiritual purposes (Johnston 1987, Hart and Moore 1976, and Gilmore 1977). Although the dependence on plants for many aspects of survival in the natural environment have become less pronounced in recent times, plants continue to be of substantial importance to the culture of most Native Americans. The plants themselves are important and in some cases, indigenous peoples consider them sacred. Places where traditionally used plants grow and have been collected for millennia may be considered to have spiritual and cultural significance.

Plants of ethnobotanical importance known or likely to occur in the project area include plants from all native vegetation communities, although many grow in wetlands and riparian areas. Important wetland and riparian plants include: cottonwood (*Populus* spp.), hawthorn (*Crataegus* spp), sweet grass (*Hierochloe odorata*), cattail (*Typha* spp.), snowberry (*Symphoricarpos* spp.), silver buffaloberry (*Sheperdia argentea*), and saskatoon (*Amelanchier alnifolia*). Wetlands and riparian habitats are a small percentage of the land area in the Great Plains, however, they are disproportionately important as sources of traditionally used plants. Native grasslands also provided numerous traditionally used plants including: Indian bread-root (*Psoralea esculenta*), wild flax (*Linum lewisii*), prickly pear cactus (*Opuntia* spp.), fringed sage (*Artemisia frigida*), and white sage (*Artemisia ludoviciana*). Reductions in native grasslands have also reduced populations of plants valued by Native Americans. In addition to plants traditionally used by Native Americans, many people also use and collect for sale the prairie coneflower (echinacea) as an herbal supplement.

3.5.3 Wetland and Conservation Easements

The Steele City Segment, Gulf Coast Segment, and Houston Lateral would potentially cross multiple conservation easements including USFWS wetland easements, Montana Fish, Wildlife, and Parks Conservation Easements, the Piney Woods Wetland Mitigation Bank, and multiple conservation easements enrolled in the NRCS Conservation Reserve Program (CRP) and the Wetland Reserve Program (WRP). The WRP and CRP are described in Section 3.9.4.6.

3.5.4 Noxious Weeds

Noxious weeds and invasive plants are non-native, undesirable native, or introduced species that are able to exclude and out-compete desirable native species, thereby decreasing overall species diversity. The term "noxious weed" is legally defined under both federal and state laws. Under the Federal Plant Protection Act of 2000 (formerly the Noxious Weed Act of 1974 [7 USC SS 2801–2814]), a noxious weed is defined as "any plant or plant product that can directly or indirectly injure or cause damage to crops, livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the United States, the public health, or the environment." The Federal Plant Protection Act contains a list of 137 federally restricted and regulated noxious weeds, as per CFR Title 7, Chapter III, Part 360, including 19 aquatic and wetland weeds, 62 parasitic weeds, and 56 terrestrial weeds. Each state is federally mandated to uphold the rules and regulations set forth by the Federal Plant Protection Act and to manage its lands accordingly. Four federally listed exotic noxious weed species and one noxious weed genus have been reported to occur in Texas, a state that would be crossed by the construction ROWs (USDA NRCS 2009) (Table 3.5.4-1). The parasitic genus (dodder) occurs as both native and introduced species within all states crossed by the ROW (Table 3.5.4-1).

In addition to federal noxious weed lists, each state maintains a list of state and local noxious weeds. County weed control boards or districts are present in most counties along the proposed pipeline corridor. These county weed control boards monitor local weed infestations and provide guidance on weed control. Weed distributions (USDA NRCS 2009) in the counties along the proposed pipeline corridor suggest that 93 noxious weeds and invasive plants could potentially occur within the construction ROW including:

- 29 aquatic or wetland weeds;
- 51 upland weeds; and
- 13 weeds that may occur in either wetland or upland habitats.

Of these, 66 are federally or state designated noxious weeds, including:

- 15 aquatic or wetland weeds;
- 42 upland weeds; and
- 8 weeds that may occur in either wetland or upland habitats.

TABLE 3.5.4-1
Federal, State, or Local Noxious Weeds Potentially Occurring along the Project Route

Species [a]	Status / Habitat	Occurrence and State Designations [b]						
		Steele City Segment			Cushing Pump Stations	Gulf Coast Segment		Houston Lateral
		MT	SD	NE	KS	OK	TX	TX
Hardheads [Russian knapweed] (*Acroptilon [Centaurea] repens*)	Introduced / Upland	√ C1	√ NW		√ NW	√		
Alligatorweed (*Alternanthera philoxeroides*)	Introduced / Wetland					√ NAP	√ NW	√ NW
Wollyleaf bur ragweed [Wollyleaf burdock] (*Ambrosia grayi*)	Native / Upland				√ NW			
Lesser [Common] burdock (*Arctium minus*)	Introduced / Upland	√ LW	√ LW	√	√	√	√	√
Absinthium (*Artemisia absinthium*)	Introduced / Upland	√	LW					
Giant reed (*Arundo donax*)	Introduced / Upland				√	√	√ NW	√ NW
Flowering rush (*Butomus umbellatus*)	Introduced / Wetland	√ C3		√				
Hedge false bindweed (*Calystegia sepium*)	Native / Upland	√	√	√	√	√	√ NW	√ NW
Whitetop [Hoary cress] (*Cardaria draba*)	Introduced / Upland	√ C1	√ NW	√	√ NW	√		
Balloon vine (*Cardiospermum halicacabum*)	Introduced / Upland					√	√ NW	√ NW
Spiny plumeless thistle (*Carduus acanthoides*)	Introduced / Upland		LW	√ NW		√		
Nodding plumeless [Musk] thistle (*Carduus nutans*)	Introduced / Upland	√	LW	√ NW	√ NW	√ NW		
Diffuse [White] knapweed (*Centaurea diffusa*)	Introduced / Upland	√ C1	LW	√ NW	IW			
Yellow star-thistle (*Centaurea solstitialis*)	Introduced / Upland	C3	√	√		√		

TABLE 3.5.4-1
Federal, State, or Local Noxious Weeds Potentially Occurring along the Project Route

Species [a]	Status / Habitat	Occurrence and State Designations [b]						
		Steele City Segment			Cushing Pump Stations	Gulf Coast Segment		Houston Lateral
		MT	SD	NE	KS	OK	TX	TX
Spotted knapweed (*Centaurea stoebe* [*maculosa*])	Introduced / Upland	√ C1	√ LW	√ NW	IW			
Chicory (*Cichorium intybus*)	Introduced / Upland	√	√ LW	√	√	√	√	√
Canada thistle (*Cirsium arvense*)	Introduced / Wetland and Upland	√ C1	√ NW	√ NW	√ NW	NW		
Bull thistle (*Cirsium vulgare*)	Introduced / Upland	√	√ LW		√ LW			
Poison hemlock (*Conium maculatum*)	Introduced / Wetland and Upland	LW	√ LW	√	√			
Field bindweed (*Convolvulus arvensis*)	Introduced / Upland	√ C1	√ LW	√	√ NW	√	√ NW	√ NW
Common crupina **(*Crupina vulgaris*)**	Introduced / Upland	√ C3						
Japanese dodder **(*Cuscuta japonica*)**	Introduced / Upland						√ NW	√ NW
Dodder **(*Cuscuta* spp.)**	Introduced and Native / Upland	√	√	√	√	√	√	√
Gypsyflower [Houndstongue] (*Cynoglossum officinale*)	Introduced / Upland	√ C1	√ LW	√	√			
Woodrush flatsedge [Deep-rooted sedge] (*Cyperus entrerianus*)	Introduced / Wetland					√	√ NW	√ NW
Common viper's bugloss [Blueweed] (*Echium vulgare*)	Introduced / Upland	C2					√	√
Common water hyacinth (*Eichhornia crassipes*)	Introduced / Aquatic					WL	√ NW	√ NW
Quackgrass (*Elymus repens*)	Introduced / Upland	√	√	√	NW		√	√

TABLE 3.5.4-1 Federal, State, or Local Noxious Weeds Potentially Occurring along the Project Route								
		Occurrence and State Designations [b]						
		Steele City Segment			Cushing Pump Stations	Gulf Coast Segment		Houston Lateral
Species [a]	**Status / Habitat**	**MT**	**SD**	**NE**	**KS**	**OK**	**TX**	**TX**
Leafy spurge (*Euphorbia esula*)	Introduced / Upland	√ C1	√ NW	√ NW	√ NW			
Baby's breath (*Gypsophila paniculata*)	Introduced / Upland	LW	√		√			
Orange hawkweed (*Hieracium aurantiacum*)	Introduced / Upland	√ C2	√					
Meadow hawkweed complex (*Hieracium caespitosum, H. x. floribundum, H. piloselloides*)	Introduced / Upland	√ C2						
Waterthyme (*Hydrilla verticillata*)	Introduced / Aquatic				IW	WL	√ NW	√ NW
Indian swampweed **(*Hygrophilla polysperma*)**	Introduced / Aquatic					NAP	√	√
Common St. Johnswort (*Hypericum perforatum*)	Introduced / Upland	√ C1	LW	√	√			
Paleyellow iris [Yellow flag iris] (*Iris pseudacorus*)	Introduced / Upland and wetland	√ C2				WL	√	
Dyer's woad (*Isatis tinctoria*)	Introduced / Upland	√ C3						
Dotted duckmeat [Giant duckweed] (*Landoltia punctata [Spirodela oligorrhiza]*)	Native / Aquatic					√ WL	√ NW	√ NW
Broadleaved [Perennial] pepperweed (*Lepidium latifolium*)	Introduced / Upland	√ C2			√			
Sericea [Chinese] lespedeza (*Lespedeza cuneata*)	Introduced / Wetland				√ NW	√ IW		
Oxeye daisy (*Leucanthemum vulgare [Chrysanthemum leucanthemum]*)	Introduced / Upland	√ C1	√		√		√	√

TABLE 3.5.4-1
Federal, State, or Local Noxious Weeds Potentially Occurring along the Project Route

		Occurrence and State Designations [b]						
		Steele City Segment			Cushing Pump Stations	Gulf Coast Segment		Houston Lateral
Species [a]	**Status / Habitat**	**MT**	**SD**	**NE**	**KS**	**OK**	**TX**	**TX**
Dalmatian toadflax (*Linaria dalmatica*)	Introduced / Upland	√ C1	√ LW		IW			
Butterandeggs [Yellow toadflax] (*Linaria vulgaris*)	Introduced / Upland	√ C1	√ LW	√	√ IW	√	√	√
Purple loosestrife (*Lythrum salicaria*)	Introduced / Wetland	√ C2	NW	√ NW	IW	√ NAP	NW	NW
European wand loosestrife (*Lythrum virgatum*)	Introduced / Wetland	√ C2		NW				
Eurasian (Spike) watermilfoil (*Myriophyllum spicatum*)	Introduced / Aquatic	C3		√		WL	NW	NW
Scotch cottonthistle (*Onopordum acanthium*)	Introduced / Upland		LW			√ NW		
Hemp broomrape (*Orobanche ramosa*)	Introduced / Upland						√ NW	√ NW
Ducklettuce (*Ottelia alismoides*)	Introduced / Aquatic					NAP	√	√
Torpedograss [Couch panicum] (*Panicum repens*)	Introduced / Upland					WL	√ NW	√ NW
Common reed (*Phragmites australis*)	Native / Wetland	√	√ LW	√ NW			√	√
Waterlettuce (*Pistia stratiotes*)	Native / Aquatic				√	WL	NW	NW
Japanese knotweed complex [Crimson beauty] (*Polygonum cuspidatum, P. polystachyum, P. sachalinense*)	Introduced / Upland and wetlands	√ C3	√ LW	√	√	√		
Sulphur cinquefoil (*Potentilla recta*)	Introduced / Upland	√ C1		√		√		
Kudzu (*Pueraria montana* [*lobata*])	Introduced / Upland			√	√ NW	√ IW	√ NW	√ NW

TABLE 3.5.4-1
Federal, State, or Local Noxious Weeds Potentially Occurring along the Project Route

		Occurrence and State Designations [b]						
		Steele City Segment			Cushing Pump Stations	Gulf Coast Segment		Houston Lateral
Species [a]	**Status / Habitat**	**MT**	**SD**	**NE**	**KS**	**OK**	**TX**	**TX**
Multiflora rose (*Rosa multiflora*)	Introduced / Upland				√ LW			
Itchgrass (*Rottboellia cochinchinensis*)	Introduced / Upland						√ NW	√ NW
Water spangles (*Salvinia minima*)	Introduced / Aquatic					√	√ NW	√ NW
Field [Perennial] sowthistle (*Sonchus arvensis*)	Introduced / Wetland and Upland	√ LW	√ NW		√		√ NW	√ NW
Johnsongrass (*Sorghum halepense*)	Introduced / Wetland and Upland				√ NW	√ IW	√	√
Tamarisk [Salt cedar] (*Tamarix* spp.)	Introduced / Wetland and Upland	√ C2	√ NW	NW		√ IW	√ NW	√ NW
Common tansy (*Tanacetum vulgare*)	Introduced / Upland	√ C1	LW	√				
Chinese tallow [tree] (*Triadica sebifera*)	Introduced / Wetland and Upland						√ NW	√ NW
Puncturevine (*Tribulus terrestris*)	Introduced / Upland	√	√ LW	√	√	√	√	
Common mullein (*Verbascum thapsus*)	Introduced species / Upland	√	√ LW	√	√	√	√	√

√ = Occurs within counties crossed by Keystone XL Project or within state if county data not available (USDA NRCS 2009).
CP = Classified as a state regulated plant.
C1 = Classified as a category 1 noxious weed for the state of Montana.
C2 = Classified as a category 2 noxious weed for the state of Montana.
C3 = Classified as a category 3 noxious weed for the state of Montana.
IW = Classified as a state invasive plant.
LW = Classified as a local noxious weed.
NAP = Classified as a state noxious aquatic plant.
NW = Classified as a state noxious weed or state noxious plant.

WL = Classified as a "Watch List" invasive plant.

[a] Species in bold are federal noxious weeds (USDA NRCS 2009). Common and species synonyms in square brackets [] are as listed on state noxious weed or plant lists.

Sources: Keystone 2009a, USDA NRCS 2009, MDA 2008, MDA 2009, SDA 2009, NDA 2009, KDA 2007, KDA 2009, ODA 2000, ODWC 2002, OBS undated, TDA 2008.

Executive Order 13112 directs federal agencies to prevent the introduction of invasive species, provide for their control, and minimize the economic, ecological, and human health impacts that invasive species can cause. It further specifies that federal agencies shall not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless it has been determined that the benefits outweigh the potential harm and that all feasible and prudent measures to minimize risk have been taken.

3.5.5 Potential Impacts and Mitigation

Total miles crossed and acres of terrestrial vegetation affected during construction and operation of the Project are presented in Tables 3.5.5-1 and 3.5.5-2.

Potential construction- and operations-related effects include:

- Temporary and permanent modification of vegetation community composition and structure from clearing and operational maintenance;
- Increased risk of soil erosion due to lack of vegetative cover;
- Expansion of invasive and noxious weed populations along the pipeline ROW as a result of construction and operational vegetation maintenance;
- Soil and sod disturbance (mixing of topsoil with subsoil with altered biological activities and chemical conditions that could affect reestablishment and natural recruitment of native vegetation after restoration);
- Compaction and rutting of soils from movement of heavy machinery and transport of pipe sections, altering natural hydrologic patterns, inhibiting water infiltration and seed germination, or increasing siltation;
- Alteration in vegetation productivity and phenology due to increased soil temperatures associated with heat input from the pipeline; and
- Loss of vegetation due to exposure to toxic materials or crude oil releases (addressed in Section 3.13, Risk Assessment and Environmental Consequences).

3.5.5.1 General Vegetation Resources

The primary impacts on vegetation from construction and operation of the Project would be cutting, clearing, or removing the existing vegetation within the construction work area and potential invasion by noxious weeds. The degree of impact would depend on the type and amount of vegetation affected, the rate at which vegetation would regenerate after construction, and the frequency of vegetation maintenance conducted on the ROW during pipeline operation.

Impacts on annually tilled croplands also generally would be short term and limited to the current growing season if topsoil is segregated and soils are not compacted during construction. Impacts on pastures, rotated croplands, and open grassland range generally would be short to long term, with vegetation typically reestablishing within 1 to 5 years after construction. Perennial herbaceous cover may require as long as 5 to 8 years to establish cover similar to adjacent undisturbed lands in northern arid portions of the project especially when drought conditions or livestock grazing interfere with reestablishment. Impacts on these communities during operation of the pipeline would be minimal because these areas would recover following construction and typically would not require maintenance mowing.

TABLE 3.5.5-1
Summary of Estimated Impacts on Vegetation Communities by State for the Project

Vegetation Community Classification	Length of Community Crossed (miles)	Community Area Affected during Construction (acres) [a]	Community Area Affected by Operations (acres) [a]
Steele City Segment			
Montana			
Cropland	70.9	1,253	451
Grassland/rangeland	203.3	3,232	1,253
Upland forest	0.9	12	5
Riverine/open water	3.3	48	20
Forested wetlands	0.0	0	0
Shrub-scrub wetlands	0.1	1	1
Emergent wetlands	1.1	15	6
Developed land	2.9	47	18
Montana total	*282.5*	*4,608*	*1,754*
South Dakota			
Cropland	82.5	1,434	512
Grassland/rangeland	222.9	3,504	1,380
Upland forest	0.9	10	6
Riverine/open water	3.6	50	21
Forested wetlands	0.0	0	0
Shrub-scrub wetlands	<0.1	0	0
Emergent wetlands	1.2	18	8
Developed land	2.9	48	19
South Dakota total	*314.1*	*5,064*	*1,946*
Nebraska			
Cropland	115.3	1,944	675
Grassland/rangeland	124.7	1,983	845
Upland forest	3.5	67	25
Riverine/open water	1.6	23	10
Forested wetlands	0.1	2	1
Shrub-scrub wetlands	0.0	0	0
Emergent wetlands	5.0	80	35
Developed land	3.9	80	29
Nebraska total	*254.1*	*4,179*	*1,620*
Cushing Extension Pump Stations			
Kansas			

TABLE 3.5.5-1 Summary of Estimated Impacts on Vegetation Communities by State for the Project			
Vegetation Community Classification	**Length of Community Crossed (miles)**	**Community Area Affected during Construction (acres) [a]**	**Community Area Affected by Operations (acres) [a]**
Cropland	0.0	12	12
Grassland/rangeland	0.0	0	0
Upland forest	0.0	0	0
Riverine/open water	0.0	0	0
Forested wetlands	0.0	0	0
Shrub-scrub wetlands	0.0	0	0
Emergent wetlands	0.0	0	0
Developed land	0.0	0	0
Kansas total	*0.0*	*12*	*12*
Gulf Coast Segment and Houston Lateral			
Oklahoma			
Cropland	11.1	160	70
Grassland/rangeland	82.4	1,178	508
Upland forest	41.1	598	256
Riverine/open water	1.7	22	11
Forested wetlands	0.5	8	5
Shrub-scrub wetlands	0.1	2	0
Emergent wetlands	0.5	8	5
Developed land	18.0	230	120
Oklahoma total	*155.4*	*2,671*	*975*
Texas			
Cropland	49.1	681	291
Grassland/rangeland	115.8	1,636	712
Upland forest	129.2	1,836	779
Riverine/open water	4.0	49	25
Forested wetlands	22.0	261	137
Shrub-scrub wetlands	1.5	18	9
Emergent wetlands	11.9	141	73
Developed land	39.9	541	280
Texas total	*373.4*	*5,959*	*2,306*

Source: Keystone 2009b (Tables 3.4-7, 3.5-2, 3.7-2; and 4.2-18).

[a] Acres disturbed on a temporary basis (permanent ROW width plus temporary workspace) during construction, and acres disturbed (maintained) on a permanent basis during operation of the proposed Keystone Project. Acreage does not include disturbance associated with access roads, or construction camps. Total acres affected by construction in Oklahoma and Texas include 465 acres and 796 acres, respectively, of pipe stockpile sites, rail sidings, and contractors yards that are not included in land use categories. These would be included after survey completion.

TABLE 3.5.5-2
Summary of Estimated Impacts on Vegetation Communities by Pipeline Segment for the Project

Vegetation Community Classification	Length of Community Crossed (miles)	Community Area Affected during Construction (acres) [a]	Community Area Affected by Operations (acres) [a]
Steele City Segment			
Cropland	268.7	4,631	1,638
Grassland/rangeland	550.9	8,719	3,478
Upland forest	5.3	89	36
Riverine/open water	8.5	121	51
Forested wetlands	0.1	2	1
Shrub-scrub wetlands	0.2	1	1
Emergent wetlands	7.3	113	49
Developed land	9.7	175	66
Steele City Segment total	*850.7*	*13,851*	*5,320*
Cushing Extension Pump Stations			
Cropland	0.0	12	12
Grassland/rangeland	0.0	0	0
Upland forest	0.0	0	0
Riverine/open water	0.0	0	0
Forested wetlands	0.0	0	0
Shrub-scrub wetlands	0.0	0	0
Emergent wetlands	0.0	0	0
Developed land	0.0	0	0
Pump Station total	*0.0*	*12*	*12*
Gulf Coast Segment			
Cropland	57.0	798	342
Grassland/rangeland	179.1	2,547	1,104
Upland forest	152.6	2,198	930
Riverine/open water	5.4	68	34
Forested wetlands	19.9	237	126
Shrub-scrub wetlands	1.6	20	9
Emergent wetlands	8.4	101	54
Developed land	56.2	748	388
Gulf Coast Segment total	*480.2*	*7,978*	*2,987*
Houston Lateral			
Cropland	3.2	43	19
Grassland/rangeland	19.1	267	116
Upland forest	17.7	236	105
Riverine/open water	0.3	3	2

TABLE 3.5.5-2 Summary of Estimated Impacts on Vegetation Communities by Pipeline Segment for the Project			
Vegetation Community Classification	**Length of Community Crossed (miles)**	**Community Area Affected during Construction (acres) [a]**	**Community Area Affected by Operations (acres) [a]**
Forested wetlands	2.6	32	16
Shrub-scrub wetlands	0.0	0	0
Emergent wetlands	4.0	48	24
Developed land	1.7	23	12
Houston Lateral total	*48.6*	*652*	*294*
Keystone XL Project			
Cropland	328.9	5,484	2,011
Grassland/rangeland	749.1	11,533	4,698
Upland forest	175.6	2,523	1,071
Riverine/open water	14.2	192	87
Forested wetlands	22.6	271	143
Shrub-scrub wetlands	1.8	21	10
Emergent wetlands	19.7	262	127
Developed land	67.6	946	466
Keystone XL Project Total	**1,379.5**	**22,493**	**8,613**

Source: Keystone 2009b (Tables 3.4-7, 3.5-2, 3.7-2; and 4.2-18).

[a] Acres disturbed on a temporary basis (permanent ROW width plus temporary workspace) during construction, and acres disturbed (maintained) on a permanent basis during operation of the proposed Keystone Project. Acreage does not include disturbance associated with access roads, or construction camps. Total acres affected by construction in Oklahoma and Texas include 465 acres and 796 acres, respectively, of pipe stockpile sites, rail sidings, and contractors yards that are not included in land use categories. These would be included after survey completion.

Clearing trees within upland and riparian forest communities would result in long-term impacts on these vegetation communities, given the length of time needed for the community to mature to pre-construction conditions. Permanent impacts would occur within the 10-foot-wide riparian and the 30-foot-wide upland permanent easements centered on the pipeline. In this area, trees would be removed and would not be allowed to reestablish due to periodic mowing and brush clearing during pipeline operation. Routine maintenance vegetation clearing would occur no more frequently than every one to three years.

Impacts on shrubland also would be long term because of the time required to reestablish the woody vegetation characteristic of this community type. Most shrubs would be expected to reestablish within the non-maintained portion of the ROW within 5 to 15 years. Permanent impacts on shrubland would result from vegetation clearing over the 10-foot-wide riparian and 30-foot-wide upland permanent easements centered over the pipeline. Vegetation clearing at 3-year intervals would prevent larger woody species from reverting to preconstruction form and size within the permanent easements.

Operation of the Project would cause increases in soil temperatures at the soil surface (from 4 to 8 ˚F) primarily during winter, and at depths of 6 inches (from 10 to 15 ˚F), with the most notable increases during spring in the northern portion of the pipeline (Keystone, 2009c) (see Appendix L). While many plants would not produce root systems that would penetrate much below 6 inches, the root systems of some plants, notably native prairie grasses, trees, and shrubs; often penetrate well below 6 inches. Soil temperatures closer to the pipeline burial depth of 6 feet may be as much as 40 ˚F warmer than the ambient surrounding soil temperatures (Appendix L). In general, increased soil temperatures during early spring would cause early germination and emergence and increased productivity in annual crops such as corn and soybeans and in tall-grass prairie species (Appendix L). Increased soil temperatures may lead to localized soil drying and localized decreases in soil moisture available for evapotranspiration.

To reduce impacts on vegetation within the construction and permanent ROW and to improve the probability of successful revegetation of disturbed areas, Keystone would implement the following measures in its CMR Plan (Appendix B) in accordance with applicable permits:

- Limit construction traffic to the construction ROW, existing roads, and approved private roads;
- Clearly stake construction ROW boundaries including pre-approved temporary workspaces to prevent disturbance to unauthorized areas;
- Mow or disc crops if present to ground level unless an agreement is made for the landowner to remove for personal use;
- Prohibit burning on cultivated lands, as well as on rangelands and pastures when recommended by regulatory agencies;
- Limit the width of the construction ROW at timber shelterbelts in agricultural areas to the minimum necessary to construct the pipeline;
- Strip topsoil in cultivated and agricultural lands to the actual depth of the topsoil to a maximum depth of 12 inches;
- Stockpile stripped topsoil in a windrow along the edge of the ROW, such that the potential for subsoil and topsoil mixing is minimized;
- Prohibit the use of topsoil as construction fill;
- Increase adhesion in topsoil piles by using water or an alternative adhesive agent if required to prevent wind erosion;
- Leave gaps in rows of topsoil and subsoil and prevent obstructions in furrows, furrow drains, and ditches to allow drainage and prevent ponding of water next to or on the ROW;
- Install flumes and ramps in furrows, furrow drains, ditches, and for any watercourse where flow is continuous during construction to facilitate water flow across the trench;
- Ramp bar ditches with grade or ditch spoil to prevent damage to the road shoulder and ditch;
- Restore original contours and drainage patterns to the extent practicable after construction;
- Survey agricultural areas with terraces such that pre-construction contours may be restored after construction;
- Use timber mats, timber riprap, or other methods to stabilize surface conditions when the construction surface is inadequate to support equipment and remove these mats or riprap when construction is complete;
- Provide and maintain temporary and permanent erosion control measures on steep slopes or wherever erosion potential is high;
- Install sediment barriers below disturbed areas where there is a hazard of offsite sedimentation such as at the base of slopes next to road crossings, at the edge of the construction ROW next to a roadway, stream, spring, wetland or impoundment, at trench or test water discharge locations, or

where waterbodies or wetlands are next to the construction ROW, across the ROW at flowing waterbody crossings, upslope of saturated wetlands or wetlands with standing water boundaries, along the edge of the ROW to contain spoil and sediment;

- Install slope breakers (water bars) on slopes greater than 5 percent on all disturbed lands to prevent erosion;
- Apply temporary mulch on disturbed construction work areas that have been inactive for one month or are expected to be inactive for a month or more, using only weed free mulch; and
- Limit soil compaction by prohibiting access by certain vehicles, using only machinery with low ground pressure (tracks or extra-wide tires), limiting access and minimize frequency of all vehicle traffic, digging ditches to improve surface drainage, using timber riprap, matting or geotextile fabric overlain with soil, and stopping construction when necessary.

To restore disturbed areas to pre-construction use and vegetation cover, Keystone would implement the following reclamation and revegetation measures in its CMR Plan (Appendix B) in accordance with applicable permits:

- Test topsoil and subsoil for compaction at regular intervals in agricultural and residential areas;
- Relieve soil compaction on all croplands by ripping a minimum of three passes at least 18 inches deep, and on all pastures by ripping or chiseling a minimum of three passes at least 12 inches deep;
- Relieve subsoil compaction on areas stripped for topsoil salvage by ripping a minimum of three passes at 18 inches or less followed by grading and smoothing (disc and harrow) to avoid topsoil mixing;
- Replace topsoil to pre-existing depths once ripping and discing of subsoil is complete up to a maximum of 12 inches, alleviate compaction on cultivated fields by cultivation;
- Consult with NRCS if there are any disputes between landowner and Keystone as to areas where compaction should be alleviated;
- Plow under organic matter, including wood chips, manure, or planting a new crop such as alfalfa, to decrease soil bulk density and improve soil structure or any other measures in consultation with the NRCS if mechanical relief of compaction is deemed unsatisfactory;
- Inspect the ROW in the first year following construction to identify areas of erosion or settling;
- Apply soil amendments if agreed to by the landowner, such as fertilize and soil pH modifiers in accordance with written recommendations from local soil conservation authorities, land management agencies, or landowners and incorporate into the normal plow layer as soon as possible after application;
- Reseed the reclaimed construction ROW following cleanup and topsoil replacement as closely as possible using seed mixes based on input from the local NRCS and specific seeding requirements as requested by the landowner or the land management agency;
- Use certified seed mixes to limit the introduction of noxious weeds within 12 months of seed germination testing, and adjust seeding rates based on test results;
- Remove and dispose of excess mulch prior to seedbed preparation to prevent seed drills from becoming plugged and to ensure that seed incorporation can operate effectively;

- Re-apply and anchor temporary mulch, such as erosion control blankets, on the construction ROW following seeding;
- Seed at a rate appropriate for the region and for the stability of the reclaimed surface based on pure live seed;
- Use seeding methods appropriate for weather conditions, construction ROW constraints, site access, and soil types using drill seeding unless the ROW is too steep. Temporary cover crop seed shall be broadcast;
- Delay seeding until soil is in an appropriate condition for drill seeding;
- Use Truax or an equivalent-type drill seeder equipped with a cultipacker that is designed and equipped to apply grass and grass-legume seed mixtures, with mechanisms such as seed box agitators to allow even distribution of all species in each seed mix and with an adjustable metering mechanism to accurately deliver the specified seeding rate and depth;
- Operate and calibrate drill seeders so that the specified seeding rate is planted using seed depths consistent with local or regional agricultural practices and row spacing that does not exceed 8 inches;
- Use broadcast or hydro-seeding in lieu of drilling at double the recommended seeding rates and use a harrow, cultipacker, or other equipment immediately following broadcasting to incorporate the seed to the specified depth and to firm the seedbed;
- Delay broadcast seeding during high wind conditions and when the ground is frozen;
- Hand rake all areas that are too steep or otherwise cannot be safely harrowed or cultipacked to incorporate broadcast seed to the specified depth;
- Use hydro-seeding on a limited basis, where the slope is too steep or soil conditions do not warrant conventional seeding methods; and
- Work with landowners to discourage intense livestock grazing of the construction ROW during the first growing season by using temporary fencing, deferred grazing, or increased grazing rotation frequency.

3.5.5.2 Vegetation Communities of Conservation Concern

The proposed pipeline corridor would cross an estimated 339 miles that lie within 66 high-quality native grasslands, and would also cross an estimated 2 miles that lie within 16 prairie dog grasslands (Table 3.5.5-3). High quality grasslands are sites dominated by native grass (>75 percent) and corridor areas adjacent to large tracts of native grasslands with a relatively high diversity of native grasses (three or more) and native forbs (four or more that are relatively common), and very few exotic weeds (Keystone, 2009b). As delineated in Table 3.5.5-3, this category may also include some sagebrush grasslands. These impacts would contribute to the decline in native grasslands described in Table 3.5.2-1 and represent an additional loss to current grassland areas across the Project area. Although native grasslands would be restored, construction affects on previously untilled native prairies could be long-term, as destruction of the prairie sod during trenching may require more than a 100 years for recovery. Short-grass prairie and mixed-grass prairie areas may take 5 to 8 or more years to reestablish due to poor soil conditions and low moisture levels. Construction through prairie dog towns would destroy the burrow systems and surrounding soil characteristics at active and inactive burrow sites. If the burrow sites are active, prairie dogs may reconstruct some of the burrows, if the site is inactive, the loss would be permanent. Soil compaction within extra work-spaces and changes in vegetation structure within the construction ROW would likely lead to reduced use or abandonment of previously used areas by ground squirrels or prairie dogs as habitat suitability would likely be reduced (Lauzon et al. 2002). Invasion of non-native plants also may prevent recovery of prairie grasslands, as would altered land management that may require suppression of wildfires that maintain prairie sod.

The proposed pipeline corridor would cross an estimated 24 miles that lie within 265 sagebrush grasslands (Table 3.5.5-3). Construction through shrublands would destroy woody shrubs and a 30-foot-wide permanent ROW would be kept free of woody vegetation during Project operations. Sagebrush would require 20 to 50 years to reestablish within the non-maintained ROW. The proposed pipeline corridor would cross an estimated 51 miles that lie within 227 riparian areas and bottomland forests (Table 3.5.5-3). Bottomland forests would require 20 to 50 years or more to reestablish late succession floodplain forests. The proposed pipeline corridor would cross an estimated 29 miles that lie within 581 upland forests potentially containing tree communities of conservation concern (Table 3.5.5-3).

TABLE 3.5.5-3
Estimated Impacts on Vegetation Communities of Conservation Concern Occurring along the Project Route

Community Type	Length (miles)[a]	Number of Communities Crossed	Milepost[a]
Steele City Segment			
Montana			
Broadleaf mixed forests	4.3	36	84.3 – 261.1
High-quality native grasslands	164.4	35	0.0 – 280.9
Prairie dog towns	0.2	2	46.8 – 115.6
Riparian habitats	16.3	164	1.0 – 281.8
Sagebrush grasslands	22.7	245	5.7 – 284.1
South Dakota			
High-quality native grasslands	103.6	17	282.5 – 576.3
Prairie dog towns	2.1	13	285.9 – 584.3
Sagebrush grasslands	1.2	20	283.3 – 490.1
Nebraska			
Deciduous forests and woods	4.0	174	597.6 – 849.5
High-quality native grasslands	70.6	14	601.4 – 724.1
Prairie dog towns	0.1	1	600.3
Riparian woodlands	0.4	5	740.0 – 755.9
Gulf Coast Segment			
Oklahoma			
Bottomland forests	3.9	42	2.6 – 151.8
Oak forests and savannas	20.8	371	0.0 – 156.0
Texas			
Swamp chestnut oak-willow oak	4.0	3	453.5 – 458.5
Water oak-willow oak	15.9	11	257.5 – 371.3

TABLE 3.5.5-3 Estimated Impacts on Vegetation Communities of Conservation Concern Occurring along the Project Route			
Community Type	**Length (miles)[a]**	**Number of Communities Crossed**	**Milepost[a]**
Houston Lateral			
Texas			
Water oak-willow oak	10.3	2	18.0 – 29.0

Sources: Keystone 2009b, Redmond et al. 1998, Smith et al. 2001, Henebry et al. 2005, Fisher and Gregory 2001, Brewer 2009, USGS 2009, TPWD 2009.

[a] Approximate mileage and milepost ranges, categories may overlap. Summaries generated using a variety of data sources including Keystone (2009b), GAP databases (USGS 2009), and Texas Natural Diversity Database (TPWD 2009).

To minimize impacts to native grasslands, Keystone would implement these measures identified in its CMR Plan (Appendix B):

- Seed disturbance areas in native range with a native seed mix after topsoil replacement; and
- Monitor the ROW to determine the success of revegetation after the first growing season, and for areas in which vegetation has not been successfully reestablished, reseed the area.

In addition, to minimize impacts to native grasslands in the Sand Hills region, Keystone would implement the following measures in its CMR Plan (Appendix B):

- Educate construction personnel about the fragility of Sand Hills soils and the necessity to adhere to BMPs designed to minimize impacts;
- Incorporate minor route alterations to avoid particularly erosion-prone locations where practicable;
- Avoid highly saturated areas to the maximum extent possible;
- Strive to reduce width of disturbance to the native prairie landscape by adopting trench-line or blade-width stripping procedures where practicable;
- Conserve topsoil to a maximum of 12 inches in depth in all areas where excavation occurs;
- Protect topsoil piles from erosion to the degree practicable; and
- Manage vehicle traffic in areas with high erosion potential or sensitive habitat.

Keystone would implement these reclamation and revegetation measures identified in its CMR Plan (Appendix B) for native grasslands in the Sand Hills region in accordance with applicable permits:

- Develop noxious-weed-free native seed mixes with input from the local NRCS offices and through collaboration with regional experts;
- Mulch and crimp into the soil noxious-weed-free straw or native prairie hay to prevent wind erosion;
- Imprint the land surface to create impressions in the soil to reduce erosion, improve moisture retention and create micro-sites for seed germination;

- Reduce soil disturbance by using sediment logs or straw wattles in place of slope breakers that are constructed of soil;
- Apply photodegradable matting anchored with biodegradable pins on steep slopes or areas prone to extreme wind exposure such as north- or west-facing slopes and ridge tops;
- Work with landowners to prevent overgrazing of the newly established vegetation;
- Monitor reclamation, repair erosion, and reseed poorly revegetated areas as necessary for several years; and
- Develop a noxious-weed management plan specific to the Sand Hills region pending consultation with state and county experts.

Native forests, especially forested floodplains, were once an integral component of the landscape throughout the Great Plains. Many of these communities have been lost due to land conversion to agricultural uses, levee construction, and urban development although in some areas trees have invaded native prairie habitats due to reduced incidence of fire.

Keystone would implement these measures identified in its CMR Plan (Appendix B) for forested uplands and wetlands:

- Salvage timber or allow landowner to salvage timber as requested by landowners;
- Grub tree stumps to a maximum of 5 feet on either side of the trench line and where necessary for grading a level surface for construction equipment using bulldozers equipped with brush rakes to preserve organic matter;
- Dispose of trees, brush, and stumps as per landowners' requirements as stated in the easement agreement;
- Fell trees toward the center line of the ROW to avoid damage to nearby trees and branches and recover trees and slash falling outside of the ROW;
- Prune any broken or damaged branches and branches hanging over the ROW as necessary;
- Burn, chip, or remove tree wastes incorporating chips into soil such that revegetation is not prevented;
- Establish decking sites, approximately 2,000 feet apart in timbered areas, on sites located on approved temporary workspaces in existing cleared areas, and size them appropriately to accommodate the loading equipment; and
- Remove unwanted timber from the construction ROW and transport it to a designated all-weather access point or mill.

In addition to the measures that Keystone has committed to use to protect terrestrial vegetation, the following potential mitigation measures have been suggested by regulatory agencies:

- In Montana, re-inspect the ROW after 5 years to identify areas of erosion or settling and to evaluate the reestablishment of vegetation cover (MDEQ).
- In Montana, test topsoils and subsoils for compaction at regular intervals on rangelands and pastures where requested by landowners, land management agencies or permitting agencies (MDEQ).

- In Montana, relieve compaction on rangelands by ripping or chiseling a minimum of three passes at least 12 inches deep where requested by landowners, land management agencies or permitting agencies (MDEQ).
- In Montana, reseed disturbed areas with seed sources from local populations of Native American traditional use plants in areas used to harvest these resources (MDEQ).

3.5.5.3 Conservation Reserve Program

There would be temporary and permanent impacts similar to those described in Sections 3.5.5.1 and 3.5.5.2 on about 51 miles of CRP land and less than 2 miles of WRP lands along the proposed pipeline corridor. Successful restoration of native vegetation and CRP fields (defined as 90 percent cover of desirable perennial plants, stable soils, and comparable vegetation community composition) would be expected within 4 to 8 years (Keystone 2009c) (see Appendix K).

3.5.5.4 Noxious Weeds

After removal of vegetation cover and disturbance to the soil, reestablishment of vegetation communities could be delayed or prevented by infestations of noxious weeds and invasive plants. Vegetation removal and soil disturbance during construction could create optimal conditions for the establishment of many weeds. Construction equipment traveling from weed-infested areas into weed-free areas could disperse noxious weed seeds or propagules, resulting in the establishment of noxious weeds in previously weed-free areas. A total of 35 miles containing 128 individual noxious weed sources occur along the Steele City Segment of the proposed pipeline corridor. These noxious weed sources could lead to additional noxious weed distribution during construction (Table 3.5.5-4).

TABLE 3.5.5-4
Noxious Weed Sources Occurring along the Steele City Segment of the Project

State and Number of Counties	Weed Type	Length (mi)	Number of Weed Sources
Steele City Segment			
Montana (six counties)			
Four	Bindweeds	0.98	5
One	Common tansy	0.09	1
One	Hawkweeds	0.01	1
Three	Knapweeds	1.24	21
Two	Leafy spurge	2.02	13
Two	Plumeless Thistles	0.20	5
One	Thistles – Canada and Bull (*Cirsium* spp.)	0.01	1
Montana total		***4.55***	47
South Dakota (ten counties)			
Two	Bindweeds	0.44	2
One	Common crupina	0.32	1
One	Knapweeds	0.35	1
Two	Knotweed (*Polygonum* spp.)	0.77	5

One	Plumeless Thistles	0.08	1
One	Tamarisk – Saltcedar	0.10	1
Four	Thistles – Canada and Bull	23.64	17
South Dakota total		***25.7***	28
Nebraska (fourteen counties)			
One	Knapweeds	0.10	2
Two	Leafy spurge	0.78	19
Four	Plumeless Thistles	4.36	30
Two	Thistles – Canada and Bull	0.08	2
Nebraska total		***5.32***	53
Steele City Segment total		***35.57***	128

Source: Keystone 2009c (Summarized from Table 3.5-4).

Specific noxious weed sources along the proposed pipeline corridor in Kansas, Oklahoma and Texas have not been identified through field surveys. A list of potential noxious weeds that occur in these states is shown in Table 3.5.4-1.

Keystone has committed to control the introduction and spread of noxious weeds by implementing the construction and restoration procedures detailed in its CMR Plan (Appendix B). The plan includes coordination with appropriate local, state, and federal agencies to prevent the spread of noxious weeds, insects and soil borne pests:

- Clean all construction equipment, including timber mats, with high-pressure washing equipment prior to moving equipment to the job site;
- Mark all areas of the ROW which contain infestation of noxious weeds;
- Clean the tracks, tires, and blades of equipment by hand or compressed air to remove excess soil prior to movement of equipment out of weed or soil-borne pest infested areas, or use cleaning stations to remove vegetative materials with high pressure washing equipment;
- Strip and store topsoil contaminated with weed populations separately from clean topsoil and subsoil;
- Use mulch and straw or hay bales that are free of noxious weeds for temporary erosion and sediment control;
- Use pre-construction treatment such as mowing prior to seed development or herbicide application (in consultation with county or state regulatory agencies, and landowners) for areas of noxious weed infestations prior to clearing grading, trenching or other soil disturbing work to weed infestation locations identified on construction drawings;
- Limit the potential for spread of weeds by providing weed control by a state-licensed pesticide applicator at valve sites, metering stations and pump stations;
- Reimburse adjacent landowners when they must control weeds that are determined to have spread from the Project's aboveground facilities; and
- Implement weed control measures as required by any applicable plan and in conjunction with the landowner.

3.5.5.5 Connected Actions

Power Distribution Lines and Substations

The primary impacts on vegetation from construction of power distribution lines to pump stations would be cutting, clearing, or removing the existing woody vegetation within the construction work area and potential invasion by noxious weeds. In general, distribution line construction impacts to vegetation would be minor, as many distribution lines would run alongside existing roadways. Where necessary, trees generally would be removed from the distribution line ROW, and the ROW would be maintained free of vegetation that poses an outage risk to the lines or interferes with access for maintenance. Total miles and area by vegetation community affected by construction and operation of the 430 miles of new distribution lines for the Project is presented in Table 3.5.5-5. After construction, power providers would reclaim affected lands in accordance with state and local standards and associated permits.

TABLE 3.5.5-5
Estimated Impacts on Vegetation Communities Crossed by Proposed Electric Distribution Lines for the Project

Vegetation Community Classification	Length of Community Crossed (miles)	Community Area Affected during Construction (acres) [a]	Community Area Affected by Operations (acres) [a]
Steele City Segment			
Montana			
Cropland	30.2	107.7	73.3
Grassland/rangeland	107.7	377.2	261.5
Upland forest	0.5	1.9	6.0
Riverine/open water	2.5	8.5	5.9
Forested wetlands	0.0	0.0	0.0
Shrub-scrub wetlands	0.1	0.4	0.2
Emergent wetlands	0.5	1.7	1.2
Developed land	5.9	21.1	14.4
Montana subtotal	*147.4*	*518.5*	*362.5*
South Dakota			
Cropland	35.7	116.9	86.5
Grassland/rangeland	104.7	327.1	253.8
Upland forest	0.4	1.3	4.8
Riverine/open water	2.4	7.4	5.6
Forested wetlands	0.3	1.0	3.6
Shrub-scrub wetlands	0.1	0.0	0.0
Emergent wetlands	0.6	2.3	1.6
Developed land	17.7	56.4	42.6
South Dakota subtotal	*161.9*	*512.4*	*398.5*
Nebraska			
Cropland	32.4	107.1	78.4
Grassland/rangeland	27.8	91.8	67.3

TABLE 3.5.5-5 Estimated Impacts on Vegetation Communities Crossed by Proposed Electric Distribution Lines for the Project			
Vegetation Community Classification	**Length of Community Crossed (miles)**	**Community Area Affected during Construction (acres)** [a]	**Community Area Affected by Operations (acres)** [a]
Upland forest	1.8	5.6	21.8
Riverine/open water	1.0	3.3	2.4
Forested wetlands	0.5	1.7	6.0
Shrub-scrub wetlands	0.0	0.0	0.0
Emergent wetlands	0.2	0.6	0.4
Developed land	4.4	14.4	10.6
Nebraska subtotal	*68.1*	*224.5*	*186.9*
Cushing Extension Pump Stations			
Kansas			
Cropland	9.0	30.8	21.8
Grassland/rangeland	9.2	31.7	22.3
Upland forest	0.5	1.7	6.0
Riverine/open water	0.3	1.0	0.7
Forested wetlands	0.4	1.3	4.8
Shrub-scrub wetlands	0.0	0.0	0.0
Emergent wetlands	0.0	0.0	0.0
Developed land	2.0	6.8	4.8
Kansas subtotal	*21.4*	*73.3*	*60.4*
Gulf Coast Segment and Houston Lateral			
Oklahoma			
Cropland	0.0	0.0	0.0
Grassland/rangeland	9.7	34.1	23.0
Upland forest	3.8	13.3	46.9
Riverine/open water	0.4	1.3	1.0
Forested wetlands	0.4	1.4	4.8
Shrub-scrub wetlands	0.1	0.3	0.2
Emergent wetlands	0.1	0.4	0.2
Developed land	2.9	10.6	6.8
Oklahoma subtotal	*17.4*	*61.4*	*82.9*
Texas			
Cropland	4.5	25.3	10.8
Grassland/rangeland	5.0	29.1	12.1
Upland forest	1.7	8.5	20.2
Riverine/open water	0.0	0.0	0.0
Forested wetlands	0.0	0.0	0.0

TABLE 3.5.5-5 Estimated Impacts on Vegetation Communities Crossed by Proposed Electric Distribution Lines for the Project			
Vegetation Community Classification	**Length of Community Crossed (miles)**	**Community Area Affected during Construction (acres) [a]**	**Community Area Affected by Operations (acres) [a]**
Shrub-scrub wetlands	0.0	0.0	0.0
Emergent wetlands	0.0	0.0	0.0
Developed land	2.4	12.3	5.8
Texas subtotal	*13.6*	*75.2*	*48.9*

Source: Keystone 2009c (Tables 7.3-2, 7.3-3, 7.3-7, 7.3-8).

[a] Temporary disturbance areas include structure pads, access roads, pulling and tension area, turn around areas, and staging areas. Permanent disturbance areas include forested areas within 80 or 150 foot right-of-way, around pole structures, and crossed by operational access roads

TABLE 3.5.5-6 Summary of Impacts on Vegetation Communities Crossed by Proposed Electric Distribution Lines for the Project			
Vegetation Community Classification	**Length of Community Crossed (miles)**	**Community Area Affected during Construction (acres) [a]**	**Community Area Affected by Operations (acres) [a]**
Steele City Segment			
Cropland	98.3	331.7	238.2
Grassland/rangeland	240.2	796.1	582.6
Upland forest	2.7	8.8	32.6
Riverine/open water	5.9	19.2	13.9
Forested wetlands	0.8	2.7	9.6
Shrub-scrub wetlands	0.2	0.4	0.2
Emergent wetlands	1.3	4.6	3.2
Developed land	28.0	91.9	67.6
Steele City Segment subtotal	*377.4*	*1,255.4*	*947.9*
Cushing Extension Pump Stations			
Cropland	9.0	30.8	21.8
Grassland/rangeland	9.2	31.7	22.3
Upland forest	0.5	1.7	6.0
Riverine/open water	0.3	1.0	0.7
Forested wetlands	0.4	1.3	4.8
Shrub-scrub wetlands	0.0	0.0	0.0
Emergent wetlands	0.0	0.0	0.0
Developed land	2.0	6.8	4.8
Pump Station subtotal	*21.4*	*73.3*	*60.4*

TABLE 3.5.5-6 Summary of Impacts on Vegetation Communities Crossed by Proposed Electric Distribution Lines for the Project			
Vegetation Community Classification	**Length of Community Crossed (miles)**	**Community Area Affected during Construction (acres) [a]**	**Community Area Affected by Operations (acres) [a]**
Gulf Coast Segment			
Cropland	4.5	25.3	10.8
Grassland/rangeland	14.7	63.2	35.1
Upland forest	5.5	21.8	67.1
Riverine/open water	0.4	1.3	1.0
Forested wetlands	0.4	1.4	4.8
Shrub-scrub wetlands	0.1	0.3	0.2
Emergent wetlands	0.1	0.4	0.2
Developed land	5.3	22.9	12.6
Gulf Coast Segment subtotal	*31.0*	*136.6*	*131.8*
Keystone XL Project			
Cropland	111.8	387.8	270.8
Grassland/rangeland	264.1	891.0	640.0
Upland forest	8.7	32.3	105.7
Riverine/open water	6.6	21.5	15.6
Forested wetlands	1.6	5.4	19.2
Shrub-scrub wetlands	0.3	0.7	0.4
Emergent wetlands	1.4	5.0	3.4
Developed land	35.3	121.6	85.0
Keystone XL Project Total	**429.8**	**1,465.3**	**1,140.1**

Sources: Keystone 2009c (Tables 7.3-2, 7.3-3, 7.3-7, 7.3-8).

[a] Temporary disturbance areas include structure pads, access roads, pulling and tension area, turn around areas, and staging areas. Permanent disturbance areas include forested areas within 80 or 150 foot right-of-way, around pole structures, and crossed by operational access roads.

Lower Brule to Witten 230-kV Transmission Line

Upgrades to the power grid in South Dakota to support power requirements for pump stations in South Dakota would include construction of a new 230-kV transmission line and a new substation.

As described in Section 4.4 of the EIS, Western and BEPC have identified two alternative corridors (‘A’ and ‘B’) for the proposed Lower Brule to Witten 230-kV transmission line project, and there are several route options within each corridor.

Lengths of vegetation communities crossed by the route options within the two alternative corridors are based on National Land Cover Data presented in Tables 3.5.5-7 and 3.5.5-8. For corridor A, these vegetation communities range from 67.2 to 72.0 miles of primarily agricultural and range lands and for corridor B, these range from 73.9 to 75.2 miles of primarily agricultural and range lands. Construction and operation impacts on vegetation cover would be the same as for the distribution lines discussed above, however, it is likely that the poles would be larger and that the area disturbed around the installation site would likely be larger.

TABLE 3.5.5-7 Summary of Impacts on Vegetation Communities Crossed by Proposed Lower Brule to Witten 230-kV Transmission Line Corridor A Route Options for the Project					
Vegetation Community Classification	**Western (miles)**	**BEPC-A (miles)**	**BEPC-B (miles)**	**BEPC-C (miles)**	**BEPC-D (miles)**
Cropland	33.1	25.7	26.7	28.2	26.3
Grassland/rangeland	30.3	41.3	40.9	38.0	40.1
Upland forest	0.1	0.1	0.1	0.1	0.1
Riverine/open water	0.3	0.3	0.3	0.3	0.2
Forested wetlands	0.5	0.4	0.2	0.3	0.2
Shrub-scrub wetlands	0.0	0.0	0.0	0.0	0.0
Emergent wetlands	0.3	0.1	0.1	0.2	0.1
Developed land	2.6	1.8	1.8	4.6	5.0
Total	*67.2*	*69.7*	*70.1*	*71.7*	*72.0*

Source: Homer et al. 2004.

TABLE 3.5.5-8 Summary of Impacts on Vegetation Communities Crossed by Proposed Lower Brule to Witten 230-kV Transmission Line Corridor B Route Options for the Project				
Vegetation Community Classification	**BEPC-E (miles)**	**BEPC-F (miles)**	**BEPC-G (miles)**	**BEPC-H (miles)**
Cropland	22.9	23.0	28.6	24.7
Grassland/rangeland	45.7	47.0	40.4	42.5
Upland forest	0.2	0.1	0.1	0.2
Riverine/open water	0.4	0.2	0.2	0.2
Forested wetlands	0.2	0.1	0.5	0.4
Shrub-scrub wetlands	0.0	0.0	0.0	0.0
Emergent wetlands	0.1	0.2	0.3	0.1
Developed land	4.4	4.0	4.4	7.1
Total	*73.9*	*74.6*	*74.5*	*75.2*

Source: Homer et al. 2004.

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3.6 WILDLIFE

The Project crosses six states with a diversity of wildlife, including big game animals, small game animals and furbearers, waterfowl and game birds, and many other nongame animals[1]. Wildlife habitats along the Project ROW include croplands, grasslands/rangelands (short-grass prairie, mixed-grass prairie, tall-grass prairie, and shrublands), upland forests and wetlands. These vegetation communities provide foraging, cover, and breeding habitats for wildlife. This section addresses common big game animals, small game animals and furbearers, waterfowl and game birds, and other nongame animals in the Project area. Protected terrestrial wildlife and wildlife that are considered conservation concerns including black-tailed prairie dogs (*Cynomys ludovicianus*), swift fox (*Vulpes velox*), bald eagle (*Haliaeetus leucocephalus*), greater prairie-chicken (*Tympanuchus cupido*), and greater sage-grouse (*Centrocercus urophasianus*) are discussed in Section 3.8 and aquatic wildlife are discussed in Section 3.7.

3.6.1 Wildlife Resources

Common Project area wildlife and the habitats they use are described in Table 3.6.1-1. Some animals such as white-tailed deer and eastern cottontail are present across the entire Project area whereas other animals, such as nutria (coypu) and armadillo, are present only within the southern portion of the Project area. Many common waterbirds and landbirds nest in the northern or central portions of the Project area and winter in the southern portion of the Project area. Many common animals are valued game resources and most hunting for big and small game animals, furbearers, upland game birds, and waterfowl occurs during the fall. Turkeys are hunted both spring and fall, with most harvest occurring during the spring hunts.

3.6.1.1 Big Game Animals

White-tailed deer, mule deer, and pronghorn are the principal big game animals that occur along the Project route. White-tailed deer and mule deer are highly adaptable and inhabit a variety of habitats, including cropland, grasslands, shrublands, and woodlands. White-tailed deer may also be found in close association with humans. In the northern portions of their range, deer may aggregate or "yard" during winter in stream bottoms, on south-facing slopes, or other areas where snow accumulations are reduced. Pronghorns are generally more abundant west of the project area. Translocation has been used to reestablish game elk populations in Montana and South Dakota and some small elk populations have been reestablished in areas crossed by the Project in Nebraska and eastern Texas. Moose occur throughout western Montana and increasingly occur within eastern Montana. American bison (*Bos bison*) are a species of conservation concern in Montana, and once occurred throughout the Great Plains in multitudes. Free-ranging bison no longer occur within the area crossed by the Project.

3.6.1.2 Small Game Animals and Furbearers

The small game animals and furbearers most often hunted or trapped in the Project area include cottontails, coyotes, opossums, raccoons, red fox, and tree squirrels. Tree squirrels depend on forested

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[1] Common names of animals are used in this section. Scientific names following nomenclature in the NatureServe Explorer database (NatureServe, 2009) for most animals discussed in this section are listed in Table 3.6.1-1. Where animals discussed in this section are not included in Table 3.6.1-1, common names are followed by the scientific name.

habitats, usually deciduous or mixed hardwood forests with abundant supplies of acorns and hickory nuts. Cottontails, coyotes, opossums, and raccoons use a wide variety of habitats, including croplands, forests, shelterbelts, living snowfences and rangelands. Many furbearers, such as American beavers, American mink, raccoon, and weasels, are associated with riparian and wetland areas.

TABLE 3.6.1-1
Common Terrestrial Wildlife Resources That Occur along the Project Route [a]

Sporting Status and Species	Occurrence by State						Habitat Association
	MT	SD	NE	KS	OK	TX	
Big Game Animals							
Elk *(Cervus canadensis)*	√	√	√				Found over a range of habitats. Uses open areas, such as alpine pastures, marshy meadows, river flats, and aspen parkland, as well as coniferous forests, brushy clear cuts or forest edges, and semi-desert areas. Generally present west of the project area, present in the Niobrara River area in Nebraska.
Mule deer *(Odocoileus hemionus)*	√	√	√	√	√	√	Found in coniferous forests, desert shrub, chaparral, grasslands with shrubs, and badlands. Often associated with successional vegetation, especially near agricultural lands. Generally more common west of the Project area.
Pronghorn [antelope] *(Antilocapra americana)*	√	√	√				Found in grasslands, sagebrush plains, deserts, and foothills. Need for free water varies with succulence of vegetation in the diet. More common west of the Project area.
White-tailed deer *(Odocoileus virginianus)*	√	√	√	√	√	√	Found in various habitats—from forest to fields—with adjacent cover. In northern regions, usually require stands of conifers for winter shelter. In the north and in mountain regions, limited ecologically by the depth, duration, and quality of snow cover; summer ranges are traditional, but winter range may vary with snow conditions.
Moose (*Alces alces)*	√						Summer habitat includes mountain meadows, river valleys, swampy areas, clearcuts, while winter habitat includes willow flats or mature coniferous forests. Uneven plant age composition and willowsare important. Closed canopy stands may be important in late winter. Woodlots, row crops, and riparian forests are important habitat in prairie regions.
Small Game Animals							
Eastern cottontail [rabbit] *(Sylvilagus floridanus)*	√	√	√	√	√	√	Found in brushy areas, open woodlands, swampy areas, stream valleys, grasslands, and suburbs. Very adaptable species. Nests usually are in shallow depressions, in thick vegetation or in underground burrows.
Eastern fox squirrel *(Sciurus niger)*	√	√	√	√	√	√	Found in open mixed hardwood forests or mixed pine-hardwood associations; species also has adapted well to disturbed areas, hedgerows, and city parks. Prefers savanna or open woodlands to dense forests. Western range extensions are associated with riparian corridors of cottonwoods (*Populus* spp.) and fencerows of osage-orange (*Maclura pomifera*). Dens are in tree hollows or leaf nests.

TABLE 3.6.1-1 Common Terrestrial Wildlife Resources That Occur along the Project Route [a]							
	Occurrence by State						
Sporting Status and Species	**MT**	**SD**	**NE**	**KS**	**OK**	**TX**	**Habitat Association**
Eastern gray squirrel *(Sciurus carolinensis)*	√	√	√	√	√	√	Prefers mature deciduous and mixed forests with abundant supplies of acorns and hickory nuts. Diversity of nut trees needed to support high densities. Uses city parks and floodplain forests. Seldom far from permanent open water. Nests in tree cavities or in leaf nests, usually 25 feet or more above ground.
North American porcupine *(Erethizon dorsatum)*	√	√					Prefers coniferous and mixed forests, also uses riparian zones, grasslands, shrublands, and deserts in some parts of range. Winter dens in rock outcrops, hollow trees, hollow logs or outbuildings, may shelter in dense conifers in winter. Range is generally west of project area in Nebraska, Kansas, Oklahoma and Texas.
Furbearers							
American badger *(Taxidea taxus)*	√	√	√	√	√	√	Prefers open grasslands and fields, and may also frequent shrublands with little groundcover. When inactive, occupies underground burrows.
American beaver *(Castor canadensis)*	√	√	√	√	√	√	Inhabits permanent sources of water of almost any type in its range, which extends from arctic North America to Gulf of Mexico and arid Southwest, and from sea level to over 6,800 feet in mountains. Prefers low-gradient streams, which it modifies, ponds, and small mud-bottomed lakes with outlets that can be dammed. Associated with deciduous tree and shrub communities.
Bobcat *(Lynx rufus)*	√	√	√	√	√	√	Found in various habitats, including mixed woodlands and forest edge, hardwood forests, swamps, forested river bottomlands, shrublands, and other areas with thick undergrowth. Dens in hollow logs, under fallen trees, in rock shelter; rests in similar habitats changing locations daily.
Coyote *(Canis latrans)*	√	√	√	√	√	√	Wide ranging and found in virtually all habitats from open prairies in west to heavily forested regions in northeast. Den in burrow or at base of tree under branches, in hollow log or rock crevice, reuses den site. Often considered a pest, especially by the livestock industry. Control programs have been largely ineffective.
Red fox *(Vulpes vulpes)*	√	√	√	√	√	√	Found in open and semi-open habitats. Usually avoids dense forest, although open woodlands are frequently used. Sometimes occurs in suburban areas or cities. Maternity dens are in burrows dug by fox or abandoned by other mammals, often in open fields or wooded areas; sometimes under rural buildings, in hollow logs, or under stumps.

TABLE 3.6.1-1
Common Terrestrial Wildlife Resources That Occur along the Project Route [a]

Sporting Status and Species	Occurrence by State MT	SD	NE	KS	OK	TX	Habitat Association
Gray fox *(Urocyon cinereoargenteus)*			√	√	√	√	Found in woodland and shrubland in rough, broken country, usually avoids open areas. Dens in cleft, small cave, hollow in tree or log or debris pile, or less frequently in abandoned burrows.
White-tailed jackrabbit *(Lepus townsendii)*	√	√	√				Found in sage-grasslands, open areas, woodlots and riparian areas. Nests in depression in ground or burrows abandoned by other animals. During day usually in shallow depressions at base of bush or in or near cavity in snow.
American mink *(Neovison vision)*	√	√	√	√	√	√	Prefers forested, permanent or semipermanent wetlands with abundant cover, marshes, and riparian zones. Dens in muskrat burrow, abandoned beaver den, hollow log, hole under tree roots or in stream bank burrows.
Common muskrat *(Ondatra zibethicus)*	√	√	√	√	√	√	Prefers fresh or brackish marshes, lakes, ponds, swamps, and other bodies of slow-moving water, most abundant in areas with cattail. Dens in bank burrow or in vegetation mound in shallow water, sometimes in uplands.
Nutria [Coypu] *(Myocastor coypus)*			√		√	√	Introduced from South America for weed control, prefers freshwater marshes, brackish marshes. Nests in burrows, abandoned muskrat houses or in dense vegetation. May displace native muskrat populations.
Virginia opossum *(Didelphis virginiana)*		√	√	√	√	√	Found in a variety of habitats, prefers wooded riparian habitats, also found in suburban areas. Very adaptable; may be found in most habitats. Generally uses abandoned burrows, buildings, hollow logs, and tree cavities for den sites.
Raccoon *(Procyon lotor)*	√	√	√	√	√	√	Found in variety of habitats usually with moisture, often along streams and shorelines; prefers riparian and edges of wetlands, ponds, streams, and lakes. Dens under logs or rocks, in tree hole, ground burrow, or in bank den.
Striped skunk *(Mephitis mephitis)*	√	√	√	√	√	√	Prefers semi-open country with woodland and meadows interspersed with brushy areas, and bottomland woods. Frequently found in suburban areas. Dens often under rocks, logs, or buildings. May excavate burrow or use burrow abandoned by other mammals.
Least weasel *(Mustela nivalis)*	√	√	√	√			Uses variety of habitats as available including open forests, farmlands, grassy fields and meadows, riparian woodlands, hedgerows, prairies and sometimes residential areas. Young born in abandoned burrows, rests in nests in abandoned vole burrows, or holes in walls, or under out buildings.

TABLE 3.6.1-1
Common Terrestrial Wildlife Resources That Occur along the Project Route [a]

Sporting Status and Species	Occurrence by State: MT	SD	NE	KS	OK	TX	Habitat Association
Long-tailed weasel *(Mustela frenata)*	√	√	√	√	√	√	Found in a variety of habitats, usually near water. Preferred habitats are shrubland and open woodlands, field edges, riparian grasslands, swamps and marshes. Dens in abandoned burrows, rock crevice, brush pile, stump hollow or among tree roots.
Waterfowl							
Dark Geese							
Canada goose *(Branta canadensis)* White-fronted goose *(Anser albifrons)*	√	√	√	√	√	√	Found in various habitats near water, from temperate regions to tundra. Usually breeds and feeds in areas near lakes, ponds, large streams, and inland and coastal marshes. Forages in pastures, cultivated lands, grasslands, and flooded fields. Canada geese may be year-round residents in Project area, seasonal migrants or overwintering populations. White-fronted geese are seasonal migrants or overwintering populations. Widely hunted, with estimated Central Flyway mid-winter population of 1.67 million during 2008.
Light Geese							
Snow goose *(Chen caerulescens)* Ross's goose *(Chen rossii)*	√	√	√	√	√		Found in various habitats near water, from temperate regions to tundra. Winters in both freshwater and coastal wetlands, wet prairies, and extensive sandbars; forages in pastures, cultivated lands, and flooded fields. Migrate and winter in the Project area. Widely hunted, with estimated Central Flyway mid-winter population of 816,000 during 2008.
Swans							
Tundra swan *(Cygnus columbianus)*	√	√	√	√	√	√	Generally found in lakes, sloughs, rivers, and sometimes fields during migration. Open marshy lakes and ponds, and sluggish streams in summer. Generally west of Project area during spring and fall migration; hunted in Montana and South Dakota.

TABLE 3.6.1-1
Common Terrestrial Wildlife Resources That Occur along the Project Route [a]

Sporting Status and Species	Occurrence by State						Habitat Association
	MT	SD	NE	KS	OK	TX	
Dabbling Ducks							
Mallard *(Anas platyrhynchos)* Gadwall *(Anas strepera)* Green-winged teal *(Anas crecca)* Blue-winged teal *(Anas discors)* American wigeon *(Anas americana)* Northern shoveler *(Anas clypeata)* Northern pintail *(Anas acuta)* Cinnamon teal *(Anas cyanoptera)*	√	√	√	√	√	√	Primarily found in shallow waters, such as ponds, lakes, marshes, and flooded fields; in migration and in winter, mostly found in fresh water and cultivated fields, less commonly in brackish situations. Widely hunted, with estimated Central Flyway mid-winter population of 5.66 million during 2008.
Diving Ducks							
Redhead *(Aythya americana)* Ring-necked duck *(Aythya collaris)* Lesser scaup *(Aythya affinis)* Greater scaup *(Aythya marila)* Canvasback *(Aythya valisineria)*	√	√	√	√	√	√	Commonly found on marshes, ponds, lakes, rivers, and bays. Widely hunted, with estimated Central Flyway mid-winter population of 600,000 during 2008.
Waterbirds							
American coot *(Fulica americanan)*	√	√	√	√	√	√	Commonly found on marshes, ponds, lakes, rivers, and bays. Widely hunted, with estimated Central Flyway mid-winter population of 730,000 during 2008.

TABLE 3.6.1-1
Common Terrestrial Wildlife Resources That Occur along the Project Route [a]

Sporting Status and Species	Occurrence by State MT	SD	NE	KS	OK	TX	Habitat Association
Sandhill crane *(Grus canadensis)*	√	√	√	√	√	√	During migration, roosts at night along river channels, on alluvial islands of braided rivers, or natural basin wetlands. Communal roost site consisting of an open expanse of shallow water is key feature of wintering habitat. Occurs throughout Project area during spring and fall migrations. Winters along Texas coastline in Project area. Hunted in all states except Nebraska. Estimated mid-continent spring abundance of 470,000 during 2008.
Game Birds							
Northern bobwhite *(Colinus virginianus)*		√	√	√	√	√	Inhabits a wide variety of vegetation types, particularly early-succession stages. Occurs in croplands, grasslands, pastures, fallow fields, grass-shrub rangelands, open pinelands, open mixed pine-hardwood forests, and habitat mosaics. Nests on the ground, in a scrape lined with grasses or dead vegetation.
Mourning dove *(Zenaida macroura)*	√	√	√	√	√	√	Found in open woodlands, forest edge, cultivated lands with scattered trees and bushes, parks and suburban areas, and arid and desert country. Usually nests in tree or shrub, may also use stumps, rocks, buildings, or ground. Breeding resident at in Montana and South Dakota, year-round resident within remainder of Project area. Widely hunted—7.0 million harvested in states crossed by the Project during 2007, primarily in Texas.
Sharp-tailed grouse *(Tympanuchus phasianellus)*	√	√	√				Requires a mosaic of dense grass and shrubs with rich forb and insect foods during nesting, relies on riparian areas during winter, also uses cultivated grains and hedgerows.
Gray partridge [hun] *(Perdix perdix)*	√	√	√				Non-native game bird; found in cultivated lands with marginal cover of bushes, undergrowth or hedgerows. Nests in grasslands, hayfields, or grain fields in scratched-out hollow lined with grasses and leaves.
Ring-necked pheasant *(Phasianus colchicus)*	√	√	√	√			Non-native game bird; found in open country (especially cultivated areas, scrubby wastes, open woodland, and edges of woods), grassy steppe, desert oases, riverside thickets, swamps, and open mountain forest. Winter shelter includes bushes and trees along streams, shelterbelts, and fencerows. Usually nests in fields, brushy edges, or pastures; also along road rights-of-way. Nest is shallow depression.

TABLE 3.6.1-1
Common Terrestrial Wildlife Resources That Occur along the Project Route [a]

Sporting Status and Species	Occurrence by State						Habitat Association
	MT	SD	NE	KS	OK	TX	
Wilson's snipe *(Gallinago delicata)*	√	√	√	√	√	√	Nests in wet grassy or marshy areas, non-breeding in wet meadows, flooded fields, bogs, swamps, marshy banks of rivers and lakes. Breeds Montana, South Dakota; migrant and nonbreeding resident Nebraska, Kansas, Oklahoma, and Texas. Widely hunted with Central Flyway harvest estimate of 12,000 in 2008.
Wild turkey *(Meleagris gallopavo)*	√	√	√	√	√	√	Found in forests and open woodland, scrub oak, deciduous or mixed deciduous-coniferous forests, also agricultural areas. Roosts in trees at night and nests on ground, usually in open areas at the edge of woods. Not native to Montana. Widely hunted.
American Woodcock *(Scolopax minor)*			√	√	√	√	Found associated with young, second-growth hardwoods and early succession habitats resulting from forest disturbance, prefers young forests and abandoned farmland mixed with forests, prefers edge habitats. Woodcock are harvested in Nebraska, Kansas, Oklahoma and Texas—6,700 during 2008.
Representative Non-Game Animals							
Mammals							
Little brown myotis [bat] *(Myotis lucifugus)*	√	√	√	√	√		Found using human-made structures for resting and maternity roosts, also uses caves and hollow trees. Forages in woodlands near water, requires caves, tunnels, abandoned mines in winter.
Nine-banded armadillo *(Dasypus novemcinctus)*			√	√	√	√	Prefers brushy areas with loose soil, also common in pinelands and hardwood uplands. Individuals make several burrows, often at side of creek.
Cinereus [Masked] shrew *(Sorex cinereus)*	√	√	√				Found in most terrestrial habitats, except areas with little or no vegetation, thick leaf litter in damp forests may be favored habitat. Nests in shallow burrows or in logs and stumps.
White-footed mouse *(Peromyscus leucopus)*	√	√	√	√	√	√	Prefers woodland edges, brushy fields, riparian zones. Nests underground, under debris, in buildings, in logs or stumps, tree cavities, old squirrel or bird nests.
Birds							
American Crow *(Corvus brachyrhynchos)*	√	√	√	√	√	√	Found in open and partly open country, agricultural lands, suburban areas. Nests in open forests and woodlands
Great blue heron *(Ardea herodias)*	√	√	√	√	√	√	Found in freshwater and brackish marshes, along lakes, rivers, fields, meadows. Nests in high trees in swamps and forested areas, often with other herons close to foraging habitat.

TABLE 3.6.1-1
Common Terrestrial Wildlife Resources That Occur along the Project Route [a]

Sporting Status and Species	Occurrence by State						Habitat Association
	MT	SD	NE	KS	OK	TX	
Prairie falcon *(Falco mexicanus)*	√	√					Found primarily in open habitats, mountainous areas, steppe, plains or prairies. Nests in hole or sheltered ledge on rocky cliff or steep earth embankments. During winter use large areas with low vegetation structure for foraging. Resident or migratory within Project area.
Red-tailed hawk *(Buteo jamaicensis)*	√	√	√	√	√	√	Found in wide variety of open woodland and open country with scattered trees, nests in forests, elevated perches are important habitat component. Often reuses nest trees.
Red-shouldered hawk *(Buteo lineatus)*				√	√	√	Found in bottomland hardwoods to upland deciduous or mixed forests. Nests usually forested area near water. Year-round resident eastern Kansas, Oklahoma and Texas.
Roseate spoonbill *(Platalea ajaja)*						√	Brackish waters and coastal bays in Texas, shallow, open, still or slow-flowing water. Nests in mangroves (*Avicennia germinans*), low bushes along coastal islands.
Turkey vulture *(Cathartes aura)*	√	√	√	√	√	√	Found in forested and open areas, may roost in large flocks. Nests on cliffs, hollow logs, trees, tree-cavities, or on ground in dense shrubs. Feeds primarily on carrion.
Eastern screech-owl *(Megascops asio)*	√	√	√	√	√	√	Open woodland, deciduous forest, woodland/forest edge, swamps, parklands, residential areas, scrub and riparian woodland in drier regions. Nests in natural tree cavity, old woodpecker hole, nest boxes.
Great horned owl *(Bubo virginianus)*	√	√	√	√	√	√	Found in various forested habitats, moist or arid, deciduous or evergreen lowland forests to open woodlands, swamps, riverine forests. Nests in trees, tree cavities, stumps, rocky ledges, barns. Year-round resident throughout Project area.
Long-eared owl *(Asio otus)*	√	√	√	√	√	√	Found in forests, riparian woodlands, woodlots next to open areas for hunting. Nests in trees, usually in old nest of other large birds or squirrels, sometimes in tree cavities. Year-round resident in Montana and South Dakota, non-breeding resident in Nebraska, Kansas, Oklahoma and Texas.
Western meadowlark *(Sturnella neglecta)*	√	√	√	√	√	√	Grasslands, open fields, pastures, cultivated lands, sometimes marshes. Nests on ground in vegetation. Primarily feed on insects, grains seeds. Migratory in northern portions of range, breeding resident in Montana and South Dakota, year-round resident in Nebraska and Kansas, overwinters in Oklahoma and Texas in the Project area.

TABLE 3.6.1-1
Common Terrestrial Wildlife Resources That Occur along the Project Route [a]

Sporting Status and Species	Occurrence by State						Habitat Association
	MT	SD	NE	KS	OK	TX	
Amphibians							
Bufonid toads (*Bufo* spp.)	√	√	√	√	√	√	Found in variety of lowland habitats, deserts, prairie grasslands, pastures, woodlands. Reproduction dependent on rain pools, flooded areas, ponds in shallow water. Adults feed primarily on invertebrates. Hibernates during winter months and during summer dry spells, burrows underground when inactive.
Ranid Frogs (*Rana* spp.)	√	√	√	√	√	√	Found in variety of aquatic and wetland habitats. Adults feed primarily on invertebrates. Hibernates during winter months, burrows in benthic sediments, generally underwater.
Reptiles							
Gartersnakes (*Thamnophis* spp.)	√	√	√	√	√	√	Found in a wide range of aquatic, wetland, and upland habitats, preference appears regional. When inactive occurs underground or in other secluded site, hibernates in northern portions of range, remains active year-sound in southern locations.
Rattlesnakes (*Crotalus* spp.)	√	√	√	√	√	√	Found in a wide variety of habitats; forests, prairies, riparian habitats often associated with rocky outcroppings. Feeds on small mammals, lizards, birds, bird eggs. Seasonally migrate between hibernacula typically located in rocky areas with underground crevices, and summer habitat, communal hibernation.
Six-lined racerunner [lizard] (*Aspidoscelis sexlineata*)		√	√	√	√	√	Found in sunny areas with open ground; grassland, sandhills, sandy or gravelly banks and floodplains of streams, sparsely vegetated rocky areas, woodland edges and open woods. Shelters underground or under rocks on ground. Eggs laid in nest in soft soil or under logs. Insectivore, hibernates.
Western box turtle (*Terrapene ornata*)		√	√	√	√	√	Found in prairie grasslands, pastures, fields, sandhills, open woodland, sometime in slow, shallow streams and creek pools. Burrows into soil or enters burrows made by other animals. Eggs laid in nests in soft well-drained soil in open area. Insectivore, hibernates.
Insects							
Cicada [locust] (Family *Cicadidae*)	√	√	√	√	√	√	Large flying insect, juveniles feed on plant roots. Varying life cycles with periods of 2 to 8 and up to 17 year periods for emergence from nymphs from the ground.
Monarch [butterfly] (*Danaus plexippus*)	√	√	√	√	√	√	Breeds and larvae feed on milkweed (*Asclepias* spp.) in North America, migrate to overwintering areas in Mexico and coastal California. Adults feed on nectar.

Sources: Keystone 2009b, NatureServe 2009, Kruse 2008, Raftovich et al. 2009.

√ = Indicates that the species occurs in the state. Square brackets present alternative common names.

[a] Protected animals including federal and state listed endangered, threatened or candidate species and species identified as conservation concerns or priority are discussed in Section 3.8. Aquatic animals are discussed in Section 3.7.

3.6.1.3 Waterfowl and Game Birds

The Project area lies within the Central Flyway; all ducks, geese, swans, waterbirds, shorebirds and sandhill cranes present within the Project area are considered migratory. Most of the region's waterfowl and waterbirds either nest within the Project area or to the north, migrate through the Project area during spring and fall, and winter in areas near the southern end of the Project in Oklahoma and Texas. All migratory birds are protected by the Migratory Bird Treaty Act (MBTA) (16 USC 703–712; 40 Stat. 755 as amended) which prohibits the take of any migratory bird without authorization from USFWS. The MBTA states that "unless and except as permitted by regulations. . . it shall be unlawful at any time, by any means or in any manner, to . . . take, capture, kill, possess. . . any migratory bird, any part, nest, or eggs of any such bird. . .". Non-migratory birds such as upland game birds and non-native birds such as European starling (*Sturnus vulgaris*), rock pigeon (*Columba livia*), and house sparrow (*Passer domesticus*) are not protected by the MBTA. Hunting seasons are set and regulated by USFWS and state wildlife management agencies. Waterfowl are harvested primarily in fall; however, spring light goose seasons (snow and Ross's geese) are open in some areas in response to expanding populations of these birds that nest in arctic Canada. Many waterfowl breed in habitats that would be crossed by the pipeline, and additional migrants pass through the Project area to and from northern breeding grounds during spring and fall. Sandhill cranes are hunted in Montana, South Dakota, Kansas, Oklahoma, and Texas. Nebraska is closed to hunting for sandhill cranes (Sharp et al. 2006).

Wild turkeys, grouse, and northern bobwhite are resident game birds and as such are not protected by the MBTA. Some native game birds are considered conservation concerns and are discussed in Section 3.8. Seasons and bag limits for native and introduced game birds, such as ring-necked pheasants and gray partridge, are set by state wildlife management agencies. Turkeys are hunted primarily during spring (bearded birds, males only), when most harvest occurs; but they also may be taken during fall hunts, which are usually open for any turkey. Most other resident game birds are hunted during fall. Mourning doves, Wilson's snipe, and American woodcock are migratory game birds that are protected by the MBTA. Hunting seasons and limits are set and regulated by USFWS and state wildlife management agencies.

3.6.1.4 Non-game Animals

The Project crosses many different habitats that are home to a wide variety of animals. A small sample of wide-ranging representative common non-game animals is described in Table 3.6.1-1. Small mammals such as northern pocket gophers (*Thomomys talpoides*), woodchucks (*Marmota monax*), mice (Muridae), shrews (generally *Sorex* spp.), ground squirrels (*Spermophilus* spp.), and voles (*Microtus* spp.) provide important prey for badgers, coyotes, foxes, weasels, raptors and snakes. Common amphibians and reptiles include frogs, toads, many types of turtles, lizards, and snakes. Many different types of invertebrates occur across the project area including bees, beetles, butterflies, cicadas, earthworms, grasshoppers, hornets, moths, and spiders which provide food for birds, amphibians, reptiles, and small mammals.

The Project area lies primarily within the Prairie Avifaunal Biome (Rich et al. 2004). Breeding landbirds in grassland habitats in the Prairie Avifaunal Biome are primarily short-distance migrants, with several species wintering in the southern portions of the Project area, and others overwintering in the southeast and southwest (Rich et al. 2004). Many migratory birds use habitats crossed by the Project for nesting, migration, and overwintering, with the largest number of species nesting in the northern portion of the Project in Montana, South Dakota and Nebraska and the largest number of wintering species in the southern portion of the Project in Texas. Bald and golden eagles (*Aquila chrysaetos*) and their nests are further protected by the Bald and Golden Eagle Protection Act (16 USC 688–688d [a and b]). Bald and golden eagles are discussed in Section 3.8, as are other migratory birds that have been identified as conservation concerns. Destruction or disturbance of a migratory bird nest that results in the loss of eggs or young is a violation of the MBTA.

Aerial stick nest surveys were conducted along the entire Project ROW during spring 2008 and 2009 to identify large stick nest sites of raptors and herons in deciduous trees within from 0.25 to 1 mile from the Project centerline (Keystone 2009b). A total of 297 nests, 8 great blue heron rookeries, and 1 roseate spoonbill rookery were documented; 226 nests and 3 great blue heron rookeries along the Steele City Segment, and 71 nests and 6 rookeries along the Gulf Coast Segment and Houston Lateral. Of the active nests where the birds could be identified for species, there were 46 red-tailed hawk nests, 16 great horned owl nests, 9 ferruginous hawk (*Buteo regalis*) nests, 7 great blue heron rookeries, 3 long-eared owl nests, 1 roseate spoonbill rookery, and 3 raptor nests occupied by Canada geese. An additional unoccupied rookery on the Gulf Coast Segment was determined to be a great blue heron rookery. Riparian habitats (75 percent) were the most common habitats recorded for raptor nests, followed by rocky cliffs (14 percent) and cottonwood woodlands (5 percent) for the Steele City Segment (Keystone 2009a). Nesting habitats were not recorded during the Gulf Coast and Houston Lateral surveys (Keystone 2009b).

3.6.2 Potential Impacts

The Project would affect wildlife resources through:

- Habitat loss, alteration, and fragmentation;
- Direct mortality during construction and operation;
- Indirect mortality because of stress or avoidance of feeding due to exposure to construction and operations noise, and from increased human activity;
- Reduced breeding success from exposure to construction and operations noise, and from increased human activity;
- Reduced survival or reproduction due to decreased abundance of forage species or reduced cover; and

The Project would cross habitats used by wildlife described in Table 3.6.1-1. Construction of the proposed Project would result in loss and alteration of about 22,493 acres, including 11,533 acres of grasslands and rangelands, 2,523 acres of forested habitat, and 554 acres of wetland habitats (including 271 acres of forested wetlands)(Table 3.5.5-2). The Project would parallel other pipelines or utility ROWs along about 34 percent of its 1,379 mile route, primarily in Oklahoma and Texas. The Steele City Segment would cross primarily rangeland and croplands. The Gulf Coast Segment would cross primarily rangeland and forestland and would parallel other ROWs along much of the route. The Houston Lateral would cross primarily forestlands and rangelands. Some, but not all, important wildlife habitats identified along the Project route are listed in Table 3.6.2-1. In addition, 400 temporary access roads (~252 miles) and 50 permanent access roads (~34 miles) would be constructed. Four construction camps (80 acres each) would be established within remote areas crossed by the project in Montana and South Dakota. Areas altered by construction of temporary access roads and construction camps would generally be restored and revegetated. Communication towers, generally 33 feet in height, would be erected at each of the 30 pump stations.

Fragmentation is the splitting of a large continuous expanse of habitat into numerous smaller patches of habitat with a smaller total habitat area, and isolation within a matrix of habitats that are unlike the original (Wilcove et al. 1986). Habitat fragmentation has two components; (1) reduction in total habitat area and (2) reorganization of areas into isolated patches (Fahrig 2003). Habitat loss generally has large negative effects on biodiversity, while fragmentation generally has a much weaker effect that may be either positive or negative (Fahrig 2003). The effects of habitat fragmentation are dependent on many variables including original habitat structure, landscape context, predator communities, and susceptibility to nest parasitism (Tewksbury et al. 1998). Habitat fragmentation effects may be most pronounced in forested and shrubland habitats and would generally be reduced for pipeline corridors compared to road corridors because their widths are usually narrower, some vegetation cover is reestablished, and there is usually less associated human disturbance during operation (Hinkle et al. 2002). During construction, however, pipelines can be significant barriers to wildlife movements (Hinkle et al. 2002). After construction, pipeline corridors may be used as travel corridors by coyotes, deer, raccoons, and many other animals. Wildlife habitat fragmentation issues relevant for pipeline construction and operation include:

- Reduction in patch size of remaining available habitats;
- Creation of edge effects;
- Barriers to movement;
- Intrusion of invasive plants, animals, and nest parasites;
- Facilitation of predator movements;
- Habitat disturbance; and
- Intrusion of humans (Hinkle et al. 2002).

Pipeline construction removes vegetation including native grasses, sagebrush, and trees, creating an unvegetated strip over the pipeline trench and the adjacent construction areas. Subsequent revegetation may not provide habitat features comparable to pre-project habitats. Typically, seed mixes for reclamation include many non-native plants that quickly establish vegetative cover to prevent soil erosion, but these plants often outcompete and do not allow subsequent reestablishment of native flora and vegetation structure. Sagebrush is particularly difficult to establish on disturbed sites; especially when these sites are seeded with non-native grasses and other plants that germinate and establish more rapidly. Removal of vegetation increases the potential for the establishment and spread of noxious weeds and other invasive plants that have little use or value for wildlife and that displace native plants resulting in degraded wildlife habitat values. Freshly seeded grasses can attract domestic livestock and wildlife and are often preferentially grazed. Grazing of the ROW prior to the development of a self-sustaining vegetative cover can inhibit revegetation and extend the time to reestablish habitat linkages across the ROW. The pipeline ROW would be maintained free of trees and shrubs, including sagebrush, resulting in long-term alteration of wildlife habitat structure and value (Keystone 2008, 2009).

During construction, pipelines can present a significant temporary physical barrier to wildlife movement. The open trench and welded pipeline sections stored along the construction ROW prior to burial can block movements of both large and small animals across the construction ROW. Small animals may also become trapped in open trench sections. Operation of heavy equipment can also create behavioral barriers to wildlife movements by displacing animals by disturbance.

After construction, the pipeline ROW, unblocked temporary access roads, and permanent access roads may alter human activity especially within remote sections of the Project which could lead to increased wildlife disturbance and potentially to increased direct wildlife mortality from vehicle-animal collisions, and legal and illegal killing of wildlife; and indirect mortality and reduced reproduction due to displacement, increased stress, and increased predation (Madson 2006, MBOGC 1989, WYGF 2004).

All-terrain vehicle users could travel on portions of the ROW, either legally or illegally. The construction of new roads, upgrades to existing roads, and the subsequent use of those roads generally would result in negative impacts to a wide range of wildlife including: elk and deer (Canfield et al. 1999); carnivores (Claar et al. 1999), small mammals (Hickman et al. 1999), birds (Hamann et al. 1999); and amphibians and reptiles (Maxell and Hokit, 1999).

Impacts associated with exposure to toxic materials or crude oil releases are addressed in Section 3.13.

TABLE 3.6.2-1 Important Wildlife Habitats along the Project Route			
Milepost	**Name**	**Ownership and Description**	**Miles**
Steele City Segment			
Montana			
4.2 to 5.0	USFWS Wetland Easement	Private	0.9
49 to 70	Cornwell Ranch Conservation Easement (proposed)	Montana Fish, Wildlife and Parks	3.0
82.7	Milk River Valley	Montana Department of Natural Resources	~0.2
88.9 – 89.1	Missouri River Valley	Montana Department of Natural Resources	~1.0
196.0	Yellowstone River Valley	Montana Department of Natural Resources	~0.5
Various	Conservation Reserve Program	Private	33.7
South Dakota			
425.9	Cheyenne River Valley		~0.7
536.9	White River Valley		~0.2
Various	State Wildlife Areas	South Dakota Game, Fish and Parks	19.6
Various	Conservation Reserve Program	Private	10.6
	Native Tall Grass Prairie Remnants		
Nebraska			
599.9	Keya Paha River Valley		~0.4
615.3	Niobrara River Valley		~0.5
616.8 – 663.5	Sand Hills	Various	95
696.5	Cedar River Valley		~0.1
739.8	Loup River Valley		~0.4
755.4	Platte River Valley		~0.5
758.0 – 847.4	Rainwater Basin	Various	50
799	Wetlands of America Trust	Private	0.7
Various	Conservation Reserve Program	Private	6.4
Gulf Coast Segment			
Oklahoma			
22.1 – 23.3	Deep Fork Wildlife Management Area	Oklahoma Department of Wildlife Conservation	1.2
38.7	North Canadian River Valley		~0.2
74.2	South Canadian River Valley		~1.0
~130	Wetland Reserve Program	Private	<0.1
155.3	Red River Valley		~0.2
	Native Tall Grass Prairie Remnants		
Texas			
155.3	Red River Valley		~0.3

TABLE 3.6.2-1 Important Wildlife Habitats along the Project Route			
Milepost	**Name**	**Ownership and Description**	**Miles**
~165	Wetland Reserve Program	Private	0.2
190.2	North Sulphur River Valley		~0.5
367.3	Neches River Valley		~2.0
~414	Big Thicket National Preserve		
	Native Tall Grass Prairie Remnants		
Houston Lateral			
Texas			
22.8	Trinity River Valley		~0.5
43.3	San Jacinto River Valley		~1.0
	Native Tall Grass Prairie Remnants		

Source: Keystone 2009c.
Note: No important wildlife habitats were reported for the pump station locations in Kansas.

Most rangeland habitats crossed by the Steele City Segment have not been previously fragmented by road and transmission line networks, and exist as expanses of open mosaics of grasslands, shrublands and croplands interrupted by forested draws. Fragmentation may be of more consequence in shrublands than grasslands, as species dependent on sagebrush cover would become more exposed when crossing the pipeline corridor. Fragmentation of native grasslands would generally be considered short-term, until sufficient herbaceous cover has reestablished to allow small mammals, amphibians and reptiles to cross without exposure. Many forestlands crossed by the Gulf Coast Segment have been previously fragmented by road and transmission line networks. Fragmentation related issues applicable to wildlife habitat types crossed by the Project are summarized in Table 3.6.2-2.

TABLE 3.6.2-2 Habitat Types and Related Fragmentation-Issues						
Habitat Type	**Breaking Large Habitat Into Smaller Areas**	**Hindered Movements**	**Nest Parasitism**	**Facilitated Predator Movements**	**Habitat Disturbance - Construction Maintenance**	**Human Intrusion**
Upland Forests	√	√	√	√	√	√
Wetland Forests	√	√	√	√	√	√
Scrub-Shrub Wetlands	√	√	√	√		√
Wetlands/Swamps	√	√				√
Aquatic/Riverine	√	√	√		√	√
Grassland/Prairie	√	√	√		√	√
Sagebrush Steppe	√	√	√	√		√
Wildlife Type Affected	Birds, small mammals	Mammals, amphibians, reptiles	Birds	Birds, small mammals	Birds, mammals, amphibians, reptiles, invertebrates	Birds, mammals, amphibians, reptiles

Sources: Hinkle et al. 2002, Inglefinger, 2001, Miller et al. 1998, Vander Haegen, 2007.

Review of land cover mapping produced for Gap analyses (USGS 2009) indicates that the pipeline could potentially contribute to increased fragmentation of several apparently contiguous areas of native prairie, shrubland or forestland that would be crossed by the pipeline ROW within the wildlife habitats identified in Table 3.6.2-1. Wildlife habitat areas that may be susceptible to fragmentation include:

- Montana – MP 4.2 to 5.0 – High Cover Grassland – 121 acres;
- Montana – MP 49 to 70 – Low/Moderate Cover Grassland – 3 locations, 217,563 acres;
- Montana – MP 49 to 70 – Salt-Desert Shrub/Dry Salt Flats – 3 locations, 836 acres;
- Montana – MP 196.0 – Low/Moderate Cover Grassland – 337,482 acres;
- Nebraska – MP 815.3 to 839.9 – Little Bluestem-Gamma Mixed Grass Prairie – 3 locations, 1,071 acres;
- Oklahoma – MP 22.2 to 22.8 – Central Bottomland Forest – 659 acres;
- Oklahoma – MP 22.9 to 23.1 – Tall Grass Oak Savanna – 118 acres;
- Oklahoma – MP 74.0 to 74.1 – Oak Cedar Forest – 304 acres;
- Oklahoma – MP 75.1 to 75.2 – Oak Cedar Forest – 224 acres; and
- Texas – MP 366 to 368 – Evergreen Forest – 164,439 acres.

Fragmentation may result in altered wildlife communities as animals adapted to exploiting edge habitats increase, and animals requiring large contiguous habitats are displaced. The severity of fragmentation-induced effects on wildlife communities depends on factors such as sensitivity of the animal, seasonal habitat use, type and timing of construction activities, and physical habitat parameters such as topography, cover, forage, and climate. Generalist animals have been found to be more abundant near trails, while specialist animals are generally less common within grassland and forest ecosystems (Miller et al. 1998).

Blasting can cause both short-term disturbance, in the form of increased noise, dust, and vibration, and permanent habitat modification. Blasting operations and mitigation measures to decrease the effects of blasting are discussed in Section 3.1.1.2. The severity of the effects of blasting on wildlife would primarily depend on timing and wildlife use of the area surrounding the area to be blasted. Blasting operations during sensitive fawning or nesting periods would potentially lead to abandonment of young. Blasting operations during severe winter conditions could potentially add significant stress to overwintering wildlife, leading to expenditures of excess energy that could reduce overwinter survival. Blasting operations during winter hibernation in rocky habitats could cause significant damage to overwintering snakes and small animals.

Loss of shrublands and wooded habitats would be long term (from 5 to 20 years or more) within reclaimed areas of the construction ROW. Due to the linear nature of the ROW, these long-term habitat losses represent a small total area of available habitat and therefore are expected to have little impact on wildlife populations (see Tables 3.6.2-1, 3.6.2-2).

Total habitat loss due to pipeline construction would be small in the context of available habitat both because of the linear nature of the Project and because restoration would follow pipeline construction. During restoration, Keystone would be obligated to reseed areas as directed by the landowner, such that areas of native vegetation could be converted to non-native species. Such conversion could reduce the value of the habitat for wildlife. If disturbance involved important remnant habitat types, habitat loss could be locally significant. Normal operation of the pipeline would result in negligible effects on wildlife. Direct impacts from maintenance activities, such as physical pipeline inspections or pipeline repair that would require digging up the pipeline, would be the same as those for construction. Keystone would consult with appropriate state wildlife management agencies prior to initiation of maintenance activities beyond standard inspection procedures.

3.6.2.1 Big Game Animals

Project construction would affect large game animals, primarily white-tailed and mule deer, by loss of potential foraging and cover habitats; and would result in increased habitat fragmentation, especially in areas with continuous forest cover within the Gulf Coast Segment. Noise and increased human activity during construction would lead to short-term displacement and may act as a temporary barrier to movements for some animals. Construction during spring fawning would potentially lead to loss of reproduction. Construction during winter within critical winter habitat, or blocking access to critical winter range during fall movements could reduce overwinter survival and reproduction of big game animals such as white-tailed deer, mule deer, and pronghorn. After construction, the maintained ROW may be used as movement corridors by some big game animals, predators, and humans. Increased predator movement could adversely affect big game survival and productivity. Human access may be facilitated by vegetation clearing and the perception that the ROW is no longer private property. Increased human use could lead to increased disturbances and hunting pressure (Hinkle et al. 2002).

3.6.2.2 Small Game Animals and Furbearers

Potential impacts on small game animals and furbearers include nest or burrow destruction, or abandonment and loss of young, foraging habitat, and cover habitat. Displacement or attraction of small game animals and furbearers from disturbance areas would be short term, as animals would be expected to return following completion of construction and reclamation activities. Small mammals can fall into and become trapped in the open trench during pipeline construction and die as a result. Burrowing animals would be expected to return and re-colonize the ROW after construction, although compacted areas such as temporary workspaces may become less suitable habitat. Disturbed areas through native prairie habitats also were found to be used less often by ground squirrels following construction of a gas pipeline, suggesting that these habitats may not be equivalent at least for several years after construction (Lauzon et al. 2002). Some badger, ground squirrel, and rodent burrows would likely be destroyed during construction if they occur within the construction ROW. Badgers, ground squirrels, and burrowing rodents may be attracted by the warmth generated by the pipeline, especially during fall, winter, or spring months. The heat generated by the pipeline would warm the soils within the proximity of the pipeline out to as much as 11 feet from the pipeline center (Keystone 2009c) (see Appendix L). Differences from surrounding soil temperature at the surface would be largest during spring. The pipeline would increase soil temperatures at the burial depth near the pipeline by as much as 40 °F and at a depth of 6 inches by as much as 10 to 15 °F, with soil temperatures at the surface increased by 4 to 8 °F during the spring (Keystone 2009c).

For animals that use tree and shrub habitats for cover, forage, and nesting, losses of these habitat types would be long term because the permanent ROW would be maintained free of trees and large shrubs. An estimated 2,794 acres of forested habitats (see Table 3.5.5-2) would be affected by construction of the Project, of which an estimated 1,214 acres would be maintained as herbaceous vegetation. Those areas crossed as part of the construction ROW would be cleared of trees and brush to provide access for construction equipment. Trees and shrubs would not be allowed to reestablish on the permanent ROW. Differences in vegetation cover between the ROW and the surrounding landscape can act as a barrier for some animals, such as snakes, lizards, mice and tree squirrels, while acting as a movement corridor for others, such as coyotes and raccoons.

3.6.2.3 Waterfowl and Game Birds

Most waterfowl and game birds nest on the ground, although a few notable species such as wood ducks (*Aix sponsa*), mergansers (*Mergus* spp.), and mourning doves nest in trees. Habitat loss, alteration, and fragmentation would occur until vegetation is reestablished; then the habitat may be degraded due to the spread of noxious and invasive species. For species that use tree and shrub habitats for cover, forage, and nesting, losses of these habitats would be long term because trees and shrubs would require from 5 to 20 years or more to reestablish and the permanent ROW would be maintained free of trees and large shrubs. Migratory waterfowl may be attracted to the pipeline corridor during early spring if it becomes snow free earlier than surrounding habitats. This would be most likely to occur in Montana, South Dakota, and Nebraska (Keystone 2009b). Communication towers at pump stations could be a collision hazard to migrant waterfowl and game birds and may provide vantage perches and artificial nesting habitat for raptors and common ravens (*Corvus corax*) or crows which may prey on ground nesting upland game birds.

Sharp-tailed grouse inhabit native prairies and nest in grasslands. These species have disappeared from large portions of their historical ranges, due primarily to habitat loss or degradation resulting from agricultural practices, livestock overgrazing, and habitat succession. Breeding habitats are vulnerable to disturbance as these birds gather to breed where males display in leks, and nesting may be concentrated within several miles of active leks. Sharp-tailed grouse are also vulnerable to displacement by the creation of roads and power lines and reductions in habitat suitability due to fragmentation.

3.6.2.4 Non-game Animals

Removal of trees from the construction ROW and extra workspaces in woodlots, riparian areas, and shelterbelts could lead to the destruction of bat roosting habitats, raptor and owl nests, migrant bird nests, and great blue heron habitat. About 297 large stick nests, 8 great blue heron rookeries and 1 roseate spoonbill rookery were found inside the survey area, which covered the area within about 0.25 to 1 mile of the Project centerline. Migratory birds and their active nests are protected under the MBTA. Direct impacts to nesting migratory birds can be avoided by limiting construction to non-nesting periods during late summer through winter. If any of these nests or rookeries are actually located within the construction ROW, and if any nests were occupied when trees were cut, the nests, eggs, or young would be lost. Because most raptors reuse nest structures, loss of nest structures would require pairs to find new nest trees. If suitable new nest trees are not available within their established territory, new territories would need to be established. These processes would lead to increased energy demands during nesting and could lead to reduced or lost reproduction in subsequent years. Losses of tree and shrub habitats used by migratory birds for cover, forage, and nesting would be long term because it would require from 5 to 20 years or more to reestablish trees and shrubs, and the permanent ROW would be maintained free of trees and large shrubs.

Habitat fragmentation caused by changes in vegetation cover within the pipeline ROW through large blocks of forest, shrub steppe, and grassland habitats would generally have the greatest effect on raptors and migrant songbirds (Hinkle et al. 2002, Vander Haegen 2007, Miller et al. 1998). The severity of fragmentation-induced effects on migratory birds depends on factors such as sensitivity of the animal, seasonal habitat use, type and timing of construction activities, and physical habitat parameters such as topography, cover, forage, and climate. Forest-nesting songbird abundance, diversity, and reproduction rates all become depressed as a result of fragmentation associated with linear developments (Jalkotzy et al. 1997). Habitat fragmentation leads to the creation of more edge habitats that in turn increase the susceptibility of nesting birds and other animals to predation, because many predators concentrate their search efforts within habitat edges (MDNRC 1979). Predators such as coyotes, badgers, foxes, crows, jays, ravens and others may use the cleared ROW for foraging leading to reduced reproduction and survival for many small mammals and birds in proximity to the ROW. Nest parasitism by brown-headed cowbirds resulting in fewer young birds fledging successfully has been documented to increase when shrub-steppe habitat is fragmented (Vander Haegen 2007). Bird community composition and productivity can change next to recreational trails in grassland and forest ecosystems. Birds are less likely to nest near trails in grasslands, and nest predation is greater near trails in both grassland and forests (Miller et al. 1998). Densities of sagebrush-obligate songbirds has been shown to decline within 100 meters of natural gas access roads, even under light traffic volumes (less than 12 vehicles per day), while horned lark (*Eremophila alpestris*) abundance has been shown to increase within 100 meters of roads (Inglefinger 2001).

Small mammals, reptiles, amphibians, and non-flying insects would be blocked from moving across the open pipeline trench during construction. If timing of the open trench coincides with migration of snakes to hibernacula, large numbers of snakes could become trapped within the open trench. Trapped animals, especially small animals that would not normally be noticed by construction crews would likely perish if they became trapped. Erosion control blankets, especially those supported by fine non-biodegradable monofilament meshes, can entangle and entrap small mammals and birds. Changes in vegetation cover and structure over the maintained ROW could inhibit movements of amphibians, reptiles, small mammals and some birds. Reduction in riparian shrubs and trees could reduce riparian habitat function as a movement corridor for small mammals, furbearers, amphibians and reptiles. Communication towers at pump stations could be a collision hazard to migrant birds and may provide vantage perches and artificial nesting habitat for raptors, ravens or crows which may prey on grassland and shrubland nesting birds and small mammals.

Several proposed blasting areas along the Gulf Coast Segment would potentially affect nesting raptors and nesting habitats depending on blast timing and proximity to nest locations (Keystone 2009a, 2009b). The locations that coincide with active and inactive nest structures primarily associated with red-tailed hawks occur at:

- MP 59.8 to 59.9 – 2 inactive hawk nests, Seminole County, Oklahoma;
- MP 65.2 to 65.9 – 1 active hawk nest, Hughes County, Oklahoma;
- MP 70.5 to 70.9 – 1 inactive hawk nest, Hughes County, Oklahoma;
- MP 73.9 to 75.4 – 1 active red-tailed hawk nest and 2 inactive hawk nests, Hughes County, Oklahoma;
- MP 104.3 to 104.4 – 1 inactive hawk nest, Coal County, Oklahoma;
- MP 135.1 to 135.2 – 1 inactive hawk nest, Bryan County, Oklahoma; and
- MP 136.9 to 138.1 – 1 active hawk nest, Bryan County, Oklahoma.

Blasting and ripping for construction through rock outcrops which may provide hibernacula for snakes could destroy all or portions of these habitats. If blasting occurs when hibernating animals are present, these animals would likely perish. Blasting near caves with hibernating or reproductive bats could cause death, habitat destruction or blocked access through landslides or cave-ins.

3.6.3 Mitigation

To reduce potential construction- and operations-related effects, Keystone would implement procedures outlined in its CMR Plan (Appendix B). Keystone has identified measures in the CMR Plan to minimize adverse effects to wildlife habitats including shelterbelts, windbreaks, and living snow fences; these measures can be found in Section 3.9.3.2. Pipeline construction would be conducted in accordance with required permits.

Keystone has committed to implementing the following measures in its CMR Plan to protect wildlife:

- Remove shavings produced during pipe bevel operation immediately to ensure that livestock and wildlife do not ingest this material;
- Collect and remove litter and garbage that could attract wildlife from the construction site at the end of the day's activities;
- Prohibit feeding or harassment of livestock or wildlife;
- Prohibit construction personnel from having firearms or pets on the construction ROW;
- Ensure all food and wastes are stored and secured in vehicles or appropriate facilities;
- Reseed disturbed native range with native seed mixes after topsoil replacement; and
- Control unauthorized off road vehicle access to the construction ROW through the use of signs; fences with locking gates; slash and timber barriers, pipe barriers, or boulders lined across the construction ROW; or plant conifers or other appropriate trees or shrubs in accordance with landowner or manager request.

Keystone would also employ the following measures to protect wildlife resources:

- Develop a Migratory Bird Conservation Plan in consultation with USFWS to avoid, minimize, and mitigate for impacts to migratory birds and migratory bird habitats;
- Develop construction timing restrictions and buffer zones, such as those described in Table 3.6.2-3, through consultation with regulatory agencies for the Steele City Segment;
- Prohibit cutting of active raptor nest trees during the nesting season; and
- If construction would occur during the raptor nesting season during January to August, pre-construction surveys would be completed to locate active nest sites to allow for appropriate construction scheduling.

In addition to the measures that Keystone has committed to use to protect wildlife, the following potential mitigation measures have been suggested by regulatory agencies:

- Avoid ground disturbing activities or infrastructure placement within 1 mile of lek sites in Montana unless the lek is located along an existing road or corridor (Montana Fish Wildlife and Parks);
- Prior to construction through rocky outcrops in Montana evaluate these habitats for bird, bat or reptile use including an evaluation for reptile hibernacula (Montana Fish Wildlife and Parks);
- Use a specialist that would be able to handle hibernating snakes in the event that they are overturned during construction activities on BLM lands in Montana (BLM);

- Consult with appropriate state wildlife agencies prior to initiation of maintenance activities beyond standard inspection measures or outside of the permanent ROW (DOS);
- Clean and/or decontaminate all equipment before entering areas either identified as sensitive habitats or new ROW (USFWS); and
- On BLM managed lands, reclaim areas of previous shrub cover within the construction ROW and in temporary use areas with shrub cover and reduce the maximum maintained ROW through areas with big sagebrush, greasewood, and saltbush habitats (BLM).

TABLE 3.6.2-3
Recommended Seasonal Timing Restrictions and Buffer Distances for Big Game Animals, Game Birds, and Raptors

Animal and Habitat Type	State	Buffer Distance	Seasonal Timing Restrictions
White-tailed deer – Winter range	Montana	NA [a]	December 1 to March 31 (MFWP & BLM)
Mule deer – Winter range	Montana	NA [a]	December 1 to March 31 (MFWP & BLM)
Antelope – Winter range	Montana	NA [a]	December 1 to March 31 (MFWP & BLM)
Sharp-tailed Grouse – Active lek and nesting habitat	Montana South Dakota	2 miles (MFWP & BLM)	March 1 to June 15
Raptors and Herons – active nests and rookeries	Entire ROW	0.5 miles (MFWP) 0.25 miles no surface occupancy (MWFP & BLM) 0.5 miles timing limitations (BLM)	March 1 to August 1 (MFWP) March 1 to July 31 (BLM)

Source: Keystone 2009a, Table 4.2-9.

[a] Not applicable

3.6.4 Connected Actions

3.6.4.1 Power Distribution Lines and Substations

Power distribution line construction and operation requires clearing of trees and shrubs, and maintaining vegetation under the power lines in an herbaceous state. Power distribution lines and substations constructed to provide power for the Project pump stations could affect wildlife resources through:

- Habitat loss, alteration, and fragmentation;
- Direct morality during construction;
- Direct mortality due to collision with or electrocution by power distribution lines;
- Stress or avoidance of feeding due to exposure to construction and operations noise, and from increased human activity;
- Loss of breeding success from exposure to construction and operations noise, and from increased human activity; and

- Reduced survival and reproduction for ground nesting birds due to the creation of perches for raptors in grassland and shrubland habitats.

Preliminary siting information indicates that approximately 430 miles of new electric distribution lines would be necessary to power pump stations along the pipeline ROW for the Project (see Section 2.1.4.1). Wildlife habitats potentially affected by construction and operation of distribution lines include 264 miles of grassland/rangeland, 112 miles of cropland, 9 miles of upland forest, 10 miles of wetland and water, and 35 miles of developed land (see Table 3.5.5-6).

The power distribution lines to Pump Stations 9 and 10 would cross the Milk River and associated oxbows and wetlands in Phillips County, Montana. The power distribution line to Pump Station 11 would cross the Missouri River and associated riparian habitats in Montana, as well the Charles M. Russell Wildlife Range in Montana. The power distribution line to Pump Station 24 would cross the Platte River and associated riparian habitats in Nebraska. Other power distribution line routes would also cross smaller rivers and streams that are likely to attract raptors and migratory birds. Power distribution lines across riparian and wetland habitats provide perches that facilitate eagle, hawk and falcon predation on waterfowl and shorebirds. Newly constructed power distribution lines across grasslands, shrublands, croplands and pastures that are used by grassland nesting songbirds, and grouse would be used as vantage perches by raptors, facilitating predation on these ground-nesting birds. Location of poles across grassland and shrubland habitats reduces habitat suitability for ground-nesting birds potentially resulting in functional habitat loss and population declines through site avoidance.

New electric power distribution line segments would increase the collision potential for migrating and foraging birds. Factors influencing collision risk are related to the avian species, the environment, and the configuration and location of lines. Species-related factors include habitat use, body size, flight behavior, age, sex, and flocking behavior. Heavy-bodied, less agile birds—or birds within large flocks, as is typical of migrating sandhill cranes—may lack the ability to quickly negotiate obstacles, making them more likely to collide with overhead lines. Environmental factors influencing collision risk include weather, time of day, lighting and line visibility, land use practices that may attract birds (such as grain fields), and human activities that may flush birds (such as nearby roadways). Power distribution line-related factors that influence collision risk include the configuration and location of the line, conductor, ground wire, and guy wire diameter, and line placement with respect to other structures or topography (APLIC and USFWS 2005).

Birds are electrocuted by power distribution lines because of two factors: (1) environmental factors such as topography, vegetation, available prey, and other behavioral or biological factors that influence avian use of power poles; and (2) inadequate separation between energized conductors or energized conductors and grounded hardware that provide two points of contact (APLIC and USFWS 2005). Raptors are opportunistic and may use power poles for nesting sites, vantages for territorial defense, or vantages for hunting. Power poles and lines may provide perches for hunting that offer a wide field of view above the surrounding terrain (APLIC and USFWS 2005).

Collision and electrocution impacts on birds resulting from construction of distribution lines would be reduced by the agencies with regulatory authority requiring that electrical power distribution line providers implement the following mitigation measures:

- Incorporate standard, safe designs, as outlined in Suggested Practice for Avian Protection on Power Lines (APLIC 2006), into the design of electrical distribution lines in areas of identified avian concern including:
  - Marking techniques to increase transmission line visibility using balls or flappers.

- A minimum 60-inch separation between conductors and/or grounded hardware and recommended use of insulation materials and other applicable measures, depending on line configuration.

- Incorporate standard raptor-proof designs, as outlined in Avian Protection Plan Guidelines (APLIC and USFWS 2005), into the design of the electrical distribution lines to prevent collision by foraging and migrating raptors in the Project area.
- Route new power lines such that they avoid areas with grouse leks, brood-rearing habitat, and wintering habitats that also support wintering raptors.

3.6.4.2 Lower Brule to Witten 230-kV Transmission Line

Upgrades to the power grid in South Dakota to support power requirements for pump stations in South Dakota would include construction of a new 230-kV transmission line and a new substation. Construction and operation impacts on wildlife would be the same as for the distribution lines discussed above, however, it is likely that the poles would be larger and that the area disturbed around the installation site would likely be larger.

Under alternative corridor A, wildlife habitats potentially affected by construction and operation of the fIVE transmission line route options include 30.3 to 41.3 miles of grassland/rangeland 25.7 to 33.1 miles of cropland, 0.1 miles of upland forest, 0.2 to 0.3 miles of wetland and water, and 1.8 to 5.0 miles of developed land (see Table 3.3.5-7). The transmission line route options would cross between one and four perennial streams/rivers and between 26 and 36 intermittent streams.

Under alternative corridor B, wildlife habitats potentially affected by construction and operation of the four transmission line route options include 40.4 to 47.0 miles of grassland/rangeland, 22.9 to 28.6 miles of cropland, less than 0.2 miles of upland forest, 0.2 to 0.4 miles of wetland and water, and 4.0 to 7.1 miles of developed land (see Table 3.3.5-8). The transmission line route options would cross the Missouri River, the White River, and between 20 and 31 intermittent streams. Transmission line crossings of the large river crossings would likely increase collision hazard for migrant and breeding waterfowl at these locations as discussed above. Collision and electrocution impacts on birds resulting from construction of the 230-kV transmission line would be reduced by the agencies with regulatory authority requiring that the electric power line providers implement the mitigation measures discussed above for power distribution lines to pump stations.

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3.7 FISHERIES

The Fisheries section addresses fish species with recreational or commercial significance that occur in waterbodies that would be crossed by the proposed pipeline route as well as waterbodies located within 0.5 mile of the proposed pipeline ROW. Special status fish species including threatened, endangered and species of conservation concern are discussed in Section 3.8.

3.7.1 Fisheries Resources

The evaluated fisheries occur in perennial waterbodies that are located within approximately 0.5 mile of the pipeline ROW and that have been identified by state agencies as having recreational or commercial value. Common fish species with recreational or commercial value that occur across the Project area are listed in Table 3.7.1-1. Many of these species[1] are native North American fishes that have been introduced into watersheds where they did not previously occur to provide for recreational fisheries, while the common carp is an exotic Eurasian introduction.

TABLE 3.7.1-1
Common Recreational and Commercial Fish Associated with Stream Crossings

Species or Group	Status [1]	Montana	South Dakota	Nebraska	Oklahoma	Texas
Atlantic croaker *Micropogonias undulatus*	Commercial					X
Bass (smallmouth, largemouth, spotted) *Micropterus* spp.	Recreational	X	X	X	X	X
Blue catfish *Ictalurus furcatus*	Recreational/ Commercial				X	X
Bluegill *Lepomis macrochirus*	Recreational		X	X	X	X
Brook trout *Salvelinus fontinalis*	Recreational	X	X	X		
Buffalo (bigmouth, smallmouth) *Ictiobus* spp.	Recreational/ Commercial	X	X	X	X	X
Bullheads (black, brown, yellow) *Ameiurus* spp.	Recreational	X	X	X	X	X
Burbot *Lota lota*	Recreational	X				
Common Carp *Cyprinus carpio*	Recreational/ Commercial	X	X	X	X	X
Channel Catfish *Ictalurus punctatus*	Recreational/ Commercial	X	X	X	X	X
Crappie (black, white) *Pomoxis* spp.	Recreational	X	X	X	X	X
Flathead catfish *Pylodictis olivaris*	Recreational/ Commercial		X	X	X	X
Freshwater drum *Aplodinotus grunniens*	Recreational/ Commercial	X	X	X	X	X
Gars (alligator, spotted, longnose)	Recreational				X	X

[1] Common names of fish are used in this section. Scientific names following nomenclature in the NatureServe Explorer database (NatureServe, 2009) for most fish discussed in this section are listed in Table 3.7.1-1. Where fish discussed in this section are not included in Table 3.7.1-1, common names are followed by the scientific name.

TABLE 3.7.1-1 Common Recreational and Commercial Fish Associated with Stream Crossings						
Species or Group	**Status** [1]	**Montana**	**South Dakota**	**Nebraska**	**Oklahoma**	**Texas**
Atractosteus spatula & *Lepisosteus* spp.						
Green sunfish *Lepomis cyanellus*	Recreational	X	X	X	X	X
Minnows (baitfish) Fathead minnow, *Pimephales promelas*; golden shiner, *Notemigonus crysoleucas*; and others	Recreational/ Commercial	X	X	X	X	X
Muskellunge *Esox masuinongy*	Recreational		X	X		
Northern Pike *Esox lucius*	Recreational	X	X	X		
Paddlefish *Polyodon spatula*	MT-SC; BLM-S; TX-T	X			X	X
Pumpkinseed *Lepomis gibbosus*	Recreational	X	X	X	X	X
Rainbow trout *Oncorhynchus mykiss*	Recreational	X	X	X	X	X
Red drum *Sciaenops ocellatus*	Commercial					X
Sauger *Sander canadensis*	MT-SC, BLM-S	X	X	X		
Shad (baitfish) Gizzard shad, *Dorosoma cepedianum*; threadfin shad, *D. petenense*	Commercial		X	X	X	X
Shovelnose sturgeon *Scaphirhynchus platorynchus*	OK-SC, TX-T	X	X	X	X	X
Spotted seatrout *Cynoscion nebulosus*	Recreational					X
Striped bass *Morone saxatilis*	Recreational					X
Sunfish (longear, orangespot, redear, warmouth) *Lepomis* spp.	Recreational	X	X	X	X	X
Walleye *Sander vitreus*	Recreational	X	X	X	X	X
White bass *Morone chrysops*	Recreational				X	X
Yellow Perch *Perca flavescens*	Recreational/ Commercial	X	X	X	X	X

[1] BLM – Bureau of Land Management, MT – Montana, OK – Oklahoma, S – sensitive, SC – species of concern, T – threatened, TX – Texas.

Several fishes that support important recreational or commercial fisheries have declined in abundance and are currently protected within some portions of their range. These fishes are classified as threatened, endangered, or sensitive and include paddlefish, pallid sturgeon (*Scaphirhynchus albus*), sauger, shortnose gar (*Lepisosteus platostomus*), and shovelnose sturgeon. These and other special status fishes are discussed in more detail in Section 3.8.

Spawning periods and habitats for some recreational and commercial fish species in the Project area are shown in Table 3.7.1-2. Fish species are particularly sensitive to habitat disruption caused by construction during spawning periods.

TABLE 3.7.1-2
Recreational and Commercial Fish Spawning Periods and Habitats

Species or Group[1]	Month[2]												Habitat
	J	F	M	A	M	J	J	A	S	O	N	D	
Steele City Segment													
Bass					X	X							Shallow areas over clean gravel and sand bottoms.
Brown bullhead *Ameiurus nebulosus*				X	X								Spawn in shallow areas by building nests in mud substrate.
Buffalo				X	X	X							Spawn at depths of 4 to 10 feet over gravel or sand substrates.
Bullhead (yellow and black)					X	X							Usually spawn in weedy or muddy shallow areas by building nests.
Burbot	X	X	X									X	Eggs are scattered over sand or gravel substrates.
Common Carp				X	X	X							Adhesive eggs scattered in shallow water over vegetation, debris, logs, or rocks.
Catfish (flathead and blue)						X	X						Nest builders with habitat similar to channel catfish.
Channel catfish					X	X	X						Prefers areas with structure such as rock ledges, undercut banks, logs, or other structure where it builds nests.
Crappie					X	X							Eggs deposited in depressions on bottom in cove or embayments.
Freshwater drum					X	X							Buoyant eggs drift in river currents during development.
Muskellunge					X	X							Spawn in tributary streams and shallow lake channels.
Northern pike					X	X							Small streams or margins of lakes over submerged vegetation.
Paddlefish				X	X								Moves into rivers and spawns over flooded gravel bars.
Sauger				X	X								Moves into tributary streams or backwaters where they spawn over rock substrates.
Shad (baitfish)				X	X	X							Spawn in shallow water over sandy/rocky substrates; eggs scattered, adhere to objects.
Shovelnose sturgeon					X	X							Spawning occurs in open water channels of large rivers over rocky or gravelly bottoms.
Sunfish					X	X	X	X					Nest builders in diverse substrates and shallow depths.
Walleye				X	X								Spawn in lakes and streams in shallow water over rock substrates.
White bass				X	X	X							Egg masses deposited over sand bars, submerged.
Yellow perch				X	X	X							Shallow open water over weedy areas.
Gulf Coast Segment and Houston Lateral													
Atlantic croaker	X	X	X	X	X				X	X	X	X	Spawning is near shore.

TABLE 3.7.1-2 Recreational and Commercial Fish Spawning Periods and Habitats													
Species or Group[1]	**Month[2]**												**Habitat**
	J	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	
Bass													Males construct a nest in whatever substrate is available but gravel is preferred in depths of 1-15 feet.
Buffalo													Spawn in quiet shallow backwaters or on flooded lands during high water; adhesive eggs deposited over bottom or on vegetation.
Catfish (blue, bullhead, channel, flathead)													Spawning occurs in a dark natural cavity or hole cleaned by the male in an undercut bank, underneath a submerged log or pile of debris.
Crappie													Nests may be located in depths of 1-20 feet, usually in silt-free substrates near a log, stump or aquatic vegetation.
Freshwater drum													Spawns in deep water of open pools.
Gar													Large numbers of individuals congregate in shallow, sluggish pools and backwaters. Adhesive eggs scattered over the substrate and then abandoned.
Minnows (baitfish)													Various strategies, generally adherent eggs with or without nest and parental care.
Red drum													Spawning occurs near shore and inshore waters close to barrier island passes and channels.
Shad (baitfish)													Spawn at night in shallow backwaters; eggs sink and attach to available substrates.
Sunfish													Male builds nest excavating circular depression in diverse substrates, guards nests after spawning.
White and striped bass													Spawn in schools near surface; adhesive eggs (white bass) settle to bottom or semi-buoyant eggs (striped bass) carried by current.

[1] Rainbow trout and brook trout are not included because these species are not likely to spawn in streams crossed by the pipeline route.

[2] Spawning periods are approximate and could occur in only a portion of a particular month.

Sources for general life history: NatureServe (2009); Eddy and Underhill (1974); Harlan et al. (1987); Pflieger (1975); Pflieger (1997); Hoese and Moore (1977); Robison and Buchanan (1988); Thomas et al. (2007); Miller and Robison (2004); Ross (2001); and Pattillo et al. (1997).

Surface water classifications based on a waterbody's water quality and resource values are important elements of fisheries management in each state. The classification systems for each of the states crossed by the proposed pipeline route are administered by the following agencies:

- Montana Department of Environmental Quality (updated 2007);
- South Dakota Department of Environmental and Natural Resources (2004);
- Nebraska Department of Environmental Quality (2006);
- Kansas Department of Health and Environment (2004);
- Oklahoma Water Resources Board (2009); and

- Texas Commission on Environmental Quality (2008).

Fisheries information was derived primarily from fishery distribution maps available on agency websites supplemented by information provided by regional biologists in meetings with Keystone personnel. The Project route would cross 92 perennial streams or rivers (some crossed multiple times) that contain known or potential habitat for fishes of recreational or commercial value. Surface water classifications used to assess potential fisheries resource values of streams either crossed or located within 0.5 miles of the proposed pipeline ROW are provided in Appendix E.

3.7.2 Stream Crossings Descriptions

Table 3.7.2-1 provides the locations of proposed pipeline crossings at perennial streams identified as contributing habitat for recreational and commercial fisheries or crossings upstream from these areas.

TABLE 3.7.2-1
Proposed Perennial Stream Crossings at or Upstream of Fisheries Habitat along the Project Route

County	Approximate Milepost	Waterbody Name – Fishery Rating	Proposed Crossing Technique	Relevant Surface Water or Fishery Class [1]	Potential Hydrostatic Test Water Source	Maximum Water Withdrawal (million gallons) [2]	Number of Crossings
Steele City Segment – Montana							
Valley	25.8	Frenchman Creek	O/C-Dry	Non-Salmonid	Yes	4.6	1
Valley	39.2	Rock Creek	O/C-Dry	Non-Salmonid			1
Valley	40.4	Willow Creek	O/C-Dry	Non-Salmonid			1
Valley	82.7	Milk River	HDD	Non-Salmonid			1
McCone	89.0	Missouri River – ***Red Ribbon, Class II Recreational Fishery***	HDD	Marginal-Salmonid	Yes	11.4	1
McCone	93.8	West Fork Lost Creek	O/C-Wet	Non-Salmonid			1
McCone	94.6	Tributary West Fork Lost Creek	O/C-Wet	Non-Salmonid			1
McCone	127.6	East Fork Prairie Elk Creek	O/C-Wet	Non-Salmonid			1
McCone	146.6	Redwater River	O/C-Dry	Non-Salmonid	Yes	8.0	1
McCone	147.5 – 153.3	Buffalo Springs Creek	O/C-Wet	Non-Salmonid			3
Dawson	159.2	Berry Creek	O/C-Wet	Non-Salmonid			1
Dawson	175.2	Clear Creek	O/C-Wet	Non-Salmonid			1
Dawson	195.7 – 196.0	Yellowstone River – ***Blue Ribbon, Class I Recreational Fishery***	HDD	Non-Salmonid,	Yes	11.6	2
Prairie	201.4 – 202.0	Cabin Creek	O/C-Dry	Non-Salmonid			2
Fallon	226.9 – 227.7	Dry Fork Creek	O/C-Wet	Non-Salmonid			5
Fallon	234.5	Pennel Creek	O/C-Wet	Non-Salmonid			1
Fallon	262.4	Little Beaver Creek	O/C-Dry	Non-Salmonid			1
Fallon	281.4	Boxelder Creek	O/C-Dry	Non-Salmonid	Yes	7.4	1
Steele City Segment – South Dakota							
Harding	292.1	Little Missouri River	HDD	WW Semiperm			1

TABLE 3.7.2-1 Proposed Perennial Stream Crossings at or Upstream of Fisheries Habitat along the Project Route							
County	Approximate Milepost	Waterbody Name – Fishery Rating	Proposed Crossing Technique	Relevant Surface Water or Fishery Class [1]	Potential Hydrostatic Test Water Source	Maximum Water Withdrawal (million gallons) [2]	Number of Crossings
Harding	318.1	South Fork Grand River	O/C-Wet	WW Semiperm			1
Harding	323.4	Clark's Fork Creek	O/C-Wet	WW Marginal			1
Butte	356.5	North Fork Moreau River	O/C-Wet	WW Marginal	Yes	7.4	1
Perkins	364.4	South Fork Moreau River	O/C-Wet	WW Marginal			1
Meade	399.6	Sulfur Creek	O/C-Wet	WW Marginal			1
Pennington	425.9	Cheyenne River	HDD	WW Perm	Yes	11.4	1
Hakkon	443.6	West Plum Creek	O/C-Wet	WW Marginal			1
Hakkon	481.3	Bad River	O/C-Wet	WW Marginal			1
Tripp	536.9	White River	HDD	WW Semiperm	Yes	6.5	1
Steele City Segment – Nebraska							
Keya Paha	599.8	Keya Paha River	HDD	Class A WW			1
Keya Paha	604.0	Spring Creek	O/C-Wet	Class B CW			1
Rock	615.3	Niobrara River	HDD	Class A WW	Yes	12.4	1
Holt	630.2; 659.9	South Fork Elkhorn River	O/C-Wet	Class A WW			2
Holt	647.0	Holt Creek	O/C-Wet	Class A WW			1
Wheeler	696.5	Cedar River	HDD	Class A WW	Yes	12.0	1
Nance	727.6	South Branch Timber Creek	O/C-Wet	Class B WW			1
Nance	739.8	Loup River	HDD	Class A WW			1
Merrick	746.2	Prairie Creek	O/C-Wet	Class B WW			1
Merrick	755.4 – 755.7	Platte River	HDD	Class A WW			1
York	764.6	Big Blue River	O/C-Wet	Class B WW			1
York	774.1	Lincoln Creek	O/C-Wet	Class B WW			1
York	779.3	Beaver Creek	O/C-Wet	Class B WW			1

TABLE 3.7.2-1
Proposed Perennial Stream Crossings at or Upstream of Fisheries Habitat along the Project Route

County	Approximate Milepost	Waterbody Name – Fishery Rating	Proposed Crossing Technique	Relevant Surface Water or Fishery Class [1]	Potential Hydrostatic Test Water Source	Maximum Water Withdrawal (million gallons) [2]	Number of Crossings
York	788.7	West Fork Big Blue River	O/C-Wet	Class A WW	Yes	11.7	1
Filmore	807.5	Turkey Creek	O/C-Wet	Class B WW			1
Keystone Cushing Extension Pump Stations – Kansas							
N/A							
Gulf Coast Segment – Oklahoma							
Creek	22.3	Deep Fork River	HDD	WW AC			1
Okfuskee	24.2	Pettiquah Creek	O/C-Wet	WW AC			1
Okfuskee	38.7	North Canadian River	HDD	WW AC	Yes	31.5 (part)	1
Seminole	43.7	Sand Creek	O/C-Wet	WW AC			1
Seminole	48.1	Little Wewoka Creek	O/C-Wet	WW AC			1
Seminole	58.9	Wewoka Creek	O/C-Wet	WW AC			1
Hughes	66.9	Bird Creek	O/C-Wet	WW AC			1
Hughes	70.5	Little River	HDD	WW AC			1
Hughes	74.2	[South] Canadian River	HDD	WW AC	Yes	31.5 (part)	1
Coal	87.4	Muddy Boggy Creek	O/C-Wet	WW AC			1
Coal	99.4	Owl Creek	O/C-Wet	WW AC			1
Coal	102.6	Little Caney Boggy Creek	O/C-Wet	WW AC			1
Atoka	122.4	Fronterhouse Creek	O/C-Wet	WW AC			1
Atoka	126.6	Clear Boggy Creek	HDD	WW AC			3
Atoka	131.0	Cowpen Creek	O/C-Wet	WW AC			1
Gulf Coast Segment – Oklahoma / Texas Border (single crossing)							
Bryan Fannin	155.3	Red River	HDD	WW AC High	Yes	33.3 (part)	1

TABLE 3.7.2-1
Proposed Perennial Stream Crossings at or Upstream of Fisheries Habitat along the Project Route

County	Approximate Milepost	Waterbody Name – Fishery Rating	Proposed Crossing Technique	Relevant Surface Water or Fishery Class [1]	Potential Hydrostatic Test Water Source	Maximum Water Withdrawal (million gallons) [2]	Number of Crossings
Gulf Coast Segment – Texas							
Lamar	170.4	Sanders Creek	O/C-Wet	High			1
Lamar	172.3	Cottonwood Creek	O/C-Wet	High			1
Lamar	189.1	Justiss Creek	O/C-Wet	High			1
Lamar	190.2	North Sulphur River	HDD	High	Yes	33.3 (part)	1
Delta	201.2	South Sulphur River	HDD	High	Yes	33.3 (part)	1
Hopkins	212.3	White Oak Creek	HDD	High			1
Hopkins	211.6	Crosstimber Creek	O/C-Wet	High			1
Franklin	232.0	Brushy Creek	O/C-Wet	High			1
Franklin	226.1 – 226.2	Little Cypress Creek	O/C-Wet	High			2
Franklin	227.6	Big Cypress Creek	HDD	High			1
Wood	234.0	Sand Branch	O/C-Wet	High			1
Upshur	256.1	Big Sandy Creek	HDD	High			1
Upshur	262.7	Sabine River	HDD	High	Yes	32.3 (part)	1
Rusk	300.4	Johnson Creek	O/C-Wet	High			1
Rusk	310.9	Angelina River[3]	O/C-Wet	High			1
Rusk	312.2 – 312.3	East Fork Angelina River	HDD	High	Yes	32.3 (part)	3
Nacogdoches	315.7	Indian Creek	O/C-Wet	High			1
Nacogdoches	333.3	Angelina River[3]	HDD	High	Yes	19.7 (part)	1
Angelina	346.9	Bodan Creek	O/C-Wet	High			1
Angelina	352.3	Crawford Creek	O/C-Wet	High			1
Angelina	359.9	Hurricane [Cedar] Creek	O/C-Wet	High			1
Angelina	367.3	Neches River	HDD	High	Yes	19.7 (part)	1

TABLE 3.7.2-1
Proposed Perennial Stream Crossings at or Upstream of Fisheries Habitat along the Project Route

County	Approximate Milepost	Waterbody Name – Fishery Rating	Proposed Crossing Technique	Relevant Surface Water or Fishery Class [1]	Potential Hydrostatic Test Water Source	Maximum Water Withdrawal (million gallons) [2]	Number of Crossings
Polk	374.0	Piney Creek	O/C-Wet	High			1
Polk	383.1 – 384.8	Bundix Branch	O/C-Wet	High			2
Polk	386.0 – 386.8	Big Sandy Creek	O/C-Wet	High			4
Polk	401.5	Menard Creek	HDD	High	Yes	3.0	1
Hardin	446.5	Pine Island Bayou	O/C-Wet	High			1
Hardin	436.9 – 438.2	Mayhaw Creek	O/C-Wet	High			2
Jefferson	455.4	Cotton Creek	O/C-Wet	High			1
Jefferson	459.2	Neches Valley Canal Authority	HDD	High			1
Jefferson	459.9	Lower Neches Valley Canal Authority	HDD	High			1
Houston Lateral – Texas							
Liberty	22.8	Trinity River	HDD	High	Yes	10.6	1
Harris	35.6	Cedar Bayou	HDD	High			1
Harris	43.3	San Jacinto River	HDD	High	Yes	1.8	1

[1] Surface water classifications and associated fisheries classifications are described within the state-by-state sections.

[2] Hydrostatic test waters identified with a volume and (part) indicate that a part of this total volume amount would be obtained from this individual source.

[3] The Angelina River is crossed in two different locations, once by O/C-Wet and once by HDD.

O/C-Wet = Open Cut Wet Method (flowing or non-flowing)
HDD = Horizontal Directional Drill
O/C-Dry = Open Cut Dry Method (flume or dam-and-pump)
AC = Aquatic Community
CW = Cold Water Fish
WW = Warm Water Fish
Non-Salmonid = Non-Salmonid Fishery
Marginal-Salmonid = Marginal-Salmonid Fishery
Marginal-Salmonid = Marginal-Salmonid Fishery
Semiperm = Semipermanent

Perm = Permanent
Class A = Provides habitat for year-round maintenance of one or more identified key species
Class B = Provides habitat where the variety of warmwater biota is limited by water volume or flow, water quality, substrate composition or other habitat conditions
High = Recreational or Commercial Fishery of High Value
N/A = Not Applicable

3.7.2.1 Steele City Segment

The Steele City Segment of the Project would extend from the Canadian border near Morgan, Montana southeast to Steele City, Nebraska. Recreationally or commercially important fish along the Steele City Segment include bass, catfish, northern pike, paddlefish, sauger, shovelnose sturgeon, sunfish, walleye, and yellow perch (Table 3.7.1-1). General spawning periods for common recreational and commercial fishes are listed in Table 3.7.1-2. Recreational and commercial fish occurrence, fishery or water quality classifications, and notable fishery resources in each State along the proposed pipeline corridor are summarized in the following sections.

Montana

Montana distinguishes surface water classifications based on their ability to support cold-water (salmonid) or warm-water (non-salmonid) aquatic life (MDEQ 2006a). The perennial streams potentially crossed by the Project are classified as supporting non-salmonid fisheries, except for the Missouri River crossing below Fort Peck dam which is classified as marginal for supporting salmonid fisheries. The Missouri River east of Fort Peck Reservoir to the border of Richland County is classified as a Red Ribbon – Class II Recreational Fishery; or a recreational fishery of high value. Salmonid fish supported by this fishery include: brown trout (*Salmo trutta*), mountain whitefish (*Prosopium williamsoni*), and rainbow trout. The reach of the Yellowstone River through Prairie County is classified as a Blue Ribbon – Class I Recreational Fishery, or a recreational fishery of outstanding value. Non-salmonid fish supported by this fishery include burbot, channel catfish, paddlefish, sauger, smallmouth bass, and walleye. Protected recreational fisheries species that potentially occur in the vicinity of the Missouri River and Yellowstone River crossings in Montana include: paddlefish, pallid sturgeon, and sauger. Shortnose gar potentially occur in the vicinity of the Missouri River crossing, and sauger may occur in the vicinity of the Frenchman Creek and Boxelder Creek crossings.

The Project would cross 18 perennial streams in Montana that support recreational or commercial fisheries (Table 3.7.2-1). Three of these perennial waterbodies, the Milk River (MP 82.7), the Missouri River (MP 89.0), and the Yellowstone River (MP 196.0) would be crossed using the Horizontal Directional Drill (HDD) technology. As part of the Yellowstone River HDD crossing, a perennial side channel of the Yellowstone River at MP 195.7 would also be crossed. All other perennial stream crossings in Montana would use either the open-cut wet crossing methodology or an open-cut dry crossing methodology.

Three fisheries streams would be crossed multiple times: Buffalo Springs Creek – at MP 147.5, MP 153.2, and MP 153.3; Cabin Creek –at MP 201.4 and MP 202.0, and Dry Fork Creek – at MP 226.9, MP 227.0, MP 227.1, MP 227.4, and MP 227.7. Cabin Creek is perennial at both crossing locations, while Buffalo Springs Creek and Dry Fork Creek include crossings within intermittent and ephemeral reaches of these streams, respectively.

South Dakota

South Dakota also classifies surface waters as supporting coldwater and warmwater fish and on the ability to support propagation of these fisheries within the waterbody (SDDENR 2008). Warmwater classes are subdivided into permanent fish life propagation, semipermanent fish life propagation and marginal fish life propagation (SDDENR 2008). All 10 perennial streams crossed by the Project in South Dakota are classified as supporting warmwater fisheries. These include one permanent warmwater fishery (Cheyenne River), three semi-permanent warmwater fisheries (Little Missouri, South Fork Grand, and White rivers), and six marginal warmwater fisheries (Table 3.7.2-1). Common recreational fish found in these streams include catfish, walleye, sauger, bullheads, and bass (South Dakota State University, 2001).

The Project would cross 10 perennial streams in South Dakota that support recreational or commercial fisheries (Table 3.7.2-1). Three of these perennial waterbodies, the Little Missouri River (MP 292.1), the Cheyenne River (MP 425.9), and the White River (MP 536.9) would be crossed using the HDD method. All other perennial stream crossings in South Dakota would use either the open-cut wet crossing methodology or an open-cut dry crossing methodology.

Nebraska

Nebraska classifies surface waters as supporting coldwater and warmwater fish and as providing habitat for year-round maintenance of one or more identified key species (Class A) or as providing habitat where the variety of warmwater biota is limited by water volume or flow, water quality, substrate composition or other habitat conditions (Class B, NEDEQ 2006). Key species are those identified as endangered, threatened, sensitive or recreationally-important aquatic species. The Project crosses one coldwater stream, Spring Creek, that is rated as a Class B water. Coldwater fish that may be maintained year-round by stocking in Spring Creek could include brook trout, brown trout, or rainbow trout. Of the 14 crossings of warmwater streams 8 are rated Class A and 6 are rated Class B (Table 3.7.2-1). Common recreationally-important warmwater fish include catfish, bass, crappie, sauger, shovelnose sturgeon, sunfish, walleye, and yellow perch. In addition, forage fish (bait fish) important for the federally endangered interior least tern are found in the Platte, Niobrara, and Loup Rivers.

The Project would cross 15 perennial streams in Nebraska that support recreationally-important fisheries (Table 3.7.2-1). Five of these waterbodies would be crossed using the HDD methodology, including: the Keya Paha River (MP 599.8), the Niobrara River (MP 615.3), the Cedar River (MP 696.5), the Loup River (MP 739.8), and the Platte River (MP 755.4). All other perennial stream crossings in Nebraska would use either the open-cut wet crossing methodology or an open-cut dry crossing methodology. One perennial fisheries stream would be crossed twice by the proposed pipeline corridor: South Fork Elkhorn River – at MP 630.2 and MP 659.9.

3.7.2.2 Cushing Extension Pump Stations

Kansas

Two new pump stations would be constructed along the Cushing Extension in Kansas to support the Project. No perennial streams would be impacted and construction would be completed using roads in upland areas. No aquatic impacts are expected from construction and operation of the new pump stations.

3.7.2.3 Gulf Coast Segment and Houston Lateral

Perennial streams along the Gulf Coast Segment and Houston Lateral proposed pipeline corridor support warmwater fishes including black bass, catfish, drum, gar, minnow, shad, sucker, sunfish, and temperate bass in freshwater dominated systems. Rivers with connection to estuarine systems may also include Atlantic croaker, red drum, and spotted seatrout. Typical streams within the South Central Plain Ecoregion support diverse communities of indigenous or introduced fishes. Fish communities are dominated by sunfishes, darters and minnows and are characterized by a number of sensitive species

Oklahoma

Oklahoma uses four classifications to sustain and manage its fisheries: Habitat Limited Aquatic Community, Warm Water Aquatic Community, Cool Water Aquatic Community, and Trout Fishery (OWRB 2009). Waters crossed by the pipeline corridor have been determined to be either Category 1 waters (adequate to support climax fish communities and Warm Water Aquatic Communities) or

Category 2 waters (not adequate to support a Warm Water Aquatic Community and Habitat Limited Aquatic Communities). Habitat Limited Aquatic Communities generally reside within intermittent and ephemeral streams. Common recreationally-important warmwater fish include bass, catfish, crappie, gar, sunfish, walleye, white bass, and yellow perch. Protected recreational fisheries species that potentially occur in the vicinity of the Red River crossing include paddlefish and shovelnose sturgeon.

The proposed pipeline corridor in Oklahoma would cross 16 perennial streams that support recreational or commercial fisheries (Table 3.7.2-1). Six of these streams would be crossed using the HDD methodology, including: the Deep Fork River (MP 22.1), the North Canadian River (MP 38.7), the Little River (MP 70.5), the South Canadian River (MP 74.2), Clear Boggy Creek (MP 126.7), and the Red River (MP 155.3). The main channel, an oxbow, and an overflow channel of Clear Boggy Creek would all be crossed using a single HDD. All other perennial stream crossings in Oklahoma would use either the open-cut wet crossing methodology or an open-cut dry crossing methodology.

Texas

Texas surface water categories establish the conditions necessary to provide a level of water quality necessary for the support, protection and propagation of aquatic life (TNRCC 2000). Exceptional, high, intermediate and limited aquatic life use categories have been described to set the benchmark for measure of species/habitat diversity. Unless otherwise classified, aquatic life use and criteria are presumed based on the stream flow type – perennial, intermittent with perennial pools, or intermittent. Unclassified perennial streams, rivers, lakes, estuaries, and other appropriate perennial waters are presumed to have high aquatic life use in accordance with ecoregion studies, dissolved oxygen (DO) criteria, and trophic structure. Unclassified intermittent streams with perennial pools suitable to support significant aquatic life are presumed to have limited aquatic life use; and intermittent streams with perennial pools not adequate to support aquatic life are presumed to have minimal aquatic life use. High aquatic life use habitats support a highly diverse and usual association of regionally expected species. This may include the presence of sensitive aquatic animals, high species diversity, high species richness, and a balanced to slightly imbalanced trophic structure. Intermediate aquatic life use supports moderately diverse aquatic communities with some expected species present, sensitive species very low in abundance, moderate species diversity, moderate species richness and a moderately imbalanced trophic structure. High aquatic life use designated waters crossed by the Project in Texas are presented in Table 3.7.3-1; intermediate aquatic life use waters crossed by the Project were not included in the fisheries evaluation. Sensitive recreational fish, paddlefish and shovelnose sturgeon, occur in the Red River, which forms the border between Oklahoma and Texas. The Red River would be crossed using HDD from Oklahoma to Texas

The Texas portion of the Gulf Coast Segment would cross 32 perennial waters that support recreational or commercial fisheries (Table 3.7.2-1). Twelve of these crossings would use the HDD crossing methodology (note that the total number of HDD crossings in Texas along the Gulf Coast Segment includes five additional crossings of waterbodies that do not support recreational or commercial fisheries). These crossings are:

- North Sulphur River (MP 190.2);
- South Sulphur River (MP 201.2);
- White Oak Creek (MP 212.3);
- Big Cypress Creek (MP 227.6);
- Big Sandy Creek (MP 256.1);
- Sabine River (MP 262.7);

- East Fork Angelina River (MP 312.3);
- Angelina River (MP 333.3);
- Neches River (MP 367.3);
- Menard Creek (MP 413.8);
- Neches Valley Canal (MP 459.7); and
- Lower Neches Valley Canal (MP 459.9).

The Angelina River would be crossed twice, at MP 310.9 using an open cut method and at MP 333.3 using HDD. The multiple perennial channels of the East Fork Angelina River between MP 312.2 and MP 312.3 would be crossed by a single HDD. All other crossings of perennial streams that support recreational or commercial fisheries in Texas along the Gulf Coast Segment of the proposed pipeline would use either the open-cut wet crossing methodology or an open-cut dry crossing methodology.

Four other fisheries streams along the proposed Gulf Coast Segment in Texas would be crossed multiple times across perennial and intermittent channels: Little Cypress Creek – at MP 226.1 and 226.2; Bundix Branch – at MP 383.1 and 384.8; Big Sandy Creek – at MP 386.0, MP 386.7. MP 386.8, and MP 387.1; and Mayhaw Creek – at MP 436.9 and MP 438.2.

The Houston Lateral Segment would cross 3 high aquatic life use perennial streams that support recreational or commercial fisheries (Table 3.7.2-1). These streams include the Trinity River (MP 22.8), the Cedar Bayou (MP 35.6), and the San Jacinto River (MP 43.3) and they would each be crossed using the HDD method (note that one waterbody crossing along the Houston Lateral Segment that does not support recreational or commercial fisheries would also be crossed using HDD methodology). The lower reaches of the San Jacinto River and Trinity River are likely to contain fish associated with estuarine and nearshore marine habitats such as Atlantic croaker, red drum, spotted seatrout, and striped bass.

3.7.3 Potential Impacts and Mitigation

Potential impacts and mitigations for fisheries resources associated with construction and operation of the pipeline system are addressed in this section. However, impacts and mitigations associated with potential spills of oil or other hazardous substances are addressed in Section 3.13.

3.7.3.1 Pipeline Construction Impacts

Stream Crossings

Open-Cut Crossings

Potential impacts resulting from all open-cut crossing methods include disturbance of the streambed resulting in impacts to subsurface macroinvertebrates and potential interference with hyporheic flows. Construction would result in a reduction of habitat, alteration of habitat structure, alteration of substrate and bank structure in the ROW, and changes in the benthic invertebrate community (Levesque and Dube 2007, Brown et al. 2002, Chutter 1969, Cordone and Kelley 1961).

Removal of bank vegetation leads to bank instability and erosion. Loss of riparian vegetation reduces shading causing an increase in water temperature and reduces dissolved oxygen, reduces nutrient input, and reduces hiding cover (Brown et al. 2002, Ohmart and Anderson 1988). A reduction in cover can increase vulnerability of certain species to predation, as they lose the ability to hide from predators. Loss of riparian vegetation and disturbance to the bank and substrate can alter benthic communities and change food availability (Brown et al. 2002). Loss of overhead riparian vegetation can also cause increased solar input. Replacement of riparian vegetation upon construction completion, and the limited extent of riparian vegetation loss (ROW width) and absence of water in intermittent or seasonal streams, will minimize risks to increased temperature.

All open-cut methods could potentially increase sedimentation during construction and result in bank erosion until erosion control measures are implemented and the bank stabilizes. Sedimentation would depend upon characteristics of the stream and adjacent uplands. Excessive suspended sediments can interfere with respiration in fish and invertebrates, leading to mortality or reduced productivity in rearing and spawning (Newcombe and Jensen 1996, Sutherland 2007, Wood and Armitage 1997). Suspended sediments can impair foraging efficiency for species that are visual predators. These impacts would be short in duration. Long-term effects may occur if sediment deposits cover eggs or young fish, causing increased mortality and reducing recruitment to the population (Newcomb and MacDonald 1991). Where the water table is shallow and exposed, trenching in the stream could cause a local increase in water temperature which could result in reduced water quality and damage to fish and macroinvertebrates.

Introduced non-native species can compete with native species and transmit diseases (e.g., whirling disease) that could adversely impact sensitive species. Invasive aquatic species can be introduced into waterways and wetlands and spread by improperly cleaned vehicles and equipment operating in water, stream channel, or wetlands (Cowie and Robinson 2003, Fuller 2003). While numerous invasive fishes occur within waters crossed by the Project, construction of the Project is not likely to cause introduction or spread of invasive fishes. The whirling disease (*Myxobolus cerebralis*) in salmonids is caused by a protozoan parasite that has a resistant myxospore stage. Myxospores can be transmitted in mud from infected streams on equipment used in water and on vehicles between watersheds. Whirling disease occurs in over 100 different streams with only a few major river drainages uninfected in Montana (Montana Aquatic Nuisance Species Technical Committee, 2002).

New Zealand mudsnails (*Potamopyrgus antipodarum*) have been reported from the Big Horn River drainage, a tributary to the Yellowstone River, in Montana (Benson 2009a) which is not close to the Project. Quagga mussels (*Dreissena rostriformis bugensis*) have been reported from the South Platte River, a tributary to the Platte River in Nebraska (Benson 2009b) which is not close to the Project. Zebra mussels (*Dreissena polymorpha*) have been reported in the Arkansas River drainage and the Red River drainage in Oklahoma and Texas (Benson 2009c). Both drainages are crossed by the Project in the vicinity of reported occurrences.

Open-Cut Wet Crossing

Construction of a non-flowing open-cut crossing is the most rapid and least impacting of the open-cut methods, primarily because water is not flowing in the streambed and sediments are not transported downstream. Post construction erosion control practices described in Keystone’s CMR Plan including revegetation, soil compaction, and sloping may provide enhanced soil stability features than are found upstream or downstream from the crossing. No impacts are expected to fisheries resources from a non-flowing open-cut wet crossing method.

Construction of flowing open-cut wet crossings may result in short-term impacts including direct mortality to fishery and aquatic resources. Sediment released during trenching of the pipeline crossings would be transported by the water flowing through the trench and has the potential to affect downstream aquatic life and habitat through either direct exposure or sediment deposition (Schubert et al. 1985, Anderson et al. 1996, Reid at al. 2004). Biological effects associated with fine sediment on fishes can vary and include gill irritation, avoidance behaviors, stress, and in extreme cases of long durations of exposure to suspended sediments can have lethal effects on individuals (Newcombe and MacDonald 1991, Wood and Armitage 1997, Waters 1995). Potential impacts include scouring of downstream areas or streambed disturbance if streambed modifications occur.

Open-Cut Dry Crossing

Open-cut dry crossing methods are used when crossing selected environmentally sensitive waterbodies. Flowing open-cut dry flumes have a moderate potential to temporarily affect fishery resources, possibly resulting in behavioral changes such as avoidance or stress on individuals. Pump failure during flowing open-cut dam and pump crossings may result in overtopping of the coffer dam causing erosion and subsequent transport of suspended and fine sediment. Keystone has committed to using a pump that maintains 1.5 times the ambient flow rate at the time of construction. At least one back up pump would be available on site and coffer dams would be constructed with materials that prevent sediment and other pollutants from entering the waterbody (e.g., sandbags or clean gravel with plastic liner). Intake hoses would be screened to prevent entrainment of fish although microinvertebrates may be transferred through the pump. Flowing open-cut dam and pump crossings have a moderate potential to temporarily affect fishery resources. Dam and pump crossings may block or delay normal fish movements. Short-term delays in movements of spawning migrations could have adverse impacts on fisheries, however, most crossings of streams less than 50 feet would be completed in less than 2 days and potential impacts would be minor.

Horizontal Directional Drill Crossing

Successful HDD crossings would avoid direct disturbance to aquatic habitat and stream banks. This method of stream crossing likely would avoid affects to those recreational or commercial fisheries that occur at the river or stream crossings (AFS 2009, MFWP 2009). Drilling fluids and additives used during implementation of a directional drill would be non-toxic to the aquatic environment (Keystone 2008, see CMR Plan). Although unintended consequences may have short-term or long-term negative effects on fishes and aquatic invertebrates, HDD remains the crossing method with the least likelihood of negative impacts.

Impacts could occur if there is unintended release of drilling fluids due to site geological conditions (a frac-out) or a problem with containment or disposal of drilling muds. A frac-out could release bentonitic drilling mud into the aquatic environment. Frac-outs in aquatic environments are difficult to contain primarily because drilling mud readily disperses in flowing water and quickly settles in standing water. Although bentonite is non-toxic, suspended bentonite may inhibit respiration of fishes and aquatic invertebrates due to fouled gills during the short-term. Long-term effects can result from bentonite if larval fish are covered and suffocate due to fouled gills and/or lack of oxygen. Egg masses of fish could be covered by a layer of bentonite inhibiting the flow of dissolved oxygen to the egg masses. Benthic invertebrates and the larval stages of pelagic organisms may be covered and suffocate.

A contingency plan to address a frac-out during HDD including preventative and response measures to control the inadvertent release of drilling lubricant would be maintained (Keystone 2009c). The contingency plan would include instructions for downstream monitoring for any signs of drilling fluid during drilling operations and would describe the response plan and mitigation in the event that a release of drilling fluids occurred. Drill cuttings and drilling mud would be disposed according to environmental permitting and disposal options may include spreading over the construction ROW in an upland location or hauling to an approved licensed landfill or other approved sites.

Hydrostatic Testing (Water Withdrawal and Replacement)

Water used for hydrostatic testing of the pipeline would be obtained from surface water resources. All surface water withdrawals would comply with permit regulations and would not exceed volumes or rates specified in the permits. Small quantities of water would also potentially be withdrawn from fisheries streams for HDD, roadway and construction site dust control or for other uses.

Water withdrawal for hydrostatic testing would likely occur in the fall for the Steele City Segment and would avoid spawning periods for most recreationally important fishes (Table 3.7.1-2). Water withdrawal for hydrostatic testing would likely occur between mid-March and the end of September for the Gulf Coast Segment and Houston Lateral and would coincide with spawning periods for all freshwater recreationally or commercially-important fishes (Table 3.7.1-2). Water withdrawal could entrain eggs, small fish, and drifting macroinvertebrates. Recreationally or commercially-important fishes occurring in waters proposed as sources for hydrostatic test-water include paddlefish, sauger, shortnose gar, or shovelnose sturgeon at Frenchman Creek, Missouri River, Yellowstone River, and Boxelder Creek in Montana; and at the Red River in Oklahoma and Texas.

The volume of water required to test a 50-mile section of 36-inch pipe would be approximately 14 million gallons (43 acre feet). Depending on locations, state requirements, and water availability, water would be obtained and withdrawn from nearby streams or privately owned reservoirs. Twenty-three fisheries streams have been identified as potential water sources for hydrostatic testing (Table 3.7.2-1). If water is withdrawn from a sensitive surface water source during a low-flow period or at a time when particular flow ranges are needed for other uses, habitat reductions for fisheries and aquatic invertebrates could occur. A similar effect on fisheries habitat could occur if large withdrawals are made from aquifer zones that provide late-season baseflows to streams. Water use for hydrostatic testing would be a one-time use and water withdrawal rates would be controlled to be less than 10 percent of the base flow at the time of testing. In some instances sufficient quantities of water may not be available from the permitted water sources at the time of testing. Withdrawal rates may be limited as stated by the permit. Alternate water sources would need approval from state regulators and any required analyses would occur prior to pipe filling. Impacts on fish habitat would be considered minor in intermediate and major streams. Minor waterbodies generally would not contain sufficient water for use in hydrostatic testing.

There is the potential for transferring aquatic invasive species to other areas of the same water source during hydrostatic test water use. In areas where zebra mussels are known to occur, Keystone has committed to thoroughly cleaning all equipment used during the withdrawal and discharge of water prior to use at subsequent test locations to prevent the transfer of this invasive species to new locations. The potential for transferring aquatic invasive species can be minimized through same basin use within a short distance of the withdrawal area or through water sampling to identify and avoid species transfer. The discharge of hydrostatic test water following state permit requirements would reduce the potential spread of invasive species and disease transfer effects on sensitive species. Withdrawal pumps would be equipped with 500 mesh (.001 in, .025 mm, 25μ) screens capable of stopping macroinvertebrates, but not the early larval stages of microinvertebrate, viral, bacterial, or parasitic pathogens. Additionally, the Project’s hydrostatic test water would be returned to the same source or to the same general vicinity.

In some locations, hydrostatic test water would be discharged to upland locations within the same basin, relying on infiltration for eventual return to the basin. In other locations, water would be returned to its waterbody of origin. Proportionally high discharge volumes to source areas could displace fish or disrupt spawning, rearing or foraging behavior (Manny 1984). Discharged water may dislodge sediment, leading to an increase in suspended sediment. The discharge of large volumes of hydrostatic test waters into surface waters could temporarily cause a change in the water temperature and DO levels, could increase downstream flows, and could increase streambank and substrate scour. Guidelines for water discharge in overland areas and absorption back through the ground would allow water temperatures to reach pre-withdrawal conditions prior to entering streams.

Keystone would be responsible for acquiring all permits required by federal, state and local agencies for procurement of water and for the discharge of water used in the hydrostatic testing operation. Any water obtained or discharged would be in compliance with permit notice requirements and with sufficient notice for Keystone's Testing Inspector to make water sample arrangements prior to obtaining or discharging water. Keystone would obtain water samples for analysis from each source before filling the pipeline. In addition, water samples would be taken prior to discharge of the water, as required by state and federal permits. NPDES permits are required for the discharge of both hydrostatic testing fluids and any water obtained during construction dewatering. Both of these activities can be authorized under an NPDES General Permit for Hydrostatic Testing and an NDPES General Permit for Dewatering. EPA Regions 6, 7 and 8 would issue a Section 402, CWA NPDES permit for the discharge of hydrostatic test water.

Upland Trenching

Disturbance to upland plant communities and environment can have direct impacts on aquatic habitats through sedimentation due to wind and water erosion, and a reduction in filtering capacity and infiltration of runoff due to reduced vegetative cover. While effects of upland disturbance on aquatic habitat can be immediate, there can also be seasonal time lags until effects are realized such as storm/flood events occurring later.

Blasting

Blasting operations could occur on or near potential waterbody crossings containing important fisheries in Montana, South Dakota, Nebraska, Oklahoma, and Texas. Potentially affected waterbodies include Buffalo Springs Creek and the Yellowstone River in Montana; the Little Missouri River, South Fork Grand River, and West Plum Creek in South Dakota; the Niobrara River in Nebraska; the Little River and Little Caney Boggy Creek in Oklahoma; and Cottonwood Creek, Brushy Creek, Sand Branch, Sabine River, and Mayhaw Creek in Texas. Streamside blasting could indirectly affect fish and aquatic invertebrates; effects include increased sedimentation, noise, vibrations, and alteration of channel morphology (Wright and Hopky 1998). Blasting in or near waterbodies can cause direct negative impacts on fish populations due to mortality associated with shockwaves propagating through the water (Teleki and Chamberlain 1978, Wright and Hopky 1998). The proposed blasting operations and mitigation measures are discussed in more detail in Section 3.1.1.2.

3.7.3.2 Pump Stations and Tank Farm Construction Impacts

The Project consists of installing and operating 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. The Project also consists of installation and operation of a tank farm, consisting of three tanks, at Steele City, Nebraska. Ten acres of land would be disturbed along the existing Cushing Extension in Kansas during the construction of two additional pump stations and construction of new permanent access roads. Two pump stations in the Project (within the Texas Gulf Coast Segment) are located in flood zones. Impacts to fisheries from these activities would be minor since the relatively small footprint in relation to pervious surface poses minimal potential impacts to fisheries habitat from overland runoff to streams.

3.7.3.3 Project Operational Impacts

Invasive Weed Control

Herbicides would be used to control vegetation before and after construction. The use of herbicides near a waterbody could harm aquatic organisms, including protected fish. Herbicides could enter a waterbody through runoff, seepage through the soil, and direct introduction to water during application through overspray or wind drift.

Soil Stabilization

Bank soils that are restored post construction may be vulnerable to erosion from soil aggregate destruction during the first few years prior to vegetation establishment and soil consolidation, leading to impacts to fisheries habitat. As soil water freezes and expands, it increases soil volume by freezing moisture in small pore spaces and pushes soil particles above the level of the original soil surface. Northern project states such as Montana, South Dakota and Nebraska are most vulnerable to this local freeze-thaw erosion issue during ensuing spring runoffs.

Maintenance

To reduce potential impacts to sensitive aquatic resources as a result of maintenance activities, Keystone would consult with the appropriate state wildlife or land management agency prior to the initiation of maintenance activities beyond standard inspection measures.

3.7.3.4 Summary of Mitigation

To reduce the potential impacts to fisheries habitat caused by the removal of riparian cover, vegetation would be cut off at ground level, leaving the existing root systems in place to provide streambank stability. Pulling of tree stumps and rooting for grading activities would be limited to the area directly over the trench line in riparian areas. After construction is complete, the banks of the waterbodies would be stabilized with temporary sediment barriers within 24 hours of completing construction activities and most minor and intermediate waterbody crossings would be completed within 2 to 3 days. Where conditions allow, riparian vegetation would be restored with native plant species or conservation grasses and legumes. In the event that a water body crossing is located within or adjacent to a wetland crossing, wetland crossing mitigation measures would be implemented to the extent practicable. Some of the more critical elements of the CMR Plan are consolidated below.

During construction, significant measures include use of HDD to prevent direct disturbance to larger river habitats and the fishery and aquatic species that occupy those habitats and planners working with agencies as necessary to further define fish spawning periods and construction schedules to avoid, to the extent practicable, in-stream activities during sensitive periods. In addition, the CMR Plan outlines stream channel restoration, bank restoration, and revegetation methods that rehabilitate affected areas. Compliance with all state water quality regulations during construction contributes to minimizing potential effects on fishery resources.

Herbicides would not be used within 100 feet of a wetland or waterbody minimizing potential exposure and impacts to aquatic and fishery resources.

Routine aerial and ground surveillance inspections would be used to identify areas of erosion, exposed pipeline and nearby construction activities. These practices would allow for early identification of bank stability problems and would minimize the potential for continuing environmental effects during pipeline operation.

Keystone's proposed mitigation measures would result in the Project having a low potential to adversely affect recreationally or commercially-important fisheries as a result of construction and normal operation. The combined efforts of fish life history stage timing considerations, construction impact mitigation, site specific crossing techniques, seasonal conditions, contingency plans, water quality testing, and water quality compliance result in a low potential effect on fisheries resources from construction and normal operation. For affects associated with oil and hazardous substance releases, see Section 3.13.

3.7.4 Connected Actions

3.7.4.1 Power Distribution Lines and Substations

Approximately 6.6 miles of riverine or open water habitats could be affected during construction and operation of new power distribution lines to pump stations for the Project in Montana, South Dakota, Nebraska, Kansas, and Oklahoma (Tables 3.7.4-1 and 3.7.4-2). The primary impacts on waterbodies would be related to clearing or removing the existing riparian vegetation in the construction work area and the maintained ROW. Preliminary siting of power lines indicates that the number of perennial streams potentially containing recreationally- and commercially-important fish that would be crossed ranges from 2 to 8 for the states crossed by the Project (Table 3.7.4-1).

TABLE 3.7.4-1
Number of Waterbody Crossings for Proposed Power Distribution Lines to Pump Stations for the Project

Waterbody Classification	Montana	South Dakota	Nebraska	Kansas	Oklahoma	Texas
Perennial	8	8	3	2	3	2
Intermittent	51	126	48	17	7	3
Total	*59*	*134*	*51*	*19*	*10*	*5*

Source: Keystone, 2008.

In general, distribution line construction impacts to waterbodies would be minor, as many lines would be co-located alongside existing roadways or ROWs and power lines would be installed by local providers under local permitting requirements. Compliance with federal, state and local agency requirements for water crossings ensures that the most feasible and least-impacting activities are performed at the site.

3.7.4.2 Lower Brule to Witten 230-kV Transmission Line

Upgrades to the power grid in South Dakota to support power requirements for pump stations in South Dakota would include a new 230-kV transmission line, that would be constructed and operated by the Basin Electric Power Cooperative (BEPC) and a new substation that would be constructed by Western and owned and operated by BEPC. As described in Section 4.4 of the EIS, Western and BEPC have identified two alternative corridors ('A' and 'B') for the proposed Lower Brule to Witten 230-kV transmission line project, and there are several route options within each corridor.

The number of waterbodies crossed by the route options within the two alternative corridors for the power grid upgrade are shown in Tables 3.7.4-2 and 3.7.4-3. The transmission line route options under alternative corridor A would cross the Missouri River, the White River, and between 26 and 36 intermittent streams (Table 3.7.4-2). The transmission line route options under alternative corridor B would cross the Missouri River, the White River, and between 20 and 31 intermittent streams (Table 3.7.4-3). Construction and operation impacts on waterbodies potentially containing fisheries would be the same as for the distribution lines discussed above; however, it is likely that the poles would be larger and that the area disturbed around the installation site would likely be larger.

TABLE 3.7.4-2
Number of Waterbody Crossings for Proposed Lower Brule to Witten 230-kV Transmission Line Corridor A Alternatives for the Project

Waterbody Classification	Western	BEPC-A	BEPC-B	BEPC-C	BEPC-D
Perennial	1	4	4	4	4
Intermittent	33	34	36	35	26
Total	*34*	*38*	*40*	*39*	*30*

TABLE 3.7.4-3
Number of Waterbody Crossings for Proposed Lower Brule to Witten 230-kV Transmission Line Corridor B Alternatives for the Project

Waterbody Classification	BEPC-E	BEPC-F	BEPC-G	BEPC-H
Perennial	3	4	7	7
Intermittent	23	25	31	20
Total	*26*	*29*	*38*	*27*

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3.8 THREATENED AND ENDANGERED SPECIES AND SPECIES OF CONSERVATION CONCERN

This section addresses animals and plants[1] that are federal or state-listed as endangered, threatened, proposed, or candidate species (Sections 3.8.1 and 3.8.2, respectively), BLM sensitive species (Section 3.8.3), and species of conservation concern (Section 3.8.4). Summaries of occurrence, life history, and impact assessments are based on available literature; correspondence and communications with federal and state agencies; agency required site-specific surveys; public and agency websites; and review of state natural heritage data. No federal proposed species were identified within the Project area. Six federal candidate species potentially occur within the Project area and are discussed in Section 3.8.1, although federal candidate species are not federally protected. Montana is the only state crossed by the Project that does not maintain an independent state endangered or threatened species list. Montana endangered or threatened species are considered species of concern. Species of conservation concern include those species that have been identified by BLM, South Dakota, Nebraska, Kansas, Oklahoma or Texas as sensitive or species of conservation concern. Montana species of concern that are not identified as sensitive by BLM or as species of concern by other states crossed by the Project are covered in Appendix I.

Types of impacts to threatened and endangered species and species of conservation concern would be similar to those described for wildlife in Section 3.6 and vegetation in Section 3.5. The proposed Project could affect these species by:

- Habitat loss, alteration, and fragmentation;
- Direct mortality during construction and operation;
- Indirect mortality because of stress or avoidance of feeding due to exposure to construction and operations noise, and from increased human activity;
- Reduced breeding success from exposure to construction and operations noise, and from increased human activity;
- Reduced survival or reproduction due to decreased abundance of forage species or reduced cover;
- Loss of individuals and habitats due to exposure to toxic materials or crude oil releases (addressed in Section 3.13, Risk Assessment and Environmental Consequences); and
- Direct mortality due to collision with or electrocution by power lines.

Habitat loss or alteration from construction of the Project is described in Section 3.6.2. Pipeline construction and associated access roads would increase habitat fragmentation by reducing the size of contiguous patches of habitat and through loss of habitat or changes in habitat structure. The pipeline ROW through native grassland, shrub, and forest communities would remove vegetation including sagebrush and native grasses, creating a temporary unvegetated strip over the pipeline trench and adjacent construction areas. Subsequent revegetation may not provide habitat features comparable to pre-project conditions. Typically, seed mixes for reclamation include non-native species that quickly become established. Sagebrush often does not quickly become established on disturbed sites, especially if these sites are seeded with grasses and other species that more-rapidly germinate and grow. Management

[1] The text of this section primarily refers to animals and plants by their common name. Scientific names are provided for many species in Tables 3.8.1-1, 3.8.2-1, 3.8.3-1, and 3.8.4-1of this section. Where animals or plants are not presented in these tables the initial mention of the common name is immediately followed by presentation of the scientific name (NatureServe 2009; USDA NRCS 2009).

actions on the ROW include removal of trees and shrubs (Keystone 2008, 2009c), likely including sagebrush. Loss of shrublands and wooded habitats would be long term (5 to 20 years) in reclaimed areas of the construction ROW.

In addition to these general impacts, specific impacts and conservation measures that have been identified for threatened and endangered species and species of conservation concern are described in the following sections. Where applicable, specific impacts to threatened and endangered species and species of conservation concern that would result from construction and operation of the connected actions of the Project (electrical transmission and distribution lines) are identified for the particular species of concern.

3.8.1 Federally-Protected and Candidate Species

The U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS) are responsible for ensuring compliance with the Endangered Species Act (ESA) for species under their jurisdictions. The Department of State (DOS), as the lead federal agency, is responsible for initiating Section 7 consultation pursuant to the ESA with the USFWS and NMFS to determine the likelihood of effects on federally-listed species. The DOS or the applicant as a non-federal party is required to consult with the USFWS and NMFS to determine whether any federally-listed or proposed endangered or threatened species or their designated critical habitat occur in the vicinity of the proposed Project. If, upon review of existing data, the DOS determines that any federally-protected species or habitats may be affected by the proposed Project, the DOS is required to prepare a Biological Assessment (BA) to identify the nature and extent of adverse impacts and to recommend mitigation measures that would avoid the habitat and/or species or that would reduce potential impact to acceptable levels. For the Project, Keystone consulted with the USFWS to identify the potential occurrence of federally-protected species along the pipeline route. Several federally-protected species under the jurisdiction of USFWS were identified which could be potentially affected by the proposed Project. An applicant prepared Draft BA was developed and reviewed by DOS and submitted to USFWS. No NMFS listed species were found to be potentially affected by the proposed Project.

Candidate species are those petitioned species that are actively being considered for listing as endangered or threatened under the ESA, as well as those species for which agencies have initiated an ESA status review that it has announced in the Federal Register. Candidate species are not federally protected but as these species may become protected within the life of the Project they are addressed in Section 3.8.1.

Proposed species are those candidate species that were found to warrant listing as either threatened or endangered and were officially proposed as such in a Federal Register notice after the completion of a status review and consideration of other protective conservation measures. Proposed species are federally protected. No proposed species were identified as occurring within the Project area.

Delisted species are species that were formerly listed as threatened or endangered under the ESA, but have been formally removed from listing. Delisted species are not federally-protected and are considered in assessments as either state-listed species in Section 3.8.2 or as species of conservation concern in Section 3.8.3 or Section 3.8.4.

Keystone received input from USFWS relative to the ESA, the Fish and Wildlife Coordination Act (FWCA), the Migratory Bird Treaty Act (MBTA), Bald and Golden Eagle Protection Act (BGEPA), and National Environmental Protection Act (NEPA). Based on USFWS input, Keystone developed a list of federally-protected species requiring surveys to fill information gaps. USFWS-approved surveys were initiated in the summer and fall of 2008 and spring 2009 (Keystone 2009c). Supplemental filing data from July 2009 included survey reports for piping plover, interior least tern, American burying beetle, Texas prairie dawn-flower, and western prairie fringed orchid. Potential impacts and mitigation measures that were identified during these surveys and consultations with federal and state resource agencies are presented within the potential effects analyses.

Federally-protected threatened or endangered species and federal candidate species with the potential to occur in the Project area include three mammals, eight birds, one amphibian, six reptiles, four fish, two invertebrates, and five plants (see Table 3.8.1-1). The general and Project area distribution, life histories, habitat requirements, potential impact summary, proposed mitigation and preliminary determinations for these federally-protected and candidate species are described in this section. Level of analysis and preliminary findings are summarized in Table 3.8.1-1.

TABLE 3.8.1-1
Summary of Federally-Protected and Candidate Species Potentially Occurring along the Project Route

Common Name	Scientific Name	Federal Status	Detailed Analysis Included	Preliminary Findings Summary[1]
MAMMALS				
Black-footed ferret	*Mustela nigripes*	Endangered/Proposed – Experimental Populations	Yes	NLAA
Louisiana black bear/ American black bear	*Ursus americanus luteolus/ Ursus americanus*	Threatened/ Threatened – Similarity of Appearance	No/No	No Effect
Red wolf	*Canis rufus*	Endangered	No	No Effect
BIRDS				
Brown pelican	*Pelecanus occidentalis*	Endangered	No	No Effect
Eskimo curlew	*Numenius borealis*	Endangered	No	No Effect
Greater sage-grouse	*Centrocercus urophasianus*	Candidate	Yes	NA
Interior least tern	*Sterna antillarum*	Endangered	Yes	NLAA
Piping plover	*Charadrius melodus*	Threatened	Yes	NLAA
Red-cockaded woodpecker	*Picoides borealis*	Endangered	No	No Effect
Whooping crane	*Grus americana*	Endangered	Yes	NLAA
Yellow-billed cuckoo	*Cocyzus americanus*	Candidate	No	NA
AMPHIBIANS				
Houston toad	*Bufo houstonensis*	Endangered	No	No Effect
REPTILES				
Green sea turtle	*Chelonia mydas*	Threatened	No	No Effect
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	No	No Effect
Kemp’s ridley sea turtle	*Lepidochelys kempii*	Endangered	No	No Effect
Leatherback sea turtle	*Dermochelys coriacea*	Endangered	No	No Effect
Loggerhead sea turtle	*Caretta caretta*	Threatened	No	No Effect
Louisiana pine snake	*Pituophis ruthveni*	Candidate	Yes	NA

TABLE 3.8.1-1 Summary of Federally-Protected and Candidate Species Potentially Occurring along the Project Route				
Common Name	**Scientific Name**	**Federal Status**	**Detailed Analysis Included**	**Preliminary Findings Summary[1]**
FISH				
Arkansas River shiner/ Designated Critical Habitat	*Notropis girardi*	Threatened	Yes	NLAA
Pallid sturgeon	*Scaphirhynchus albus*	Endangered	Yes	NLAA
Smalleye shiner	*Notropis buccula*	Candidate	No	NA
Topeka shiner	*Notropis topeka*	Endangered	No	No Effect
INVERTEBRATES				
American burying beetle	*Nicrophorus americanus*	Endangered	Yes	NLAA
Ouachita rock pocketbook	*Arkansia wheeleri*	Endangered	No	No Effect
PLANTS				
Neches River rose-mallow	*Hibiscus dasycalyx*	Candidate	Yes	NA
Texas golden gladecress	*Leavenworthia texana [aurea]*	Candidate	Yes	NA
Texas prairie dawn-flower	*Hymenoxys texana*	Endangered	Yes	NLAA
Texas trailing phlox	*Phlox nivalis texensis*	Endangered	No	No Effect
Western prairie [white-] fringed orchid	*Platanthera praeclara*	Threatened	Yes	NLAA

[1] NA – Not Applicable. Brackets present alternative names as listed in USDA Plants database (USDA NRCS 2009).
NLAA – May affect, not likely to adversely affect.
MALAA – May affect, likely to adversely affect.

3.8.1.1 Federally Protected Mammals

Preliminary evaluations identified three federally protected mammals that could potentially occur within the Project area (Table 3.8.1-1).

Black-Footed Ferret

The black-footed ferret was federally listed as endangered in March 1967. In Montana it is a species of special concern and it is listed as endangered in both South Dakota and Nebraska. No critical habitat has been designated for the black-footed ferret. Black-footed ferrets once numbered in the tens of thousands, but widespread destruction of their habitat and exotic diseases in the 1900s brought them to the brink of extinction. Only 18 remained in 1986, and approximately 750 black-footed ferrets occur in the wild today (Defenders of Wildlife 2009). The primary threat to the black-footed ferret is loss of habitat via conversion of grasslands to agricultural uses. Also, widespread prairie dog eradication programs have reduced black-footed ferret habitat to less than 2 percent of what once existed.

Black-footed ferrets are nocturnal and solitary; they feed almost exclusively on prairie dogs and use prairie dog burrows (USFWS 2009b). Black-footed ferrets use the same habitats as prairie dogs; grasslands, steppe, and shrub steppe. It is estimated that about 40 to 60 hectares of prairie dog colony are needed to support one ferret (NatureServe 2009). The breeding season is generally between March and April. After a gestation period of 31 to 45 days, a litter, typically of three or four young, is born in May to June. By October, the young are independent and disperse to their own territories (Defenders of Wildlife 2009).

Experimental, non-essential populations were reintroduced to several sites in the United States in 1994, including north-central Montana and South Dakota. None of the three reintroduced ferret populations in Montana are well established at this time, and there is ongoing concern about the genetic viability of the captive population (MFWP 2009a, USFWS 2008d). In 2008, ferrets were reintroduced on the Northern Cheyenne Indian Reservation in southeast Montana (USFWS 2008d). In Montana, the recovery goal is to reestablish two viable ferret populations with a minimum of 50 breeding adults in each. Ferrets have been reintroduced to South Dakota where an estimated 200 ferrets inhabit the Conata Basin, a 70,000-acre prairie in the Badlands area. In Nebraska, the black-footed ferret probably occurred historically in the western three-quarters of the state coincident with the range of the prairie dog. The black-footed ferret is a Nebraska state endangered species, although there are no estimated occurrences of the ferret in Nebraska (Schneider et al. 2005) and Nebraska does not identify the ferret as a priority management species (NGPC 2008). The last known museum specimen from Nebraska is an animal killed on a road near Overton in Dawson County in 1949 (NGPC 2009a). Many reports have been received since then, but no specimens or photographs have been positively identified.

Potential Impacts and Conservation Measures

The proposed Project would cross two counties in Montana and four counties in South Dakota with black-tail prairie dog colonies that may contain potential or remnant black-footed ferret habitat. If black-footed ferrets were present in prairie dog colonies along the Project route, direct impacts would include increased habitat loss and fragmentation from the disturbance of prairie dog colonies or complexes. Construction and operation activities from the proposed Project could cause direct mortalities resulting from collisions with construction equipment and vehicles. Other indirect impacts could include increased habitat alteration due to fragmentation, dust deposition, and spread of noxious and invasive plants; and increased disturbance due to noise and human presence. Indirect effects could also include a reduction of prairie dog colonies due to the spread of infectious diseases such as distemper and plague.

In Nebraska and South Dakota, black-footed ferret surveys are no longer recommended in prairie dog colonies. To prevent potential direct or indirect impacts to the black-footed ferret from construction in Montana, Keystone has committed to:

- Provide USFWS with the results of Montana prairie dog colony surveys, and to continue to coordinate with the Montana USFWS to determine the need for black-footed ferret surveys at these colonies, in accordance with the Black-footed Ferret Survey Guidelines (USFWS 1989). The need for black-footed ferret surveys would be based on relative size and density of affected prairie dog colonies, activity status, and colony location relative to disturbance areas.
- If surveys for black-footed ferrets were required by the Montana USFWS, and if the species was documented to be present within the Project area, additional conservation measures would be developed in coordination with the Montana USFWS.
- Workers would not be allowed to keep domestic pets in construction camps and/or worksites;
- Workers would be made aware of how canine distemper and sylvatic plague diseases are spread (domestic pets and fleas);
- Workers will not be allowed to feed wildlife; and,

- Concentrations of dead and/or apparently diseased animals (prairie dogs, ground squirrels, others) would be reported to the appropriate state and federal agencies.

Although USFWS has indicated that the Project area in South Dakota has been block-cleared for black-footed ferret, the South Dakota Department of Game, Fish, and Parks has requested an estimate of the number of prairie dog habitat acres that would be lost to pipeline construction and operation and a survey conducted to determine the presence of black-footed ferrets on these acres before any construction activity occurs.

The proposed Project may affect, but is not likely to adversely affect black-footed ferrets. Prairie dog colonies found in South Dakota and Nebraska do not require conservation measures or additional consultation under the ESA because any black-footed ferrets potentially associated with these prairie dog colonies are reintroduced and designated as non-essential experimental populations. The prairie dog towns in Montana, however, may support black-footed ferrets.

Louisiana Black Bear/American Black Bear

The Louisiana black bear, one of 16 recognized subspecies of the American black bear, was federally listed as endangered in February 1992. In Texas, the Louisiana black bear is listed as a threatened species. The American black bear is also federally-protected where it occurs within the historic range of the Louisiana black bear due to similarity in appearance. Louisiana black bears occur in eastern Texas, Louisiana, and western Mississippi. Within Texas, reliable sightings of the species have occurred in 19 counties, seven of which would be crossed by the proposed Project (Angelina, Fannin, Franklin, Hopkins, Lamar, Nacogdoches, and Polk Counties) (TPWD 2009c). Critical habitat has been designated for the Louisiana black bear within 15 parishes in Louisiana, east and outside of the proposed Project area (50 CFR 17).

Black bear habitat is primarily associated with forested wetlands; however, bears may use a variety of habitat types including marsh, spoil banks, and upland forests. In upland forests, black bears utilize soft and hard forage for food, thick vegetation for escape cover, vegetated corridors for dispersal and movement, large trees for den sites, and isolated areas for refuge from human disturbance. The primary threats to this species are continued loss of bottomland hardwoods and fragmentation of the remaining forested tracts as well as human conflicts where they may be intentionally and illegally shot or killed in automobile collisions (USFWS 2007c). Bears also may become habituated to human food sources, especially garbage, when activities encroach on their habitat (USFWS 2007d). Such habituation can cause nuisance behavior by black bears, which can be very difficult to control and may require removal of the animal or euthanasia, thereby impacting the recovery of this species.

Louisiana black bears den from December through April, preferably in bald cypress (*Taxodium distichum*) and water-tupelo (*Nyssa aquatica*) trees with visible cavities that have a diameter at breast height of 36 inches or greater and are located along rivers, lakes, streams, bayous, sloughs, or other waterbodies. Where suitable den trees are unavailable, black bears would often den in shallow burrows or depressions within areas of dense cover (USFWS 2007c). The USFWS has extended legal protection to "actual" (used by a denning bear during winter and early spring) and "candidate" (having visible cavities, appropriate diameter for entrance, and located along a waterbody) den trees.

Potential Impacts and Conservation Measures

Approximately 39 percent of the land that would be crossed along the Gulf Coast Segment and Houston Lateral would be forested. Should a black bear occur within the proposed Project area, impacts could occur from habitat disruption, removal of den trees, and temporary displacement during construction. If black bears were denning within trees that would be removed during construction, direct mortality could occur.

Currently, there is not a resident breeding population of the Louisiana black bear in Texas, although dispersing juvenile males have been sighted in Texas (Campbell 2003, TPWD 2009c). There are no known den sites in the Project area in Texas (Campbell 2003) and individuals are expected to migrate quickly through the Project area. Construction and operation of the proposed Project would therefore have no effect on Louisiana black bears.

Red Wolf

The red wolf was federally listed as endangered in 1974. In Texas, it is state-listed as threatened. With an average size of 45 to 80 pounds and an average length of 4 feet, the species is smaller than the gray wolf and larger than the coyote (USFWS 2009a, Davis and Schmidly 1994). The historic range of the red wolf included east Texas; however, the population declined due to land conversion and interbreeding with coyotes, to the point that the red wolf is now considered extinct in Texas (Davis and Schmidly 1994). Currently, the species occurs in Florida, North Carolina, South Carolina, and Tennessee; the populations occupying Tennessee and portions of North Carolina belong to an experimental population (USFWS 2009a) and Species Survival Plan Facilities exist in east-central Texas and central Oklahoma outside of their original distribution. No critical habitat has been designated for the red wolf. The primary threats to red wolves are hybridization with the eastern coyote, illegal mortality, vehicle mortality, and diseases such as mange, hookworm, and heartworm.

Potential Impacts and Conservation Measures

The red wolf is considered extinct in Texas and is known to occur only in states that are not crossed by the proposed Project; therefore, construction and operation of the proposed Project would have no effect on the red wolf.

3.8.1.2 Federally-Protected and Candidate Birds

Preliminary evaluations identified six birds protected by the ESA as endangered or threatened and two candidate birds that could potentially occur within the Project area (Table 3.8.1-1). In addition to federal ESA protections, all of the birds listed in this section are also federally protected under the MBTA, except for the greater sage-grouse. Additional federal protections under the MBTA and the BGEPA are discussed in Section 3.8.2.

Brown Pelican

The brown pelican is federally listed but has been proposed for delisting (73 Federal Register 9407 9433) and no critical habitat rules have been published. The brown pelican is state-listed in Texas as endangered. Brown pelicans inhabit the coastal areas from Texas through Florida and north up the Atlantic coast. Brown pelicans migrate through the Texas coast and nest in colonies along the coast on barrier islands. Many are year-round residents of the Texas coast. They feed on fish by plunge-diving into the water and screening out fish through the pouches on their beaks. Brown pelicans nest in early spring or summer and generally prefer mangroves as nesting sites. However, along the Texas coast, not many areas of mangroves are left. The birds can also nest in similar size vegetation or on the ground (TPWD 2008a, UFWS 1995a).

Historically, the populations of brown pelicans were drastically reduced by low productivity and nest success due to the use of pesticides. These pesticides, including DDT, were banned from use in 1972 and some populations of the birds have been increasing ever since; namely, the Atlantic coast, Florida, and Alabama populations. Current threats to these birds include habitat disturbance; disturbance of nesting colonies; entanglement in monofilament fishing line; erosion, which causes excessive turbidity in water; oil and chemical spills; hurricanes; and unpredictable food availability (USFWS 1995a).

Potential Impacts and Conservation Measures

Brown pelicans are both migratory and year-round residents in the coastal areas of Texas. The proposed Project would cross Jefferson and Chambers counties where brown pelicans are known to occur, however brown pelicans do not venture far inland. Although this species is listed in counties crossed by the Project, the brown pelican nests, winters, and migrates along the coast, outside of the Project area. Therefore the proposed Project would have no effect on the brown pelican.

Eskimo Curlew

The Eskimo curlew is federally listed and state-listed in Texas as endangered. The Eskimo curlew was once abundant; historical accounts indicate flocks of thousands migrated from northern North America to the Argentine pampas, crossing central North America and the Atlantic coast. They bred in northern Canada and migrated through the prairies of the U.S. south to the grasslands in South America, spending most of their time in prairies and grasslands along the way (Audubon 2009a, TPWD 2009a). Currently, the Eskimo curlew is thought to be extinct. The last sighting of an Eskimo curlew was in 1962 on the coast of Texas.

The primary threat to the Eskimo curlew was un-curtailed hunting by market hunters following the population crash of the passenger pigeon (*Ectopistes migratorius*). In addition to hunting, the conversion of prairies in the central U.S. to cropland and suppression of wildfires resulted in large-scale habitat loss. Cropland was not ideal feeding habitat during migration and suppression of wildfires resulted in succession of prairie grasslands to woodlands. Although a few unconfirmed sightings of individuals and flocks have occurred since the early 1900s, the species is thought, but not confirmed, to be extinct.

Potential Impacts and Conservation Measures

No Eskimo curlews have been recorded or spotted in the Project area in decades. Any reported sightings throughout the nation have been unconfirmed. As the Eskimo curlew is thought to be extinct, no individuals or flocks are expected to move through the Project area and no impacts are expected to occur due to construction or operation of the proposed Project.

The Eskimo curlew is considered extirpated with no records in recent years in the Project area; therefore, the proposed Project would have no effect on the Eskimo curlew.

Greater Sage-Grouse

The greater sage-grouse has been petitioned for federal listing under the ESA several times. In April 2004, the USFWS determined that listing the greater sage-grouse under the ESA may be warranted and initiated a status review. The 12-month finding of the status review determined that listing was not warranted (70 FR 2244), however, this determination was ruled arbitrary and capricious by the U.S. District Court of Idaho. USFWS initiated a status review to reevaluate this finding; and on 5 March 2010, USFWS announced that listing the greater sage-grouse (rangewide) was warranted, but precluded by higher priority listing actions (USFWS 2010, 75 FR 13910). The greater sage-grouse is protected as a sensitive species by BLM and is considered a conservation concern by Montana and South Dakota. Sage-grouse occur in 11 western states including Montana and South Dakota, where they are hunted during a limited season in September. Populations of sage-grouse, which depend on large areas of contiguous sagebrush, have continued to decline during the last century primarily due to habitat loss and alteration and they now occupy about 56 percent of their original range (USFWS 2010). Primary threats to sage-grouse include sage brush habitat loss and fragmentation resulting from wildfire, energy development, urbanization, agricultural conversion, and infrastructure development (USFWS 2010).

Sage-grouse use a lek system for mating with males establishing strutting grounds or leks to attract females which then nest on average between 2.1 to 4.8 miles and up to 12.5 miles from the lek site. Leks are typically located in areas of bare ground or low-density vegetation such as ridge tops; and individuals return to about the same location each spring, although leks may shift in location over time. Nesting typically occurs in areas with a sagebrush canopy cover of between 15 to 30 percent. Although sagebrush habitat is crucial for all seasons and life stages, wet meadows and riparian areas are critical for the brood-rearing. Sage-grouse diet varies by season with nesting and brood-rearing birds using forbs and insects and wintering birds using sagebrush (USFWS 2010). Sage-grouse may migrate between winter, breeding and summer areas with movements of up to 100 miles (USFWS 2010); all sage-grouse gradually move from sagebrush uplands to moister areas such as streambeds or wet meadows during the late brood-rearing period (3 weeks after hatch) as vegetation desiccates during the hot, dry summer months (USFWS 2010).

Steele City Segment

The Steele City Segment crosses through greater sage-grouse Management Zone I (MZ I) in Montana and western South Dakota, which supported an estimated 62,320 sage-grouse in Montana and 1,500 sage-grouse in South Dakota during 2007 (USFWS 2010).

Montana: Aerial lek surveys of the Project route completed by Keystone (2009c) found no undocumented sage-grouse leks within 0.6 mile of the proposed centerline in Montana or within 2 miles of proposed pump station locations; however, surveys were not comprehensive. In spring 2009, MFWP (Regions 6 and 7) conducted a lek survey in areas near a short portion of the proposed route (the survey was conducted along about 10 percent of the route in Montana); data from this survey combined with previously documented lek locations indicate that 36 sage-grouse leks were active within 4 miles of the proposed route, 24 leks were within 3 miles, 11 leks were within 2 miles, and 5 leks were within 1 mile of the proposed route (MFWP 2009b, 2009c). Because comprehensive surveys following recommended protocols were not been completed along the entire proposed route; it is likely that additional sage-grouse leks were present in the vicinity of the proposed Keystone route through Montana.

South Dakota: Aerial lek surveys of the Project route completed by Keystone (2009c) identified one undocumented sage-grouse lek in Harding County, South Dakota; for a total of 3 leks within 4 miles of the proposed route in South Dakota.

Potential Impacts and Conservation Measures

Approximately 190 miles of the proposed route extend through areas with sage-grouse habitat in Montana (MFWP 2001a). Of this distance, 94 miles are classified as moderate to high-quality habitat and 96 miles are classified as marginal habitat for greater sage-grouse. MFWP (2009b) has mapped core sage-grouse habitat in Montana which include habitats associated with (1) Montana's highest densities of sage-grouse (25 percent quartile), based on male counts, and/or (2) sage-grouse lek complexes and associated habitat important to sage-grouse distribution. The proposed route would pass through approximately 20 miles of core sage-grouse habitat in Montana. One 2.75 mile long permanent access road and one pump station would also occur within core sage-grouse habitat in Montana.

Using a 4-mile buffer around only the known greater sage-grouse leks that occur within 4 miles of the route, the proposed Project route would cross about 166 miles of greater sage-grouse buffer zone in 12 locations (Table 3.8.1-2).

TABLE 3.8.1-2
Greater Sage-Grouse Lek 4-Mile Buffer Zones Crossed by the Project in Montana and South Dakota

Milepost Locations		Buffer Zone Length Crossed (miles)	Buffer Zone Acreage Affected During Construction[1]
Beginning Milepost	Ending Milepost		
MONTANA			
17.0	25.3	8.3	111.3
43.2	49.9	6.7	89.8
50.2	61.8	11.6	155.4
67.1	72.1	5.0	66.6
87.7	121.9	34.2	455.4
207.7	220.0	12.3	164.4
229.3	243.6	14.3	191.3
247.1	264.5	17.4	232.1
280.4	282.3	1.9	26.0
Montana Totals	**9 locations**	**111.7**	**1,492.3**
SOUTH DAKOTA			
282.5	290.9	8.4	112.0
294.2	316.4	22.2	296.0
323.9	347.2	23.3	310.7
South Dakota Totals	**3 locations**	**53.9**	**718.7**
Steele City Totals	**12 locations**	**165.6**	**2,211.0**

[1] Based on a nominal ROW of 110 feet.
Source: MFWP 2009b, 2009c; Keystone 2009c.

Studies of the effects of energy development on greater sage-grouse indicate a variety of adverse impacts to sage-grouse from sources of disturbance, such as construction and operation of facilities, road construction and use, and development of transmission lines (Naugle et al. 2009). However, many studies evaluated impacts resulting from different and higher-density types of disturbance and development than the proposed Project (i.e., a single pipeline as compared to oil and gas field developments). Although similar types of impacts would be expected to result from construction of the Project, the magnitude would be expected to be different.

Sage-grouse would be especially vulnerable to pipeline construction activities in spring when birds are concentrated on strutting grounds (leks) and where the pipeline and access roads are constructed through sagebrush communities with leks and nesting sage-grouse. Partial field surveys and public databases indicate that at least 36 known sage-grouse leks are present within 4 miles of the proposed route, and at least 5 leks are present within 1 mile of the route in Montana (MFWP 2009a, 2009b, and 2009c). Construction near leks could displace breeding birds from leks or disturb nests, resulting in a decrease in local reproduction. Traffic on roads near active leks could cause vehicle collision mortality.

Disruption of courtship and breeding behavior could be minimized by scheduling construction after birds have left the leks (usually by mid May). Mortality to sage-grouse and loss of nests, eggs, and young could be avoided by scheduling construction through occupied sagebrush steppe habitats after young sage-grouse have become mobile and are able to fly (usually by mid-August). Sage-grouse chicks are precocious and capable of leaving the nest immediately after hatching, but they are not sufficiently mobile to avoid construction related impacts until after they can fly.

After construction, reestablishment of sagebrush on the ROW may take 30 or more years. During this period, vegetation on reclaimed areas would likely be dominated by grasses with low densities of native forbs and shrubs. Typically, communities of big sagebrush have proven difficult to reestablish on reclaimed lands (Schuman and Booth 1998, Vicklund et al. 2004), and restoration may not always be possible (USFWS 2010). Growth of big sagebrush on reclaimed land has been shown to benefit from the application of mulch, compacting soil after seeding, and reduced competition with herbaceous species (lower seeding rate of grasses and forbs) (Schuman and Booth 1998). Management of a 30-foot-wide area of the permanent ROW to prevent shrub and tree growth could prevent reestablishment of sagebrush communities for at least the life of the Project. A maintained path over the pipeline that is free of shrubs could facilitate predator movement along the ROW and increase predation risk for grouse nesting or foraging on or near the ROW. Maintenance of the ROW and the three new permanent access roads in Montana and on new permanent access road in South Dakota may also encourage recreational use of the ROW. Recreational use (motorized vehicles, wildlife viewing, etc.) of the area during the breeding season could have an adverse effect on sage-grouse reproduction.

The three new permanent access roads in Montana and one new permanent access road in South Dakota would be constructed within 4 miles of at least 4 greater sage-grouse leks in Montana and South Dakota and one of the access roads would occur within 2 miles of at least 1 greater sage-grouse lek in Montana. The six new pump stations in Montana would be constructed within 1 mile of at least 0 greater sage-grouse leks and within 4 miles of at least 8 greater sage-grouse leks. Two new pump stations and one permanent access road would be constructed within the range of the greater sage-grouse in Harding County, South Dakota. Noise from the pump stations would attenuate to background levels within 0.5 miles from the pump stations and would not be expected to cause disturbance to sage-grouse leks because no leks were identified within 2 miles of the proposed pump station locations in Montana. Communication towers associated with the pump stations could lead to increased collision hazard and increased predation by raptors by providing vantage perches.

If construction and future activities and use were to disturb about 40 or more leks and associated nesting habitat near the ROW during the breeding season, local and regional populations of greater sage-grouse could decline. Limiting construction to periods outside the breeding season would protect nesting grouse and offspring. In addition, several agencies, including MFWP, identified mitigation measures to minimize the impact of the Project on greater sage-grouse. These measures are summarized below and are included in the MDEQ Environmental Specifications for the Project (see Attachment 1 to Appendix I), along with other mitigation measures.

- Conduct surveys of greater sage-grouse leks prior to construction using appropriate methods to detect leks within 4 miles of the edge of the construction ROW;
- Avoid construction within 4 miles of active greater sage-grouse leks from March 1 to June 15;

- Contact BLM, MFWP or SDGFP to determine what mitigation measures are needed for a lek found within the construction ROW;
- Implement reclamation measures (i.e., application of mulch or compaction of soil after broadcast seeding, and reduced seeded rates for non-native grasses and forbs) that favor the establishment of big sagebrush in disturbed areas where compatible with the surrounding land use and habitats;
- Prior to construction, conduct studies along the route to identify areas that support stands of big sagebrush and silver sagebrush and incorporate these data into reclamation activities to prioritize reestablishment of sagebrush communities;
- Monitor establishment of sagebrush on reclaimed areas annually for at least 4 years to ensure that sagebrush plants become established at densities similar to densities in adjacent sagebrush communities and implement additional seeding or plantings of sagebrush if necessary;
- Establish criteria to determine when reclamation of sagebrush communities has been successful based on reference communities that provide suitable habitat for greater sage-grouse with optimum sagebrush densities greater than 4,000 plants per hectare (as recommended in Pyke 2009);
- Use locally adapted sagebrush seed, collected within 100 miles of the areas to be reclaimed;
- Where facilities would permanently remove sagebrush communities, implement compensatory mitigation nearby to restore, enhance and preserve sagebrush communities for greater sage-grouse and other sagebrush-obligate species;
- Monitor densities of native forbs and perennial grasses on reclaimed areas and reseed with native forbs and grasses where densities are not comparable to adjacent communities;
- Restrict or appropriately manage livestock grazing of reclaimed areas until successful reclamation of sagebrush communities has been achieved as described above (i.e., at least 4 years of restrictions); and
- Implement measures to prevent colonization of reclaimed areas by noxious weeds and invasive annual grasses such as cheatgrass.

With incorporation of the Keystone CMR Plan and the mitigation measures described above, construction and operation of the Project would not likely affect greater sage-grouse courtship activities on leks and would likely result in a minor impact on nesting birds. However, construction would likely result in an incremental loss of big sagebrush habitat that is currently used for foraging and nesting by greater sage-grouse for 30 years or longer.

Connected Actions

The construction of electrical distribution lines to pump stations in Montana and South Dakota would incrementally increase the collision and predation hazards for foraging and nesting greater sage-grouse in the Project area. Construction of these distribution lines during the breeding season could also potentially disturb breeding, nesting, and brood-rearing birds. Keystone would not construct or operate these electrical distribution lines, but would inform electrical power providers of the candidate status of the greater sage-grouse and would encourage consultations with Montana and South Dakota regulatory agencies for the electrical infrastructure components constructed for the Project to prevent impacts to greater sage-grouse.

The proposed alternative corridors for the 230 kV transmission line in southern South Dakota are generally outside of the range of breeding greater sage-grouse (USFWS 2010) and construction of a transmission line would be unlikely to affect the greater sage-grouse. Keystone would inform Basin Electric Power Cooperative (BEPC) and Western Area Power Administration (Western) of the candidate status of the greater sage-grouse and would encourage consultations with Montana and South Dakota regulatory agencies for the electrical infrastructure components constructed for the Project to prevent impacts to greater sage-grouse.

Interior Least Tern

The interior least tern was federally listed as endangered in 1985. Interior least tern is state-listed as endangered in South Dakota, Nebraska, Oklahoma, and Texas, and is a Montana species of concern. They are small seabirds that feed almost exclusively on small fish, crustaceans, and insects that they catch by skimming over the water surface or by hovering and diving from the air (Reel et al. 1989). The interior least tern is a subspecies of the least tern; the east coast subspecies is not threatened or endangered and the west coast subspecies is federally listed as endangered. The interior least tern is migratory; it winters in South America, then journeys north to central North American river systems to breed. It has also been known to winter along the coast of southeast Texas (TPWD 2009b). Nesting season for interior least tern is from April 15 through September 15.

Primary threats to the interior least tern are channelization of river systems and construction of dams that alter the rivers' natural flow regimes. This can cause water levels to remain high during the nesting season, eliminating nesting areas and forcing the birds to choose less ideal nest sites. Flood control has also caused nesting habitat to decline due to vegetation encroachment on river banks. River recreation has increased in recent decades, causing more disturbances to prime nesting habitats by boaters, fishers, campers, and ATVs. Excessive human disturbance has been shown to decrease nesting success and productivity and this remains a threat to the interior least tern population throughout its range (NGPC 1997, TPWD 2009b).

The proposed Project would cross several rivers at which suitable foraging and nesting habitat exists for the interior least tern. These areas include the Yellowstone River and the Missouri River below Fort Peck dam, in Montana; the Platte River, Loup River, and Niobrara River in Nebraska; the Cheyenne River in South Dakota; the Red River, Canadian River, and North Canadian River in Oklahoma; and the Red River in Texas. Results of occurrence and habitat surveys for the interior least tern at large river crossings are summarized in Table 3.8.1-3.

Steele City Segment

Montana. Nesting of these birds has been documented on islands and sand bars in the Missouri River and Yellowstone River. The Missouri River from Fort Peck Dam to Lake Sakakawea lies within the northwestern fringes of the least tern's breeding range. Tern populations on that reach fluctuate with habitat conditions as they do elsewhere in their range. Numbers peaked in 1997 when other habitat along the Missouri River was inundated (USFWS 2000). High flows can scour vegetation from sandbars and can also deposit material to create sandbars, both of which create least tern habitat on the Missouri River. Construction of Fort Peck Dam has altered these conditions by reducing the frequency of flooding downriver and minimizing sediment deposition. According to the USFWS Billings Ecological Services Field Office and the Montana Department of Fish, Wildlife and Parks (MFWP) the Yellowstone River crossing in Dawson County, Montana has historically supported, or currently supports, breeding populations of the interior least tern (Keystone 2008; Keystone 2009a).

South Dakota. During a meeting with Keystone representatives on June 10, 2008, South Dakota Game Fish and Parks (SDGFP) indicated that the Cheyenne River crossing on the border of Meade, Pennington, and Haakon counties has historically supported, or currently supports, breeding populations of the interior least tern (Keystone 2008). No interior least terns were observed at the Platte, Loup, or Niobrara rivers in Nebraska or the Cheyenne River in South Dakota,

Nebraska. According to the USFWS Grand Island Ecological Services Field Office, the distribution of the interior least tern within the Project area in Nebraska includes the Platte, Loup, and Niobrara Rivers (Keystone 2008). The Project would cross the Platte River at the border between Merrick and Hamilton counties and sandbars and sand/gravel pits associated with this segment of the river are known to still support breeding least terns. The Loup River in Nance County and the Niobrara River on the border of Keya Paha and Rock counties contain sandbars and also continue to support breeding least terns.

Gulf Coast Segment and Houston Lateral

Oklahoma. The interior least tern is known to use reaches of the North Canadian River, South Canadian River, and Red River in Oklahoma (USFWS 2007a). The Project would cross the North Canadian River in Seminole County, the South Canadian River in Hughes County, and the Red River in Bryan County. A review of data from the Oklahoma Natural Heritage Inventory (ONHI) found that the only tracked occurrence of the least tern within 10 miles of the Project area in Oklahoma was along the South Canadian River. The closest recorded occurrence was 0.5 mile to the east of the Project area. No least terns were observed at the North Canadian or South Canadian rivers in Oklahoma; however, foraging interior least terns were observed at the Red River on the Oklahoma and Texas border.

Texas. The interior least tern is known to use reaches of the Red River in Texas and foraging least terns were documented at the Project crossing of the Red River on the Texas and Oklahoma border during July, 2009 (Table 3.8.1-2). The Project would cross the Red River in Fannin County. The interior least tern also occurs in Delta, Hopkins, and Wood counties, which are crossed by the Project; although there are few known occurrences and all of the records are outside of the Project area. In Delta and Hopkins counties, the least tern is known to nest along Cooper Lake, about 7 miles west of the Project. In Wood County, a foraging least tern was sighted at Lake Fork, about 18 miles west of the Project (Keystone 2009b).

TABLE 3.8.1-3
Survey Results for the Interior Least Tern at Potentially Occupied River Crossings along the Project Route

State	County	Survey Location	Survey Corridor	Survey Date	Survey Results	Comments
STEELE CITY SEGMENT						
Montana	Dawson	Yellowstone River	At crossing	2008	Incomplete	Suitable habitat present at crossing location.
South Dakota	Meade/ Pennington/ Haakon	Cheyenne River	0.25 mile each side of centerline	July 23, 2008	No least terns observed.	Good bank and poor island nesting habitat, suitable foraging habitat at crossing location.
Nebraska	Keya Paha/Rock	Niobrara River	0.25 mile each side of centerline	July 22, 2008	No least terns observed.	Good bank and island nesting habitat, suitable foraging habitat at crossing location.
Nebraska	Nance	Loupe River	0.25 mile each side of centerline	July 21, 2008	No least terns observed.	Suitable nesting and foraging habitat at crossing location.
Nebraska	Merrick/ Hamilton	Platte River	0.25 mile each side of centerline	July 22, 2008	No least terns observed.	Good nesting and foraging habitat at crossing location.
GULF COAST SEGMENT						
Oklahoma	Seminole	North Canadian River	0.25 mile each side of centerline	June 24, 2009	No least terns observed.	Suitable nesting and foraging habitat at crossing location.
Oklahoma	Hughes	South Canadian River	0.25 mile each side of centerline	June 23, 2009	No least terns observed.	Suitable nesting and foraging habitat at crossing location.
Oklahoma/Texas	Bryan/Fannin	Red River	0.25 mile each side of centerline	June 25, 2009	Foraging least terns observed.	Suitable nesting and foraging habitat at crossing location.

Sources: ENSR 2008a, AECOM 2009.

Potential Impacts and Conservation Measures

Potential impacts from construction and operation of the Project could include disturbance to interior least tern habitat. The rivers listed above that are associated with interior least tern habitat would all be crossed using the HDD method to reduce disturbance to nesting and foraging habitats. However, Project construction near these rivers could potentially cause temporary impacts to breeding and nesting interior least terns. Nest abandonment or predation could occur if construction is scheduled during the breeding season (April 15 through August 15). The USFWS recommends the use of 300 foot buffers from bank full width on each side of the North Canadian, South Canadian, and Red rivers in Oklahoma and Texas to minimize impacts to nesting birds. Construction is expected to be complete prior to active nesting. Limited clearing of vegetation and limited human access would be required within the riparian areas of these rivers for the True Tracker Wire (3 foot hand cleared path) used during HDD drilling and to access these rivers to withdraw water for hydrostatic testing.

Indirect impacts could also result from the withdrawal of water for hydrostatic testing from the Platte River basin. Forage fish supplies could be reduced and predators may be afforded easier access to nest sites. Impacts to the interior least tern from temporary water reductions during hydrostatic testing in the lower Platte River Basin would be avoided, based on Keystone's plan to withdraw the volume needed at a rate less than 10 percent of the baseline daily flow and to return water to its source within a 30-day period. The one time water use for hydrostatic testing, the low volume of water used (compared to daily flows in the river basin), and the return of water to its source would not impact least tern nesting or foraging habitats.

The following USFWS conservation measures would apply if construction-related activities, including HDD and hydrostatic testing, were to occur during the interior least tern breeding season:

- For the Steele City Segment, if construction occurs after April 15, pre-construction surveys would occur no more than 2 weeks prior to construction within 0.25 mile from suitable breeding habitat at the Platte, Loup, and Niobrara rivers in Nebraska; the Cheyenne River in South Dakota; or the Yellowstone River in Montana.
- For the Gulf Coast Segment, if construction occurs after April 15, -construction surveys would occur no more than 2 weeks prior to construction within 0.25 mile from suitable breeding habitat at the North Canadian River and South Canadian River in Oklahoma and the Red River at the Oklahoma/Texas border.
- Construction would not be permitted within 0.25 mile from an occupied nest site during the breeding season (April 15 though August 15) or until the fledglings have left the nesting area.

The Project may affect, but is not likely to adversely affect interior least terns based on Keystone's plan to HDD the Missouri River, Yellowstone River, Cheyenne River, Niobrara River, Platte River, Loup River, North Canadian River, South Canadian River, and Red River crossings, and Keystone's commitment to follow recommended conservation measures identified by the USFWS.

Connected Actions

The construction of electrical distribution lines across the Missouri River and the Yellowstone River in Montana, and the Platte River in Nebraska would incrementally increase the collision and predation hazards for foraging and nesting interior least terns in the Project area. Construction of these distribution lines during the breeding season could also potentially disturb nesting and brood-rearing birds. Keystone would not construct or operate these electrical distribution lines, but would inform electrical power providers of the requirements for ESA consultations with the USFWS for the electrical infrastructure components constructed for the Project to prevent impacts to foraging least terns.

Construction of the proposed 230-kV transmission line in southern South Dakota during the breeding season could also potentially disturb nesting and brood-rearing birds. Operation of the line would increase the collision and predation hazards for foraging and nesting interior least terns in the Project area. Keystone would inform Basin Electric Power Cooperative (BEPC) and Western Area Power Administration (Western) of the requirements for ESA consultations with the USFWS for the electrical infrastructure components constructed for the Project to prevent impacts to foraging least terns.

Piping Plover

The piping plover is federally listed as threatened and is listed as a state-threatened species in South Dakota, Nebraska, and Kansas. Piping plover is a species of concern in Montana. The final rule designating critical habitat for the Northern Great Plains breeding population of the piping plover (67 FR 57638) in Minnesota, Montana, Nebraska, North Dakota, and South Dakota has been vacated by the USFWS resulting in no currently designated critical habitat in areas crossed by the Project in Montana, South Dakota or Nebraska. Critical habitat for wintering piping plovers has been designated on the barrier islands outside of Galveston Bay, Texas (74 FR 23475), which is outside of the Project area.

The piping plover is a small shorebird that occupies sand and gravel bars and beaches along major rivers and around lakes, reservoirs, ponds, and alkali wetlands, and forages on invertebrates (Reel et al. 1989). The piping plover forages for invertebrates on exposed beach substrates and nests on unvegetated or sparsely vegetated sandbars in river channels and wetlands. Females nest in small depressions scraped in sand and gravel during March and April. Nesting season for the piping plover is from April 15 through September 15. Nests are constructed on the higher parts of sandy shores away from the water line and vegetation. There are an estimated 2,953 piping plovers in the Great Plains region (Morrison et al. 2006). The primary threats to the piping plover are habitat modification and destruction, and human disturbance to nesting adults and flightless chicks. Damming and channelization of rivers have also eliminated sandbar nesting habitat.

Nesting surveys for piping plovers were conducted in July 2008 at the Cheyenne, Niobrara, Loup, and Platte rivers (Table 3.8.1-4). In addition, the Yellowstone River also appears to contain suitable nesting habitat but access to the crossing was not possible at the time of surveys due to high water levels.

Montana. Piping plovers are known to breed at Fort Peck Reservoir (Valley County) outside of the Project area. Additional consultation with the USFWS Billings Ecological Services Field Office (Keystone 2009c) indicates that historical surveys have failed to identify nesting piping plovers within the Project area and additional surveys were not recommended in Montana.

South Dakota. Breeding piping plovers have not been identified within the Project area in South Dakota. Surveys for the least tern along the Cheyenne River in South Dakota indicate that suitable nesting habitat for the piping plover occurs on an island in the Cheyenne River at the proposed crossing location. No nesting piping plovers were observed at this location (Keystone 2009c).

Nebraska. Birds breeding in Nebraska are found on sandbars and at commercial sand pits along the Niobrara, Loup, and Platte rivers. The Project crossing locations for these three rivers had been identified as critical habitat for the piping plover; however this designation was later vacated and there is currently no designated critical habitat for the piping plover in Nebraska (Keystone 2008, 2009c). No nesting piping plover were identified at the proposed crossings of the Platte and Loup rivers in Nebraska. One foraging piping plover was identified at the Niobrara River crossing location, but this individual did not exhibit any breeding behaviors (Keystone 2009c).

Oklahoma. Piping plovers may be present throughout the Project area in Oklahoma during migrations to and from northern breeding grounds. Migration periods for the piping plover in Oklahoma during spring migration are late February through mid-May and during fall migration are mid-July through September (USFWS 2001b). The USFWS Tulsa Ecological Services Field Office recommended the identification of suitable migration stopover habitats for piping plovers that would potentially be crossed by the Project. Suitable migration stopover habitats include sandy shorelines of lakes and rivers (Campbell 2003). Review of the Gulf Coast Segment in Oklahoma identified suitable migration habitats at crossings of the North Canadian River and the South Canadian River in Oklahoma; and the Red River at the Oklahoma and Texas border.

Texas. Piping plovers may be present throughout the Project area in Texas during migrations to and from northern breeding grounds during spring migrations in late February through mid-May and during fall migrations in mid-July through September (USFWS 2001b). Review of the Gulf Coast Segment in Texas identified suitable migration stopover habitats at crossings of the Red River at the Texas and Oklahoma border; Bois D'Arc Creek, North Sulphur River and Neches River. Review of the Houston Lateral in Texas identified suitable migration stopover habitats at crossings of the Trinity River and San Jacinto River. Critical winter habitat for the piping plover has been designated in Texas; however, no critical habitat would be crossed by the Project in Texas.

TABLE 3.8.1-4
Survey Results for the Piping Plover at Potentially Occupied River Crossings along the Project Route

State	County	Survey Location	Survey Results	Survey Date	Survey Location	Comments
STEELE CITY SEGMENT						
South Dakota	Meade/ Pennington	Cheyenne River	No piping plovers observed	July 23, 2008	North Bank	Poor habitat; vegetation to bank edge
					Island	Good habitat; sand, gravel, rocks, sparse vegetation
Nebraska	Keya Paha/ Rock	Niobrara River	Foraging piping plover observed	July 22, 2008	South Bank	Good habitat; sandy shoreline with patches of sparse vegetation
					Island	Excellent habitat; sandbar with sparse vegetation
					North Bank	Poor habitat; vegetation to bank edge
Nebraska	Nance	Loupe River	No piping plovers observed	July 21, 2008	North Bank	Poor habitat; vegetation to bank edge
					Island	Excellent habitat; mudflats with sparse vegetation
Nebraska	Merrick/ Hamilton	Platte River	No piping plovers observed	July 22, 2008	North Bank	Good habitat; sandy beach with sparse vegetation
					Island	Poor habitat; dense vegetation
					South Bank	Poor habitat; vegetation to bank edge

Source: ENSR 2008a

Potential Impacts and Conservation Measures

No direct impacts to piping plover breeding habitats would occur in Montana, South Dakota and Nebraska at the Yellowstone, Cheyenne, Niobrara, Loup, or Platte rivers because pipeline construction across these rivers would be completed using the HDD method. Construction is expected to be complete prior to the time of year when nests would potentially be active. Limited clearing of vegetation and limited human access would be required within the riparian areas of these rivers for the True Tracker Wire (3 foot hand cleared path) used during HDD drilling and to access these rivers to withdraw water for hydrostatic testing.

Indirect impacts at breeding habitats could result from increased noise and human presence at work site locations if breeding piping plovers are located within 0.25 mile of the Project construction site. If construction-related activities were to occur during the breeding season, including HDD and hydrostatic testing that would occur within 0.25 mile from potential breeding habitat, Keystone would conduct presence/absence surveys up to 2 weeks prior to construction-related activities to identify active nest sites, in coordination with the USFWS. If occupied breeding territories and/or active nest sites are identified, the USFWS would be notified and appropriate protection measures would be implemented on a site-specific basis in coordination with the USFWS.

Indirect impacts to piping plovers from temporary water reductions during hydrostatic testing in the lower Platte River Basin would be negligible, based on Keystone's plan to return water to its source within a 30-day period and to withdraw water at a rate less than 10 percent of the baseline daily flow.

Keystone has developed conservation measures in consultation with the USFWS that would apply if construction-related activities, including HDD and hydrostatic testing, were to occur during the piping plover breeding season on the Steele City Segment. The following conservation measures would apply if construction-related activities, including HDD and hydrostatic testing, were to occur during the piping plover breeding season within suitable habitat:

- If construction were to occur during the plover breeding season (April 15 through August 15), Keystone would conduct pre-construction surveys within 0.25 mile from suitable breeding habitat at the Niobrara, Loup, and Platte rivers in Nebraska, no more than 2 weeks prior to construction.
- If occupied piping plover nests are found, then construction within 0.25 mile of the nest would be suspended until the fledglings have left the nest area.

No direct impacts to migrating piping plovers are anticipated from the construction and operation of the Project in Oklahoma and Texas. Impacts to potentially suitable resting and foraging habitat that occurs within the Project area in Oklahoma and Texas would be avoided by using the HDD method to cross the Red River; Bois D'Arc Creek, North Sulphur River, Neches River, Trinity River and San Jacinto River. Indirect impacts could result from migrating individuals being flushed from the Project area during construction-related activities. Since piping plovers are highly mobile, it is anticipated that individuals would move to other suitable resting and foraging habitats within the Project region. Based on the linear nature of the Project and the mobility of migrating individuals, potential impacts from encountering and flushing a migrating piping plover from the Project area would be negligible. Habitat loss from construction would be negligible since the major river crossings would be crossed using the HDD method.

Keystone has developed conservation measures in consultation with the USFWS that would apply if construction-related activities, including HDD and hydrostatic testing, were to occur during the piping plover breeding season on the Gulf Coast Segment and Houston Lateral. The following conservation measures, based on agency consultation would apply if construction-related activities, including HDD and hydrostatic tests, were to occur during the migration periods of the piping plover:

- The USFWS has recommended that if this species lands in close proximity to the construction ROW during construction, its presence would be documented.

The Project may affect, but is not likely to adversely affect the piping plover. This determination is based on Keystone's construction plan to use the HDD method to cross rivers with suitable breeding habitat, consultation with the USFWS, and Keystone's commitment to follow conservation measures recommended by the USFWS.

Connected Actions

The construction of electrical distribution lines across the Yellowstone River in Montana and the Platte River in Nebraska would incrementally increase the collision and predation hazards for foraging and nesting piping plovers in the Project area. Construction of these distribution lines during the breeding season could also potentially disturb nesting and brood-rearing birds. Keystone would not construct or operate these electrical distribution lines, but would inform electrical power providers of the requirements for ESA consultations with the USFWS for the electrical infrastructure components constructed for the Project to prevent impacts to nesting and foraging piping plovers.

Red-cockaded Woodpecker

The red-cockaded woodpecker is federally listed as endangered and is state-listed as endangered in Texas. Red-cockaded woodpeckers prefer old-growth (60 to 70+ years) forest/savanna habitat with loblolly, shortleaf, slash, or longleaf pines. Longleaf pine savannas are most suitable because of their resistance to fire; because the trees generally are not killed by fire, shorter fire regimes create a more open forest which is highly preferred by this species (USFWS 2002a). Nesting and roosting cavities are excavated only in living mature pine trees, usually in trees over 80 years old. Red-cockaded woodpeckers nest and roost in clusters of trees containing and surrounding excavated cavity trees, ideally with a grassy or herbaceous understory with little mid-story (Campbell 2003). Ideal cluster sites are located in stands of pines with little or no understory growth as a result of sporadic fires. Longleaf pines are the preferred nesting trees, as they produce more resin when wounded than other pine species. Excavation of the nest cavity produces resin that the red-cockaded woodpecker uses to protect the nest cavity from predators (such as tree-climbing snakes). The red-cockaded woodpecker accomplishes this protection by drilling small holes around the nest cavity so that resin flows down the trunk of the tree (USFWS 2002a). Red-cockaded woodpeckers are primarily insectivores, feeding on the eggs, larvae, and adult forms of many insects found on pine trees, although they also eat fruits and berries (USFWS 2002a).

Primary threats to red-cockaded woodpeckers include habitat loss and fragmentation. Timber harvesting of pine forests for various industries has resulted in a loss of mature pine forest habitat required by the birds for food, shelter, and breeding. Commercial forestry in Texas has focused on fiber production, and commercial forests are managed on a short rotation such that trees are too small for nest cavity excavation (TPWD 2006). Fire suppression over the past decades has allowed forests to replace open savanna with dense tree canopies and dense herbaceous ground cover that is not preferred for nesting or foraging (USFWS 2002a).

In 2002, there were 342 known active red-cockaded woodpecker clusters distributed within 15 counties of the Pineywoods Region of eastern Texas (Campbell 2003). The USFWS reviewed maps of the Project route in eastern Texas and confirmed that there are no known red-cockaded woodpecker clusters or potential suitable habitat within the proposed Project area. Aerial surveys conducted in 2008 and 2009 identified no areas of suitable red-cockaded woodpecker habitat along the Project corridor.

Potential Impacts and Conservation Measures

The Project would have no effect on the red-cockaded woodpecker. This determination is based on USFWS confirmation that no known active red-cockaded woodpecker clusters occur near the Project, and USFWS and aerial confirmation that no suitable habitat for this species would be crossed by the Project.

Whooping Crane

The whooping crane was federally listed as endangered in 1970, is state listed as endangered by South Dakota, Nebraska, Kansas, Oklahoma, and Texas, and is state listed as a species of concern by Montana. Critical habitat was designated in 1978 (43 FR 20938-942) and includes wintering grounds in the Aransas National Wildlife Refuge in Texas and migration routes through Nebraska, Kansas, and Oklahoma. An International Recovery Plan exists for North America (USFWS 2007b). The Rainwater Basin in south Central Nebraska provides migration habitat. The whooping crane breeds, migrates, winters, and forages in a variety of habitats, including coastal marshes and estuaries, inland marshes, lakes, ponds, wet meadows and rivers, and agricultural fields. Whooping cranes use numerous habitats such as cropland and pastures; wet meadows; shallow marshes; shallow portions of rivers, lakes, reservoirs, and stock ponds; and both freshwater and alkaline basins for feeding and resting during their spring and fall migration. Overnight roosting sites frequently require shallow water in which they stand and rest. Shallow, sparsely vegetated streams and wetlands are required for feeding and roosting during migration. Primary threats to the whooping crane are habitat loss and alteration. Habitat alteration through water diversion is a major threat along the Platte River and other large riverine migration stopover habitats.

The north-south migration corridor through South Dakota, Nebraska, Kansas, and Oklahoma, would be crossed by the Project. The Project in Montana is west of the whooping crane primary migration pathway. The spring migration from about March 23 through May 10 and fall migration from about September 16 through November 16 are usually completed within about 2 to 4 weeks. However, migration timing throughout the states crossed by the Project varies with latitude during the general migration period. Migrating whooping cranes could roost or feed within the Project area.

The majority of the Project route in South Dakota and Nebraska is located within the central Great Plains migration pathway (CWS and USFWS 2007). The Project in Oklahoma and Texas is generally east of the central Great Plains migration pathway (CWS and USFWS 2007). However, individual birds can be found outside the primary movement corridor and could possibly occur within the Project area during spring and fall migration. Habitats potentially used by whooping cranes during migration would include major rivers and their associated wetlands crossed by the Project.

Potential Impacts and Conservation Measures

Temporary displacement of migrating whooping cranes from construction noise could occur if construction occurred near migratory stopover habitats. The use of the HDD method at major river crossings would prevent potential roosting and foraging habitat loss. In other areas along the corridor, revegetation, particularly within riparian zones, would reduce habitat impacts..

Temporary water withdrawals to support hydrostatic testing are not expected to result in impacts to the whooping crane based on Keystone's plan to return water to its source within a 30-day period and to withdraw the volume needed at a rate less than 10 percent of the baseline daily flow.

The USFWS has recommended that if a whooping crane lands in close proximity to the ROW during construction, its presence should be documented and appropriate mitigation measures implemented to prevent direct impacts.

The Project may affect, but is not likely to adversely affect whooping cranes. This determination is based on the rarity of the species, its status as a migrant through the Project area, and Keystone's commitment to follow recommended USFWS conservation measures.

Connected Actions

Electrical distribution lines associated with the Project are collision hazards to migrant whooping cranes. The construction of new electrical distribution lines, especially those across riverine roosting habitats (Yellowstone River in Montana, the Missouri River in South Dakota, and Platte River in Nebraska) or between roosting habitat and nearby foraging habitat (including wetlands and grain fields), would incrementally increase the collision hazard for migrating whooping cranes because a portion the Project area is located within the primary migration corridor for this species. The Platte River electrical distribution line crossing is within the primary migration corridor for whooping cranes, and the Yellowstone and Missouri River electrical distribution line crossings are on the western edge. An analysis of suitable migration stop-over habitat (e.g., large waterbodies, wetlands, and associated agricultural fields) during migration in relation to preliminary electrical distribution line routes identified 74 locations within the primary migration corridor for 19 pump stations where electrical distribution lines could potentially increase collision hazards for migrating whooping cranes. There is no indication, however, that any of these locations have been used by whooping cranes. Keystone would inform electrical power providers of the requirements for ESA consultations with the USFWS for the electrical infrastructure components constructed for the Project to prevent impacts to the whooping crane.

Operation of the proposed 230-kV transmission line in southern South Dakota may increase the collision hazards for migrating whooping cranes in the Project area. Keystone would inform BEPC and Western of the requirements for ESA consultations with the USFWS for the electrical infrastructure components constructed for the Project to prevent impacts to whooping cranes.

Yellow-billed Cuckoo

The yellow-billed cuckoo western U.S. Distinct Population Segment (DPS) is a candidate for federal listing and the yellow-billed cuckoo is a BLM Sensitive species. The western DPS occurs west of the crest of the Rocky Mountains in Montana, Wyoming, and northern and central Colorado; and west of the Pecos River drainage in Texas and does not occur within the Project area. Yellow-billed cuckoos that occur within the Project area are considered to belong to the eastern DPS which is not a candidate for federal listing. Further discussions of the yellow-billed cuckoo are presented in Section 3.8.2 and 3.8.4.

3.8.1.3 Federally-Protected Amphibian

Preliminary evaluations identified one federally protected amphibian that could potentially occur within the Project area (Table 3.8.1-1).

Houston Toad

The Houston toad is federally listed and state-listed in Texas as endangered. It occurs primarily in Bastrop County, Texas and in limited numbers in eight other Texas counties; Austin, Burleson, Colorado, Lavaca, Lee, Leon, Milam, and Robertson. The primary threats to the Houston toad are habitat loss and degradation, especially conversion of ephemeral wetlands to uplands or perennial waterbodies. Ephemeral wetland conversion to uplands eliminates water needed for breeding; while conversion to perennial waterbodies increases predation on eggs, tadpoles and toadlets and competition with invasive aquatic animals. Drought, habitat fragmentation due to infrastructure, fire suppression, and the invasion of the red imported fire ant (*Solenopsis invicta*) are also threats to the Houston toad (TPWD 2008b).

Houston toads are primarily terrestrial and inhabit areas with deep sandy soils. They are poor burrowers and require loose soils for burrowing and protection against cold conditions in winter and hot, dry conditions in summer. Slow-flowing waterbodies persisting for 30 days or more are required for breeding and development of tadpoles. Suitable breeding habitats may include ephemeral ponds, flooded fields, wet areas associated with springs or seeps, or shallow permanent ponds (TPWD 2008b). The Houston toad generally breeds in February and March, but males can be heard calling from December through June. The toads can only breed when temperature and moisture conditions are suitable. Eggs are laid in the water and hatch within seven days; tadpoles metamorphose in 15 to 100 days; and toadlets leave the water and become terrestrial to feed and winter. First-year toadlets and juvenile Houston toads are generally active year round. Adult toads can also be active year round if the temperature and moisture conditions are favorable (TPWD 2008b).

The distribution of the Houston toad is outside of the Project area; none of the counties where the toad has been recorded would be crossed by the proposed Project. The county closest to the proposed Project is Austin County, but the county line is about 10 miles from the proposed Project area.

Potential Impacts and Conservation Measures

The Houston toad is not known or expected to occur near the Project area; therefore, the proposed Project would have no effect on the Houston toad.

3.8.1.4 Federally-Protected and Candidate Reptiles

Preliminary evaluations identified six federally protected and candidate reptiles that could potentially occur within the Project area (Table 3.8.1-1).

Green Sea Turtle

The green sea turtle is federally listed and state-listed in Texas as threatened. This species nests in tropical and subtropical waters worldwide and inhabits shallow waters inside reefs, bays, and inlets, except during migration. Within the southeastern U.S., green turtles generally nest between June and September. Hatchlings eat a variety of plants and animals and forage in areas such as coral reefs, emergent rocky bottoms, Sargassum mats, lagoons, and bays. The adults feed on marine algae and sea grasses including: *Cymodocea* spp., *Thalassia* spp., and *Zostera* spp. Feeding grounds in the Gulf of Mexico include inshore south Texas waters, the upper west coast of Florida, and the northwestern coast of the Yucatan Peninsula in Mexico. Green sea turtles prefer to nest on high energy beaches with deep sand and little organic content. Primary threats to the green turtle include incidental capture in fishing gear and, in some areas of the world, harvesting of eggs and adults for human consumption (USFWS 2002b).

Green sea turtles are primarily pelagic but may rarely venture into brackish waters, such as Sabine Lake which is east of the end of the Gulf Coast Segment.

Potential Impacts and Conservation Measures

Marine and estuarine habitats are not crossed by the Project; therefore the Project would have no effect on green sea turtles.

Hawksbill Sea Turtle

The hawksbill sea turtle is federally listed and state-listed in Texas as endangered. It occurs primarily in coastal waters and seldom ventures to waters deeper than 65 feet. It inhabits rocky areas, coral reefs, lagoons, oceanic islands, shallow coastal areas, and narrow creeks and passes and is found in tropical and subtropical waters in the Atlantic, Pacific, and Indian Oceans. Nesting generally occurs between April and November on undisturbed deep-sand beaches. Nesting beaches are normally low-energy with woody vegetation near the waterline (USFWS 2002c).

Hawksbill sea turtles are the least common sea turtle in the Gulf of Mexico (MMS 2002), although they have been recorded in waters all along the coast of the Gulf of Mexico (USFWS 2002c). Adults usually forage around coral reefs and other hard bottom habitats and primarily eat sponges. They also forage on jellyfish, crustaceans, sea urchins, and mollusks (TPWD 2009d). This diet and their dependence on hard bottom communities make the species especially vulnerable to deteriorating conditions on coral reefs.

The hawksbill sea turtle is primarily pelagic and seldom ventures into brackish waters, such as Sabine Lake, east of the Gulf Coast Segment.

Potential Impacts and Conservation Measures

Marine and estuarine habitats are not crossed by the Project; therefore the Project would have no effect on hawksbill sea turtles.

Kemp’s Ridley Sea Turtle

The Kemp’s ridley sea turtle is federally listed and state-listed in Texas as endangered. It is the smallest of all the marine sea turtles and the most endangered. It occurs mainly in the coastal areas of the Gulf of Mexico and northwestern Atlantic Ocean. Nesting occurs mainly in Mexico from May to July, but Kemp’s ridley sea turtles also nest in small numbers along the Gulf Coast. Juveniles and sub-adults occupy shallow coastal regions and are commonly associated with crab-laden, sandy or muddy water bottoms. Young turtles often float on mats of Sargassum. Kemp’s ridley sea turtles feed mostly on swimming crabs, but their diet also includes fish, jellyfish, and mollusks. Between the eastern Gulf Coast of Texas and the Mississippi River delta, Kemp’s ridley sea turtles can be found in nearshore waters, ocean sides of jetties, small boat passageways through jetties, and dredged and non-dredged channels (NOAA 2009a, TPWD 2009e). They have been observed within Sabine Lake in the past and most likely these sightings were post-pelagic sub-adults or juveniles (Metz 2004). Major threats to this species include over-exploitation of their nesting beaches, collection of eggs, drowning in fishing nets, and pollution that results in ingestion of floating trash (NOAA 2009a, TPWD 2009e).

The Kemp’s ridley sea turtle is primarily pelagic and does not occur within the Project area. Sub-adults and juveniles would use nearshore waters as a nursery, especially where Sargassum mats are found. Individuals have been uncommonly observed in Sabine Lake.

Potential Impacts and Conservation Measures

Marine and estuarine habitats are not crossed by the Project, therefore the Project would have no effect on Kemp's ridley sea turtles.

Leatherback Sea Turtle

The leatherback sea turtle is federally listed and state-listed in Texas as endangered. It is primarily a pelagic species, although it occasionally forages in coastal waters, and is distributed in temperate and tropical waters worldwide. It is the largest, deepest-diving, and widest-ranging sea turtle. Leatherbacks undergo extensive migrations from feeding grounds to nesting beaches. Although southeast Florida only supports minor nesting colonies, the area represents the most significant nesting group within the continental United States, with the nesting period extending through the fall and winter. Rarely are leatherbacks seen along the Gulf Coast of Texas. Leatherback sea turtles feed primarily on jellyfish and other soft-bodied pelagic prey, but also feed on sea urchins, squid, crustaceans, tunicates, fish, blue-green algae, and floating seaweed. Significant threats to the species include disturbance of their nesting grounds, incidental capture in fishing gear, pollution that results in ingestion of floating trash, and harvest of adults and eggs (NOAA 2009b, TPWD 2009f).

The leatherback sea turtle is primarily pelagic and seldom ventures into brackish waters, such as Sabine Lake, east of the Gulf Coast Segment.

Potential Impacts and Conservation Measures

Marine and estuarine habitats are not crossed by the Project; therefore the Project would have no effect on leatherback sea turtles.

Loggerhead Sea Turtle

The loggerhead sea turtle is federally listed and state-listed in Texas as threatened. It is the most abundant sea turtle in the Gulf of Mexico and inhabits temperate and tropical waters in the estuaries and continental shelves of both hemispheres. In the southeastern U.S., females nest from late April through early September. Nesting occurs primarily on barrier islands adjacent to mainlands in warm-temperate and sub-tropical waters. Nest sites are typically located on open, sandy beaches above the mean high tide line and seaward of well-developed dunes. Adults occupy a variety of habitats, ranging from turbid bays to clear reef waters, whereas sub-adults occur mainly in nearshore and estuarine waters. Hatchlings move directly to sea after hatching and often float in mats of Sargassum. Loggerheads can be found throughout the Gulf of Mexico, but only occasionally venture to the Texas Gulf Coast near the Project area. The loggerhead diet consists of a wide variety of benthic and pelagic food items, including conches, shellfish, horseshoe crabs, prawns and other crustaceans, squid, sponges, jellyfish, basket stars, fish, and hatchling loggerheads. The most significant threats to the loggerhead populations are commercial harvesting, incidental capture in fishing and shrimping nets, coastal development, and pollution that results in ingestion of floating trash (NOAA 2009c, TPWD 2009g).

The loggerhead sea turtle is primarily pelagic, but also frequents nearshore waters. Loggerhead turtles are the most common sea turtle in the Gulf of Mexico, but do not often venture to the Texas Gulf Coast.

Potential Impacts and Conservation Measures

Marine and estuarine habitats are not crossed by the Project, therefore the Project would have no effect on loggerhead sea turtles.

Louisiana Pine Snake

The Louisiana pine snake is a federal candidate for listing and is state-listed in Texas as threatened. Recent studies on the status of the Louisiana pine snake in Texas indicate that populations are extremely small and isolated, occurring mostly in Angelina, Newton, Jasper, and Sabine counties, with single specimens being recorded in Montgomery and Tyler Counties in the 1990s. Louisiana pine snakes are terrestrial reptiles that inhabit fire-maintained pine-oak sandhills interspersed with moist bottomlands (Werler and Dixon 2000). They are accomplished burrowers, which aids in capturing their preferred prey, pocket gophers (*Geomys* spp.). They also use the pocket gopher burrow systems for hibernacula and subsurface retreats from threats such as predators and fire. Breeding habits of the Louisiana pine snake are not well known, and no field observations of natural breeding activities have been recorded. The primary threats to the Louisiana pine snake are habitat loss and degradation and suppression of the natural fire regime. Louisiana pine snakes are closely associated with a well-developed herbaceous ground cover, and with pocket gophers that are dependent on herbaceous vegetation (Rudolph et al. 2002). The absence of fire allows a thick layer of duff to form, which suppresses herbaceous ground cover and affects pocket gopher populations. Silvicultural practices, pesticide use, and vehicular traffic are other existing threats to the Louisiana pine snake (Werler and Dixon 2000).

The proposed Project route would cross Angelina County, where Louisiana pine snakes have been recorded, although all records are clustered within the eastern part of the county outside of the Project area.

Potential Impacts and Conservation Measures

Indirect effects on the Louisiana pine snake could include decreases in pocket gopher populations through habitat fragmentation or through construction-related direct mortality. However, restoration and seeding practices would be implemented to restore the ROW to pre-construction conditions as far as possible. Therefore, much of the pocket gopher habitat could recover within 1 to 3 years which could potentially support the Louisiana pine snake.

3.8.1.5 Federally-Protected and Candidate Fish

Preliminary evaluations identified four federally protected and candidate fish that could potentially occur within the Project area (Table 3.8.1-1).

Arkansas River Shiner

The Arkansas River shiner was federally listed as endangered in 1998 (USFWS 1998a; Federal Register 63 FR 64771 64799) and critical habitat was designated in 2001 (USFWS 2001a; 66 FR 18001 18034). In early 2009, the USFWS included the Arkansas River shiner in a 5-year status review (Federal Register 74 FR 6917 6919). Arkansas River shiners are present in Oklahoma in the Canadian River and potentially in North Canadian River (Pigg 1991). The species is known to occur in 7 of the 8 counties through Oklahoma. Historically, the Arkansas River shiner was found throughout the western portion of the Arkansas River basin in Kansas, New Mexico, Oklahoma, and Texas. Losing over 80 percent of its historical habitat, it is currently found in the Canadian River in Oklahoma, Texas, and New Mexico and potentially is present in the Cimarron River in Oklahoma. With current abundance and distributions, the species is considered stable (Warren et al. 2000). Preferred habitats are turbid waters of broad, shallow, unshaded channels of creeks and small to large rivers, over mostly silt and shifting sand bottoms (Gilbert 1980a). These fish tend to congregate on the downstream side of large transverse sand ridges. Juvenile Arkansas River shiners associate most strongly with current, conductivity (total dissolved solids), and backwater and island habitat types (Polivka 1999). Diet consists mainly of plankton and organisms that are exposed by moving sand or by drifting downstream (Moore 1944). Spawning occurs from June to July in main stream channels but spawning may also occur into August.

The Project would cross the North and South Canadian rivers. The Arkansas River shiner is known to occur in the South Canadian River and potentially occurs in the North Canadian River. The Project also crosses designated critical habitat in the South Canadian River. Surveys for the Arkansas River shiner were not recommended in Oklahoma within the South Canadian and North Canadian rivers since the presence of this species at these crossings is assumed.

Potential Impacts and Conservation Measures

Both the North and South Canadian rivers would be crossed using the HDD method. As recommended by the USFWS, a buffer of 300 feet from bank full width would be maintained on each side of these rivers unless USFWS and Keystone agree to adjust buffer width based on habitat conditions. The HDD entry and exit locations would be outside the 300-foot buffer.

The crossings of these rivers would be in compliance with the HDD Plan and Hydrostatic Test Plan. No direct habitat impacts are likely to occur from construction. HDD poses a small risk of frac-out, or spills of drilling fluids. Drilling fluid spills are rare and are contained by the best management practices that are described within the HDD Contingency Plans required for drilling crossings. Most leaks of HDD drilling mud occur near the entry and exit locations for the drill and are quickly contained and cleaned up. Some clearing of vegetation and limited human access would be required within the 300-foot buffer zone for the True Tracker Wire used during HDD drilling and to access these rivers to withdraw water for hydrostatic testing.

Water withdrawals for HDD and for hydrostatic testing would also occur. A water pump and intake hose would be placed in the waterbody to provide water to the HDD operation and for hydrostatic testing of the pipeline. Intake ends would be screened during water withdrawal using an appropriate mesh size to prevent entrainment or entrapment of adult, juvenile and larval fish or other aquatic organisms. Although intake ends would be screened, any drifting pelagic eggs could be entrained and destroyed if water withdrawal for HDD occurs during the Arkansas River shiner’s spawning period. The withdrawal rates for the pumps would be controlled, thus reducing the potential for entrainment or entrapment of aquatic species. The combination of effective screening and controlled water withdrawal rates would prevent most direct impacts to the Arkansas River shiner. Currently, water withdrawals for the HDD of the North and South Canadian rivers and the hydrostatic test of this section of pipeline are scheduled to occur between November 1, 2010 and April 13, 2011, which is prior to the Arkansas River shiner’s spawning period (June 1 to August 15). Therefore, it is not expected that eggs or newly emerged Arkansas River shiner larvae would be present in the rivers during water withdrawal activities.

The North and South Canadian rivers have been identified as hydrostatic test water sources. Water withdrawal for hydrostatic testing would require much larger volumes. During this testing process, a pump would be placed in or next to the river for the duration of the water intake and filling period. The intake end of the pump would be screened to prevent entrainment of larval fish or debris. Once the pipeline is filled with water and pressure tested, the water would be returned to the drainage. Care would be taken during the discharge to prevent erosion or scouring of the waterbody bed and banks. The water would be tested prior to discharge to ensure compliance with the NPDES discharge permit requirements, treated if necessary, and discharged.

Keystone would implement the following conservation measures to minimize impacts to the Arkansas River shiner at the North Canadian and South Canadian river crossings:

- Construction activities would be prohibited during the spawning period (June 1 through August 15) at the North Canadian and South Canadian river crossings unless a plan is developed in consultation with the USFWS that would minimize impacts to this species.
- Only a limited amount of clearing of vegetation would occur within the critical habitat area along the South Canadian River and the habitat along the North Canadian River.
- If the HDD crossing on this steam is unsuccessful and a different crossing method is required, the USFWS will be consulted to determine the measures that would be implemented to avoid and minimize adverse impacts to this species. These measures could include salvage and relocation efforts in consultation with the USFWS.
- Erosion control measures would be implemented as described in the CMR Plan (Appendix B). Erosion and sediment controls would be monitored daily during construction to ensure effectiveness, particularly after storm events, and only the most effective techniques would be used.

The Project may affect, but is not likely to adversely affect the Arkansas River shiner. This determination is based on Keystone's plan to use HDD to cross the South Canadian and North Canadian rivers, Keystone's commitment to remove minimal amounts of vegetation at these rivers, and Keystone's commitment to follow recommended conservation measures provided by the USFWS. The Project may affect, but is not likely to adversely affect designated critical habitat for the Arkansas River shiner at the South Canadian River crossing.

Pallid Sturgeon

The pallid sturgeon was federally listed as endangered in 1990 (55 FR 36641). The USFWS (1993) produced a recovery plan for the pallid sturgeon. No critical habitat rules have been published for the species. Current distribution of the pallid sturgeon includes the upper and lower Missouri River drainage, the lower Yellowstone River drainage, the upper and lower Mississippi River drainages, and the lower Ohio River drainage (NatureServe 2009). The pallid sturgeon is one of the rarest fish of the Missouri and Mississippi rivers. This sturgeon is adapted to habitat conditions that existed in these large rivers prior to their wide-scale modification by dams, diversions, and flood control structures. Habitats required by pallid sturgeon are formed by floodplains, backwaters, chutes, sloughs, islands, sandbars, and main channel waters within large river ecosystems. Prior to dam development along the Missouri and Mississippi rivers, these features were in a constant state of change. With the introduction of dams and bank stabilization, areas of former river habitat have been covered by lakes, water velocity has increased in remaining river sections making deep stretches of clear water, and water temperatures have significantly decreased. All of these factors are believed to have contributed to the decline in pallid sturgeon populations (USFWS 1993).

Pallid sturgeons live in large, free-flowing, warmwater stream systems with a diverse assemblage of physical habitats. They are adapted for a variety of habitats (USFWS 2007e, Dryer and Sandvol 1993) living close to the bottom of large, shallow, silty rivers with sand and gravel bars. Pallid sturgeons have historically occupied turbid rivers and have been found in habitats maintaining 31 to 137 Nephelometric turbidity units (NTU) (EPA, 2007). Limited empirical evidence is available to describe spawning habitat. Pallid sturgeons are presumed to spawn in swift water over gravel, cobble or other hard surfaces (USFWS 1993, Laustrop et al. 2007). Spawning habitat characterization in controlled rivers has indicated that pallid sturgeon spawn in spring and early summer (from April into July) releasing their eggs at intervals. Spawning is triggered by increased spring season flow from runoff; which also initiates spawning in paddlefish and shovelnose sturgeon. Adhesive eggs are released during spawning in deep channels or gravelly riffles and are left unattended. Newly hatched pallid sturgeon are buoyant and active immediately after hatching, and drift downstream with the current for up to 13 days, traveling distances of 40 to 400 miles. Pallid sturgeon can live over 50 years and can grow quite large as indicated by the report of an 86 pound specimen from the Missouri River. Pallid sturgeon feeding and nursery habitats include floodplains and backwaters where adults and juveniles feed primarily on fish, and smaller juveniles feed primarily on the larvae of aquatic insects.

Within the Project area, the pallid sturgeon potentially occurs at the crossing of the Missouri River below Ft. Peck Dam, the crossing of the Milk River, and the crossing of the Yellowstone River downstream of Fallon, Montana. In larger Mississippi tributaries crossed by the Project such as the Platte, Kansas, Arkansas and Red rivers, pallid sturgeon occur only near the rivers' confluences with the Mississippi River. Since the 1980s the most frequent occurrences are from the Missouri River, between the Marias River and Fort Peck Reservoir in Montana, and within the lower 70 miles of the Yellowstone River to downstream of Fallon, Montana. Larval pallid sturgeons have rarely been collected within their range likely due to low reproductive success or ineffective sampling gear.

It is estimated that 50 to 100 pallid sturgeons remain in the Missouri River above Fort Peck Dam, and 200 to 300 pallid sturgeons remain in the Missouri and lower Yellowstone rivers between Fort Peck Dam and Garrison Dam in North Dakota (Krentz 1997, Gardner 1994). Populations of pallid sturgeon in Montana are declining, with no evidence of reproduction. Pallid sturgeon between Fort Peck Dam and Lake Sakakawea are an important portion of the total population (Tews 1994). Adult fish in this reach are nearing the end of their life expectancy and may attempt reproduction only several more times (USFWS 2000). Pallid sturgeon move downstream from the Fort Peck Dam to below the confluence of the Yellowstone and Missouri rivers in summer, and generally return to the Fort Peck tailrace during winter. Most pallid sturgeons have been documented in the Missouri River downstream from its confluence with the Yellowstone River (Liebelt 1998). While no specific pallid sturgeon spawning locations have been identified in the Missouri River, there are likely suitable sites in the Missouri and possibly in the Milk River. Regulated flows from Fort Peck Dam coupled with lower water temperatures during spring and early summer have failed to provide adequate spawning cues for pallid sturgeon in the Project area. The U.S. Army Corps of Engineers proposes to modify operations of Fort Peck Dam to provide additional water from the surface of Fort Peck Reservoir to stimulate spawning and optimize spawning habitat for pallid sturgeon and other native fish.

Potential Impacts and Conservation Measures

Potential impacts to pallid sturgeon are reduced as a result of Keystone's commitment to using the HDD crossing technique at the Milk, Missouri, and Yellowstone and Platte rivers. The HDD method avoids any direct disturbance to the river, channel bed, or banks. While the HDD method poses a small risk of frac-out (an unexpected release of bentonite-based drilling fluids), such events are relatively infrequent. Should a drilling fluid release occur, Keystone has committed to containing and cleaning up the release using best management practices as described within the contingency plans required for HDD crossings. Most leaks of HDD drilling fluids occur near the entry and exit locations for the drill and are quickly contained and cleaned up. Frac-outs occurring in aquatic environments are difficult to contain primarily because bentonite, readily disperses in flowing water and quickly settles in standing water. Bentonite is non-toxic, but in sufficient concentration may physically inhibit respiration of adult fish and eggs.

Larval life stages could be entrained through water withdrawals for both HDD and hydrostatic testing and would not likely survive. Newly emerged pallid sturgeon larvae drift with currents for many days and over large distances (Braaten 2008) before they achieve any volitional movements. At streams and rivers crossed by the HDD method, the water pump intake hose would be screened using an appropriate mesh size to prevent entrainment of larval fish or other aquatic organisms. The withdrawal rates for the pumps would be controlled, also reducing the potential for entrainment or entrapment of aquatic species.

The Missouri, Yellowstone, Milk, and Platte rivers have been identified as water sources for hydrostatic testing. The water pump intake would be screened to prevent entrainment of larval fish or debris. All water pump intake screens would be periodically checked for entrainment of fish during water withdrawals and care would be taken to prevent erosion or scouring of the waterbody bed and banks during discharge.

Platte River basin water depletions in Nebraska may affect pallid sturgeon habitats by reducing the amount of water available for this species in the lower Platte River. Impacts to the pallid sturgeon from temporary water reductions during hydrostatic testing in the lower Platte River Basin would be avoided based on Keystone's plan to withdraw the volume needed at a rate of less than 10 percent of the baseline daily flow and to return water to its source within a 30-day period.

The Project may affect, but is not likely to adversely affect the pallid sturgeon. This determination is based on Keystone's plan to use the HDD crossing method at the Missouri, Yellowstone, Milk and Platte rivers and Keystone's commitment to follow USFWS recommended conservation measures.

Smalleye Shiner

The smalleye shiner is a candidate for federal listing and is listed as threatened in the state of Texas. It is endemic to the Brazos River drainage and presumed to have been introduced to the Colorado River (Hubbs et al. 1991). Historically the smalleye shiner was found in the lower Brazos River as far south as Hempstead, Texas. Smalleye shiners inhabit turbid waters within broad, sandy main stream channels with shifting sand bottoms (Gilbert 1980, Page and Burr 1991). These minnows are batch spawners, and may produce multiple cohorts within a spawning season. Populations usually are asynchronous egg producers, but may also synchronize egg production during pulse flows (Durham 2007). Spawning habitat is likely open water. Smalleye shiners are opportunistic feeders that consume aquatic insects (primarily dipterans), terrestrial insects, detritus, and plant material (Moss and Mayes 1993, Marks et al. 2001).

Potential Impacts and Conservation Measures

Smalleye shiners have been reported from Angelina County in Texas. However, the known distribution of the smalleye shiner in Texas is west of the Project and the Project would not cross any drainages currently or historically occupied by this species.

Topeka Shiner

The Topeka shiner was federally listed as endangered in 1999 (Shearer 2003). It is state listed as a species of concern in South Dakota and threatened in Kansas. Critical habitat was designated in July, 2004, and includes 6 miles of the Elkhorn River in Madison County, Nebraska. The Topeka shiner is susceptible to water quality changes in its habitat and has disappeared from several sites because of increased sedimentation resulting from accelerated soil runoff. Stream modifications, sediment deposition, pollution, overgrazing, and predation by introduced fish are thought to have led to the decline of the Topeka shiner across its Midwestern range.

The fish inhabits spring-fed, sandy-bottomed streams with good water quality and lives in pools and slack water areas between riffle sequences along stream courses. Topeka shiners inhabit less than 10 percent of their original geographic range (USFWS 1998b) and are opportunistic omnivore predators. Their prey includes insects, algae, fish larvae, and worms. The maximum life span of the Topeka shiner is three years. Most reach maturity in the spring or summer of their second year. They spawn from late-May to mid-July and deposit their eggs in the nests of green and orange-spotted sunfish. Topeka shiners are known to occupy numerous small streams in eastern South Dakota, and most are concentrated in the Big Sioux, Vermillion, and James River watersheds.

Potential Impacts and Conservation Measures

The Topeka shiner is listed as occurring in Butler County, Kansas (USFWS 2008a). One new 10-acre Project pump station site is proposed for Butler County, Kansas, on the Cushing Extension of the Keystone Pipeline Project. The proposed pump station site is located within an agricultural field and suitable habitat does not exist for the Topeka shiner in or near this location. The Project would therefore have no effect on the Topeka shiner.

3.8.1.6 Federally-Protected Invertebrates

Preliminary evaluations identified two federally protected invertebrates that could potentially occur within the Project area (Table 3.8.1-1).

American Burying Beetle

The American burying beetle was federally listed as endangered in August 1989 (54 FR 29652). Critical habitat has not been designated. The Final Recovery Plan (USFWS 1991) was signed on September 27, 1991. This species was recorded historically from at least 35 states in the eastern and central United States, as well as along the southern portions of the eastern Canadian provinces. Currently, it is known to exist in isolated colonies in at least six states: Arkansas, Kansas, Nebraska, Oklahoma, South Dakota, and Rhode Island (Backlund and Marone 1997, Bedick et al. 1999). American burying beetles have disappeared from over 90 percent of their historic range, even though they are considered feeding habitat generalists. The decline of the American burying beetle has been attributed to habitat loss, alteration, and degradation. American burying beetles have generally been found in level areas with relatively loose, well-drained soils amongst litter layers from previous years.

The American burying beetle is nocturnal, lives for only one year, and typically reproduces only once. American burying beetles are scavengers, dependent on carrion for food and reproduction. This species plays an important role in breaking down decaying matter and recycling it back into the ecosystem. Identified habitat in Nebraska consists of grassland prairie, forest edge, and scrubland. Within remaining range for the American burying beetle in Nebraska, there is a large population (>500 individuals) in the southern loess hills (Bedick et al. 1999). However, large areas within Nebraska remain unexamined for remnant populations. In 2006, sampling in Custer County re-discovered a small population of the species, and the expected distribution in Oklahoma includes most eastern counties.

Suitable habitat was located along the proposed Project in South Dakota, Nebraska, Oklahoma and Texas (Table 3.8.1-5). Presence/absence surveys for American burying beetles along the route in Nebraska completed in June and August 2009 failed to capture any American burying beetles along the Project route. In Oklahoma, American burying beetles may potentially occur within the Project area in Creek, Okfuskee, Seminole, Hughes, Coal, Atoka, and Bryan counties. Of the 138 miles of Project ROW in Oklahoma, 26.5 miles were classified as prime habitat for the American burying beetle, 24.9 miles were classified as good habitat, and 27.8 miles were classified as fair habitat for a total of 79.2 miles of suitable habitat for the species (Bauer and Abbott 2009). Surveys for the American burying beetle occurred n Texas during the summer of 2009 using baited pitfall traps. The surveys failed to trap any American burying beetles (Bauer and Abbott 2009). Trapping that occurred during May to August 2009 in known American burying beetle habitat ranges in Lamar County outside of the Project area also failed to trap any American burying beetles.

TABLE 3.8.1-5 American Burying Beetle Occurrence along the Project			
State	**County**	**Distance (Miles) Crossed by ROW[a]**	**Suitable American Burying Beetle Habitat**
Steele City Segment			
South Dakota	Tripp	59.3	Extensive
Nebraska	Keya Paha	18.6	Extensive
Nebraska	Rock	9.4	Extensive
Nebraska	Holt	44.8	Extensive
Nebraska	Garfield	9.6	Limited
Nebraska	Wheeler	18.7	Limited
Nebraska	Greeley	23.9	Unknown
Nebraska	Boone	3.4	Unknown
Nebraska	Nance	17.1	Unknown
Nebraska	Merrick	15.5	Unknown
Nebraska	Hamilton	6.7	Unknown
Nebraska	York	30.2	Unlikely
Nebraska	Fillmore	14.7	Unlikely
Nebraska	Saline	16.7	Unlikely
Nebraska	Jefferson	25.8	Unlikely
Gulf Coast Segment			
Oklahoma	Creek	5.7	Historic
Oklahoma	Okfuskee	15.5	Confirmed
Oklahoma	Seminole	20.5	Likely
Oklahoma	Hughes	27.6	Confirmed
Oklahoma	Coal	26.2	Confirmed
Oklahoma	Atoka	19.8	Confirmed
Oklahoma	Bryan	22.7	Confirmed
Texas	Lamar	28.5	Confirmed

Source: ENSR 2008b, Bauer and Abbott 2009.
[a] Based on the 021509 Centerline.

Potential Impacts and Conservation Measures

Direct impacts to American burying beetles as a result of Project construction could include habitat loss and degradation, increased habitat fragmentation, and potential mortality of eggs, larvae and adults from excavation and construction vehicle traffic. Construction would take place during the daylight hours and construction areas would not use artificial lighting, therefore, no impacts from artificial lighting during construction would occur.

During operations, lights associated with aboveground facilities may attract local American burying beetles, particularly if the lights emit wave lengths in the UV spectrum. Facilities associated with the pipeline would generally not be lighted, although a single light would be used above pump station doors.

The activity period for the American burying beetle across its range is generally late April through September (USFWS 1991) and is associated with air temperature. Peak activity occurs when temperatures are 60 °F or greater at midnight. The American burying beetle overwinters as an adult by burrowing in soil (Schnell et al. 2008). Schnell et al. (2008) found that in Arkansas, surviving American burying beetles overwintered at an average depth of 6 cm (2.4 inches) with some as deep as 20 cm (6 inches). Heat generated by the pipeline typically increases soil temperature 6 inches below the surface between 5 and 8 °F above background levels, with differences occurring during January to April, particularly in northern latitudes (Keystone 2009c). Early season temperature differences at northern latitudes are between 10 and 15 °F directly over the pipeline compared to background levels (Keystone 2009c). Seasonal differences as a result of pipeline heat are not noticeable in Oklahoma and Texas (Keystone 2009c). Soil heating associated with Project operation could produce some increase in the activity period for the American burying beetle, although the overall impacts of this increased activity would likely be negligible since species survival is more closely linked to its access to carrion and the availability of whole vertebrate carcasses (USFWS 2008c).

It is likely that all direct impacts to the American burying beetle may not be avoided. Keystone has volunteered to provide monetary compensation to the Nature Conservancy Fund for habitat acquisition as compensatory mitigation. The Nature Conservancy Fund would then purchase and protect lands which are known to contain sustainable populations of the American burying beetle, providing an ecologically sound option for increasing the species within its historic range.

General conservation measures that have been discussed to avoid and minimize potential impacts to the American burying beetle include:

- Bait away and/or trap and relocate adult American burying beetles to remove them from the construction ROW.
- Establish a compensatory mitigation plan for potential impacts to the American burying beetle by contributing to habitat conservation.

State specific conservation measures for the American burying beetle that have been recommended by respective USFWS offices and state resource agencies include:

- The Pierre, South Dakota USFWS Field Office and SDGFP does not recommend trap and relocate procedures in South Dakota. According to the USFWS, recommended conservation measures for American burying beetle impacts include setting up a compensatory mitigation plan for potential impacts to the American burying beetle in Tripp County (AECOM 2008).
- If surveys on route changes indicate the presence of the American burying beetle along the Project ROW in Nebraska, Keystone would implement trap and relocate measures in those areas prior to construction activities.
- The USFWS Field Office in Tulsa, Oklahoma does not recommend trap and relocate procedures in Oklahoma. According to the USFWS, recommended conservation measures for American burying beetle impacts include setting up a compensatory mitigation plan for potential impacts to the American burying beetle in Oklahoma.
- If the route changes and future surveys indicate the presence of the American burying beetle in Lamar County, Texas, bait away or trap and relocate efforts would be undertaken prior to construction activities.

In addition to the conservation measures outlined above, the Pierre, South Dakota USFWS Field Office has recommended the following additional measures to protect the American burying beetle:

- The construction camp near Winner, South Dakota, should be built on cropland very close to Winner, and/or north of Highway 18 in Tripp County.
- The two pipe stockpile sites planned for Tripp County should be placed on cropland, or north of Highway 18.
- The Gregory County, South Dakota contractor yard should be built on cropland, or north of Highway 18.
- Because the American burying beetle is attracted to light at night, working at night with lights in southern Tripp County should be avoided. If working at night cannot be avoided, lighting should only be used between September 1 and June 1.

The Project may affect, but is not likely to adversely affect the American burying beetle. This determination is based on the location of the Project within the known range and habitat of the American burying beetle, the results from surveys along the Steele City Segment of the Project, and Keystone's commitment to comply with recommended conservation measures for the American burying beetle.

Ouachita Rock Pocketbook

The Ouachita rock pocketbook is federally listed as endangered and is state-listed in Texas as threatened. It is a freshwater mussel that inhabits slow-moving backwaters of rivers and large creeks. It generally resides near sand, gravel, or cobble bars, as it requires a stable substrate to thrive. Most often, it is found in mussel beds containing a large diversity of species. This mussel is very rare and only a few Natural Heritage records exist (NatureServe 2009, USFWS 2002d). Little is known about the life history or reproductive characteristics of the Ouachita rock pocketbook as it occurs in only a few counties in Oklahoma, Texas, and Arkansas. The primary threats to Ouachita rock pocketbook beds are from construction and operation of dams which alter stream structure and function, and from declines in water quality.

The Ouachita rock pocketbook may potentially exist in the Red River system in large mussel beds containing a diversity of species. These beds are generally found within medium-size rivers with stable substrates of mud, sand, and gravel, and backwater or slackwater areas adjacent to the main channel. The Texas Parks and Wildlife Department lists the Ouachita rock pocketbook as potentially occurring in Lamar County, Texas. The mussel was reported to occur in Sanders Creek and Pine Creek, Lamar County, Texas in the early 1990s (USFWS 2004). However, the USFWS does not currently list the species as occurring in any of the counties crossed by the Project in Oklahoma or Texas (USFWS 2009d). The Project would cross Sanders Creek upstream from Pat Mayse Lake in Lamar County over 30 miles upstream from reported occurrences (USFWS 2004). The Project would not cross the Pine Creek drainage in Lamar County, and is located over 40 miles from the reported occurrence of the Ouachita rock pocketbook in this stream in Lamar County, Texas.

Potential Impacts and Conservation Measures

Although the Oauchita rock pocketbook has been reported in Lamar County in Texas, its areas of known occurrence in Texas would not be crossed by the Project and are at least 30 miles distant from the Project corridor. Therefore, the Project would have no effect on the Ouachita rock pocketbook.

3.8.1.7 Federally-Protected and Candidate Plants

Information on federally protected and candidate plants potentially found along the Project route was obtained from the USFWS, the various state Natural Heritage Programs (NHPs), state wildlife agencies, and field surveys. The NHPs provided information on the status of plant populations within individual states and in some cases, surveys were completed along the Project route. Potential occurrence within the ROW was evaluated for each plant based on its known distribution and habitat requirements. Preliminary evaluations identified three federally-protected and two candidate plants that could occur within the Project area. Four of these plants occur only in Texas.

Texas Prairie Dawn-Flower

The Texas prairie dawn-flower is a federally listed endangered plant and state-listed in Texas as endangered. The Texas prairie dawn-flower is an annual plant that grows in a specific range of soil and site conditions in the open grasslands in Harris and Fort Bend Counties in Texas. Habitat where this plant is found includes sparsely vegetated areas at the base of mima mounds (low, domelike natural prairie mounds) or other barren areas on saline soils (Katy Prairie Conservancy 2008). The species can also be found where mima mounds have been leveled in the past. It flowers in March and early April; the flowers are less than half an inch in diameter and bright yellow (Center for Plant Conservation 2008a). The primary threats to the Texas prairie dawn-flower are urban development and road construction, heavy grazing by cattle, and competition with woody plants (Center for Plant Conservation 2008a).

The Houston Lateral would cross Harris County. Field surveys for the Texas prairie dawn-flower were conducted within 40 percent of the suitable soil types identified along the Houston Lateral in Harris County, Texas on April 15, 2009. No Texas prairie dawn-flowers were observed.

Potential Impacts and Conservation Measures

Project construction could result in loss of habitat, altered habitat suitability, and introduction or spread of competing exotic invasive plants. The Texas prairie dawn-flower is a pioneering species which may be displaced by invasive plants.

Conservation measures for identified populations could include:

- Reducing the width of the construction ROW in areas where populations have been identified, to the extent possible.
- Salvaging and segregating topsoil appropriately where populations have been identified to preserve native seed sources in the soil for use in re-vegetation efforts in the ROW.
- Restoring habitat by using an approved seed mix provided by the NRCS or appropriate state agency.
- Collecting seed to repopulate the ROW or an appropriate offsite location, or for creation of a nursery population until viable natural populations have established themselves.

Presence/absence surveys are anticipated to be completed during late March to mid-April in 2010 depending on landowner permission. Survey results would be submitted to the USFWS for review. If surveys identify the Texas prairie dawn-flower within the ROW, final conservation measures would be based on the quantity and quality of the population and would be refined based on further consultation with the USFWS.

The Project may affect, but is not likely to adversely affect the Texas prairie dawn-flower. This determination is based on preliminary survey data that indicate that the plant is not present within the Project area and Keystone’s commitment to follow recommended conservation measures that would be provided by the USFWS if occurrences are identified.

Texas Trailing Phlox

Texas trailing phlox is a federally endangered species and state listed in Texas as endangered. This perennial plant was thought to be extinct, but was rediscovered in 1991 and a number of specimens have been discovered since. Reintroduction measures have also had some success. Texas trailing phlox inhabits the Pineywoods of southeast Texas where soils are deep and sandy. The plant grows in forests with open to moderately dense canopies in mixed forests of pines and hardwoods, but is most commonly found in open pine savannas. It is adapted to fire and can endure short-cycle fire regimes, but does not thrive in areas with heavy groundcover. Texas trailing phlox habitats are generally the same as habitats preferred by the red-cockaded woodpecker. Texas trailing phlox flowers from March until May and the flowers are usually bright pink. If prescribed burns are conducted in April, the species can flower again in May (Center for Plant Conservation 2008b). Primary threats to Texas trailing phlox are habitat loss and fragmentation due to urban expansion, conversion to pine plantations or pasture, disturbance of soil and vegetation by human activities, and dense understory resulting from fire suppression (Center for Plant Conservation 2008b, USFWS 2008b).

Three populations of Texas trailing phlox are known from Hardin, Polk, and Tyler counties in Texas. The largest population is located in Hardin County on the Roy E. Larsen Sandylands Sanctuary managed by The Nature Conservancy. The Sanctuary is located in the eastern portion of Hardin County, Texas (USFWS 2008b). The Project crosses the southwestern portion of this county, would be about 30 miles from the known Hardin County population, and would not cross the Roy E. Larsen Sandylands Sanctuary. The two smaller populations are located on land owned by International Paper in Tyler County, and in the Big Thicket National Preserve in Polk County. The Project would not cross Tyler County. The population in Big Thicket National Preserve is in the Big Sandy Creek Unit (NPS 2009; USFWS 2008b). The proposed Project route avoids crossing the Big Thicket National Preserve.

Potential Impacts and Conservation Measures

The Project would have no effect on the Texas trailing phlox based on avoidance of the three known populations in Hardin, Polk and Tyler counties in Texas.

Western Prairie Fringed Orchid

The western prairie fringed orchid is federally listed as threatened, state listed as threatened in Nebraska, and is a species of conservation concern in South Dakota. No critical habitat has been designated for the western prairie fringed orchid. The western prairie fringed orchid is presently known to occur in 6 states in the U.S. (Iowa, Kansas, Minnesota, Missouri, Nebraska, and North Dakota) and in one province (Manitoba) in Canada, and appears to be extirpated from South Dakota and Oklahoma (USGS 2006c, USFWS 1996). Most remaining populations are found in North Dakota and Minnesota, with about three percent of the populations found in the southern portion of its historic range (USFWS 1996). The spread of invasive plants into prairie swales has had a negative effect on western prairie fringed orchid populations (Sieg 1997, USFWS 2007f). Invasive plants which may displace the western prairie fringed orchid through competition include: leafy spurge (*Euphorbia esula*), Kentucky bluegrass (*Poa pratensis*), and Canada thistle (*Cirsium arvense*) (Sieg 1997, USFWS 2007f). Other threats to the long-term survival of western prairie fringed orchid include the use of herbicides, heavy livestock grazing, early haying, habitat fragmentation, river channelization, river siltation, and road and bridge construction (USGS 2006c).

This perennial orchid is found in tall-grass calcareous silt loam or sub-irrigated sand prairies and may occur along ditches or roadsides. Flooding may be an important agent of seed dispersal (Hof et al. 1999), although seeds develop into flowering plants only under appropriate hydrologic and other conditions. The western prairie fringed orchid flowers from May to August.

The known distribution of the western prairie fringed orchid includes the Project area in Nebraska and south of Highway 18 in Tripp County in South Dakota (NGPC 2009b). The Project is near known populations in Holt, Greeley, and Wheeler counties in Nebraska (USFWS 2007f). Populations in South Dakota are possibly extirpated (NatureServe 2009), but factors that indicate this orchid may still be present include: 1) incomplete surveys in areas of suitable habitat crossed by the Project route on private lands, and 2) erratic flowering patterns with long dormancies that make detection difficult (Phillips 2003). Surveys to assess habitat suitability and occurrence of the western prairie fringed orchid were completed during June 2009. A total of 74 sites over 95 miles of habitat were selected for surveys in Tripp County, South Dakota and throughout Nebraska based on input from federal and state agencies. Of these 74 sites, 60 were evaluated and 18 sites were determined to have high quality habitat with one population of western prairie fringed orchid documented along the ROW at MP 662 in Holt County, Nebraska. Surveys will be completed within the Project area in South Dakota and Nebraska during 2010, depending on landowner permission.

Potential Impacts and Conservation Measures

Consultation with the USFWS regarding the identified population of western prairie fringed orchid is ongoing.

Conservation measures for identified populations could include:

- Reducing the width of the construction ROW in areas where populations have been identified, to the extent possible.
- Salvaging and segregating topsoil appropriately where populations have been identified to preserve native seed sources in the soil for use in re-vegetation efforts in the ROW.
- Restoring habitat by using an approved seed mix provided by the NRCS or appropriate state agency.
- Collecting seed to repopulate the ROW or an appropriate offsite location, or for creation of a nursery population until viable natural populations have established themselves.

If surveys identify additional western prairie fringed orchid populations, Keystone would continue to consult with the USFWS to develop site-specific conservation measures for these populations.

The Project may affect, but is not likely to adversely affect the western prairie fringed orchid based on the Project proximity to the extant western prairie fringed orchid range, the presence of an identified population and suitable habitat within the Project area, and Keystone’s commitment to follow recommended USFWS conservation measures identified through consultation.

Neches River Rose-Mallow

The Neches River rose-mallow is a candidate for federal listing. This perennial flower, found in prairie wetlands of eastern Texas, grows within floodplains of perennial streams or rivers that flood at least once a year (Center for Plant Conservation 2008c). The plant roots are normally in standing water early in the growing season and this plant grows where soils are moist year round. The Neches River rose-mallow occurs in hydric soils in marshes along the Neches River in Cherokee, Houston, and Trinity counties in Texas, and may also be found in borrow pits along highways (Center for Plant Conservation 2008c). The primary threats to the Neches River rose-mallow are wetland draining, vegetation clearing on stream banks, herbicide application along transportation ROWs, and timber harvest (Center for Plant Conservation 2008c).

The Neches River rose-mallow has been reported in Cherokee County, Texas. The proposed route runs through the southeastern corner of Cherokee County, while the reported location on Neches River is located at the western boundary of Cherokee County. The Neches River crossing for the Project occurs at the Angelina and Polk County border, southeast of the Cherokee, Houston, and Trinity County populations.

Potential Impacts and Conservation Measures

The known occurrences of Neches River rose-mallow populations in Texas would not be crossed by the Project and occur northwest of the Project crossing of the Neches River.

Texas Golden Gladecress

Texas golden gladecress is a candidate for federal listing. This winter annual mustard grows in shallow calcareous soils on ironstone outcrops of the Weches Formation within the Coastal Plain region of east Texas. The Weches formation consists of alkaline areas surrounded by acid soils common in the Pineywoods. The plants flower and fruit from late February to April or May and seeds generally germinate in the fall. The primary threats to the Texas golden gladecress are open-pit mining of the mineral glauconite for road construction, urban expansion, over-grazing, and fire suppression which allows for greater canopy cover and deeper litter layers (Center for Plant Conservation 2008d).

Four populations are known; three endemic populations are located in San Augustine and Sabine counties and one experimental introduced population is located in Nacogdoches County (Center for Plant Conservation 2008d).

Potential Impacts and Conservation Measures

The Project does not cross San Augustine or Sabine counties and the Texas golden gladecress is not known or expected to occur in the vicinity of the Project in Nacogdoches County.

3.8.2 Bureau of Land Management Sensitive Animals and Plants

BLM has responsibility for the designation and protection of sensitive species on BLM managed lands that require special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA. The Project would cross BLM managed lands in Montana. BLM Montana offices evaluate potential Project impacts on BLM sensitive species which include species that have been determined in coordination with the Montana Natural Heritage Program, Montana Fish, Wildlife and Parks, US Forest Service to be recommended for sensitive designation. BLM also evaluates both federal candidate species and federal delisted species within five years of delisting. Federal candidate species are addressed in Section 3.8.1 and the federal delisted bald eagle and peregrine falcon are discussed in more detail in Section 3.8.3. The Project would cross about 42 miles of BLM land in Montana. All BLM designated sensitive animals and plants are also Montana designated species of concern. Additional Montana species of concern that potentially occur within the Project area that are not designated by BLM as sensitive are discussed in Appendix I. Analyses and discussions of state protected species are presented in Section 3.8.3, some of which are also BLM sensitive species in these states. The BLM sensitive species that have the potential to occur within the Project area include 8 mammals, 28 birds, 5 reptiles, 3 amphibians, 5 fish, and 4 plants. Evaluation of potential impacts and proposed conservation measures for these species are summarized in Table 3.8.2-1.

TABLE 3.8.2-1
Evaluation of BLM Sensitive Species Potentially Occurring along the Project ROW in Montana

Species	Group	Occurrence and Habitat	Threats	Potential Impacts	Proposed Conservation Measures
Black-tailed prairie dog *Cynomys ludovicianus*	Prairie Mammal	Prairie dog town surveys in Montana were conducted. Two active colonies identified MP 46.8 in Valley County and MP 115.6 in McCone County; associated with open grasslands and shrub grasslands in relatively level sites with silty clay loam, sandy clay loam or clay loam soils.	Habitat loss, poisoning, recreational shooting, subdivision development, population fragmentation, dispersal barriers, changes in land ownership, disease.	Habitat loss, colony destruction or fragmentation, direct construction mortality, vehicle collision mortality.	Conservation methods for black-footed ferrets, vegetation restoration, and wildlife mitigation from CMR.
Fringed myotis *Myotis thysanodes*	Mammal – Bat	Occur throughout Montana during mid-June to early September; variety of habitats from low to mid-elevation grassland, woodland, and desert habitats, up to and including spruce-fir forests; roost sites include caves, mines, and buildings.	Disturbance of roost sites, recreational caving and mine exploration, renewed mining at historic sites, building and bridge conversion, toxic material impoundments, pesticides, loss or alteration of riparian habitats that support insect prey.	No known roost sites along Project route; loss or alteration of insect prey availability in riparian foraging habitats.	No proposed mitigation.
Long-eared myotis *Myotis evotis*	Mammal – Bat	Occur throughout Montana active during mid-June to early September, hibernacula located in riverbreaks habitat in northeast Montana; found in wooded and rocky areas; roost sites include hollow trees, caves, mines and buildings.	Habitat disturbance through forest harvesting and mineral extraction, recreational caving and industrial activities.	No known roost sites along Project route; loss or alteration of insect prey availability in riparian foraging habitats.	No proposed mitigation.

TABLE 3.8.2-1
Evaluation of BLM Sensitive Species Potentially Occurring along the Project ROW in Montana

Species	Group	Occurrence and Habitat	Threats	Potential Impacts	Proposed Conservation Measures
Long-legged myotis *Myotis volans*	Mammal – Bat	Occur throughout Montana, active during mid-June to early September, roost in trees (under thick bark), hollow trees, buildings, caves, and abandoned mines, hibernate in caves, montane coniferous forest and riparian habitat.	Roosting and hibernating habitat disturbance, closure of abandoned mines, forest management practices	Loss of maternity roosting habitat, loss or alteration of forested and riparian foraging habitat and insect prey availability.	Conduct a habitat assessment for potential maternity roost tree locations; if maternity tree roosts are found on the ROW, remove the trees outside of the breeding season.
Meadow jumping mouse *Zapus hudsonius*	Mammal – Mice	Occurs in southeastern Montana, dense stands of tall grass and forbs in marshy areas, riparian areas, woody draws, grassy upland slopes, in or near ponderosa pine forests, often favor sites bordered by small streams.	Loss or alteration of mesic grassland, shrub-grassland and meadow habitats, alteration of surface waters for livestock.	Loss of habitat including dens and tunnels, direct mortality during construction	Restore ROW using appropriate plants for soil and range conditions.
Northern myotis *Myotis septentrionalis*	Mammal – Bat	Occurs in northeast corner of Montana, forage for insects along hillsides and ridges, solitary, parturition late June or July, summer roosts under tree bark and buildings, hibernacula moist caves and abandoned mines.	Recreational caving, closure of abandoned mines without surveys, pest control activities in human structures, disturbance and removal of nursery trees.	No known habitat use along Project route.	No proposed mitigation.
Swift fox *Vulpes velox*	Prairie Mammal	Occurs in north central Montana, no reported occurrences within 5 miles of Project, prairie habitats with high density of small mammals (ground squirrels or prairie dogs), burrows in sandy soil on high ground in open prairies, along fencerows.	Habitat loss and alteration, vehicle collision mortality, accidental trapping, predation by coyotes, and inter-specific competition with red fox.	Loss and alteration of foraging and/or den habitat, disturbance due to construction activities and increased human presence resulting in displacement from foraging or den habitat, reduced reproductive success.	Conduct surveys for potential den sites; restrict construction activities within 0.25 mile of active natal dens from April 1 to August 31.

TABLE 3.8.2-1
Evaluation of BLM Sensitive Species Potentially Occurring along the Project ROW in Montana

Species	Group	Occurrence and Habitat	Threats	Potential Impacts	Proposed Conservation Measures
Townsend's big-eared bat *Corynorhinus townsendii*	Mammal – Bat	Occurs throughout much of Montana, roosts and hibernates in caves and mines and forages on flying insects near trees and shrubs.	Loss of habitat due to reclamation of abandoned mines, disturbance or destruction of maternity roost sites and hibernacula.	No known roost sites along Project route; loss or alteration of insect prey availability in forested and riparian habitats.	No proposed mitigation.
Baird's sparrow *Ammodramus bairdii*	Bird – Grassland	Occurs throughout central and eastern Montana, mixed-grass prairies, alfalfa fields, fallow cropland, breeds early June to late July nests on ground feeds on insects and spiders, grass and forb seeds.	Grassland habitat loss or degradation due to conversion to agriculture and heavy grazing, nest parasitism.	Grassland habitat loss, alteration, and fragmentation, loss of eggs or young during construction; facilitated raptor predation from power poles for associated power lines.	Restore ROW using appropriate plants for soil and range conditions; develop Migratory Bird Conservation Plan in consultation with USFWS to avoid or mitigate impacts.
Bald eagle *Haliaeetus leucocephalus*	Bird – Raptor	Occurs throughout Montana, nest and roost in large trees near water with abundant fish and waterfowl prey.	Nesting and roosting habitat loss or alteration, poisons and environmental contaminants; electrocution and collision mortality form power lines, and wind turbines.	Two nest sites identified along ROW; loss or alteration of nest, roost or foraging sites; disturbance to breeding, roosting, foraging areas during construction, electrocution or collision mortality from project associated power lines.	Surveys for nest and communal roost sites prior to construction; restrict activities within 0.5 mile of active bald eagle nests or active winter roost sites; develop Migratory Bird Conservation Plan in consultation with USFWS to avoid or mitigate impacts.
Black-crowned night-heron *Nycticorax nycticorax*	Bird – Water	Nests and migrates throughout Montana, shallow marshes, and other wetlands, nests May to July on islands for protection from predators.	Nesting and foraging habitat loss and degradation, disturbance, pesticides.	No large wetland complexes and associated water that provide nesting habitat are crossed by Project	Avoidance of large wetland complexes; develop oil spill contingency plan; develop Migratory Bird Conservation Plan in consultation with USFWS to avoid or mitigate impacts.

TABLE 3.8.2-1
Evaluation of BLM Sensitive Species Potentially Occurring along the Project ROW in Montana

Species	Group	Occurrence and Habitat	Threats	Potential Impacts	Proposed Conservation Measures
Black tern *Chlidonias niger*	Bird – Water	Occurs in perennial wetlands throughout Montana, nest in marshes on old muskrat houses, floating vegetation or abandoned coot or grebe nests, open water with emergent vegetation 0.5 to 1 meter deep.	Loss and degradation of freshwater marsh habitat, human disturbance of nest sites, pesticide use, migration and winter range habitat loss and alteration.	See Black-crowned night heron.	See Black-crowned night heron.
Bobolink *Dolichonyx oryzivorus*	Bird – Grassland	Nests and migrates throughout Montana, native and agricultural grasslands, wet meadows, fallow fields, nests on ground late April through July, forages on seeds, insects.	Conversion of tall and mixed-grass prairie to agriculture, changes from grass hay to alfalfa, earlier and more frequent harvest.	See Baird's sparrow.	See Baird's sparrow.
Brewer's sparrow *Spizella breweri*	Bird – Sagebrush	Nests and migrates throughout Montana, sagebrush steppe, high shrub cover and large patch size, nests in big sagebrush May through July, forages on insects and seeds.	Widespread loss and degradation of sagebrush habitat, fire suppression, invasion of non-native grasses, nest parasitism, predation, pesticides.	Sagebrush habitat loss, alteration, fragmentation, loss of eggs or young during construction.	Restoration measures that favor establishment of big sagebrush in areas that contained sagebrush, monitor establishment, seed, reseed, with locally adapted seed; develop Migratory Bird Conservation Plan in consultation with USFWS to avoid or mitigate impacts.

TABLE 3.8.2-1
Evaluation of BLM Sensitive Species Potentially Occurring along the Project ROW in Montana

Species	Group	Occurrence and Habitat	Threats	Potential Impacts	Proposed Conservation Measures
Burrowing owl *Athene cunicularia*	Bird – Grassland	Nests and migrates throughout much of Montana, March to October, open grasslands with abandoned prairie dog, ground squirrel, or badger burrows,	Habitat loss through agricultural conversion, habitat degradation through control of prairie dogs and ground squirrels, habitat fragmentation, predation, pesticides.	Loss or alteration of two prairie dog towns, loss of eggs or young during construction.	Construct outside nesting period from March 15 to Oct 31 within prairie dog towns; if construction within nesting period survey for presence; restrict activity within 500 feet of active nests until chicks have fledged; develop Migratory Bird Conservation Plan in consultation with USFWS to avoid or mitigate impacts.
Chestnut-collared Longspur *Calcarius ornatus*	Bird – Grassland	Nests throughout central and eastern Montana, May through July, native mixed-grass prairie, nest May to August on ground in short to medium grasses that have been recently grazed or mowed.	Habitat loss through agricultural conversion and suburban expansion, predation, nest parasitism, pesticides.	See Baird's sparrow.	See Baird's sparrow.
Dickcissel *Spiza americana*	Bird – Grassland	Nests throughout eastern Montana, late May to August, nest in grasses, shrubs or trees in grasslands, meadows, savanna, fields.	Poisoning on winter grounds, nest and young loss when fields are mowed, nest parasitism, habitat loss and alteration.	See Baird's sparrow.	See Baird's sparrow.

TABLE 3.8.2-1
Evaluation of BLM Sensitive Species Potentially Occurring along the Project ROW in Montana

Species	Group	Occurrence and Habitat	Threats	Potential Impacts	Proposed Conservation Measures
Ferruginous hawk *Buteo regalis*	Bird – Raptor	Migrate and nest throughout Montana, February through October, nests on ground, shrubs, rock outcrops, trees during April through August, mixed grass prairie with greasewood and big sagebrush, prey on jackrabbits, ground squirrels.	Habitat loss due to agricultural conversion, forest invasion, invasive plants, fire suppression, prairie dog poisoning.	One nest site identified within 0.5 mile of ROW, Habitat loss, alteration, fragmentation; nest disturbance, loss of eggs or young during construction.	Survey for presence prior to construction; remove nest trees outside of breeding season, prohibit construction activities within 0.5 mile of active nests until young have fledged; develop Migratory Bird Conservation Plan in consultation with USFWS to avoid or mitigate impacts.
Franklin's gull *Leucophaeus pipixcan*	Bird – Water	Primarily migratory April to October through Montana, few known breeding areas in Phillips, Roosevelt, Sheridan counties, nests colonially on large prairie marsh complexes over water in emergent cattails and bulrushes, forages on insects, worms, fish, mice and seeds.	Wetland habitat loss or alteration, hydrologic changes, invasive species.	See Black-crowned night heron.	See Black-crowned night heron.
Golden eagle *Aquila chrysaetos*	Bird – Raptor	Migrate, nest and winter throughout Montana, nest March to August on rock outcrops, cliff ledges, trees; forage in prairie, sagebrush, open woodlands, on jackrabbits, ground squirrels, carrion, ungulate fawns, waterfowl, grouse.	Illegal killing, powerline electrocution, poison intended for coyotes, habitat loss due to conversion to agriculture or suburbs.	Five nest sites identified along ROW, nesting and prey habitat loss or alteration, disturbance to breeding, foraging areas during construction, electrocution or collision mortality from project associated power lines.	See Bald eagle.

TABLE 3.8.2-1
Evaluation of BLM Sensitive Species Potentially Occurring along the Project ROW in Montana

Species	Group	Occurrence and Habitat	Threats	Potential Impacts	Proposed Conservation Measures
Greater sage-grouse *Centrocercus urophasianus*	Bird – Sagebrush	Occur year-round in east, central and southwest Montana; require sagebrush habitat, breed and nest in lek system during March to May; forage on insects, forbs, sagebrush, riparian habitats and wet meadows critical for brood-rearing.	Invasive species, loss, alteration, fragmentation of sagebrush habitats due to energy development, urbanization, agriculture, fires and fire suppression' collisions with cars, trucks, all terrain vehicles.	Leks: 5 within 1 mile, 11 within 2 miles, 24 within 3 miles, 36 within 4 miles; sagebrush habitat loss, alteration, fragmentation; disturbance and disruption of breeding and nesting, loss of nests and young during construction; collision mortality with construction vehicles;; facilitated raptor predation from power poles for associated power lines.	Survey for presence prior to construction during nesting period; restrict construction activities within 4 miles of active leks March 1 to June 15; contact BLM and MFWP if lek found within ROW for further measures; use restoration measure that favor establishment of big sagebrush in areas that contained sagebrush, monitor establishment, seed, reseed, with locally adapted see.
LeConte's sparrow *Ammodramus lecontei*	Bird – Water	Breeds in northeast and northwest corners of Montana May to August, nests and forages in moist meadows, marsh and bog edges in rushes, grass or sedges; forages on insects and seeds.	Wetland habitat loss or alteration, nest parasitism.	See Black-crowned night heron; documented Montana occurrences not within Project area.	See Black-crowned night heron.
Loggerhead shrike *Lanius ludovicianus*	Bird – Grassland	Breeds throughout most of Montana, nests in variety of habitats mid June to mid July, selects areas with large component of shrubs and forbs, forages on large insects, small birds, lizards, frogs, rodents, scavenges.	Pesticides, predation, breeding habitat loss, winter habitat loss, vehicle collision mortality.	See Baird's sparrow.	See Baird's sparrow.
Long-billed curlew *Numenius americanus*	Bird – Grassland	Breeds and migrates throughout Montana, nests on ground May to July, nests and forages in well drained native grasslands, shrublands, and agricultural fields.	Conversion of native grasslands to agriculture, pesticides.	See Baird's sparrow.	See Baird's sparrow.

TABLE 3.8.2-1
Evaluation of BLM Sensitive Species Potentially Occurring along the Project ROW in Montana

Species	Group	Occurrence and Habitat	Threats	Potential Impacts	Proposed Conservation Measures
Marbled godwit *Limosa fedoa*	Bird – Grassland	Breeds east of continental divide north of Yellowstone River in Montana, nests May to Julyin short-grass prairie, pastures, marshes, flooded plains, forages on insects.	Nesting and wintering habitat loss, alteration, fragmentation, fire suppression, land conversion, wetland draining, invasive plants.	See Baird's sparrow.	See Baird's sparrow.
McCown's longspur *Calcarius mccownii*	Bird – Grassland	Breeds throughout Montana east of continental divide May through July, nest and forage in short-grass prairie or heavily grazed mixed-grass prairie.	Habitat loss, alteration, and fragmentation from conversion of native prairie to agriculture, fire suppression.	See Baird's sparrow.	See Baird's sparrow.
Mountain plover *Charadrius montanus*	Bird – Grassland	Breeds throughout central and eastern Montana May through August; use short-grass prairie and prairie dog colonies during nesting; forage on insects	Loss, alteration, and fragmentation of nesting habitat; prairie dog eradication.	Loss or alteration of two prairie dog towns crossed by Project, loss of eggs or young during construction.	Construct outside nesting period from May 1 to June 15 within prairie dog towns; if construction within nesting period survey for presence; delay construction within 0.25 mile of active nests until chicks have 7 days post hatching; develop Migratory Bird Conservation Plan in consultation with USFWS to avoid or mitigate impacts.
Nelson's (sharp-tailed) sparrow *Ammodramus nelsoni*	Bird – Water	Nests in Sheridan County, Montana May through July, nests in freshwater marshes among emergent vegetation, forage on insects and seeds.	Loss, degradation, and fragmentation of freshwater marsh habitat.	See Black-crowned night heron; documented Montana occurrences not within Project area.	See Black-crowned night heron.

TABLE 3.8.2-1
Evaluation of BLM Sensitive Species Potentially Occurring along the Project ROW in Montana

Species	Group	Occurrence and Habitat	Threats	Potential Impacts	Proposed Conservation Measures
Northern goshawk *Accipiter gentilis*	Bird – Raptor	Year-round Montana resident, breeding primarily in western and winter generally in eastern Montana, nests May to September in mature to conifer forest, forage on tree squirrels, ground squirrels, rabbits	Nesting habitat loss, alteration, and fragmentation due to logging, predation, pesticides, and disturbance.	Not likely to nest in Project area, See Bald eagle.	See Bald eagle
Peregrine falcon *Falco peregrinus*	Bird – Raptor	Year-round Montana resident and breeding resident April to September; nests June and July on ledges and cliffs, often near open habitats, preys on birds, small mammals, lizards.	Disturbance of cliff nesting sites; shooting; egg collecting; the taking of young for falconry; pesticides.	No peregrine falcons or suitable nesting habitat identified within 0.5 mile of Project; construction related disturbance to foraging birds; increased collision mortality from associated power lines.	Develop Migratory Bird Conservation Plan in consultation with USFWS to avoid or mitigate impacts.
Red-headed woodpecker *Melanerpes erythrocephalus*	Bird – Forest	Breeds throughout central and eastern Montana Man and June, deciduous riparian forests, savanna, old burns, nest in cavities, forage on insects, fruit, bird eggs and young.	Habitat loss, alteration, and fragmentation due to firewood cutting and forest clearing for agriculture and suburban development, competition for nesting habitat with invasive birds.	Riparian and wooded draw habitat loss and fragmentation, loss of eggs and young during tree clearing for pipeline construction.	Major rivers crossed using HDD which minimizes riparian habitat disturbance; develop Migratory Bird Conservation Plan in consultation with USFWS to avoid or mitigate impacts.
Sage thrasher *Oreoscoptes montanus*	Bird – Sagebrush	Nest throughout central and eastern Montana April through July, nest on ground or in sagebrush, use sagebrush and shrubs during migration, forage on insects and plant materials.	Loss, alteration, and fragmentation of Sagebrush habitats, grazing, invasive grasses, predation, nest parasitism.	See Brewer's sparrow.	See Brewer's sparrow.
Sedge wren *Cistothorus platensis*	Bird – Water	Breeds northeast corner of Montana May through August, nests near ground in wet sedge meadows and sedge marsh edges, forages on insects.	Wetland habitat loss, alteration, fragmentation due to agricultural and suburban development.,	See Black-crowned night heron; documented Montana occurrences not within Project area.	See Black-crowned night heron.

TABLE 3.8.2-1
Evaluation of BLM Sensitive Species Potentially Occurring along the Project ROW in Montana

Species	Group	Occurrence and Habitat	Threats	Potential Impacts	Proposed Conservation Measures
Sprague's pipit *Anthus spragueii*	Bird – Grassland	Breeds throughout central and eastern Montana during May to August, nests on ground in short-grass and mixed-grass prairie, wet meadows, alkaline wetlands, forage on insects and seeds.	Loss, alteration and fragmentation of native prairie habitats due to conversion to agriculture, wetland drainage, overgrazing, invasion of non-native plants.	See Baird's sparrow.	See Baird's sparrow.
Swainson's hawk *Buteo swainsoni*	Bird – Raptor	Summer resident, breeder throughout Montana April to October, nests May to September in river bottoms, woody draws and shelterbelts, forages on small mammals, songbirds and insects.	Habitat and prey loss due to agriculture, poisoning by pesticides and insecticides	One nest site identified within 0.5 mile of ROW, nesting and prey habitat loss or alteration, disturbance to breeding, foraging areas during construction, collision mortality from project associated power lines.	See Bald eagle.
Yellow-billed cuckoo Eastern DPS *Coccyzus americanus*	Bird – Forest	Nests southern half of Montana in June and July, nests in trees in riparian forests and wooded draws, forages on insects, fruits, small lizards, frogs, bird eggs.	Loss, alteration, fragmentation of riparian habitat.	See Red-headed woodpecker.	See Red-headed woodpecker.
Yellow rail *Coturnicops noveboracensis*	Bird – Water	Nests in northeast corner of Montana, breed in marshes, wet meadows during May through July, forage on snails, insects, seeds.	Wetland habitat loss, alteration or fragmentation for agricultural and suburban development, changes in wetland hydrology reduce habitat suitability.	See Black-crowned night heron; documented Montana occurrences not within Project area.	See Black-crowned night heron.

TABLE 3.8.2-1
Evaluation of BLM Sensitive Species Potentially Occurring along the Project ROW in Montana

Species	Group	Occurrence and Habitat	Threats	Potential Impacts	Proposed Conservation Measures
Milksnake *Lampropeltis triangulum*	Reptile – Snake	Occurs throughout central and eastern Montana, active May through October, hibernates November to March, sandstone bluffs, rock outcrops, grasslands, open ponderosa pine savanna, forage on small vertebrates.	Habitat loss through agricultural and suburban development, collection for pet trade.	Habitat loss or alteration, direct mortality during construction, trapping in open trench, soil compaction, direct mortality from construction vehicles, movement barriers.	Appropriate off-site mitigation measures being discussed with BLM.
Snapping turtle *Chelydra serpentina*	Reptile – Turtle	Occurs lower Yellowstone River basin in eastern Montana, and Missouri River, backwaters of large rivers, reservoirs, ponds, streams with permanent water and sandy or muddy bottoms, nest May to June on land up to several km from water, overwinter in cut banks, submerged log jams or mud bottoms.	Habitat loss through urbanization, overharvest, mortality from vehicles during nesting.	Construction-related mortality during nesting, movement barrier.	Large river habitats crossed using HDD, avoids impacts to shoreline and bottom habitats; appropriate off-site mitigation measures being discussed with BLM.
Spiny-softshell *Apalone spinifera*	Reptile – Turtle	Occurs in Yellowstone River basin Montana, large prairie rivers and slow-moving streams, active May through September, nest in open areas in sand, gravel, soft soil near water, feed on crayfish, aquatic insects, fish.	Recreational beach use, boat collisions, water pollution and urban and agricultural development.	See Snapping turtle.	See Snapping turtle.

TABLE 3.8.2-1
Evaluation of BLM Sensitive Species Potentially Occurring along the Project ROW in Montana

Species	Group	Occurrence and Habitat	Threats	Potential Impacts	Proposed Conservation Measures
Western Hog-nosed snake *Heterodon nasicus*	Reptile – Snake	Occur in central and eastern Montana along major river systems and tributaries; active May through October, sagebrush grasslands with sandy soil, forage on frogs, toads, small mammals, reptiles.	Habitat loss due to conversion of prairie habitat to agriculture and drainage of prairie wetlands, vehicle collisions,	See Milksnake.	See Milksnake.
Great Plains toad *Bufo cognatus*	Amphibian – Toad	Occur throughout central and eastern Montana, grasslands near glacial potholes, stock ponds, irrigation ditches, coulees, breed in temporary pools flooded grasslands May to July, active May to September, may use prairie dog burrows during droughts, feed on insects.	Drought, predation, habitat alteration and destruction, hydrological changes, road kills.	Ephemeral wetland habitat loss or alteration, loss of eggs or tadpoles during construction, loss of inactive adults during winter construction, vehicle collisions, movement barrier.	Appropriate off-site mitigation measures being discussed with BLM.
Greater short-horned lizard *Phrynosoma hernandesi*	Reptile – Lizard	Occur throughout central and eastern Montana, active April to October, dry open forests, grasslands and sagebrush with sun-baked soil, ridges between coulees, limestone outcrops, forage on insects.	Habitat loss due to conversion to agriculture, sagebrush clearing, off-road vehicle traffic, road building, pesticides.	Habitat loss and alteration, vehicle collisions, movement barrier.	Appropriate off-site mitigation measures being discussed with BLM.
Northern leopard frog *Rana pipiens*	Amphibian – Frog	Occur throughout central and eastern Montana, active March to November, ponds, pools in intermittent streams, wetlands.	Wetland and aquatic habitat loss and alteration, introduction of non-native aquatic animals, pesticides.	Wetland habitat loss or alteration, loss of eggs or tadpoles during construction, loss of inactive adults during winter construction, vehicle collisions, movement barrier.	See Great Plains toad.

TABLE 3.8.2-1
Evaluation of BLM Sensitive Species Potentially Occurring along the Project ROW in Montana

Species	Group	Occurrence and Habitat	Threats	Potential Impacts	Proposed Conservation Measures
Plains spadefoot *Spea bombifrons*	Amphibian – Toad	Occurs throughout central and eastern Montana, active May to August, sagebrush-grasslands with soft sandy/gravelly soils near permanent or temporary water, burrow up to 1 meter deep, forage on insects	Wetland and aquatic habitat loss and alteration, introduction of non-native aquatic animals, pesticides, vehicle collisions.	See Great Plains toad.	See Great Plains toad.
Northern redbelly and finescale dace hybrid *Phoxinus eos* and *Phoxinus neogaeus*	Fish – Minnow	Upper Missouri River and tributaries north of Milk River in Montana, beaver ponds, bogs and clear streams, hybrid dace are female clones, slow-flowing creeks and ponds, spawn spring and early summer, forage on diatoms, algae, zooplankton, insects.	Stream alteration, dewatering, pollution, pesticides.	No suitable habitat crossed by Project on BLM lands; potential occurrences in Redwater River crossed MP 146.6 McCone County, Montana; stream, pond or bog habitat loss or alteration, stream dewatering hydrostatic test source, erosion, siltation, movement barrier, loss of eggs, larval, juvenile fish during construction.	Open Cut-Dry trench method to be used for Redwater River crossing, screening of water intake, to prevent entrainment; ongoing consultation with agencies regarding spawning periods and construction schedules.
Paddlefish *Polyodon spathula*	Fish – Paddlefish	Missouri and Yellowstone rivers in Montana; quiet waters of large rivers or impoundments, spawn on the gravel bars of large rivers during late spring and early summer high water.	Habitat loss and alteration through dam construction; stream dewatering; overharvest; pollution; pesticides.	No suitable habitat crossed by Project on BLM lands; habitat loss or alteration; stream dewatering during hydrostatic testing; entrainment of eggs or larval fish.	Missouri and Yellowstone rivers crossed using HDD avoid instream impacts; screening of water intake, to prevent entrainment; ongoing consultation with agencies regarding spawning periods and construction schedules.

TABLE 3.8.2-1 Evaluation of BLM Sensitive Species Potentially Occurring along the Project ROW in Montana					
Species	**Group**	**Occurrence and Habitat**	**Threats**	**Potential Impacts**	**Proposed Conservation Measures**
Pearl dace *Margariscus margarita*	Fish – Minnow	Cool tributaries of the Missouri River including Milk River, Frenchman, Rock, and Willow creeks in Montana; spawn in spring over gravel or sand.	Habitat loss and alteration; stream dewatering; pollution, pesticides.	No suitable habitat crossed by Project on BLM lands; habitat loss or alteration; stream dewatering during hydrostatic testing; entrainment of eggs or larval fish.	Missouri and Milk river crossed using HDD avoid instream impacts; Frenchman, rock and Willow creeks crossed using open cut-dry method; screening of water intake to prevent entrainment; ongoing consultation with agencies regarding spawning periods and construction schedules.
Sauger *Sander canadensis*	Fish – Perch	Occurs in Missouri, Milk, Yellowstone rivers; Frenchman and Boxelder creeks in Montana; found in turbid rivers and muddy shallows of lakes and reservoirs; spawn mainstem, large tributaries with bluff pools rocky substrates, forage on fish, insects.	Spawning and rearing habitat loss and alteration, overharvest, stream dewatering.	No suitable habitat crossed by Project on BLM lands; habitat loss or alteration, stream dewatering hydrostatic test source, erosion, siltation, movement barrier, loss of eggs, larval, juvenile fish during construction.	Missouri, Milk and Yellowstone rivers crossed using HDD method, Frenchman and Boxelder creeks open cut-dry method; screening of water intake to prevent entrainment; ongoing consultation with agencies regarding spawning periods and construction schedules.
Sturgeon chub *Macrhybopsis gelida*	Fish – Minnow	Occurs in Missouri, Milk and Yellowstone rivers; turbid water with moderate to strong current over bottoms ranging from rocks and gravel to coarse sand; spawning June through July.	Habitat alteration by dam operations; irrigation operations and development.	No suitable habitat crossed by Project on BLM lands; habitat loss or alteration, stream dewatering hydrostatic test source, loss of eggs, larval, juvenile fish during water withdrawal .	Missouri, Milk and Yellowstone rivers crossed using HDD method avoids instream impacts; screening of water intake to prevent entrainment; ongoing consultation with agencies regarding spawning periods and construction schedules.

TABLE 3.8.2-1
Evaluation of BLM Sensitive Species Potentially Occurring along the Project ROW in Montana

Species	Group	Occurrence and Habitat	Threats	Potential Impacts	Proposed Conservation Measures
Bractless blazingstar [Bractless mentzelia] *Mentzelia nuda*	Plant – Biennial Forb	Occurs in Dawson and Valley counties in Montana; sandy or gravelly soil of open hills and roadsides, flowers July.	Habitat loss, alteration, or fragmentation; spread of invasive plants.	Potentially occurs on BLM land in Valley County; construction could cause loss of individual plants, reduction in available habitat suitability; spread of invasive plants.	Pre-construction clearance surveys on BLM lands in Valley County; topsoil would be segregated for reestablishment of the seed bank within the ROW; habitat would be restored to pre-construction conditions.
Broadbeard beardtongue [Narrowleaf Penstemon] *Penstemon angustifolius*	Plant – Perennial Forb	Occurs in Dawson and Fallon counties in Montana; grasslands on hills and slopes with sandy soil; often abundant in blowouts or sparsely-vegetated areas; flowers May through June.	Habitat loss, alteration, or fragmentation; spread of invasive plants.	Potentially occurs on BLM land in Fallon County; construction could cause loss of individual plants, reduction in available habitat suitability; spread of invasive plants.	Pre-construction clearance surveys on BLM lands in Fallon County; topsoil would be segregated for reestablishment of the seed bank within the ROW; habitat would be restored to pre-construction conditions.
Persistent-sepal yellow-cress *Rorippa calycina*	Plant – Perennial Forb	Occurs in McCone County, Montana; found on sparsely vegetated, moist sandy to muddy banks of streams, stock ponds and man-made reservoirs near the high water line; flower and fruit May through July.	Habitat loss, alteration, or fragmentation; spread of invasive plants.	Potentially occurs on BLM land in McCone County; construction could cause loss of individual plants, reduction in available habitat suitability; spread of invasive plants.	Pre-construction clearance surveys on BLM lands in McCone County; topsoil would be segregated for reestablishment of the seed bank within the ROW; habitat would be restored to pre-construction conditions.
Prairie phlox [Plains phlox] *Phlox andicola*	Plant – Perennial Forb	Occurs in Dawson County, Montana; sandy soils in grasslands and ponderosa pine woodland, often associated with sparsely vegetated blowouts and loose sand below sandstone outcrops, flowers May and early June.	Habitat loss, alteration, or fragmentation; fire suppression, spread of invasive plants.	No BLM lands in Dawson County crossed by Project; construction could cause loss of individual plants, reduction in available habitat suitability; spread of invasive plants.	Topsoil would be segregated for reestablishment of the seed bank within the ROW; habitat would be restored to pre-construction conditions.

Sources: Adams 2003, AFS 2009, BLM 2009, Ehrlich et al. 1988, Foresman 2001, Green et al. 2002, MSGWG 2005, MTNHP 2009, NatureServe 2009, Schmutz et al. 1990, Suter and Jones 1981, USDA NRCS 2009, USDI BR and MTDNR 2002, USDI GBWG 1996, Werner et al. 2004, White et al. 1979.

3.8.3 State-Protected Animals and Plants

All states crossed by the Project, except Montana, maintain listings of endangered and threatened species, and afford additional protections to these species. Montana maintains a listing of species of conservation concern and those species that are only listed in Montana are discussed in Appendix I. Those species that are listed in Montana and are also state-protected in other states are presented here. The protections afforded animals and plants on these lists are established within the statutes for each state. Table 3.8.3-1 lists state endangered and threatened species that have been identified through consultations with state resource agencies as potentially occurring along the Project ROW. State-protected animals and plants that are also federally protected or are candidates for federal protection are discussed in Section 3.8.1. State-protected species potentially occurring along the Project ROW include 3 mammals, 9 birds, 6 reptiles, 13 fish and 1 plant. Potential Project-related impacts to state-protected animals and plants along with proposed conservation measures would be similar to impacts and mitigation discussed in Section 3.6 for wildlife and Section 3.5 for plants. Summaries of potential project related impacts and conservation measures are presented in Table 3.8.3-2. Additional occurrence information, impact discussions, and conservation measures are presented in the following sections.

3.8.3.1 State-Protected Mammals

Rafinesque's Big-Eared Bat

Rafinesque's big-eared bats occur in bottomland forested habitats and hibernate in caves. Summer roosts are often in hollow trees, but may occasionally be under loose bark or in abandoned structures.

Potential Impacts and Conservation Measures

This bat may occur in eastern Texas, however, there are no known roosting sites within the Project area and this bat is not expected to be affected by the Project (Campbell 2003).

River Otter

River otters are adaptable and use a variety of habitat types, but require aquatic habitats. Although they frequent lakes and ponds, river otters typically live in marshes and along wooded rivers and streams with sloughs and backwater areas. Otters use dens in the ground that were previously built by beavers or other animals. Denning occurs during March to September. Most river otter mortality is related to human activity. In Nebraska, accidental trapping has been the largest known mortality factor for reintroduced animals. Habitat destruction, pesticide use, and pollutants also affect the species (NGPC 2009c). River otters are likely to occur throughout the Project area along large rivers.

Potential Impacts and Conservation Measures

To minimize impacts to river otters, Keystone would implement the following measures:

- Surveys for river otters would occur prior to Project construction along the Bad River, White River, and Cheyenne River in South Dakota; along the Niobrara River, Loup River, North Branch Elkhorn River, South Fork Elkhorn River, Cedar River and Platte River in Nebraska if suitable den habitat occurs near the river crossings and if construction would occur during the denning period;
- Construction activities would be restricted within 0.25 mile of active natal dens; and

- All of the rivers identified as potentially supporting river otters, except the Bad River in South Dakota, and the North Branch and South Fork Elkhorn River in Nebraska would be crossed using the HDD construction method which would avoid impacts to shoreline habitats that could potentially be used by denning river otters.

Swift Fox

Swift foxes were historically widely distributed throughout the central Great Plains. Swift fox use open prairie and arid plain habitats, including areas intermixed with winter wheat fields. Swift fox are thought to have been common on the eastern plains of Montana in the early 1900s but were believed to be exterminated in the state by 1969. Reintroductions of the swift fox on the Blackfeet Indian Reservation, Fort Peck Indian Reservation, and in southern Alberta and Saskatchewan from 1983 to 1991 are likely to be the source of expanding populations in Montana (MTNHP 2009, Foresman 2001). Swift foxes create dens within burrows. A fox may dig a burrow or use a burrow made by other animals, usually in sandy soil on high ground in open prairies, along fencerows, and occasionally in plowed fields. Individuals may use several different dens throughout the year (NatureServe 2009). Reasons for declines in swift fox populations include habitat loss, alteration, and fragmentation due to agriculture and mineral extraction, and collision with automobiles (NatureServe 2009).

The Project occurs within swift fox range in Phillips, Valley, Dawson, and Prairie Counties in Montana (Keystone 2009c, Kahn et al. 1997) and in Haakon and Jones counties in South Dakota between the reintroduction sites of the Bad River Ranches (Turner Endangered Species Fund), Badlands National Park, and the Lower Brule Sioux Tribe Reservation (SDGFD 2009). Additionally, the Project crosses suitable habitat in Fallon and McCone counties in Montana and in Harding, Butte, Perkins, Meade, Pennington counties in South Dakota (Kahn et al. 1997). Montana Natural Heritage Program data indicates that swift fox have not been reported within 5 miles of the Project route. South Dakota National Heritage Program (SDNHP) data indicate three swift fox records in Haakon County along the Project route between MP 452.3 and 468.0. The Project would not cross the known distribution of the swift fox in Nebraska.

Potential Impacts and Conservation Measures

Potential impacts to swift fox occurring along the Project route include a temporary loss of foraging and/or denning habitat. Adult foxes would be disturbed by increased human presence and associated construction activities (noise, dust), however, because they are mobile, displacement would likely be temporary and foxes would likely return to the Project area after construction is completed.

If occupied swift fox dens occur within the Project construction ROW, Project construction could result in a loss of individual animals and young. It is assumed that both adults and young would not avoid construction activities and would remain in or near natal den sites that could be directly removed by trenching activities or collapsed due to vehicle operation. Construction activities prior to March would avoid direct effects to pups, if present. Loss of individual animals would result in an incremental reduction in the local population, however, no significant population effects are anticipated. If construction activity would occur in suitable habitat in the counties mentioned above during the breeding season (spring/summer), where dens are present, restrictions on construction activities would be required.

To minimize impacts to swift foxes, Keystone would implement the following measures:

- Revegetation of the ROW to support small mammal and insect prey;
- Conduct surveys of potential den sites; and

- Restrict construction activities within 0.25 mile of active natal dens between April 1 and August 31.

Connected Actions

The proposed 230 kV transmission line in southern South Dakota would cross the Lower Brule Sioux Reservation. Construction of this transmission line could potentially impact a reintroduction area for the swift fox. Potential impacts to swift fox may include a temporary loss of foraging and/or denning habitat, disturbance by increased human presence and associated construction activities (noise, dust), however, because they are mobile, displacement would likely be temporary and foxes would likely return after construction is completed.

TABLE 3.8.3-1
State-Protected Animals and Plants Potentially Occurring along the Project Route

Species	Federal and BLM Status	State Status and Occurrence						Comments
		MT	SD	NE	KS	OK	TX	
MAMMALS								
Rafinesque's big-eared bat *Corynorhinus rafinesquii*						SC	T	Southeastern US, forest and riparian habitats, roosts in caves, hollow trees, eats insects.
River otter *Lontra canadensis*			T	T		SC		North America, uses aquatic and riparian habitats, burrows along shorelines, eats fish.
Swift fox *Vulpes velox*	BLM-S	SC	T	E		SC		Central Plains, uses habitats with high densities of small mammal prey, uses dens year-round.
BIRDS								
Bachman's sparrow *Aimophila aestivalis*						SC	T	Southeastern US, nest on ground in open pine savanna, resident or short-distance migrant.
Bald eagle *Haliaeetus leucocephalus*	DM BLM-S	SC	T		T		T	North America, breeds and winters in areas near water, eats fish and waterfowl; resident and migrant populations.
Mountain plover *Charadrius montanus*	BLM-S	SC		T		SC		Great Plains, nests in short-grass prairie with prairie dogs, eats insects and seeds, long-distance migrant.
Peregrine falcon *Falco peregrinus*	DM BLM-S	SC	E				T	North America, nests on ledges, cliffs; eats birds, winters coastal Project area, resident and migrant.
Reddish egret *Egretta rufescens*							T	Caribbean, coastal US, mangroves, large rivers colonial nests, eats fish, resident and short-distance migrant.
Swallow-tailed kite *Elanoides forficatus*							T	Southeastern US, nests in Trinity, Neches and Sabine watersheds, colonial, eats insects, long-distance migrant.
White-faced Ibis *Plegadis chihi*	BLM-S	SC					T	North America, marshes, colonial nests floating plants or low trees, eats animals, resident and migrant.
White-tailed hawk *Buteo albicaudatus*							T	Coastal Texas, prairies, savanna, chaparral, nests in trees and shrubs, eats animals, resident.
Wood stork *Mycteria americana*							T	Coastal North America, marshes and lagoons, colonial nests and roosts in trees, eats fish, resident.
REPTILES								
Alligator snapping turtle *Macrochelys temminckii*						SC	T	Central North America, Mississippi; large rivers, lakes; nests sandy soils near water; eats aquatic animals.

TABLE 3.8.3-1
State-Protected Animals and Plants Potentially Occurring along the Project Route

Species	Federal and BLM Status	State Status and Occurrence						Comments
		MT	SD	NE	KS	OK	TX	
Massasauga *Sistrurus catenatus*				T				Central US, Great Lakes region; wet prairies, marshes, uplands; uses burrows, eats animals, short migrations.
Northern scarletsnake *Cemophora coccinea copei*						SC	T	East and Central US; forest and riparian habitats with sandy or loamy soils for digging; eats animals.
Smooth green snake *Liochlorophis vernalis*		SC					T	Central, Northeast, Great Lakes US; short-grass prairies, marshes, forest edge; burrows; eats insects.
Texas horned lizard *Phrynosoma cornutum*						SC	T	Southwest US; deserts, grasslands with sandy to rocky soils; burrows; eats insects.
Timber [canebrake] rattlesnake *Crotalus horridus*							T	Central and East US; forests and woodlands near water; burrows; hibernates in rocky outcrops; eats small animals.
FISH								
Blacknose shiner *Notropis heterolepis*			E	E				Northern US; Keya Paha, Niobrara rivers and tributaries, Spring Creek, SD, NE; weedy lakes streams; eats insects.
Blackside darter *Percina maculata*					T	T	T	Central US; Red, Sulfur, Cypress river drainages, OK, TX; clear gravel or sand bottom streams, eats insects.
Blue sucker *Cycleptus elongatus*		SC				SC	T	Central US; Missouri, Red rivers, MT, OK, TX; large rivers, migrates, spawns on riffles, bottom feeder.
Bluehead shiner *Pteronotropis hubbsi*						SC	T	Central US; Ouachita, Red river drainages, OK, TX; backwaters streams, spawn on roots; omnivorous.
Creek chubsucker *Erimyzon oblongus*							T	Central, East US; Red, Sabine, Neches, Trinity, San Jacinto rivers, OK, TX; streams, rivers; omnivorous.
Finescale dace *Phoxinus neogaeus*			E	T				North US; Keya Paha, Niobrara, SF Elkhorn rivers, Spring Creek, SD, NE; bogs, creeks, rivers, eats invertebrates.
Longnose sucker *Catostomus catostomus*			T					North US; Keya Paha tributaries; cold clear lakes and streams; spawns over gravel; eats invertebrates.
Northern redbelly dace *Phoxinus eos*	BLM-S		T	T				North US; Keya Paha, Niobrara rivers and tributaries, Spring Creek, SD, NE; boggy lakes, streams; herbaceous.
Paddlefish *Polyodon spathula*	BLM-S	SC					T	Central US; Missouri, MT, Red, Neches, Trinity, San Jacinto, TX; slow rivers, spawns on gravel; eats plankton.
Pearl dace *Margariscus margarita*	BLM-S	SC	T					North US; Missouri River, MT, Keya Paha tributaries, SD; bogs, clear streams, spawns on sand-gravel; omnivorous.
Shovelnose sturgeon *Scaphirhynchus platorynchus*						SC	T	Central US; Red River and tributaries, OK, TX; large, deep turbid rivers; bottom feeder.

TABLE 3.8.3-1
State-Protected Animals and Plants Potentially Occurring along the Project Route

Species	Federal and BLM Status	State Status and Occurrence						Comments
		MT	SD	NE	KS	OK	TX	
Sicklefin chub *Macrhybopsis meeki*		SC	E		E			Missouri River, MT, SD, NE, KS; Yellowstone, Milk rivers, MT; large warm rivers with gravel, sand; bottom feeder.
Sturgeon chub *Macrhybopsis gelida*	BLM-S	SC	T	E	T			Missouri River; Yellowstone, Milk rivers, MT; Cheyenne and White rivers SD; large turbid rivers; bottom feeder.
PLANTS								
Small white lady's slipper *Cypripedium candidum*				T				North Central, Northeast US; perennial orchid, mesic to wet native prairie, flowers May to June.

DM = Federally delisted

E = Endangered

T = Threatened

SC = Species of Concern

BLM-S = BLM Sensitive

TABLE 3.8.3-2
Evaluation of State-Protected Animals and Plants Potentially Occurring along the Project Route

Species	Group	Habitat	Threats	Potential Impacts	Proposed Conservation Measures
Rafinesque's big-eared bat *Corynorhinus rafinesquii*	Mammal	Forests and riparian areas; roost in caves, hollow trees, and abandoned buildings.	Loss of roosting trees; disturbance of other roosting sites.	Removal of roosting trees; disturbance of other types of roosts; none expected.	No proposed mitigation; species is unlikely to occur in Project area.
River otter *Lontra canadensis*	Mammal	Lakes, ponds, marshes and along wooded rivers and streams with sloughs and backwater areas	Accidental trapping; habitat fragmentation; the introduction of pesticides and pollutants into the food chain	Riparian habitat loss and fragmentation.	Survey for river otters at river crossings if they contain suitable den habitat and construction would occur during denning season; restrict construction activities within 0.25 mile of active natal dens.
Swift fox *Vulpes velox*	Mammal	Prairie habitats with high density of small mammals (ground squirrels or prairie dogs), its primary prey.	Habitat loss, alteration or fragmentation due to conversion to agriculture and mineral extraction, vehicle mortality, prairie dog poisoning.	Temporary loss of den or foraging habitat, disturbance and increased human presence during construction, vehicle mortality.	Survey for den sites in appropriate locations; restrict construction activities within 0.25 of active natal den sites.
Bachman's sparrow *Aimophila aestivalis*	Bird – Grassland	Open pine savannas with high density groundcover and low density mid and overstory.	Habitat loss, alteration, and fragmentation due conversion of longleaf pine forests to pine plantations, fire suppression, nest parasitism.	Loss, alteration, or fragmentation of native grasslands within native open pine savanna habitat; loss of eggs and young due to vegetation clearing and construction during nesting season.	Develop Migratory Bird Conservation Plan in consultation with USFWS to avoid or mitigate potential Project impacts.
Bald eagle *Haliaeetus leucocephalus*	Bird – Raptor	Nesting and perching trees near water with primary prey species (fish and waterfowl) present	Habitat loss which decreases nesting sites and food supply; disturbance by humans; poisons and contaminants.	Five nests sited along ROW: 2 in MT, 2 in NE, 1 in OK; loss of nest and roost sites; disturbance to breeding or roosting areas during construction; loss or injury through collision or electrocution from power lines.	Consult with USFWS under the BGEPA for protective buffers around nests and roosts; inform power providers of requirement to consult with USFWS under BGEPA.

TABLE 3.8.3-2
Evaluation of State-Protected Animals and Plants Potentially Occurring along the Project Route

Species	Group	Habitat	Threats	Potential Impacts	Proposed Conservation Measures
Mountain plover *Charadrius montanus*	Bird – Grassland	Arid shortgrass prairie, often in association with prairie dog colonies	Native habitat is being losses to agriculture; suitable breeding habitat declining due to declines in populations of grazers which maintain short grass.	Habitat degradation and loss	Construct outside nesting period within prairie dog colonies, survey if within this period, and buffer of 0.25 mile if nests are found.
Peregrine falcon *Falco peregrinus*	Bird – Raptor	Nests on ledges and cliffs, often near water with prevalent prey base (birds)	Disturbance of cliff nesting sites; shooting; egg collecting; the taking of young for falconry; pesticides.	Habitat alteration and loss.	No specific measures; species not known or expected in Project area.
Reddish egret *Egretta rufescens*	Bird – Water	Shallow salt and brackish waters for hunting; mixed species colonial nesting in mangroves.	Habitat loss due to coastal development and harvest of mangroves; human disturbance from recreation in coastal areas, pesticides, predation.	Habitat loss or alteration, disturbance during breeding.	No coastal habitat impacts from Project; develop Migratory Bird Conservation Plan in consultation with USFWS to avoid or mitigate potential Project impacts.
Swallow-tailed kite *Elanoides forficatus*	Bird – Raptor	Temperate, tropical and subtropical habitats with forests and open areas for foraging generally with associated wetlands; breeds in Trinity River, Neches River, and Sabine River watersheds.	Prairie habitat loss due to conversion to agriculture, wetland drainage, logging; predation; pesticides.	Habitat loss or alteration, disturbance during breeding.	No known nest sites in the Project area; develop Migratory Bird Conservation Plan in consultation with USFWS to avoid or mitigate potential Project impacts.
White-faced ibis *Plegadis chihi*	Bird – Water	Freshwater marshes, swamps, wetlands, and rivers; nests in colonies on floating vegetation or in low trees above shallow water.	Wetland habitat loss and altered water level fluctuations; pesticide contamination from wintering areas in Mexico.	Wetland habitat loss, hydrologic alteration or fragmentation, disturbance during breeding.	Not known to nest within the Project area; develop Migratory Bird Conservation Plan in consultation with USFWS to avoid or mitigate potential Project impacts.

TABLE 3.8.3-2 Evaluation of State-Protected Animals and Plants Potentially Occurring along the Project Route					
Species	**Group**	**Habitat**	**Threats**	**Potential Impacts**	**Proposed Conservation Measures**
White-tailed hawk *Buteo albicaudatus*	Bird – Raptor	Coastal prairies, cordgrass flats, scrub-live oak; further inland on prairies, mesquite and oak savannas, mixed savanna-chaparral.	Habitat loss or alteration; pesticide runoff.	Habitat loss or alteration, disturbance during breeding.	No known nest sites in the Project area; develop Migratory Bird Conservation Plan in consultation with USFWS to avoid or mitigate potential Project impacts.
Wood stork *Mycteria americana*	Bird – Water	Coastal marshes, swamps, lagoons, ponds, flooded fields; brackish wetlands; nests and roosts communally.	Draining and alteration of wetland habitats resulting in inadequate forage, low productivity, nesting habitat loss from logging and development, human disturbance.	Wetland habitat loss, hydrologic alteration or fragmentation, disturbance during breeding.	No known nest sites in Project area; develop Migratory Bird Conservation Plan in consultation with USFWS to avoid or mitigate potential Project impacts.
Alligator snapping turtle *Macrochelys temminckii*	Reptile – Turtle	Large rivers, lakes, canals; swamps and marshes adjacent to rivers.	Habitat alteration and fragmentation, water pollution, illegal harvest, and incidental mortality from commercial fishers	Habitat loss, alteration, or fragmentation due to waterbody crossings or hydrostatic testing water withdrawal; disturbance of nesting sites; construction mortality; mortality from construction vehicles.	Most large rivers crossed using HDD which avoids direct impacts to in-river habitats.
Massasauga *Sistrurus catenatus*	Reptile – Snake	Wet prairies, marshes, and low areas along rivers and lakes, and adjacent uplands during part of the year, uses crayfish burrows.	Habitat loss, alteration, and fragmentation; late season buring; summer mowing; mortality from vehicles.	Habitat loss, alteration, or fragmentation due to vegetation removal, hydrologic changes or soil compaction; construction mortality of hibernating snakes; mortality from construction vehicles.	Site specific surveys in Jefferson County, Nebraska, prior to construction activities to clear the area for snakes; continued consultation with NGFP if species occurs within the construction area.

TABLE 3.8.3-2
Evaluation of State-Protected Animals and Plants Potentially Occurring along the Project Route

Species	Group	Habitat	Threats	Potential Impacts	Proposed Conservation Measures
Northern scarletsnake *Cemophora coccinea copei*	Reptile – Snake	Upland environments in the vicinity of marshes, swamps, or other bodies of water; areas with well-drained soil to facilitate burrowing.	Habitat loss, alteration, and fragmentation; collection for pet trade; vehicle mortality.	Habitat loss, alteration, or fragmentation due to vegetation removal, hydrologic changes, or soil compaction; construction mortality of hibernating snakes; mortality from construction vehicles.	No specific measures; species not known or expected in Project area.
Smooth green snake *Liochlorophis vernalis*	Reptile – Snake	Coastal shortgrass prairies, riparian areas, open woodlands.	Habitat loss and degradation, especially conversion of native shortgrass prairie.	Loss, alteration, or fragmentation of shortgrass prairie habitat; construction mortality of hibernating snakes; mortality from construction vehicles.	No specific measures; species not known or expected in Project area.
Texas horned lizard *Phrynosoma cornutum*	Reptile – Lizard	Arid or semi-arid areas of flat, open terrain with sparse plant cover.	Habitat loss and degradation; pesticide use; over-collection; invasion of the red imported fire ant.	Loss or fragmentation of habitat; further invasion by fire ant due to disturbed soils; direct mortality from vehicles; none expected.	No specific measures; species not known or expected in Project area.
Timber (canebrake) rattlesnake *Crotalus horridus*	Reptile – Snake	Moist lowland forest; hilly woodlands near rivers, streams, and lakes.	Habitat loss and degradation, especially deforestation.	Lowland forest habitat loss, alteration, or fragmentation; construction mortality to hibernating snakes; mortality from construction vehicles.	No specific measures; species not known or expected in Project area.
Blacknose shiner *Notropis heterolepis*	Fish – Minnow	Clean, cool, well-oxygenated streams with abundant aquatic vegetation.	Habitat alteration due to increased turbidity, siltation and disappearance of aquatic vegetation; long disturbance and loss of vegetated backwaters cited as responsible for declines.	Habitat loss or alteration due to increased turbidity, erosion, siltation, altered hyporheic flow; removal of riparian and instream vegetation during construction.	Survey for occurrence within suitable habitats crossed in tributaries of the Niobrara and South Fork Elkhorn rivers; consult with NGPC on conservation measures if blacknose shiners are found within surveyed streams.
Blackside darter *Percina maculata*	Fish – Perch	Pools of creeks and small to medium rivers, usually with moderate current and gravel or sand bottoms	Highly intolerant of organic pollutants.	Habitat loss or alteration due to increased turbidity, erosion; fuel spills during construction.	No specific measures or surveys requested.

TABLE 3.8.3-2
Evaluation of State-Protected Animals and Plants Potentially Occurring along the Project Route

Species	Group	Habitat	Threats	Potential Impacts	Proposed Conservation Measures
Blue sucker *Cycleptus elongatus*	Fish – Sucker	Large rivers, usually in channels and flowing pools with moderate current.	Over fishing, habitat loss due to surface water depletion, impaired water quantity and quality; migration barriers due to dams.	Habitat loss or alteration; reduced water quantity; entrainment of eggs or juveniles.	Missouri, Milk, Yellowstone, and Red rivers would be crossed using HDD method avoid impacts; screening of water intake to prevent entrainment.
Bluehead shiner *Notropis hubbsi*	Fish – Minnow	Quiet backwater areas of small to medium-sized, sluggish streams and oxbow lakes having mud or mud-sand substrate.	Habitat loss, and degradation due to draining, filling, farming or flooding of backwater habitats; dispersal barriers.	Habitat loss or alteration; reduced water quality during construction; disruption of spawning; entrainment of adults, eggs, or larval fish.	No specific measures; species not known or expected in Project area.
Creek chubsucker *Erimyzon oblongus*	Fish – Sucker	Inhabits sand and gravel-bottomed pools of clear headwaters, creeks and small rivers, often near vegetation.	Habitat alteration, pollution.	Habitat loss or alteration; reduced water quality during construction; disruption of spawning; entrainment of adults, eggs, or larval fish.	Red, Sabine, Neches, Trinity, and San Jacinto rivers would be crossed using HDD method avoid impacts; screening of water intake to prevent entrainment.
Finescale dace *Phoxinus neogaeus*	Fish – Minnow	Headwater streams, beaver ponds, and small spring-fed lakes and bogs.	Habitat alteration and introduction of non-native fishes.	Fine sediments from construction activities could displace foraging dace.	No specific measures; species not known or expected in Project area.
Northern redbelly dace *Phoxinus eos*	Fish – Minnow	Sluggish, spring-fed streams with abundant vegetation and woody debris.	Habitat alteration, turbidity, erosion, sedimentation and flow alterations.	Fine sediments from construction activities could displace foraging dace; disrupt spawning; movement barriers.	Survey for occurrence within suitable habitats crossed in tributaries of the Keya Paha River in South Dakota or in tributaries of the Niobrara and South Fork Elkhorn rivers in Nebraska; consult with SDGFP and NGPC on conservation measures if northern redbelly dace are found within surveyed streams.

TABLE 3.8.3-2
Evaluation of State-Protected Animals and Plants Potentially Occurring along the Project Route

Species	Group	Habitat	Threats	Potential Impacts	Proposed Conservation Measures
Paddlefish *Polyodon spathula*	Fish – Paddlefish	Quiet waters of large rivers or impoundments, spawning on the gravel bars of large rivers during late spring and early summer high water.	Habitat loss and alteration through dam construction; stream dewatering; overharvest; pollution; pesticides.	Habitat loss or alteration; stream dewatering during hydrostatic testing; entrainment of eggs or larval fish.	Missouri, Yellowstone, Red rivers would be crossed using HDD method avoid impacts; screening of water intake to prevent entrainment.
Pearl dace *Margariscus margarita*	Fish – Minnow	Cool bogs, ponds, beaver ponds, lakes, creeks and clear streams.	Habitat alteration, turbidity, erosion, sedimentation and flow alterations.	Fine sediments from construction activities could displace foraging dace.	Keya Paha River in South Dakota or in tributaries of the Niobrara and South Fork Elkhorn rivers in Nebraska which would be surveyed for northern redbelly dace.
Shovelnose sturgeon *Scaphirhynchus platorynchus*	Fish – Sturgeon	Lives at or near the bottom of large rivers with a sand substrate.	Habitat loss and alteration; blockage of movements by dams.	Habitat loss or alteration; stream dewatering during hydrostatic testing; entrainment of eggs or larval fish.	Missouri, Milk, Yellowstone rivers in Montana; Niobrara and Platte rivers in Nebraska; Red River in Oklahoma and Texas would be crossed using HDD method avoid impacts; screening of water intake to prevent entrainment.
Sicklefin chub *Macrhybopsis meeki*	Fish – Minnow	Main channels of large, turbid rivers where they live in a strong current over a bottom of sand or fine gravel	Habitat alteration by dam operations; dewatering for irrigation and development.	Habitat loss or alteration; stream dewatering during hydrostatic testing; entrainment of eggs or larval fish.	Missouri, Milk, Yellowstone rivers in Montana; Cheyenne and White rivers in South Dakota; Platte River in Nebraska would be crossed using HDD method avoid impacts; screening of water intake to prevent entrainment.

TABLE 3.8.3-2
Evaluation of State-Protected Animals and Plants Potentially Occurring along the Project Route

Species	Group	Habitat	Threats	Potential Impacts	Proposed Conservation Measures
Sturgeon chub *Macrhybopsis gelida*	Fish – Minnow	Turbid sandy rivers over bottoms of gravel to coarse sand	Habitat alteration by dam operations; irrigation operations and development.	Habitat loss or alteration; stream dewatering during hydrostatic testing; entrainment of eggs or larval fish.	Cheyenne and White rivers in South Dakota; Platte River in Nebraska would be crossed using HDD method avoid impacts; screening of water intake to prevent entrainment.
Small white lady's slipper *Cypripedium candidum*	Plant – Perennial Forb	Mesic black soil prairie, wet black soil prairie, glacial till hill prairie, sedge meadow, calcareous fen, glade; calcareous soils.	Habitat loss due to conversion of wet prairies to cropland and heavy livestock grazing; competition from invasive plants such as smooth brome and reed canary grass; herbicides.	Habitat loss, alteration or fragmentation; loss of plants due to soil and vegetation disturbance.	Suitable habitat identified between Keya Paha County and northern York County, Nebraska and Tripp County, South Dakota; surveys for presence/absence during the May 15 to June 7 flowering period in Nebraska.

Note: All state-protected birds listed are protected under the Migratory Bird Treaty Act.

3.8.3.2 State-Protected Birds

State-protected birds fall into three groups based on ecology and habitat use; raptors, grassland birds, and water birds. Summaries of potential Project-related impacts and proposed conservation measures are presented in Table 3.8.3-2. Additional occurrence information, impact discussions, and conservation measure descriptions are presented in the following section. All of the state-protected birds listed in Tables 3.8.3-1 and 3.8.3-2 are considered migratory and are federally protected under the MBTA. In addition, bald eagles are also federally protected under BGEPA. Keystone would develop a Migratory Bird Conservation Plan in consultation with USFWS to avoid or mitigate potential Project-related impacts to migratory birds.

Raptors

Peregrine Falcon

The peregrine falcon is a non-breeding resident, breeding resident, permanent resident, or migrant throughout the U.S., primarily west of the Project area; although non-breeding residents are found throughout the east and Gulf of Mexico coasts. Two of the three recognized subspecies could occur within the Project area: the American peregrine falcon (*Falco peregrinus anatum*) and the Arctic peregrine falcon (*Falco peregrinus tundrius*). Both subspecies were previously federally protected as endangered under the ESA but have been delisted. The American peregrine falcon nests across interior Alaska and across Canada south to Baja California and northern Mexico. The Arctic peregrine falcon breeds on the North American tundra and winters in Latin America from Cuba and Mexico south through Central and South America and along the Gulf Coast from Florida west to eastern Mexico. Peregrine falcons use open habitats near cliffs and mountains. Nesting habitat occurs on cliffs near an adequate prey base.

Potential Impacts and Conservation Measures

Raptor surveys along the Project route did not identify any nesting peregrine falcon nests, and no breeding records of peregrine falcons exist along the Project route; therefore the Project is not likely to affect nesting peregrine falcons.

Bald Eagle

Bald eagles occur throughout the U.S. and the Project area. The bald eagle was removed from the list of threatened and endangered species on August 8, 2007, but remains state-listed in South Dakota, Kansas, and Texas. The bald eagle is federally protected under both the BGEPA and the MBTA. Bald eagles are associated with riparian or lacustrine areas for foraging and nesting. They generally nest and roost in large trees or snags with open crowns in areas that are relatively free of disturbance. Nesting territories are most often near open water with a prey base of fish and waterfowl. Bald eagles use upland areas to feed on small mammals and carrion, especially during the winter. Nests are typically within 1 mile of permanent water. Roost sites are an important habitat component for bald eagles and include live trees and snags that provide good visibility and that are located near nest sites or foraging areas.

Four active bald eagle nests were documented during raptor nest surveys for the Steele City Segment during April, 2009; two in Montana and two in Nebraska. Twelve bald eagle winter roost sites were identified during surveys of the Steele City Segment during February, 2009. Winter roost sites included: 3 river crossings in Montana (Yellowstone River, Missouri River, and Frenchman Reservoir; 3 river crossings in South Dakota (White River, Cheyenne River, South Fork Moreau River); and 6 river crossings in Nebraska (Platte River, Loup River, Cedar River, Dry Creek, Niobrara River, Keya Paha River). Six bald eagle sightings were recorded during nesting surveys of the Gulf Coast Segment and Houston Lateral; three in Oklahoma and three in Texas. One of the sightings in Oklahoma was associated with a nest that was outside of the survey area; but the other sightings did not appear to coincide with any nest structures.

Potential Impacts and Conservation Measures

To minimize impacts to bald eagles, Keystone would implement the following measures:

- Conduct additional nest/roost surveys within 1 mile of the ROW prior to construction, if construction occurs during the nesting or roosting period;
- Consult with USFWS under the BGEPA regarding required buffers and construction activities within 660 feet of active bald eagle nests during the nesting season (February 1 through August 15); and
- Consult with USFWS under the BGEPA regarding required buffers and construction activities within 660 feet of active winter roost sites during the winter roosting season (November 1 through April 1) and the ability to conduct construction activities within 660 feet of active winter roosts between 10 a.m. and 3 p.m.

The above measures would be implemented on a site-specific basis in consultation with the USFWS and states that list bald eagles as threatened including: South Dakota, Kansas, and Texas. Keystone would consult with BLM for any bald eagle nest or roost sites that occur within 0.5 mile of the Project on BLM lands in Montana as noted in Table 3.8.2-1.

Connected Actions

The construction of electrical distribution lines to provide power to pump stations and the proposed 230 kV transmission line in southern South Dakota would incrementally increase the collision and electrocution hazards for bald eagles. Construction of power lines during the nesting or roosting periods has the potential to destroy or disturb nests or roosts if they occur within or near the transmission line corridors. Keystone would inform electrical power providers, BEPC, and Western of the requirement to consult with USFWS under the BGEPA relative to impacts to bald eagles.

Swallow-Tailed Kite

The swallow-tailed kite occurs as a breeding resident and vagrant in coastal areas of the southeastern U.S. and formerly was widely distributed throughout the Mississippi River drainage. Past population declines have been attributed to conversion of native prairie habitats to agriculture, wetland drainage, logging of forests, egg collection, and shooting. The swallow-tailed kite currently breeds in tropical and subtropical forests with wetlands. Populations in temperate and subtropical portions of the U.S. are migratory, with spring migrants arriving in early to mid February and fall migrants leaving from late July through early September. Swallow-tailed kites are known to breed in the Trinity River, Neches River, and the Sabine River watersheds of east Texas. Nest building and initiation of egg laying begins in mid to late March, and young fledge in May or June. They nest in loose colonies with groups of two to five nests.

Potential Impacts and Conservation Measures

There are no known nesting locations near the Project ROW. Conservation measures developed for migratory birds would also avoid or minimize potential Project impacts on the swallow-tailed kite.

White-Tailed Hawk

White-tailed hawk habitat preferences include open country, primarily savanna, prairie and arid habitats of mesquite, cacti and bushes (TPWD 2009i). In Texas, white-tailed hawks are found near coasts on prairies, cordgrass flats, and scrub-live oak habitats; farther inland they use prairie, mesquite and oak savanna, and mixed savanna-chaparral habitats. They nest in low trees, large shrubs or the crown of yucca.

Potential Impacts and Conservation Measures

There are no known nesting sites for the white-tailed hawk within the Project area. Although this species is considered to be a local non-migratory resident bird, it is covered under the MBTA and conservation measures developed for migratory birds would also avoid or minimize potential Project impacts on the white-tailed hawk.

Grassland Birds

Bachman's Sparrow

The Bachman's sparrow occurs throughout the southeastern U.S. and inhabits open pine savannas and open coniferous and hardwood woodlands with high density groundcover and low density midstory and overstory. Historically this sparrow was associated with old growth southern pine woodlands that were subject to frequent growing-season fires, breeding wherever fires created suitable conditions. Bachman's sparrows nest on the ground in dense cover, against or under grass tufts or low shrubs.

Potential Impacts and Conservation Measures

The Bachman's sparrow potentially occurs in areas of eastern Oklahoma and Texas crossed by the Project. Vegetation clearing during the nesting season, typically late April through July or August could result in loss of eggs or young. There are Natural Heritage records of the Bachman's sparrow in Atoka and Creek counties in Oklahoma. There are no known nesting sites in the Project area in Texas. Although migrant birds may occur within the Project area, this sparrow is not expected to be nesting in habitats affected by the Project.

Mountain Plover

Mountain plovers breed from northern Montana south to Arizona. Nesting populations are primarily in Montana, Wyoming, and Colorado; and although their breeding has experienced long-term reduction, the population has not declined in recent years. The mountain plover generally arrives at its northern nesting range during mid-March to mid-May. They depart in mid to late July to head back to their winter range. Nesting habitat includes high plains/short-grass prairie and desert tablelands, commonly prairie dog towns in some areas, such as sagebrush (*Artemisia* spp.)/blue grama (*Bouteloua gracilis*) habitats in central Montana. In central and southwestern Montana nesting often occurs in short-grass prairie with a history of heavy grazing or in low shrub semi-deserts. Nests are on the ground in shallow depressions that may be lined with plant material and/or next to dried cattle dung. Threats to the mountain plover include conversion of short-grass prairie to agricultural land, conversion of short-grass prairie to mixed-grass prairie by seeding with taller grasses, destruction of prairie dog towns, changes to crops that require spring tillage that destroys nests, and conversion of winter habitats. A recent review of the threats to the mountain plover, however, concluded that these threats were unlikely to endanger the mountain plover in the foreseeable future.

Potential Impacts and Conservation Measures

Construction through prairie dog towns in Montana could affect nesting mountain plovers if they are present and if construction occurs during the nesting season. Nests, eggs, and young could be lost during construction. Disturbance could lead to nest abandonment resulting in loss of eggs or young. In Montana, Mountain plover surveys are recommended within the two identified prairie dog towns and in the bentonite fields of Valley County during the May 1 to June 15 breeding season. Mountain plover were not identified as occurring within the Project area in Nebraska by the Nebraska Game and Parks Commission.

To minimize impacts to mountain plovers, Keystone would implement the following measures:

- Conduct surveys for mountain plover if construction is scheduled between May 1 and June 15;
- If a nest is identified, construction activities within 0.25 mile of the nest would be delayed for 37 days (typical fledging duration); and
- If a brood of flightless chicks is identified, construction activities would be delayed for at least seven days.

Water Birds

Three state-protected waterbirds potentially occur within the Project area in Texas: the reddish egret, the white-faced ibis, and the wood stork. The reddish egret and wood stork are generally coastal species, while the white-faced ibis nests as far north and inland as Montana. All three species are listed as threatened in Texas. Aerial surveys of the entire Project ROW were completed to identify avian tree nests and rookeries including those used by reddish egrets and wood storks.

Reddish Egret

The reddish egret is a common winter resident along the southeast coast of Texas. The reddish egret population in the United States has been slowly increasing, although it remains vulnerable due to development and environmental degradation of coastal habitats. The reddish egret depends exclusively on coastal habitats.

Potential Impacts and Conservation Measures

No suitable habitat for the reddish egret is found within the Project area and this species is not known or expected to occur in the Project area.

White-Faced Ibis

The White-faced Ibis breeds in marshes and irrigated areas throughout the Great Basin, most commonly in Utah, Nevada, and California, although they may also breed in Montana and Nebraska. The breeding range of white-faced ibis in Montana extends diagonally from northeast to southwest across the state (MTNHP 2009). The white-faced ibis also nests in Nebraska along the Platte River outside of the Project corridor. Breeding habitats include large wetland complexes such as marshes, ponds, and river floodplains where water surrounds emergent vegetation, shrubs, or low trees. In Montana, white-faced ibis often nest in old cattail stems or bulrushes over shallow water (MTNHP 2009). Ibis feed on aquatic invertebrates, insects, earthworms and small vertebrates (Ehrlich et al. 1988). They may also forage in flooded hay meadows and cultivated fields.

Northern breeding populations are also known to winter from the southern US south to northern Central America. Although the species is a permanent resident in coastal Texas, it is not known to nest there within the Project corridor.

Potential Impacts and Conservation Measures

No large wetland complexes that provide nesting habitat for this species would be directly affected by the Project.

Wood Stork

The wood stork lives in colonies in cypress and mangrove swamps in the southeastern United States. It frequently flies in flocks, alternately flapping and gliding, or soaring on thermals to great altitudes. After nesting in South and Central America, and in the Caribbean islands, some migrate into Texas during the summer. Few wood storks use wetland areas in Texas (Audubon 2009c). Threats to the wood stork include draining and alteration of wetland habitat, and while some wood storks may be able to adapt to human-caused environmental changes, they may eventually abandon historic nesting colonies to move to more suitable habitats. Wood storks may use constructed wetlands for feeding and nesting (Audubon 2009c).

Potential Impacts and Conservation Measures

The Project is not expected to produce impacts to wood storks due to lack of suitable habitat along the Project corridor.

3.8.3.3 State-Protected Reptiles

State-protected reptiles with the potential to occur within the Project area include one turtle, one lizard and four snakes (Table 3.8.3-1). Summaries of potential project-related impacts and proposed conservation measures are presented in Table 3.8.3-2. Additional occurrence information, impact discussions, and conservation measure descriptions are presented in the following section. The state-protected Louisiana pine snake is a candidate for federal protection and is discussed in Section 3.8.1.

Alligator Snapping Turtle

The alligator snapping turtle is the largest freshwater turtle in North America, and it is found in eastern Oklahoma and Texas in the Arkansas, Canadian, Red, Sabine, Neches, Trinity, and San Jacinto river systems (Center for Reptile and Amphibian Conservation and Management 2009). They are threatened by habitat alteration and fragmentation, water pollution, illegal harvest, and incidental mortality from commercial fishers. Alligator snapping turtles are found in the slow-moving, deep water of rivers, sloughs, oxbows and canals or lakes associated with big rivers.

Potential Impacts and Conservation Measures

Most large river habitats in Texas crossed by the Project would use the HDD method, which would prevent direct impacts to in-river and riparian habitats potentially used by the alligator snapping turtle. These rivers would also provide water sources for HDD and hydrostatic pipeline testing. The one-time water use would not be expected to reduce or alter habitats for the alligator snapping turtle.

BMPs associated with hydrostatic testing water withdrawal would include:

- Chemical additives would be prohibited;
- Discharges would be designed to prevent erosion;
- Inter-basin water transfers would be prohibited; and
- Procedures would be implemented to prevent the spread of invasive aquatic animals and plants.

Texas Horned Lizard

The Texas horned lizard is a diurnal species that prefers flat, open terrain with little plant cover. In order to maintain an ideal body temperature through thermoregulation, they spend much of their time either basking or burrowing. They are commonly found in loose sand or loamy soils where they burrow underground for nesting and to escape heat and cold. The Texas horned lizard has disappeared from many parts of its former range over the past 30 years due to collection for the pet trade, spread of the red imported fire ant, changes in land use, and environmental contamination (TPWD 2009h). The Texas horned lizard may potentially occur within the Project area in Kansas, Oklahoma and Texas.

Potential Impacts and Conservation Measures

Project impacts could include habitat loss, alteration, or fragmentation, facilitated invasion by fire ants due to soil disturbance, and direct mortality from construction vehicles. Access roads may serve as barriers to movement and increase vehicular mortality (Maxell and Hokit 1999). No Texas horned lizards are expected to be present within the Project area in Texas as the known distribution of this species is west of the Project area.

Massasauga

The massasauga, or pygmy rattlesnake, is state listed as threatened in Nebraska. It lives in wet areas, including wet prairies, marshes, and low areas along rivers and lakes. In many areas, massasaugas also use adjacent uplands—including forest—during part of the year. They often hibernate in crayfish burrows, but they also may be found under logs and tree roots or in small mammal burrows. Unlike other rattlesnakes, massasaugas hibernate alone. Small mammal and crayfish burrows are used for winter hibernation. Females sexually mature in three years and breed every few years thereafter, giving birth in late July through early September. Movement within the home range occurs between suitable winter and summer habitats, sometimes spanning almost 2 miles. Most movement, however, occurs within 650 feet of their burrows. Peak activity occurs from about April or May through October. Massasauga distribution within the Project area includes southeastern Nebraska, Kansas, Oklahoma and Texas. Suitable habitat is known to occur along the Project corridor within Jefferson County, Nebraska along waterbody shorelines (Keystone 2009c).

Potential Impacts and Conservation Measures

To minimize impacts to the massasauga in Nebraska, Keystone would implement the following measures:

- Complete surveys of suitable habitats along the Project ROW in Jefferson County, Nebraska to clear the area for the massasauga; and
- Continue consultations with the Nebraska Game and Parks Commission to avoid adverse impacts to the massasauga.

Northern Scarletsnake, Smooth Green Snake, and Timber Rattlesnake

These Texas state-protected snakes are generally widely distributed (Table 3.8.3-1), although consultations with the Texas Department of Fish and Wildlife indicate that these species are not expected to occur within the Project area in Texas.

Potential Impacts and Conservation Measures

Potential Project-related impacts are listed in Table 3.8.3-2 should these snakes occur within the Project area.

3.8.3.4 State-Protected Fish

There are 12 species of state-protected fish potentially occurring within the Project area. These species are within five fish families: minnows, paddlefish, perch, sturgeon and suckers (Table 3.8.3-1). Summaries of potential project-related impacts and proposed conservation measures are presented in Table 3.8.3-2. Additional occurrence information, impact discussions, and conservation measure descriptions are presented in the following section.

Minnows

Seven state-protected minnows potentially occur in waters crossed by the Project including: two shiners, two chubs, and three dace (Table 3.8.3-1).

Blacknose Shiner

The blacknose shiner requires clean, cool, well oxygenated streams with abundant aquatic vegetation. It is found in areas swept by currents, island heads and sandbars, and is intolerant of turbid water and pollution. Spawning occurs in Nebraska during the last week of June and in general, from spring to midsummer. The blacknose shiner feeds on small aquatic insects, crustaceans and algae. It serves as a host for the cylindrical papershell freshwater mussel (*Anodontoides ferussacianus,* NatureServe 2009). The blacknose shiner is an important indicator of high water quality within pristine streams. This minnow potentially occurs within suitable habitat in waterbodies crossed by the Project in South Dakota and Nebraska (Keystone 2009c). There are five known populations in Nebraska.

Bluehead Shiner

The bluehead shiner is known from two locations in northeastern Texas; Caddo Lake, and Big Cypress Bayou in Harrison County (Ranvestel and Burr 2002). This species inhabits small to mid-size streams and oxbow lakes with mud or mud-sand substrate; water typically tannin-stained, and heavy growth of submerged of semi-emergent vegetation (Ranvestel and Burr 2002). The bluehead shiner has a diverse diet dominated by microcrustaceans (Ranvestel and Burr 2002). The current distribution of the bluehead shiner in northeast Texas would not be crossed by the Project.

Finescale Dace

Populations of the finescale dace in South Dakota, and Nebraska occur as small, isolated demes that have been declining steadily since European settlement of this region over 100 years ago. Finescale dace can be found in headwater streams, beaver ponds, and small spring-fed lakes and bogs (Stasiak and Cunningham 2006). They have an affinity for abundant vegetation, woody debris, and cool groundwater.

They may be associated with undercut banks and areas without predatory fish. Finescale dace spawn in early spring from April to early June. Non-adhesive eggs are broadcast by a group of spawning fish onto substrates such as brush, logs, rocks, or aquatic plants. Embryos hatch in about six days at 20 °C. Newly hatched fish associate with vegetative cover and reduced currents. As they mature, finescale dace move to more open water and seek cooler water with reduced current, complex cover, and lack of predatory fish. They can live between four to six years. Primary threats to finescale dace include habitat alteration and the introduction of non-native fishes. Finescale dace occur in small, confined habitats with permanent spring seeps, usually at the headwaters of small streams. Finescale dace and its suitable habitat are not expected along the Project corridor in South Dakota (USGS 2006a).

Northern Redbelly Dace

The northern redbelly dace prefers sluggish, spring-fed streams with abundant vegetation and woody debris (Stasiak 2006). This minnow requires a constant supply of cool, spring water that maintains sufficient oxygen levels during hot and dry summer conditions. During spawning the northern redbelly dace becomes quite colorful; reaching a maximum size of about three inches. Primary threats to the northern redbelly dace include habitat alteration and the introduction of non-native fishes. In some locations in the northern U.S. and Canada, the northern redbelly dace hybridizes with its close relative, the finescale dace. The resulting hybrids are all females and produce female clones as offspring. The northern redbelly dace potentially occurs in tributaries of the Keya Paha River in South Dakota, and in tributaries of the Niobrara River, and South Fork Elkhorn River in Nebraska (Keystone 2009c).

Pearl Dace

The pearl dace inhabits bog drainage streams, ponds, and small lakes, and is usually found over sand or gravel. Pearl dace spawn in clear water in weak or moderate currents (NatureServe 2009). They potentially occur in suitable habitat within tributaries to the Keya Paha River in South Dakota that would be crossed by the Project (Keystone 2009c).

Sicklefin Chub

The sicklefin chub inhabits the shallows of warm large rivers that are continuously and heavily turbid, with strong currents over stable gravel and sand substrates (NatureServe 2009). The sicklefin chub potentially occurs in the Missouri, Milk and Yellowstone rivers in Montana and in the Cheyenne and White rivers in South Dakota. This species is not expected to be found in South Dakota along the proposed route (USGS 2006b).

Sturgeon Chub

The sturgeon chub prefers large turbid sandy rivers over substrate of small gravel and coarse sand. It is often found in areas swept by currents especially at the head of islands or exposed sandbars. Sturgeon chubs occur in the Cheyenne and White rivers in South Dakota, and the Platte River in Nebraska.

Potential Impacts and Conservation Measures

For the minnows listed above, construction through streams during spawning periods could result in disruption of spawning and loss of eggs and young. Additionally, construction methods that lead to increased siltation and turbidity could temporarily displace these fish. Construction conservation measures to reduce fine sediment would minimize displacement of foraging minnows. Water withdrawals for use in the HDD crossing method or for hydrostatic test purposes could lead to entrainment of these fish. Water withdrawal would be consistent with permit requirements and intake hoses would be screened to prevent entrainment of fish. Protections for aquatic life during water withdrawal for HDD and hydrostatic testing would be implemented for all proposed water sources. Construction timing considerations and BMPs for maintaining water quality and flow would minimize potential impacts on state-protected minnows.

Conservation measures for these fish may vary from state to state. In South Dakota, the following conservation measures would apply:

- The determination of suitable habitat present along the route would be made by South Dakota Game Fish and Parks (SDGFP);
- If suitable habitat is present, presence / absence surveys would be conducted;
- If surveys results are negative for these minnows, no further conservation measures would be required; and
- If survey results are positive for these minnows, construction activities would be excluded during the spawning period (to be provided by SDGFP) and/or salvage and relocation methods could be applied.

In addition, surveys have been recommended for the blacknose shiner, northern redbelly dace, and pearl dace in tributaries of the Keya Paha River that would be crossed by the Project in South Dakota.

In Nebraska, surveys have been recommended for the blacknose shiner, northern redbelly dace, and finescale dace in tributaries of the Niobrara and South Fork Elkhorn rivers that would be crossed by the Project. Nebraska Game and Parks Commission (NGPC) has requested that Keystone re-consult to identify additional conservation measures if blacknose shiners, northern redbelly dace, or finescale dace are found within any streams surveyed for the Project.

The use of HDD stream crossing technology would reduce impacts to these minnows and their habitats. Most large rivers along the pipeline corridor would be crossed using HDD technology. In Nebraska, NGPC recommends HDD methods for any stream crossings occupied by these minnows, as open-cut crossings typically cause affects from increased turbidity and suspended sediment such as avoidance and gill irritation.

Perch

The blackside darter is state listed as threatened in Kansas, Oklahoma and Texas. It is a member of the Perch family that potentially occurs in creeks and small to medium rivers where it prefers quiet pools and pools with some current over gravel or sand bottoms (Page and Burr 1991). Blackside darter feed on benthic invertebrates and spawn in gravel pools greater than one foot deep; and they may migrate several miles between spawning and non-spawning habitats. The blackside darter inhabits streams within the Project area including the Red, Sulfur and Cypress River basins of southeast Oklahoma and northeast Texas.

Potential Impacts and Conservation Measures

Construction through streams during spawning periods could result in disruption of spawning and loss of eggs and young. Additionally, construction methods that lead to increased siltation and turbidity could cause temporarily displacement, although construction conservation measures to reduce fine sediment would minimize this impact. Water withdrawals for use in the HDD crossing method or for hydrostatic test purposes could lead to entrainment of fish. Water withdrawal would be consistent with permit requirements and intake hoses would be screened to prevent entrainment of fish. Protections for aquatic life during water withdrawal for HDD and hydrostatic testing would be implemented for all proposed water sources. Construction timing considerations and BMPs for maintaining water quality and flow would minimize potential impacts. No survey recommendations or conservation measures have been requested for the blackside darter.

Paddlefish

Paddlefish could potentially occur in waterbodies crossed by the Project in Montana, Oklahoma, and Texas. Paddlefish occur in the Missouri and Yellowstone rivers in Montana and the Red River and tributaries in Oklahoma and Texas. Historically paddlefish occurred in the Sulphur River, Big Cypress Bayou, Sabine River, Neches River, Angelina River, Trinity River, and San Jacinto River (TPWD 2008c). This fish inhabits slow moving water of large rivers or reservoirs, usually in water deeper than four feet (130 cm). Paddlefish require large volumes of slow flowing water in order to reproduce. Construction of dams and reservoirs along Texas rivers have decreased flow and interrupted spawning movements (TPWD 2008c).

Potential Impacts and Conservation Measures

Construction through streams during spawning periods could result in disruption of spawning and loss of eggs and young. Additionally, construction methods that lead to increased siltation and turbidity could cause temporarily displacement, although construction conservation measures to reduce fine sediment would minimize this impact. Water withdrawals for use in the HDD crossing method or for hydrostatic test purposes could lead to entrainment of fish. Water withdrawal would be consistent with permit requirements and intake hoses would be screened to prevent entrainment of fish. Protections for aquatic life during water withdrawal for HDD and hydrostatic testing would be implemented for all proposed water sources. Construction timing considerations and BMPs for maintaining water quality and flow would minimize potential impacts.

Surveys for paddlefish are not planned in either Montana or Texas because the major rivers crossed by the Project in which paddlefish could occur would be crossed using the HDD method, which would avoid impacts to in river habitats.

Sturgeon

The shovelnose sturgeon is state listed as threatened in Texas and is an Oklahoma species of concern. The shovelnose sturgeon prefers the bottom of deep channel habitats and the embayments of large turbid rivers, often over sand mixed with gravel or mud in areas with strong current. Spawning occurs in open water channels of larger rivers or over rocky or gravelly bottoms. Declines in shovelnose sturgeon abundance are due primarily to dam construction. Hybridization between shovelnose sturgeon and pallid sturgeon is also a concern. Introgression of genes from the more common shovelnose sturgeon is a potential threat to the endangered pallid sturgeon (Keenlyne 1997). Shovelnose sturgeon potentially occur in rivers crossed by the Project including the Missouri, Milk and Yellowstone rivers in Montana; the Niobrara and Platte rivers in Nebraska; and the Red River in Oklahoma and Texas. In Texas, shovelnose sturgeon are found in the Red River below Dennison Dam (Lake Texoma Reservoir) (Hubbs et al. 2008); and the Red River drainage (Bonn and Kemp 1952).

Potential Impacts and Conservation Measures

Construction through streams during spawning periods could result in disruption of spawning and loss of eggs and young. Water withdrawals for use in the HDD crossing method or for hydrostatic test purposes could lead to entrainment of fish. Water withdrawal would be consistent with permit requirements and intake hoses would be screened to prevent entrainment of fish. Protections for aquatic life during water withdrawal for HDD and hydrostatic testing would be implemented for all proposed water sources. Construction timing considerations and BMPs for maintaining water quality and flow would minimize potential impacts. All of the rivers potentially containing shovelnose sturgeon would be crossed using the HDD method, which would avoid direct impacts to the fish and its habitats.

Suckers

Suckers are most often found in rivers but can be found in any freshwater environment. Their food habits range from detritus and bottom dwelling organisms, to surface insects and small fishes.

Blue Sucker

The blue sucker is state listed as threatened in Texas and is a species of concern in Montana and Oklahoma. It inhabits larger rivers and the lower reaches of major tributaries, and is usually found in channels and flowing pools with moderate current, and in some impoundments. Adults probably winter in deep pools. Young are present in shallower and less swift water than adults. The blue sucker spawn in deep riffles (1-2 meters) with cobble and bedrock substrate (NatureServe 2009). They potentially occur within suitable habitat in rivers crossed by the Project including the Missouri, Milk, and Yellowstone rivers in Montana; and the Red River in Oklahoma and Texas (Keystone 2009c). However, the blue sucker has not been documented in the Red River near the proposed Project crossing.

Creek Chubsucker

The creek chubsucker is state listed as threatened in Texas. It inhabits small rivers and creeks with sand and gravel bottomed pools often near vegetation. Occasionally it is found in lakes. It spawns in river mouths or pools, riffles, lake outlets and upstream creeks (Becker 1983, Goodyear et al. 1982). Young typically occur in headwater rivulets or marshes (Lee et al. 1980). Populations apparently are declining in streams subject to siltation. Creek chubsuckers occur in the Red, Sabine, Neches, Trinity, and San Jacinto rivers and their tributaries in eastern Texas and Oklahoma.

Potential Impacts and Conservation Measures

Construction through streams during spawning periods could result in disruption of spawning and loss of eggs and young. Additionally, construction methods that lead to increased siltation and turbidity could cause temporarily displacement, although construction conservation measures to reduce fine sediment would minimize this impact. Water withdrawals for use in the HDD crossing method or for hydrostatic test purposes could lead to entrainment of fish. Water withdrawal would be consistent with permit requirements and intake hoses would be screened to prevent entrainment of fish. Protections for aquatic life during water withdrawal for HDD and hydrostatic testing would be implemented for all proposed water sources. Construction timing considerations and BMPs for maintaining water quality and flow would minimize potential impacts.

Occurrence surveys are not planned for the blue sucker, or creek chubsucker because the river crossings where these suckers may occur within the Project area would be crossed using the HDD method, which would avoid impacts to suckers and their habitats. Rivers where these suckers may occur would also be used for HDD and hydrostatic test water sources.

3.8.3.5 State-Protected Plants

Small White Lady's Slipper

The small white lady's slipper is a Nebraska state threatened species. It is found in wet prairies, mesic blacksoil prairie, wet blacksoil prairie, glacial till hill prairie, sedge meadow, calcareous fens, and glades, generally with calcareous soils. It is a medium sized perennial orchid that flowers in Nebraska from mid-May through early June. This orchid maintains a symbiotic relationship with mycorrhiza fungi which assist the plant with seed germination and seedling growth though soil moisture and nutrient uptake. The small white lady's slipper could potentially occur within suitable habitat along the Project route in Nebraska.

Potential Impacts and Conservation Measures

Potential impacts to the small white lady's slipper include habitat disturbance, trampling and excavation disturbance. Surveys would be conducted for presence/absence within suitable habitat prior to Project construction between Keya Paha County and northern York County, Nebraska. If this plant is observed within the Project route in Nebraska, appropriate mitigation measures would be developed and implemented in consultation with the NGFP.

3.8.4 Animals and Plants of Conservation Concern

Animals and plants identified during consultations with resource agencies that are of conservation concern that potentially occur along the Project ROW, and that are not fully discussed in Sections 3.8.1, 3.8.2, 3.8.3, or Appendix I are evaluated in Table 3.8.4-1. Some of these animals or plants have been identified as concerns by single states and a few have been identified throughout the Project area. Many of these species are tied to woodland, wetland, or prairie habitats. Many of these habitats have been historically converted to agricultural use throughout the Project area. The species of conservation concern have been identified and designated by federal and state wildlife management agencies after review of abundance, population trends, distribution, number of protected sites, degree of threat to survival, suitable habitat trends, degree of knowledge about the species, and species life history. These designations are intended to assist with conservation planning and maintenance of the natural heritage of each state.

Many resident and migratory birds are identified as species of conservation concern, primarily due to habitat loss, alteration, fragmentation, and declining population trends. Birds associated with native prairie habitats and wetlands that have been extensively altered by agriculture are included, as are birds that rely on forested floodplain habitats (Table 3.8.4-1).

TABLE 3.8.4-1 Animals and Plants of Conservation Concern Potentially Occurring along the Project ROW					
Species	**Group**	**Occurrence and Habitat**	**Threats**	**Potential Impacts**	**Proposed Mitigation**
Cougar [Mountain Lion] *Puma concolor*	Mammal	Cliff, desert, forest - hardwood and mixed, shrubland/chaparral, woodland - conifier, hardwood, and mixed.	Loss of remote undisturbed habitat, habitat fragmentation; overharvest.	Concern in OK – Atoka County; loss or fragmentation of habitat; disturbance; vehicle collisions	No specific measures; proposed.
Eastern Harvest Mouse *Reithrodontomys humulis*	Mammal	Old fields, marshes, and wet meadows;nests in tangled vegetation under debris or above ground.	Habitat loss due to urban development; dispersal barriers from roads and highways.	Concern in OK – Payne County; loss, alteration, or fragmentation of habitat; blockage of movements; construction-related mortality; vehicle mortality.	No specific measures proposed.
Marsh oryzomys [rice rat] *Oryzomys palustris*	Mammal	Saltwater and freshwater marshes, swamps and moist meadows; semi-aquatic; omnivorous, nocturnal.	Residential and commercial development; habitat loss; spread and or increase in non-native predators and competitors.	Concern in OK – Bryan County; loss, alteration, or fragmentation of habitat; blockage of movements; construction-related mortality; vehicle mortality.	No specific measures proposed.
Southern myotis *Myotis austroriparius*	Mammal	Roosts in caves, mines, bridges, buildings, culverts, tree hollos; prefers oak-hickory to mixed conifer-hardwood bottomland forests; feeds over water.	Cave vandalism, upland roost habitat loss, reduced aquatic insect abundance,	Concern in TX; Pineywoods ecoregion; loss, alteration, or fragmentation of upland roost habitats; water quality degradation; roost disturbance.	No specific measures proposed.
Woodchuck *Marmota monax*	Mammal	Rolling farmland, grassy pastures, small woodlots, brushy fence lines, forest edges and openings.	Their ability to reproduce quickly is sufficient to prevent local extermination due to sport hunting.	Concern in OK; loss, alteration, or fragmentation of habitat; blockage of movements; construction mortality-burrow destruction; vehicle mortality.	No specific measures proposed.

TABLE 3.8.4-1
Animals and Plants of Conservation Concern Potentially Occurring along the Project ROW

Species	Group	Occurrence and Habitat	Threats	Potential Impacts	Proposed Mitigation
Golden eagle *Aquila chrysaetos*	Bird – Raptor	Migrate, nest and winter throughout much of Project area, nest March to August on rock outcrops, cliff ledges, trees; forage in prairie, sagebrush, open woodlands, on jackrabbits, ground squirrels, carrion, ungulate fawns, waterfowl, grouse.	Illegal killing, powerline electrocution, poison intended for coyotes, habitat loss due to conversion to agriculture or suburbs.	Eight nest sites identified along Project: 5 in MT and 3 in SD, nesting and prey habitat loss or alteration, disturbance to breeding, foraging areas during construction, electrocution or collision mortality from project associated power lines.	Pre-construction raptor surveys; develop Migratory Bird Conservation Plan in consultation with USFWS; advise power providers of BGEPA and MBTA consultation requirements.
Great blue heron rookery *Ardea herodias*	Bird – Water	Migrate, nest and winter throughout Project area; nest; forested wetlands, riparian habitats; freshwater and brackish marshes; eats invertebrates and fish.	Nest habitat destruction; human disturbance of rookeries; aquatic habitat degradation.	Eight rookeries identified along Project: 1 in MT, 1 in SD, 1 in NE, 5 in TX; nesting and prey habitat loss or alteration, disturbance to breeding, foraging areas during construction, electrocution or collision mortality from project associated power lines.	Pre-construction surveys; develop Migratory Bird Conservation Plan in consultation with USFWS; advise power providers of MBTA consultation requirements.
Roseate spoonbill rookery *Platalea ajaja*	Bird – Water	Coastal Texas; forested wetlands, marshes, swamps, rivers, lagoons; prefer brackish waters and coastal bays in Texas; eats fish and invertebrates.	Nest habitat destruction; human disturbance of rookeries; aquatic habitat degradation.	One rookery identified along Project in TX; nesting and prey habitat loss or alteration, disturbance to breeding, foraging areas during construction, electrocution or collision mortality from project associated power lines.	Pre-construction surveys; develop Migratory Bird Conservation Plan in consultation with USFWS; advise power providers of MBTA consultation requirements.

TABLE 3.8.4-1
Animals and Plants of Conservation Concern Potentially Occurring along the Project ROW

Species	Group	Occurrence and Habitat	Threats	Potential Impacts	Proposed Mitigation
Raptor nests (except eagles)	Bird – Raptor	Migrate, nest and winter throughout Project area depending on species, nest on rock outcrops, cliff ledges, trees; forage in various habitats and small to medium size prey, and/or carrion.	Nest habitat destruction; human disturbance; prey habitat loss or alteration.	~230 nest structures, 38% active along ROW; nesting and prey habitat loss or alteration, disturbance to breeding and foraging areas during construction; electrocution or collision mortality from project associated power lines.	Pre-construction surveys; develop Migratory Bird Conservation Plan in consultation with USFWS; advise power providers of MBTA consultation requirements.
Mole Salamander *Ambystoma talpoideum*	Amphibian	Forested wetlands, riparian, temporary pools; usually found near breeding ponds; pine flatwoods, floodplains, and bottomland hardwood forests; burrows in soil; eats terrestrial invertebrates, larvae eat aquatic invertebrates; nocturnal.	Clear cutting of forests surrounding breeding ponds, draining or filling of breeding ponds, and the introduction of predatory fishes to breeding ponds.	Concern in OK in southeast portion of state; loss, alteration, fragmentation of habitat; mortality during construction; vehicle collisions.	No specific measures proposed, CMR Plan.
Oklahoma cave amphipod *Allocrangonyx pellucidus*	Invertebrate – Aquatic	Subterranean waters; karst springs.	Excessive groundwater withdrawal, invasive species.	Concern in OK in Clear Boggy watershed crossed downstream from occurrence in Murray County, OK: withdrawal of hydrostatic testing water; alteration of spring/seep flow.	Clear Boggy Creek would be crossed using the HDD method; Clear Boggy Creek not proposed for hydrostatic test water source.
Prairie mole cricket *Gryllotalpa major*	Invertebrate – Terrestrial	Southern tall-grass prairie; burrows in soil; mesic to dry mesic soils; omnivorous, nocturnal.	Habitat loss to urban development, agriculture; habitat fragmentation.	Concern in OK; loss, alteration, or fragmentation of grassland habitat; loss of adults, eggs during construction; blockage of dispersal.	No specific measures; CMR Plan.
Three-flower snakeweed [broomweed] *Thurovia triflora*	Plant – Annual/ Perennial	Black clay soils of remnant grasslands, also tidal flats; flowering July-November.	Habitat loss and fragmentation; fire suppression.	Concern in TX: Gulf Coast Prairies and Marshes region; Loss, alteration, or fragmentation of habitat; loss during vegetation clearing; spread of invasive plants.	No specific measures; CMR Plan, invasive plant control.

TABLE 3.8.4-1
Animals and Plants of Conservation Concern Potentially Occurring along the Project ROW

Species	Group	Occurrence and Habitat	Threats	Potential Impacts	Proposed Mitigation
Texas screwstem *Bartonia texana*	Plant – Annual	Sandy soils in dry to mesic pine or mixed pine-oak forests and forest borders; usually in fire-maintained longleaf pine savannas, but also in more mesic habitats; flowering June.	Habitat loss and fragmentation; fire suppression.	Concern in TX: Pineywoods region; loss, alteration, or fragmentation of habitat; loss during vegetation clearing; spread of invasive plants.	No specific measures; CMR Plan, invasive plant control.

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3.9 LAND USE, RECREATION, AND VISUAL RESOURCES

3.9.1 Introduction

The proposed Project would affect land use on or near the pipeline right-of-way (ROW) and in the locations of appurtenant facilities. Construction, operation, and maintenance would cause temporary and permanent impacts to land uses such as agriculture, rangeland, forestland, residential and planned development, commercial and industrial land, recreation and special interest areas, and visual resources.

3.9.2 Environmental Setting

3.9.2.1 Land Ownership

Steele City Segment

Most of the Project along the Steele City Segment would be on private land. Land ownership along the pipeline ROW is displayed in Table 3.9.2-1. Of the 850.7 miles of land that would be crossed by the pipeline within the segment, private land accounts for 767.7 miles (90.2 percent), state land accounts for 43.5 miles (5.1 percent), and federal land accounts for 42.4 miles (5.0 percent). The Steele City Segment would cross through 282.5 miles of Montana (33 percent), 314.1 miles of South Dakota (37 percent), and 254.1 miles of Nebraska.

TABLE 3.9.2-1
Ownership Crossed by the Proposed Project in Distance (Miles)

	Federal	State	Private	Total	Percent of Total
Steele City Segment					
Montana	42.3	19.5	220.7	282.5	33%
South Dakota	0.1	21.1	292.9	314.1	37%
Nebraska	0.0	0.0	254.1	254.1	30%
Segment Total	*42.4*	*40.6*	*767.7*	*850.7*	*100%*
Gulf Coast Segment					
Oklahoma	0.0	2.1	153.3	155.4	32%
Texas	0.0	0.8	324.0	324.8	68%
Segment Total	*0.0*	*2.9*	*477.3*	*480.2*	*100%*
Houston Lateral					
Texas	-	-	48.6	48.6	100%
Project Total	**42.4**	**43.5**	**1,293.6**	**1,379.5**	**100%**

Source: Keystone 2009c.

Construction of the Project would affect a total of 22,494 acres, not including power lines, access roads, or construction camps (see Table 3.9.2-2). Private land would comprise 94.8 percent of the total, federal land 2.6 percent, and state land 2.6 percent. Of the land affected, 13,852 acres or 61.5 percent would be in the Steele City Segment, 7,798 or 34.7 percent would be in the Gulf Coast Segment, and 2.9 percent would be in the Houston Lateral.

TABLE 3.9.2-2
Land Ownership Affected by Construction (Acres)

	Federal	State	Private	Total	Percent of Total
Steele City Segment					
Montana	578.0	276.0	3,754.0	4,608.0	33%
South Dakota	1.0	306.0	4,758.0	5,065.0	37%
Nebraska	0.1	-	4,179.0	4,179.0	30%
Segment Total	*579.0*	*582.0*	*12,691.0*	*13,852.0*	*100%*
Cushing Extension					
Kansas	0.0	0.0	12.0	12.0	100%
Gulf Coast Segment					
Oklahoma	0.0	0.1	2,671.0	2,671.1	33%
Texas	0.0	0.1	5,307.0	5,307.1	67%
Segment Total	*0.0*	*0.2*	*7,978.0*	*7,978.2*	*100%*
Houston Lateral					
Texas	-	-	652.0	652.0	100%
Project Total	**579.0**	**582.0**	**21,333.0**	**22,494.0**	**100%**

Source: Keystone 2009c.

Note: Acreages do not include disturbance associated with power lines, access roads or construction camps so totals are less than those presented in Table 2.1.4-1.

Keystone Cushing Extension

Two new pump stations would be constructed along the previously permitted Cushing Extension of the Keystone Pipeline system to accommodate increased crude oil volumes associated with the Project. Approximately 12 acres of privately owned land in Kansas would be required for these two new pump stations.

Gulf Coast Segment

The Gulf Coast Segment would cross 480.2 miles in Oklahoma and Texas, 68 percent (326.5 miles) in Oklahoma and 32 percent (153.7 miles) in Texas. Nearly all of the land (477.3 miles) is in private ownership, and the remaining 2.9 miles is under state management. The Gulf Coast Segment would not cross any federally-owned land.

Houston Lateral

The Houston Lateral would cross 48.6 miles in Texas, all privately owned.

3.9.3 Land Use

Land use along the proposed pipeline route varies. As shown in Table 3.9.3-1, of the 853.5 miles that would be crossed in the Steele City Segment, 550.9 miles are rangelands, 268.7 miles are agricultural land, 16.1 miles are water/wetland, 9.7 miles are developed land and 8.1 miles are forest land.

The land use type for the pump stations in Kansas is agricultural land.

Within the Gulf Coast Segment (480.2 miles), 179.1 miles are rangelands, 152.6 miles are forest land, 57 miles are agricultural land, 56.2 miles are developed land, and 35.3 miles are water/wetlands.

Within the Houston Lateral (48.6 miles), 19.1 miles are rangelands, 17.7 miles are forest land, 6.9 miles are water/wetlands, 3.2 mile are agricultural land, and 1.7 miles are developed land.

TABLE 3.9.3-1
Current Uses of Land Which Would be Affected by the Project (Miles)

	Developed	Agriculture	Rangeland	Forest[1]	Water/ Wetland	Total
Steele City Segment						
Montana	2.9	70.9	203.3	0.9	4.5	**282.5**
South Dakota	2.9	82.5	222.9	3.6	5.0	**316.9**
Nebraska	3.9	115.3	124.7	3.6	6.6	**254.1**
Segment Total	9.7	268.7	550.9	8.1	16.1	**853.5**
Cushing Extension						
Kansas	0	<1	0	0	0	**<1**
Gulf Coast Segment						
Oklahoma[2]	18.0	11.1	82.4	41.1	2.8	**155.4**
Texas[2]	38.2	45.9	96.7	111.5	32.5	**324.8**
Segment Total[2]	*56.2*	*57.0*	*179.1*	*152.6*	*35.3*	**480.2**
Houston Lateral						
Texas	1.7	3.2	19.1	17.7	6.9	**48.6**
Project Total	**67.6**	**328.9**	**749.1**	**175.7**	**58.3**	**1,379.6**

[1] No groves or nurseries are crossed by the Project. Locations of forestland are identified by milepost in Appendix O.
[2] Includes pipeline ROW; additional temporary workspace areas; pipe storage, rail sidings, and contractor yards, and pump station/delivery facilities.

Note: Miles account for Keystone XL construction only and do not include disturbances from construction of new pump stations within the Keystone Cushing Extension. Workspace locations do not reflect environmental survey results. Discrepancies in totals are due to rounding.

Source: Keystone 2009c.

3.9.3.1 Construction

Types of land use along the construction ROW vary. As shown in Table 3.9.3-2, rangeland is the most common land type, accounting for 11,533 acres of the total land that would be affected during construction. Agricultural land accounts for 5,484 acres. Forestland accounts for 2,523 acres, developed land accounts for 945 acres, and water and wetlands make up the remaining 747 acres.

Construction would affect 13,851 acres of land in the Steele City Segment. Rangelands make up 8,719 acres, agriculture constitutes 4,631 acres, water and wetlands amount to 237 acres, developed land makes up 175 acres and forest land amounts to 89 acres.

There are 12 acres in Kansas associated with new pump station construction, all agricultural land.

Construction would affect 6,717 acres of land in the Gulf Coast Segment. Rangeland and forestland are the most common land uses within the segment, covering 2,547 acres and 2,198 acres, respectively. Agricultural land amounts to 798 acres, developed land accounts for 748 acres, and water and wetlands comprise 426 acres.

Construction would affect 652 acres in the Houston Lateral. The most common land uses are rangeland and forestland, covering 267 acres and 236 acres, respectively. The remaining land uses are water and wetlands accounting for 83 acres, agricultural makes up 43 acres, and developed lands account for 23 acres.

TABLE 3.9.3-2
Current Uses of Land Which Would be Affected by Construction (Acres)

	Developed	Agriculture[1]	Rangeland	Forest[2]	Water/ Wetland	Total[3]
Steele City Segment						
Montana	47	1,253	3,232	12	64	**4,608**
South Dakota	48	1,434	3,504	10	68	**5,064**
Nebraska	80	1,944	1,983	67	105	**4,179**
Segment Total	*175*	*4,631*	*8,719*	*89*	*237*	**13,851**
Cushing Extension						
Kansas	0	12	0	0	0	**12**
Gulf Coast Segment						
Oklahoma[3]	230	160	1,178	598	40	**2,206**
Texas[3]	518	638	1,369	1,600	386	**4,511**
Segment Total[3]	*748*	*798*	*2,547*	*2,198*	*426*	**6,717**
Houston Lateral						
Texas	23	43	267	236	83	**652**
Project Total	**945**	**5,484**	**11,533**	**2,523**	**747**	**21,232**[4]

[1] Includes land listed by the NRCS (2007) as potential prime farmland if adequate protections from flooding and adequate drainage are provided.

[2] No groves or nurseries are crossed by the Project. Locations of forestland are identified by milepost in Appendix O.

[3] Includes pipeline ROW; additional temporary workspace areas; pipe storage, rail sidings, and contractor yards, and pump station/delivery facilities.

[4] Additional areas of 465 acres and 796 acres are affected by construction in Oklahoma and Texas, respectively, for pipe storage sites, rail sidings, and contractor's yards. These acres have not been included in land use categories. These would be included after survey completion.

Note: Acreage does not include acres of disturbance associated with construction camps, access roads, or disturbance associated with power lines. Discrepancies in totals are due to rounding.

3.9.3.2 Operation

Operation of the Project would also affect land use. As shown in Table 3.9.4-3, rangeland would be the most common land use affected by operation of the Project, accounting for 4,698 acres. Agricultural land would account for 2,011 acres, forestland would account for 1,071 acres, developed land 465 acres, and water and wetlands would make up 368 acres.

Pipeline operation would affect 5,320 acres in the Steele City Segment. The most common land uses would be rangeland and agricultural land, accounting for 3,478 acres and 1,638 acres, respectively. The remaining affected land uses in the segment would be water and wetlands, developed, and forestland, accounting for 102, 66, and 36, acres respectively.

Operations of the Cushing Extension associated with the Project would impact about 12 acres of privately-owned land currently being used for agricultural purposes.

Operation of the Gulf Coast Segment would affect 2,987 acres of land. Rangeland and forestland are the most common uses, covering 1,104 and 930 acres respectively. Developed, agricultural, and water and wetlands would comprise the remaining uses at 388, 342, and 223 acres, respectively.

Operation of the Houston Lateral would affect 294 acres. The most common uses are rangeland and forestland, covering 116 and 105 acres, respectively. The remaining affected land uses are water and wetlands, agricultural and developed lands, accounting for 42, 19, and 12 acres, respectively.

TABLE 3.9.3-3
Current Uses of Land Which Would be Affected by Operations (Acres)

	Developed	Agriculture[1]	Rangeland	Forest[2]	Water/ Wetland	Total
Steele City Segment						
Montana	18	451	1,253	5	27	1,754
South Dakota	19	512	1,380	6	29	1,946
Nebraska	29	675	845	25	46	1,620
Segment Total	*66*	*1,638*	*3,478*	*36*	*102*	*5,320*
Cushing Extension						
Kansas	0	12	0	0	0	12
Gulf Coast Segment						
Oklahoma	120	70	508	256	21	975
Texas	268	272	596	674	202	2,012
Segment Total	388	342	1,104	930	223	2,987
Houston Lateral						
Texas	12	19	116	105	42	294
Project Total	**465**	**2,011**	**4,698**	**1,071**	**368**	**8,613**

[1] Includes land listed by the NRCS (2007) as potential prime farmland if adequate protection from flooding and adequate drainage is provided.

[2] Acreage does not include acres of disturbance associated with pipe storage/contractor yards or disturbance associated with power lines.

Source: Keystone 2009c.

Note: Discrepancies in totals are due to rounding.

3.9.3.3 Temporary and Permanent Access Roads

Keystone would access most of the construction ROW by public and existing private roads. Before construction would begin, Keystone would consult with state transportation agencies and would check road infrastructure such as bridges to determine if heavy loads could be handled. If infrastructure is insufficient to handle the project loads, Keystone would develop a plan to avoid or reinforce it. No improvement or maintenance is likely to be required for paved roads before or during construction, although because of high use, gravel and dirt roads may require maintenance during that time. Keystone would use private roads and temporary access roads only with permission of the affected landowner or management agency. In the event that oversized or overweight loads would be needed to transport construction materials to the Project work spreads, Keystone would submit required permit applications to the appropriate state regulatory agencies.

Construction of the Project would require the use of 918 acres for access roads (see Table 3.9.3-4) including 424 acres in the Steele City Segment, 432 acres in the Gulf Coast Segment, and 62 acres in the Houston Lateral. Project operations would require 124 acres for permanent access roads, including 31 acres in the Steele City Segment, 74 acres in the Gulf Coast Segment, and 19 acres in the Houston Lateral.

TABLE 3.9.3-4
Land Affected by Access Roads (Acres)

	Construction (Temporary)	Operation (Permanent)
Steele City Segment		
Montana	265	22
South Dakota	103	9
Nebraska	56	-
Steele City Subtotal	*424*	*31*
Keystone Cushing Extension		
Kansas	-	-
Gulf Coast Segment		
Oklahoma	103	19
Texas	329	55
Gulf Coast Subtotal	*432*	*74*
Houston Lateral		
Texas	62	19
Project Total[1]	**918**	**124**

[1] Acres of disturbances from temporary and permanent access roads are calculated based upon a 30-foot width.

Source: Keystone 2009c.

3.9.3.4 Agricultural Land, Rangeland and Prime Farmland

As shown in Tables 3.9.3-2 and 3.9.3-3, agricultural land and rangeland together make up 80 percent of the land that would be affected by Project construction and 78 percent of the land that would be affected by Project operation. For the overall Project construction is expected to affect 5,484 acres of agricultural land and 11,533 acres of rangeland. Operation is expected to affect 2,011 acres of agricultural land and 4,698 acres of rangeland.

Prime farmland exists within several of the listed land use categories shown in Tables 3.9.3-2 and 3.9.3-3. Table 3.9.3-5 shows acreages affected by construction and operation of the Project by state. Construction would affect 6,495 acres of prime farmland and operation of the Project would affect 3,204 acres of prime farmland.

TABLE 3.9.3-5
Prime Farmland1 Affected by the Project (Acres)

	Construction[1]	Operation
Steele City Segment		
Montana	1,294	549
South Dakota	1,935	863
Nebraska	518	307
Segment Total	*3,747*	*1,719*
Cushing Extension		
Kansas	10	10
Gulf Coast Segment		
Oklahoma	434	842
Texas	1,858	434
Segment Total	*2,292*	*1,276*
Houston Lateral		
Texas	446	199
Project Total	**6,495**	**3,204**

[1] Includes land listed by the NRCS (2007) as potential prime farmland if adequate protection from flooding and adequate drainage is provided.

[2] Acreage does not include land disturbance associated with pipe storage/contractor yards or that associated with power lines.

Source: Keystone 2009c.

3.9.3.5 Crop Types in Affected Areas

Crops grown along the Project route vary somewhat by state, but are typical of those in the Great Plains, Heartland, and Prairie regions of the country. As shown in Table 3.9.3-6, the principal crops include wheat, hay, barley, corn, soybeans, and sorghum.

TABLE 3.9.3-6
Acreages of Largest Crops Grown in Project Area, 2008

State	Crop	Harvested Acres (1,000)
Steele City Segment		
Montana	Wheat, All	5,470
	Hay, All	2,400
	Barley, All	740
	Total Principal Crops	*8,757*

TABLE 3.9.3-6 Acreages of Largest Crops Grown in Project Area, 2008		
State	**Crop**	**Harvested Acres (1,000)**
South Dakota	Corn For Grain	4,400
	Soybeans	4,060
	Wheat All	3,420
	Hay, All	3,850
	Total Principal Crops	*16,715*
Nebraska	Corn For Grain	8,550
	Soybeans	4,860
	Hay, All	2,570
	Wheat, All	1,670
	Total Principal Crops	*18,231*
Gulf Coast Segment and Houston Lateral		
Kansas	Wheat, All	8,900
	Corn For Grain	3,630
	Soybeans	3,250
	Hay, All	2,750
	Sorghum for Grain	2,750
	Total Principal Crops	*21,577*
Oklahoma	Wheat, All	4,500
	Hay, All	2,910
	Soybeans	360
	Corn For Grain	320
	Total Principal Crops	*8,090*
Texas	Hay, All	4,430
	Cotton, Upland	3,400
	Wheat, All	3,300
	Sorghum For Grain	3,050
	Total Principal Crops	*17,066*

Source: USDA National Agricultural Statistics Service (NASS) Quick Stats, accessed June 22, 2009.

3.9.3.6 Conservation Programs

USFWS Wetland Easements are areas which have permanent protection from conversion of natural land cover. It also grants federally listed endangered or threatened species protection through out the area. The easement protects the predominate areas while allowing for localized, low-intensity, or broad extraction of natural resources (e.g., logging or mining).

The Natural Resources Conservation Service (NRCS) and Farmland Services Agency (FSA) of the USDA manage various types of government land conservation, cost-sharing, and financial programs. Among the most popular NRCS programs are the Wetland Reserve Program (WRP), Farm and Ranchland Protection Program (FRPP), and Wildlife Habitat Incentives Program (WHIP). Similar to USFWS easements, these areas have long-term or permanent protection for areas the landowner has restored to natural land cover type with NRCS funding assistance. Precise location information was not available, but more general information by state was provided by the agency (Keystone 2008).

Among the most popular FSA programs are the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Farmable Wetlands Program (FWP) and the Emergency Conservation Program (ECP). The CRP is one of the largest conservation programs in the country. Under it, landowners with CRP contracts are provided rental payments and cost sharing to develop long-run resource-conserving vegetative covers on eligible farmland. The program goals are the reduction of erosion, improvement of water quality, enhancement of forest and wetlands resources, and establishment of wildlife habitat. Landowners are encouraged to plant grasses, trees, and other vegetation on highly-erodible cropland.

Table 3.9.3-7 lists the conservation easements that would be crossed by the Project by state. Within the Steele City Segment of the pipeline corridor numerous tracts of land may be partially or entirely enrolled in the CRP. There are no CRP tracts in either the Gulf Coast Segment or Houston Lateral. The full listing of affected tracts in the Steele City Segment may be found in Appendix K, Conservation Reserve Program Facilities. The tracts extend from MP 4.21 in Montana to MP 849.64 in Nebraska.

TABLE 3.9.3-7
USFWS, NRCS and Other Easements Crossed by the Project

Easements	Approximate Mileposts	Miles Crossed
Montana		
Cornwell Ranch Conservation Easement (FWP)	49 and 70	3.0
Philips County USFWS Wetland Easement	4.2 - 5.0	0.8
CRP Contract Land (consists of 39 easements)	Multiple	33.7
South Dakota		
Wetlands of America Trust, Inc	799	0.7
CRP Contract Land (consists of 39 easements)	Multiple	10.6
Nebraska		
CRP Contract Land (consists of 27 easements)	Multiple	6.4
Oklahoma		
WRP Contract Land (consists of 1 easement)	Near 130	0.02
Texas		
WRP Contract Land (consists of 2 easements)*	Near 165	0.2
**to be crossed using HDD to avoid impacts*		

Source: Keystone 2009c.

3.9.3.7 Forest Land

Forestland in the Steele City Segment, Gulf Coast Segment, and Houston Lateral would be affected by the Project. As shown in Table 3.9.3-8, a total of 7.5 miles of the Project would affect forestland in the Steele City Segment from MP 25.7 to MP 849.5. A total of 176.1 miles of the Project would affect forestland in the Gulf Coast Segment from MP 0.7 to MP 480.2. A total of 2.95 miles of the Project would affect forestland in the Houston Lateral from MP 0.0 to MP 40.8. A total of 186.55 miles of the Project would affect forestland across all segments (Keystone 2009a).

TABLE 3.9.3-8 Forestland Along Project Route (Miles)		
	Miles Crossed	**Mileposts**
Steele City Segment		
Montana	1.2	25.7 to 229.6
South Dakota	1.4	399.5 to 595.7
Nebraska	4.9	599.7 to 849.5
Segment Total	*7.5*	
Cushing Extension		
Kansas	0	--
Gulf Coast Segment		
Oklahoma	42.4	0.7 to 155.4
Texas	133.7	155.4 to 480.2
Segment Total	*176.1*	
Houston Lateral		
Texas	2.95	0 to 40.8
Project Total	**186.55**	

Source: Keystone 2009c.

Distances crossed reflect the sum of the actual distance within the referenced mileposts.

Note: Totals were rounded to the nearest 1/10 of a mile. Values less than 1/10 of a mile, but greater than zero, were rounded to 1/20 of a mile.

The acreages of forestland affected by the construction and operation of the Project by state are shown in Table 3.9.3-9. Construction would affect 2,523 acres of forestland and operation of the Project would affect 1,071 acres of forestland.

TABLE 3.9.3-9 Forestland Affected by the Project (Acres)		
	Construction[1]	**Operation**
Steele City Segment		
Montana	12	5
South Dakota	10	6
Nebraska	67	25
Segment Total	*89*	*36*
Cushing Extension		
Kansas	-	-
Gulf Coast Segment		
Oklahoma	598	256
Texas	1,600	674
Segment Total	*2,198*	*930*
Houston Lateral		
Texas	236	105
Project Total	**2,523**	**1,071**

[1] Acreage does not include acres of disturbance associated with pipe storage/contractor yards or disturbance associated with power lines.

Note: Discrepancies in totals are due to rounding.

3.9.3.8 Water and Wetlands

Construction of the Project would affect 747 acres of water and wetlands and operation of the Project would affect a total of 367 acres of water and wetlands, as shown by state in Table 3.9.3-10.

During construction, 237 acres would be affected within the Steele City Segment, 426 acres would be affected within the Gulf Coast Segment, and 83 acres of water and wetlands would be affected within the Houston Lateral. During operations, 102 acres would be affected within the Steele City Segment, 223 acres would be affected within the Gulf Coast Segment, and 42 acres would be affected within the Houston Lateral.

TABLE 3.9.3-10
Water and Wetlands Affected by the Project (Acres)

	Construction[1]	Operation
Steele City Segment		
Montana	64	27
South Dakota	68	29
Nebraska	105	46
Segment Total	*237*	*102*
Cushing Extension		
Kansas	-	-
Gulf Coast Segment		
Oklahoma	40	21
Texas	386	202
Segment Total	*426*	*223*
Houston Lateral Segment		
Texas	83	42
Project Total	**747**	**367**

Source: Keystone 2009a.

[1] Total acres affected by construction in Oklahoma and Texas include 465 acres and 196 acres, respectively, of pipe storage sites, rail sidings, and contractors yards that are not included in land use categories. Acres do not include disturbances associated with power lines, access roads, or construction camps.

Based on aerial photo interpretation, NWI map review, and 2008 and 2009 field survey results, approximately five percent of total construction disturbance associated with the Project by mile would occur in wetlands. Wetland easements that would be crossed by the Project are shown in Table 3.9.3-7.

Construction of the proposed pipeline would cross several waterbodies. Table 3.9.3-11 lists the number of waterbody crossings that would occur along the Project by state. The table also provides the type of waterbodies that would be crossed. A total of 1,926 waterbody crossings would occur along the entire Project route. The Steele City Segment would cross 905 waterbodies, the Gulf Coast Segment would cross 1,001 waterbodies, and the Houston Lateral would cross 20 waterbodies.

TABLE 3.9.3-11 Waterbody Crossings								
	Perennial Rivers or Streams	Intermittent Streams	Ephemeral Streams	Natural Ponds	Canals	Reservoirs	Other[1]	Total
Steele City Segment								
Montana	20	107	243	--	15	4	--	389
South Dakota	15	125	206	4		5	--	355
Nebraska	21	52	75	1	9	3	--	161
Segment Total	*54*	*284*	*524*	*5*	*24*	*12*	*0*	*905*
Keystone Cushing Extension								
Kansas	--	--	--	--	--	--	--	--
Gulf Coast Segment								
Oklahoma	83	137	136	--	--	--	12	368
Texas	199	198	215	--	9	--	12	633
Segment Total	*282*	*335*	*351*	*0*	*9*	*0*	*24*	*1,001*
Houston Lateral								
Texas	5	2	8		3	--	2	20
Total	**341**	**621**	**883**	**5**	**36**	**12**	**26**	**1,926**

[1] Artificial water paths, seasonal water, and unclassified waterbodies.

3.9.3.9 Developed Land – Residential/Commercial/Industrial

Construction of the Project would affect 946 acres of developed land along the Project route as shown by state in Table 3.9.3-12. This includes 175 acres within the Steele City Segment, 748 acres within the Gulf Coast Segment, and 23 acres within the Houston Lateral.

TABLE 3.9.3-12 Developed Land Affected by the Project (Acres)		
	Construction	Operations
Steele City Segment		
Montana	47	18
South Dakota	48	19
Nebraska	80	29
Segment Total	*175*	*66*
Cushing Extension		
Kansas	0	0
Gulf Coast Segment		
Oklahoma	230	120
Texas	518	268
Segment Total	*748*	*388*
Houston Lateral		
Texas	23	12
Project Total	**946**	**466**

[1] Acreage does not include acres of disturbance associated with pipe storage/contractor yards or disturbance associated with power lines.

Note: Discrepancies in totals are due to rounding.

Operation of the Project would affect 466 acres of developed land along the Project route. This includes 66 acres within the Steele City Segment, 388 acres within the Gulf Coast Segment, and 12 acres within the Houston Lateral.

Keystone surveyed the Project area to discern the number of buildings within 25 feet and within 500 feet of the construction ROW. The results are shown in Table 3.9.3-13. Approximately 167 structures are within 25 of the ROW, including 58 in the Steele City Segment, 100 in the Gulf Coast Segment, and 9 in the Houston Lateral. The approximate number of structures within 500 feet of the construction ROW is 2,014, with 726 in the Steele City Segment, 1,190 in the Gulf Coast Segment, and 98 in the Houston Lateral. At the new pump station locations in Kansas, no structures occur within 500 feet of the construction ROW.

TABLE 3.9.3-13
Number of Structures Within 25 and 500 Feet of Construction ROW

	Within 25 feet of the ROW	Within 500 feet of the ROW
Steele City Segment		
Montana	17	141
South Dakota	12	126
Nebraska	14	218
Segment Total	*43*	*485*
Cushing Extension		
Kansas	0	0
Gulf Coast Segment		
Oklahoma	26	415
Texas	71	1,548
Segment Total	*97*	*1,963*
Houston Lateral		
Texas	11	100
Project Total	**151**	**2,548**

Source: Keystone 2009c.

Note: Excludes swimming pools, above and below ground, power poles, groundwater wells, and baseball fields.

The types of structures within 25 feet and 500 feet of the construction ROW are shown in Table 3.9.3-14.

TABLE 3.9.3-14
Types of Structures Within 25 and 500 Feet of the Construction ROW

Type of Structure	Within 25 feet of the ROW	Percent of Total	Within 500 feet of the ROW	Percent of Total
Barn	40	26.5%	203	0.52%
Building	5	3.3%	8	0.31%
Cabin	1	0.7%	1	0.0%
Camp Hut	-	0.0%	1	0.0%
Church	1	0.7%	-	0.0%

TABLE 3.9.3-14 Types of Structures Within 25 and 500 Feet of the Construction ROW				
Type of Structure	**Within 25 feet of the ROW**	**Percent of Total**	**Within 500 feet of the ROW**	**Percent of Total**
Commercial Building	2	1.3%	72	2.8%
Commercial Structure	3	2.5%	11	0.4%
Garage	2	1.3%	13	0.5%
Home/Residence*	41	27.2%	763	29.9%
Hunting Lodge	1	0.7%	1	0.0%
Industrial	1	0.7%	5	0.2%
Other	45	12.4%	1185	46.5%
Out-Building	2	1.3%	165	6.48%
Public Assembly	-	0.0%	1	0.0%
School	-	0.0%	1	0.0%
Shelter	1	0.7%	-	0.0%
Storage Building	4	2.6%	118	4.63%
Storm Shelter**	2	1.3%	-	0.0%
Project Total	**151**	**100.0%**	**2,548**	**100.0%**

*Includes mobile homes and homes with swimming pools.
**Above and below ground combined.
Source: Keystone 2009c.

3.9.4 Recreation and Special Interest Areas

The Project would cross several recreation and special interest areas in Montana, South Dakota, and Oklahoma as shown in Table 3.9.4-1. Recreational and special interest areas include state or federal public lands, important recreational waterbodies, state and national parks, state and national forests, national historic trails, wildlife management areas, and wildlife refuges. The Project would not cross any national parks or forests, but would cross six national historic trails.

The Project would cross a total of 61.8 miles of recreational and special interest areas in Montana, including 19.2 miles of Montana State Trust Lands, 42 miles of BLM land, 0.2 miles of navigable water (classified in Montana as recreational areas), and 0.4 miles of U.S. Department of Defense land. The proposed Project would pass within 2 miles of the Bear Creek recreational area in Montana. The Project would cross a total of 21.6 miles of recreation and special interest areas in South Dakota, including 0.3 miles of waterbodies (classified in South Dakota as recreational areas), and 21.3 miles of state school land. In southeastern Oklahoma the Project would cross the Western Ouachita region, a popular destination for recreationists (Keystone 2008).

The field offices under BLM's jurisdiction are required to manage public lands according to the resource management plans for the Big Dry (April 1996), the Powder River (March 1985), and the Judith Valley Phillips Plan (*in* Keystone 2009c). The BLM lands are primarily composed of grasslands leased to farmers with livestock. Construction and operation of the Project would be consistent with the agreements in place, according to the management plans and current land uses.

TABLE 3.9.4-1 Recreation and Special Interest Areas Crossed by the Project		
State	**Name / Ownership**	**Miles Crossed**
Steele City Segment		
Montana	Montana State Trust Lands (consists of 25 parcels)	19.2
	BLM (consists of 50 parcels)	42
	Missouri River (MP 88.9); Yellowstone River (MP 196.0)	0.2
	US Dept of Defense	0.4
	Lewis and Clark National Historic Trail	<1
South Dakota	Spring Creek (MP 346.8); Cheyenne River (MP 425.6); Sarah Laribee Creek (MP 464.8)	0.3
	State School Land	21.3
Nebraska	Bureau of Reclamation - canal	0.1
	Mormon Pioneer National Historic Trail	<1
	Pony Express National Historic Trail	<1
	California National Historic Trail	<1
	Oregon National Historic Trail	<1
Segment Total		*83.5*
Keystone Cushing Extension		
Kansas	--	--
Gulf Coast Segment		
Oklahoma	Deep Fork Wildlife Management Area - Oklahoma Department of Wildlife Conservation	1.2
	Western Ouachita Region	--
Texas	El Camino Real de los Tejas National Historic Trail	<1
Houston Lateral		
Texas	--	--
Project Total		84.7

Source: Keystone 2008.

For information on waterbodies that support recreational and commercial fisheries, see Section 3.7.

3.9.5 Visual Resources

Visual resources are landscape characteristics which have an aesthetic value to residents and visitors from sensitive viewpoints such as residences, recreation areas, rivers, and highways. Characteristics include the aesthetics of natural and developed landscapes, and are considered an element of land use on federally managed lands. Other than in Montana, there are no formal guidelines for managing visual resources for private or state owned lands (Keystone 2008).

Construction and operation of the Project would have some visual impacts, although most would be temporary. Such impacts would be associated with construction ROW; additional temporary workspace; clearing and removal of existing vegetation; exposure of bare soils; earthwork and grading scars; trenching; rock formation alteration; machinery and pipe storage; new aboveground structures; and various landform changes. Visual impacts associated with construction would be of limited duration.

BLM is responsible for identifying and protecting scenic values on BLM administered public lands. The Visual Resource Management (VRM) system was developed by BLM to assist in the identification and protection of scenic lands in a systematic and interdisciplinary manner. The VRM system uses several aesthetic value classes to define the rehabilitation objective when landscapes are altered. The system classifies resources based on scenic quality, viewer sensitivity to visual change, and viewing distance. The system includes four classes. The class I objective is to preserve the existing character of the landscape, including the natural ecological qualities. Some very limited management activity is permitted. The class II objective is also to preserve the existing character of the landscape and to keep landscape changes at a minimum. Landscape changes should reflect the ambient colors, textures, and form of the surrounding features. The class III objective is to keep landscape changes moderate and retain some portion of the existing character of the landscape. Management activities should not attract much attention or dominate the view. Landscape changes should reflect the basic features found in the landscape character. The class IV objective is to allow management activities that require major alterations in the existing character of the landscape. The view may be dominated by management activities. However, the location, disturbance, and blending with the surrounding landscape should be minimized (Keystone 2008).

3.9.6 Right-of-Way Acquisition Process

The Project would require the acquisition of temporary and permanent easements with landowners along the pipeline ROW. Pipeline construction would require temporary workspaces which would necessitate the negotiation of temporary ROW easements. Operation and maintenance of the pipeline and ancillary facilities would require permanent ROW easements for the expected 50 year life of the Project. Keystone would provide monetary compensation to landowners who grant easements for the Project to cover the loss of use of the land during construction, loss of crops, loss of nonrenewable or other resources, lost use of private roads, and the long term use associated with Project operation and maintenance. Keystone would also restore land or compensate landowners for any unavoidable construction-related damage to property. For some areas such as water crossings, road/railroad crossings, steep or rocky slopes, additional temporary workspaces may be needed. Keystone would also purchase some sites in fee for certain aboveground facilities.

3.9.7 Potential Impacts and Mitigation

Keystone has committed to measures that would reduce Project impacts. These measures are described in the Project CMR Plan (Appendix B). The CMR Plan, broadly, includes such general conditions as worksite appearance, noise control, and dust control. The CMR plan includes specific conditions for construction within agricultural, forest, pasture, range, and grass lands; drain tile systems; and wetland crossings; waterbodies and riparian lands. As noted in the CMR Plan, Keystone may deviate from specific requirements of the plan based on agreements with landowners and land managers. In all cases Keystone would comply with the conditions of applicable federal, state, and local permits.

Construction of the pipeline would involve several key land use issues and impacts, including:

- Lease or acquisition and development of the pipeline ROW and land for appurtenant facilities.
- Possible damage to agricultural features such as irrigation systems or drain tiles.
- Temporary loss of the agricultural productivity of the land.

- Potential visual impacts attributable to removal of existing vegetation and visibility of exposed soil.
- Increased dust and noise to neighboring residential and commercial areas.

Duration of construction would impact land uses. Keystone plans to construct the pipeline in 17 separate "spreads." The company anticipates concurrent construction activity on the spreads within each segment (Keystone 2008). It is anticipated that each spread would require from six to eight months for construction and that all pump stations would be completed in 18 to 24 months.

Acreage required for construction and operation of the Project would impact land uses. Keystone would require a 110-foot-wide construction ROW for installation of the 36-inch diameter pipeline, including a 60-foot temporary easement and a 50-foot permanent easement (Keystone 2008). The construction ROW width would be reduced to 85 feet in some areas, which may include wetlands, cultural sites, and residential and commercial/industrial areas. Table 3.9.7-1 provides estimates of the total acreage of land impacted during construction of the Project as well as estimates by Project segment and by state. Total Project land use is estimated to be 23,768 acres[1]. Pipeline ROW is estimated at 17,567 acres, pipe and contractor yards at 2,891 acres, additional temporary workspace areas at 1,164 acres, access roads at 918 acres, lateral ROW at 652 acres, and the remaining 576 acres for construction camps, pump stations/delivery facilities, and tank farm.

Changes in land use due to construction are generally expected to be temporary. Temporary land use issues include loss of agricultural productivity, potential damage to drain tiles (see Section 3.9.9) or other irrigation systems, visual impacts from the removal of vegetation within the ROW, and increased noise and dust. Existing commercial or industrial sites with public or private road access would be used when practical and all temporary workspaces would be restored to preconstruction levels (Keystone 2008). All disturbed acreage, other than 368 acres of permanent ROW that would be used for such aboveground facilities as pump stations and valves, would be returned to its previous aboveground use.

Temporary and permanent changes in vegetation due to the clearing of trees and shrubs, pipeline excavation, and general construction activity are expected in the ROW preparation process. It is estimated that disturbed pastures, croplands, and grassy rangelands may take one to five years to recover to preconstruction levels. Depending on the species and age, herbaceous vegetation, low shrubs, and forestlands are estimated to take 1 to 5 years, 5 to 15 years, and 20 or more years to recover, respectively (Keystone 2008). Keystone would periodically inspect the entire pipeline, which would require occasional removal of woody vegetation and of trees from the permanent easement. Landowners would be permitted to cultivate crops in the permanent easement.

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[1] This total number of acres varies from the total provided in Table 3.9.1-1 (21,232 acres) since it includes: pipe storage, rail, and contractor yards in Oklahoma (≈ 465 acres) and Texas (≈ 796 acres); access roads (≈ 918 acres); construction camps (≈ 320 acres); and the tank farm (≈50 acres). Variations between the two numbers also result from mathematical rounding.

TABLE 3.9.7-1 Summary of Land Affected During Construction[1] (Acres)									
	Pipeline ROW	**Lateral ROW**	**Additional Temporary Workspace Areas[6]**	**Pipe Stockpile Sites, Rail Sidings, and Contractor Yards**	**Constr. Camps**	**Pump Stations Delivery Facilities**	**Access Roads[7]**	**Tank Farm**	***Subtotal***
Steele City Segment									
Montana	3,767		278	521	160	42	265		5,033
South Dakota	4,188		255	579	160	42	103		5,327
Nebraska	3,388		186	525	-	30	56	50	4,235
Segment Subtotal[3,5]	*11,343*	-	*719*	*1,625*	*320*	*114*	*424*	*50*	14,595
Keystone Cushing Extension[5]									
Kansas[3,4,5]	-		-	-	-	12	-	-	12
Gulf Coast Segment									
Oklahoma	2,044		130	465	-	32	103	-	2,774
Texas	4,180		283	796	-	48	329	-	5,636
Segment Subtotal[3]	*6,224*	-	*413*	*1,261*	-	*80*	*432*	-	8,410
Houston Lateral									
Texas		652	32	5	-	-	62	-	751
Project Total[3,4,5,6]	17,567	652	1,164	2,891	320	206	918	50	23,768

[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 would be used, or in areas requiring extra width for workspace necessitated by site conditions. Disturbance also includes pipe stock piles, contractor yards, and construction camps.

[2] Operational acreage was estimated based on a 50-foot permanent ROW in all areas. All pigging facilities would be located within either pump stations or delivery facility sites. Intermediate mainline valves and densitometers would be constructed within the construction easement and operated within a 50-foot by 50-foot area or 50 foot x 66 foot area, respectively, within the permanently maintained 50-foot ROW. Other mainline valves, check valves and block valves, and meters would 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. Potential disturbance associated with these areas would be included in supplemental filings when these additional temporary work spaces are identified.

[7] Access roads temporary and permanent disturbances are based on a 30-foot width; all non-public roads are conservatively estimated to require upgrades and maintenance during construction.

Source: Keystone 2009c, Table 2.1-3, in which total land affected by the Project is shown as 23,768 acres.

Table 3.9.7-2 provides estimates of the total acreage of land impacted during operation of the Project as well as estimates by Project segment and by state. Total Project land use during operations is estimated to be 8,737 acres[2]. Pipeline ROW is estimated at 8,063 acres, access roads at 124 acres, lateral ROW at 294 acres, and the remaining 256 acres for pump stations/delivery facilities, and tank farm.

TABLE 3.9.7-2
Summary of Land Affected During Operation[1] (Acres)

	Pipeline ROW	Lateral ROW	Pump Stations Delivery Facilities	Access Roads[7]	Tank Farm	*Subtotal*
Steele City Segment						
Montana	1,712		42	22	-	*1,776*
South Dakota	1,904		42	9	-	*1,955*
Nebraska	1,540		30	-	50	*1,620*
Steele City Subtotal[3,5]	*5,156*	-	*114*	*31*	*50*	*5,351*
Keystone Cushing Extension[5]						
Kansas[3,4,5]	-		12	-		*12*
Gulf Coast Segment						-
Oklahoma	942		32	19	-	*993*
Texas	1,965	-	48	55	-	*2,068*
Gulf Coast Subtotal[3]	*2,907*	-	*80*	*74*	-	*3,061*
Houston Lateral						-
Texas	-	294	-	19		*313*
Project Total[3,4,5,6]	**8,063**	**294**	**206**	**124**	**50**	***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 would be used, or in areas requiring extra width for workspace necessitated by site conditions. Disturbance also includes pipe stock piles, contractor yards, and construction camps.

[2] Operational acreage was estimated based on a 50-foot permanent ROW in all areas. All pigging facilities would be located within either pump stations or delivery facility sites. Intermediate mainline valves and densitometers would be constructed within the construction easement and operated within a 50-foot by 50-foot area or 50 foot x 66 foot area, respectively, within the permanently maintained 50-foot ROW. Other mainline valves, check valves and block valves, and meters would 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. Potential disturbance associated with these areas would be included in supplemental filings when these additional temporary work spaces are identified.

[7] Access roads temporary and permanent disturbances are based on a 30-foot width; all non-public roads are conservatively estimated to require upgrades and maintenance during construction.

Source: Keystone 2009c, Table 2.1-3, in which total land affected by the Project is shown as 8,737 acres.

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[2] This total number of acres varies from the total provided in Table 3.9.1-1 (21,232 acres) since it includes: pipe storage, rail, and contractor yards in Oklahoma (≈ 465 acres) and Texas (≈ 796 acres); access roads (≈ 918 acres); construction camps (≈ 320 acres); and the tank farm (≈50 acres). Variations between the two numbers also result from mathematical rounding.

3.9.7.1 Agricultural Land and Rangeland

Construction may have varied adverse impacts on agricultural land and rangeland and result in reduced land productivity and crop loss. The Project would require clearing of vegetation and obstacles along the pipeline ROW.

Agricultural Land

On agricultural land where crops are present, crops would be disked or mowed to ground level to provide clear, safe, and efficient access for construction. In agricultural areas with timber shelterbelts within the construction ROW, Keystone would only remove the minimum necessary to construct the pipeline.

Construction and operation of the pipeline may also have other physical impacts on agricultural land, including impacts to:

- Soil profiles;
- Irrigation systems; and
- Drainage systems.

Impacts to soil profiles could include topsoil degradation, soil compaction, and rock introduction or redistribution. The CMR plan commits Keystone to measures that would protect the soil profile. These include: segregating the upper 12 inches of topsoil during construction and replacing it during site restoration; utilizing soil ripping or chiselling to alleviate soil compaction and return the soil to pre-construction conditions; ploughing wood chips, manure, or other organic matter into the soil to further enhance soil aeration, if required; removing excess rock that is greater than 3 inches in diameter from the top 12 inches of soil in all active agricultural fields, pastures, hayfields, and residential areas.

Irrigation systems such as ditches, flood, pivots, wheels, or other types may be impacted by construction of the Project. If pipeline construction crosses active irrigation ditches, they would not be stopped or obstructed except during the typical one day or less time period needed to install the pipeline beneath the ditch.

Construction activities may also damage drain tiles, fences, or farm terraces during construction. Keystone would repair or restore drain tiles, repair fences either using original material or high quality new material, and restore farm terraces to their preconstruction functions.

Construction may cause the loss of crops or forage on affected lands. Other than the typical disturbances associated with annual planting operations, there would be minimal changes to agricultural areas because they would be allowed to revegetate with a similar preconstruction plant cover (Keystone 2008). Landowners would be compensated for any crop or forage loss.

Rangeland

Impacts to rangeland could include:

- Loss of forage;
- Livestock harassment or injury; and
- Fence damage or removal.

The CMR plan (Appendix B) includes measures that Keystone would implement to reduce these potential impacts. These include: restoring disturbed areas with custom seed mixes (approved by landowners and land managers) to match the native foliage; providing access to rangeland when practicable; installing temporary fences with gates around construction areas to prevent injury to livestock or workers; leaving hard plugs (short lengths of unexcavated trench) or installing soft plugs (areas where the trench is excavated and replaced with minimal compaction) to allow livestock and wildlife to cross the trench safely; removing litter, garbage, and any pipeline shavings at the end of each construction day, to protect livestock and wildlife from accidental ingestion; prohibiting construction personnel from feeding or harassing livestock; prohibiting construction personnel from carrying firearms or pets into the construction area; securing rangeland fences to prevent drooping; closing any openings in the fence at the end of each day to prevent livestock escape; maintaining all existing improvements such as fences, gates, irrigation ditches, cattle guards, and reservoirs to the degree practicable; and returning any damaged improvements to at least their condition prior to construction.

Compensation

Keystone presumes that production on all areas disturbed during construction would be temporarily lost. Agricultural lands would become productive during the next planting season, while rangelands would be productive after reclamation is successful. In its CMR plan, Keystone commits to compensate landowners for any demonstrated decreases in land productivity resulting from Project-related soil degradation. Further, Keystone would compensate land owners for yields less than those on unaffected lands where lesser yields would result from Project impacts. Compensation for crop losses would be based on the types of crop planted or planned specific to the impacted land. Crop values would be assessed based on values of those crops in the specific area as well as local crop prices at grain elevators. Keystone would compensate landowners for crop loss effects over three years. During the year of construction, 100 percent of calculated losses would be compensated. In the second year 75 percent would be compensated and during the third year 50 percent would be compensated. If landowners demonstrate that crop losses persist beyond three years, Keystone would provide further compensation.

3.9.7.2 Conservation Programs

Pipeline construction and operation should have no effect on landowners' participation in CRP. Affected landowners would be required to contact their local FSA offices. FSA would require that landowners, prior to pipeline construction, notify the FSA of the planned construction activities; and commit to restoring their land to its pre-construction condition (M. Braun, pers. comm. 2009). In doing so, land owners should not lose their eligibility for participation in the CRP. Keystone has indicated that cleanup shall occur immediately after backfill operations, assuming favorable weather and seasonal conditions. Should CRP participants be required to leave the program because of the Project, they would be compensated. Compensation would be for any lost CRP payments, including retroactive forfeit payments.

3.9.7.3 Forestland

Impacts to forest land use could include:

- Removal of trees;
- Introduction of slash along the Project ROW;
- Grubbing of tree stumps to a height which permits grading and safe equipment operation; and

- Disposing of any trees in accordance with landowner or land manager wishes.

Keystone would minimize adverse impacts to forestland with various protection, reclamation, and remediation measures committed to in its CMR Plan, including remediation to reverse effects on windbreaks, shelterbelts, and living snow fences. Examples of protective or restorative measures on forestlands would include:

- Routing the Project along existing ROW areas in forestlands, when practical;
- Felling trees toward the pipeline centerline to minimize land and tree disturbance;
- Recovering all trees and slash that fall outside the ROW;
- Depositing all tree materials according to specific protection measures and in accordance with landowner or land manager requirements; and
- Removing stumps using equipment that helps preserve organic matter.

In some circumstance, trees would be removed from the ROW. Prior to removal, landowners would be consulted to determine if the timber has a commercial or salvage value. Landowners could contract with Keystone to clear and harvest trees in the ROW. Tree removal and disposal would be accomplished consistent with all local, state, and federal permit requirements. Trees would be allowed to regrow on all but 641 acres of the Project ROW after construction, consistent with DOT pipeline safety standards and Keystone requirements for aerial pipeline safety inspections.

3.9.7.4 Waterbodies and Wetlands

Impacts to waterbodies and wetlands land use could include:

- Changes to flow rates within affected waterbodies;
- Changes to hydrological and vegetation characteristics of wetland areas;
- Increases in turbidity within waterbodies as a result of construction; and
- Introduction of fill materials into wetland areas.

The CMR plan (Appendix B) includes measures that Keystone would implement to reduce these potential impacts. These include:

- Reducing the construction ROW to 85 feet in wetland areas to minimize potential adverse effects unless non-cohesive soil conditions require utilization of a greater width;
- Posting visible advisory signs on the construction ROW and on roads which provide access to waterbody crossing sites;
- Maintaining adequate flow rates to protect aquatic life and prevent interruption of downstream uses;
- Utilizing specific construction techniques to preserve the hydrological and vegetation characteristics of wetlands that could be adversely affected by construction;
- Restoring all wetland areas within conservation lands or easements to levels established by the appropriate agency;

- Using appropriate methods to cross small streams, temporary water drainages, and wetlands based on site-specific conditions;
- Using the HDD crossing method on selected perennial and other stream or river crossings;
- Conducting topographic surveys prior to construction in USFWS wetlands and installing sediment barriers to protect wetlands adjacent to construction ROW;
- Grading and restoring USFWS wetlands to within 0.1 foot of preconstruction elevation;
- Complying with USACE Section 404 guidelines for construction through wetlands, including limiting the discharge of dredged or fill material into wetland areas if a practicable, less environmentally-adverse alternative is available;
- Consulting with each pertinent USACE district regarding required compensation for the conversion of forested wetland to herbaceous wetland.

The Project would not result in any permanent loss of wetlands, although approximately 82 acres of forested wetland would be permanently converted to herbaceous wetlands. Within palustrine emergent wetlands some short term loss of herbaceous vegetation would result in temporary habitat loss for some wildlife species. Reclamation to pre-construction levels would take three to five years and trees in forested wetlands would take approximately 20 to 50 years to recover.

3.9.7.5 Developed Land – Residential/Commercial/Industrial

Impacts to developed land could include:

- Construction or operations related noise effects;
- Construction or operations related dust effects;
- Hindrances to short or long term land uses on lands within or in near proximity to the ROW.

It is reasonable to expect that occupants of residences or commercial/industrial buildings within 25 feet of the construction work area would be more affected by the Project than those within 500 feet or further. However, residences within one mile of the construction ROW may be affected by noise and dust.

Some current land uses would be converted to long-term utility use for the life of the Project. The long-term conversion would put long-run constraints on development of private land. Keystone would not permit certain objects such as bushes, catch basins, leaching fields, garages, guy wires, houses, leaching fields, poles, septic tanks, sheds, swimming pools, or any other structures that are not easily removed to remain on the permanent ROW. Such structures could impair maintenance or emergency access to the pipeline. No dwellings could be placed within the 50-foot operational ROW, which would be maintained in an open condition for the life of the pipeline.

The CMR plan (Appendix B) includes measures that Keystone would implement to reduce these potential impacts. These include:

- Before construction begins, Keystone would conduct surveys to confirm the location of buildings relative to the pipeline and to ascertain whether the buildings are occupied residences or businesses;

- Residential and commercial/industrial structures within 25 feet of the construction ROW would require site-specific protective constructions plans;
- Control noise levels during non-daylight hours in compliance with any applicable noise regulations around residential and commercial/industrial areas;
- If noise levels are expected to exceed regulations, Keystone would give advance notice to all residences within 500 feet of the construction ROW;
- Keystone will also limit the hours that activities with high noise levels occur and will make extra efforts coordinate schedules to expedite the construction work through the area;
- In some cases, Keystone would grant written permission for certain objects related to current land uses to remain in the permanent ROW;
- Where practical, Keystone would reduce the construction ROW width;
- Keystone would consider shielding land improvements such as fences and sheds from construction activities;
- Keystone would consider preserving landscaping and mature trees in some cases;
- Keystone would fence workspaces from residential areas where appropriate;
- Keystone would accelerate construction schedules where possible to reduce effects on nearby residences and businesses;
- Keystone would provide vehicle access and assist in traffic flows in construction areas (including emergency vehicles);
- Keystone would remove and dispose of trash and debris from the construction site each day;
- Keystone would install plating to cover open trenches during non-construction times in developed areas;
- For areas in which the pipeline is within 25 feet of a residential structure, Keystone would delay excavation of the pipeline trench until the pipe is ready to be installed, then immediately backfilling after installation;
- Following installation of the pipeline and backfilling, Keystone would restore all fences, landscaping improvements, shrubs, lawn areas, and other structures to pre-construction aesthetics (or as directed by the landowner); and
- Keystone would hire individuals with knowledge of local horticulture and turf establishment practices for developed landscape restoration.

The potential impacts of Project construction and operation on local resources, including available housing and critical services are addressed in Section 3.10.

Compensation

Commercial and industrial landowners would be compensated for any construction-related impacts based upon land values determined by local professional appraisers. Any damaged infrastructure would be repaired or replaced by Keystone, or the owner would be compensated for the damage.

The construction ROW is 110 feet wide and residents with homes within 500 feet would experience short-term inconveniences (see tables 3.9.4-13 and 3.9.4-14). Dust and noise from equipment may occur for a period of 7 to 30 days. During this time, Keystone would be required to comply with any local construction noise restrictions. Noise and dust impacts would be mitigated as outline in the CMR Plan.

The Gulf Coast Segment has the largest concentration of structures within 25 feet of the construction ROW (Table 3.9.4-13). In the spring of 2009, Keystone conducted surveys of these structures to determine if they are inhabited or abandoned and to develop site-specific crossing plans and procedures for residences in close proximity.

3.9.8 Recreation and Special Interest Areas

Construction activities would temporarily affect recreational traffic and use patterns in special management and recreational areas, and sightseers, hikers, wildlife viewers, fishers and hunters, and other recreationists would be temporarily dislocated. In some cases, construction of the pipeline may cause disrupted or delayed recreational usage of private lands. Keystone would negotiate any resulting damages with affected landowners. Keystone would cooperate with local agencies to reduce the conflict between recreational users and Project construction. Impacts are expected to be only short term. Noise impacts from pump stations are expected to be minor. In Butler County in Kansas, noise levels in recreational land use areas are required to be kept below 55 dBA during daytime hours, for one hour. Recreational use access would not be affected by Project operations within special management areas.

The proposed Project does not cross rivers within any reaches that have been designated as federal Wild and Scenic Rivers declared as scenic or wild nor does it cross any national parks or forests. However, areas with slow or fast moving waters are popular recreation areas and often hold recreationally and commercially valuable fish species. The Project would cross several properties under the management of the Montana State Lands Department. The CMR Plan includes measures to minimize impacts to these properties.

3.9.9 Visual Resources

Table 3.9.9-1 displays the VRM classes on Federal lands that would be affected by the Project. The lands crossed range from MP 0.0 to MP 282.5, are under the management of BLM or Department of Defense, and are all within the Steele City Segment. The lands crossed include 35.9 miles of class II, 37.1 miles of class III, and 209.5 miles of class IV.

TABLE 3.9.9-1
Visual Resource Management Classifications of Land Crossed by the Project

	BLM's Visual Resource Management Classification (Distance in Miles)				
Type of Federal Land Crossed	**Class I**	**Class II**	**Class III**	**Class IV**	**Total**
BLM	--	28.6	12.4	142.7	183.7
BLM and Department of Defense	--	2.4	--	--	2.4
None	--	4.9	24.7	66.8	96.4
Total	**--**	**35.9**	**37.1**	**209.5**	**282.5**

Source: Keystone 2008.

Visual impacts due to construction would be temporary and may include removal of existing vegetation, exposure of bare soils, earthwork and grading scars, and landform alterations. Keystone would adjust the pipeline route to minimize adverse aesthetic features where possible and would implement measures to reduce long term visual impacts to insignificant levels. Keystone would paint aboveground facilities in accordance with standard industry painting practices to further reduce visual impacts. They would also consult with landowners to address any visual aesthetic issues that arise.

3.9.10 Connected Actions

3.9.10.1 Power Distribution Lines and Substations

The Project would require electrical service from local power providers (see Section 2.3.1). This section addresses the land use, recreation, and visual resource effects of the proposed power distribution lines.

Land Ownership

Land ownership crossed by power distribution lines is summarized in Table 3.9.10-1. Power distribution lines would primarily affect privately-owned land, crossing 356 miles, which accounts for 82.9 percent of the total linear miles of power distribution lines required for the Project. The power distribution lines would also be located on public lands, including federal land at 44 miles (10.3 percent of the total) and state land at 29.3 miles (6.8 percent).

TABLE 3.9.10-1
Land Ownership Affected by Power Distribution Lines (Miles Crossed)

	Federal	State	Private	Total	Percent of Total
Steele City Segment					
Montana	42.3	17.7	87.6	147.4	34.3%
South Dakota	1.7	11.6	148.5	161.8	37.7%
Nebraska	0	0	68.1	68.1	15.9%
Segment Total	*44.0*	*29.3*	*304.2*	*377.3*	*87.9%*
Cushing Extension New Pump Stations					
Kansas	0.0	0.0	21.4	21.4	5.0%
Gulf Coast Segment					
Oklahoma	0	0	16.9	16.9	3.9%
Texas	0	0	13.5	13.5	3.1%
Segment Total	*0*	*0*	*30.4*	*30.4*	*7.1%*
Houston Lateral					
Texas	-	-	-	-	-
Project Total	**44**	**29.3**	**356.0**	**429.1**	**100%**
Total Percent	**10.3%**	**6.8%**	**82.9%**	**100%**	

Source: Keystone 2009c.

As shown in Table 3.9.10-1, the proposed power distribution lines within the Steele City Segment would comprise approximately 377 miles, primarily in South Dakota and Montana. Of this total, 304 miles would be on privately-owned land, 44 miles on federally-owned land, and 29.3 miles on state-owned land. The two new pump stations in Kansas would require 21.4 miles of new power distribution lines, all of which would be located on privately-owned property. Similarly, all power distribution lines in the Gulf Coast Segment, approximately 30.4 miles, would be on privately-owned land.

Land Use

The proposed power distribution lines would be located on lands in a range of different uses. For this analysis, land uses affected include agricultural and rangeland, forestland, water and wetlands, and developed land (i.e., residential, commercial, and industrial). The extent of land uses affected would vary during the construction and operations phases of the Project based on different sizes of proposed ROW and construction and design requirements, as discussed below.

Assumptions on Land Use Disturbance

Construction Assumptions

Assumptions used to calculate temporary impacts from ground disturbances during power distribution line construction are displayed in Table 3.9.10-2. As shown, a 69-kV structure with a maximum height to 40-60 feet, spaced 350 feet apart and spanning 300-400 feet, would disturb a 60-foot radius, on average. Structures supporting 115-kV and 138-kV lines would disturb, on average, a 70-foot and 80-foot radius, respectively. An H-frame power line of any voltage would disturb, on average, a 90-foot radius.

TABLE 3.9.10-2
Power Distribution Line Construction Impact Assumptions

Transmission Structure	Maximum Structure Height (feet)	Spacing Between Structures (feet)	Average Structure Span (feet)	Average Disturbance Radius (feet)
69 kV	40-60	350	300-400	60
115 kV	50-70	550	500-600	70
138 kV	60-80	650	600-700	80
H-frame	70-90	800	700-900	90

Source: Keystone 2009c.

In addition, other facilities and construction techniques would result in ground disturbance. Power distribution line construction would require the development of temporary access roads, which have a 20-foot wide area within the ROW for all power poles. Pulling and tensioning areas would require one acre per change in direction. Turnaround areas would require a 30-foot radius at each structure. Lastly, staging areas would require one acre every 25 miles.

Operations Assumptions

Assumptions used to calculate permanent impacts from ground disturbances during power distribution line operation are displayed in Tables 3.9.10-3 and 3.9.10-4. As shown, a 69 kV, 115 kV, and 138 kV structure would each permanently disturb, on average, a 12 square-foot area. An H-frame power line of any voltage would permanently disturb approximately 24 square-feet. Once the area of ground disturbance was calculated, this area was proportionally divided to each land use and vegetation cover type, including open water, found along each route. Actual impacts may differ based on more specific power line designs developed by each power provider.

TABLE 3.9.10-3 Power Distribution Line Operation Impact Assumptions				
Structure	**Maximum Structure Height (feet)**	**Spacing Between Structures (feet)**	**Average Structure Span (feet)**	**Average Disturbance (square feet)**
69 kV	40-60	350	300-400	12
115 kV	50-70	550	500-600	12
138 kV	60-80	650	600-700	12
H-frame	70-90	800	700-900	24

Source: Keystone 2009c.

ROW widths in forested areas are listed in Table 3.9.10-4. As shown, a 69 kV, 115 kV, and a 138 kV structure with a ROW of 60 to 80 feet with each disturb 80 square feet, on average. An H-frame structure with a ROW 100 to 150 feet, on average, would disturb 150 square feet.

TABLE 3.9.10-4 Power Distribution Line Operation Impact Assumptions in Forestland		
Structure	**ROW (feet)**	**Average Disturbance (square feet)**
69 kV	60-80	80
115 kV	60-80	80
138 kV	60-80	80
H-frame	100-150	150

Source: Keystone 2009c.

Agricultural Land and Rangeland

Tables 3.9.10-5 and 3.9.10-6 show land uses, by segment and state, which would be affected by power distribution line construction and operations, respectively. As shown in these tables, the proposed power distribution lines would primarily be located on agricultural land and rangeland, which together comprise 87.3 percent and 79.8 percent of the total land area that would be disturbed by Project construction and operations. This is consistent with the rural character of the area. Specifically, construction and operations are estimated to disturb 387.5 acres and 271.2 acres of agricultural land, as well as 891.2 acres and 640.2 acres of rangeland, respectively.

Along the Steele City Segment, power distribution line construction and operation are expected to disturb, respectively, 331.7 acres and 238.2 acres of agricultural land. The largest area of agricultural land temporarily and permanently disturbed by Project construction and operations would be in South Dakota. For rangeland, construction and operation are expected to disturb 796.1 acres and 582.6 acres, respectively. The largest area of rangeland disturbance would be in South Dakota.

For the two new pump stations in Kansas, construction and operation of power distribution lines would disturb 30.8 acres and 21.8 acres of agriculture land, respectively, and 31.7 acres and 22.3 acres of rangeland, respectively.

Along the Gulf Coast Segment, power distribution line construction and operation would disturb 25.3 acres and 10.8 acres of agricultural land, respectively, all of which is located in Texas. Construction and operation are expected to disturb, respectively, 63.2 and 35.1 acres of rangeland throughout both Oklahoma and Texas.

TABLE 3.9.10-5 Existing Land Uses Temporarily Affected by Construction of Power Distribution Lines (Acres)						
	Developed	**Agriculture[1]**	**Rangeland**	**Forest[2]**	**Water/ Wetland**	**Total**
Steele City Segment						
Montana	21.1	107.7	377.2	1.9	10.5	**518.1**
South Dakota	56.4	116.9	327.1	1.3	10.7	**512.6**
Nebraska[1]	14.4	107.1	91.8	5.6	5.8	**224.5**
Segment Total	*91.9*	*331.7*	*796.1*	*8.8*	*27.0*	**1,255.2**
Cushing Extension New Pump Stations						
Kansas	6.8	30.8	31.7	1.7	2.3	**73.4**
Gulf Coast Segment						
Oklahoma	10.6	0	34.1	13.3	3.4	**61.5**
Texas	12.3	25.3	29.1	8.5	0	**74.2**
Segment Total	*22.9*	*25.3*	*63.2*	*21.8*	*3.4*	**135.7**
Houston Lateral						
Texas	--	--	--	--	--	--
Project Total[2]	**121.6**	**387.5**	**891.2**	**31.1**	**33.7**	**1,464.2**

[1] Includes power to Steele City Tank Farm.

[2] Discrepancies in totals are due to rounding.

Source: Keystone 2009c.

TABLE 3.9.10-6 Existing Land Uses Permanently Affected by Power Distribution Lines during Operations (Acres)						
	Developed	**Agriculture[1]**	**Rangeland**	**Forest[2]**	**Water/ Wetland**	**Total**
Steele City Segment						
Montana	14.4	73.3	261.5	6	7.4	362.6
South Dakota	42.6	86.5	253.8	4.8	10.9	399.2
Nebraska	10.6	78.4	67.3	21.8	8.9	187.4
Segment Total	*67.6*	*238.2*	*582.6*	*32.6*	*27.2*	*949.2*
Cushing Extension New Pump Stations						
Kansas	4.8	21.8	22.3	6	5.5	60.6
Gulf Coast Segment						
Oklahoma	6.8	0.0	23.0	46.9	6.3	82.9
Texas	5.8	10.8	12.1	20.2	0.0	48.9
Segment Total	12.6	10.8	35.1	67.1	6.3	131.8
Houston Lateral						
Texas	--	--	--	--	--	--
Project Total	**85.0**	**271.2**	**640.2**	**105.9**	**39.2**	**1,141.5**

[1] Includes power to Steele City Tank Farm.

[2] Discrepancies in totals are due to rounding.

Source: Keystone 2009c.

Forest Land

Forestland along the power distribution line corridors would be affected by construction and operations. As shown in Tables 3.9.10-5 and 3.9.10-6, a total of 31.1 and 105.9 acres of forestland would be disturbed by construction and operation, respectively.

During construction, 8.8 acres of forestland would be disturbed by power distribution lines along the Steele City Segment, including 1.9 acres in Montana, 1.3 acres in South Dakota and 5.6 acres in Nebraska. In Kansas, 1.3 acres of forestland would be disturbed during construction in Kansas. Along the Gulf Coast Segment, 21.8 acres of forestland would be disturbed during construction, including 13.3 acres in Oklahoma and 8.5 acres in Texas.

The amount of forestland disturbed during operation of the power distribution lines is relatively greater than during construction. Operation of power distribution lines would disturb 32.6 acres along the Steele City Segment, including 6.0 acres in Montana, 4.8 acres in South Dakota, and 21.8 acres in Nebraska. Approximately 6.0 acres of forestland would be disturbed along the power distribution line corridors for the two new pump stations in Kansas, and along the Gulf Coast Segment, 67.1 acres of forestland would be disturbed, including 46.9 acres in Oklahoma and 20.2 acres in Texas.

Water and Wetlands

As shown in Table 3.9.10-6, construction of the power distribution lines would disturb 32.7 acres of water and wetlands along the power distribution line corridor. Of this total, 27.0 acres are located along the Steele City Segment, including 10.5 acres in Montana, 10.7 acres in South Dakota, and 5.8 acres in Nebraska. In Kansas, 2.3 acres of water and wetlands would be disturbed by construction. Along the Gulf Coast Segment, 3.4 acres of water and wetlands would be disturbed, all of which are located in Oklahoma.

Operation of the power distribution lines would disturb a total of 39.2 acres of water and wetlands. Along the Steele City Segment, 27.2 acres of water and wetlands would be disturbed, including 7.4 acres in Montana, 10.9 acres in South Dakota, and 8.9 acres in Nebraska. In Kansas, 5.5 acres of water and wetlands would be disturbed by power distribution line construction, and along the Gulf Coast Segment, 6.3 acres would be disturbed in Oklahoma.

Developed Land – Residential, Commercial, and Industrial

Construction of the Project would temporarily affect 121.6 acres of developed land along power distribution line routes (see Table 3.9.10-5). Along the Steele City Segment, 91.9 acres would be disturbed, including 21.1 acres in Montana, 56.4 acres in South Dakota, and 14.4 acres in Nebraska. In Kansas, 6.8 acres of developed land would be disturbed during construction. Along the Gulf Coast Segment, 22.9 acres of developed land would be disturbed, including 10.6 acres in Texas and 12.3 acres in Oklahoma.

Operation of the power distribution lines would permanently affect 85 acres of developed land along power distribution line routes. Along the Steele City Segment, 67.6 acres of developed land would be disturbed including 14.4 acres in Montana, 42.6 acres in South Dakota, and 10.6 acres in Montana. In Kansas, 4.8 acres of developed land would be disturbed by operations. Along the Gulf Coast Segment, 12.6 acres of developed land would be affected, including 6.8 acres in Oklahoma and 5.8 acres in Texas.

Aerial interpretation and field surveys were used to discern the number of buildings within 50 feet of the power distribution line route (see Table 3.9.10-7). An estimated 81 structures would occur within 50 feet of the proposed power distribution line route, including 62 in the Steele City Segment, 6 in Kansas, and 13 in the Gulf Coast Segment.

TABLE 3.9.10-7
Number of Buildings Within 50 Feet of a Power Distribution Line

	Number of Structures within 50 Feet
Steele City Segment	
Montana	15
South Dakota	35
Nebraska	12
Segment Total	*62*
Cushing Extension New Pump Stations	
Kansas	6
Gulf Coast Segment	
Oklahoma	5
Texas	8
Segment Total	*13*
Houston Lateral	
Texas	--
Project Total	**81**

Source: Keystone 2009c.

Note: Discrepancies in totals are due to rounding.

Recreation and Special Interest Areas

The power distribution lines would cross several special interest areas in Montana and South Dakota along the Steele City Segment, portions of which may provide recreation opportunities to local residents and visitors (see Table 3.9.10-8). In Montana, the power distribution lines would cross Montana State Trust Lands, BLM land, Bureau of Reclamation land, and U.S. Department of Defense land. In South Dakota, power distribution lines would cross South Dakota Game, Fish, and Park land, BLM land, and State School land. There are no special interest areas crossed in Nebraska, Kansas, Oklahoma, or Texas.

TABLE 3.9.10-8
Special Interest Areas Crossed by Power Distribution Lines

State	Name / Ownership
Steele City Segment	
Montana	Montana State Trust Lands
	BLM
	Bureau of Reclamation
	US Dept of Defense
South Dakota	BLM
	South Dakota Game, Fish, and Park Lands
	State School Land

TABLE 3.9.10-8 Special Interest Areas Crossed by Power Distribution Lines	
State	**Name / Ownership**
	US Dept of Defense
Nebraska	None
Cushing Extension New Pump Stations	
Kansas	None
Gulf Coast Segment	
Oklahoma	None
Texas	None
Houston Lateral	
Texas	None

Source: Keystone 2009c.

Note: Discrepancies in totals are due to rounding.

Visual Resources

Visual resources are natural or developed landscape characteristics which have an aesthetic value to residents and visitors from sensitive viewpoints such as residences, recreation areas, rivers, and highways. The Visual Resource Management (VRM) system was developed by BLM to assist in the identification and protection of scenic lands in a systematic and interdisciplinary manner. See Section 3.9.5 for a description of the VRM classification system.

Table 3.9.10-9 displays the VRM classes on Federal lands crossed by the proposed power distribution line corridor, which include lands managed by BLM, Bureau of Reclamation, and Department of Defense along the Steele City Segment. The proposed power distribution line corridor is located on lands designated as VRM Class II (1.6 miles), Class III (31.4 miles), Class IV (10.0 miles), and 1.9 miles of unclassified lands.

TABLE 3.9.10-9
Visual Resource Management Classifications in the Power Distribution Line Corridor (Miles)

	BLM's Visual Resource Management Classification					
Type of Federal Land Crossed	**Class I**	**Class II**	**Class III**	**Class IV**	**Unclassified**	**Total**
BLM	--	1.2	30.8	10.0	1.9	43.9
Bureau of Reclamation	--	--	0.6	--	--	0.6
Department of Defense	--	0.4	--	--	--	0.4
Total	**--**	**1.6**	**31.4**	**10.0**	**1.9**	**44.9**

Source: Keystone 2009c.

Note: Discrepancies in totals are due to rounding.

Potential Impacts

This section addresses the potential impacts on land use, recreation, and visual resources due to construction and operations and maintenance of the proposed power distribution lines associated with the

Project. The construction of power distribution lines would require the acquisition of temporary and permanent easements with landowners along power distribution line routes. Each electric power provider is responsible for obtaining the necessary easements.

Impacts on Land Use

Proposed power line routes were evaluated for potential disturbances through aerial interpretation of preliminary routes and field surveys. The evaluation process included the survey of land ownership, land use, and residential structures. Impacts to land use are based upon surface disturbance areas. Impacts associated with service drops from adjacent distribution lines are expected to be minimal and comparable to those associated with supplying electricity to the average home or farm.

Land Use Impacts during Construction

Construction of power distribution lines would temporarily disturb different types of land use along the power distribution line corridor. The areas of disturbance during construction have been estimated based on the number and type of proposed structures. Exact power distribution line design specifications are not yet finalized, therefore acreage disturbances are based upon the percentage of each land use type within each power line construction ROW. Disturbance impacts during Project construction are presented above in Table 3.9.13-5.

The ROW area would be cleared to prepare for construction, resulting in a short-term deviation from existing land uses. Limited clearing would be required along existing roads in native and improved rangelands and agricultural lands. Some trees may require removal to provide adequate clearance between the conductors and underlying vegetation. Where possible, trees would be trimmed to avoid removal.

Once the power distribution poles are in place and the conductor wires are strung between poles, all disturbed lands (i.e., agriculture, rangeland, forestland, water and wetlands, and developed lands) within the construction ROW would be reclaimed pursuant to each power provider’s requirements. Soil reshaping and contouring back to original condition would occur in disturbed areas as well as any reseeding specified by landowners. All remaining materials and litter would be removed from the construction area and properly disposed of.

Preliminary power lines have been identified in consultation with each utility company. Where feasible, the entire length of each of these preliminary power line routes would be placed along existing county roads, section lines, or field edges to minimize interference with adjacent agricultural lands. Upon completion, power providers would restore the work area around the new service drop as required by local permits.

Temporary impacts associated with turnaround areas and structure placement pad footprint could occur simultaneously. This includes construction of access roads, structure placement pads, staging areas, and pulling and tensioning areas. All construction-related impacts on existing land uses are considered temporary.

Land Use Impacts during Operations

Due to the smaller size of the permanent ROW required for operation of the proposed power distribution line, the extent of land uses permanently affected is smaller than temporary construction effects (see Table 3.9.10-6); however, there would be similar patterns of land uses disturbed by the power distribution lines during operations. Specific to power distribution line operations, each power provider would maintain a ROW free of woody vegetation where identified as a forested land use and vegetation cover type. All operations-related impacts on land use are considered permanent. (Impacts associated with permanent access roads for use during operation are not included in this analysis due to the lack of detailed power line specifications including number and location of these roads; actual impacts may be higher as a result.)

Impacts on Recreation and Special Interest Areas

Power distribution line impacts on recreation and special interest areas are unknown. To the extent that the power distribution lines would change the character, general use, and/or recreation opportunities provided on special interest lands, there would be an adverse impact. However, no information is currently available that documents recreation opportunities and land uses on these lands.

Impacts on Visual Resources

Outside Montana, there are no formal guidelines for managing visual resources on private- or state-owned lands (Keystone 2008). BLM is responsible for identifying and protecting scenic values on public lands under several provisions of the Federal Land Policy Management and NEPA. It is plausible that the proposed power distribution lines could generate adverse impacts on visual resources due to their high visibility, although other power distribution lines are assumed to be present in the study area. Preliminary evaluations of visual impacts from power lines are in process; therefore, such impacts are currently unknown.

3.9.10.2 Lower Brule to Witten 230-kV Transmission Line

The Western Area Power Administration (Western) determined that a 230-kV transmission line would be required to support power requirements for pump stations 21 and 21 in the Witten, South Dakota area (Keystone 2008). To meet these requirements, the existing Big Bend-Fort Thompson No. 2 230-kV line turning structure would be converted to a double circuit structure. Western would construct 2.1 miles of new double circuit transmission line south to the new Lower Brule Substation and would construct the Lower Brule Substation. Western would own and operate the 2.1 mile line. Ownership of the Lower Brule Substation would be transferred to the Basin Electric Power Cooperative (BEPC).

BEPC has proposed construction and operation of a new 230-kV transmission line from the Lower Brule Substation to the existing Witten Substation, the latter owned by Rosebud Electric Cooperative. The approximately 70 mile line would be built, owned, and operated by BEPC. The proposed line would be built within a 125-foot ROW, although the specific type of structure has not yet been determined. All substation and switchyard work would be within secured areas. The Lower Brule substation site and the Witten area expansion site would be cleared and leveled. Topsoil would be separated from underlying soils and placed on disturbed areas outside security fences. Substation components would be moved to the site on local highways and roads.

As described in Section 4.4 of the EIS, Western and BEPC have identified two alternative corridors (‘A’ and ‘B’) for the proposed Lower Brule to Witten 230-kV transmission line project, and there are several route options within each corridor. For corridor A, all of the route options would cross between 6.8 and 7.0 miles of the Lower Brule Reservation, depending upon the alternative chosen (Table 3.9.10-10). For corridor B, all of the route options would cross between 8.7 and 9.0 miles of the Lower Brule Reservation, depending upon the alternative chosen (Table 3.9.10-11). Consultation between DOS and the Lower Brule Tribe is ongoing. A Programmatic Agreement (PA) is being developed to address the identification, evaluation and protection of historic properties as part of the consultation effort, as outlined in Section 3.11.3.2. Visual effects to historic properties are also discussed as part of Section 3.11.

Land Ownership

Land ownership that would be crossed by the alternative alignments that are being considered for the Lower Brule to Witten Transmission Project is summarized in Tables 3.9.10-10 and 3.9.10-11. All affected land would be in South Dakota, and no other states are therefore included in the tables.

TABLE 3.9.10-10
Land Ownership Affected by Lower Brule to Witten 230-kV Transmission Project for Corridor A by Alternative (Miles Crossed)

	Western	BEPC-A	BEPC-B	BEPC-C	BEPC-D
Federal[1]					
Lower Brule Reservation	6.8	7.0	7.0	7.0	7.0
State [2]	0.3	0	0.0	0.3	0
Private[3]	60.1	62.7	63.1	64.4	65.0
Total	67.2	69.7	70.1	71.7	72.0

[1] Federal lands and Lower Brule Reservation from ESRI.
[2] State Lands from South Dakota GIS.
[3] Private Lands are the difference in length from total transmission line, federal land, and state land.

TABLE 3.9.10-11
Land Ownership Affected by Lower Brule to Witten 230-kV Transmission Line by Alternative for Corridor B (Miles Crossed)

	BEPC-E	BEPC-F	BEPC-G	BEPC-H
Federal[1]				
Lower Brule Reservation	8.8	8.7	8.7	9.0
State [2]	0	0	0.3	0
Private[3]	65.1	65.9	65.5	66.2
Total	73.9	74.6	74.5	75.2

[1] Federal lands and Lower Brule Reservation from ESRI.
[2] State Lands from South Dakota GIS.
[3] Private Lands are the difference in length from total transmission line, federal land, and state land.

Land Use

The proposed Lower Brule to Witten Transmission Project would be located on lands in varied uses. For this analysis, land uses considered include barren, agricultural, developed, forested, rangeland, and wetlands as well as open water. The acreages for each land use type for each alternative corridor and route option are summarized in Tables 3.9.10-12 and 3.9.10-13.

Within alternative corridor A, BEPC-D affects more land than the other route options at 1,091.6 acres and the Western Route affects the least amount of land among route options at 1,018.5 acres.

TABLE 3.9.10-12 Existing Land Uses Affected by Lower Brule to Written 230-kV Transmission Line Corridor A Alternatives (Acres)						
Alternatives	Developed	Agriculture	Rangeland	Forest	Water/ Wetland	Total[2]
Western[1]	40.1	501.5	458.9	1.6	15.9	1,018.5
BEPC-A	27.4	389.5	627.0	0.7	11.8	1,056.4
BEPC-B	27.3	404.3	620.5	0.7	8.7	1,061.5
BEPC-C	69.3	427.7	576.6	0.7	12.0	1,086.3
BEPC-D[3]	76.9	398.6	608.2	0.7	7.2	1,091.6

[1] Western route includes an additional 0.5 acres of barren land.
[2] Totals may not sum due to rounding.
Source: Land use from National Land Cover Database, 2001. Acres based off (125-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).

Within alternative corridor B, BEPC-H affects more land than the other route options at 1,139.0 acres and the BEPC-E affects the least amount of land among route options at 1,119.3 acres.

TABLE 3.9.10-13 Existing Land Uses Affected by Lower Brule to Written 230-kV Transmission Line Alternatives for Corridor B (Acres)						
Alternatives	Developed	Agriculture	Rangeland	Forest	Water/ Wetland	Total[1]
BEPC-E	66.9	346.4	692.7	2.4	10.9	1,119.3
BEPC-F	61.5	348.8	712.3	0.6	7.5	1,130.7
BEPC-G	66.5	433.5	611.8	1.8	14.7	1,128.3
BEPC-H[2]	107.1	374.7	645.8	2.6	8.8	1,139.0

[1] Western route includes an additional 0.5 acres of barren land.
[2] Totals may not sum due to rounding.
Source: Land use from National Land Cover Database, 2001. Acres based off (125-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).

Assumptions on Land Use Disturbance

Construction Assumptions

Land disturbance would be confined to a relatively small area needed for site access and equipment operations. Tables 3.9.10-14 and 3.9.10-15 show the assumptions on temporary, construction-related land disturbances for each alternative corridor and route option. As shown, pre-construction surveys and geotechnical analyses would require an additional 0.001 acres, and temporary contractor yards and workspaces would require ten-acre areas. Land disturbance from construction is estimated to be 0.29 acres per structure, and 129 to 144 structures would be required depending upon the alternative corridor and route option chosen.

Pulling and tensioning of the conductor wires would be required every 10,000 feet, resulting in approximately 35 to 40 pulling and tensioning sites, depending upon the alternative corridor and route option chosen. Each tensioning site can be located within the ROW, although angles in the route will require an additional 1.8 acres outside of the ROW.

TABLE 3.9.10-14 Estimated Lower Brule to Witten 230-kV Transmission Line Construction Impacts for Corridor A (Acres)									
Alternative	**Pre-Construction Surveys** (acres)	**Additional Temp Work-spaces** (acres)	**Number of Pulling Tensioning Sites**	**(1) Temp Disturbances per Structure** (acres)	**(2) Number of Structures**	**(1) x (2) Temp Disturbances** (acres)	**Route Length** (miles)	**ROW** (acres)	**Estimated Total** (acres)[1]
Western[1]	0.001	10	35	0.29	444	129	67.2	1,018.5	1,157.5
BEPC-A	0.001	10	37	0.29	460	133	69.7	1,056.4	1,199.4
BEPC-B	0.001	10	37	0.29	463	134	70.1	1,061.5	1,205.5
BEPC-C	0.001	10	38	0.29	473	137	71.7	1,086.3	1,233.3
BEPC-D	0.001	10	38	0.29	475	138	72.0	1,091.6	1,239.6

Source: BEPC 2009.

[1] Totals may not sum due to rounding.

TABLE 3.9.10-15 Estimated Lower Brule to Witten 230-kV Transmission Line Construction Impacts for Corridor B (Acres)									
Alternative	**Pre-Construction Surveys** (acres)	**Additional Temp Work-spaces** (acres)	**Number of Pulling Tensioning Sites**	**(1) Temp Disturbances per Structure** (acres)	**(2) Number of Structures**	**(1) x (2) Temp Disturbances** (acres)	**Route Length** (miles)	**ROW** (acres)	**Estimated Total** (acres)[1]
BEPC-E	0.001	10	39	0.29	488	142	73.9	1,119.3	1,271.3
BEPC-F	0.001	10	39	0.29	492	143	74.6	1,130.7	1,283.7
BEPC-G	0.001	10	39	0.29	492	143	74.5	1,128.3	1,281.3
BEPC-H	0.001	10	40	0.29	496	144	75.2	1,139.0	1,293.0

Source: BEPC 2009.

[1] Totals may not sum due to rounding.

Operations Assumptions

Operation of the transmission lines would cause a relatively small amount of permanent land disturbance. Depending on the alternative route chosen, 10 to 11 permanent structures would be required. The average height of the structures would be 110 feet, and each would span approximately 800 feet (Table 3.9.10-16). Permanent land disturbance would be 8.7 square feet (0.0002 acres) per structure.

TABLE 3.9.10-16 Lower Brule to Witten 230-kV Transmission Line Operation Impact Assumptions for Corridors A and B			
Average Number of Structures Per Mile	**Average Structure Height (feet)**	**Average Structure Span (feet)**	**Permanent Disturbance per Structure Pole (square feet)**
6.6	110	800	8.7

Source: BEPC 2009.

Agricultural Land and Rangeland

Agricultural and rangeland would be the most impacted land use types among the alternatives (see Tables 3.9.10.12 and 3.9.10-13). With alternative corridor A, Impacted agricultural land ranges from 342.7 acres for the BEPC-A route option, to 441.3 acres for the Western alternative. Route option BEPC-A would impact the greatest number of rangeland acres at 551.7 acres, and the Western alternative would impact the fewest with 403.8 acres.

With alternative corridor B, Impacted agricultural land ranges from 304.8 acres for the BEPC-E route option, to 381.5 acres for the BEPC-G route option. Route option BEPC-F would impact the greatest number of rangeland acres at 626.9 acres, and the BEPC-G option would impact the fewest with 538.4 acres.

Forest Land

Forest land acres impacted among route alternatives are very similar and are the least impacted land use type. As shown in Table 3.9.10.12, under alternative corridor A, the Western route would impact 1.4 acres of forestland, while routes BEPC-A, BEPC-B, BEPC-C, BEPC-D, would each impact 0.7 acres. Under alternative corridor B, as shown in Table 3.9.10-13, route option BEPC-F would impact the least amount of forest land at 0.5 acres, whilst BEPC-H would impact the most at 2.3 acres.

Water and Wetlands

Water and wetland acres impacted among route alternatives are displayed in Tables 3.9.10.12 and 3.9.10-13. As shown, under alternative corridor A, route option BEPC-D would impact the least amount of water and wetlands at 6.4 acres, and the Western route would impact the greatest number at 14.0 acres. Alternative routes BEPC-A, BEPC-B, BEPC-C would impact 10.4, 7.7, and 10.5 acres, respectively. Under alternative corridor B, route option BEPC-F would impact the least number of water and wetlands at 6.6 acres, whilst BEPC-G would impacts the most at 12.9 acres.

The Lower Brule to Witten Transmission line would cross several perennial and intermittent streams/rivers. As shown in Table 3.9.10-17, under alternative corridor A, the BEPC-D route would cross the least number of streams, four perennial and 26 intermittent streams. All other routes would cross between one and four perennial stream/rivers and between 33 and 36 intermittent streams. As shown in Table 3.9.10-18, under alternative corridor B, route option BEPC-E would cross the least number of streams, three perennial and 23 intermittent streams. All other routes would cross between four and seven perennial stream/rivers and 20 to 31 intermittent streams.

TABLE 3.9.10-17 Streams/River Crossings along the Lower Brule to Witten 230-kV Transmission Line Corridor A Alternatives for the Project					
	Western	**BEPC-A**	**BEPC-B**	**BEPC-C**	**BEPC-D**
Perennial	1	4	4	4	4
Intermittent	33	34	36	35	26
Total	***34***	***38***	***40***	***39***	***30***

Source: Streams/Rivers from ESRI.

TABLE 3.9.10-18 Streams/River Crossings along the Lower Brule to Witten 230-kV Transmission Line Corridor B Alternatives for the Project				
	BEPC-E	**BEPC-F**	**BEPC-G**	**BEPC-H**
Perennial	3	4	7	7
Intermittent	23	25	31	20
Total	***26***	***29***	***38***	***27***

Source: Streams/Rivers from ESRI.

Developed Land – Residential, Commercial, and Industrial

Developed land acres impacted among route alternatives are displayed in Tables 3.9.10.12 and 3.9.10-13. As shown, under alternative corridor A, route option BEPC-D would impact the greatest area of developed lands, at 67.6 acres, while routes BEPC-A and BEPC-B would impact the smallest areas at 24.1 and 24.0 acres respectively. Under alternative corridor B, BEPC-H route option would impact the most developed land at 94.2 acres, whilst BEPC-F would impact the least at 54.1 acres.

Recreation and Special Interest Areas

The proposed route from the Lower Brule Substation to Fort Thompson would be located within eyesight of three identified recreation areas managed by The Lower Brule Indian Reservation; the Trailwaters Recreation Area, the Tailwaters Recreation Area, and the Good Soldier Creek Recreation Area. Recreation opportunities year-round include shore fishing, hiking, picnicking, camping, boat launching, horseback riding, ATV, snowmobile and dirt bike riding, cross-country skiing, wildlife viewing and photography. Recreational access permits are required for all non-tribal members using these recreation areas and all other tribal lands.

Potential Impacts

Impacts on Land Use

Land Use Impacts during Construction and Operations

Existing roads and trails would be left in comparable or better condition than what existed before construction. Gates would be installed where fences cross the ROW and locks would be installed at the landowner's request. Each route alternatives consists largely of agricultural land and rangeland, and therefore tree and brush removal in the ROW is anticipated to be minimal. Trees and brush will not be removed unless they interfere with construction activities or the safe operation of the transmission line. Woodlands associated with drainages were avoided during the preliminary routing process.

Construction of transmission structures would require some ground leveling. Blading would be confined to the ROW, and any soil removed would be saved and reused for reclamation. Temporary workspace areas would be reshaped to closely match the original contour. Agricultural land and rangeland would also be revegetated or tilled upon completion of structure construction.

Access for construction would be from existing public roads and section line trails within the ROW. Existing roads and section line trails are not expected to require grading. All existing roads and trails would be left in equal or improved conditions.

Impacts on Visual Resources

Changes to visual resources would be both temporary (e.g., digging the foundations for power poles) and permanent (e.g., erection of power poles and lines). Impacts to visual resources would result from both construction activities and the presence of workers, equipment, and vehicles along the construction route. Visual impacts would result from clearing and removal of existing vegetation, exposure of bare soils, and the presence of machinery and new aboveground structures.

The majority of viewers of the Project during construction and operation would be travelers along the transportation corridors in the vicinity of the Project. Their views would typically be limited to short periods of time and small portions of the route. In addition, recreationists using recreation areas within the Lower Brule Reservation may be affected by the addition of power poles and lines. Some individuals viewing the route from residences within 0.75 mile of the route may be able to observe portions of the construction activities throughout the construction period.

Keystone proposes to incorporate measures into the Project that would minimize the visual effects of the Project as described in the CMR Plan (Appendix B).

3.9.11 References

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3.10 SOCIOECONOMICS

This section describes existing socioeconomic conditions and evaluates the potential socioeconomic impacts that may result from the Project. The resource topics used to describe the existing socioeconomic conditions include:

- Population;
- Housing and property values;
- Local economic activity measured primarily by employment and income;
- Tax revenues;
- Public services; and
- Environmental justice.

The socioeconomic topics identified as potentially impacted, either positively or negatively, by the proposed Project include:

- Compensation to property owners for ROW easements, restrictions on land use and damage to property;
- Construction worker demands on local infrastructure;
- Creation of local area jobs;
- Economic benefits from the purchase of goods and services during construction and operations; and
- Fiscal impacts associated with property, sales and other tax revenues, as well as public service costs generated by the proposed Project.

3.10.1 Environmental Setting

This section provides a general overview of the socioeconomic resources that could be affected by the Project and represents existing (or current) socioeconomic conditions in the Project area. Further, it provides context to the analysis of socioeconomic impacts and establishes baseline conditions against which the potential socioeconomic impacts of the proposed Project were evaluated. The data used to establish baseline socioeconomic conditions derive from a variety of federal, state, and local sources. Both text and tables in this section are organized by Project area (e.g., Segment, Pump Station or Lateral), state, and county.

3.10.1.1 Region of Influence

The proposed Project in the U.S. would consist of a 1,380 mile pipeline and ancillary facilities, as described in Section 2.0. From its point of entry into the United States near Morgan, Montana the proposed pipeline would cross 59 counties in six states. From north to south the states are Montana, South Dakota, Nebraska, Kansas, Oklahoma, and Texas (see Table 3.10.1-1).

TABLE 3.10.1-1 States and Counties within the Project Area		
Segment/State	**Number of Counties**	**Counties**
Steel City Segment		
Montana	6	Phillips, Valley, McCone, Dawson, Prairie, Fallon
South Dakota	9	Harding, Butte, Perkins, Meade, Pennington, Haakon, Jones, Lyman, Tripp
Nebraska	14	Keya Paha, Rock, Holt, Garfield, Wheeler, Greeley, Boone, Nance, Merrick, Hamilton, York, Fillmore, Saline, Jefferson
Pump Station		
Kansas	2	Clay, Butler
Gulf Coast Segment		
Oklahoma	9	Atoka, Bryan, Coal, Creek, Hughes, Lincoln, Okfuskee, Payne, Seminole
Texas	16	Angelina, Cherokee, Delta, Fannin, Franklin, Hardin, Hopkins, Jefferson, Lamar, Liberty, Nacogdoches, Polk, Rusk, Smith, Upshur, Wood
Houston Lateral		
Texas	3	Liberty, Chambers, Harris

Source: Keystone 2009c.

Within each county, several local communities are expected to incur most of the direct socioeconomic impacts of the Project, both positive and negative. Communities located with 0.5 miles to 2.0 miles of the proposed pipeline are listed in Table 3.10.1-2. However, for the purposes of the analysis information to describe the environmental setting is reported at the County versus community level. The determination to develop the analysis at the County versus community level is based on the following factors:

- The rural nature of the majority of the potentially affected environment limits the availability of consistent data below the County level.
- Project economic impacts may occur in towns further away than 2 miles from the pipeline.
- In communities that are not predominately rural, such as Houston, located in Harris County Texas, the economic impacts of building and operating the proposed pipeline are relatively small.

Several types of socioeconomic effects could occur within the region of influence, as described in more detail in the impact analysis presented in Section 3.10.2. Temporary effects during construction of the proposed Project could include changes in population levels or local demographics, changes in the demand for housing and public services, disruption of local transportation corridors, increased employment opportunities and related labor income benefits, and increased government revenues associated with sales and payroll taxes. Isolated impacts on individual property owners and economic land use also could occur along the pipeline route. The primary socioeconomic impacts associated with long-term operation of the proposed Project likely would include employment and income benefits resulting from long-term staffing requirements and local operating expenditures, as well as an increased property tax base and associated tax revenues. Long-term impacts could include impacts to property owners if there is any decrease in land value or usefulness as a result of the pipeline. However, tilled agricultural land would still be useable after construction, according to Keystone.

TABLE 3.10.1-2 Communities Within 2 Miles of the Proposed Project		
Community	**County**	**Proximity to Project (miles)**
Steele City Segment		
Montana		
Nashua	Valley	2
Circle	McCone	2
Baker	Fallon	2
South Dakota		
Buffalo	Harding	2
Midland	Haakon	2
Draper	Jones	2
Winner	Tripp	2
Nebraska		
Ericson	Wheeler	2
Hordville	Hamilton	2
McCool Junction	York	2
Exeter	Fillmore	2
Milligan	Fillmore	2
Western	Saline	2
Steele City	Jefferson	2
Pump Stations - Kansas		
Towanda	Butler	0.5
Potwin	Butler	0.5
Augusta[3]	Butler	2
Douglass[3]	Butler	2
Wakefield[3]	Clay	2
Green	Clay	2
Gulf Coast Segment		
Oklahoma		
Stroud	Creek	2
Paden	Okfuskee	2
Boley	Okfuskee	2
Wewoka	Seminole	2
Allen	Pontotoc	2
Allen	Hughes	2
Atoka	Atoka	2
Tushka	Atoka	2
Caney	Atoka	2

TABLE 3.10.1-2 Communities Within 2 Miles of the Proposed Project		
Community	**County**	**Proximity to Project (miles)**
Texas		
Arp	Smith	0.5
Beaumont	Jefferson	0.5
Port Arthur	Jefferson	0.5
Central Gardens	Jefferson	0.5
Nederland	Jefferson	0.5
China	Jefferson	2
Port Neches	Jefferson	2
Tira	Hopkins	2
Winnsboro	Franklin	2
Winnsboro	Wood	2
Big Sandy	Upshur	2
Reklaw	Rusk	2
Wells	Cherokee	2
Hudson	Angelina	2
Diboll	Angelina	2
Corrigan	Polk	2
Houston Lateral		
Texas		
Hardin	Liberty	2
Liberty	Chambers	2
Ames	Harris	0.5
Mont Belvieu	Chambers	0.5
Barrett	Harris	0.5
Highlands	Harris	2
Channelview	Harris	2
Sheldon	Harris	2
Houston	Harris	0.5

States and counties are listed geographically from north to south as the proposed Project crosses the area.
Source: Keystone 2008.

3.10.1.2 Population

Population-related characteristics in the region of socioeconomic influence are summarized in Table 3.10.1-3 and Table 3.10.1-4. The state populations for those states in which the Project would be constructed are shown in Table 3.10.1-3. For reference the U.S. population is also included in Table 3.10.1-3. The annual average increase in population for the period 2000 to 2007 was 0.9 percent for the nation. Every state except Texas experienced an average annual population growth lower than the federal annual average – ranging between 0.5 percent and 0.8 percent. Texas' annual average population growth was 1.9 percent between 2000 and 2007.

TABLE 3.10.1-3
State Population

Geographic Area	Population		Annual Average Percent Change
	2000	2007	
U.S.	282,171,936	301,290,332	0.9%
States			
Montana	903,283	956,624	0.7%
South Dakota	755,657	795,689	0.8%
Nebraska	1,713,194	1,769,473	0.5%
Kansas	2,688,418	2,777,382	0.5%
Oklahoma	3,453,861	3,608,123	0.6%
Texas	20,946,049	23,843,432	1.9%

Source: U.S. Census Population, Population change and estimated components of population change: April 1, 2000 to July 1, 2008 (NST-EST2008-alldata).

The Project route is predominantly rural and sparsely populated, with the population tending to increase from north to south along the route. The total population in the counties comprising the region of influence was over 5.7 million in 2007 (see Table 3.10.1-4). Texas comprised 5.0 million, with 3.9 million of those people living in Harris County where Houston is located. The remainder of the population was distributed across counties that would be traversed by the Project in the other five states as follows: 23,747 in Montana, 146,320 in South Dakota, 85,207 in Nebraska, 71,570 in Kansas, and 323,738 in Oklahoma. The population densities in these five counties range from less than 1 person per square mile to 99 people per square mile. Population densities in Texas are slightly greater, ranging from 10 people per square mile (Coal County) to 1,967 people per square mile (Harris County). These population figures demonstrate the relatively rural nature of the proposed Project area.

In addition to being rural and sparsely populated, the counties within the Project area have experienced relatively low to negative population growth between 2000 and 2007. The counties located within the Project area in Montana and Nebraska experienced a reduction in population ranging from 2.5 percent to 0.1 percent between 2000 and 2007. The counties within the Project route in Kansas, South Dakota and Oklahoma experienced an average annual increase in population for the same time period ranging from 0.6 percent to 0.7 percent. The majority of the average annual population growth occurred in Texas, which experienced a 1.7 percent average annual increase in population between 2000 and 2007 (see Table 3.10.1-4).

TABLE 3.10.1-4
County Population and Population Density

County	Population		Annual Average % Change	Density per Sq. Mile
	Population 2000	Population 2007		
Steele City Segment				
Montana				
Phillips	4,601	3,934	-2.2%	<1

TABLE 3.10.1-4 County Population and Population Density				
County	**Population**		**Annual Average % Change**	**Density per Sq. Mile**
	Population 2000	**Population 2007**		
Valley	7,675	6,884	-1.5%	2
McCone	1,977	1,716	-2.0%	1
Dawson	9,059	8,554	-0.8%	4
Prairie	1,199	1,043	-2.0%	<1
Fallon	1,695	1,616	-0.7%	2
Subtotal Montana	*26,206*	*23,747*	-1.4%	
South Dakota				
Harding	1,353	1,173	-2.0%	<1
Butte	9,094	9,449	0.5%	4
Perkins	3,369	2,907	-2.1%	1
Meade	24,245	24,057	-0.1%	7
Pennington	88,573	96,230	1.2%	32
Haakon	2,196	1,842	-2.5%	1
Jones	1,193	1,047	-1.8%	1
Lyman	3,895	3,882	0.0%	2
Tripp	6,430	5,733	-1.6%	4
Subtotal South Dakota	*140,348*	*146,320*	0.6%	
Nebraska				
Keya Paha	983	851	-2.0%	1
Rock	1,756	1,515	-2.1%	2
Holt	11,551	10,310	-1.6%	5
Garfield	1,902	1,714	-1.5%	3
Wheeler	886	806	-1.3%	2
Greeley	2,714	2,312	-2.3%	5
Boone	6,259	5,505	-1.8%	9
Nance	4,038	3,554	-1.8%	9
Merrick	8,204	7,665	-1.0%	17
Hamilton	9,403	9,282	-0.2%	17
York	14,598	14,339	-0.3%	25
Fillmore	6,634	6,026	-1.4%	12
Saline	13,843	13,823	0.0%	24
Jefferson	8,340	7,505	-1.5%	14
Subtotal Nebraska	*91,111*	*85,207*	-1.0%	
Pump Stations - Kansas				
Clay	8,822	8,691	-0.2%	14
Butler	59484	62879	0.8%	42

TABLE 3.10.1-4 County Population and Population Density				
County	Population		Annual Average % Change	Density per Sq. Mile
	Population 2000	Population 2007		
Subtotal Kansas	*68,306*	*71,570*	0.7%	
Gulf Coast Segment				
Oklahoma				
Atoka	13,879	14,479	0.6%	14
Bryan	36,534	39,298	1.0%	40
Coal	6,031	5,698	-0.8%	12
Creek	67,369	68,940	0.3%	70
Hughes	14,154	13,576	-0.6%	18
Lincoln	32,080	32,211	0.1%	34
Okfuskee	11814	11197	-0.8%	19
Payne	68,186	77,724	1.9%	99
Seminole	24,896	24,103	-0.5%	39
Pontotoc	35,143	36,512	0.5%	49
Subtotal Oklahoma	*310,086*	*323,738*	0.6%	
Texas				
Angelina	80,130	82,570	0.4%	10
Cherokee	46,663	48,056	0.4%	44
Delta	5,327	5,368	0.1%	19
Fannin	31,242	32,930	0.8%	35
Franklin	9,458	11,104	2.3%	33
Hardin	48,073	51,530	1.0%	54
Hopkins	31,960	33,699	0.8%	41
Jefferson	252,051	242,372	-0.6%	279
Lamar	48,499	49,090	0.2%	53
Liberty	70,159	74,930	0.9%	60
Nacogdoches	59,203	62,221	0.7%	62
Polk	41,139	46,206	1.7%	39
Rusk	47,372	48,452	0.3%	51
Smith	174,706	197,952	1.8%	188
Upshur	35,291	37,881	1.0%	60
Wood	36,752	41,817	1.9%	56
Subtotal Texas (Gulf Coast Segment)	*1,018,025*	*1,066,178*	0.7%	
Houston Lateral				
Texas				
Liberty (see the Gulf Coast Segment)				

TABLE 3.10.1-4 County Population and Population Density				
County	Population		Annual Average % Change	Density per Sq. Mile
	Population 2000	Population 2007		
Chambers	26,031	28,740	1.4%	43
Harris	3,400,590	3,912,196	2.0%	1,967
Subtotal Texas (Houston Lateral)	*3,426,621*	*3,940,936*	2.0%	
Subtotal Texas	*4,444,646*	*5,007,114*	1.7%	
Total Counties	5,080,703	5,657,696	1.5%	

Source: US Census County population, population change and estimated components of population change: April 1, 2000 to July 1, 2008 (CO-EST2008-alldata).

Table 3.10.1-5 shows the communities located within a 2-mile proximity of the proposed Project. The total population of these communities is 2.467 million. Of that 2.467 million, 2.208 million are located in Houston. The remaining 259,000 are distributed along the remainder of the proposed Project area. The total community populations by state are; 2,465 located in three communities in Montana, 3,368 located in four communities in South Dakota, 1,520 located in seven communities in Nebraska, 13,251 located in six communities in Kansas 12,210 located in eight communities in Oklahoma and 214,045 in fifteen communities in Texas, excluding Houston. Many of the potentially-affected communities along the northern portions of the route have experienced an average annual reduction in population between 2000 and 2007, particularly in Montana, South Dakota, Nebraska and Kansas. Another indication of the relatively sparsely populated nature of the Project area is the fact that in several counties there are no communities within a 2-mile proximity of the proposed Project, e.g., Phillips, Dawson and Prairie counties in Montana. Likewise in South Dakota, 6 of the 9 counties do not have communities within 2 miles of the Project. In Nebraska there are 8 of 15 counties without communities within 2 miles of the Project. In Oklahoma 3 of 12 and in Texas 7 of 31 counties do not have communities within 2 miles of the Project.

Between 2000 and 2007, the highest average annual growth rate occurred along the Houston Lateral component of the proposed Project, in Mont Belvieu and Houston.

TABLE 3.10.1-5 Population of Communities within 2-mile Proximity of the Project				
County	Communities	Population		Annual Average % Change
		2000	2007	
Steele City Segment				
Montana				
Phillips	NA	NA	NA	NA
Valley	Nashua	325	291	-1.6%
McCone	Circle	644	558	-2.0%
Dawson	NA	NA	NA	NA
Prairie	NA	NA	NA	NA
Fallon	Baker	1,695	1,616	-0.7%
Subtotal Montana		*2,664*	*2,465*	*-1.1%*

TABLE 3.10.1-5 Population of Communities within 2-mile Proximity of the Project				
County	Communities	Population		Annual Average % Change
		2000	2007	
South Dakota				
Harding	Buffalo	380	330	NA
Butte	NA	NA	NA	NA
Perkins	NA	NA	NA	NA
Meade	NA	NA	NA	NA
Pennington	NA	NA	NA	NA
Haakon	Midland	179	150	-2.5%
Jones	Draper	92	83	-1.5%
Lyman	NA	NA	NA	NA
Tripp	Winner	3,137	2,805	-1.6%
Subtotal South Dakota		*3,788*	*3,368*	*-1.7%*
Nebraska				
Keya Paha	NA	NA	NA	NA
Rock	NA	NA	NA	NA
Holt	NA	NA	NA	NA
Garfield	NA	NA	NA	NA
Wheeler	Ericson	104	95	-1.3%
Greeley	NA	NA	NA	NA
Boone	NA	NA	NA	NA
Nance	NA	NA	NA	NA
Merrick	NA	NA	NA	NA
Hamilton	Hordville	150	144	-0.6%
York	McCool Junction	385	NA	NA
Fillmore	Exeter	712	647	-1.4%
Fillmore	Milligan	315	284	-1.5%
Saline	Western	287	274	-0.7%
Jefferson	Steele City	84	76	-1.4%
Subtotal Nebraska		*2,037*	*1,520*	*-4.1%*
Pump Stations				
Kansas				
Clay	Wakefield	838	854	0.3%
Clay	Green	147	137	-1.0%
Butler	Towanda	1,338	1,354	0.2%
Butler	Potwin	457	433	-0.8%
Butler	Douglass	1,813	1,790	-0.2%
Butler	Augusta	8423	8683	0.4%

TABLE 3.10.1-5 Population of Communities within 2-mile Proximity of the Project				
County	Communities	Population		Annual Average % Change
		2000	2007	
Subtotal Kansas		*13,016*	*13,251*	*0.3%*
Gulf Coast Segment				
Oklahoma				
Atoka	Atoka	2,988	3,069	0.4%
Atoka	Tushka	345	366	0.8%
Atoka	Caney	199	210	0.8%
Bryan	NA	NA	NA	NA
Coal	NA	NA	NA	NA
Creek	Stroud	2,758	2,742	-0.1%
Hughes	Allen	2,398	NA	NA
Lincoln	NA	NA	NA	NA
Okfuskee	Paden	446	422	-0.8%
Okfuskee	Boley	1126	1091	-0.5%
Payne	NA	NA	NA	NA
Seminole	Wewoka	3,562	3,326	-1.0%
Pontotoc (?)		35,143	36,512	0.5%
Subtotal Oklahoma		*14,773*	*12,210*	*-2.7%*
Texas				
Angelina	Hudson	3,792	4,231	1.6%
Angelina	Diboll	5,470	5,541	0.2%
Cherokee	Wells	769	792	0.4%
Delta	NA	NA	NA	NA
Fannin	NA	NA	NA	NA
Franklin/Wood	Winnsboro	3,584	3,909	1.2%
Hardin	NA	NA	NA	NA
Hopkins	Tira	248	258	0.6%
Jefferson	Beaumont	113,866	109,579	-0.5%
Jefferson	Port Arthur	57,755	55,313	-0.6%
Jefferson	Central Gardens	4,106	NA	NA
Jefferson	Nederland	17,422	16,178	-1.1%
Jefferson	China	1,112	1,042	-0.9%
Jefferson	Port Neches	13,301	12,681	-0.7%
Lamar	NA	NA	NA	NA
Liberty	NA	NA	NA	NA
Nacogdoches	NA	NA	NA	NA
Polk	Corrigan	1,721	1,887	1.3%

TABLE 3.10.1-5 Population of Communities within 2-mile Proximity of the Project				
County	**Communities**	**Population**		**Annual Average % Change**
		2000	**2007**	
Rusk	Reklaw	327	336	0.4%
Smith	Arp	901	952	0.8%
Upshur	Big Sandy	1,288	1,346	0.6%
Wood	See Franklin	NA	NA	NA
Subtotal Texas (Gulf Coast Segment)		*225,662*	*214,045*	*-0.8%*
Houston Lateral				
Texas				
Liberty	Hardin	755	792	0.7%
Chambers	Liberty	8,033	8,033	0.0%
Chambers	Mont Belvieu	2,324	2,637	1.8%
Harris	Ames	1,079	1,138	0.8%
Harris	Barrett	2,872	NA	NA
Harris	Highlands	7,089	NA	NA
Harris	Channelview	29,685	NA	NA
Harris	Sheldon	1,831	NA	NA
Harris	Houston	1,953,631	2,208,180	1.8%
Subtotal Texas (Houston Lateral)		*2,007,299*	*2,220,780*	*1.5%*
Subtotal Texas		*2,232,961*	*2,434,825*	*1.2%*
Total All Communities		**2,269,239**	**2,467,639**	**1.2%**

Population, Population change and estimated components of population change: April 1, 2000 to July 1, 2008 (NST-EST2008-alldata).

3.10.1.3 Housing

Available housing to serve the Project is a function of the housing stock (mainly rental and short-term accommodations), recent economic and population growth, and demand for housing from other sources. Tables 3.10.1-6 and 3.10.1-7 show the existing housing units in the Project area and the existing short-term housing resources, such as rentals and hotel and motel rooms.

The total number of housing units in the counties that would be crossed by the Project was estimated at over 2,187,827 in 2007, with 1,557,935 (71.2 percent) of those units in the Houston lateral (Table 3.10.1-6). The fewest number of units are found in Montana, Kansas and Nebraska with 14,622 units, 29,850 units and 41,082 units, respectively. Most of the existing housing stock is occupied single-family residences that would not be available for use by Project workers.

TABLE 3.10.1-6 Housing Units for Counties along the Project				
County	Total Housing Units		Percent of Total	Building Permits
	Housing Units 2000	Housing Units 2007		
Steele City Segment				
Montana				
Phillips	2,502	2,484		0
Valley	4,847	4,807		1
McCone	1,087	1,076		0
Dawson	4,168	4,135		3
Prairie	718	711		0
Fallon	1,410	1,409		0
Subtotal Montana	*14,732*	*14,622*	*0.7%*	*4*
South Dakota				
Harding	804	804		0
Butte	4,059	4,384		91
Perkins	1,854	1,897		5
Meade	10,149	11,523		118
Pennington	37,249	42,208		838
Haakon	1,002	1,036		3
Jones	614	627		5
Lyman	1,636	1,690		6
Tripp	3,036	3,098		0
Subtotal South Dakota	*60,403*	*67,267*	*3.1%*	*1,066*
Nebraska				
Keya Paha	548	572		3
Rock	935	947		3
Holt	5,281	5,425		8
Garfield	1,021	1,028		2
Wheeler	561	573		0
Greeley	1,199	1,221		0
Boone	2,733	2,787		11
Nance	1,787	1,771		7
Merrick	3,649	3,770		30
Hamilton	3,850	3,980		28
York	6,172	6,240		22
Fillmore	2,990	2,989		6
Saline	5,611	5,788		62
Jefferson	3,942	3,991		21
Subtotal Nebraska	*40,279*	*41,082*	*1.9%*	*203*

TABLE 3.10.1-6 Housing Units for Counties along the Project				
County	Total Housing Units		Percent of Total	Building Permits
	Housing Units 2000	Housing Units 2007		
Pump Stations - Kansas				
Clay	4,084	4,200		20
Butler	23,176	25,650		408
Subtotal Kansas	*27,260*	*29,850*	*1.4%*	*428*
Gulf Coast Segment				
Oklahoma				
Payne	29,326	32,906		167
Lincoln	13,712	14,241		24
Creek	27,986	29,603		228
Okfuskee	5,114	5,314		5
Seminole	11,146	11,537		21
Hughes	6,237	6,368		4
Coal	2,744	2,821		1
Atoka	5,673	5,868		7
Bryan	16,715	17,998		415
Subtotal Oklahoma	*118,653*	*126,656*	*5.8%*	*872*
Texas				
Fannin	12,887	13,568		44
Lamar	21,113	22,130		81
Delta	2,410	2,489		11
Hopkins	14,020	14,651		14
Franklin	5,132	5,410		4
Wood	17,939	18,607		14
Upshur	14,930	15,593		67
Smith	71,701	77,281		679
Cherokee	19,173	19,965		33
Rusk	19,867	20,598		8
Nacogdoches	25,051	26,720		256
Angelina	32,435	34,125		185
Polk	21,177	22,636		460
Liberty	26,359	28,294		293
Hardin	19,836	20,966		129
Jefferson	102,080	104,499		1,576
Subtotal Texas -Gulf Coast	*426,110*	*447,532*	*20.5%*	*3,854*
Houston Lateral				
Texas				

TABLE 3.10.1-6 Housing Units for Counties along the Project				
County	Total Housing Units		Percent of Total	Building Permits
	Housing Units 2000	Housing Units 2007		
Chambers	10,336	13,351		368
Harris	1,298,130	1,544,584		46,455
Subtotal Texas – Houston Lateral	*1,308,466*	*1,557,935*	*71.2%*	*46,823*
Subtotal Texas	*1,734,576*	*2,005,467*	*91.7%*	*50,677*
Total All Communities		1,908,240	2,187,827	*100.0%*

[1] States and counties are listed geographically from north to south as proposed Project crosses area.

[2] Housing in counties on the Cushing Extension were analyzed as part of the Keystone Pipeline Project and are included for clarity only. Construction in these counties would be related to pump stations only except in Jefferson County, NE, and Payne County, OK, where some new pipeline construction would occur.

NA = Data not available.

Source: Census 2000.

More pertinent to the analysis is the number of rental units and short-term accommodations, such as motel and hotel rooms and recreational vehicle (RV) sites, and related vacancy rates (Table 3.10.1-7). The total number of rental units located across all affected counties was about 757,191 in 2000, of which 592,018 (78.2 percent) were located in Chambers and Harris counties in Texas. Montana, Kansas and Nebraska had the fewest rental units. Rental vacancy rates and available rental housing varied considerably across states and counties. The highest vacancy rates for rental units were in Montana, ranging from 7.9 percent to 25.8 percent in the affected counties, compared with the lowest weighted average of 8.3 percent in Nebraska. Based on these data, approximately 68,051 vacant rental units are available in the region of influence, of which 49,451 occur in the counties along the Houston Lateral. At the county level, the number of available units is smallest in Wheeler County, Nebraska at nine units.[1] Of the 57 counties in the Project area, 12 had less than 50 available units. Most of those counties are located in Montana and South Dakota.

Within the spectrum of currently available housing, alternatives to rental housing are temporary short-term accommodations in hotels/motels rooms, and RV sites. In some cases, recreational cabins and seasonal housing for migratory workers also may be available. Short-term accommodations are more flexible and likely would be the preferred form of housing for construction workers. It is estimated that approximately 23,855 hotel/motel rooms are located within a 50-mile corridor of the pipeline route. Of that number more than half are located in the two-county Houston Lateral portion of the Project. The fewest hotels/motel rooms are in Kansas (356) and Montana (761). The total number of hotels/motel rooms and RV sites by county are presented in Table 3.10.1-7. The availability of short-term accommodations varies throughout the year and depends on a number of factors, including seasonal fluctuations and timing of local events.

[1] Available units are calculated by multiplying the rental units by the vacancy rate.

TABLE 3.10.1-7 Short-term Housing Assessment for Counties along the Project							
	Rentals (2000)				Hotel/ Motel		
County	**Units**	**Vacancy Rate**	**Per cent of Total**	**Available Units (Calculated)**	**Rooms**	**Percent of Total**	**RV Sites**
Steele City Segment							
Montana							
Phillips	632	14.1		89	126		40
Valley	826	7.9		65	253		44
McCone	240	25.8		62	14		0
Dawson	1,076	12.5		135	277		94
Prairie	143	15.4		22	0		9
Fallon	333	22.5		75	91		18
Subtotal Montana	*3,250*	*13.8*	*0.4%*	448	*761*	*3.2%*	*205*
South Dakota							
Harding	152	8.6		13	20		0
Butte	1,119	15.9		178	222		93
Perkins	396	15.4		61	90		0
Meade	3,105	9.9		307	398		465
Pennington	12,516	6.4		801	4,045		1,895
Haakon	233	13.3		31	29		21
Jones	159	11.9		19	189		200
Lyman	477	10.1		48	390		166
Tripp	736	12.4		91	194		20
Subtotal South Dakota	*18,893*	*8.2*	*2.5%*	1,550	*5,577*	*23.4%*	*2,860*
Nebraska							
Keya Paha	124	8.1		10	0		20
Rock	216	4.6		10	36		0
Holt	1,376	11.6		160	198		19
Garfield	257	13.2		34	28		25
Wheeler	117	7.7		9	0		0
Greeley	244	5.3		13	0		0
Boone	676	9.8		66	34		0
Nance	440	9.3		41	16		0
Merrick	896	7.4		66	33		0
Hamilton	956	8.8		84	10		45
York	1,905	8.3		158	575		4
Fillmore	742	7.5		56	26		0
Saline	1,598	4.8		77	77		48

TABLE 3.10.1-7 Short-term Housing Assessment for Counties along the Project							
	Rentals (2000)				Hotel/ Motel		
County	**Units**	**Vacancy Rate**	**Per cent of Total**	**Available Units (Calculated)**	**Rooms**	**Percent of Total**	**RV Sites**
Jefferson	932	9.4		88	45		0
Subtotal Nebraska	*10,479*	*8.3*	*1.4%*	871	*1,078*	*4.5%*	*161*
Pump Stations - Kansas							
Clay	973	13.6		132	55		0
Butler	5,327	9.8		522	301		36
Subtotal Kansas	*6,300*	*10.4*	*0.8%*	654	*356*	*1.5%*	*36*
Gulf Coast Segment							
Oklahoma							
Payne	12,680	7.3		926	650		0
Lincoln	2,738	10.9		298	145		29
Creek	6,182	10.1		624	142		0
Okfuskee	1,138	10.6		121	47		0
Seminole	2,991	12		359	141		0
Hughes	1,403	8.2		115	13		0
Coal	653	9.6		63	27		0
Atoka	1,354	12.9		175	54		0
Bryan	4,887	9.7		474	203		159
Subtotal Oklahoma	*34,026*	*9.3*	*4.5%*	3,154	*1,422*	*6.0%*	*188*
Texas							
Fannin	3,167	11.5		364	53		0
Lamar	6,902	9.4		649	621		0
Delta	506	5.9		30	0		0
Hopkins	4,034	12.7		512	466		0
Franklin	907	13		118	44		0
Wood	3,003	9.7		291	61		0
Upshur	2,745	11.7		321	74		0
Smith	22,065	9.8		2,162	1,937		180
Cherokee	4,895	10		490	222		0
Rusk	3,891	10.3		401	240		0
Nacogdoches	9,334	9.4		877	106		24
Angelina	8,810	10.1		890	920		0
Polk	3,212	13.9		446	281		215
Liberty	5,405	9.6		519	168		0
Hardin	3,545	12.9		457	108		0

TABLE 3.10.1-7 Short-term Housing Assessment for Counties along the Project							
	Rentals (2000)				Hotel/ Motel		
County	**Units**	**Vacancy Rate**	**Per cent of Total**	**Available Units (Calculated)**	**Rooms**	**Percent of Total**	**RV Sites**
Jefferson	34,997	9.7		3,395	2,911		144
Subtotal Texas	*117,418*	*10.2*	*15.5%*	11,923	*8,212*	*34.4%*	*563*
Houston Lateral							
Texas							
Chambers	1,804	17		307	202		110
Harris	590,214	8.7		51,349	12,180		501
Texas – Houston Lateral Total	*592,018*	*8.7*	*78.2%*	51,655	*12,382*	*51.9%*	*611*
Subtotal Texas	*709,436*	*8.9*	*93.7%*	63,140	*20,594*	*86.3%*	*1,174*
Total All Communities	**757,191**	**9.3**	*100.0%*	**68,051**	**23,855**	*100.0%*	**1,728**

[1] States and counties are listed geographically from north to south as proposed Project crosses area.

[2] Housing in counties on the Cushing Extension were analyzed as part of the Keystone Pipeline Project and are included for clarity only. Construction in these counties would be related to pump stations only except in Jefferson County, NE, and Payne County, OK, where some new pipeline construction would occur.

NA = Data not available.

Sources: Keystone 2009 from primary data sources: Rentals: Census 2000, RV sites: using Delorme Gazetteers; Total hotel and motel rooms: were found using www.travelpost.com/hotels.aspx, www.aaacolorado.com/travel/, www.tripadvisor.com/

3.10.1.4 Economic Activity

Employment and income patterns provide insight into local economic conditions, including the strength of the local economy and the well-being of its residents. Summary statistics covering these economic parameters are shown in Table 3.10.1-8. The most recent per capita income, median household income, unemployment rates, and work force statistics for each county are shown in Table 3.10.1-8 along with one historical data point. For reference, data are included for each state and the U.S. In every state on the Project route, both the 2007 per capita income and the 2007 median household income were less than the U.S. levels. In nearly every county the 2007 per capita income and median household income were less than the respective state levels. Despite the relatively lower level of income the most recent unemployment rate (June 2009) in each state is lower than the U.S. level for the same time period. The county unemployment rates are generally less than the respective state unemployment rates, except in Oklahoma and Texas. Each statistic is discussed below in more detail.

The state with the lowest 2007 per capita income is Montana, at $33,225, or $5,390 less than the national average. The state with the highest 2007 per capita income is Texas, at $37,083, or $1,532 less than the national average. The county with the lowest per capita income in 2007 was Keya Paha, Nebraska at $21,254, or $15,118 less than per capita income for Nebraska. The county with the highest per capita income is Harris, Texas (where Houston is located) at $49,634, or $12,551 larger than the state level. The range of county-level per capita income ($21,254 to $49,634) shows the diversity of economic conditions along the Project corridor.

The state with the lowest 2007 median household income is Oklahoma at $41,551, or $9,189 less than the national level. The state with the highest 2007 median household income is Texas at $47,563, or $3,177 less than the national average. The county with the lowest median household income in 2007 was Hughes, Oklahoma at $28,689, or $12,862 less than Oklahoma's median household income. The county with the lowest median income relative to the state level is Keya Paha, Nebraska, with a difference of $16,067 from the state level. Chambers County, Texas had the highest median household income at $62,164, or $14,601 higher than Texas. This range of county-level median household income ($28,689 to $62,124) also demonstrates the diversity of economic conditions along the Project corridor.

The state with the highest unemployment rate in June 2009 is Texas, at 7.5 percent or 2.2 percent lower than the national level of 9.7 percent. The state with the lowest unemployment rate in June 2009 is Nebraska at 5.0 percent, or 4.7 percent less than the national average. The county with the highest unemployment rate is Hughes, Oklahoma at 11.7 percent, or 5.4 percent higher than the state level. The lowest unemployment rate is in Garfield County, Nebraska at 2.7 percent, or 2.3 percent less than the state average. The relatively lower unemployment rates along most of the Project corridor shows the diversity of economic conditions and the dependence on agriculture in many of the counties, as the unemployment statistic is for non-farm payroll employment.

The number of individuals in the work force by county ranges from a low of 384, in Keya Paha, Nebraska to a high of 1,945,022 in Harris, Texas. The work force numbers represent all individual either employed or unemployed and looking for employment.

TABLE 3.10.1-8
Per Capita Income, Median Household Income and Unemployment Rates by County (nominal dollars)

	Per Capita Income [a]			Median Household Income [b]			Unemployment Rate [c]				Labor Force
	2007	1999	2007 higher (+) lower (-) than State [d]	2007	2004	2007 higher (+) lower (-) than State [d]	Jun-09	2008	2002	June '09 higher (+) lower (-) than State [d]	2008 [e]
Steele City Segment											
Montana											
Phillips	$26,876	$17,288	-6,349	$33,798	$31,742	-9,202	4.40%	4.50%	4.50%	-2.00%	2,179
Valley	$31,556	$23,247	-1,669	$37,019	$34,514	-5,981	4.40%	3.80%	4.10%	-2.00%	3,649
McCone	$24,857	$20,499	-8,368	$38,535	$29,746	-4,465	3.00%	2.60%	2.70%	-3.40%	1,015
Dawson	$29,268	$20,307	-3,957	$43,678	$35,740	678	4.10%	3.30%	3.40%	-2.30%	4,386
Prairie	$28,874	$21,524	-4,351	$32,857	$31,221	-10,143	3.30%	3.80%	5.10%	-3.10%	578
Fallon	$35,405	$20,281	2,180	$42,408	$37,822	-592	3.00%	2.30%	3.30%	-3.40%	1,824
State of Montana	**$33,225**	**$21,585**	**-5,390**	**$43,000**	**$35,574**	**-7,740**	**6.40%**	**4.50%**	**4.50%**	**-3.30%**	**506,162**
South Dakota											
Harding	$26,439	$17,807	-9,321	$34,729	$32,895	-8,778	4.10%	2.80%	2.50%	-1.00%	762
Butte	$29,497	$18,341	-6,263	$38,513	$33,286	-4,994	5.70%	2.70%	3.20%	0.60%	5,411
Perkins	$28,636	$22,162	-7,124	$34,085	$30,730	-9,422	4.60%	3.10%	3.20%	-0.50%	1,603
Meade	$35,599	$22,237	-161	$46,063	$44,516	2,556	4.80%	3.00%	3.00%	-0.30%	12,579
Pennington	$36,425	$25,099	665	$44,296	$40,624	789	4.80%	2.90%	3.10%	-0.30%	54,828
Haakon	$42,511	$28,797	6,751	$40,461	$33,470	-3,046	3.50%	2.60%	2.30%	-1.60%	1,154
Jones	$31,324	$26,213	-4,436	$36,106	$31,281	-7,401	3.20%	2.40%	2.00%	-1.90%	694
Lyman	$26,024	$21,419	-9,736	$32,330	$30,035	-11,177	6.20%	4.80%	4.50%	1.10%	1,968
Tripp	$30,384	$21,180	-5,376	$35,631	$32,606	-7,876	3.80%	3.00%	4.10%	-1.30%	2,935
State of South Dakota	**$35,760**	**$24,475**	**-2,855**	**$43,507**	**$39,265**	**-7,233**	**5.10%**	**3.00%**	**3.30%**	**-4.60%**	**444,892**
Nebraska											
Keya Paha	$21,254	$13,813	-15,118	$31,005	$32,279	-16,067	4.40%	4.70%	3.80%	-0.60%	384

TABLE 3.10.1-8
Per Capita Income, Median Household Income and Unemployment Rates by County (nominal dollars)

Rock	$23,001	$19,493	-13,371	$32,257	$27,512	-14,815	3.10%	2.90%	2.80%	-1.90%	839
Holt	$31,910	$21,025	-4,462	$37,354	$35,139	-9,718	3.00%	2.70%	3.00%	-2.00%	6,092
Garfield	$28,712	$22,361	-7,660	$32,967	$30,568	-14,105	2.70%	2.60%	2.90%	-2.30%	1,051
Wheeler	$26,742	$21,715	-9,630	$34,173	$33,834	-12,899	4.30%	2.50%	2.20%	-0.70%	435
Greeley	$29,263	$19,654	-7,109	$34,812	$32,241	-12,260	3.80%	3.00%	3.60%	-1.20%	1,298
Boone	$30,930	$21,047	-5,442	$37,466	$35,655	-9,606	3.30%	2.70%	3.10%	-1.70%	3,214
Nance	$31,190	$20,466	-5,182	$38,372	$35,011	-8,700	3.30%	3.00%	4.50%	-1.70%	2,057
Merrick	$29,338	$21,476	-7,034	$41,711	$38,222	-5,361	3.90%	3.00%	3.80%	-1.10%	4,296
Hamilton	$30,294	$22,302	-6,078	$49,655	$45,934	2,583	3.00%	6.40%	3.00%	-2.00%	5,895
York	$32,536	$24,966	-3,836	$48,369	$41,098	1,297	4.10%	3.70%	3.00%	-0.90%	7,115
Fillmore	$33,949	$25,850	-2,423	$41,162	$38,911	-5,910	3.50%	3.00%	3.50%	-1.50%	3,195
Saline	$30,142	$21,541	-6,230	$45,645	$41,876	-1,427	4.10%	3.40%	3.00%	-0.90%	8,533
Jefferson	$32,691	$22,183	-3,681	$39,914	$37,559	-7,158	4.80%	3.90%	4.60%	-0.20%	4,394
State of Nebraska	**$36,372**	**$26,465**	**-2,243**	**$47,072**	**$42,166**	**-3,668**	**5.00%**	**3.30%**	**3.70%**	**-4.70%**	**995,642**
Kansas											
Clay	$34,076	$23,697	-2,449	$42,035	$37,306	-5,306	4.20%	3.30%	4.30%	-2.80%	5,077
Butler	$34,739	$25,351	-1,786	$56,372	$49,599	9,031	7.20%	4.10%	5.70%	0.20%	33,094
State of Kansas	**$36,525**	**$26,195**	**-2,090**	$47,341	$41,664	**-3,399**	**7.00%**	**4.40%**	**5.10%**	**-2.70%**	**1,496,954**
Gulf Coast Segment											
Oklahoma											
Payne	$27,050	$19,244	-7,947	$33,840	$31,259	-7,711	6.30%	4.00%	3.50%	0.00%	35,805
Lincoln	$26,316	$18,280	-8,681	$38,204	$33,820	-3,347	7.00%	4.00%	5.00%	0.70%	14,061
Creek	$27,585	$19,779	-7,412	$41,745	$36,134	194	7.80%	4.40%	5.50%	1.50%	30,948
Okfuskee	$22,415	$14,343	-12,582	$29,516	$26,340	-12,035	8.80%	4.20%	5.80%	2.50%	4,614
Seminole	$26,460	$15,974	-8,537	$33,207	$27,124	-8,344	9.60%	4.60%	7.00%	3.30%	11,069
Hughes	$22,449	$14,774	-12,548	$28,689	$25,324	-12,862	11.70%	5.60%	7.30%	5.40%	5,046
Coal	$21,426	$14,230	-13,571	$30,241	$25,525	-11,310	9.60%	5.00%	6.60%	3.30%	2,496

TABLE 3.10.1-8
Per Capita Income, Median Household Income and Unemployment Rates by County (nominal dollars)

Atoka	$21,348	$14,713	-13,649	$29,810	$27,211	-11,741	8.60%	4.70%	5.10%	2.30%	6,061
Bryan	$27,361	$18,106	-7,636	$33,584	$29,055	-7,967	5.00%	3.40%	3.90%	-1.30%	20,712
State of Oklahoma	**$34,997**	**$22,567**	**-3,618**	**$41,551**	**$37,109**	**-9,189**	**6.30%**	**3.80%**	**4.80%**	**-3.40%**	**1,748,421**
Texas											
Fannin	$25,258	$19,465	-11,825	$40,840	$35,434	-6,723	7.80%	5.90%	7.80%	0.30%	13,657
Lamar	$27,500	$21,730	-9,583	$38,110	$32,581	-9,453	6.70%	5.50%	6.90%	-0.80%	23,811
Delta	$25,066	$18,721	-12,017	$34,975	$31,122	-12,588	7.30%	5.30%	6.30%	-0.20%	2,340
Hopkins	$27,843	$22,168	-9,240	$39,105	$33,267	-8,458	5.40%	4.20%	5.40%	-2.10%	17,482
Franklin	$28,517	$22,126	-8,566	$40,152	$35,830	-7,411	5.90%	4.30%	4.80%	-1.60%	5,387
Wood	$26,537	$19,143	-10,546	$40,592	$34,843	-6,971	7.10%	5.10%	6.40%	-0.40%	18,250
Upshur	$28,164	$19,918	-8,919	$40,616	$34,690	-6,947	7.30%	4.30%	6.40%	-0.20%	19,709
Smith	$34,713	$25,543	-2,370	$44,699	$39,665	-2,864	7.00%	5.00%	5.60%	-0.50%	98,942
Cherokee	$27,439	$21,562	-9,644	$35,413	$30,223	-12,150	8.50%	6.00%	5.80%	1.00%	20,374
Rusk	$28,081	$19,140	-9,002	$41,906	$35,343	-5,657	6.80%	4.40%	6.60%	-0.70%	24,081
Nacogdoches	$24,491	$19,056	-12,592	$32,774	$29,952	-14,789	5.60%	4.40%	5.50%	-1.90%	30,614
Angelina	$32,627	$20,944	-4,456	$37,953	$35,749	-9,610	8.10%	4.90%	6.60%	0.60%	38,987
Polk	$31,832	$22,873	-5,251	$37,152	$36,368	-10,411	8.30%	6.40%	7.80%	0.80%	16,653
Liberty	$30,638	$19,958	-6,445	$46,159	$39,120	-1,404	9.30%	6.00%	8.20%	1.80%	31,455
Hardin	$32,380	$21,307	-4,703	$52,798	$41,677	5,235	8.70%	5.50%	7.30%	1.20%	25,947
Jefferson	$33,795	$22,894	-3,288	$39,499	$35,110	-8,064	9.00%	6.80%	7.80%	1.50%	113,734
State of Texas	**$37,083**	**$26,250**	**-1,532**	**$47,563**	**$41,645**	**-3,177**	**7.50%**	**4.90%**	**6.40%**	**-2.20%**	**11,701,608**
Houston Lateral											
Texas											
Chambers	$38,856	$25,883	1,773	$62,164	$54,474	14,601	8.60%	5.80%	5.20%	1.10%	14,254
Harris	$49,634	$32,633	12,551	$49,977	$41,922	2,414	6.90%	4.80%	6.10%	-0.60%	1,945,022
State of Texas	**$37,083**	**$26,250**	**-1,532**	**$47,563**	**$41,645**	**-3,177**	**7.50%**	**4.90%**	**6.40%**	**-2.20%**	**11,701,608**
U.S.	**$38,615**	**$27,939**	**NA**	**$50,740**	**$44,334**	**NA**	**9.70%**	**5.80%**	**5.80%**	**0.00%**	**NA**

[1] States and counties are listed geographically from north to south as proposed Project crosses area.

[2] Housing in counties on the Cushing Extension were analyzed as part of the Keystone Pipeline Project and are included for clarity only. Construction in these counties would be related to pump stations only except in Jefferson County, NE, and Payne County, OK, where some new pipeline construction would occur.

Notes:

(a) U.S. Bureau of Economic Analysis, Regional Economic Accounts, Local Area Personal Income, Table CA1-3: Per capita personal income, http://bea.gov/regional/reis/.

(b) U.S. Census Bureau, Small Area Income & Poverty Estimates, State and County Interactive Table, http://www.census.gov/did/www/saipe/data/statecounty/index.html.

(c)) U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics, http://www.bls.gov/lau/#tables.

(d) For each state the difference is reported as the difference between US and state

(e) Source: Bureau of Labor Statistics, Local Area Umemployment Statistics, County Data. http://www.bls.gov/lau/#tables

3.10.1.5 Tax Revenue

The Project would generate varied tax revenues for local and state jurisdictions, as well as the federal government. The major incremental tax revenue at the state and local levels would be property taxes, which are based on the assessed value of Project facilities and applicable tax rates. Generally, states assess the value of pipelines in order to facilitate consistent valuation among counties crossed within the state. Table 3.10.1-9 displays the 2007 property tax levied by county, the assessed value of property and the implied effective tax rate by county for the Project area of influence.

Effective property tax rates in the area of influence range from a low of 1.05 percent of property value in Harding County, South Dakota to a high of 2.73 percent in Jefferson County, Texas. In general the property tax rates are between 1.0 and 3.0 percent, with an average of 2.09 percent. The property tax rates in Texas are relatively higher than the other counties within the area of influence, averaging above 2.0 percent.

Other fiscal revenues that may be generated by the proposed Project include sales and use taxes, which are based on the value of goods and materials purchased for the Project and by construction workers, as well as income taxes levied on labor earnings. In some states, there may be corporation taxes at both a state and local level as well. In addition, federal agencies assess fees for use of public lands for activities such as pipeline ROWs and electrical transmission line or electrical distribution line ROWs. Applicable sales and income tax rates vary across counties.

TABLE 3.10.1-9
2007 Tax Levy and Assessed Valuation by County

Project Component - State/ County	Taxes Levied ($)	Assessed Value ($)	Effective Tax Rate (%)
Steele City Segment			
Montana			
Phillips	5,365,348	321,173,215	1.67%
Valley	10,664,457	485,988,933	2.19%
McCone	3,164,719	191,888,122	1.65%
Dawson	9,655,689	389,463,999	2.48%
Prairie	1,653,199	94,403,567	1.75%
Fallon	4,841,377	334,310,467	1.45%
Subtotal Montana	*35,344,789*	*1,817,228,303*	*1.94%*
South Dakota			
Harding	2,226,716	212,834,056	1.05%
Butte	(a)	431,961,877	(a)
Perkins	3,264,315	242,943,061	1.34%
Meade	21,100,792	1,283,587,876	1.64%
Pennington	95,055,282	5,844,272,499	1.63%
Haakon	(a)	238,038,114	(a)
Jones	1,698,003	159,781,297	1.06%
Lyman	4,006,951	366,472,296	1.09%
Tripp	6,353,944	477,303,334	1.33%

TABLE 3.10.1-9 2007 Tax Levy and Assessed Valuation by County			
Project Component - State/ County	**Taxes Levied ($)**	**Assessed Value ($)**	**Effective Tax Rate (%)**
Subtotal South Dakota	*133,706,003*	*9,257,194,410*	*1.44%*
Nebraska			
Keya Paha	2,973,340	197,869,109	1.50%
Rock	4,312,550	252,048,909	1.71%
Holt	20,636,815	1,207,224,347	1.71%
Garfield	2,820,969	167,106,798	1.69%
Wheeler	2,759,762	211,131,099	1.31%
Greeley	5,476,377	316,644,025	1.73%
Boone	11,719,719	692,307,733	1.69%
Nance	6,523,215	351,882,579	1.85%
Merrick	12,719,873	677,474,809	1.88%
Hamilton	18,045,995	1,087,894,709	1.66%
York	23,513,215	1,323,917,546	1.78%
Fillmore	13,731,263	753,036,314	1.82%
Saline	20,727,020	1,058,221,220	1.96%
Jefferson	13,245,717	717,959,001	1.84%
Subtotal Nebraska	*159,205,830*	*9,014,718,198*	*1.77%*
Pump Stations - Kansas			
Clay	9,547,982	706,839,030	1.35%
Butler	79,382,164	5,849,633,370	1.36%
Subtotal Kansas	*88,930,146*	*6,556,472,400*	*1.36%*
Gulf Coast Segment			
Oklahoma			
Atoka	2,498,917	30,238,520	8.26%
Bryan	11,413,199	136,416,335	8.37%
Coal	958,960	11,798,330	8.13%
Creek	22,517,818	225,072,546	10.00%
Hughes	2,522,911	33,385,804	7.56%
Lincoln	7,058,488	78,055,230	9.04%
Okfuskee	1,959,761	23,543,168	8.32%
Payne	28,349,366	293,459,900	9.66%
Seminole	4,357,597	48,614,451	8.96%
Pontotoc	7,918,904	98,800,803	8.02%
Subtotal Oklahoma	*89,555,921*	*979,385,087*	*9.14%*
Texas			
Angelina	60,969,218	3,052,256,882	2.00%
Cherokee	34,338,336	1,812,810,085	1.89%

TABLE 3.10.1-9 2007 Tax Levy and Assessed Valuation by County			
Project Component - State/ County	**Taxes Levied ($)**	**Assessed Value ($)**	**Effective Tax Rate (%)**
Delta	4,534,214	310,482,390	1.46%
Fannin	22,818,196	1,219,567,614	1.87%
Franklin	12,764,553	1,201,312,450	1.06%
Hardin	$45,760,882	2,061,986,220	2.22%
Hopkins	29,938,733	1,471,649,558	2.03%
Jefferson	506,643,329	18,574,203,161	2.73%
Lamar	47,442,151	2,229,909,021	2.13%
Liberty	81,305,222	4,153,229,220	1.96%
Nacogdoches	52,297,618	2,837,250,144	1.84%
Polk	36,050,016	2,111,521,453	1.71%
Rusk	67,211,423	4,444,332,830	1.51%
Smith	212,734,763	12,541,361,198	1.70%
Upshur	33,340,080	1,911,716,646	1.74%
Wood	41,862,352	2,910,033,737	1.44%
Subtotal Texas (Gulf coast Segment)	*1,290,011,086*	*62,843,622,609*	*2.05%*
Houston Lateral			
Texas			
Liberty	*see above*	*see above*	*see above*
Chambers	126,062,105	6,078,153,460	2.07%
Harris	6,333,806,178	304,029,290,532	2.08%
Subtotal Texas (Houston Lateral)	*6,459,868,283*	*310,107,443,992*	*2.08%*
Subtotal Texas	*7,749,879,369*	*372,951,066,601*	*2.08%*
Total Counties	**8,248,703,154**	**400,477,264,196**	***2.06%***

Sources: South Dakota, Equalized Valuations and Property Taxes Collected from All Sources, http://www.state.sd.us/drr2/propspectax/property/publications.htm

Nebraska Dept of Revenue Property Assessment Division 2007 and 2008 Comparison, December 2008.http://pat.ne.gov/researchReports/map/index.html

Oklahoma, Personal communication with Teresa Strawther, Ad Valorem Division, Oklahoma Tax Commission, July 27, 2009

Kansas http://www.ksrevenue.org/pdf/forms/08arcomplete.pdf

Texas taxes by County http://www.window.state.tx.us/taxinfo/proptax/07taxrates/. Includes County, School and Special District Taxes on the County Valuation.

Note: (a) County did not report.

3.10.1.6 Public Services

The region of influence is served by a range of public services and service providers. Public services most pertinent to the proposed Project include police and fire protection and medical facilities.[2] Table 3.10.1-10 shows selected information for relevant public services in the region of influence. Generally, the extent of public service resources in a region is a function of its size, population, and number of established communities. Accordingly, public service infrastructure is typically not as developed in remote rural areas as in urban areas.

There are multiple law enforcement service providers in the region of influence, including state patrols, county sheriff departments, local police departments, and special law enforcement agencies such as university police. In many cases, mutual aid or cooperative agreements allow one agency to provide support to other agencies in emergencies. On average, from 1 to 10 law enforcement agencies serve any given county. In the region of influence, the exception is Harris County, Texas, which is served by 36 law enforcement agencies.

A network of fire departments and districts provides fire protection and suppression services throughout the region of influence. Many of these organizations are staffed by volunteers, particularly in rural areas. In larger urban areas, fire protection staff typically is housed in fire stations. At the county level, the number of fire departments is approximately the same as the number of law enforcement agencies.

Table 3.10.1-10 also shows the nearest medical facilities to the proposed Project; specifically all critical access facilities that are located within 50 miles of the pipeline route. Non-federal, short-term, acute care facilities nearest the route are distinguished in the table based on their likelihood of serving Project-related medical needs. In every county along the pipeline route, there is at least one acute care facility within the county or nearby in a neighboring county. These facilities would provide emergency medical care and, in some cases, would serve as the base for local emergency medical response and transport services for construction accidents or operating concerns.

TABLE 3.10.1-10
Existing Public Services and Facilities along the Project Route

State / County[1]	Police/Sheriff Departments[2]	Fire Departments[2]	Nearest Medical Facilities[3]
Steele City Segment - Montana			
Phillips	1	2	Phillips County Hospital (Malta)
Valley	4	3	Frances Mahon Deaconess Hospital (Glasgow)
McCone	2	1	McCone County Health Center (Circle)
Dawson	2	4	Glendive Medical Center (Glendive)
Prairie	2	1	Prairie Community Health Center (Terry)
Fallon	2	2	Fallon Medical Complex (Baker)
Steele City Segment - South Dakota			
Harding	2	3	
Butte	2	3	
Perkins	3	2	

[2] Education facilities are not addressed in the section because most construction workers are not expected to relocate with school-aged children; therefore, impacts on schools would be negligible.

TABLE 3.10.1-10 Existing Public Services and Facilities along the Project Route			
State / County[1]	Police/Sheriff Departments[2]	Fire Departments[2]	Nearest Medical Facilities[3]
Meade	4	6	Sturgis Regional Hospital (Sturgis)
Pennington	5	14	Rapid City Regional Hospital (Rapid City)
Haakon	2	3	Hans P. Peterson Memorial Hospital (Philip)
Jones	2	1	
Lyman	1	3	
Tripp	2	1	Winner Regional Healthcare Center (Winner)
Steele City Segment - Nebraska			
Keya Paha	1	2	
Rock	1	0	Rock County Hospital (Bassett)
Holt	5	2	Avera St. Anthony's Hospital (O'Neil)
Garfield	3	0	Valley County Hospital: Burwell Medical Clinic (Burwell)
Wheeler	1	0	
Greeley	2	3	
Boone	4	3	Boone County Health Center (Albion)
Nance	1	2	
Merrick	4	3	Litzenberg Memorial County Hospital (Central City)
Hamilton	2	4	Memorial Hospital (Aurora)
York	2	3	York General Hospital (York)
Fillmore	3	6	Fillmore County Hospital (Geneva)
Saline	4	5	
Jefferson	3	5	Jefferson Community Health Center (Fairbury); Thayer County Health Services (Hebron)
Keystone Cushing Extension Pump Stations - Kansas			
Clay[4]	4	3	Clay County Medical Center (Clay Center); *Mercy Regional Health Center (Manhattan)
Butler[4]	8	12	*Newton Medical Center (Newton); *Susan B. Allen Memorial Hospital (El Dorado); *Via Christi Riverside Medical Center (Wichita); *Wesley Medical Center (Wichita)
Gulf Coast Segment - Oklahoma			
Lincoln	9	6	Prague Municipal Hospital (Prague); Stroud Regional Medical Center (Stroud)
Creek	10	10	Bristow Medical Center (Bristow); Sapulpa Hospital (Sapulpa); Saint John Sapulpa (Sapulpa
Okfuskee	4	6	Creek Nation Community Hospital (Okemah)
Seminole	5	6	Seminole Medical Center (Seminole)
Hughes	3	4	Holdenville General Hospital (Holdenville)
Coal	3	4	Mary Hurley Hospital (Coalgate)

TABLE 3.10.1-10 Existing Public Services and Facilities along the Project Route			
State / County[1]	**Police/Sheriff Departments[2]**	**Fire Departments[2]**	**Nearest Medical Facilities[3]**
Atoka	3	7	Atoka Memorial Hospital (Atoka)
Bryan	8	12	Medical Center of Southeastern Oklahoma (Durant)
Lincoln	9	6	Prague Municipal Hospital (Prague); Stroud Regional Medical Center (Stroud)
Gulf Coast Segment - Texas			
Fannin	8	6	Northeast Medical Center (Bonham)
Lamar	7	12	Saint Joseph's (Paris); Dubuis Hospital of Paris (Paris); Paris Regional Medical Center (Paris)
Delta	5	2	Wintermute Memorial Hospital (Klondike)
Hopkins	5	8	Hopkins County Memorial Hospital (Sulphur Springs)
Franklin	2	3	East Texas Medical Center (Mt. Vernon)
Wood	6	6	Presbyterian Hospital of Winnsboro (Winnsboro)
Upshur	4	7	
Smith	8	9	East Texas Medical Center (Tyler); Mother Frances Hospital (Tyler); University of Texas Health Center (Tyler)
Cherokee	5	6	Mother Frances Hospital (Jacksonville); Rusk State Hospital (Rusk)
Rusk	6	6	Henderson Memorial Hospital (Henderson)
Nacogdoches	4	11	Nacogdoches Medical Center (Nacogdoches)
Angelina	6	8	Woodland Heights Medical Center (Lufkin)
Polk	4	8	Memorial Medical Center (Livingston)
Liberty	6	11	Cleveland Regional Medical Center (Cleveland); Kersting Hospital (Liberty); Leggett Memorial Hospital (Cleveland); Liberty-Dayton Hospital (Liberty)
Hardin	6	4	
Jefferson	10	8	Saint Elizabeth Hospital (Beaumont); Debuis Hospital of Beaumont (Beaumont); Memorial Herman Baptist (Beaumont) Saint Mary Hospital (Port Arthur); Promise Specialty Hospital of Southeast Texas (Port Arthur); Mid-Jefferson Hospital (Nederland);
Houston Lateral - Texas			
Liberty			*See Liberty County in Gulf Coast Segment, above*
Chambers	4	5	Bayside Community Hospital & Clinic (Anahuac)
Harris	36	41	Bay Area Surgicare Center (Webster); Bayshore Medical Center (Pasadena); Bayou City Medical Center (Houston); Ben Taub General Hospital (Houston); Children's Memorial Hermann Hospital (Houston);

TABLE 3.10.1-10 Existing Public Services and Facilities along the Project Route			
State / County[1]	**Police/Sheriff Departments[2]**	**Fire Departments[2]**	**Nearest Medical Facilities[3]**
			Saint Catherine Hospital (Katy); Saint John Hospital (Nassau Bay); Saint Joseph Hospital (Houston); Clear Lake Regional Medical Center (Webster); Cypress Creek Hospital (Houston); Cypress Fairbanks Medical Center (Houston); Dubuis Hospital of Houston (Houston); East Houston Regional Medical Center (Houston); Lyndon B. Johnson General Hospital (Houston); Quentin Mease Community Hospital (Houston); Kingwood Medical Center (Kingwood); Spring Branch Medical Center (Houston); West Houston Medical Center (Houston); Women's Hospital of Texas (Houston) Hermann Hospital (Houston); Kindred Hospital Bay Area (Pasadena); Kindred Hospital Houston (Houston); Kindred Hospital Houston Northwest (Houston); Memorial Hermann Northwest Hospital (Houston); Memorial Hermann Katy Hospital (Katy); Memorial Hermann Southeast Hospital (Houston); Memorial Hermann Southwest Hospital (Houston); Methodist Hospital (Houston); Methodist Willowbrook Hospital (Houston); San Jacinto Methodist Hospital (Houston); Michael E. Debakey VA Medical Center (Houston); Park Plaza Hospital (Houston); Parkview Community Hospital (Houston) Saint Joseph Hospital (Houston); Saint Luke's Episcopal Hospital (Houston); Twelve Oaks Medical Center (Houston); West Houston Medical Center (Houston); West Oaks Hospital (Houston)

3.10.1.7 Environmental Justice

Other demographic characteristics of the local population are important to consider when evaluating potential environmental justice impacts of the Project. Environmental justice refers to the "fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." An analysis of potential environmental justice effects is included in this section pursuant to EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (1994). Related guidance—Environmental Justice: Guidance under the National Environmental Policy Act (1997)—also has been prepared by the CEQ. The EPA has developed a GIS Mapping Tool to help identify areas of environmental justice concern within a state. This tool was used to establish the demographic categories of concern.[3] The key socioeconomic demographic data pertinent for environmental justice are the racial/ethnic composition and income status of affected communities, which are summarized in Table 3.10.1-11.

Minority Populations

In accordance with the CEQ Guidance, minority populations should be identified where either (a) the minority population in the affected area exceeds 50 percent; or (b) the minority population of the affected area is meaningfully greater than the minority population in the general population of the surrounding area. For the purposes of this analysis, the "affected area" is defined as county, the "general population" refers to the state within which the county is located, and "meaningfully greater" means at least 1.5 times the corresponding measure for the general population. The percent of minority populations and individuals living below the poverty level by county within the Project area are shown in Table 3.10.1-11.

[3] See http://www.epa.gov/compliance/environmentaljustice/assessment.html

TABLE 3.10.1-11
Environmental Justice Statistics in Affected Communities along the Project Route

County	Total Population	Total Population 2000							Percent of Individuals Living Below Poverty Line (2007)
		White	Black	Native American or Alaskan Native	Asian or Pacific Islander	Hispanic[4]	Other(a)	Two or More Races	
Steele City Segment									
Montana									
Phillips	4,601	89.4%	0.2%	7.6%	0.3%	1.2%	0.4%	2.1%	16.7%
Valley	7,675	88.1%	0.1%	9.4%*	0.2%	0.8%	0.3%	1.8%	14.8%
McCone	1,977	97.0%	0.3%	1.1%	0.3%	1.0%	0.0%	1.4%	11.8%
Dawson	9,059	97.4%	0.3%	1.2%	0.1%	0.9%	0.3%	0.6%	12.2%
Prairie	1,199	98.0%	0.0%	0.5%	0.2%	0.7%	0.2%	1.2%	13.1%
Fallon	2,837	98.6%	0.1%	0.3%	0.4%	0.4%	0.1%	0.5%	9.3%
Subtotal Montana	*902,195*	*98.3%*	*0.3%*	*6.2%*	*0.6%*	*2.0%*	*0.6%*	*1.7%*	*14.1%*
South Dakota									
Harding	1,353	97.6%	0.3%	0.7%	0.6%	1.6%	0.4%	0.4%	11.5%
Butte	9,094	95.5%	0.1%	1.6%	0.2%	2.9%*	1.1%*	1.4%	14.0%
Perkins	3,363	96.6%	0.1%	1.6%	0.2%	0.7%	0.5%	0.8%	13.7%
Meade	24,253	92.7%	1.5%*	2.0%	0.6%	2.1%	0.6%	2.5%*	9.8%
Pennington	88,656	86.7%	0.9%	8.1%	1.0%*	2.6%*	0.7%	2.7%*	12.4%
Haakon	2,196	96.4%	0.0%	2.5%	0.1%	0.6%	0.0%	1.0%	12.0%
Jones	1,193	95.8%	0.0%	2.4%	0.1%	0.3%	0.2%	1.5%	12.9%
Lyman	3,895	64.7%	0.1%	33.3%*	0.2%	0.5%	0.1%	1.6%	22.9%*
Tripp	6,430	87.5%	0.0%	11.2%	0.1%	0.9%	0.1%	1.2%	18.4%
Subtotal South Dakota	*754,844*	*88.7%*	*0.6%*	*8.3%*	*0.6%*	*1.4%*	*0.5%*	*1.3%*	*13.2%*
Nebraska									
Keya Paha	983	99.6%	0.0%	0.4%	0.0%	3.9%	0.0%	0.4%	16.5%

TABLE 3.10.1-11
Environmental Justice Statistics in Affected Communities along the Project Route

County	Total Population	Total Population 2000							Percent of Individuals Living Below Poverty Line (2007)
		White	Black	Native American or Alaskan Native	Asian or Pacific Islander	Hispanic[4]	Other(a)	Two or More Races	
Rock	1,756	99.0%	0.0%	0.7%	0.2%	0.5%	0.1%	0.3%	18.0%*
Holt	11,551	98.9%	0.0%	0.5%	0.2%	0.7%	0.2%	0.4%	13.6%
Garfield	1,902	98.8%	0.0%	0.2%	0.1%	1.0%	0.4%	0.5%	14.2%
Wheeler	886	99.1%	0.0%	0.2%	0.0%	0.6%	0.6%	0.1%	14.9%
Greeley	2,714	97.9%	0.7%	0.1%	0.1%	0.8%	0.8%	0.5%	14.3%
Boone	6,259	99.2%	0.0%	0.0%	0.0%	0.9%	0.3%	0.3%	9.5%
Nance	4,038	98.4%	0.0%	0.8%	0.0%	1.1%	0.4%	0.7%	12.1%
Merrick	8,204	98.3%	0.2%	0.3%	0.2%	2.0%	0.7%	0.5%	9.2%
Hamilton	9,403	98.4%	0.2%	0.1%	0.2%	1.1%	0.5%	0.6%	8.0%
York	14,598	96.8%	1.0%	0.3%	0.6%	1.4%	0.6%	0.8%	9.1%
Fillmore	6,634	97.8%	0.2%	0.4%	0.1%	1.7%	0.8%	0.7%	11.7%
Saline	13,843	93.0%	0.4%	0.4%	1.7%	6.6%	3.4%	1.1%	9.4%
Jefferson	8,333	98.4%	0.1%	0.4%	0.2%	1.3%	0.5%	0.4%	10.8%
Subtotal Nebraska	*1,711,263*	*89.6%*	*4.0%*	*0.9%*	*1.3%*	*5.5%*	*2.8%*	*1.4%*	*11.1%*
Pump Stations - Kansas									
Clay	8,822	97.7%	0.6%	0.4%	0.1%	0.8%	0.3%	0.9%	9.5%
Butler	59,482	94.9%	1.4%	0.9%	0.4%	2.2%	0.7%	1.7%	7.9%
Subtotal Kansas	*2,688,418*	*86.1%*	*5.7%*	*0.9%*	*1.7%*	*7.0%*	*3.4%*	*2.1%*	*11.2%*
Gulf Coast Segment									
Kansas									
Atoka	13,879	75.9%	5.9%	11.4%	0.2%	1.4%	0.6%	6.1%	23.6%
Bryan	36,534	80.0%	1.4%	12.2%*	0.4%	2.6%	1.1%	4.8%	21.7%

TABLE 3.10.1-11
Environmental Justice Statistics in Affected Communities along the Project Route

County	Total Population	Total Population 2000							Percent of Individuals Living Below Poverty Line (2007)
		White	Black	Native American or Alaskan Native	Asian or Pacific Islander	Hispanic[4]	Other(a)	Two or More Races	
Coal	6,031	75.2%	0.4%	17.3%*	0.3%	2.1%	0.7%	6.1%	24.4%*
Creek	67,367	82.3%	2.6%	9.1%	0.3%	1.9%	0.6%	5.2%	16.4%
Hughes	14,154	72.8%	4.5%	16.2%*	0.2%	2.5%	1.0%	5.4%	25.7%*
Lincoln	32,080	86.4%	2.5%	6.6%	0.2%	1.5%	0.4%	3.8%	16.4%
Okfuskee	11,814	65.5%	10.4%	18.2%*	0.1%	1.6%	0.6%	5.3%	21.9%
Payne	68,186	84.3%	3.6%	4.6%	3.0%*	2.1%	0.0%	0.5%	21.8%
Seminole	24,894	70.7%	5.6%	17.4%*	0.2%	2.2%	0.7%	5.3%	22.8%
Pontotoc	35,143	75.8%	2.1%	15.5%*	0.5%	2.3%	0.0%	4.9%	16.1%
Subtotal Oklahoma	*3,450,654*	*76.2%*	*7.6%*	*7.9%*	*1.5%*	*5.2%*	*2.4%*	*4.5%*	*15.8%*
Texas									
Angelina	80,130	66.4%	23.5%*	0.6%	0.4%	12.2%	8.0%	1.0%	19.3%
Cherokee	46,659	74.3%	16.0%	0.5%	0.5%	13.2%	7.4%	1.3%	18.6%
Delta	4,857	87.9%	8.3%	0.8%	0.1%	3.1%	1.2%	1.7%	17.7%
Fannin	31,242	86.6%	8.0%	0.9%	0.3%	5.6%	2.8%	1.5%	16.5%
Franklin	9,458	89.2%	3.9%	0.6%	0.2%	8.9%	5.1%	0.9%	14.4%
Hardin	48,073	90.9%	6.9%	0.3%	0.2%	2.5%	0.7%	0.9%	11.2%
Hopkins	31,960	85.1%	8.0%	0.7%	0.2%	9.3%	4.6%	1.4%	14.6%
Jefferson	252,051	57.2%	33.7%*	0.3%	2.9%	10.5%	4.3%	1.5%	17.1%
Lamar	48,499	82.5%	13.5%	1.1%*	0.4%	3.3%	1.2%	1.4%	16.2%
Liberty	70,154	78.9%	12.8%	0.5%	0.3%	10.9%	6.0%	1.4%	14.4%
Nacogdoches	59,203	75.0%	16.7%	0.4%	0.7%	11.2%	5.7%	1.4%	21.1%
Polk	41,133	79.3%	13.2%	1.7%*	0.4%	9.4%	3.7%	1.3%	17.5%
Rusk	47,372	74.9%	19.2%	0.2%*	0.2%	8.4%	4.2%	1.1%	13.1%

TABLE 3.10.1-11
Environmental Justice Statistics in Affected Communities along the Project Route

County	Total Population	Total Population 2000: White	Black	Native American or Alaskan Native	Asian or Pacific Islander	Hispanic[4]	Other(a)	Two or More Races	Percent of Individuals Living Below Poverty Line (2007)
Smith	174,706	72.6%	19.1%	0.4%	0.7%	11.2%	5.7%	1.4%	14.3%
Upshur	35,291	85.7%	10.1%	0.6%	0.2%	4.0%	2.1%	1.2%	15.7%
Wood	36,752	89.1%	6.1%	0.6%	0.2%	5.7%	2.9%	1.1%	11.9%
Subtotal Texas (Gulf coast Segment)	*1,017,540*	*71.0%*	*11.5%*	*0.6%*	*2.8%*	*32.0%*	*11.7%*	*2.5%*	*16.3%*
Houston Lateral									
Texas									
Liberty	**See above**	Liberty	**See above**	Liberty	**See above**	Liberty	**See above**	Liberty	**See above**
Chambers	26,031	81.9%	9.8%	0.5%	0.7%	10.8%	6.0%	1.2%	8.6%
Harris	3,400,578	58.7%	18.5%	0.4%	5.1%	32.9%	14.2%	3.0%	16.3%
Subtotal Texas (Houston Lateral)	20,851,820	*71.0%*	*11.5%*	*0.6%*	*2.8%*	*32.0%*	*11.7%*	*2.5%*	*16.3%*
Subtotal Texas	20,851,820	*71.0%*	*11.5%*	*0.6%*	*2.8%*	*32.0%*	*11.7%*	*2.5%*	*16.3%*
U.S.		**75.0%**	**12.3%**	**0.9%**	**3.7%**	**12.5%**	**5.5%**	**2.4%**	**13.0%**

Notes: (a) Other accounts for those individuals who marked “Some other race”, a category included in the 2000 Census for respondents who were unable to identify with the five Office of Management and Budget race categories. Respondents who provided write-in entries such as Moroccan, South African, Belizean, or a Hispanic origin (for example, Mexican, Puerto Rican, or Cuban) are included in the some other race category. (http://www.census.gov/prod/2001pubs/c2kbr01-1.pdf)

Source: **Population:** US Census: QT-P3. Race and Hispanic or Latino: 2000. Percent of Individuals Living Below Poverty Line: Table 1: 2007 Poverty and Median Income Estimates – Counties, U.S. Census Bureau, Small Area Estimates Branch Release date: 12.2008.

The 2000 Census shows that no minority group exceeds 50 percent of the population in any county along the Project route. Minority populations that are meaningfully greater than the corresponding minority population at the state level are identified with an asterisk (*) in the relevant racial/ethnic category columns of Table 3.10.1-11 and listed in Table 3.10.1-12. In the Steele City Segment there are nine combinations of minority population within a county that are meaningfully greater than the corresponding state population. One of those is the Native American or Alaska Native population in Valley, Montana. The other eight populations are located in South Dakota counties and include Black, Native American or Alaska Natives, Asian or Pacific Islanders, Hispanic and 'Other'. In Kansas there are no minority populations within a county that are meaningfully greater than the corresponding state population. In the Gulf Coast Segment there is one combination of minority population within one county that has a population greater than 50 percent of the total population. Also in the Gulf Coast Segment there are 13 combinations of minority populations within counties that are meaningfully greater than the corresponding state population. Nine of those populations are located in Oklahoma and are comprised of Native Americans or Alaska Natives and Asian or Pacific Islander. The remaining four populations are located in Texas and include Blacks and Native Americans or Alaska Natives. Along the Houston Lateral there are two combinations of minority population within a county that are meaningfully greater than the corresponding state population. Both populations are in Harris County. The populations are Black and Asian or Pacific Islander.

TABLE 3.10.1-12
Minority Populations Meaningfully Greater than Corresponding States' Minority Population

Minority Population	County	State
Steele City Segment		
Native American or Alaska Native	Valley	Montana
	Meade	South Dakota
	Butte	South Dakota
Asian or Pacific Islander	Pennington	South Dakota
Hispanic	Butte	South Dakota
	Pennington	South Dakota
Other	Butte	South Dakota
Two or More Races	Meade	South Dakota
	Pennington	South Dakota
Gulf Coast Segment		
Black	Angelina	Texas
	Jefferson	Texas
	Rusk	Texas
	Smith	Texas
Native American or Alaska Native	Bryan	Oklahoma
	Coal	Oklahoma
	Hughes	Oklahoma
	Okfuskee	Oklahoma
	Seminole	Oklahoma
	Pontotoc	Oklahoma
	Lamar	Texas

TABLE 3.10.1-12 Minority Populations Meaningfully Greater than Corresponding States' Minority Population		
Minority Population	**County**	**State**
	Polk	Texas
Asian or Pacific Islander	Payne	Oklahoma
Houston Lateral		
Black	Harris	Texas
Asian or Pacific Islander	Harris	Texas

Source: ENTRIX analysis from Census Data.

Low-Income Populations

Low-income populations in the region of influence were identified and evaluated using poverty statistics from the U.S. Census, namely the percentage of individuals living below the poverty level. If the percentage of population living below the poverty line was greater in a county than the state in which it is located, it was considered to be a low-income population; these communities are noted with an asterisk (*) in the far right column of Table 3.10.1-11.

The income characteristics of the states and counties along the proposed pipeline route vary. Four states, Montana, South Dakota, Oklahoma and Texas have higher rates of low-income populations than the U.S. rate of 13.0 percent. The highest rate is in Texas with 16.3 percent of low-income populations. In total, 31 of the 59 counties that comprise the Project area are low income. Along the Steele City Segment 14 out of 29 counties are low income, as are two counties in Montana, four counties in South Dakota, and eight counties in Nebraska. None of the counties in Kansas are classified as low income. Along the Gulf Coast Segment seventeen of the thirty counties are low income. All 10 of the counties in Oklahoma and seven of the eighteen counties in Texas are considered low income.

The highest rate of low income is found in Hughes county Oklahoma where 25.7 percent of the individuals lived below the poverty line. The state with the most counties considered low income is Oklahoma, with 10 counties ranging between 16.1 percent (Pontotoc County) and 25.7 percent (Hughes County).

3.10.1.8 Traffic and Transportation

Highways, Major Roads and Rural Roads

The Project would meet or intersect many local, state, federal, and interstate roadways along its length. This section provides information on those roads using GIS data. The GIS data are accurate to plus or minus (+/-) 167 feet (ESRI 2008). Consequently, while the data are not intended for survey positional accuracy, they nonetheless provide adequate information to describe the roads crossed. The roads have been classified into four categories based on the U.S. Census Feature Class Codes:

- Category I: Local, Neighborhood, Rural or City roads;
- Category II: Secondary State and County Highways;
- Category III: Primary US and State Highways; and
- Category IV: Primary Limited Access or Interstate.

The roads in rural areas are well developed within the states the Project would cross. Keystone would require the construction contractors to submit a road use plan prior to mobilization, to coordinate with the appropriate state and county representatives to develop a mutually acceptable plan, and to obtain all necessary road permits. Keystone would have inspection personnel ensure that the construction contractor complies with these road use plans and road use permits.

Steele City Segment

The Steele City Segment extends from the border crossing near Morgan, Montana to Steele City, Nebraska. The Steele City Segment passes through Montana, South Dakota and extends to the southern border of Nebraska. This segment of the pipeline would cross three Interstate Highways; I-94, I-90 and I-80 (see Figure 3.10.1-1).

The Steele City Segment would meet or intersect with a total of 713 roads in Categories I, II, III, and IV (Table 3.10.1-13), with the largest number of crossings in Montana (265), followed by Nebraska (258) and South Dakota (190).

TABLE 3.10.1-13
Intersections of Steele City Segment with Roads, by State

State	Road Category	Road Name	Number of Road Intersections
Montana	Category I		250
	Category II	Marsh Rd	1
		Old Us Hwy 10	1
		River Rd	1
		Rock Creek Rd	1
		SR 117	1
		SR 24	1
		SR 243	1
		SR 7	1
		Weldon Rd	1
	Category III	SR 13	1
		SR 200	2
		US 12	1
		US 2	1
	Category IV	I 94	1
Montana Total			**265**
Nebraska	Category I		236
	Category II	SR 11	1
		SR 12	1
		SR 137	1
		SR 14	1
		SR 15	1
		SR 22	1
		SR 4	1
		SR 41	1
		SR 56	1

TABLE 3.10.1-13 Intersections of Steele City Segment with Roads, by State			
State	**Road Category**	**Road Name**	**Number of Road Intersections**
		SR 66	1
		SR 70	1
		SR 74	1
		SR 8	1
	Category III	SR 92	1
		US 136	1
		US 20	1
		US 281	1
		US 30	1
		US 34	1
		US 6	1
		US 81	1
	Category IV	I 80	1
Nebraska Total			**258**
South Dakota	Category I		171
	Category II	Bad River Rd	1
		CR 35	1
		CR 797	1
		CR 867	1
		CR S6 Jones	1
		CR S9 Jones	1
		SR 16	1
		SR 20	1
		SR 34	1
		SR 53	1
		SR 73	1
		SR 79	1
	Category III	US 14	1
		US 18	1
		US 183	2
		US 212	1
		US 85	1
	Category IV	I 90	1
South Dakota Total			**190**
Total Steele City Intersections			**713**

Notes:
SR = State Road
US = U.S. Highway
I = Interstate
CR = County Road

Gulf Coast Segment

The Gulf Coast Segment passes through Oklahoma and Texas, starting from Cushing, Oklahoma and extending to Nederland in Jefferson County, Texas. This segment would cross Interstate Highways I-44, I- 40, I-30, I-20 and I-10. It would also parallel SR 146 in Texas for approximately 7.5 miles (see Figure 3.10.1-2). The Gulf Coast Segment would meet or intersect with 489 roads in Categories I, II, III, and IV (Table 3.10.1-14). The total includes 336 in Texas and 153 in Oklahoma.

TABLE 3.10.1-14
Intersections of Gulf Coast Segment with Roads, by State

State	Road Category	Road Name	Number of Road Intersections
Oklahoma	Category I		138
	Category II	SR 1	1
		SR 3	1
		SR 31	1
		SR 56	1
		SR 7	1
		SR 9	1
		SR 99	1
		SR 99a	1
	Category III	SR 66	1
		US 270	1
		US 62	1
		US 69	1
		US 70	1
	Category IV	I 40	1
		I 44	1
Oklahoma Total			**153**
Texas	Category I		268
	Category II	Berard	1
		E Fm 852	1
		Fm 137	1
		Fm 16	1
		Fm 1911	1
		Fm 2122	1
		Fm 225	2
		Fm 2352	1
		Fm 2869	1
		Fm 3357	1
		Fm 343	1
		Fm 38	2
		Fm 62	1
		Fm 71	1
		Fm 770	1
		Fm 787	1

TABLE 3.10.1-14 Intersections of Gulf Coast Segment with Roads, by State			
State	**Road Category**	**Road Name**	**Number of Road Intersections**
		Fm 79	1
		Fm 839	1
		Fm 900	1
		Fm 942	2
		Fm 943	1
		Fm Road 2088	1
		Fm Road 69	1
		Hillebrandt Rd	1
		HWY 1448	1
		S Major Dr	1
		S Pine Island Rd	1
		SE Fm 13	1
		SR 103	1
		SR 105	1
		SR 11	1
		SR 124	1
		SR 135	1
		SR 146	2
		SR 154	1
		SR 155	1
		SR 19	1
		SR 204	1
		SR 21	1
		SR 31	1
		SR 326	1
		SR 347	1
		SR 37	1
		SR 64	1
		SR 7	1
		SR 94	1
		Tyrrell Park Rd	1
		W Port Arthur Rd	1
		Walden Rd	1
	Category III	US 190	1
		US 271	1
		US 287	1
		US 59	1
		US 67	1
		US 69	2
		US 79	1
		US 80	1

TABLE 3.10.1-14 Intersections of Gulf Coast Segment with Roads, by State			
State	**Road Category**	**Road Name**	**Number of Road Intersections**
		US 82	1
		US 84	1
		US 90	1
	Category IV	I 10	1
		I 20	1
		I 30	1
Texas Total			**336**
Total Intersections			***489***

Source: *ESRI Data & Maps 9.3 [DVD]. (2008). Redlands, California, USA: Environmental Systems Research Institute.*

Houston Lateral

The Houston Lateral extends from the Gulf Coast Segment in Liberty County Texas, for approximately 49 miles to Harris County, Texas. This segment would intersect U.S. Highway 90 (see Figure 3.10.1-3). The Houston Lateral would meet or intersect with 51 roads (see Table 3.10.1-15). All are in Categories I, II, and III.

TABLE 3.10.1-15 Intersections of Houston Lateral with Roads			
State	**Road Category**	**Road Name**	**Number of Road Intersections**
Texas	Category I		43
	Category II	Fm 1409	1
		Fm 160	1
		Fm 1942 Rd	1
		Fm 563	1
		Sheldon Rd	1
		SR 134	1
		SR 146	1
	Category III	US 90	1
Texas Total			**51**
Total Intersections			

Source: *ESRI Data & Maps 9.3 [DVD]. (2008). Redlands, California, USA: Environmental Systems Research Institute.*

Railroads

The Project would also cross several railway service tracks. Table 3.10.1-16 lists the railroad names and owners. The roads are listed alphabetically by state rather than by segment because some states include more than one segment. As shown, there are expected to be 80 total intersections, including 17 in Kansas, 8 in Montana, 7 in Nebraska, 12 in Oklahoma, 2 in South Dakota, and 34 in Texas.

The Burlington Northern Santa Fe (BNSF) has main, branch, and spur tracks in the states which would be traversed by the pipeline.[4] The proposed pipeline route would cross the BNSF main tracks in the Montana Operating Division running between Snowden and Shelby and between Snowden and Jones Junction. In Nebraska, the proposed pipeline would cross the BNSF main track in the Nebraska Operating Division between Lincoln and Hastings. In the BNSF Kansas Operating Division, the proposed pipeline would cross two main tracks, one between Newton and Los Animas Junction and the other between Wichita and Amarillo (Texas). The proposed pipeline route would also cross several branch tracks, spurs, and short line tracks throughout the BNSF system area.

The Union Pacific Railroad (UPRR) has main, branch, and spur track throughout Nebraska and Kansas as well as other states which would not be affected by the proposed pipeline Project route.[5] In Nebraska, the proposed route would cross a UPRR main track between Omaha and North Platte. In Kansas, the proposed route would cross several main tracks connecting Topeka, Wichita, and other cities. In Oklahoma and Texas, the proposed pipeline route would cross UPRR main tracks running between Dallas and Houston and other cities in Texas and Louisiana.

Other railroads would also be crossed by the proposed pipeline route in Nebraska, Oklahoma, South Dakota, and Texas. These include Southern Kansas and Oklahoma; United States Gypsum; Nebraska Central Railroad; Stillwater Central Railroad; Kiamichi Railroad; Dakota, Minnesota and Eastern Railroad; Dakota Southern Railway; Dallas, Garland, and Northeastern Railroad; Moscow Camden and San Augustine Railroad; Kansas City Southern Railroad; Texas Southeast Railway; and Port Terminal Railroad Association.

TABLE 3.10.1-16
Intersection of Project with Railroads, by Segment and State

Pipeline Segment	Railroad Name	Railroad Owner (Reporting Mark)	Number of Rail Intersections
Kansas - Cushing Extension			
	A T and S F Railway	BNSF (Burlington Northern Santa Fe)	2
	A T and SF Railway	BNSF (Burlington Northern Santa Fe)	1
	A T and SF Railway	BNSF (Burlington Northern Santa Fe)	2
	Unnamed	SKOL (Southern Kansas & Oklahoma)	1
	Chicago Rock Island and Pacific Railroad	UP (Union Pacific)	3
	Federal Railroad Administration	BNSF (Burlington Northern Santa Fe)	1
	Missouri Pacific Railroad	UP (Union Pacific)	1
	Missouri Pacific Railroad	UP (Union Pacific)	1
	Union Pacific Railroad	UP (Union Pacific)	5
Kansas Total			**17**
Montana - Steele City Segment			
	Burlington Northern Railroad	BNSF (Burlington Northern Santa Fe)	7
	Unnamed	USG (United States Gypsum)	1
Montana Total			**8**
Nebraska - Cushing Extension			

[4] See the BNSF system map at http://www.bnsf.com/tools/reference/division_maps, accessed August 3, 2009.
[5] See the UPRR system map at http://www.uprr/com/aboutup/maps/sysmap/index.shtml, accessed August 3, 2009.

TABLE 3.10.1-16 Intersection of Project with Railroads, by Segment and State			
Pipeline Segment	**Railroad Name**	**Railroad Owner (Reporting Mark)**	**Number of Rail Intersections**
	Union Pacific Railroad	UP (Union Pacific)	1
Nebraska - Steele City Segment			
	Burlington Northern Railroad	BNSF (Burlington Northern Santa Fe)	3
	Chicago Rock Island and Pacific Railroad	UP (Union Pacific)	1
	Union Pacific Railroad	NCRC (Nebraska Central Railroad Company)	1
	Unnamed	UP (Union Pacific)	1
Nebraska Total			**7**
Oklahoma - Cushing Extension			
	A T and SF Railway	BNSF (Burlington Northern Santa Fe)	2
	Unnamed	SLWC (Stillwater Central Railroad)	1
	St. Louis-San Francisco Railway	BNSF (Burlington Northern Santa Fe)	1
Oklahoma - Gulf Coast Segment			
	Burlington Northern Railroad	BNSF (Burlington Northern Santa Fe)	3
	unnamed	KRR (Kiamichi Railroad)	1
	unnamed	SLWC (Stillwater Central Railroad)	3
	Missouri-Kansas-Texas Railroad	UP (Union Pacific)	1
Oklahoma Total			**12**
South Dakota - Steele City Segment			
	Chicago and Northwestern Railway	DME (Dakota Minnesota & Eastern Railroad Corporation)	1
	South Dakota State Railroad	DSRC (Dakota Southern Railway Company	1
South Dakota Total			**2**
Texas - Gulf Coast Segment			
	AT and SF Railway	BNSF (Burlington Northern Santa Fe)	1
	Kansas City Southern Railway (KCS)	KCS (Kansas City Southern Railway)	9
	Missouri Pacific Railroad	DGNO (Dallas, Garland &Northeastern Railroad, Inc.)	1
	unnamed	UP (Union Pacific)	1
	Moscow Camden San Augustine RR	MCSA (Moscow Camden San Augustine RR)	1
	Railroad	UP (Union Pacific)	1
	P Railroad	UP (Union Pacific)	2
	Southern Pacific Railroad	UP (Union Pacific)	1
	unnamed	BLR	1
	unnamed	BNSF (Burlington Northern Santa Fe)	3
	unnamed	KCS (Kansas City Southern Railway)	1

TABLE 3.10.1-16 Intersection of Project with Railroads, by Segment and State			
Pipeline Segment	**Railroad Name**	**Railroad Owner (Reporting Mark)**	**Number of Rail Intersections**
	unnamed	TSE (Texas Southeast Railway)	2
	unnamed	UP (Union Pacific)	4
Texas - Houston Lateral			
	Missouri Pacific Railroad	PTRA (Port Terminal Railroad Association)	1
	Railroad	UP (Union Pacific)	2
	Southern Pacific Railroad	UP (Union Pacific)	1
	unnamed	UP (Union Pacific)	2
Texas Total			**34**
		Total Intersections	***80***

Source: *ESRI Data & Maps 9.3 [DVD]. (2008). Redlands, California, USA: Environmental Systems Research Institute.*

3.10.2 Potential Impacts and Mitigation

3.10.2.1 Socioeconomics

The socioeconomic consequences of constructing and operating the Project would vary in duration and magnitude. From a temporal perspective, impacts are characterized as temporary, short term, long term, or permanent. Impacts are considered in the context of duration, magnitude (relative to baseline conditions), and any proposed measures or activities that Keystone would implement as part of the proposed Project. The following impact thresholds for social and economic impacts were used in the analysis:

- Changes to local social or economic activities, including changes in employment and income levels, resulting from the proposed pipeline construction and operations.
- Overburdening of the local housing stock because of demand generated by the temporary and permanent workforce.
- Substantial changes in private property values.
- Substantial changes in fiscal revenues, including tax receipts, of local jurisdictions.
- Substantial burden on public service providers serving the Project area such that they would need to expand their service capacities in order to meet those demands.

Impacts are characterized as positive (beneficial) or negative (adverse) and, where possible, are evaluated relative to regional conditions to help assess the magnitude of socioeconomic effects.

3.10.2.2 Environmental Justice

As described in Section 3.10.1.7 and shown in Table 3.10.1-11, portions of the new pipeline and new and upgraded pumping stations are located in areas with minority populations and with families living below the poverty level (31 of the 59 counties that comprise the Project area are low income, for a full description of the number and location of these counties see Section 3.10.1.7). The Project also is located in areas of majority populations (18 out of the 59 counties). The 2000 Census shows that no minority group exceeds 50 percent of the population in any county along the Project route. The Project is not expected to result in adverse impacts that would fall disproportionately on minority or low-income populations located along the pipeline route. Public participation in assessing the Project is especially important in areas where low-income populations and/or minority populations have the potential to be affected Public outreach would continue throughout the life of the Project (Keystone 2009).

3.10.2.3 Construction Impacts

Keystone would construct approximately 1,380 miles of new pipeline, 30 pump stations and other ancillary facilities as listed in Table 3.10.2-1. Construction activities would involve the movement of people, equipment, and materials on roadways throughout the Project area. In some cases, construction may increase the demands for permits for vehicle load and width limits (Keystone 2008). Some temporary traffic delays are likely. However, Keystone would provide vehicle access and would assist traffic flows in construction areas including emergency vehicles (Appendix B, CMR Plan).

Each state has various road construction projects planned or underway. However, because specific construction dates for the Project are unknown, potential conflicts with roadway construction are uncertain. Nonetheless, construction across roads and highways would comply with the requirements of the road crossing permits and approvals obtained by Keystone (Appendix B, CMR Plan).

TABLE 3.10.2-1
Construction Projects 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	

Source: Keystone 2009c.

Construction of the pipeline is planned to occur in 17 construction spreads or completed lengths (Table 3.10.2-2). Ten spreads are planned along the Steele City Segment, six spreads along the Gulf Coast Segment and one spread along the Houston Lateral. Keystone anticipates 500 to 600 construction and inspection personnel associated with each spread, except for the Houston Lateral, which would require approximately 250 workers. Each spread would require 6 to 8 months to complete. Construction of new pump stations would require 20 to 30 additional workers at each site. Construction of all pump stations would be completed in 18 to 24 months.

Keystone, through its construction contractors and subcontractors, would attempt to hire temporary construction staff from the local population. Provided qualified personnel are available, approximately 10 to 15 percent (50 to 100 people) may be hired from the local work force for each spread. This may not be possible in more rural areas. The number of individuals in the work force for each county where a base for construction is planned is listed in Table 3.10.2-2.

TABLE 3.10.2-2
Pipeline Construction Spreads of the Proposed Project

Spread Number	Location	Approximate Length of Construction Spread (miles)	Base(s) for Construction[1]	Work Force in Respective Counties[(a)] (2008)
Steele City Segment				
Spread 1	MP 0 to 81	81	Hinsdale, Montana, and Glasgow, Montana (both in Valley County)	3,649
Spread 2	MP 81 to 163	82	Glasgow, Montana (Valley County), and Circle, Montana (McCone County)	3,649 (Valley, County) and 1,015 (McCone County)
Spread 3	MP 163 to 247	84	Glendive, Montana (Dawson County), and Baker, Montana (Fallon County)	4,386 (Dawson County) and 1,824 (Fallon County)
Spread 4	MP 247to 333	86	Buffalo, South Dakota (Harding County)	762
Spread 5	MP 333 to 415	82	Faith, South Dakota, and Union Center, South Dakota (both in Meade County)	12,579
Spread 6	MP 415 to 500	85	Phillip, South Dakota (Haakon County)	1,154
Spread 7	MP 500 to 580	80	Murdo, South Dakota (Jones County), and Winner, South Dakota (Tripp County)	694 (Jones County) and 2,935 Tripp County)
Spread 8	MP 580 to 664	84	Fairfax, Nebraska (Custer, Nebraska) Stuart, Nebraska, and O'Neill, Nebraska (both in Holt County)	6,092 (Custer County) and 6,092 (Holt County)
Spread 9	MP 664 to 758	94	Greeley, Nebraska (Greeley County), and Central City, Nebraska (Merrick County)	1,298 (Greeley County) and 4,296 (Merrick County)
Spread 10	MP 758 to 851	93	York (York County), Nebraska, Beatrice, Nebraska (Gage County), and Fairbury, Nebraska (Jefferson County)	7,115 (York County) and 4,394 (Jefferson County)
Gulf Coast Segment				
Spread 1	MP 0 to 95	95	Holdenville, Oklahoma (Hughes County)	5,046
Spread 2	MP 95 to 185	90	Paris, Texas (Lamar County)	23,811 (Lamar County)
Spread 3	MP 185 to	99	Mt. Pleasant, Texas (Titus	617

TABLE 3.10.2-2 Pipeline Construction Spreads of the Proposed Project				
Spread Number	Location	Approximate Length of Construction Spread (miles)	Base(s) for Construction[1]	Work Force in Respective Counties[(a)] (2008)
	284		County)	
Spread 4	MP 284 to 366	82	Henderson, Texas (Rusk County), Nacogdoches, Texas (Nacogdoches County) Crockett, Texas Houston County)	24,081 (Rusk County) and 30,614 Nacogdoches County)
Spread 5	MP 366 to 433	67	Lufkin, Texas (Angelina County)	38,987 (Angelina County)
Spread 6	MP 433 to 480	47	Sour Lake, Texas (Hardin County)	25,947 (Hardin County)
Houston Lateral				
Spread 7	MP 0 to 49	49	Sour Lake, Texas, Liberty, Texas (Chambers County), Dayton, Texas (Liberty County)	14,254 (Chambers County) and 31,455 (Liberty County)

[1] Some of the communities listed above were not included in Table 3.10.2 because they are located more than two miles from the proposed pipeline.

Source: Keystone 2009c. (a) Source: Bureau of Labor Statistics, Local Area Unemployment Statistics, County Data. http://www.bls.gov/lau/#tables

Population

The number of residents within the region of influence would increase temporarily during construction with the influx of construction workers and Project staff. The construction workforce would consist of approximately 5,000 to 6,000 workers, including Keystone employees, contractor employees, and construction and environmental inspection staff. These workers would be distributed across the pipeline route by construction spread, with approximately 500 to 600 construction personnel allocated to each spread. Construction of the pump stations and delivery facilities would require additional staff. It is anticipated that an additional 20 to 30 workers per station would be required. Tank farm construction would involve approximately 30 to 40 construction personnel over a period of 15 to 18 months concurrent with the Steele City Segment construction.

Population impacts in the region of influence would depend on the composition of the construction workforce in terms of local versus non-local workers and the existing population of the area. Keystone would utilize temporary local construction labor where possible. It is estimated that 10 to 15 percent of the total construction workforce could be hired from local communities, with the remaining workers (85 to 90 percent) from outside the local area. Few non-local workers would be expected to be accompanied by their children or other family members because of the mobile nature of the workforce along the pipeline route during construction.

Based on these data and assumptions, it is estimated that 4,500 to 5,100 non-local residents would temporarily move into the region of influence, resulting in short-term population increases during the construction period. These workers would be distributed throughout the region of influence according to construction spread, thereby potentially affecting isolated communities along the pipeline route. Because of the relative differences in existing population along the proposed route, impacts may vary by area. For example, the existing population in the affected area in Montana was 23,747 in 2007 (See Table 3.10.10-

4, U.S Census). The three planned spreads and the 6 new pump stations in Montana, if constructed concurrently could cause local population to increase by about 8.0 percent. However, since construction on spreads is planned sequentially the impact on the population in Montana is more likely between 4 percent and 5 percent. In South Dakota and Nebraska, a similar sized construction effort would only result in a change in existing population of approximately 1.0 percent because some of the counties in South Dakota and Nebraska are more densely populated. Depending on the size of the local community and duration of stay, the influx of construction workers may result in a range of short-term socioeconomic effects. These potential temporary increases in local population levels are addressed in the analysis of related resource topics in this section, including housing and public services.

Housing

Non-local construction workers moving into the region of influence would require short-term accommodations. Because workers are not expected to relocate with their families and their stay in any one community would be temporary, it is expected that most workers would use temporary housing, such as hotels/motels, RV sites, and campgrounds. Most workers likely would prefer short-term accommodations, primarily hotels and motels, in the more populated, service-oriented communities located within a reasonable commuting distance from the work site. As local accommodations fill, workers would be forced to seek alternative accommodations, including RV parks and campgrounds, in smaller, more distant communities. Further, some employees may elect to utilize furnished apartments and rental homes due to the constrained availability of other accommodations, although this is expected to be limited based on extended-period lease requirements. Depending on location and available accommodations, workers may elect to reside temporarily in one location during the construction period or relocate within each spread as needed as construction proceeds along the pipeline route.

There could be a need for nearly 2,900 housing units throughout the region of influence, or 450 to 510 housing units within any one construction spread, assuming that each worker would require his/her own unit. The availability of short-term housing varies across the pipeline route. In total, there are approximately 91,000 vacant rentals, 30,000 hotel/motel rooms and 4,700 RV sites available to serve the housing needs of the Project. The anticipated Project-related demand for housing would account for about 5 percent of all available temporary housing in the region of influence, or 17.0 percent of hotel/motel rooms plus RV sites. At a regional scale, therefore, it appears that the temporary housing available within the region of influence would be sufficient to meet the temporary and moderately increased demand for housing resulting from construction activities.

In the northern, more rural portions of the pipeline route, particularly Montana and Nebraska and Kansas, it may be difficult to meet the local housing needs based on the limited amount of short-term accommodations in proximity to the Project. Based on an in-depth housing analysis and on updated discussions with construction contractors, Keystone would rely on temporary construction camps to house workers in remote areas. These temporary camps would supplement local housing in remote areas of Montana and South Dakota for the duration of construction in the area. 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. Each construction camp would be capable of housing up to 600 workers. Camps would typically include sleeping areas with shared and private baths, craft rooms, recreation facilities, media rooms, kitchen/dining facilities, laundry facilities, a security/infirmary unit, offices, and wastewater treatment facilities. These temporary construction camps would be permitted, constructed, and operated in compliance with applicable county, state, and federal regulations (Keystone 2009).

Conversely, in more urban areas, such as most of Texas and Oklahoma, short-term housing is more abundant, particularly hotels and motels; therefore, it is more likely that the available housing stock in proximity to the Project would be sufficient to meet the increased housing demands generated by the Project.

Local Economic Activity

The proposed pipeline has the potential to generate substantial direct and indirect economic benefits for local and regional economies along the pipeline route. During construction, these benefits are derived from the construction labor requirements of the Project and spending on construction goods and services that would not otherwise have occurred if the line were not built. At the local level, these benefits would be in the form of employment of local labor as part of the construction workforce and related income benefits from wage earnings, construction expenditures made at local businesses, and construction worker spending in the local economy. However, if a person leaves an existing job to take a job building the proposed pipeline only the additional income earned by that person would be considered a benefit of the Project. The Project job obtained by the local worker would become a local Project-related benefit when the job that was left is filled by another worker.

Construction of the proposed Project, including the pipeline and pump stations, would result in hiring approximately 5,000 to 6,000 workers over the 3 year construction period. As indicated above, it is expected that roughly 10 to 15 percent of the construction workforce would be hired from local labor markets, thus 500 to 900 local workers throughout the entire region of influence would be hired, or 50 to 90 local workers per construction spread. Related income benefits would be substantial. Some short-term shifting in local job distribution may occur in all areas as a result of the proposed pipeline. This job shifting could cause short-term labor shortages in other areas of local economies due to workers leaving existing jobs for jobs on the Project.

In addition to payroll spending, construction would generate substantial expenditures on goods and services, both inside and outside of the region of influence. Typically, such spending includes outlays for fuel supplies, hardware needs, and parts/equipment.

Construction also would generate indirect local economic benefits from secondary activity spurred by the direct effects described above. This would include short-term benefits of increased business to local and statewide businesses supplying supplies and services to Project workers. Such businesses would include equipment suppliers, restaurants, gas stations and hotels. Spending by the non-local construction workforce within local economies during the construction period could include expenditures on food, clothing, lodging, gasoline, and entertainment. The extent of local spending by non-local workers would be tied to labor earnings and individual spending patterns. Construction worker spending, in conjunction with outlays for construction goods and services, also would generate indirect economic benefits as these monetary flows circulate throughout the economy based on economic linkages among industries. These “ripple” effects, commonly referred to as “multiplier effects,” result from businesses buying from other businesses and can generate additional economic benefits within the region of influence. These impacts, however, have not been quantified for this analysis.

Labor and income benefits also would extend outside the region of influence based on the employment of non-local labor for the Project and expenditures on construction materials and services that would be imported into the area. Although these benefits would not be realized locally, they do represent a positive economic impact at the national level.

Overall, construction of the proposed Project would result in a positive impact on the local economies in the region of influence.

Tax Revenue and Fiscal Resources

The fiscal benefits of the Project include short-term tax revenues generated during construction and long-term tax revenues associated with property tax payments. The Project is not expected to require substantial new government expenditures. The range of potential tax revenues during construction is described below.

In the short term, the predominant source of tax revenues would be sales/use and fuel taxes levied on goods and services purchased during the construction period. This includes, for example, construction materials and construction worker spending in the local economy for basic living expenses such as food, housing, gasoline, and entertainment. It is difficult to quantify these short-term tax benefits because tax rates and their applicability vary by region and jurisdiction.

For construction-related purchases, tax benefits would be dependent on construction spending levels and the ability of local businesses to meet the demand for required materials and services.

For employee-generated purchases, tax revenues would depend on the proportion of the workforce that is local, the behavior of individual workers, and the duration of their stay. Some portion of the construction payroll would be retained and spent within the region of influence by the construction workforce over the construction period. The resulting tax revenues generated by this spending represent additional fiscal benefits of the Project.

Short-term fiscal benefits may also arise from fees assessed by federal agencies for the use of public land for pipeline and electrical transmission line or distribution line ROWs, as well as from local, state, and federal income taxes paid by corporations and employees serving the Project. These taxes and fees vary by region and have not been quantified for this analysis.

Public Services

Various types of emergency events may occur during construction, such as worker accidents requiring medical attention. As a result, the proposed Project could temporarily increase the demand for emergency response, medical, police, and fire protection services during the construction period. Table 3.10.1-10 lists the public service providers located in the region of influence. Emergency response in more urban areas likely would be quick, based on the proximity of public service facilities to the pipeline. However, in more rural sections of the proposed route, particularly Montana, South Dakota and Nebraska, emergency response times may be long based on communication, dispatch, and travel time constraints. It is the intent of Keystone to work with local law enforcement, fire departments, and emergency services providers, including medical aid facilities, to establish appropriate measures that would ensure effective emergency response and provision of related services; this information would be included in the ERP developed as part of the Project. With implementation of applicable measures in the ERP, construction-related impacts on public services are expected to be minor.

The influx of construction workers in local communities also has the potential to generate additional demands on local public services. The magnitude of public service impacts would vary by community, depending on the size of the non-local workforce and their accompanying families, the size of the community, and duration of stay. However, as noted above, few non-local workers are expected to be accompanied by family members because of the short construction period and transient nature of the work. Therefore, potential public service impacts associated with temporary increases in population would be short term and minor in much of the proposed Project area. The effect could be greater in areas with few small towns and fewer services.

Property Damages and Values

Any potential damages to private property during Project construction would be concentrated along the ROW and appurtenant facilities and would be localized. Keystone would compensate property owners for any damages caused by Project construction. Land disturbed by the Project would be restored to the extent practicable. Keystone would repair or restore drain tiles, fences, and land productivity if these are damaged or adversely affected during construction. Project construction activities would not likely create long term adverse impacts to property values.

Environmental Justice

The Project would not be expected to result in adverse impacts that would fall disproportionately on minority or low-income populations located along the Project route. Construction dust and noise is restricted to the brief construction period along each segment of the proposed Project route and impacts diminish once construction activities end. These impacts are spread equally among counties with minority populations meaningfully greater than the state total and/or a meaningfully greater percent of individuals living below poverty. No group is greater than 50 percent of the state average. Table 3.10.2-3 provides a list of the counties within the Project area and specifies: 1) whether a construction facility (a pipe yard (PY) ,a construction camp (CY), or a contractors camp (CC)) is planned to be located within that county ; 2) whether there is at least one minority population meaningfully greater than the overall state minority population in that county; and 3) whether the number of individuals living below the poverty line in that county is meaningfully greater than the state average. Construction facilities are planned in 32 counties within the Project area and eight of those counties have meaningfully greater environmental justice statistics (25 percent). Of the 59 counties along the Project corridor, 20 counties have meaningfully greater environmental justice statistics (34 percent)

TABLE 3.10.2-3
Location of Construction Facilities Relative to Environmental Justice Statistics

		Statistic Meaningfully Greater than Respective State (2000)	
County	**Construction Facility**	**Minority Population**	**Poverty Line (2007)**
Montana			
Phillips	PY	No	No
Valley	PY, CC and 2 CY	Yes	No
McCone	2 PY, 1 CC, 1 CY	No	No
Dawson	2 PY, 1 CY	No	No
Prairie	No	No	No
Fallon	2 PY	No	No
South Dakota			
Harding	3 PY, 1 CY	No	No
Butte	No	Yes	No
Perkins	No	No	No
Meade	2 PY, 1 CY	Yes	No
Pennington	No	Yes	No
Haakon	2 PY, 1 CY	No	No
Jones	2 PY, 1 CY	No	No

TABLE 3.10.2-3 Location of Construction Facilities Relative to Environmental Justice Statistics			
		Statistic Meaningfully Greater than Respective State (2000)	
County	**Construction Facility**	**Minority Population**	**Poverty Line (2007)**
Lyman	No	Yes	Yes
Tripp	2 PY, 1 CC	No	No
Nebraska			
Keya Paha	1 PY	No	No
Rock	No	No	Yes
Holt	1 PY, 2 CY	No	No
Garfield	No	No	No
Wheeler	1 PY	No	No
Greeley	1 PY, 1 CC	No	No
Boone	No	No	No
Nance	1 PY	No	No
Merrick	1 CC	No	No
Hamilton	1 PY	No	No
York	1 CC	No	No
Fillmore	1 PY	No	No
Saline	No	No	No
Jefferson	2 PY, 1 CC	No	No
Pump Stations – Kansas			
Clay	No	No	No
Butler	No	No	No
Oklahoma			No
Atoka	No	No	No
Bryan	No	Yes	No
Coal	No	Yes	Yes
Creek	No	No	No
Hughes	1 CY	Yes	Yes
Lincoln	1 PY	No	No
Okfuskee	No	Yes	No
Payne	No	Yes	No
Seminole	No	Yes	No
Pontotoc	No	Yes	No
Texas			
Angelina	2 CY	Yes	No
Cherokee	No	No	No
Delta	No	No	No
Fannin	No	No	No

TABLE 3.10.2-3 Location of Construction Facilities Relative to Environmental Justice Statistics			
		Statistic Meaningfully Greater than Respective State (2000)	
County	Construction Facility	Minority Population	Poverty Line (2007)
Franklin	1 RRS/PY	No	No
Hardin	1 RRS/PY	No	No
Hopkins	No	No	No
Jefferson	2 PY, 1 CY	Yes	No
Lamar	A PY, 2 CY, 1RRS/PY	Yes	No
Liberty	1 CY	No	No
Nacogdoches	1 CY	No	No
Polk	2 PY	Yes	No
Rusk	1 CY	Yes	No
Smith	1 PY	No	No
Upshur	No	No	No
Wood	No	No	No
Texas			
Chambers	No	Yes	No
Harris	No	Yes	No

Abbreviations: Pipe Yard (PY), Construction Camp (CC) and Contractor Yards (CY) Railroad Siding and or a Pipe Yard (RRS/PY).

Traffic and Transportation

Keystone would utilize public and existing private roads to access most of the construction ROW. Keystone would implement construction, mitigation, and reclamation actions presented in the Project CMR Plan (Appendix B) except where those actions would conflict with any federal, state, or local rules and regulations or other permits or approvals. It is unlikely that any improvement or maintenance would be required for paved roads before or during construction, while some gravel and dirt roads could require maintenance. Keystone would ensure that construction across paved roads, highways, and rail routes would concur with the requirements stipulated in the road and railroad crossing permits and approvals it obtains prior to construction. Generally, all roads and railroads would be traversed by borings that would involve excavation of a pit on each side of the roadway, placing required equipment into the pits, and boring a hole with a diameter large as the pipeline itself.

Construction activities could result in short-term impacts to traffic and transportation infrastructure. Traffic volumes along roads proximate to the pipeline route could increase with movements of construction-related employees, equipment, and materials. Bored roadway crossings would reduce or eliminate the need for road closures, although temporary road closures could be required in some cases. However, impacts to local traffic would be minor and temporary.

Keystone would use open-cut methods, where permitted by local authorities and private owners, to traverse mostly smaller unpaved roads and driveways. This method would require temporary closure of the feature to traffic and use of detours. If such detours are not feasible, Keystone would keep at least one lane of traffic open other than when it would be necessary to close the road completely to install the pipeline. In general, open-cut road crossings would be finished and the subject roads resurfaced within two days. At each such crossing, Keystone would post signs and utilize other measures as required by federal, state, and local transportation agencies to minimize traffic disturbances and ensure safety.

3.10.2.2 Operations Impacts

Population

The limited number of permanent employees associated with the Project would result in negligible long-term impacts on public services.

Housing

The limited number of permanent employees associated with the Project would result in negligible long-term impacts on housing.

Local Economic Activity

During operation, the proposed Project would generate a demand for goods and services, including power, which would result in economic benefits to the region.

Tax Revenue and Fiscal Resources

Once the Project is constructed, it would generate long-term property tax revenues for the states and counties traversed by the pipeline, in accordance with applicable tax structures. Keystone has developed estimates of property taxes by state based on the value and/or length of pipe in the ground and quantity of aboveground facilities (see Table 3.10.2-3). The estimated tax data for Montana was developed by the Montana Department of Revenue (e-mail correspondence with Vern Fogle). Keystone estimates that $138.4 million in annual property tax revenues would be generated by the Project in the region of influence. This estimate is based on 2006 tax rates and an estimated $7.0 billion of capital costs. The estimate implies an average 2.0 percent effective tax rate on $7.0 billion. Most of these revenues, about $98.2 million, are attributed to the Steele City Segment. The Pump Stations in Kansas would generate $2.0 million. The Gulf Coast Segment would generate $37.3 million. The remaining $1.1 million would be generated on the Houston Lateral.

The incremental property tax revenues for the Project area would be an increase of 9.0 percent over the 2006 taxes reported by each State as levied in the counties within the proposed Project area. The greatest percent increase over 2006 taxes, 42.0 percent, would occur along the Steele City Segment. Keystone estimates that in Montana the increase over 2006 taxes would be 145.9 percent. The Keystone estimate implies an effective tax rate of 4.3 percent on the estimated capital costs. This tax rate is twice that of the Project average and may cause an overstatement of the taxes that would be paid to Montana counties. Without regard to magnitude, the impact of the property taxes is a benefit to the counties. The percent increase of taxes over 2006 levels in Kansas is 2.7 percent. Along the Gulf Coast Segment the Project property taxes represent an 11.9 percent increase over 2006 levels. The increase in property taxes along the Houston Lateral is 2.1 percent above 2006 levels. Local counties would be the primary beneficiaries of estimated property tax benefits. Given the size of the existing tax base of affected jurisdictions and assuming that the 2006 tax rates would remain in effect once the Project is built, these revenues represent a minor to major long-term Project fiscal benefit.

TABLE 3.10.2-3
2006 Tax Levy and Estimated Project Property Tax by County

County	Taxes Levied ($)	Property Taxes	Percent of 2007 Taxes Levied
Steele City Segment			
Montana			
Phillips	6,891,579	4,367,060	63.37%
Valley	12,731,805	14,860,604	116.72%
McCone	3,161,702	18,038,389	570.53%
Dawson	12,141,019	14,126,149	116.35%
Prairie	2,106,988	5,869,630	278.58%
Fallon	4,663,545	5,695,963	122.14%
Subtotal Montana	*41,696,638*	*62,957,795*	*150.99%*
South Dakota			
Harding	876,254	3,346,244	381.88%
Butte	1,811,097	134,730	7.44%
Perkins	1,290,869	624,306	48.36%
Meade	6,773,987	2,608,096	38.50%
Pennington	25,958,625	41,365	0.16%
Haakon	825,951	2,818,539	341.25%
Jones	612,854	2,044,666	333.63%
Lyman	1,057,054	489,057	46.27%
Tripp	2,197,509	3,298,393	150.10%
Subtotal South Dakota	*41,404,200*	*15,405,396*	*37.21%*
Nebraska			
Keya Paha	2,429,603	1,133,796	46.67%
Rock	4,031,120	649,588	16.11%
Holt	19,720,255	3,548,059	17.99%
Garfield	2,613,263	659,714	25.24%
Wheeler	2,699,567	1,328,431	49.21%
Greeley	5,144,809	1,714,863	33.33%
Boone	11,109,437	222,867	2.01%
Nance	6,195,427	1,280,136	20.66%
Merrick	12,327,924	1,581,338	12.83%
Hamilton	16,950,108	499,036	2.94%
York	22,800,935	2,175,921	9.54%
Fillmore	13,129,028	1,577,037	12.01%
Saline	19,624,429	1,339,885	6.83%
Jefferson	13,079,964	4,184,344	31.99%
Subtotal Nebraska	*151,855,869*	*21,895,015*	*14.42%*
Pump Stations - Kansas			
Clay	9,037,940	1,542,806	17.07%
Butler	65,068,063	453,949	0.70%
Subtotal Kansas	*74,106,003*	*1,996,755*	*2.69%*

TABLE 3.10.2-3 2006 Tax Levy and Estimated Project Property Tax by County			
County	**Taxes Levied ($)**	**Property Taxes**	**Percent of 2007 Taxes Levied**
Gulf Coast Segment			
Oklahoma			
Lincoln	2,311,059	1,620,262	70.11%
Creek	31,369,794	411,919	1.31%
Okfuskee	3,409,877	1,239,748	36.36%
Seminole	9,064,881	2,169,785	23.94%
Hughes	6,340,078	2,188,917	34.53%
Coal	3,733,358	2,604,589	69.77%
Atoka	4,059,497	1,568,644	38.64%
Bryan	15,568,464	2,494,487	16.02%
Subtotal Oklahoma	*75,857,008*	*14,298,351*	*18.85%*
Texas			
Fannin	6,861,098	415,734	6.06%
Lamar	9,288,471	1,514,314	16.30%
Delta	1,457,836	1,550,784	106.38%
Hopkins	7,451,377	573,610	7.70%
Franklin	3,831,662	1,098,306	28.66%
Wood	10,396,712	1,863,930	17.93%
Upshur	8,345,374	348,966	4.18%
Smith	30,868,384	1,645,008	5.33%
Cherokee	10,459,552	1,393,088	13.32%
Rusk	13,641,514	646,068	4.74%
Nacogdoches	10,942,646	1,139,530	10.41%
Angelina	12,421,410	1,470,148	11.84%
Polk	12,316,738	3,015,148	24.48%
Hardin	10,863,453	593,311	5.46%
Liberty	21,705,512	4,156,875	19.15%
Jefferson	66,382,570	1,618,688	2.44%
Subtotal Texas (Gulf Coast Segment)	*237,234,309*	*23,043,508*	*9.71%*
Houston Lateral			
Texas			
Liberty	see above	see above	see above
Chambers	26,053,006	207,106	0.79%
Harris	885,849,380	667,702	0.08%
Subtotal Texas (Houston Lateral)	*911,902,386*	*874,808*	*0.10%*
Subtotal Texas	*1,149,136,695*	*23,918,316*	*2.08%*

Source: Keystone 2009 from the following:

South Dakota, Equalized Valuations and Property Taxes Collected from All Sources, http://www.state.sd.gov/applications/DLASearches/countymenu.aspx

Nebraska Dept of Revenue Property Assessment Division 2007 and 2008 Comparison, December 2008.http://pat.ne.gov/researchReports/annual/pdf/2006/NE%20PA&T%20Annrpt2006%20part%201%20of%204%20Text%20&%20Tables%201-18.pdf.html

Kansas http://www.ksrevenue.org/pdf/forms/07arcomplete.pdf
Oklahoma, Personal communication with county assessors and treasures.
Texas taxes by County http://www.window.state.tx.us/taxinfo/proptax/annual06/table18.pdf.

Public Services

Decline in public service levels would be negligible in most areas of the proposed Project. In remote areas, the need for public services would be somewhat ameliorated by construction of the work camps. No existing public service facility expansions are would be required based on current Project projections.

Environmental Justice

The proposed Project would result in negligible to minor and temporary adverse effects on certain socioeconomic resources in the region, such as housing availability and public services. Conversely, Project-related spending and tax revenues would result in economic benefits in the region of influence, which may in turn positively affect low-income and minority populations through increased employment opportunities (and income benefits) and improved public service levels.

The public review and comment process that DOS has implemented in association with the environmental review under NEPA has or will provide multiple opportunities in multiple formats for public input. Keystone has communicated directly with the property owners who would be affected by the proposed Project, irrespective of minority or income status, regarding the proposed route and the results of archaeological and environmental surveys of their property.

As a result of the stringent safety and integrity measures Keystone has incorporated into the design, construction, and operation of the Project, as well as governing PHMSA pipeline safety regulations, the Project does not appear to pose a significant risk to residents along the route, whether in rural or urban areas. Further, there is no evidence that such risks would be disproportionately borne by any minority or low-income populations identified within potentially affected communities in proximity to the Project. Section 3.13 addresses the risks and associated impacts to public health and safety that would result from a pipeline crude oil release and also describes how applicable safety regulations and standards would minimize the potential risk of such releases.

In summary, the Project is not expected to result in any adverse environmental justice impacts to minority or low-income populations in the region of influence. These populations may benefit from the positive socioeconomic effects of the Project.

Traffic and Transportation

Keystone would primarily utilize underground boring methods to cross under roads and railroads. Impacts to local traffic would be minor and would occur only during the construction period. No substantive ongoing impacts to roads and railroads from operation and maintenance of the pipeline would be expected. Such activities could require occasional use of roads to access the pipeline site with much less equipment and personnel than would occur during construction.

3.10.3 Connected Actions

3.10.3.1 Power Distribution Lines and Substations

Construction of the substations, transformers and necessary electrical power distribution lines would impact local economies by creating temporary employment, and potentially through the purchase of goods and services, and taxes on those goods. The magnitude of the positive economic impact is not known at the time this report is being written as the estimate of construction costs for the substations, transformers and electrical power distribution lines from the various local power providers is not yet available. The economic impact would be distributed throughout the Project area. Table 3.10.3-1 shows the geographic distribution of the planned improvements to power infrastructure as a proxy for estimating the geographic distribution of the economic impact. In general relatively more transformers and miles of electrical power distribution lines would be required for the Steele City Segment. Also included in Table 3.10.3-1 are the number and names of the local power providers.

TABLE 3.10.3-1
Summary of Power Supply Requirements for Pump Stations and Tank Farm

Segment	State	Number of Transformers	Miles of Power Distribution lines	Number of Power Providers	Power Provider
Steele City Segment	Montana	6	147.4	5	Big Flat Electric Cooperative, McCone Electric Cooperative, Norval Electric Cooperative' Tongue River Electric Cooperative, Montana-Dakota Utilities Company
Steele City Segment	South Dakota	7	161.8	3	Grand Electric Cooperative, West Central Electric Cooperative, Rosebud Electric Cooperative
Steele City Segment	Nebraska	5	68.1	1	Nebraska Public Power District
Keystone Cushing Extension	Kansas	2	21.4	2	Clay Center Public Utility, Westar Energy
Gulf Coast Segment	Oklahoma	4	16.9	4	Oklahoma Gas and Electric Company, Canadian Valley Electric Cooperative/PSO, People's Electric Cooperative/PSO, Southeastern Electric Cooperative
Gulf Coast Segment	Texas	6	13.5	4	Lamar Electric Cooperative, Wood County Electric Cooperative, Cherokee County Electric Cooperative, Sam Houston Electric Cooperative

Source: Keystone 2009c.

3.10.3.2 Lower Brule to Witten 230-kV Transmission Line

Construction of the 230-kV transmission line (originating from the Fort Thompson/Big Bend area and running south to the existing Witten Substation), the new Lower Brule Substation and expansion of the Witten Substation would impact local economies by creating temporary employment, and potentially through the purchase of goods and services, and taxes on those goods. The magnitude of the positive economic impact is not known at the time this report is being written as the estimate of construction costs for this connected action is not yet known. The economic impact would likely be concentrated in Lyman and Tripp counties in south-central South Dakota, the location of the Big Bend Dam and the Witten Substation. The currently proposed alternative alignments for the Lower Brule to Witten 230-kV Transmission Line cross the Lower Brule Indian Reservation. Future assessments of the socioeconomic impacts of this connected action will include an analysis of Environmental Justice.

3.10.4 References

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3.11 CULTURAL RESOURCES

Cultural resources include the locations of human activity, occupation, or usage that contain materials, structures, or landscapes that were used, built, or modified by people. Cultural resources include spatially circumscribed areas of human activity, such as Pre-contact Native American archaeological sites, American farmsteads, or a district of historic buildings. For the purposes of the proposed Project, field studies to identify cultural resources have occurred and are continuing to assess archaeological resources (sites), historic resources (buildings, structures, objects, and districts), and properties of religious and cultural significance, including Traditional Cultural Properties (TCPs). Paleontological resources are discussed in the Geology Section 3.1.

3.11.1 Section 106 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA, 1966), as amended, requires the lead federal agency with jurisdiction over a federal undertaking (i.e., a project, activity, or program that is funded by a federal agency or that requires a federal permit, license, or approval) to consider impacts on historic properties before that undertaking occurs. A "historic property" is defined as any district, archeological site, building, structure, or object that is either listed, or eligible for listing, in the National Register of Historic Places (NRHP). Under this definition, other historic and archaeological resources may be present within a project's Area of Potential Effect (APE) but are not historic properties if they do not meet the eligibility requirements for listing in the NRHP. For the purposes of this section, "historic resource" is a term that refers to buildings, structures, objects, and districts that may or may not meet NRHP criteria of evaluation. Likewise, "archaeological resource" refers to a site that may or may not meet the NRHP criteria of evaluation. The term "sites of religious and/or cultural significance" refers to areas of concern to Indian tribes that, in consultation with the respective tribe(s), may or may not be eligible for listing in the NRHP. These sites may also be considered TCPs. To be considered eligible for listing in the NRHP, a property must retain integrity and be greater than 50 years of age, although there are provisions for listing cultural resources of more recent origin if they are of "exceptional" importance. The intent of Section 106 is for federal agencies to take into account the impacts of a proposed "undertaking" on any historic properties situated within the APE and to consult with the Advisory Council on Historic Preservation (ACHP), State Historic Preservation Officers (SHPOs), federally recognized Indian tribes, applicants for federal assistance, local governments, and any other interested parties regarding the proposed undertaking and its potential impacts on historic properties. The proposed Project is considered an undertaking under Section 106 and the lead federal agency is DOS.

The implementing regulation of Section 106 is 36 CFR Part 800 (2004). This regulation establishes a process of identifying historic properties that may be affected by the proposed undertaking; assessing the undertaking's impacts on those resources; and engaging in consultation that seeks ways to avoid, reduce, or mitigate any impacts on NRHP-listed or -eligible properties. Impacts include, but are not limited to, destruction or alteration of all or part of a property; isolation from or alteration of its surrounding environment; introduction of visual, audible, or atmospheric elements that are out of character with the property or that alter its setting; transfer or sale of a federally owned property without adequate conditions or restrictions regarding preservation, maintenance, or use; and neglect of a property resulting in its deterioration or destruction.

36 CFR Part 800 specifies that several state, tribal, and federal agencies must be consulted. This includes each SHPO whose state would physically include any portion of the APE. The SHPO is appointed by each state to protect the interests of its citizens with respect to issues of cultural heritage. Section 101(b)(3) of the NHPA provides each SHPO a prominent role in advising the responsible federal agencies

and ACHP. In addition to the SHPO, the lead federal agency has an obligation to work with state and local governments, private organizations, and individuals during the initial planning and development of the Section 106 process.

On non-tribal lands, the DOS, in consultation with the SHPOs, Tribal Historic Preservation Officers (THPOs) and other consulting parties, assesses the need for historic and archaeological resource investigations in the Project APE, generates and approves methodologies for undertaking such investigations within the state, and evaluates the preliminary NRHP status of any historical or archaeological resources located within the APE. The SHPO also assists the lead federal agency and ACHP to assess any potential impacts to historic properties and works with Keystone, the lead federal agency, ACHP, and Indian tribes to mitigate any negative impacts that could occur to historic properties. On Indian tribal lands, the Section 106 responsibilities of the SHPO can also be assumed by a THPO under Section 101(d)(2) of the NHPA.

On January 28 2009 DOS issued a Notice of Intent (NOI) to prepare an EIS under NEPA for the Project. Along with the NOI, DOS notified the public of its intent to conduct a parallel Section 106 process along with the NEPA compliance process. On January 30, 2009, the DOS invited Indian tribes and state and federal agencies by letter to become consulting parties for the proposed Project (undertaking) and notified the consulting parties that DOS would be the lead federal agency. Additional Indian tribes and agencies were identified by the BLM and an invitation was forwarded to those parties on February 19, 2009. Another letter from DOS sent March 1, 2009 again invited Indian tribes that had not responded to the initial invitations. Those Indian tribes that did not respond to the first or second written invitations were called by phone on March 18 and March 19, 2009.

On March 30, 2009, DOS proposed the APE for the Project and requested comments from consulting parties that included the SHPOs, Indian tribes, and other federal agencies. DOS will continue consultation as determinations are made concerning NRHP eligibility of identified resources, Project impacts on historic properties, and resolution of any adverse impacts.

Section 106 recognizes the importance of consulting with Indian tribes when federal undertakings occur. Specifically, 36 CFR 800.2(c)(2)(ii) notes: "Section 101(d)(6)(B) of the NHPA requires the agency official to consult with any Indian tribe or Native Hawaiian organization that attaches religious and cultural importance to historic properties that may be affected by an undertaking. This requirement applies regardless of the location of the historic property." In addition, 36 CFR 800.2(c)(2)(ii)(B) says the "Federal Government has a unique legal relationship with Indian tribes set forth in the Constitution of the United States, treaties, statutes, and court decisions. Consultation with Indian tribes should be conducted in a sensitive manner respectful of tribal sovereignty. Nothing in this part alters, amends, repeals, interprets or modifies tribal sovereignty, any treaty rights, or other rights of an Indian tribe, or preempts, modifies or limits the exercise of any such rights."

The DOS is consulting with Indian tribes and the SHPOs regarding the identification, evaluation, and mitigation of historic properties located on non-tribal lands. If a THPO assumes the Section 106 responsibilities of the SHPO on tribal lands, all consultations regarding the Project and its potential effect on historic properties within the relevant tribal lands will be through the THPO. In the event that the tribe has not identified a THPO, as is the case of the Lower Brule Sioux Tribe (LBST), the lead federal agency is required to consult with both the SHPO and the Indian tribe's designated cultural resource representative for any impacts on historic properties situated on the tribal lands. A 230-kV electrical transmission line, a connected action to the Project, is needed to ensure Western's transmission system reliability based on pump station power demands would cross the Reservation of the LBST. The LBST cultural resource specialist and the South Dakota SHPO will be consulted concerning the Project and the connected actions.

Section 106 regulations state that each SHPO (or THPO, if they have assumed the SHPO's role) is required to respond within 30 days of receiving a request to review a proposed action, or a request to review a federal agency's finding or determination regarding historic properties located within the Project APE. In the event that the SHPO/THPO does not respond within this timeframe, 36 CFR 800.3(c)(4) states that the lead agency can decide to (1) proceed to the next step in the application process based on any earlier findings or determinations that have been made up to that point; or (2) consult directly with the ACHP in lieu of the SHPO/THPO. If, after this step is followed, the SHPO or THPO decides to re-enter the Section 106 process, 36 CFR 800.3(c)(4) further states that the lead agency official may continue the consultation proceeding without being required to reconsider previous findings or determinations. TransCanada Keystone Pipeline, LP (Keystone), the Project applicant, provided information, analyses, and recommendations to assist DOS in complying with NEPA and Section 106, in accordance with NHPA regulations.

3.11.1.1 Properties of Religious and Cultural Significance (Including TCPs)

Historic properties include sites of religious or cultural significance including TCPs that meet the NRHP criteria of eligibility but that do not necessarily have physical evidence of human activity. National Register Bulletin 38 defines TCPs as locations that embody the "beliefs, customs, and practices of a living community of people that have been passed down through the generations, usually orally or through practice. The traditional cultural significance of a historic property, then, is significance derived from the role the property plays in a community's historically rooted beliefs, customs, and practices" that are essential for continuing the cultural identity of the community. As a part of Section 106 consultation, funding for TCP studies has been offered to every consulting tribe. Table 3.11.4-3 lists the Indian tribes who have responded to the funding offer. Several tries are currently conducting studies of areas of cultural and religious value including TCPs. The DOS is consulting with Indian tribes to assist in determining the best ways to identify, evaluate, and mitigate impacts to these areas. The summary of this tribal consultation is in section 3.11.4.3.

3.11.1.2 National Register of Historic Places

Not all archaeological resources, historic resources, or sites of religious and traditional significance are considered historic properties under Section 106. To be designated as a historic property, the resource must be listed, or eligible for listing, in the NRHP. The criteria (36 CFR 60.4 [a–d]) used to evaluate the significance of a resource are as follows:

- It is associated with events that have made a significant contribution to the broad patterns of American history; or
- It is associated with the lives of past significant persons; or
- It embodies the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- It has yielded or may be likely to yield, information important in history or prehistory.

Properties also need to exhibit integrity of location, materials, setting, design, association, workmanship, and feeling and must also be at least 50 years old

The analysis in the draft EIS consists of a summary of all cultural resources that have been reported to DOS for the proposed Project. This includes cultural resources assessed as being eligible and ineligible for listing in the NRHP, and cultural resources for which NRHP eligibility has not been evaluated. The reported cultural resources are divided into three main temporal groupings: Precontact period, Historic period, and multi-component. Precontact resources are sites that contain material evidence of Native American activities before Europeans entered the Project area. Examples of Precontact sites include, but are not limited to, rock art; camp or village sites; rock shelters; and scatters of stone, bone, or ceramic tool-making debris. Historic period resources can include recent Native American activity locations but generally reflect Euro-American activities of the last 250 years. These can include residential, government, or commercial structures; farmsteads; mining sites; roads or railways; and ceramic, metal, and glass artifact scatters. Multi-component resources are locations where both Historic period and Precontact cultural remains are present.

3.11.1.3 Archaeological Resources Protection Act and Native American Graves Protection and Repatriation Act

In addition to Section 106, the Archaeological Resources Protection Act of 1979 (ARPA) (16 USC 470; 43 CFR 7) requires federal land-owning agencies to issue ARPA permits to qualified individuals, institutions, or firms that conduct archaeological surveys within federal and Indian lands. The proposed Project has the potential to be within federally controlled, maintained, managed, or owned lands—including BLM lands, Reclamation lands, and USACE managed lands. A connected action, a 230-kv electrical transmission line would cross the Lower Brule Sioux Reservation. For the one reservation, BIA would be responsible for supplying ARPA permits for archaeological investigations, while the BLM, Reclamation, and USACE would be responsible for supplying ARPA permits on their respective lands. An ARPA permit can be granted by BIA only if the respective tribe with jurisdiction over the land consents. Terms and conditions may be added to the permit by the jurisdictional tribe. Tribal conditional permits to conduct archaeological surveys on reservation lands may also be required by the tribe.

The Native American Graves Protection and Repatriation Act (NAGPRA 1990) applies to all federal and tribal lands. NAGPRA effectively protects tribal burial sites and rights to items of cultural significance, including human remains, funerary objects, sacred objects, and objects of cultural patrimony (25 USC §3001[3]; 43 CFR 10). On federal lands, intentional excavation and removal of Native American human remains and objects from federal or tribal lands for discovery, study, or removal is permissible only if an ARPA permit is issued by a federal land-holding agency. Consultation with Native Americans must occur prior to the issuance of an ARPA permit and removal of human remains and objects requires the consent of the applicable Native American tribe. NAGPRA applies to all federal and tribal lands affected by the proposed Project. Each state has statutes that govern the inadvertent discovery and/or excavation of human remains as well as artifacts on private lands. Unanticipated Discovery Plans shall be prepared for the states of Montana, South Dakota, Nebraska, Kansas, Oklahoma, and Texas to provide a clear process of notification and consultation.

3.11.2 Project Setting

3.11.2.1 Description

The proposed Project crosses Montana, South Dakota, Nebraska, Kansas, Oklahoma, and Texas. Keystone is proposing to construct and operate a crude oil pipeline and related facilities from Hardisty, Alberta, Canada, to the Port Arthur and east Houston areas of Texas in the United States (U.S.). The Project will have a nominal capacity to deliver up to 900,000 barrels per day (bpd) of crude oil from an oil supply hub near Hardisty to existing terminals in Nederland near Port Arthur and Moore Junction in

Houston. The Project will consist of three new pipeline segments plus additional pumping capacity on the Cushing Extension Segment of the Keystone Pipeline Project (Keystone Cushing Extension). The Steele City Segment of the Project extends from Hardisty, Alberta southeast to Steele City, Nebraska. The Gulf Coast Segment extends from Cushing, Oklahoma south to Nederland, Texas. The Houston Lateral extends from the Gulf Coast Segment, in Liberty County, Texas southwest to Moore Junction, Harris County, near the Houston Ship Channel. In total, the Project will consist of approximately 1,702 miles of new, 36-inch-diameter pipeline, about 327 miles in Canada and 1,375 miles within the U.S. It will interconnect with the northern and southern terminus of the previously approved 298-mile-long, 36-inch-diameter Keystone Cushing Extension. The Project is planned to be placed into service in phases. The Gulf Coast Segment and the Houston Lateral are planned to be in service in 2011 and the Steele City Segment is planned to be in service in 2012 (Carpenter et al. 2008; Lawrence et al. 2008). Figure 1.1-1 provides the route of the pipeline through the affected states.

3.11.2.2 Project Area

The Project area contains cultural resources resulting from human settlement and other activities over the last 10,000 years. These include archaeological sites, special activity areas such as food processing sites, cemeteries, and sites of spiritual and traditional use. Later historic activities expressed on the landscape include mining-related resources, railroads, commercial buildings, domestic residences, and agricultural buildings. Many of these cultural resources are associated with mineral exploration, transportation, settlement, logging, and agricultural production. Lands and resources within and outside the respective Reservations are very important to Native American peoples for subsistence gathering, for the collection of plants for medicines, for spiritual and ceremonial purposes, and for everyday life. This section of the draft EIS, therefore, summarizes the cultural resources aspects of the Project in relation to each individual affected state.

3.11.2.3 Area of Potential Effect

The APE is defined as the "geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist" (36 CFR 800.16(d)). For the purposes of the proposed Project and Section 106 of the NHPA, the APE consists of a 300-foot-wide survey area that includes a 110-foot wide construction right-of-way (ROW) that will primarily be collocated along existing pipeline facilities/easements. Keystone will also retain a 50-foot-wide permanent ROW to accommodate other Project-related construction areas, such as pipeline operations and maintenance. The 300-foot wide corridor will allow for minor Project adjustments or route variations as they become known. Other areas that may lie outside of the pipeline construction ROW but that are considered a part of the Project APE include temporary work spaces, access roads, storage/warehouse yards, pump stations and valves, and associated electrical transmission/distribution lines. The electrical power distribution lines and the Lower Brule to Witten 230-kV transmission line are connected actions to the Project and are discussed further in Section 3.11.7. However, the results of surveys conducted for identification and mitigation of historic properties for the electrical power distribution lines and the transmission line are included for ease of reference in the State-by State Analysis (Section 3.11.3.1) Due to the nature of current Project planning, additional workspace areas may still be identified. Once they are identified, DOS will ensure that cultural resources surveys are conducted for these locations in consultation with the consulting parties. Table 3.11.2-1 describes the Project APE for the Project through each state and respective counties.

TABLE 3.11.2-1 Area of Potential Effect for the Project Corridor by State		
State	**Counties**	**Corridor Area of Potential Effect**
Montana	Dawson, Fallon, McCone, Phillips, Prairie, and Valley	300 feet (if existing pipeline is present then 300 feet from the centerline of outermost existing pipeline)
South Dakota	Butte, Haakon, Harding, Jones, Lyman, Meade, Perkins, and Tripp	300 feet (if existing pipeline is present then 300 feet from the centerline of outermost existing pipeline)
Nebraska	Keya Paha, Rock, Holt, Garfield, Wheeler, Greeley, Boone, Nance, Merrick, Hamilton, York, Fillmore, Saline, and Jefferson	300 feet (if existing pipeline is present then 300 feet from the centerline of outermost existing pipeline)
Kansas	Butler and Clay	Area of soil disturbance related to construction of two pumping stations.
Oklahoma	Lincoln, Okfuskee, Creek, Seminole, Hughes, Coal, Atoka, Bryan, Grady, Pittsburg, and Potawottamie	300 feet (if existing pipeline is present then 300 feet from the centerline of outermost existing pipeline)
Texas	Angelina, Chambers, Cherokee, Delta, Fannin, Franklin, Hardin, Harris, Hopkins, Jefferson, Lamar, Liberty, Nacogdoches, Polk, Rusk, Smith, Upshur, and Wood	300 feet (if existing pipeline is present then 300 feet from the centerline of outermost existing pipeline)

Montana

The Montana portion of the Project is part of the Steele City Segment and would enter Montana at the Canadian border, extending through the state for approximately 282 miles to South Dakota. Within Montana, the pipeline would cross six counties: Dawson, Fallon, McCone, Phillips, Prairie, and Valley. SWCA Environmental Consultants (SWCA) was contracted on behalf of Keystone to perform the required cultural resources assessments within the state. Approximately 42.6 miles (15 percent) of the Project corridor in Montana crosses federally-owned land largely administered by the BLM and 19.1 miles (7 percent) of state lands which is administered by the Montana Department of Natural Resources and Conservation (MDNRC).

The SWCA draft Level III Cultural Resources Survey report was submitted to the Montana SHPO in 2008 to identify and evaluate resources and to provide recommendations concerning impacts stemming from the Project. The report describes background research and field efforts conducted within the Montana portion of the Project. Additional reports were submitted in 2009, describing background research and field efforts done as part of proposed route variations, access roads, pipe yards, and lay down areas. The reports are listed below:

- Berg, C. et al. 2008a. Class III Cultural Resources Survey for the Steele City Segment in Montana of the Keystone XL Project, Dawson, Fallon, McCone, Phillips, Prairie, and Valley Counties, Montana. SWCA Environmental Consultants. Broomfield, CO.

- Cooper, J. et al. 2009. Addendum 1: Additional Fieldwork Results. Class III Cultural Resources Survey for the Steele City Segment in Montana of the Keystone XL Project, Dawson, Fallon, McCone, Phillips, Prairie, and Valley Counties, Montana. SWCA Environmental Consultants. Broomfield, CO.
- Zietz, V. et al. 2009. Addendum 2: Additional Fieldwork Results. Class III Cultural Resources Survey for the Steele City Segment in Montana of the Keystone XL Project, Dawson, Fallon, McCone, Phillips, Prairie, and Valley Counties, Montana. SWCA Environmental Consultants. Broomfield, CO.

Before beginning fieldwork, SWCA conducted a Class I file search prior to the Class III inventory of the proposed Project centerline and associated centerline route variations on April 14-18, 2008, and May 23, 2008, through the Montana SHPO Cultural Resources Annotated Bibliography System Report (CRABS) and the Cultural Resource Information Systems Report (CRIS) under SHPO Project Number 2008052306. An additional Class I file/record search was conducted at the BLM Miles City Field Office on April 23, 2008. The purpose of the file search was to identify previously recorded cultural resources and previously completed cultural resource investigations within a 3.2-kilometer (km)-wide (2-mile-wide) corridor centered on the proposed pipeline centerline, proposed access roads, and proposed power distribution line routes. The search also included a review of General Land Office (GLO) maps of the Project region from the late 1800s and early 1900s to identify locations of potential historic sites within the study area.

The file searches of the proposed pipeline route and environs identified 605 previous inventories, which documented 216 archaeological sites and historic structures. The 216 previously recorded sites consisted of 148 Precontact archaeological sites, 5 historic archaeological sites, 6 multi-component archaeological sites, and 57 historic structures. None of the Precontact sites are eligible for listing on the NRHP. The 57 historic structures included 27 homesteads, 9 railroad crossings, 8 bridges, 4 canal systems, a cemetery, a trading post and 2 crossings of the Lewis and Clark National Historic Trail (LCNHT). Thirteen of the historic structures are eligible for listing on the NRHP, including 7 railroads (24VL0099, 24MC0097, 24MC0257, 24DW0419, 24DW0426, 24FA0382, and 24VL1628); 2 railroad bridges (24MC0413 and 24MC0414); 2 canals (24DW0289 and 24VL1194); a road bridge (24VL1833); and a cemetery site (24PE0633).

The file searches along the proposed access road routes identified 121 previously recorded archaeological sites and historic structures. Of these, 84 were Precontact archaeological sites, 5 were historic archaeological sites, 3 were multi-component sites, 13 did not have an identified time period, and 15 were historic structures. None of the Precontact archaeological sites are eligible for listing on the NRHP. Three of the historic structures are identified as eligible for listing on the NRHP. They include portions of three historic railroads (24FA0382, 24DW0426, 24VL0099).

The file searches along the proposed power distribution line routes identified 278 previously recorded archaeological sites and historic structures. Of these, 217 were Precontact archaeological sites, 25 were historic archaeological sites, 8 were multi-component sites, 3 did not have an identified time period, and 25 were historic structures. Fourteen of the Precontact archaeological sites are eligible for listing in the NRHP. These sites include lithic scatters (24FA0611, 24FA0613, 24FA0614, 24FA0615, 24FA0616, 24FA0617, 24FA0618, 24FA0619, and 24FA0622); stone circle sites (tipi ring sites) (24FA0625, 24PH1162, 24PH3547, and 24PH3548); and a rock cairn and alignment (24PH3183). One of the multi-component sites (24FA0621), a Precontact lithic scatter with rock piles and an historic herder camp, was eligible for listing on the NRHP. Thirteen of the historic structures are identified as eligible for listing on the NRHP. These 13 sites consist of railroads (24FA0382, 24MC0097, 24MC0257, 24MC0413, 24MC0414, 24MC0415, 24PH3008, and 24VL0099) and agricultural/irrigation (24DW0289, 24PE0267, 24PH2710, 24PH3103, and 24VL1194).

South Dakota

The South Dakota portion of the Project is part of the Steele City Segment and would enter South Dakota from Montana, extending through the state for approximately 312.8 miles to Nebraska. Within South Dakota, the pipeline would cross eight counties: Butte, Haakon, Harding, Jones, Lyman, Meade, Perkins, and Tripp. SWCA was contracted on behalf of Keystone to perform the required cultural resources assessments within the state.

The SWCA draft Level III Cultural Resources Survey report was submitted to the South Dakota SHPO to simultaneously identify and evaluate resources as well as provide recommendations concerning impacts stemming from the Project. The report describes background research and field efforts conducted within the South Dakota portion of the Project in compliance with Section 106 requirements. The report is listed below:

- Berg, C. et al. 2008b. Level III Cultural Resources Survey for the Steele City Segment in South Dakota of the Keystone XL Project, Butte, Haakon, Harding, Jones, Lyman, Meade, Perkins, and Tripp Counties, South Dakota. SWCA Environmental Consultants. Broomfield, CO.
- Barnes, Z. et al. 2009. Addendum 1: Additional Fieldwork Results. Level III Cultural Resources Survey for the Steele City Segment in South Dakota of the Keystone XL Project, Butte, Haakon, Harding, Jones, Lyman, Meade, Perkins, and Tripp Counties, South Dakota. SWCA Environmental Consultants. Broomfield, CO.
- Doyle, S. et al. 2009. Addendum 2: Additional Fieldwork Results. Level III Cultural Resources Survey for the Steele City Segment in South Dakota of the Keystone XL Project, Butte, Haakon, Harding, Jones, Lyman, Meade, Perkins, Tripp, and Gregory Counties, South Dakota. SWCA Environmental Consultants. Broomfield, CO.

Before beginning fieldwork, SWCA conducted a file search on May 7 and 8, 2008, at the South Dakota State Archaeological Resource Center (SARC). The purpose of the file search was to identify previously recorded cultural resources and previously completed cultural resource investigations within a 3.2-kilometer (km)-wide (2-mile-wide) corridor centered on the proposed pipeline centerline. The search also included a review of GLO maps of the Project region from the late 1800s and early 1900s to identify locations of potential historic sites within the study corridor.

The file searches identified 52 previous inventories, which documented 49 archaeological sites and 15 historic structures along the proposed pipeline route. The 49 previously recorded archeological sites consisted of 33 Precontact sites, 10 historic sites, and 6 sites that did not have an identified time period. Only one of the Precontact sites (39MD0502) was previously identified as potentially eligible for the NRHP, but the South Dakota SHPO had not concurred with this determination. None of the historic sites are listed as eligible for the NRHP. Only one site (39BU0039) located within the 2-mile buffer (based on previously recorded location information) is located within the proposed 300-foot survey corridor for the pipeline. Of the 15 historic structures, 6 are historic bridges, and 9 are historic buildings including a school house, barns, and a ranch. None of the historic bridges are eligible for listing on the NRHP. However, three of the structures: two barns (TP00000010 and TP00000018) and one ranch (PE00000020) are eligible for listing on the NRHP.

Nebraska

The Project would enter Nebraska from South Dakota and would extend through the state for approximately 255.2 miles. The counties crossed would be Keya Paha, Rock, Holt, Garfield, Wheeler, Greeley, Boone, Nance, Merrick, Hamilton, York, Fillmore, Saline, and Jefferson. The American Resources Group, Ltd. (ARG) was contracted on behalf of Keystone to perform the required cultural resources assessments within the state.

The ARG draft Level III Cultural Resources Survey report was submitted to the Nebraska SHPO to simultaneously identify and evaluate resources as well as provide recommendations concerning impacts stemming from the Project. The report describes background research and field efforts conducted within the Nebraska portion of the Project in compliance with Section 106 requirements. Three addendum reports with background research and field efforts for construction access roads, extra work spaces, and proposed route variations were also submitted. The reports are listed below:

- Fink, M. et al. 2008. A Phase I Cultural Resources Survey of the Steele City Segment in Nebraska of the Proposed Keystone XL Pipeline Project in Keya Paha, Rock, Holt, Garfield, Wheeler, Greeley, Boone, Nance, Merrick, Hamilton, York, Fillmore, Saline, and Jefferson Counties, Nebraska. American Resources Group, Ltd. Carbondale, IL.
- Lomas, M. 2009a. Addendum No. 1: A Phase I Cultural Resources Survey of the Steele City Segment in Nebraska of the Proposed Keystone XL Pipeline Project in Keya Paha, Rock, Holt, Garfield, Wheeler, Greeley, Boone, Nance, Merrick, Hamilton, York, Fillmore, Saline, and Jefferson Counties, Nebraska. American Resources Group, Ltd. Carbondale, IL.
- Anderson J. and M. Lomas. 2009. Addendum No. 2: A Phase I Cultural Resources Survey of the Steele City Segment in Nebraska of the Proposed Keystone XL Pipeline Project in Keya Paha, Rock, Holt, Garfield, Wheeler, Greeley, Boone, Nance, Merrick, Hamilton, York, Fillmore, Saline, and Jefferson Counties, Nebraska. American Resources Group, Ltd. Carbondale, IL.
- Lomas, M. and K. Lomas. 2009. Addendum No. 3: A Phase I Cultural Resources Survey of the Steele City Segment in Nebraska of the Proposed Keystone XL Pipeline Project in Keya Paha, Rock, Holt, Garfield, Wheeler, Greeley, Boone, Nance, Merrick, Hamilton, York, Fillmore, Saline, and Jefferson Counties, Nebraska. American Resources Group, Ltd. Carbondale, IL.

For the initial report, ARG conducted a file search on April 11 and May 22, 2008 at the Nebraska State Historical Society (NSHS) in Lincoln, Nebraska. The purpose of the file search was to identify previously recorded cultural resources and previously completed cultural resource investigations within a 3.2-kilometer (km)-wide (2-mile-wide) corridor centered on the proposed pipeline centerline. A review of documented architectural sites was conducted at NSHS on April 22, 2008. The search also included a review of GLO maps, county histories, and historic maps and atlases to identify locations of potential historic sites within the study corridor.

The initial file search identified 60 previous inventories, which documented 57 archaeological sites and 220 historic structures near the proposed pipeline route. The 57 previously recorded archeological sites consisted of 30 Precontact sites, 23 historic sites, one site containing both precontact and historic components, and three sites that did not have an identified time period. Only one archaeological site within the 2-mile corridor is listed on the NRHP. Site 25NC2, the Horse Creek site, is a historic Pawnee earth lodge village, occupied between 1810 and 1842. This site is not located within the proposed 300-foot survey corridor. Of the 220 historic structures, 36 have been evaluated as eligible or potentially eligible for listing on the NRHP. Eleven of the historic structures were identified adjacent to the 300-foot corridor. Only one of the historic structures adjacent to the 300-foot survey corridor, the District 81

Shiloh School, has been recommended as potentially eligible for listing on the NRHP. The school building, YK-00-183, is a Craftsman-style schoolhouse built in 1920.

Along with the literature review, ARG submitted its research design and methodology for cultural resources field studies to the Nebraska SHPO in April 2008 (Fink et al., 2008). The purpose of the research design was to present the methods ARG would use to assess the Project in Nebraska and identify historic properties. Approval of the research design was received from the Nebraska SHPO on May 27, 2008.

Kansas

The Kansas portion of the Project is part of the existing Keystone Cushing Extension beginning at Steele City, Nebraska, and extending to Cushing, Oklahoma. The Cushing Extension lateral pipeline enters Kansas from Jefferson County, Nebraska and extends through the state for approximately 210.36 miles. The counties crossed are: Washington, Clay, Dickinson, Marion, Butler, and Cowley. No new pipeline construction is planned within the Cushing Extension corridor, however, two new pump stations will be constructed.

Geo-Marine, Inc. and ARG were the companies contracted by Keystone to perform the required cultural resources background investigations and assessments within the state for the Project. Prior to commencing fieldwork, in March 2006, ARG submitted a research design to the SHPO that included a records review and plan to conduct field surveys for the Cushing Extension pipeline route in Kansas. The purpose of the research design was to present the field methods to be used to assess the Cushing Extension pipeline and to identify historic properties within the APE. It was based on the results of the site file research and results of previous surveys. The design incorporated a sampling strategy that assessed the route in terms of high and low probabilities for containing Section 106-defined historic properties (excluding TCPs); this strategy follows procedures accepted by the SHPO and FERC for pipeline projects in Kansas. The submitted research design used the preliminary pipeline route as its basis; subsequent alterations to the route did not require submission of a new research design but involved implementation of the general procedures outlined in the research design.

Two pump station facilities will be located within the Kansas section of the Project corridor and two power distribution lines that serve the pumping stations are anticipated. The ARG draft Phase II Cultural Resources Survey report was submitted to the Kansas SHPO to simultaneously identify and evaluate resources as well as provide recommendations concerning impacts stemming from the Project. The report describes background research and field efforts conducted within the Kansas portion of the Project in compliance with Section 106 requirements. The report is listed below:

- Lomas, M. 2009b. A Phase II Cultural Resources Survey of Pump Stations 27 and 29 for the Proposed Keystone XL Pipeline Project, Clay and Butler Counties, Kansas. American Resources Group, Ltd. Carbondale, IL.

Through their previous work in the APE, ARG identified one archaeological site within one of the proposed pipeline pump station locations. The site (14BU131), a historic period scatter, was recommended as not eligible for listing on the NRHP. Additional reports that include information about the power distribution lines are scheduled for submittal to DOS in December.

Oklahoma

The Oklahoma portion of the Project is part of the Gulf Coast Segment and ties into the Keystone Cushing Extension at Cushing, Oklahoma, and extends through the state for approximately 154.9 miles to

Texas. Within Oklahoma, the pipeline would cross 11 counties: Lincoln, Okfuskee, Creek, Seminole, Hughes, Coal, Atoka, Bryan, Grady, Pittsburg, and Pottawatomie. SWCA was contracted on behalf of Keystone to perform the required cultural resources assessments within the state.

The SWCA draft Cultural Resource Inventory report was submitted to the Oklahoma SHPO in 2008 to simultaneously identify and evaluate resources as well as provide recommendations concerning impacts stemming from the Project. The report describes background research and field efforts conducted within the Oklahoma portion of the Project in compliance with Section 106 requirements. An additional report was submitted in 2009, describing background research and field efforts done as part of proposed route variations, access roads, pipe yards, and lay down areas. The reports are listed below:

- Miller, K. et al. 2008. Cultural Resource Inventory of the Keystone XL Pipeline Project: Gulf Coast Segment in Oklahoma: Payne, Lincoln, Okfuskee, Creek, Seminole, Hughes, Coal, Atoka, and Bryan Counties, Oklahoma. SWCA Environmental Consultants. Austin, TX.
- Carpenter, S. et al. 2009. Cultural Resource Inventory of the Keystone XL Pipeline Project: Gulf Coast Segment in Oklahoma, Lincoln, Okfuskee, Creek, Seminole, Hughes, Coal, Atoka, and Bryan Counties, Oklahoma. SWCA Environmental Consultants. Austin, TX.

Before beginning fieldwork, SWCA conducted background research in April and May, 2008. The research included sources at the Oklahoma Archaeological Survey, the Oklahoma SHPO, and the Oklahoma Historical Society, as well as the Museum of the Red River in Idabel and the Texas Archeological Research Laboratory. The purpose of the research was to identify previously recorded cultural resources and previously completed cultural resource investigations within a 3.2-kilometer (km)-wide (2-mile-wide) corridor centered on the proposed pipeline centerline. The search also included a review of GLO maps of the Project region from the late 1800s and early 1900s to identify locations of potential historic sites within the study corridor.

The file searches identified 80 previous inventories, which documented three archaeological sites and one historic structure within the proposed pipeline route. The Precontact archaeological site (34HU21), a lithic procurement site, was identified as not eligible for listing on the NRHP. Three historic sites include 34AT662, a farmstead; 34LN182, a collapsed residential building; and 34AT661, a historic farmstead; were determined as not eligible for listing in the NRHP.

Texas

The Project would enter Texas from Oklahoma on the Gulf Coast Segment and would extend through the state along the Gulf Coast Segment for approximately 323 miles, and along the Houston Lateral for 47.2 miles. The Texas portion of the Gulf Coast Segment begins in Fannin County approximately 3 miles northeast of Riverby, Texas, and crosses southeast across 16 counties from the Red River to a point between Port Neches and Nederland, Texas. These counties are Angelina, Cherokee, Delta, Fannin, Franklin, Hardin, Hopkins, Jefferson, Lamar, Liberty, Nacogdoches, Polk, Rusk, Smith, Upshur, and Wood counties. Approximately 89 percent of the Gulf Coast Segment in Texas parallels existing infrastructure and other easements, while 11 percent is not collocated. The proposed Houston Lateral parallels existing pipeline for most of the 47.2 mile route that crosses through Liberty, Chambers, and Harris counties. SWCA and HRA Gray & Pape (HRA G&P) was contracted on behalf of Keystone to perform the required cultural resources assessments within the state.

The SWCA and HRA G&P draft Cultural Resource Inventory reports were submitted to the Texas SHPO in 2008 to identify and evaluate resources as well as provide recommendations concerning impacts stemming from the Project. The report describes background research and field efforts conducted within the Texas portion of the Project in compliance with Section 106 requirements. Additional reports were submitted in 2009, describing background research and field efforts done as part of proposed route variations, access roads, pipe yards, and lay down areas. The reports are listed below:

- Carpenter, S. et al. 2008. "Cultural Resource Inventory of the Keystone XL Project, Gulf Coast Segment in Texas: Angelina, Cherokee, Delta, Fannin, Franklin, Hardin, Hopkins, Jefferson, Lamar, Liberty, Nacogdoches, Polk, Rusk, Smith, Upshur, and Wood Counties, Texas." TransCanada Keystone XL Project, Cultural Report, Gulf Coast – Texas (Confidential Section 106 Consultation Field Survey Reports in Keystone 2009c). SWCA Austin.
- Lawrence, K. et al. 2008. Final Draft: Cultural Resource Inventory of the Keystone XL Houston Lateral: Liberty, Chambers, and Harris Counties, Texas. TransCanada Keystone XL Project, Cultural Report, Houston Lateral – Texas (Confidential Section 106 Consultation Field Survey Reports in Keystone 2009c). SWCA Austin.
- Lawrence, K. et al. 2009. Cultural Resource Inventory of the Keystone XL Pipeline Project Gulf Coast Segment Crude-Oil Pipeline: Houston Lateral, Liberty, Chambers, and Harris Counties, Texas. TransCanada Keystone XL Project, Cultural Report, Houston Lateral – Texas (Confidential Section 106 Consultation Field Survey Reports in Keystone 2009c) SWCA, Austin.
- Carpenter S. et al. 2009. Cultural Resource Inventory of the Keystone XL Gulf Coast Segment in Texas, Angelina, Cherokee, Delta, Fannin, Franking, Hardin, Hopkins, Jefferson, Lamar, Liberty, Nacogdoches, Polk, Rusk, Smith, Upshur, and Wood Counties, Texas. SWCA, Austin.

SWCA and HRA G&P conducted a Class I and Class III cultural resources inventory of the Texas section of the Gulf Coast Segment and the Houston Lateral of the proposed Project. Along with the literature review, ENSR submitted its research design and survey protocols for cultural resources field studies to the Texas Historical Commission (THC) or SHPO in May 2008. The purpose of the research design was to present the methods ENSR would use to assess the Project and identify historic properties. It was based on the results of the site file research and previous surveys. The procedures used to identify historic properties of cultural or religious importance to Indian tribes, including TCPs, are outlined in the discussion of the consultation process (see Section 3.11.4).

Additional survey protocols for this Project are currently being reviewed by DOS for compliance with 36 CFR Part 800 and Section 106 of the NHPA. The DOS considers the survey protocols acceptable for archaeological resources, but requires historic structures be assessed by an Architectural Historian within the APE of the project corridor. HRA G&P and SWCA prepared a site-location model for the survey area along the Gulf Coast Segment in Texas. This model focused on physiographic and other significant characteristics, such as distance to water, landform type, and soil type. The model was used to stratify the survey area into zones of probability for cultural resources. The Project's protocols required field surveys in only the High Probability Areas (HPAs). All HPAs were field-verified and subject to 100 percent coverage. In addition, moderate-probability areas were ground-truthed. Consistent with THC standards, these field surveys consisted of a 100-percent surface survey of HPAs supplemented by shovel testing in an attempt to discover subsurface sites when ground surface visibility was less than or equal to 30 percent. Shovel testing was completed in all areas with potential for intact buried soils or cultural materials regardless of ground surface visibility. When areas with the potential for deeply buried soils or cultural materials (inclusive of alluvial, colluvial, or aeolian soils or a combination) were encountered, backhoe trenching was employed.

Before beginning fieldwork in Texas section of the Gulf Coast Segment and the Houston Lateral, ENSR reviewed the Texas Archaeological Research Library (TARL) site files at the University of Texas at Austin and online information from the THC's Atlas for archaeological and historical sites. The purpose of the research was to identify previously recorded cultural resources and previously completed cultural resource investigations within a 3.2-kilometer (km)-wide (2-mile-wide) corridor centered on the proposed pipeline centerline.

The file searches identified 29 previous inventories, which documented 215 archaeological sites, 57 cemeteries, and 14 historic markers in Texas section of the Gulf Coast Segment of the proposed pipeline route, and no cultural resources within the Houston Lateral. The 215 previously recorded archeological sites consisted of 109 Precontact sites, 91 historic sites (of which 56 are historic structures), and 15 sites containing both Precontact and historic components. None of the previously recorded sites within the 300-foot survey corridor have been determined eligible for listing on the NRHP, although one is a National Historic Trail. All of the 57 cemeteries are historic resources, which are typically not recorded as archaeological sites, but are protected under Texas state law.

During the pedestrian surveys, both HRA G&P and SWCA recorded Historic Standing Structures (HSSs) or historic architectural remnants on and immediately adjacent to the HPAs. Whenever possible, the approximate date of construction, rationale for the date assigned, architectural styles and function, building materials, techniques of construction, and construction sequence were recorded.

HSSs or historic architectural remnants were mapped using GPS points to capture the location, orientation, and size of the structure footprint. When appropriate, documentation included a sketched floor plan and site sketch maps drawn to-scale (including interior features where possible) of the major structure or remnants (e.g., houses, barns). In addition to sketch maps, photographs of each structure or structural remnant were taken to illustrate the general setting and inter-relationship among all cultural resources on-site. HRA G&P and SWCA completed a THC Historic Resources Survey Form for each HSS and historic site.

The DOS requires HSSs be recorded throughout the Project corridor, rather than only in or adjacent to HPAs. Survey reports will be submitted to DOS for review when work is completed.

3.11.3 NRHP Eligibility, Impacts, and Mitigation

Section 106 of the NHPA (as codified in 36 CFR 800.5) requires federal agencies to apply the “criteria of adverse effect” to determine whether a project will affect historic properties. Impacts are found when an undertaking alters, directly or indirectly, the characteristics of a historic property that qualify it for inclusion in the NRHP, in a manner that diminishes the historical integrity of the property. Impacts may include reasonably foreseeable impacts caused by the undertaking that may occur later in time, be distant, or be cumulative. Federal agencies are required to consult with consulting parties when there are potential adverse effects. The consultation should attempt to resolve adverse effects and develop mitigation measures as necessary.

For the Project, the principal types of impacts that would occur include physical destruction or damage, to all or part of the property, caused by pipeline trenching or related excavations or boring; introduction of visual, atmospheric, or audible elements that diminish the integrity of the property’s significant historic features by short-term pipeline construction or construction of above ground appurtenant facilities and roads; and change of the character of the property’s use or of physical features within the property’s setting that contribute to its significance.

Historic properties under Section 106 are determined eligible by the lead federal agency with the concurrence of the applicable land managing agency (BLM) and SHPO/THPO. If adverse impacts to the resource cannot be avoided, DOS will develop a Memorandum of Agreement (MOA) which includes a mitigation plan in consultation. This will be reviewed by the consulting parties. Cultural resources that are considered "unevaluated" have not been sufficiently assessed at this time to finalize an eligibility determination for the NRHP. These sites must either be further assessed through NRHP evaluation procedures or will be treated by DOS as a historic property and mitigation plans must be developed.

Avoidance can be achieved by moving the proposed pipeline corridor or the location of proposed pipeline facilities. Avoidance can also be achieved by keeping construction activities away from NRHP-eligible properties, limiting the impact to existing demonstrated disturbance areas, or digging underneath the cultural deposits by boring or horizontal direct drilling (HDD). At least 30 days prior to construction commencing in the area, Keystone would be required to file with DOS the results of NRHP assessments, demonstrating that historic properties designated as unevaluated are not historic properties. Alternatively, Keystone must provide plans that detail the specific avoidance procedures to be implemented in order to avoid impact to each eligible and unevaluated site, using the procedures described below. DOS and the consulting parties would evaluate the submitted information, following the protocols outlined in any Programmatic Agreement (PA) developed for the proposed Project.

The following mitigation measures are applicable for historic properties for a finding of No Effect or No Adverse Effect:

(1) Avoidance through pipeline or access road route variation or Project feature relocation

For each route variation or feature relocation, Keystone would file with DOS a map at 1:24,000 scale or better that clearly shows the original surveyed corridor or feature location, the known boundaries of the eligible or unevaluated property, the route variation or feature relocation that avoids the property, and survey information showing that no historic properties are located within the route variation or feature relocation.

(2) Avoidance through abandonment.

For each abandonment, Keystone would file with DOS a letter that states the facility or road at which the eligible or unevaluated property was located and a statement that the facility or road is no longer associated with the Project.

(3) Avoidance through bore or HDD.

For each instance, Keystone would file with DOS a map and technical drawing that clearly shows the projected depth below surface and the entrance and exit points of the drill in relation to the boundaries of the eligible or unevaluated property.

(4) Avoidance by narrowing the construction corridor ("neck down").

For each instance, Keystone would file with DOS an alignment sheet map at 1:500 scale or better that clearly shows the construction corridor (including additional temporary workspace) in relation to the eligible or unevaluated property boundary. Prior to any construction commencing in the area, safety fencing must be erected along the relevant outer edges of the eligible or unevaluated property. A qualified monitor must be present during installation of the pipeline in that area to ensure that accidental impacts do not occur to the property.

(5) Avoidance through the use of existing roadways as Project access roads to the extent practicable

For each instance, Keystone would file with DOS an alignment sheet map at 1:500 scale that clearly shows the existing roadway in relation to the eligible or unevaluated property, a description of the existing state of the roadway, and a statement that Project traffic would be limited entirely to the existing roadway and that the road would not be widened or upgraded as a result of the Project.

Short-term construction-related impacts would be mitigated by implementing measures such as the use of construction mats. If impacts should occur to any historic property or unevaluated cultural resource, they would be resolved through consultation with all consulting parties.

3.11.3.1 State-by-State Analyses

Montana

For the Level III Cultural Resource Inventory through July 2009, SWCA conducted a pedestrian survey of 270.4 miles of the total 284.3 miles of proposed pipeline, 116.7 miles of the total of 129 miles of access roads, 69.2 miles of the total of 137.7 miles of power distribution lines, and 699 acres of proposed ancillary facilities sites in Montana on the Steele City Segment. Through July 2009, SWCA identified 190 cultural resources during the cultural resource inventory in Montana, 124 in the Project corridor, 42 in the survey of proposed power distribution lines, 19 in the survey of proposed access roads, and 5 in the survey of ancillary facilities. Of those 190 cultural resources, 134 were archaeological sites, 15 were historic structures, and 41 were isolated finds.

Since the July 2009 report, additional cultural resource surveys have been conducted in Montana for proposed Project route alternatives, power distribution lines, and ancillary facilities. This field work resulted in the survey of an additional 21.36 miles of centerline, 6.09 miles of access road, 64.26 miles of power distribution lines, and 11 ancillary facilities.

In total, 31 sites and 22 isolated finds were recorded. The results of these surveys will be reported in the Addendum 3 report that will be submitted to DOS in December 2009. Based on preliminary information received by DOS from Keystone, Table 3.11.3-1 has been updated to include resources that have been identified in the field and will be included in the December 2009 reports not yet received by DOS. Additional cultural resource surveys for Project pipeline corridor, power distribution lines, and ancillary facilities are scheduled for Spring 2010. These reports will be reviewed by DOS and then forwarded to the applicable consulting parties.

Archaeological Sites

Of the 134 archaeological sites, 16 were previously recorded cultural resources and included 7 Precontact sites, 4 historic sites, 3 multi-component sites, and 2 sites that did not have an identified time period. Of the 118 archaeological sites identified during the survey, 74 were Precontact sites, 18 were historic sites, 4 were multi-component sites, and 22 were sites that did not have an identified time period. Of the 41 isolated finds recorded during the field survey, 29 were Precontact and 12 were historic.

Four of the previously recorded archeological sites and three of the newly identified archaeological sites in the Montana section have been recorded as eligible, and 119 additional sites are considered unevaluated. Avoidance is recommended for all eligible or unevaluated sites with the exception of a number of tipi rings and a historic trail discussed below. By avoiding these sites, the proposed Project will not affect historic properties. By definition, the isolated finds are not eligible for listing in the NRHP.

Thirty-nine of the sites (32 newly recorded and 7 previously recorded) remain unevaluated, but are considered potential properties of religious and cultural significance including TCPs and may be eligible for the NRHP. Keystone plans to avoid the thirty-nine sites, if possible. The DOS will consult Indian tribes about the significance of the sites and work to avoid any detrimental impacts to the resources.

Historic Structures

Of the total 190 cultural resources identified by SWCA during the cultural resource inventory, 15 were historic structures. Five were previously recorded historic structures and included railways, homesteads, and canals. Eight of the structures have been recorded as eligible and two of the structures are unevaluated. Avoidance is recommended for all eligible or unevaluated sites. By avoiding these sites, the proposed Project will not affect historic properties.

Historic Trail

The proposed Project route crosses the LCNHT at two locations. Cultural resource investigations conducted in the vicinity of the trail did not identify any resources associated with the LCNHT. DOS is committed to working with NPS to evaluate the segments of the trail that cross the Project corridor for NRHP eligibility, and if eligible (or contributing to the trail's larger significance as a district), the DOS will avoid or mitigate any short or long-term impacts to the resources. Site forms for the LCNHT have not been prepared by Keystone. DOS is requiring that historic property site forms be completed for the trail for the segments that cross the Project APE so that they can be evaluated for the NRHP. Additional information concerning resources associated with the trail and potential Project impacts to the LCNHT will be submitted by Keystone.

Stone Circle Sites (Tipi Rings)

The Project APE contains several unevaluated stone circle sites (Table 3.11.3-1) that were identified during cultural resource surveys. The recordation and evaluation of these sites are guided by the *Recordation Standards and Evaluation Guidelines for Stone Circle Sites* (MT SHPO, 2002). Several of these sites may be adversely affected by the Project. The DOS will continue to work with the Indian tribes, BLM, MT SHPO, and Keystone to avoid or treat sites that will be adversely affected by the Project. To facilitate this process DOS will develop an MOA with the consulting parties. The DOS has also met with the Blackfeet and Chippewa-Cree tribes along the project route in Montana to look at and discuss stone circle sites, identify avoidance options, and to describe Project effects.

TABLE 3.11.3-1
Archaeological Sites and Historic Structures Identified in Montana

Site #	Description	NRHP Eligibility Recommendation from Keystone	NRHP Determination by DOS	Action Recommended by Keystone	Montana SHPO/ THPO Concurrence with DOS Finding
24DW289	Previously recorded Historic canal	Eligible, contributing segment	Eligible, contributing segment	Avoided by Bore*	Pending
24DW419	Previously recorded Historic railroad	Eligible, contributing segment	Eligible	Avoided by Bore*	Pending

TABLE 3.11.3-1
Archaeological Sites and Historic Structures Identified in Montana

Site #	Description	NRHP Eligibility Recommendation from Keystone	NRHP Determination by DOS	Action Recommended by Keystone	Montana SHPO/ THPO Concurrence with DOS Finding
24DW426	Previously recorded Historic railroad	Eligible, contributing segment	Eligible, contributing segment	Avoided by Bore*	Pending
24DW0524	Historic transportation corridor	Not Eligible	Not Eligible	No Further Work	Concur
24DW0525	Historic homestead	Unevaluated	Unevaluated	Avoidance	Pending
24DW0530	Historic homestead	Not Eligible	Not Eligible	No Further Work	Pending
24DW0531	Historic homestead	Not Eligible	Not Eligible	No Further Work	Pending
C001DA001*	Historic isolate*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C001DA002*	Historic isolate*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C001DA003*	Historic isolate*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C57DA001	Precontact isolate	Not Eligible	Not Eligible	No Further Work	Pending
C57DA002	Precontact isolate	Not Eligible	Not Eligible	No Further Work	Pending
C57DA003	Precontact isolate	Not Eligible	Not Eligible	No Further Work	Pending
C57DA005	Precontact isolate	Not Eligible	Not Eligible	No Further Work	Pending
C57DA008	Historic isolate	Not Eligible	Not Eligible	No Further Work	Pending
C82DA002*	Historic isolate*	Not Eligible*	Unevaluated*	Avoided*	Pending*
C001FA002*	Historic isolate*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C001FA003*	Prehistoric isolate*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C001FA004*	Isolated find*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
24FA382	Previously recorded Historic railroad	Eligible, contributing segment	Eligible, contributing segment	Fencing, Monitoring, or Avoidance	Pending
24FA0749	Historic pump house	Not Eligible	Not Eligible	Avoided*	Concur
24FA0750	Precontact lithic scatter and possible pronghorn processing locale	Unevaluated	Unevaluated	Avoided*	Pending
24FA0751	Historic debris scatter	Not Eligible	Not Eligible	No Further Work	Concur
24FA0752	Historic artifact scatter	Not Eligible	Not Eligible	Avoided*	Concur
24FA0753	Historic railroad grade	Not Eligible	Not Eligible	Avoided*	Pending
24FA0754	Historic debris scatter	Not Eligible	Not Eligible	Avoided*	Concur
24FA0755	Precontact stone cairn	Potentially Eligible	Unevaluated	Avoided*	Pending
24FA0756	Historic berm/dam	Not Eligible	Not Eligible	Avoided*	Pending

TABLE 3.11.3-1 Archaeological Sites and Historic Structures Identified in Montana					
Site #	**Description**	**NRHP Eligibility Recommendation from Keystone**	**NRHP Determination by DOS**	**Action Recommended by Keystone**	**Montana SHPO/ THPO Concurrence with DOS Finding**
C001FA001*	Historic isolate*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C001FA005*	Prehistoric isolate*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C001FA006*	Prehistoric isolate*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C001FA007*	Prehistoric isolate*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C57FA003	Precontact isolate	Not Eligible	Not Eligible	Avoided*	Pending
C57FA004	Historic isolate	Not Eligible	Not Eligible	No Further Work	Pending
C57FA006	Historic isolate	Not Eligible	Not Eligible	Avoided*	Pending
C58FA001	Precontact isolate	Not Eligible	Not Eligible	No Further Work	Pending
C58FA002	Precontact isolate	Not Eligible	Not Eligible	Avoided*	Pending
C58FA003	Precontact isolate	Not Eligible	Not Eligible	No Further Work	Pending
C58FA004	Precontact isolate	Not Eligible	Not Eligible	No Further Work	Pending
C58FA005	Precontact isolate	Not Eligible	Not Eligible	Avoided*	Pending
C210FA001	Precontact isolate	Not Eligible	Not Eligible	No Further Work	Pending
C001MC001*	Historic Isolate*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C001MC002*	Roadbed*	Unevaluated*	Unevaluated*	Avoidance*	Pending*
C001MC003*	Prehistoric isolate	Not Eligible	Unevaluated*	No Further Work*	Pending*
C002MC001*	Stone Cairns*	Potentially Eligible*	Unevaluated*	Avoidance*	Pending*
24MC0257 (multiple segments)	Previously recorded Historic railroad	Previously recorded Eligible, segment within APE contributing	Not Eligible	Avoided by Bore*	Pending
24MC0461	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24MC0462	Undated stone cairn	Potentially Eligible	Unevaluated	Avoided*	Pending
24MC0463	Precontact stone feature and lithic scatter	Potentially Eligible	Unevaluated	Avoided*	Pending
24MC0464	Historic homestead	Unevaluated	Unevaluated	Avoided*	Pending
24MC0465	Precontact stone feature and lithic scatter	Potentially Eligible	Unevaluated	Avoided*	Pending
24MC0466	Precontact stone feature	Potentially Eligible	Unevaluated	Avoided*	Pending
24MC0467	Precontact stone alignment and lithic scatter	Potentially Eligible	Unevaluated	Avoided/Fence and Monitor*	Pending
24MC0468	Undated stone cairn	Potentially Eligible	Unevaluated	Avoided*	Pending

TABLE 3.11.3-1 Archaeological Sites and Historic Structures Identified in Montana					
Site #	**Description**	**NRHP Eligibility Recommendation from Keystone**	**NRHP Determination by DOS**	**Action Recommended by Keystone**	**Montana SHPO/ THPO Concurrence with DOS Finding**
24MC0469	Historic boxcar structure	Unevaluated	Unevaluated	Avoided*	Pending
24MC0476	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24MC0477 (multiple segments)	Historic road	Not Eligible	Not Eligible	No Further Work	Pending
24MC0478	Historic ranch complex	Unevaluated	Unevaluated	Avoidance	Pending
C54MC001	Precontact isolate	Not Eligible	Not Eligible	No Further Work	Pending
C56MC006	Precontact isolate	Not Eligible	Not Eligible	Avoided*	Pending
C56MC007	Precontact isolate	Not Eligible	Not Eligible	Avoided*	Pending
C56MC009	Precontact isolate	Not Eligible	Not Eligible	Avoided*	Pending
C82MC001	Precontact isolate	Not Eligible	Not Eligible	No Further Work	Pending
C210MC001	Precontact isolate	Not Eligible	Not Eligible	No Further Work	Pending
24PE0720	Historic farmstead	Unevaluated	Unevaluated	Avoided*	Pending
24PE0721	Historic homestead	Unevaluated	Unevaluated	Avoided*	Pending
24PE0723	Historic ranch complex	Unevaluated	Unevaluated	Avoidance	Pending
C001PH001*	Cairn*	Potentially Eligible*	Unevaluated*	Avoidance, Native American Consultation*	Pending*
C001PH002*	Homestead*	Unevaluated*	Unevaluated*	Avoidance*	Pending*
C001PH003*	Stone Circle, Cairn/Depression, Artifact Scatter*	Potentially Eligible*	Unevaluated*	Avoidance, Native American Consultation*	Pending*
C001PH004*	Stone Feature*	Potentially Eligible*	Unevaluated*	Avoidance, Native American Consultation*	Pending*
C001PH005*	Stone Circle*	Potentially Eligible*	Unevaluated*	Avoidance, Native American Consultation*	Pending*
C002PH001*	Homestead*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C002PH002*	Stone Circle*	Potentially Eligible*	Unevaluated*	Avoidance, Native American Consultation*	Pending*
C002PH003*	Prehistoric isolate*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C002PH004*	Prehistoric isolate*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C002PH005*	Prehistoric isolate*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C002PH006*	Stone Circle*	Potentially Eligible*	Unevaluated*	No Further Work*	Pending*
C002PH008*	Stone Circle*	Unevaluated*	Unevaluated*	Avoided*	Pending*

TABLE 3.11.3-1 Archaeological Sites and Historic Structures Identified in Montana					
Site #	**Description**	**NRHP Eligibility Recommendation from Keystone**	**NRHP Determination by DOS**	**Action Recommended by Keystone**	**Montana SHPO/ THPO Concurrence with DOS Finding**
24PH3462*	Cairn*	Potentially Eligible*	Unevaluated*	Avoidance, Native American Consultation*	Pending*
C002PH009*	Stone Circle*	Unevaluated*	Unevaluated*	Avoided*	Pending*
C002PH010*	Stone Circle*	Unevaluated*	Unevaluated*	Avoided*	Pending*
C002PH011*	Stone Circle*	Unevaluated*	Unevaluated*	Avoided*	Pending*
24PH008/ 1781/1801	Previously recorded Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH0037	Previously recorded Undated stone cairn and depression	Potentially Eligible	Unevaluated	Avoidance	Pending
24PH1759	Previously recorded Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH1790	Previously recorded Historic rock cairns/ depression/artifact scatter	Unevaluated	Unevaluated	Avoided*	Pending
24PH1805	Previously recorded Historic homestead	Unevaluated	Unevaluated	Avoidance	Pending
24PH3008	Historic railroad grade	Eligible	Eligible	Avoidance	Pending
24PH4144	Precontact stone circle	Potentially Eligible	Unevaluated	Avoidance	Pending
24PH4145	Precontact stone circle and rock cairn	Potentially Eligible	Unevaluated	Avoidance	Pending
24PH4146	Precontact stone circle	Potentially Eligible	Unevaluated	Avoidance	Pending
24PH4159	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH4160	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH4161	Undated rock cairns	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH4162	Precontact/Historic stone features	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH4163	Precontact stone circle and rock cairn	Potentially Eligible	Unevaluated	Avoidance	Pending
24PH4164	Undated rock cairn	Potentially Eligible	Unevaluated	Avoidance	Pending
24PH4165	Undated rock cairn	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH4166	Precontact stone circle	Potentially Eligible	Unevaluated	Avoidance	Pending
24PH4168	Precontact stone	Potentially Eligible	Unevaluated	Avoidance	Pending

TABLE 3.11.3-1 Archaeological Sites and Historic Structures Identified in Montana					
Site #	**Description**	**NRHP Eligibility Recommendation from Keystone**	**NRHP Determination by DOS**	**Action Recommended by Keystone**	**Montana SHPO/ THPO Concurrence with DOS Finding**
	circle				
24PH4169	Historic artifact scatter / Precontact stone feature	Potentially Eligible	Unevaluated	Avoidance	Pending
24PH4218	Previously recorded Precontact stone feature	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH4219	Precontact stone feature	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH4220	Precontact stone feature	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH4221	Precontact stone feature	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH4222	Undated stone cairn	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH4223	Undated stone cairn	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH4224	Undated stone cairn	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH4225	Precontact stone circle	Potentially Eligible	Unevaluated	Avoidance	Pending
24PH4226	Historic artifact scatter / Precontact stone feature	Potentially Eligible	Unevaluated	Avoidance	Pending
24PH4227	Historic debris scatter	Not Eligible	Not Eligible	No Further Work	Pending
24PH4228	Undated stone cairn	Potentially Eligible	Unevaluated	Avoidance	Pending
24PH4229	Precontact stone feature and lithic scatter	Potentially Eligible	Unevaluated	Avoidance	Pending
24PH4230	Precontact stone circle	Potentially Eligible	Unevaluated	Avoidance	Pending
24PH4231	Precontact stone circle	Potentially Eligible	Unevaluated	Avoidance	Pending
24PH4232	Precontact stone circle	Potentially Eligible	Unevaluated	Avoidance	Pending
24PH4233	Precontact stone feature	Potentially Eligible	Unevaluated	Avoidance	Pending
24PH4234	Precontact stone circle	Potentially Eligible	Unevaluated	Avoidance	Pending
24PH4235	Precontact stone cairn	Potentially Eligible	Unevaluated	Avoidance	Pending
24PH4236	Precontact stone circle	Potentially Eligible	Unevaluated	Avoidance	Pending

TABLE 3.11.3-1 Archaeological Sites and Historic Structures Identified in Montana					
Site #	**Description**	**NRHP Eligibility Recommendation from Keystone**	**NRHP Determination by DOS**	**Action Recommended by Keystone**	**Montana SHPO/ THPO Concurrence with DOS Finding**
24PH4237	Undated stone cairn	Potentially Eligible	Unevaluated	Avoidance	Pending
24PH4238	Undated stone cairn	Potentially Eligible	Unevaluated	Avoidance	Pending
24PH4239	Precontact stone feature	Potentially Eligible	Unevaluated	Avoidance	Pending
24PH4240	Precontact stone feature	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH4241	Precontact stone feature	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH4242	Precontact stone feature	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH4243	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH4244	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH4245	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH4265	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH4266	Undated stone cairn	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH4267	Historic farmstead	Eligible	Eligible	Avoidance	Pending
24PH4268	Precontact stone feature	Potentially Eligible	Unevaluated	Avoided*	Pending
24PH4269	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
C54PH002	Precontact isolate	Not Eligible	Not Eligible	Avoided*	Pending
C63PH006	Historic isolate	Not Eligible	Not Eligible	Avoided*	Pending
C84PH002	Historic isolate	Not Eligible	Not Eligible	No Further Work	Pending
C84PH003	Historic isolate	Not Eligible	Not Eligible	No Further Work	Pending
C83PH007	Precontact isolate	Not Eligible	Not Eligible	No Further Work	Pending
C001PR002*	Precontact isolate*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C001PR003*	Homestead*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C001PR004*	Historic isolate*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C001PR005*	Prehistoric isolate*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C001PR006*	Homestead*	Unevaluated*	Unevaluated*	Avoidance*	Pending*
C001PR007*	Prehistoric/historic isolate*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C001PR008*	Historic isolate*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C58PR002	Precontact isolate	Not Eligible	Not Eligible	Avoided*	Pending

TABLE 3.11.3-1 Archaeological Sites and Historic Structures Identified in Montana					
Site #	**Description**	**NRHP Eligibility Recommendation from Keystone**	**NRHP Determination by DOS**	**Action Recommended by Keystone**	**Montana SHPO/ THPO Concurrence with DOS Finding**
C58PR003	Precontact isolate	Not Eligible	Not Eligible	Avoided*	Pending
C58PR004	Precontact isolate	Not Eligible	Not Eligible	Avoided*	Pending
C58PR005	Precontact isolate	Not Eligible	Not Eligible	Avoided*	Pending
C58PR006	Precontact isolate	Not Eligible	Not Eligible	Avoided*	Pending
C001VA001*	Stone Circle*	Potentially Eligible*	Unevaluated*	Avoidance, Native American Consultation*	Pending*
C001VA002*	Homestead*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C001VA003*	Road*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C001VA004*	Stone Circle*	Not Eligible*	Unevaluated*	Avoidance, Native American Consultation*	Pending*
C001VA005*	Historic railroad bed*	Unevaluated*	Unevaluated*	Bore, Fence, and Monitor	Pending*
C002VA001*	Railroad grade*	Unevaluated*	Unevaluated*	Avoidance*	Pending*
C002VA002*	Foundation and Depression*	Unevaluated*	Unevaluated*	Avoidance*	Pending*
C002VA003*	Dump*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
C002VA004*	Homestead*	Unevaluated*	Unevaluated*	Avoidance*	Pending*
C002VA005*	Stone Circle*	Potentially Eligible*	Unevaluated*	Avoidance, Native American Consultation*	Pending*
C002VA006*	Stone Circle*	Potentially Eligible*	Unevaluated*	Avoided*	Pending*
C002VA207*	Isolate*	Not Eligible*	Unevaluated*	No Further Work*	Pending*
24VL0041*	Homestead*	Eligible*	Unevaluated*	Avoidance*	Pending*
24VL0099-6*	Railroad grade*	Eligible*	Unevaluated*	Avoidance*	Pending*
24VL99	Previously recorded Historic railroad	Eligible, contributing segment	Unevaluated	Avoid by Bore*	Pending
24VL805	Previously recorded Undated stone cairn	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL962	Previously recorded Precontact/Historic stone feature site, lithic scatter, historic artifact scatter	Potentially Eligible	Unevaluated	Avoidance	Pending
24VL972	Previously recorded Precontact/Historic stone circle and cairn, historic fence line	Potentially Eligible	Unevaluated	Avoidance	Pending

TABLE 3.11.3-1
Archaeological Sites and Historic Structures Identified in Montana

Site #	Description	NRHP Eligibility Recommendation from Keystone	NRHP Determination by DOS	Action Recommended by Keystone	Montana SHPO/ THPO Concurrence with DOS Finding
24VL979	Historic homestead	Eligible	Eligible	Avoidance	Pending
24VL1194	Previously recorded Historic canal	Eligible	Eligible	Avoid by Bore*	Pending
24VL1269/ 24VL1274	Previously recorded Precontact stone circle	Potentially Eligible	Unevaluated	Avoidance	Pending
24VL1273	Previously recorded Precontact stone feature	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1298	Previously recorded Historic homestead / Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1628	Previously recorded Historic Railroad	Eligible, Non-contributing segment	Eligible, Non-contributing segment	No Further Work	Concur
24VL1700	Precontact stone feature	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1712	Previously recorded Precontact stone feature	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1889	Historic canal	Not Eligible	Not Eligible	No Further Work	Concur
24VL1890	Historic artifact scatter	Not Eligible	Not Eligible	Avoided*	Concur
24VL1891	Precontact stone circle and cairn	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1892	Historic artifact scatter	Not Eligible	Not Eligible	No Further Work	Concur
24VL1893	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1894	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1895	Precontact stone circle, cairn, lithic scatter	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1896	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1897	Historic animal pen	Not Eligible	Not Eligible	Avoided*	Concur
24VL1898	Historic stone alignment	Not Eligible	Not Eligible	Avoided*	Concur
24VL1899	Precontact stone cairn	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1900	Undated stone cairn	Potentially Eligible	Unevaluated	Avoided*	Pending

TABLE 3.11.3-1 Archaeological Sites and Historic Structures Identified in Montana					
Site #	**Description**	**NRHP Eligibility Recommendation from Keystone**	**NRHP Determination by DOS**	**Action Recommended by Keystone**	**Montana SHPO/ THPO Concurrence with DOS Finding**
24VL1901	Historic fence line and associated debris	Not Eligible	Not Eligible	No Further Work	Concur
24VL1902	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1903	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1904	Precontact stone circle and cairn	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1905	Undated stone cairn	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1906	Undated stone feature	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1908	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1909	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1910	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1911	Undated rock cairn	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1912	Historic homestead	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1913	Undated stone cairn	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1914	Precontact stone feature	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1915	Precontact stone feature	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1916	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1917	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1918	Historic homestead	Eligible	Unevaluated	Avoidance	Pending
24VL1919	Precontact stone circle	Potentially Eligible	Unevaluated	Avoidance	Pending
24VL1920	Historic artifact scatter	Unevaluated	Unevaluated	Avoidance	Pending
24VL1921	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1922	Undated stone cairn	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1923	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1924	Precontact stone	Potentially Eligible	Unevaluated	Avoided*	Pending

TABLE 3.11.3-1 Archaeological Sites and Historic Structures Identified in Montana					
Site #	Description	NRHP Eligibility Recommendation from Keystone	NRHP Determination by DOS	Action Recommended by Keystone	Montana SHPO/ THPO Concurrence with DOS Finding
	cairn				
24VL1925	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1926	Historic homestead	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1927	Historic homestead	Unevaluated	Unevaluated	Avoided*	Pending
24VL1928	Undated stone cairn	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1929	Precontact stone feature	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1930	Undated stone cairn	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1931	Undated stone feature	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1932	Historic fence line	Not Eligible	Not Eligible	Avoided*	Pending
24VL1933	Precontact stone circle	Potentially Eligible	Unevaluated	Avoidance	Pending
24VL1934	Precontact stone circle	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1935	Historic debris scatter / Precontact stone feature	Potentially Eligible	Unevaluated	Avoided*	Pending
24VL1936	Precontact stone feature	Potentially Eligible	Unevaluated	Avoidance	Pending
24VL1937	Precontact stone feature	Potentially Eligible	Unevaluated	Avoidance	Pending
24VL1938	Historic ranch complex	Unevaluated	Unevaluated	Avoidance	Pending
24VL1939	Undated stone cairn	Potentially Eligible	Unevaluated	Avoidance	Pending
24VL1940	Historic farmstead	Unevaluated	Unevaluated	Avoidance	Pending
24VL1941	Undated stone cairn	Potentially Eligible	Unevaluated	Avoidance	Pending
24VL1942	Historic artifact scatter / Precontact stone circle	Potentially Eligible	Unevaluated	Avoidance	Pending
C55VA002	Historic isolate	Not Eligible	Not Eligible	Avoided*	Pending
C63VA003	Historic isolate	Not Eligible	Not Eligible	Avoided*	Pending
C55VA005	Precontact isolate	Not Eligible	Not Eligible	Avoided*	Pending
C55VA006	Precontact isolate	Not Eligible	Not Eligible	Avoided*	Pending
C55VA007	Historic isolate	Not Eligible	Not Eligible	Avoided*	Pending
C54VA008	Historic isolate	Not Eligible	Not Eligible	No Further Work	Pending
C55VA013	Precontact isolate	Not Eligible	Not Eligible	No Further Work	Pending

TABLE 3.11.3-1 Archaeological Sites and Historic Structures Identified in Montana					
Site #	**Description**	**NRHP Eligibility Recommendation from Keystone**	**NRHP Determination by DOS**	**Action Recommended by Keystone**	**Montana SHPO/ THPO Concurrence with DOS Finding**
C54VA006	Historic isolate	Not Eligible	Not Eligible	Avoided*	Pending
C55VA009	Historic isolate	Not Eligible	Not Eligible	Avoided*	Pending
C55VA001	Precontact isolate	Not Eligible	Not Eligible	Avoided*	Pending
C66VA001	Historic isolate	Not Eligible	Not Eligible	Avoided*	Pending
C69VA001	Precontact isolate	Not Eligible	Not Eligible	Avoided*	Pending
C82VA002	Historic isolate	Not Eligible	Not Eligible	No Further Work	Pending
Lewis and Clark National Historic Trail			Unevaluated	Site form needed for evaluation	

* Information is derived from project updates received by DOS from Keystone. This updated information will be included in cultural resource reports that are due to be submitted to DOS in December 2009. Following review by the DOS, these reports will be forwarded to consulting parties for review consistent with 36 CFR Part 800.

As of July 2009, there are 13.9 miles of the pipeline corridor, 12.3 miles of access roads, and 68.5 miles of power distribution lines in Montana that need to be surveyed for historic properties at this time because of a lack of owner permission. Once owner permission is obtained, the remaining areas will be surveyed and documented in future reports. The cultural resources surveys for Project route variations, gap analysis, and extra work spaces will be documented in future reports. Upon receipt, the DOS will review these reports consistent with 36 CFR Part 800.

South Dakota

For the Level III Cultural Resource Inventory through July 2009, SWCA conducted a pedestrian survey of 257.7 miles of the total 312.3 miles of proposed pipeline, 22.3 miles of the total of 38.9 miles of access roads, 103.2 miles of the total of 106.7 miles of power distribution lines, and 308 acres of proposed ancillary facilities sites in the South Dakota section of the Steele City Segment. The remaining 54.6 miles of proposed pipeline, 16.6 miles of access roads, and 3.5 miles of power distribution lines could not be accessed mostly due to a lack of landowner permission. Through July 2009, SWCA identified 71 cultural resources during the cultural resource inventory in South Dakota, 40 in the Project corridor, 26 in the survey of proposed power distribution lines, and 5 in the survey of proposed access roads. Of those 71 cultural resources, 31 were archaeological sites, 9 were historic structures, and 31 were isolated finds.

Since the July 2009 report (Addendum 2), two rounds of archaeological survey have been completed in South Dakota. This field effort resulted in the survey of 69.68 miles of centerline, 5.92 miles of access road, 71.54 miles of power distribution line, and 20 ancillary facilities. In total, 18 sites and 13 isolated finds were recorded. Based on preliminary information received by DOS from Keystone, Table 3.11.3-2 has been updated to include resources that have been identified in the field and will be included in the December 2009 reports not yet received by DOS.

The results of the new survey will be reported in the Addendum 3 report and will be submitted to the DOS in December 2009. Additional cultural resource surveys within the Project APE (pipeline corridor, power distribution lines, and ancillary facilities) are planned for Spring 2010. These reports will be reviewed by DOS and then forwarded to the applicable consulting parties.

Archaeological Sites

In total, SWCA identified 71 cultural resources in South Dakota during the cultural resource inventory, of which 31 were archaeological sites. There were no previously recorded archaeological sites. Of the 31 archaeological resources identified during the survey, 3 were Precontact sites, 18 were historic, 6 were multi-component sites, and 4 did not have an identified time period. Of the 31 isolated finds recorded during the field survey, 13 were precontact and 18 were historic.

Two of the newly identified archaeological sites in the South Dakota section have been recorded as eligible, and 12 additional sites are considered unevaluated. Avoidance is recommended for all eligible or unevaluated sites. By avoiding these sites, the proposed Project will not affect historic properties. By definition, the isolated finds are not eligible for listing in the NRHP.

Historic Structures

Of the 71 cultural resources identified in South Dakota during the cultural resource inventory, nine are historic structures. One structure is listed in the NRHP (PE00000020) and five structures are eligible for the NRHP (39GR0165, 39GR0169, 39JN0051, 39JN2007and 39TP0063). One structure is unevaluated (LM009), and the remainder are not eligible. Avoidance is recommended for all eligible and unevaluated sites. By avoiding these sites, the proposed Project will not affect historic properties.

TABLE 3.11.3-2
Archaeological Sites and Historic Structures Identified in South Dakota

Site #	Description	NRHP Eligibility Recommendation from Keystone	NRHP Determination by DOS	Action Required by Keystone	South Dakota SHPO /THPO Concurrence with DOS Finding
39BU0039	Precontact stone circle	Potentially eligible	Unevaluated	Avoided	Pending
39BU0447	Precontact isolate	Not eligible	Not eligible	Avoided	Concur
39BU0448	Historic artifact scatter / Precontact isolate	Unevaluated	Unevaluated	Avoidance	Pending
39BU0449	Undated Stone Cairn	Potentially eligible	Unevaluated	Avoided, Fence, and Monitor	Pending
39GR0159	Precontact isolate	Not eligible	Not eligible	No further work	Concur
39GR0160	Historic artifact scatter	Not eligible	Not eligible	No further work	Concur
39GR0161	Precontact isolate	Not eligible	Not eligible	No further work	Concur
39GR0162	Precontact isolate	Not eligible	Not eligible	No further work	Concur
39GR0163	Historic well and artifact scatter / Precontact artifact scatter	Not eligible	Not eligible	No further work	Concur
39GR0164	Historic isolate	Not eligible	Not eligible	No further work	Concur
39GR0165	Historic farmstead	Eligible	Eligible	Avoidance	Concur

TABLE 3.11.3-2 Archaeological Sites and Historic Structures Identified in South Dakota					
Site #	**Description**	**NRHP Eligibility Recommendation from Keystone**	**NRHP Determination by DOS**	**Action Required by Keystone**	**South Dakota SHPO /THPO Concurrence with DOS Finding**
39GR0166	Historic farmstead	Unevaluated	Unevaluated	Avoidance	Pending
39GR0167	Historic isolate	Not eligible	Not eligible	No further work	Concur
39GR0168	Historic farmstead	Not eligible	Not eligible	No further work	Pending
39GR0169	Historic farmstead	Eligible	Eligible	Avoidance	Concur
39GR0170	Historic foundation and artifact scatter	Not eligible	Not eligible	No further work	Concur
39GR0171	Historic farmstead	Unevaluated	Unevaluated	Avoidance	Pending
39GR0172	Historic farmstead	Unevaluated	Unevaluated	Avoidance	Pending
39GR0173	Precontact isolate	Not eligible	Not eligible	No further work	Concur
39HK0136	Historic isolate	Not eligible	Not eligible	Avoided	Concur
39HK0137	Historic isolate	Not eligible	Not eligible	Avoided	Concur
39HK0138	Historic homestead	Unevaluated	Unevaluated	Avoidance	Pending
39HK0139	Historic well and artifact scatter	Not eligible	Not eligible	No further work	Concur
39HK0140	Historic farmstead	Not eligible	Not eligible	No further work	Pending
39HK0141	Historic trash dump	Unevaluated	Unevaluated	Avoidance	Pending
39HK0142	Historic isolate	Not eligible	Not eligible	No further work	Concur
39HK0143	Precontact isolate	Not eligible	Not eligible	No further work	Concur
39HK0144	Historic isolate	Not eligible	Not eligible	Avoided	Concur
39HN1078	Undated Stone Cairn	Potentially eligible	Unevaluated	Avoided	Pending
39HN1079	Undated Stone Cairn	Potentially eligible	Unevaluated	Avoided	Pending
39HN1080	Precontact stone features	Potentially eligible	Unevaluated	Avoided	Pending
39HN1081	Historic artifact scatter / Precontact isolate	Not eligible	Not eligible	Avoided	Concur
39HN1082	Precontact isolate	Not eligible	Not eligible	Avoided	Concur
39HN1083	Historic isolate / Precontact isolate	Not eligible	Not eligible	Avoided	Concur
39JN0050	Historic stock pond and trash scatter	Not eligible	Not eligible	No further work	Concur
39JN0051	Historic farm/ranch	Eligible	Eligible	Avoided, Fence and Monitor	Pending
39JN0052	Historic trash dump	Not eligible	Not eligible	No further work	Concur
39JN0053	Precontact isolate	Not eligible	Not eligible	No further work	Concur
39JN0054	Historic train passenger car	Not eligible	Not eligible	No further work	Concur

TABLE 3.11.3-2
Archaeological Sites and Historic Structures Identified in South Dakota

Site #	Description	NRHP Eligibility Recommendation from Keystone	NRHP Determination by DOS	Action Required by Keystone	South Dakota SHPO /THPO Concurrence with DOS Finding
39JN0055	Historic isolate	Not eligible	Not eligible	No further work	Concur
39JN0056	Historic farmstead / Precontact isolate	Not eligible	Not eligible	No further work	Pending
39JN0057	Historic isolate	Not eligible	Not eligible	No further work	Concur
39JN2007	Previously recorded Historic railroad	Eligible	Eligible	Boring / monitoring	Concur
39LM009	Historic farmstead	Unevaluated	Unevaluated	Avoidance	Pending
39LM0518	Historic trash scatter	Not eligible	Not eligible	No further work	Concur
39LM0519	Historic burial place	Eligible	Eligible	Avoided	Concur
39MD0820	Historic isolate	Not eligible	Not eligible	Avoided	Concur
39MD0821	Precontact isolate	Not eligible	Not eligible	Avoided	Concur
39MD0822	Precontact isolate	Not eligible	Not eligible	Avoided	Concur
39MD0823	Precontact lithic scatter	Not eligible	Not eligible	Avoided	Concur
39MD0824	Historic artifact scatter	Not eligible	Not eligible	Avoided	Concur
39MD0825	Historic isolate	Not eligible	Not eligible	Avoided	Concur
39MD0826	Historic isolate	Not eligible	Not eligible	Avoided	Concur
39MD0827	Historic isolate	Not eligible	Not eligible	Avoided	Concur
39MD0834	Historic isolate / Precontact isolate	Not eligible	Not eligible	No further work	Concur
39MD0835	Historic artifact scatter	Eligible	Eligible	Avoidance	Concur
39PE0398	Precontact isolate	Not eligible	Not eligible	Avoided	Concur
39PE0399	Historic isolate	Not eligible	Not eligible	No further work	Concur
39PE0400	Undated rock alignment	Not eligible	Not eligible	TBD	Additional work requested
39PE0402	Historic artifact scatter	Unevaluated	Unevaluated	Avoided	Pending
39PE0405	Precontact isolate	Not eligible	Not eligible	No further work	Concur
39PE0406	Historic depression and artifact scatter	Not eligible	Not eligible	No further work	Concur
PE00000020	Previously recorded Historic homestead	Listed in NR	Listed in NR	Avoided	Concur
39TP0056	Historic isolate	Not eligible	Not eligible	No further work	Concur
39TP0057	Historic isolate	Not eligible	Not eligible	No further work	Concur
39TP0058	Historic artifact scatter	Not eligible	Not eligible	Avoided	Concur

TABLE 3.11.3-2 Archaeological Sites and Historic Structures Identified in South Dakota					
Site #	**Description**	**NRHP Eligibility Recommendation from Keystone**	**NRHP Determination by DOS**	**Action Required by Keystone**	**South Dakota SHPO /THPO Concurrence with DOS Finding**
39TP0059	Historic isolate	Not eligible	Not eligible	Avoided	Concur
39TP0060	Historic isolate	Not eligible	Not eligible	No further work	Concur
39TR0061	Historic isolate	Not eligible	Not eligible	No further work	Concur
39TP0062	Precontact isolate	Not eligible	Not eligible	Avoided	Concur
39TP0063	Historic farmstead	Eligible	Eligible	Avoidance	Concur
C-Bravo-HA004*	Precontact isolated find*	Not eligible*	Pending*	No further work*	Pending*
C-Alpha-HA002*	Precontact isolated find*	Not eligible*	Pending*	No further work*	Pending*
C-Alpha-HA001*	Historic Depressions and artifact scatter*	Not eligible*	Pending*	No further work*	Pending*
C-Bravo-HA003*	Precontact isolated find*	Not eligible*	Pending*	No further work*	Pending*
C-Bravo-HA001*	Precontact isolated find*	Not eligible*	Pending*	No further work*	Pending*
C-Bravo-HA002*	Historic rock art*	Not eligible*	Pending*	No further work*	Pending*
C-Alpha-HA003*	Historic isolated find*	Not eligible*	Pending*	No further work*	Pending*
C-Alpha-HA004*	Precontact isolated find*	Not eligible*	Pending*	No further work*	Pending*
C-Bravo-HA005*	Precontact isolated find*	Not eligible*	Pending*	No further work*	Pending*
C-Alpha-HA006*	Precontact isolated find*	Not eligible*	Pending*	No further work*	Pending*
C-Alpha-HA007*	Historic artifact Scatter*	Not eligible*	Pending*	No further work*	Pending*
C-Alpha-HA008	Precontact isolated find	Not eligible*	Pending*	No further work*	Pending*
C-Alpha-HA010*	Precontact isolated find*	Not eligible*	Pending*	No further work*	Pending*
C-Bravo-HA007*	Precontact isolated find*	No eligible*	Pending*	No further work*	Pending*
C-Bravo-HA006*	Stone Cairn*	Potentially eligible*	Pending*	Avoided*	Pending*
C-Bravo-HA006*	Stone Cairn*	Potentially eligible*	Pending*	Avoided*	Pending*
C-Alpha-HA009*	Precontact isolated find*	Not eligible*	Pending*	No further work*	Pending*
C003ME001*	Grave*	Not eligible*	Pending*	No further work*	Pending*
C001ME001*	Schoolhouse (Standing	Eligible*	Pending*	Avoided, fence, & monitor*	Pending*

TABLE 3.11.3-2 Archaeological Sites and Historic Structures Identified in South Dakota					
Site #	**Description**	**NRHP Eligibility Recommendation from Keystone**	**NRHP Determination by DOS**	**Action Required by Keystone**	**South Dakota SHPO /THPO Concurrence with DOS Finding**
	Structure)*				
C001HN002*	Precontact isolated find*	Not eligible*	Pending*	No further work*	Pending*
C002HA002*	Homestead*	Not eligible*	Pending*	No further work*	Pending*
C002HA001*	Cairn*	Unevaluated*	Pending*	Avoid/Additional Consultation*	Pending*
C001HN001*	Precontact isolated find*	Not eligible*	Pending*	No further work*	Pending*
C001PE002	Precontact isolated find*	Not eligible*	Pending*	No further work*	Pending*
C002PE003*	Homestead*	Not eligible*	Pending*	No further work*	Pending*
C002HA003*	Homestead*	Unevaluated*	Pending*	No further work*	Pending*
39HN0998*	Precontact artifact scatter*	Unevaluated*	Pending*	Span power distribution lines over resource, no ground disturbance*	Pending*
C002PE002*	Homestead*	Eligible*	Pending*	Span power distribution lines over resource, no ground disturbance*	Pending*
C002PE001*	Cairn*	Unevaluated*	Pending*	Avoid/Additional Consultation*	Pending*
C003TR002*	Historic isolated find*	Not eligible*	Pending*	No further work*	Pending*
C003TR003*	Historic artifact scatter*	Not eligible*	Pending*	No further work*	Pending*
C003TR001*	Historic isolated find*	Not eligible*	Pending*	No further work*	Pending*
C003TR004*	Precontact isolated find*	Not eligible*	Pending*	No further work*	Pending*
C001PE001*	Precontact isolated find*	Not eligible*	Pending*	No further work*	Pending*
C002HA004*	Cairn*	Unevaluated*	Pending*	Avoided*	Pending*

* Information is derived from project updates received by DOS from Keystone. This updated information will be included in cultural resource reports that are due to be submitted to DOS in December 2009. Following review by the DOS, these reports will be forwarded to consulting parties for review consistent with 36 CFR Part 800.

As of July 2009, there are 54.6 miles of the pipeline corridor, 16.6 miles of access roads, and 3.5 miles of power distribution lines in South Dakota that need to be surveyed for historic properties at this time because of a lack of owner permission. Once owner permission is obtained, the remaining areas of the corridor will be surveyed and documented in future reports. The cultural resources surveys for Project route variations, gap analysis, and extra work spaces are anticipated and will be documented in future reports. Upon receipt, the DOS will review these reports consistent with 36 CFR Part 800.

Nebraska

For the Phase I Cultural Resources Survey through July 2009, ARG conducted a pedestrian survey of 239.67 miles of the total 250.3 miles of proposed pipeline, 8.9 miles of the total 11.77 miles of access roads, 521.7 acres of the total 665.42 acres of proposed ancillary facilities sites in the Nebraska section of the Steele City Segment. The remaining 10.63 miles of pipeline corridor, 2.87 miles of access roads, and 143.72 acres of proposed ancillary facilities sites could not be accessed mostly due to a lack of landowner permission.

In total, ARG identified 68 cultural resources during the cultural resource inventory, 55 in the Project corridor, 4 in the survey of proposed access roads, 6 in the survey of ancillary facilities, and 3 in the survey of 43 backhoe trenches. Of those 68 cultural resources, 50 were archaeological sites, 17 were historic structures, and one was an isolated find.

Since July 2009, a new Project centerline was issued and an additional 11.2 miles of the Project corridor was surveyed. In addition, two access roads, two staging areas, four pump stations, five contractor yards, four pipe yards, and a tank farm were surveyed. This new survey identified seven sites and three architectural resources. The report containing information on these resources has not been submitted for review. Submittal is anticipated in December 2009. Additional cultural resource surveys of Project centerline (11.73 miles), an access road (1.05 miles), and six ancillary facilities (182.4 acres) are scheduled for Spring 2010. Based on preliminary information received by DOS from Keystone, Table 3.11.3-3 has been updated to include resources that have been identified in the field and will be included in the December 2009 reports not yet received by DOS. These reports will be reviewed by DOS and then forwarded to the applicable consulting parties.

Archaeological Sites

No previously recorded archaeological resources were located in the proposed Project area. Of the 50 resources identified during the survey, 9 were precontact sites and 41 were historic sites. The one recorded isolated find is historic.

One of the historic sites (25HM25) is possibly associated with a Pawnee Indian burial ground and may be protected under Nebraska's Unmarked Human Burial Law. The site will be avoided during construction activities. Seven archaeological sites are considered unevaluated. Avoidance is recommended for all eligible or unevaluated sites. By avoiding these sites, the proposed Project will not affect historic properties. By definition, the isolated finds are not eligible for listing in the NRHP.

Historic Structures

Of the 68 cultural resources identified by ARG during the cultural resource inventory, 17 were historic structures, including 8 farmsteads, 4 roads, 4 railroads, and a canal. Two of the resources are unevaluated for listing in the National Register, 25BO54 and 25MK20, both historic farmsteads. Avoidance is recommended for all eligible and unevaluated sites. By avoiding these sites, the proposed Project will not affect historic properties. By definition, the isolated finds are not eligible for listing in the NRHP.

Historic Trails

The proposed Project route crosses the Oregon, California, Mormon Pioneer, and Pony Express National Historic Trails in the vicinity of the Platte River. The physical area where these trails cross the Project APE have been surveyed but no cultural resources associated with the trails have been identified. DOS is requiring that historic property site forms be completed for these trails for the segments that cross the Project APE so that they can be evaluated for the NRHP. DOS is committed to working with NPS to identify and avoid or mitigate any detrimental impacts to historic trails. Additional information concerning the trail segments will be submitted by Keystone. LIDAR imagery, shallow trenching, and magnetometers may be used to pinpoint the location of the trail in the APE. These trails are listed in the table below as unevaluated until additional information is received from Keystone.

TABLE 3.11.3-3
Archaeological Sties and Historic Structures Identified in Nebraska

Site #	Description	NRHP Eligibility Recommendation from Keystone	NRHP Eligibility Determination by DOS	Action Recommended by Keystone	Nebraska SHPO/ THPO Concurrence with DOS Finding
25BO54	Historic farmstead/rural household	Potentially Eligible	Unevaluated	Avoid by Route Variation*	Pending
25FM23	Historic farmstead	Not eligible	Not Eligible	No further work	Concur
25FM24	Active railroad	Not eligible	Not Eligible	No further work	Concur
25FM25	Historic railroad bed	Not eligible	Not Eligible	No further work	Concur
25FM26	Historic farmstead	Not eligible	Not Eligible	No further work	Concur
25FM27	Precontact limited activity site	Not eligible	Not Eligible	No further work	Concur
25FM28	Historic farmstead/rural household	Not eligible	Not Eligible	No further work	Pending
25GF16	Historic isolate	Not eligible	Not Eligible	No further work	Pending
25GY51	Historic farmstead/rural household	Not eligible	Not Eligible	No further work	Pending
25GY52	Historic farmstead/rural household	Not eligible	Not Eligible	No further work	Pending
25HM24	Precontact limited activity site	Not eligible	Not Eligible	No further work	Pending
25HM25	Historic burial ground	Not eligible	Not Eligible	Avoid by Route Variation*	Consultation with Pawnee Tribe recommended
25HM26	Historic road	Not eligible	Not Eligible	No further work	Concur
25HM27	Historic dump	Not eligible	Not Eligible	No further work	Concur
25HM28	Historic farmstead	Not eligible	Not Eligible	No further work	Concur
25HM29	Active railroad	Not eligible	Not Eligible	No further work	Concur
25HM30	Historic farmstead	Not eligible	Not Eligible	No further work	Concur

TABLE 3.11.3-3 Archaeological Sties and Historic Structures Identified in Nebraska					
Site #	**Description**	**NRHP Eligibility Recommendation from Keystone**	**NRHP Eligibility Determination by DOS**	**Action Recommended by Keystone**	**Nebraska SHPO/ THPO Concurrence with DOS Finding**
25HM31	Historic dump	Not eligible	Not Eligible	No further work	Pending
25HT44	Historic railroad bed	Not eligible	Not Eligible	No further work	Concur
25HT45	Historic road	Not eligible	Not Eligible	No further work	Concur
25HT46	Historic road	Not eligible	Not Eligible	No further work	Concur
25JF43	Previously recorded Historic windmill structure	Not eligible	Not Eligible	No further work	Pending
25JF45	Historic farmstead	Not eligible	Not Eligible	No further work	Concur
25JF46	Active railroad	Not eligible	Not Eligible	No further work	Concur
25JF47	Historic railroad bed	Not eligible	Not Eligible	No further work	Concur
25JF48	Historic farmstead	Not eligible	Not Eligible	No further work	Concur
25JF49	Historic farmstead	Not eligible	Not Eligible	No further work	Concur
25JF50	Historic railroad bed	Not eligible	Not Eligible	No further work	Pending
25JF51	Historic farmstead/rural household	Not eligible	Not Eligible	No further work	Pending
25JF52	Precontact field camp	Potentially Eligible	Unevaluated	Avoid by Route Variation*	Pending
25JF53	Historic farmstead/rural household	Not eligible	Not Eligible	No further work	Pending
25JF54	Historic farmstead/rural household	Not eligible	Not Eligible	No further work	Pending
25KP150	Precontact field camp	Potentially Eligible	Unevaluated	Avoid by Route Variation*	Pending
25KP151	Precontact field camp	Potentially Eligible	Unevaluated	Avoid by Route Variation*	Pending
25KP339*	Historic dump*	Not eligible*	Unevaluated*	Pending*	Pending*
25MK17	Historic dump	Not eligible	Not Eligible	No further work	Concur
25MK18	Historic farmstead	Not eligible	Not Eligible	No further work	Concur
25MK19	Historic farmstead	Not eligible	Not Eligible	No further work	Concur
25MK20	Previously recorded Historic farmstead/rural household	Potentially Eligible	Unevaluated	Avoid by Route Variation*	Pending
25MK21	Historic farmstead/rural household	Not eligible	Not Eligible	No further work	Pending

TABLE 3.11.3-3 Archaeological Sties and Historic Structures Identified in Nebraska					
Site #	**Description**	**NRHP Eligibility Recommendation from Keystone**	**NRHP Eligibility Determination by DOS**	**Action Recommended by Keystone**	**Nebraska SHPO/ THPO Concurrence with DOS Finding**
25MK22*	Historic railroad bed*	Not eligible*	Unevaluated*	Pending*	Pending*
25NC143	Historic farmstead	Not eligible	Not Eligible	No further work	Concur
25NC144	Historic farmstead	Not eligible	Not Eligible	No further work	Concur
25NC145	Historic farmstead	Not eligible	Not Eligible	No further work	Concur
25NC146	Historic canal	Not eligible	Not Eligible	No further work	Concur
25RO13	Historic road	Not eligible	Not Eligible	No further work	Concur
25SA73*	Kasak Cemetery*	Not eligible/ Protected*	Unevaluated*	Avoid by Bore*	Pending*
25SA86	Precontact limited activity site	Not eligible	Not Eligible	No further work	Concur
25SA87	Historic farmstead	Not eligible	Not Eligible	No further work	Concur
25SA88	Historic railroad bed	Not eligible	Not Eligible	No further work	Concur
25SA89*	Historic farmstead	Not eligible*	Unevaluated*	Pending*	Pending*
25YK17	Precontact field camp	Potentially Eligible	Unevaluated	Avoid by Route Variation*	Pending
25YK18	Historic farmstead	Not eligible	Not Eligible	No further work	Concur
25YK19	Historic farmstead	Not eligible	Not Eligible	No further work	Concur
25YK20	Active railroad	Not eligible	Not Eligible	No further work	Concur
25YK21	Historic farmstead	Not eligible	Not Eligible	No further work	Concur
25YK22	Historic farmstead	Not eligible	Not Eligible	No further work	Concur
25YK23	Historic artifact scatter	Potentially Eligible	Unevaluated	Avoidance	Pending
25YK24	Historic farmstead	Not eligible	Not Eligible	No further work	Concur
25YK25	Historic railroad bed	Not eligible	Not Eligible	No further work	Concur
25YK26	Precontact limited activity site	Not eligible	Not Eligible	No further work	Concur
25YK27	Historic farmstead	Not eligible	Not Eligible	No further work	Concur
25YK28	Precontact field camp	Not eligible	Not Eligible	No further work	Pending
25YK29	Historic farm outbuilding /activity area	Not eligible	Not Eligible	No further work	Pending
25YK30	Historic farm outbuilding /activity area	Not eligible	Not Eligible	No further work	Pending
25YK31	Historic farmstead/rural	Not eligible	Not Eligible	No further work	Pending

TABLE 3.11.3-3 Archaeological Sties and Historic Structures Identified in Nebraska					
Site #	**Description**	**NRHP Eligibility Recommendation from Keystone**	**NRHP Eligibility Determination by DOS**	**Action Recommended by Keystone**	**Nebraska SHPO/ THPO Concurrence with DOS Finding**
	household				
25WH4	Historic farmstead	Not eligible	Not Eligible	No further work	Concur
25WH5	Historic farmstead/rural household	Not eligible	Not Eligible	No further work	Pending
C203GR002AP	Historic building	Not eligible	Not Eligible	No further work	Pending
C201JE003AP*	Historic farmstead	Not eligible*	Unevaluated*	Pending*	Pending*
C201JE004AP*	Historic farmstead	Not eligible*	Unevaluated*	Pending*	Pending*
C201JE005AP*	Historic farmstead	Not eligible*	Unevaluated*	Pending*	Pending*
C203JE003AP	Historic buildings	Not eligible	Not Eligible	No further work	Pending
C203JE004AP	Historic buildings	Not eligible	Not Eligible	No further work	Pending
C203JE005AP	Historic buildings	Not eligible	Not Eligible	No further work	Pending
NA00-042*	Historic building*	Not eligible*	Unevaluated*	Pending*	Pending*
Oregon, California, Mormon Pioneer, and Pony Express National Historic Trails			Unevaluated	Site forms to be prepared by Keystone	

* Information is derived from project updates received by DOS from Keystone. This updated information will be included in cultural resource reports that are due to be submitted to DOS in December 2009. Following review by the DOS, these reports will be forwarded to consulting parties for review consistent with 36 CFR Part 800.

As of July 2009, there are 10.63 miles of the pipeline corridor, 2.87 miles of access roads, and 143.72 acres of ancillary facilities in Nebraska that need to be surveyed for historic properties at this time because of a lack of owner permission. Once owner permission is obtained, the remaining areas of the corridor will be surveyed and documented in future reports. The cultural resources surveys for Project route variations, gap analysis, and extra work spaces are anticipated and will be documented in future reports. Upon receipt, the DOS will review these reports consistent with 36 CFR Part 800.

Kansas

Keystone contracted ARG to conduct background research and field inventory for two Project pump stations (PS-27 and PS-29) and power distribution lines that would serve the pump stations. Through July 2009, no new sites were identified.

Since the July 2009 report, an additional site was identified during a survey of power distribution lines. Based on preliminary information received by DOS from Keystone, Table 3.11.3-4 has been updated to include resources that have been identified in the field and will be included in the December 2009 reports not yet received by DOS. An additional survey of 0.54 mile segment of the 4.61 mile power distribution line (noted above) and another 11.2 mile power distribution line are planned for the Spring 2010 and will be submitted to DOS for review once they are completed. This report will be reviewed by DOS and then forwarded to the applicable consulting parties.

Archaeological Sites

No new archaeological sites were identified in the potential pump station locations surveyed. One previously recorded site (14BU131), was determined not eligible for listing on the National Register. An additional site (C230CY001) has also been identified during a survey of a 4.61 mile power distribution line and recommended as not eligible for the NRHP by Keystone.

Historic Structures

No historic structures were identified in the potential pump station locations surveyed.

Historic Trails

The proposed Project route does not cross the Santa Fe National Historic Trail (SFNHT). No effects to the trail are anticipated. If this should change, the DOS will work with NPS to identify and avoid or mitigate any detrimental impacts to the resource.

TABLE 3.11.3-4
Archaeological Sites and Historic Structures Identified in Kansas

Site #	Description	NRHP Eligibility Recommendation from Keystone	NRHP Determination by DOS	Action Recommended by Keystone	Kansas SHPO /THPO Concurrence with DOS Finding
14BU131	Previously recorded historic artifact scatter	Not eligible	Not eligible	No further work	Concur
C230CY001	Historic railroad bed*	Not eligible*	Unevaluated*	Pending*	Pending*

* Information is derived from project updates received by DOS from Keystone. This updated information will be included in cultural resource reports that are due to be submitted to DOS in December 2009. Following review by the DOS, these reports will be forwarded to consulting parties for review consistent with 36 CFR Part 800.

Oklahoma

For the cultural resource inventory conducted through July 2009, SWCA conducted a pedestrian survey of 155.13 miles of the total 155.42 miles of proposed pipeline in the Oklahoma section of the Gulf Coast Segment. The remaining 0.29 miles of survey area could not be accessed mostly due to a lack of landowner permission. No inventories have been conducted on proposed access roads, power distribution lines, or ancillary facilities, but reports on these inventories are anticipated. The inventory also included 61 backhoe trenches at eight stream crossings and 2,830 shovel tests within the survey area. In total through July 2009, SWCA identified 81 cultural resources during the cultural resource inventory of the proposed pipeline of the Gulf Coast Segment in Oklahoma. Of those 81 cultural resources, 41 were archaeological sites, 22 were historic structures, and 18 were isolated finds.

Since the July 2009 report, additional cultural resource surveys have been conducted in Oklahoma for proposed route variations, auxiliary facilities, pump stations, power distribution lines, temporary work stations and access roads. This field work resulted in the survey of an additional 7.61 miles of route variations, 645.72 acres of auxiliary facilities, 17.25 acres of pump stations, 5.375 miles of power distribution lines, 7.36 acres of temporary work stations, and 9 miles of access roads. In total, seven new cultural resources were identified during these efforts. The results of these surveys will be reported in a revised report that will be submitted to DOS in December 2009. Based on preliminary information received by DOS from Keystone, Table 3.11.3-5 has been updated to include resources that have been identified in the field and will be included in the December 2009 reports not yet received by DOS. Additional cultural resource surveys of auxiliary facilities (100.24) and access roads (8.15 miles) are scheduled for Spring 2010. These reports will be reviewed by DOS and then forwarded to the applicable consulting parties.

Archaeological Sites

Of the 41 archaeological sites through July 2009, one was previously recorded, 34BR322, a historic farmstead. Of the 40 archaeological sites identified during the field survey, 29 were Precontact, 7 were historic, and 4 were multi-component. Of the 18 isolated finds recorded during the field inventory, 13 were Precontact and 5 were historic.

Six of the sites are unevaluated for listing in the NRHP. Avoidance is recommended for all listed, eligible, or unevaluated sites. By avoiding these sites, the proposed Project will not affect historic properties. By definition, the isolated finds are not eligible for listing in the NRHP.

Historic Structures

Of the 81 cultural resources identified through 2009, 22 were historic structures: 2 cultural landscapes, 4 newly recorded historic structures, and three historic cemeteries. One of the cultural landscapes (historic Route 66 roadway) is listed on the NRHP, and the other (34LN163, Key West town site) is considered eligible for listing on the NRHP. Six other historic structures are considered unevaluated for listing in the NRHP. Avoidance is recommended for all listed, eligible, or unevaluated sites. By avoiding these sites, the proposed Project will not affect historic properties. Although historic cemeteries 34OF103, 34SM130 (Baker Cemetery), and 34CO152 are not eligible for the NRHP, avoidance is recommended in accordance with Oklahoma state law.

TABLE 3.11.3-5
Archaeological Sites and Historic Structures Identified in Oklahoma

Site #	Description	NRHP Eligibility Recommendation from Keystone	NRHP Determination by DOS	Action Recommended by Keystone	Oklahoma SHPO/THPO Concurrence with DOS Finding
34AT56	Historic structure and artifact scatter / Precontact artifact scatter	Not eligible	Not eligible	No further work	Pending
34AT661	Historic structure, artifact scatter, and possible burial / Precontact artifact scatter	Unevaluated	Unevaluated	Avoidance	Pending
34AT664	Historic artifact scatter	Not eligible	Not eligible	No further work	Pending
34AT665	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending

TABLE 3.11.3-5
Archaeological Sites and Historic Structures Identified in Oklahoma

Site #	Description	NRHP Eligibility Recommendation from Keystone	NRHP Determination by DOS	Action Recommended by Keystone	Oklahoma SHPO/THPO Concurrence with DOS Finding
34AT666	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
34AT667	Historic structure / Precontact lithic scatter	Not Eligible*	Pending*	No further work*	Pending
34AT669	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
34AT670	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
34AT671	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
34AT672	Historic debris / Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
34AT673	Precontact campsite	Unevaluated	Unevaluated	Avoidance	Pending
NA	Precontact isolate	Not eligible	Not eligible	No further work	Pending
NA	Precontact isolate	Not eligible	Not eligible	No further work	Pending
NA	Precontact isolate	Not eligible	Not eligible	No further work	Pending
NA	Historic isolate	Not eligible	Not eligible	No further work	Pending
34BR322	Previously recorded Historic farmstead	Not eligible	Not eligible	No further work	Pending
34BR338	Historic artifact scatter	Not eligible	Not eligible	No further work	Pending
34BR339	Historic artifact scatter	Not eligible	Not eligible	No further work	Pending
34BR340	Historic artifact scatter / Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
34BR341	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
NA	Historic isolate	Not eligible	Not eligible	No further work	Pending
34CO146	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
34CO147	Historic structure ruins and artifact scatter	Not eligible	Not eligible	No further work	Pending
34CO148	Precontact lithic scatter and midden	Eligible	Unevaluated	Avoidance	Pending
34CO149	Historic structure ruins and artifact scatter	Not eligible	Not eligible	No further work	Pending
34CO150	Precontact lithic scatter and hearth	Eligible	Unevaluated	Avoidance	Pending
34CO151	Historic barn and artifact scatter	Not eligible	Not eligible	No further work	Pending
34CO152	Historic grave	Not eligible	Not eligible	Avoidance	Pending

TABLE 3.11.3-5 Archaeological Sites and Historic Structures Identified in Oklahoma					
Site #	**Description**	**NRHP Eligibility Recommendation from Keystone**	**NRHP Determination by DOS**	**Action Recommended by Keystone**	**Oklahoma SHPO/THPO Concurrence with DOS Finding**
34CO153	Precontact lithic reduction loci	Not eligible	Not eligible	No further work	Pending
34CO154	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
34CO155	Historic cistern and debris	Not eligible	Not eligible	No further work	Pending
34CO158*	Historic farmstead*	Unevaluated*	Pending*	No further work*	Pending*
CIF2A COx.002	Precontact isolate	Not eligible	Not eligible	No further work	Pending
CIF1A COx.001	Precontact isolate	Not eligible	Not eligible	No further work	Pending
CIF2A COx.001	Precontact isolate	Not eligible	Not eligible	No further work	Pending
34CR189	Historic residential remnants	Not eligible	Not eligible	No further work	Pending
CIF2A CRx.003	Historic isolate	Not eligible	Not eligible	No further work	Pending
CARC2ACO X.008*	Historic structural remains*	Undetermined*	Pending*	No further work*	Pending*
CARC2ACO X.009*	Prehistoric lithic scatter*	Not eligible*	Pending*	No further work*	Pending*
CARC1ACO X.009*	Prehistoric open camp*	Undetermined*	Pending*	Avoidance*	Pending*
34HU21	Historic culvert / Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
34HU134	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
34HU135	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
34HU136	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
34HU137	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
34HU138	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
34HU139	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
34HU140	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
34HU141	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
34HU142	Precontact open camp	Not eligible	Not eligible	No further work	Pending

TABLE 3.11.3-5 Archaeological Sites and Historic Structures Identified in Oklahoma					
Site #	**Description**	**NRHP Eligibility Recommendation from Keystone**	**NRHP Determination by DOS**	**Action Recommended by Keystone**	**Oklahoma SHPO/THPO Concurrence with DOS Finding**
34HU143	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
34HU144	Precontact open camp	Undetermined	Unevaluated	Testing	Pending
34HU145	Precontact campsite	Undetermined	Unevaluated	Testing or avoidance	Pending
34HU146	Historic ceramic / Precontact open campsite	Undetermined	Unevaluated	Testing	Pending
34HU147	Historic abandoned railroad	Undetermined	Unevaluated	Additional archival research	Pending
34HU148	Historic Farmstead	Undetermined	Unevaluated	Additional archival research by architectural historian; avoidance	Pending
34HU149	Historic Farmstead	Structures undetermined, archaeological portion not eligible	Unevaluated	Additional archival research by architectural historian; avoidance	Pending
Holdenville Airport*	Historic airport buildings*	Eligible*	Pending*	Avoidance*	Pending*
NA	Precontact lithic debitage	Not eligible	Not eligible	No further work	Pending
NA	Precontact isolate	Not eligible	Not eligible	No further work	Pending
NA	Precontact isolate	Not eligible	Not eligible	No further work	Pending
NA	Precontact isolate	Not eligible	Not eligible	No further work	Pending
NA	Precontact isolate	Not eligible	Not eligible	No further work	Pending
NA	Precontact isolate	Not eligible	Not eligible	No further work	Pending
34LN160	Historic stone house ruin / Precontact artifact scatter	Undetermined	Unevaluated	Further research or avoidance	Pending
34LN161	Historic artifact scatter, probable homestead site	Not eligible	Not eligible	No further work	Pending
34LN162	Historic trash dump	Not eligible	Not eligible	No further work	Pending
34LN163	Cultural Landscape Key West town site	Eligible	Eligible	Avoidance	Pending
34LN178	Historic homestead	Not eligible	Not eligible	No further work	Pending
34LN182*	Historic structural remains*	Not eligible*	Pending*	No further work*	Pending*
CIF1A LNx.001	Historic isolate	Not eligible	Not eligible	No further work	Pending

TABLE 3.11.3-5 Archaeological Sites and Historic Structures Identified in Oklahoma					
Site #	**Description**	**NRHP Eligibility Recommendation from Keystone**	**NRHP Determination by DOS**	**Action Recommended by Keystone**	**Oklahoma SHPO/THPO Concurrence with DOS Finding**
CCUL2A LNx.001	Historic Route 66 roadway	Listed, Non-Contributing*	Listed	No Further Work*	Pending
CHSS2A LNx.001	Residence	Not eligible	Not eligible	No further work	Pending
34OF97	Historic artifact scatter	Not eligible	Not eligible	No further work	Pending
34OF98	Historic artifact scatter	Not eligible	Not eligible	No further work	Pending
34OF99	Historic artifact scatter / Precontact artifact scatter	Not eligible	Not eligible	No further work	Pending
34OF100	Precontact artifact scatter	Not eligible	Not eligible	No further work	Pending
34OF101	Precontact open campsite	Not eligible	Not eligible	No further work	Pending
34OF102	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
34OF103	Historic cemetery	Not eligible	Not eligible	Avoidance	Pending
CIF1A OFx.001	Precontact lithic projectile point/drill isolate	Not eligible	Not eligible	No further work	Pending
CHSS1A OFx.001	Historic standing structure/complex	Undetermined	Unevaluated	Further research or Avoidance	Pending
NA	Historic isolate	Not eligible	Not eligible	No further work	Pending
34SM130	Historic Baker Cemetery 1900-1907	Not eligible	Not eligible	Avoidance	Pending
34SM131	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
34SM132	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
34SM133	Historic artifact scatter	Not eligible	Not eligible	No further work	Pending

* Information is derived from project updates received by DOS from Keystone. This updated information will be included in cultural resource reports that are due to be submitted to DOS in December 2009. Following review by the DOS, these reports will be forwarded to consulting parties for review consistent with 36 CFR Part 800.

The proposed pipeline corridor has been surveyed for cultural resources and some access roads and auxiliary facilities remain to be surveyed. The cultural resources surveys for remaining Project route variations, gap analysis, access roads, ancillary facilities, and extra work spaces are anticipated and will be documented in future reports. No inventories have been conducted on power distribution lines, but reports on these inventories are anticipated. Upon receipt, the DOS will review these reports consistent with 36 CFR Part 800.

Texas

For the cultural resource inventory in the Texas section of the Gulf Coast Segment through July 2009, HRA G&P and SWCA conducted a pedestrian survey of 181.90 miles of the total 188.95 miles of HPAs for which the Texas Historic Commission required survey. The remaining 7.05 miles of HPAs were not inventoried due to landowner access restrictions. Some inventories have been conducted on proposed access roads, power distribution lines, and ancillary facilities, and reports on these inventories are anticipated when the inventories are completed.

For the cultural resource inventory in the Houston Lateral section of the Gulf Coast Segment, SWCA conducted a pedestrian survey of 6.44 miles of the total 14.4 miles of HPAs for which the THC required to survey. The remaining 7.96 miles of HPAs were not inventoried due to landowner access restrictions. No inventories have been conducted on proposed access roads, power distribution lines, and ancillary facilities, but reports on these inventories are anticipated when the inventories are completed. Inventories will be conducted by architectural historians of historic structures located outside of the HPAs in the Project corridor.

In total through July 2009, HRA G&P and SWCA identified 80 cultural resources during the cultural resource inventory of the proposed pipeline of the Gulf Coast Segment in Texas. Of those 80 cultural resources, 42 were archaeological sites, 16 were historic structures, and 22 were isolated finds. No cultural resources were identified in the Houston Lateral section.

Since the July 2009 report, additional cultural resource surveys have been conducted in Texas for 1.578 miles of Project centerline, 18.102 miles of route variations, 633.25 acres of auxiliary facilities, 7.61 acres of pump stations, 4 acres of temporary work stations, and 66.08 miles of access roads. In total, eight new cultural resources were recorded. Based on preliminary information received by DOS from Keystone, Table 3.11.3-6 has been updated to include resources that have been identified in the field and will be included in the December 2009 reports not yet received by DOS. Additional cultural resource surveys of Project centerline, route variations, auxiliary facilities, pump stations, temporary work stations, and access roads are scheduled for Spring 2010. These reports will be reviewed by DOS and then forwarded to the applicable consulting parties.

Archaeological Sites

Of the 42 archaeological sites, four were previously recorded cultural resources and included two precontact sites, one historic site, and two multi-component sites. Of the 38 archaeological sites identified during the survey, 24 were precontact sites, 5 were historic sites, 9 were multi-component sites. Of the 22 isolated finds recorded during the field survey, 16 were precontact and 6 were historic.

One of the newly identified archaeological sites in the Texas section have been recorded as eligible, and 28 additional sites are considered unevaluated. Avoidance is recommended for all eligible or unevaluated sites. By avoiding these sites, the proposed Project will not affect historic properties. By definition, the isolated finds are not eligible for listing in the NRHP.

Historic Structures

Of the 80 cultural resources identified in the Texas section of the Gulf Coast Segment, 16 were historic structures. Two were previously recorded historic structures, while 14 were newly recorded historic structures, including a railroad, a historic trail, and a historic cemetery. Eight of the structures are unevaluated for eligibility. Avoidance is recommended for all unevaluated sites. By avoiding these sites, the proposed Project will not affect historic properties. Although the historic cemetery is not eligible for the NRHP, avoidance is recommended in accordance with Texas state law.

Historic Trails

The proposed Project route crosses the El Camino Real de Los Tejas National Historic Trail (ELTE NHT) in Nacogdoches County. The trail was used by Native Americans in the precontact period, then through the Spanish Colonial Period (1690–1821) to connect colonial capitals and missions, and later by Anglo-American settlers in the area. At least two segments of historic roadbeds, potentially associated with the ELTE NHT have been identified as historic properties and are associated with components within archaeological sites 41NA156 (eligible), 41NA316 (unevaluated), and 41NA317 (unevaluated). DOS is requiring that historic property site forms be completed for these trails for the segments that cross the Project APE so that they can be evaluated for the NRHP. DOS is committed to working with Indian tribes, NPS and Texas SHPO to identify and avoid or mitigate adverse impacts to the resources. Two meetings with NPS were held on February 18, 2009 and November 11, 2009 to discuss the Project, the location of the ELTE NHT, visiting resources associated with the trail such as 41NA156, 41NA316, and 41NA317 , and preferred avoidance and/or mitigation measures. Additional information concerning the trail segments will be submitted by Keystone which includes site forms for trail segments previously unidentified. LIDAR imagery, shallow trenching, and magnetometers may be used to pinpoint the location of the trail in the APE. Keystone has not developed plans to avoid the trail segments in two areas. If adverse effects cannot be resolved, then mitigation measures will be required by the DOS in consultation with the Indian tribes, NPS, and Texas SHPO.

TABLE 3.11.3-6
Archaeological Sites and Historic Structures Identified in Texas

Site #	Description	NRHP Eligibility Recommendation from Keystone	NRHP Determination by DOS	Action Recommended by Keystone	Texas SHPO/THPO Concurrence with DOS Finding
41AG196	Precontact camp	Unevaluated	Unevaluated	Avoidance	Pending
41AG197	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
41AG198	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
41AG199	Historic cemetery	Not eligible	Not eligible	Avoidance	Pending
41AG200	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
41AG201	Precontact artifact scatter and probable campsite	Eligible	Unevaluated	Avoidance	Pending
41AG202	Historic standing structures and artifact scatter	Not eligible	Not eligible	No further work	Pending
CIF6B AG34.001	Precontact isolate	Not eligible	Not eligible	No further work	Pending
41CE417	Historic standing structure	Unevaluated	Unevaluated	Avoidance	Pending
41CE418	Historic artifact scatter	Not eligible	Not eligible	No further work	Pending
41CE419	Precontact artifact scatter	Not eligible	Not eligible	No further work	Pending
41CE430	Precontact artifact	Unevaluated	Unevaluated	Avoidance	Pending

TABLE 3.11.3-6 Archaeological Sites and Historic Structures Identified in Texas					
Site #	**Description**	**NRHP Eligibility Recommendation from Keystone**	**NRHP Determination by DOS**	**Action Recommended by Keystone**	**Texas SHPO/THPO Concurrence with DOS Finding**
	scatter				
41CE431	Historic artifact scatter and structural remnant / Precontact artifact scatter and settlement	Eligible	Unevaluated	Avoidance	Pending
CIF2B CE14.001	Precontact isolate	Not eligible	Not eligible	No further work	Pending
41DT266	Historic artifact scatter	Not eligible	Not eligible	No further work	Pending
41DT267	Precontact artifact scatter and possible open campsite	Undetermined	Unevaluated	Avoidance	Pending
41DT268	Historic artifact scatter	Not eligible	Not eligible	No further work	Pending
41DT269	Precontact artifact scatter and possible open campsite	Not eligible	Not eligible	No further work	Pending
CIF7B DT13.001	Precontact isolate	Not eligible	Not eligible	No further work	Pending
41FK63	Previously recorded Historic artifact scatter / Precontact artifact scatter and possible occupation area	Unevaluated	Unevaluated	Avoidance	Pending
41FK104	Precontact open camp	Eligible	Unevaluated	Avoidance	Pending
41FK130	Historic standing structure	Unevaluated	Unevaluated	Avoidance	Pending
41FK131	Precontact artifact scatter, occupation	Unevaluated	Unevaluated	Avoidance	Pending
41FK132	Precontact artifact scatter	Not eligible	Not eligible	No further work	Pending
41FK133	Historic farmstead and scatter (early to mid-20th century residential site)	Not eligible	Not eligible	No further work	Pending
41FK134	Precontact pottery scatter, possible occupation area	Unevaluated	Unevaluated	Avoidance	Pending
41FK135	Historic artifact scatter / Precontact artifact scatter	Not eligible	Not eligible	No further work	Pending
41FK136	Precontact artifact scatter	Not eligible	Not eligible	No further work	Pending
41FK137	Precontact artifact scatter, possible occupation area	Unevaluated	Unevaluated	Avoidance	Pending
41FK138*	Prehistoric lithic scatter*	Not eligible*	Pending*	No further work*	Pending*
CIF4B	Precontact isolate	Not eligible	Not eligible	No further work	Pending

TABLE 3.11.3-6 Archaeological Sites and Historic Structures Identified in Texas					
Site #	**Description**	**NRHP Eligibility Recommendation from Keystone**	**NRHP Determination by DOS**	**Action Recommended by Keystone**	**Texas SHPO/THPO Concurrence with DOS Finding**
FK04.001					
CIF7B FK104.001	Precontact isolate	Not eligible	Not eligible	No further work	Pending
CIF7B FK104.002	Precontact isolate	Not eligible	Not eligible	No further work	Pending
CIF6B FK07.001	Precontact isolate	Not eligible	Not eligible	No further work	Pending
41FN91	Historic artifact scatter / Precontact lithic debris	Unevaluated	Unevaluated	Avoidance	Pending
41HP241	Historic artifact scatter / Precontact artifact scatter and possible settlement	Eligible	Unevaluated	Avoidance	Pending
41HP242	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
CIF2B HP12.001	Historic isolate	Not eligible	Not eligible	No further work	Pending
CIF4B HP23.001	Precontact isolate	Not eligible	Not eligible	No further work	Pending
41JF92	Historic railroad grade	Unevaluated	Unevaluated	Avoidance	Pending
41LB78	Previously recorded Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
41LR2	Historic artifact scatter / Precontact village	Eligible	Eligible	Avoidance	Pending
41LR314	Historic artifact scatter / Precontact lithic debris	Unevaluated	Unevaluated	Avoidance	Pending
41LR315	Historic artifact scatter	Not eligible	Not eligible	No further work	Pending
41LR316*	Historic trash dump*	Not eligible*	Pending*	No further work*	Pending*
CIF6B LR24.001	Historic isolate	Not eligible	Not eligible	No further work	Pending
CIF8B LR24.001	Historic isolate	Not eligible	Not eligible	No further work	Pending
41NA156	Previously recorded Historic slave quarters and residence / Precontact artifact scatter and possible settlement (association with ELTE NHT)	Eligible	Eligible	Avoidance	Pending
41NA307	Historic artifact scatter	Not eligible	Not eligible	No further work	Pending
41NA308	Historic Euro-American cemetery	Not eligible	Not eligible	Avoidance	Pending
41NA314	Historic artifact scatter	Not eligible	Not eligible	No further work	Pending

TABLE 3.11.3-6 Archaeological Sites and Historic Structures Identified in Texas					
Site #	**Description**	**NRHP Eligibility Recommendation from Keystone**	**NRHP Determination by DOS**	**Action Recommended by Keystone**	**Texas SHPO/THPO Concurrence with DOS Finding**
41NA315	Historic foundation and artifact scatter	Unevaluated	Unevaluated	Avoidance	Pending
41NA316	Historic Trail (association with ELTE NHT)	Unevaluated	Unevaluated	Avoidance	Pending
41NA317	Historic artifact scatter / Precontact settlement	Historic scatter not eligible / Precontact eligible	Unevaluated	Avoidance	Pending
41NA318	Precontact artifact scatter	Not eligible	Not eligible	No further work	Pending
41NA319	Historic artifact scatter / Precontact isolate	Not eligible	Not eligible	No further work	Pending
CIF6B NA09.001	Precontact isolate	Not eligible	Not eligible	No further work	Pending
CIF4B NA12.001	Precontact isolate	Not eligible	Not eligible	No further work	Pending
41PK258	Precontact artifact scatter	Unevaluated	Unevaluated	Avoidance	Pending
41PK260	Precontact lithic scatter	Unevaluated	Unevaluated	Avoidance	Pending
41PK261	Precontact artifact scatter	Unevaluated	Unevaluated	Avoidance	Pending
41PK262	Precontact artifact scatter	Not eligible	Not eligible	No further work	Pending
41PK263	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
41PK264	Precontact lithic scatter	Not eligible	Not eligible	No further work	Pending
CIF8B PK04.001	Precontact isolate	Not eligible	Not eligible	No further work	Pending
CIF6B PK09.001	Precontact isolate	Not eligible	Not eligible	No further work	Pending
CIF7B PK10.001	Precontact isolate	Not eligible	Not eligible	No further work	Pending
CIF8B PK25.001	Historic isolate	Not eligible	Not eligible	No further work	Pending
CIF9B PK36.001	Precontact isolate	Not eligible	Not eligible	No further work	Pending
41RK97	Previously recorded Historic oil pumping station and camp	Unevaluated	Unevaluated	Avoidance	Pending
41RK588	Historic artifact scatter / Precontact artifact scatter and possible open camp	Historic component not eligible, Precontact component undetermined	Unevaluated	Avoidance	Pending
CIF2B RK07.001	Precontact isolate	Not eligible	Not eligible	No further work	Pending

TABLE 3.11.3-6 Archaeological Sites and Historic Structures Identified in Texas					
Site #	**Description**	**NRHP Eligibility Recommendation from Keystone**	**NRHP Determination by DOS**	**Action Recommended by Keystone**	**Texas SHPO/THPO Concurrence with DOS Finding**
41SM40*	Prehistoric subsurface campsite*	Undetermined*	Pending*	Avoidance*	Pending*
41SM287	Previously recorded Precontact open camp	Unevaluated	Unevaluated	Avoidance	Pending
41SM397	Historic church complex	Eligible	Unevaluated	Avoidance	Pending
41SM405*	Prehistoric subsurface campsite*	Undetermined*	Pending*	Avoidance*	Pending*
CIF7B SM06.001	Historic isolate	Not eligible	Not eligible	No further work	Pending
41UR325	Historic barn, shed, and artifact scatter	Not eligible	Not eligible	No further work	Pending
CIF UR02.001	Precontact isolate	Not eligible	Not eligible	No further work	Pending
41WD649	Precontact lithic scatter, possible open campsite	Unevaluated	Unevaluated	Avoidance	Pending
41WD650	Historic well or cistern	Not eligible	Not eligible	No further work	Pending
41WD651	Historic cemetery	Not eligible	Not eligible	Avoidance	Pending
41WD653	Precontact pottery scatter	Not eligible	Not eligible	No further work	Pending
CIF4B WD02.001	Historic isolate	Not eligible	Not eligible	No further work	Pending
ELTE NHT			Unevaluated	TBD	

* Information is derived from project updates received by DOS from Keystone. This updated information will be included in cultural resource reports that are due to be submitted to DOS in December 2009. Following review by the DOS, these reports will be forwarded to consulting parties for review consistent with 36 CFR Part 800.

As of July 2009, 7.05 miles of survey area in Texas on the Gulf Coast Segment and 7.96 miles of survey area on the Houston Lateral that could not be accessed mostly due to a lack of landowner permission. Once owner permission is obtained, the remaining areas of the corridor will be surveyed and documented in future reports. The cultural resources surveys for Project route variations, gap analysis, and extra work spaces are anticipated and will be documented in future reports. No inventories have been conducted on proposed access roads, power distribution lines, or ancillary facilities, but reports on these inventories are anticipated. Upon receipt, the DOS will review these reports consistent with 36 CFR Part 800.

3.11.3.2 Programmatic Agreement

The evaluation of historic properties for the Project will not be completed until full access to all parcels along the proposed corridor is feasible. Additionally, the Project design, including a determination of the final alignment after all route variations are assessed, continues to evolve as a result of the NEPA and Section 106 processes, continuing engineering analysis, and ongoing landowner and land manager negotiations. As a result, DOS and the consulting parties are developing a Programmatic Agreement (PA) to facilitate the Section 106 process. The use of a PA for this Project is consistent with 36 CFR

800.4(b)(2), which provides that when “alternatives under consideration consist of corridors or large land areas, or where access to properties is restricted, the agency official may use a phased process to conduct identification and evaluation efforts.” The PA will allow the DOS and the consulting parties to continue the identification and evaluation of historic properties pursuant to the provisions in the PA should the Project receive all necessary certifications and permits. The PA will ensure that appropriate consultation procedures are followed and that cultural resources surveys would be completed prior to construction.

The DOS has circulated multiple drafts of the PA to the consulting parties. The initial draft was provided to the consulting parties on July 13, 2009. Comments received on this draft were evaluated by DOS and a second draft was provided to the consulting parties on September 28, 2009. DOS conducted a webinar with the consulting parties on October 7, 2009 to describe the rationale for changes incorporated into the second draft of the PA. Comments received on the second draft have been reviewed and resulted in a third draft of the PA. Comments on the third draft PA were accepted until February 1, 2010, resulting in a fourth draft of the PA which is attached as Appendix S to the draft EIS. The final PA will be attached as an appendix to the final EIS.

3.11.4 Consultation

3.11.4.1 Introduction

Under Section 106 of the NHPA, the lead federal agency is required to share Project information and consult with consulting parties. This includes Indian tribes, SHPOs, local governments, and applicants for federal permits. For this Project, DOS is consulting with six SHPOs, over 95 Indian tribes, numerous federal and state agencies and local governments, and seeking the views of the public. Government-to-government Section 106 consultation meetings, direct mailings, teleconferencing, direct telephone communications, and email will be used to keep consulting party members informed and to solicit comments on the Project.

Informal discussions with SHPOs and Indian tribes were initiated by Keystone and their consultants in 2008 and 2009 when a number of tribal engagement meetings were conducted in an effort to inform interested Indian tribes of the Project and seek initial comments. DOS recognized its lead federal agency status under Section 106 and its responsibilities to consult directly with the Indian tribes, SHPOs, and agencies in its NOI issued on January 28, 2009 in the FR.

3.11.4.2 Federal and State Agency Consultation

In compliance with NEPA and Section 106, DOS is consulting with federal agencies whose participation in the Project was considered an undertaking as per 36 CFR 800.16(y). These agencies include BLM, Reclamation, Western, RUS, NRCS, USACE, ACHP, and NPS. In coordination with DOS, each of these agencies are reviewing the cultural resource findings as appropriate given their responsibilities as discussed in Section 1.0.

DOS is consulting with state agencies, including the SHPOs in the six states crossed by the pipeline corridor as well as the Montana DNRC and the Montana DEQ, who is the lead for the Montana Environmental Policy Act (MEPA). Several agencies have attended the agency and tribal Section 106 consultation meetings held in May, July, October and November 2009 (See Table 3.11.4-2).

3.11.4.3 Indian Tribal Consultation

The list of Indian tribes that were notified for this Project was derived from lists maintained by DOS, BLM, USACE, SHPOs, state tribal liaisons, THPOs, the BIA, and recommendations from other Indian tribes. In compliance with 36 CFR 800.2 and confidentiality requirements, DOS provided consulting Indian tribes with findings or determinations that were derived from historic properties reports prepared for portions of the Project's APE. Indian tribes initially were invited to consult regarding the proposed Project by letters dated January 30, 2009. Additional tribal members identified by the BLM were invited to consultation by letters dated February 19, 2009. Another letter from DOS dated April 1, 2009 again invited Indian tribes that had not yet responded to the invitations. Phone calls were also made on March 18 through March 23, 2009 to Indian tribes that had not yet responded.

Following these invitations, 46 Indian tribes notified DOS that they would like to become consulting parties. Additionally, two Indian tribes are undecided and have been participating in calls and meetings. Nineteen Indian tribes have notified DOS that they do not wish to consult on the Project and/or have no objection to the Project, but would like to be notified should human remains be found. Twenty-nine Indian tribes did not respond to requests for consultation. Indian tribes that DOS contacted are listed in Table 3.11.4-1 and the list of consultation meetings is included in Table 3.11.4-2.

To facilitate consulting party participation in Section 106 consultation, DOS is holding government-to-government and agency consultation meetings in both the Steele City Segment and the Gulf Coast Segment of the Project. Three meetings have been held in each Segment to date. Steele City Segment meetings were held in Rapid City, South Dakota (May and July 2009) and in Billings, Montana (October 2009). Gulf Coast Segment meetings were held in Oklahoma City, Oklahoma (May and July 2009) and in Dallas, Texas (November 2009). Transcripts for all of the meetings held to date have been prepared and distributed to the consulting parties.

The Indian tribes listed in Table 3.11.4-3 have submitted scopes of work (SOW) to DOS to conduct TCP studies within the Project APE and several of the SOWs have been approved by DOS. Several of these studies are currently underway. If these reports provide recommendations concerning the eligibility of a historic property and/or Project effects, the DOS will consult with the consulting parties consistent with 36 CFR 800. The DOS will make determinations of eligibility and Project effect and attempt to resolve any adverse effects to historic properties.

TABLE 3.11.4-1
Tribes Consulted under Section 106 for the Keystone XL Project

	Interested/Consulting Party	Tribe
1	Yes	Absentee-Shawnee Tribe of Indians of Oklahoma
2	No	Alabama Quassarte Tribal Town
3	Yes	Alabama-Coushatta Tribe of Texas
4	No response	Apache Tribe
5	Yes	Blackfeet Nation
6	Yes	Caddo Nation of Oklahoma
7	No	Cherokee Nation
8	Yes	Cheyenne River Sioux Tribe
9	Yes	Cheyenne-Arapaho Tribe of Oklahoma
10	No response	Chickasaw Nation of Oklahoma

TABLE 3.11.4-1 Tribes Consulted under Section 106 for the Keystone XL Project		
	Interested/Consulting Party	Tribe
11	Yes	Chippewa-Cree Indians
12	Yes	Choctaw Nation of Oklahoma
13	No response	Citizen Potawatomi Nation
14	No	Comanche Nation
15	No response	Confederated Salish and Kootenai Tribes of the Flathead Indian Nation
16	No response	Crow Creek Sioux Tribe
17	Yes	Crow Tribe of Indians
18	Yes	Delaware Nation
19	No	Delaware Tribe of Indians
20	No response	Eastern Band of Cherokee Indians
21	No response	Eastern Shawnee Tribe
22	No response	Eastern Shoshone Tribe
23	No response	Flandreau Santee Sioux Tribe
24	No response	Forest County Potawatomi Community of Wisconsin Potawatomi Indians
25	No response	Fort Berthold Reservation
26	Yes	Fort Peck Tribes
27	No	Fort Sill Apache Tribe
28	Yes	Gros Ventre and Assiniboine Tribe of Ft. Belknap
29	No	Gun Lake Potawatomi
30	No response	Hannahville Indian Community of Michigan
31	Yes	Ho-Chunk Nation of Wisconsin
32	No	Huron Potawatomi Nation
33	Yes	Iowa Tribe of Kansas and Nebraska
34	Yes	Iowa Tribe of Oklahoma
35	No response	Jena Band of Choctaw Indians
36	Undecided	Jicarilla Apache Tribe
37	Yes	Kaw Nation
38	Yes	Kialegee Tribal Town of the Creek Nation of Oklahoma
39	No	Kickapoo Traditional Tribe of Texas
40	Yes	Kickapoo Tribe of Kansas
41	No response	Kickapoo Tribe of Oklahoma
42	Yes	Kiowa Indian Tribe of Oklahoma
43	Yes	Lower Brule Sioux Tribe
44	Yes	Lower Sioux Indian Community
45	Yes	Miami Tribe of Oklahoma
46	Yes	Mille Lacs Band of Ojibwe
47	No	Modoc Tribe of Oklahoma

TABLE 3.11.4-1 Tribes Consulted under Section 106 for the Keystone XL Project		
	Interested/Consulting Party	**Tribe**
48	Yes	Muscogee (Creek) Nation
49	No response	Nez Perce
50	Yes	Northern Arapaho Tribe
51	Yes	Northern Cheyenne Tribe
52	Yes	Northern Ute Tribe
53	Yes	Oglala Sioux Tribe
54	No response	Omaha Tribe of Nebraska
55	Yes	Osage Nation of Oklahoma
56	No	Otoe-Missouri Tribe
57	No response	Ottawa Tribe of Oklahoma
58	Yes	Pawnee Nation of Oklahoma
59	No	Peoria Indian Tribe of Oklahoma
60	No response	Poarch Band of Creek Indians
61	No response	Pokagon Band of Potawatomi Indians of Michigan
62	Yes	Ponca Tribe of Indians of Oklahoma
63	Yes	Ponca Tribe of Nebraska
64	No response	Prairie Band of Potawatomi Indians
65	No	Prairie Island Indian Community
66	No	Quapaw Tribe
67	No response	Red Lake Band of Chippewa Indians of Minnesota
68	Yes	Rosebud Sioux Tribe
69	Yes	Sac & Fox Nation of Oklahoma
70	No	Sac and Fox Nation of Missouri in Kansas and Nebraska
71	No response	Sac and Fox Tribe of the Mississippi in Iowa
72	Yes	Santee Sioux Tribe of Nebraska
73	No	Seminole Nation
74	No	Seneca-Cayuga Tribe of Oklahoma
75	Undecided	Shakopee Mdewakanton Sioux
76	Yes	Shoshone-Bannock Tribe
77	No response	Shawnee Tribe
78	Yes	Sisseton-Wahpeton Oyate Sioux
79	No response	Southern Ute Indian Tribe
80	Yes	Spirit Lake Tribe
81	Yes	Standing Rock Sioux Tribe
82	No	Stockbridge-Munsee Tribe
83	No response	Thlopthlocco Tribal Town
84	Yes	Three Affiliated Tribes

TABLE 3.11.4-1
Tribes Consulted under Section 106 for the Keystone XL Project

	Interested/Consulting Party	Tribe
85	Yes	Tonkawa Tribe
86	No response	Trenton Indian Service Area
87	Yes	Turtle Mountain Band of Chippewa
88	No	United Keetoowah Band of Cherokee Indians
89	No response	Upper Sioux -Pezihutazizi Kapi
90	No response	Ute Mountain Tribe
91	No	White Earth Band of Minnesota Chippewa
92	Yes	Wichita and Affiliated Tribes
93	Yes	Winnebago Tribe
94	No response	Wyandotte Nation
95	Yes	Yankton Sioux
96	No	Ysleta del Sur Pueblo

TABLE 3.11.4-2
List of DOS Group Consultation Meetings and Webinars with Indian Tribes

Date	Place	Indian Tribes Present	Agencies Represented
May 12, 2009	Rapid City, South Dakota	Ponca Tribe of NE, Standing Rock Sioux, Cheyenne River Sioux, Rosebud Sioux, Santee Sioux, Sisseton Wahpeton Oyate, Oglala Sioux, Iowa Tribe of KS and NE	BIA, BLM, NPS, USACE, SD SHPO, DOS
May 14, 2009	Oklahoma City, Oklahoma	Osage Nation, Kickapoo, Cheyenne-Arapaho, Pawnee Nation of Oklahoma, Kickapoo Tribe in Kansas, Caddo Nation, Delaware Nation, Muscogee Nation, Absentee-Shawnee	USACE, OK SHPO
July 14, 2009	Rapid City, South Dakota	Fort Peck, Lower Sioux, Ponca Tribe, Northern Cheyenne, Rosebud Sioux, Cheyenne River Sioux, Three Affiliated Tribes, Mille Lacs Band of Ojibwe, Kickapoo Tribe in Kansas	USACE, Western, MT DEQ, BLM, DOS
July 28, 2009	Oklahoma City, Oklahoma	Pawnee Nation of Oklahoma, Iowa Tribe of KS and NE, Alabama Coushatta Tribe, Muscogee Nation, Osage Nation, Kaw Nation, Choctaw Nation, Delaware Nation, Kickapoo Tribe KS, Absentee Shawnee Tribe	USACE, NPS, OK SHPO, DOS
October 7, 2009	Webinar	Cheyenne River Sioux Tribe, Osage Nation of Oklahoma, Pawnee Nation of Oklahoma, Rosebud Sioux Tribe, Sisseton-Wahpeton Oyate Sioux, Turtle Mountain Band of Chippewa	Reclamation, BLM, MT DEQ, USACE, Texas Historical Commission
October 20-21, 2009	Billings, MT	Blackfeet Nation, Chippewa-Cree, Spirit Lake, Lower Sioux Indian Community, Yankton Sioux, Cheyenne River Sioux, Rosebud Sioux, Standing Rock Sioux, Turtle Mountain Band of Chippewa, Mille Lacs Band of Ojibwe, Osage	BLM, USACE, BIA, Western, DOS, Montana SHPO, MT DEQ

TABLE 3.11.4-2 List of DOS Group Consultation Meetings and Webinars with Indian Tribes			
Date	**Place**	**Indian Tribes Present**	**Agencies Represented**
		Nation, Fort Belknap, Northern Cheyenne	
October 22, 2009	Malta, MT (vicinity)	Chippewa-Cree, Blackfeet	MT DEQ, DOS
November 12-13, 2009	Dallas, TX	Kaw Nation, Choctaw, Pawnee, Kialegee Tribal Town, Pawnee, Muscogee (Creek) Nation, Osage nation, Alabama-Coushatta Tribe, Absentee Shawnee Tribe, Lower Sioux	USACE, NPS, DOS

TABLE 3.11.4-3 List of Indian Tribes participating in Traditional Cultural Property Studies			
Tribe	**Date of Contact**	**Date SOW Rec'd**	**Date of Response**
Alabama-Coushatta Tribe of Texas	8/24/2009	8/24/2009	9/14/2009
Blackfeet Nation	8/18/2009	8/24/2009	9/14/2009
Caddo Nation	8/7/2009	8/7/2009	9/14/2009
Cheyenne and Arapaho Tribes of Oklahoma	8/14/2009	8/24/2009	9/14/2009
Fort Peck	8/10/2009	11/20/2009	11/30/2009
Lower Sioux	8/4/2009	8/11/2009	9/14/2009
Spirit Lake Tribe	8/11/2009	8/11/2009	9/14/2009
Muscogee (Creek) Nation	8/14/2009	11/20/2009	11/30/2009
Kialagee Tribal Town	8/10/2009	8/10/2009	9/14/2009
Turtle Mountain	8/11/2009	9/22/2009	9/24/2009
Northern Arapaho	10/26/2009	Pending	Pending
Yankton Sioux Tribe	8/13/2009	Pending	Pending
Rosebud Sioux Tribe	11/12/2009	11/20/2009	11/30/2009

3.11.5 Public Involvement

Consistent with 36 CFR 800.2(d)(1–3), DOS has followed ACHP guidance in its efforts to seek the views of the public in the Section 106 process through the NEPA process. As stated previously, DOS placed notices in the Federal Register (including the Receipt of Application and Scoping Notices) and provided copies of the application to local communities within the Project APE. Twenty scoping meetings were held in the vicinity of the pipeline corridor between February 9 through April 8, 2009 Additional public comment meetings will be scheduled following publishing of the draft EIS. DOS provided direct mailings to stakeholders through mailing lists that included approximately 700 individuals and organizations.

3.11.6 Unanticipated Discovery Plans

Unanticipated Discovery Plans will be prepared for Montana, South Dakota, Nebraska, Kansas, Oklahoma, and Texas and the Lower Brule Sioux Reservation. They will be prepared in consultation with the consulting parties for this Project that includes the SHPOs of the six states, Indian tribes, as well as state and federal agencies. Keystone would implement these plans, with DOS oversight, in the event that unanticipated cultural materials or human remains are encountered during the construction phase of the Project and will apply to federal, state, and private lands.

3.11.7 Connected Actions

DOS has consulted with ACHP concerning DOS responsibility under Section 106 of the NHPA in regards to the proposed electrical energy distribution lines that would provide the power to Project pump stations. These lines would be designed and constructed by local power providers along the proposed pipeline corridor. DOS has also consulted with ACHP regarding the proposed Lower Brule to Witten 230-kV transmission line that would be designed and constructed by a combination of Western and BEPC. As a result of these discussions, DOS as the lead federal agency for Section 106 has made a determination that its responsibility to ensure Section 106 compliance extends to both the proposed distribution lines and the proposed 230-kV transmission line. These connected actions are progressing under different schedules than the Project, and in many cases the alignments for the required facilities have not yet been firmly established and cultural resource surveys of the routes have not been conducted. Where surveys have occurred to date, the results of those surveys are incorporated into the draft EIS, and future surveys that are completed early enough will be incorporated into the final EIS. The connected actions would also be covered under the PA that DOS and the consulting parties are developing for the Project. This would ensure that identification, evaluation, and mitigation of historic properties would occur prior to construction of these connected actions.

3.11.7.1 Power Distribution Lines and Substations

The cultural resources information collected during surveys along electrical power distribution lines is presented in the State-by-State analyses (Section 3.11.3.1) for ease of reference. For those power distribution lines where Keystone has selected a local power provider and preliminary distribution line route selection has occurred, some surveys related to historic properties have been completed. The work in each state that has been completed to date and the work that remains to be conducted include:

- In Montana, 91.6 miles of power distribution line were surveyed prior to July 2009. Since July 2009, 64.26 miles of power distribution line have been surveyed. Additional surveys of power distribution lines are anticipated in Spring 2010.
- In South Dakota, 72 miles of power distribution line were surveyed prior to July 2009. Since July 2009, 71.54 miles of power distribution line have been surveyed. Additional surveys of power distribution lines are anticipated in Spring 2010.
- In Nebraska, no power distribution lines have been surveyed to date.
- In Kansas, no power distribution lines were surveyed prior to July 2009. Since July 2009, 4.07 miles of power distribution line have been surveyed. Additional surveys for 11.74 miles of power distribution lines are anticipated in Spring 2010.
- In Oklahoma, approximately 5.4 miles of power distribution lines have been surveyed to date.

- In Texas, no power distribution lines have been surveyed to date.

3.11.7.2 Lower Brule to Witten 230-kV Transmission Line

No cultural resource studies or historical property surveys specific to the proposed Lower Brule to Witten 230-kV transmission line have been conducted to date. A portion of the Lower Brule to Witten 230-kV transmission line would cross the Reservation of the Lower Brule Sioux Tribe (LBST), and a new substation (Lower Brule Substation) that is a part of the transmission system would also be constructed on the reservation. As a result, the LBST are a signatory party to the PA that addresses the proposed 230-kV transmission line project. With the advice of the ACHP, the Section 106 consultation for the proposed 230-kV transmission line has been initiated by DOS and is continuing in conjunction with the consultation for the Project. The LBST does not have a THPO; therefore, both the Tribe’s Acting Director of the Cultural Resources Department and South Dakota SHPO will be consulted by the DOS consistent with 36 CFR Part 800. There are two conceptual alternative transmission corridors (A and B) that have been proposed at this time, and there are multiple potential routings within each of these corridors. Alternative corridor B has been developed by Western and BEPC with the cooperation of the LBST, and at this time is the favored corridor by all stakeholders. An additional and separate NEPA environmental review of the selected route and alternatives for the Lower Brule to Witten 230-kV transmission line will be conducted in the future. The design and environmental review of the proposed 230-kV transmission line are on a different schedule than the pipeline system itself. Regional transmission system reliability concerns are not associated with the initial operation of the proposed pipeline pump stations, but rather with later stages of proposed pipeline operation at higher levels of crude oil throughput.

3.11.8 References

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3.12 AIR QUALITY AND NOISE

3.12.1 Air Quality

As described in Section 2.0, the Project consists of installation of pipeline and construction of pump stations and associated facilities, including the proposed Steele City tank farm. The proposed pump stations would be electrically driven, with electricity to be provided from existing local electric utilities. Backup power at each pump station would be provided by an uninterruptible power supply (UPS). No back up generators at pump stations are planned and, therefore, no fuel storage tanks would be located at pump stations.

3.12.1.1 Environmental Setting

Regional climate and meteorological conditions can influence the transport and dispersion of air pollutants that affect air quality. The existing climate and ambient air quality in the Project area are described below.

Regional Climate

The proposed Project would be constructed in portions of Montana, South Dakota, Nebraska, Kansas, Oklahoma, and Texas.

The project area in Montana, South Dakota, Nebraska, and Kansas is located within the humid continental climate. This climate is noted for its variable weather patterns and large temperature ranges. Summer high temperatures average over 89 ˚F, while winter low temperatures average 12 to 20 ˚F. The climate lies in the boundary between many different air masses, principally polar and tropical. Polar-type air masses collide with tropical-type air masses, causing uplift of the less dense and moister tropical air resulting in precipitation.

The project area in Texas and Oklahoma is located within the humid subtropical climate. This climate is noted for its warm summer months and relatively mild winters. The daily temperature range tends to be very small as the evening does not cool down much during the summer. The tropical air masses and warm ocean currents enhance the instability of the air. These factors combine to produce moderate amounts of precipitation during most of the year.

Representative climate data for Circle, Montana; Midland, South Dakota; Lincoln, Nebraska; Marion Lake, Kansas; Cushing, Oklahoma; and Beaumont and Houston, Texas are presented in Table 3.12.1-1.

TABLE 3.12.1-1
Representative Climate Data in the Vicinity of the Keystone XL Pipeline

Location/ Measurement (Average)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Annual
Circle, Montana													
Maximum temperature (ºF)	26.0	33.1	43.2	57.7	68.8	78.2	86.9	85.8	73.4	59.7	42.0	30.2	57.1
Minimum temperature (ºF)	3.8	10.6	19.4	31.1	41.5	50.3	55.8	53.9	42.8	31.9	19.0	8.2	30.7
Total precipitation (inches)	0.4	0.3	0.6	1.3	2.0	2.6	1.9	1.3	1.3	0.8	0.4	0.4	13.3
Total snowfall (inches)	5.6	3.4	3.6	2.2	0.4	0.0	0.0	0.0	0.1	0.9	2.6	5.1	23.9
Snow depth (inches)	4	4	1	0	0	0	0	0	0	0	0	2	1
Midland, South Dakota													
Maximum temperature (ºF)	32.8	38.3	47.2	62.4	73.2	82.5	90.8	89.9	79.2	65.7	48.1	36.6	62.2
Minimum temperature (ºF)	6.0	11.1	20.2	32.6	44.1	54.0	59.6	57.4	45.9	33.5	20.1	10.2	32.9
Total precipitation (inches)	0.3	0.4	1.1	1.6	2.8	3.1	2.2	1.7	1.4	1.1	0.5	0.3	16.4
Total snowfall (inches)	3.9	5.8	6.4	1.8	0.2	0.0	0.0	0.0	0.0	0.6	3.1	4.4	26.2
Snow depth (inches)	1	1	1	0	0	0	0	0	0	0	0	1	0
Lincoln, Nebraska													
Maximum temperature (ºF)	33.8	39.9	50.7	63.8	73.9	84.6	89.3	86.6	78.6	66.3	49.7	37.5	62.9
Minimum temperature (ºF)	12.2	17.8	27.5	38.9	50.2	60.7	66.0	63.6	53.1	40.3	27.4	16.5	39.5
Total precipitation (inches)	0.7	0.9	2.1	2.9	4.3	3.6	3.4	3.4	3.0	1.9	1.5	0.8	28.4
Total snowfall (inches)	6.4	5.3	5.1	1.4	0.0	0.0	0.0	0.0	0.0	0.6	2.6	5.4	26.7
Snow depth (inches)	2	2	0	0	0	0	0	0	0	0	0	1	0
Marion Lake, Kansas													
Maximum temperature (ºF)	37.9	43.9	55.1	66.1	75.1	84.8	91.4	89.9	81.0	69.1	53.7	41.8	65.8
Minimum temperature (ºF)	17.1	21.3	31.6	42.6	52.8	62.5	67.7	65.4	55.8	43.7	31.8	21.7	42.8
Total precipitation (inches)	0.7	0.9	2.4	3.0	4.6	4.9	3.8	3.8	3.2	2.8	1.7	1.0	33.0
Total snowfall (inches)	1.1	1.1	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.0	4.0
Snow depth (inches)	0	0	0	0	0	0	0	0	0	0	0	0	0
Cushing, Oklahoma													
Maximum temperature (ºF)	45.8	52.2	61.2	71.0	78.4	86.5	92.7	92.4	83.6	73.4	59.4	49.0	70.5

TABLE 3.12.1-1
Representative Climate Data in the Vicinity of the Keystone XL Pipeline

Location/ Measurement (Average)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Annual
Minimum temperature (ºF)	24.6	29.8	38.6	48.1	58.2	66.7	71.3	69.9	61.5	49.7	38.1	28.3	48.7
Total precipitation (inches)	1.2	1.9	3.2	3.7	5.8	4.4	2.9	2.7	4.1	3.4	2.9	1.9	38.2
Total snowfall (inches)	3.0	1.7	0.9	T	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.2	7.1
Snow depth (inches)	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaumont, Texas													
Maximum temperature (ºF)	61.5	65.3	72.0	77.8	84.3	89.4	91.6	91.7	88.0	80.5	70.9	63.9	78.1
Minimum temperature (ºF)	42.9	45.9	52.4	58.6	66.4	72.3	73.8	73.2	69.4	59.6	50.8	44.5	59.2
Total precipitation (inches)	5.7	3.4	3.8	3.8	5.8	6.6	5.2	4.8	6.1	4.7	4.7	5.2	59.8
Houston, Texas													
Maximum temperature (ºF)	59.1	65.9	75.4	76.4	84.7	89.7	88.7	93.4	90.1	84.3	74.2	70.8	79.4
Minimum temperature (ºF)	45.1	46.7	58.3	59.0	69.1	75.1	75.5	78.0	74.5	64.1	55.6	49.6	62.6
Total precipitation (inches)	6.7	1.4	8.8	4.8	9.6	5.6	10.0	7.2	6.3	1.8	4.4	1.6	68.2

Notes:
ºF = Degrees Fahrenheit
T = Trace amounts.
Source: Keystone 2009c.

Ambient Air Quality

Ambient air quality is regulated by federal, state, and local agencies. EPA has established national ambient air quality standards (NAAQS) for six criteria pollutants: sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter (PM_{10} particulates and $PM_{2.5}$ particulates), carbon monoxide (CO), ozone (O_3), and lead (Pb). The NAAQS were developed to protect human health (primary standards) and human welfare (secondary standards). State air quality standards cannot be less stringent than the NAAQS. South Dakota, Nebraska, Kansas, Oklahoma, and Texas have adopted ambient air quality standards that are the same as the NAAQS for all six criteria pollutants, whereas Montana has more stringent standards as discussed in detail in Appendix I. Table 3.12.1-2 lists the NAAQS for the six criteria pollutants.

TABLE 3.12.1-2
National Ambient Air Quality Standards

Pollutant	Time Frame	Primary	Secondary
Particulate matter less than 10 microns in diameter	Annual[a]	Revoked	Revoked
	24-hour[b]	150 μg/m^3	150 μg/m^3
Particulate matter less than 2.5 microns in diameter	Annual[c]	15 μg/m^3	15 μg/m^3
	24-hour[d]	35 μg/m^3	NA
Sulfur dioxide	Annual	0.030 ppm (80 μg/m^3)	NA
	24-hour[b]	0.14 ppm (365 μg/m^3)	NA
	3-hour[b]	NA	0.5 ppm (1,300 μg/m^3)
Carbon monoxide	8-hour[b]	9 ppm (10,000 μg/m^3)	NA
	1-hour[b]	35 ppm (40,000 μg/m^3)	NA
Nitrogen dioxide	Annual	0.053 ppm (100 μg/m^3)	0.053 ppm (100 μg/m^3)
	1-hour[e]	0.100 ppm	NA
Ozone	8-hour[f]	0.075 ppm (147 μg/m^3)	0.075 ppm (147 μg/m^3)
	1-hour[g]	0.12 ppm (235 μg/m^3)	0.12 ppm (235 μg/m^3)
Lead	3-month rolling[h]	0.15 μg/m^3	0.15 μg/m^3
	Quarterly	1.5 μg/m^3	1.5 μg/m^3

[a] Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, the United States Environmental Protection Agency revoked the annual PM_{10} standard of 50 μg/m^3 in 2006 (effective December 17, 2006).

[b] Not to be exceeded more than once per year.

[c] To attain this standard, the 3-year average of the weighted annual mean particulate matter less than 2.5 microns in diameter concentrations from single- or multiple community-oriented monitors must not exceed 15.0 μg/m^3.

[d] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 μg/m^3 (effective December 17, 2006).

[e] To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010).

[f] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations, measured at each monitor within an area over each year, must not exceed 0.075 ppm (effective May 27, 2008).

[g] The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is < 1. As of June 15, 2005, EPA revoked the 1-hour ozone standard in all areas, except the fourteen 8-hour ozone nonattainment Early Action Compact Areas.

[h] Final rule signed October 15, 2008.

Notes:

μg = Microgram(s)
m^3 = Cubic meter(s)
NA = Not applicable
ppm = Part(s) per million

Source: EPA 2009a.

EPA has characterized all areas of the United States as attainment, unclassifiable, maintenance, or nonattainment. Areas where the ambient air concentration of a pollutant is less than the NAAQS are designated as attainment; areas where no ambient air quality data are available are designated as unclassifiable. Unclassifiable areas are treated as attainment areas for the purposes of permitting stationary sources. Areas are designated as nonattainment when a pollutant's ambient air concentration is greater than the NAAQS. If an area was designated as nonattainment and has since demonstrated compliance with the NAAQS, it is considered a maintenance area. While maintenance areas are treated as attainment areas for the purposes of permitting stationary sources, states may have specific provisions to ensure that the area would continue to comply with the NAAQS.

The Project would pass through nonattainment areas in Texas. Liberty, Hardin, Jefferson, Harris, and Chambers counties are designated as nonattainment for the 8-hour ozone federal standard. Ozone is not emitted directly into the air but rather develops as inversion-layer ozone formed through photochemical reactions between atmospheric oxygen, oxides of nitrogen (NOx), and volatile organic compounds (VOCs) in the presence of sunlight (ultraviolet light). The major sources of NOx and VOC precursor emissions include motor vehicles, industrial facilities, electric utilities, gasoline storage facilities, chemical solvents, and biogenic sources. Because of this nonattainment designation, the Project would be subject to a General Conformity Determination, as described further in Sections 3.12.1.2 and 3.12.1.3.

A network of ambient air quality monitoring stations has been established by EPA and state and local agencies to measure and track the background concentrations of criteria pollutants across the United States, and to assist in designation of nonattainment areas. To characterize the background air quality in the regions surrounding the proposed Project area, data from air quality monitoring stations were obtained. A summary of the available regional background air quality concentrations for 2008 is presented in Table 3.12.1-3.

TABLE 3.12.1-3
2008 Regional Background Air Quality Concentrations for the Project [a]

Location	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)		SO_2 (ppm)			CO (ppm)		NO_2 (ppm)	O_3 (ppm)	
	24-Hr[b]	Annual	24-Hr[c]	Annual	24-Hr[b]	3-Hr[b]	8-Hr[b]	1-Hr[b]	Annual	8-Hr[d]	1-Hr[b]
Montana											
Flathead County	--	--	--	--	--	--	1.9	3.4	--	0.057	0.061
Rosebud County	45	--	--	--	--	--	--	--	--	--	--
Yellowstone County	--	6.66	15.7	0.004	0.021	0.043	--	--	--	--	--
South Dakota											
Jackson County	56	5.80	12.8	0.002	0.005	0.006	--	--	0.001	0.052	0.058
Meade County	32	--	--	--	--	--	--	--	--	0.060	0.068
Pennington County	110	8.16	21.6	--	--	--	--	--	--	--	--
Nebraska											
Douglas County	124	9.81	22.0	0.002	0.017	0.050	2.0	2.9	--	0.058	0.068
Hall County	--	8.21	18.6	--	--	--	--	--	--	--	--
Lancaster County	--	8.30	23.4	--	--	--	1.8	4.5	--	0.051	0.059
Kansas											
Sedgwick County	62	10.15	22.9	--	--	--	1.5	2.7	0.009	0.067	0.077
Shawnee County	49	10.47	19.5	--	--	--	--	--	--	0.065	0.072
Sumner County	--	9.48	22.3	0.002	0.003	0.004	--	--	0.004	0.068	0.080
Oklahoma											
Creek County	--	--	--	--	--		--	--	--	0.069	0.085
Kay County	84	--	--	0.003	0.018	0.037	0.3	0.3	--	0.069	0.090
Lincoln County	--	--	--	--	--	--	--	--	--	0.061	0.073
Tulsa County	77	12.10	24.7	0.007	0.036	0.067	1.3	1.9	0.011	**0.079**	0.099
Texas											
Gregg County	--	--	--	0.002	0.013	0.055	--	--	0.007	0.071	0.101
Harris County	127	14.26	32.4	0.002	0.015	0.046	5.2	8.1	0.015	**0.083**	0.122
Jefferson County	--	10.41	32.6	0.003	0.018	0.064	0.7	1.7	0.008	**0.078**	0.099

[a] The values shown are the highest reported during the year by all monitoring sites in a county.
[b] Data represents the second-highest daily maximum concentrations.
[c] Data represents the 98th percentile of 24-hour average $PM_{2.5}$ concentrations.
[d] Data represents the fourth-highest daily maximum 8-hour average ozone concentrations.

Notes:
µg = Microgram(s)

CO	=	Carbon monoxide
m^3	=	Cubic meter(s)
NO_2	=	Nitrogen dioxide
O_3	=	Ozone
ppm	=	Part(s) per million
PM_{10}	=	Particulate matter less than 10 microns in diameter
$PM_{2.5}$	=	Particulate matter less than 2.5 microns in diameter
SO_2	=	Sulfur dioxide

Source: EPA, 2009b.

3.12.1.2 Regulatory Requirements

The Clean Air Act (CAA) and its implementing regulations (42 USC 7401 et seq., as amended in 1977 and 1990) are the basic federal statutes and regulations governing air pollution in the United States. The following requirements have been reviewed for applicability to the proposed Project:

- New Source Review (NSR) / Prevention of Significant Deterioration (PSD);
- Air Quality Control Regions (AQCRs);
- New Source Performance Standards (NSPS);
- National Emission Standards for Hazardous Air Pollutants (NESHAPs) / Maximum Achievable Control Technology (MACT);
- Chemical Accident Prevention Provisions;
- Title V Operating Permits / State Operating Permits;
- Other Applicable State Permits;
- General Conformity Rule; and
- Greenhouse Gases (see Section 3.14 Cumulative Effects).

New Source Review / Prevention of Significant Deterioration

The NSR permitting program was established as part of the 1977 Clean Air Act Amendments (CAAA). NSR is a preconstruction permitting program that ensures that air quality is not significantly degraded from the addition of new or modified major emissions sources.[1] In poor air quality areas, NSR ensures that new emissions do not inhibit progress toward cleaner air. In addition, the NSR program ensures that any large new or modified industrial source would be as clean as possible, and that the best available pollution control is utilized. The NSR permit establishes what construction is allowed, how the emission source is operated, and which emission limits must be met.

If construction or modification of a major stationary source located in an attainment area would result in emissions greater than the significance thresholds, the project must be reviewed in accordance with PSD regulations. Construction or modification of a major or, in some jurisdictions, non-major stationary source in a nonattainment or PSD maintenance (Section 175A) area requires that the project be reviewed in accordance with nonattainment NSR regulations.

The proposed Project includes construction of a tank farm in Steele City, Nebraska. The tank farm includes three crude oil storage tanks, each with a capacity of 350,000 barrels (14,700,000 gallons). Estimated emissions are less than the 100 ton per year (tpy) threshold level for a petroleum storage and transfer unit with a total storage capacity exceeding 300,000 barrels (i.e., one of the 28 named source types subject to the 100 tpy threshold for PSD permitting; see Table 3.12.1-4). In addition, mobile source emissions and fugitive emissions during the construction phase would be excluded from the determination of "potential to emit" for applicability purposes in accordance with the CAA. Therefore, the proposed tank farm would not trigger NSR or PSD review.

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[1] A major stationary pollutant source in a nonattainment area has the potential to emit more than 100 tpy of any criteria pollutant. In PSD areas, the threshold level may be either 100 or 250 tpy, depending on whether the source is classified as one of the 28 named source categories listed in Section 168 of the CAA.

TABLE 3.12.1-4 Estimated Emissions from the Steele City Tank Farm in Nebraska			
Emission Unit	**VOC (tpy)**	**Total HAPs (tpy)**	**Maximum Individual HAP (tpy)**
Crude Oil Tank #1	5.31	0.37	0.34 (hexane)
Crude Oil Tank #2	5.31	0.37	0.34 (hexane)
Crude Oil Tank #3	5.31	0.37	0.34 (hexane)
Fugitive Emissions	5.10	0.46	0.36 (hexane)
Total	21.03	1.57	1.38 (hexane)

Notes:
tpy = Tons per year.
HAP = Hazardous air pollutant.
Source: Keystone 2008.

During construction, Keystone may use temporary diesel-fired generator engines at construction camps near Nashua and Baker, Montana, and Union Center and Winner, South Dakota if line power is not acquired. If line power is acquired, emergency back-up generators may still be used at these locations. The generators would be considered nonroad engines under 40 CFR 89.2 if they meet the definitions of portable or transportable, and are at a location for less than 12 consecutive months. Nonroad engine emissions would be excluded from the determination of "potential to emit" for applicability purposes in accordance with the CAA. Subsequently, emissions would be less than the 250 tpy threshold level, and as a result, NSR or PSD review would not be triggered. If the temporary diesel-fired generator engines are considered stationary rather than nonroad, estimated emissions would still be less than the 250 tpy threshold level (see Tables 3.12.1-5 and 3.12.1-6). Therefore, the construction camps would not trigger NSR or PSD review.

TABLE 3.12.1-5 Estimated Emissions Per Construction Camp [a, b]	
Pollutant	**Annual Emissions (tpy)**
Nitrogen Oxides + Nonmethane Hydrocarbon	61.80
Carbon Monoxide	54.07
Particulate Matter	3.09
Sulfur Oxides	4.31
Lead	7.2e-04

Notes:
tpy = Tons per year.
[a] Emission estimates include four, 400-kW generator engines per camp.
[b] Engines would be "Tier 3" certified and assumed to operate 8,760 hours per year for worst-case emissions.
Source: Keystone 2009c.

TABLE 3.12.1-6 Estimated Emissions Per Emergency Generator [a, b]	
Pollutant	**Annual Emissions (tpy)**
Nitrogen Oxides + Nonmethane Hydrocarbon	15.45
Carbon Monoxide	13.52
Particulate Matter	0.77
Sulfur Oxides	1.08
Lead	1.8e-04

Notes:
tpy = Tons per year.
[a] Emission estimates include one, 400-kW generator engine.
[b] Engine would be "Tier 3" certified and assumed to operate 8,760 hours per year for worst-case emissions.
Source: Keystone 2009c.

Air Quality Control Region

AQCRs are categorized as Class I, Class II, or Class III. Class I areas are designated specifically as pristine natural areas or areas of natural significance; these areas receive special protections under the CAA because of their good air quality. If a new source or major modification to an existing source is subject to the PSD program requirements and is within 62 miles (100 kilometers) of a Class I area, the facility is required to notify the appropriate federal officials and assess the impacts of the proposed project on the Class I area. Class III designations, intended for heavily industrialized zones, can be made only on request and must meet all requirements outlined in 40 CFR Part 51.166. The remainder of the United States is designated as Class II.

The following Class I areas are within 62 miles (100 kilometers) of the Project ROW: Badlands/Sage Creek Wilderness and Badlands National Park in South Dakota; Theodore Roosevelt National Park in North Dakota; and Fort Peck Reservation in Montana. However, the proposed Project does not include construction or operation of significant stationary sources of air pollutants subject to the PSD program requirements. The Steele City tank farm in Nebraska, although not subject to PSD review, is located over 600 kilometers from the nearest Class I area. Therefore, the Project would not trigger a federal Class I area impact assessment.

New Source Performance Standards

The NSPS, codified at 40 CFR Part 60, establish requirements for new, modified, or reconstructed units in specific source categories. NSPS requirements include emission limits, monitoring, reporting, and record keeping.

The proposed Project includes construction of a tank farm in Steele City, Nebraska. The tank farm includes three crude oil storage tanks, each with a capacity of 350,000 barrels (14,700,000 gallons). 40 CFR 60 Subpart Kb applies to storage vessels containing volatile organic liquids (VOLs) with a capacity greater than 75 m^3 (approximately 19,800 gallons). As stated in 40 CFR 60.112b(a), the owner or operator of a storage vessel with a design capacity greater than or equal to 151 m^3 (approximately 39,900 gallons) containing a VOL that has a maximum true vapor pressure greater than or equal to 5.2 kPa (approximately 0.7 psia) shall equip each storage vessel with one of several control options:

- A fixed roof in combination with an internal floating roof;

- An external floating roof;
- A closed vent system and control device; or
- A system equivalent to those described above.

Each of the crude oil tanks to be located at the Steele City tank farm would be installed with a fixed roof in combination with an internal floating roof. As set out by 40 CFR 60.112b(a)(1)(ii), each internal floating roof shall be equipped with a mechanical shoe seal, which is a metal sheet held vertically against the wall of the storage vessel by springs or weighted levers and is connected by braces to the floating roof. A flexible coated fabric (envelope) spans the "annular space" between the metal sheet and the floating roof. The Project would be required to comply with all applicable provisions of Subpart Kb, and the General Provisions in 40 CFR 60 Subpart A.

During construction, Keystone proposes to locate temporary fuel storage systems at contractor yards and pipe yards. Each system would consist of temporary aboveground 10,000 to 20,000-gallon onroad and offroad diesel skid mounted tanks and/or 9,500-gallon gasoline fuel trailers. Normally, a two to three day supply of fuel would be maintained in storage, resulting in approximately 30,000 gallons in storage volume at each fuel storage location. The regulatory applicability of 40 CFR 60 Subpart XX depends on the gasoline throughput of transfer facilities. As long as the throughput of Keystone's transfer facilities are less than 75,700 liters per day (i.e., 19,998 gallons per day), they would be exempt from Subpart XX. In addition, as long as Keystone stores only diesel fuel in tanks larger than 75 cubic meters (19,813 gallons) that are constructed after July 23, 1984, the Keystone temporary fuel tanks would be exempt from 40 CFR 60 Subpart Kb.

During construction, Keystone may use construction camp generator engines in Montana and South Dakota. 40 CFR 60 Subpart IIII applies to stationary compression ignition internal combustion engines manufactured after April 1, 2006 or modified or reconstructed after July 11, 2005 as set out by 40 CFR 60.4200(a). Subpart IIII requires that these engines be certified to meet the emission standards starting in 40 CFR 60.4201 for nitrogen oxides (NOx), particulate matter (PM), carbon monoxide (CO), and non-methane hydrocarbons (NMHC). In addition, owners and operators of the engines must use low sulfur fuel, and beginning October 1, 2010, ultra low sulfur fuel. The regulation has specific provisions for emergency engines starting in 40 CFR 60.4202. If the generator engines are located at construction camps for less than 12 months and considered nonroad engines per 40 CFR 89.2, the engines would not be considered stationary units nor would they be subject to this subpart.

No other subparts would apply because the proposed Project does not include construction or operation of any other specific source category of air pollutants.

National Emission Standards for Hazardous Air Pollutants / Maximum Achievable Control Technology

NESHAPs, codified in 40 CFR Parts 61 and 63, regulate hazardous air pollutant (HAP) emissions. Part 61 was promulgated prior to the 1990 CAAA and regulates only eight types of hazardous substances (asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride). The Project would not include facilities that fall under one of the source categories regulated by Part 61; therefore, the requirements of Part 61 are not applicable.

The 1990 CAAA established a list of 189 additional HAPs, resulting in the promulgation of Part 63. Also known as the MACT standards, Part 63 regulates HAP emissions from major sources of HAPs and specific source categories that emit HAPs. Part 63 considers any source with the potential to emit 10 tpy of any single HAP or 25 tpy of HAPs in aggregate as a major source of HAPs. Neither the Steele City tank farm nor any other of the Project facilities would have the potential to emit HAP emissions greater than 10 tpy for a single HAP, nor would they have the potential to emit 25 tpy of multiple HAPs (see Table 3.12-1-4). Thus, the proposed Project facilities would not be considered a major source of HAP emissions and would not be subject to NESHAPs.

Chemical Accident Prevention Provisions

The chemical accident prevention provisions, codified in 40 CFR Part 68, are federal regulations designed to prevent the release of hazardous materials in the event of an accident and to minimize potential impacts if a release did occur. The regulations contain a list of substances and threshold quantities for determining applicability to stationary sources. If a stationary source stores, handles, or processes one or more substances on this list in a quantity equal to or greater than specified in the regulation, the facility must prepare and submit a Risk Management Plan. If a facility does not have a listed substance onsite, or if the quantity of a listed substance is below the applicability threshold, the facility does not need to prepare a Risk Management Plan. No hazardous materials subject to the Chemical Accident Prevention Provision/Risk Management Plan (40 CFR Part 68) would be stored at any of the Project aboveground facilities (Keystone 2009c).

Title V Operating Permits/State Operating Permits

Title V of the federal CAA requires individual states to establish an air operating permit program. The requirements of Title V are outlined in 40 CFR Parts 70 and 71, and the permits required by these regulations are often referred to as Part 70 or 71 permits. The permit includes all air pollution requirements that apply to the source, including emissions limits and monitoring, record keeping, and reporting requirements. It also requires that the source report its compliance status with respect to permit conditions to the permitting authority. Operating permits (also known as Title V permits) are required for all major stationary sources. What constitutes a major source varies according to what pollutant(s) are being emitted and the attainment designation of the area where the source is located. In general, a source is Title V major if it emits or has the potential to emit 100 tpy or more of any criteria air pollutant.

The proposed Project includes construction of a tank farm in Steele City, Nebraska. The tank farm includes three crude oil storage tanks, each with a capacity of 350,000 barrels (14,700,000 gallons). In Nebraska, the State of Nebraska Department of Environmental Quality has authority to implement the Title V (Class I) program, and Class II program for minor sources not subject to Title V. Regulations are contained in Nebraska Administrative Code, Title 129, Chapters 7 through 14. The department requires a Title V (Class I) operating permit for all sources that have actual emissions that are equal to or greater than the Title V (Class I) thresholds, and requires a Class II operating permit for all sources that have actual emissions that are equal to or greater than the Class II thresholds (see Table 3.12.1-7). The proposed tank farm would not have potential emissions that exceed the Title V (Class I) or Class II thresholds (see Table 3.12.1-4). In addition, Title 129, Chapter 5 authorizes a Source Category Exemption for sources subject to a standard, limitation, or other requirement under Chapter 18 (NSPS) that are not major or affected sources. Consequently, the Project’s tank farm would not trigger Title V (Class I) or Class II permitting.

TABLE 3.12.1-7 Nebraska Department of Environmental Quality Permitting		
Pollutant	Class I (Major Source) Thresholds	Class II (Minor Source) Thresholds
Nitrogen Oxides	100 tpy	50 tpy
Carbon Monoxide	100 tpy	50 tpy
Sulfur Oxides	100 tpy	50 tpy
Volatile Organic Compounds	100 tpy	50 tpy
Particulate Matter less than 10 microns in diameter	100 tpy	50 tpy
Hazardous Air Pollutants	10 tpy of any single HAP or 25 tpy of a combination of HAPs	5 tpy of any single HAP or 12.5 tpy of a combination of HAPs
Lead	5 tpy	2.5 tpy

Notes:
tpy = Tons per year.
HAP = Hazardous air pollutant.
Source: Nebraska DEQ 2009. Available online at: <http://www.deq.state.ne.us/AirDivis.nsf/pages/AirOPP>.

During construction, Keystone may use temporary diesel-fired generator engines at construction camps near Nashua and Baker, Montana, and Union Center and Winner, South Dakota if line power is not acquired. If line power is acquired, emergency back-up generators may still be used at these locations. In Montana, the State of Montana Department of Environmental Quality has authority to implement the Title V program. Regulations are contained in the Administrative Rules of Montana, Title 17, Chapter 8, Subchapter 12. The diesel-fired generator engines and emergency back-up generators at each camp in Montana would not have potential emissions that exceed the Title V threshold of 100 tpy (see Tables 3.12.1-5 and 3.12.1-6). Consequently, Project camps in Montana would not trigger Title V permitting.

In South Dakota, the State of South Dakota Department of Environment and Natural Resources has authority to implement the Title V program, and operating permit program for minor sources not subject to Title V. Regulations are contained in the Administrative Rules of South Dakota, Chapters 74:36:04-05. The department exempts sources from the requirements for a minor operating permit as set out in Chapter 74:36:04:03, including if a facility that has the potential to emit 25 tons or less per year of any criteria pollutant. The diesel-fired generator engines and emergency back-up generators at each camp in South Dakota would not have potential emissions that exceed the Title V threshold of 100 tpy (see Tables 3.12.1-5 and 3.12.1-6). However, the generator engines would have potential emissions greater than the minor operating permit threshold. Consequently, Project camps in South Dakota would not trigger Title V permitting, but appear to trigger the need for a minor operating permit unless exemptions exist and are met for temporary nonroad engines.

Other Applicable State Permits

The State of Montana Department of Environmental Quality requires preconstruction air quality permits under the Administrative Rules of Montana, Title 17, Chapter 8, Subchapter 7. Permitting is required for sources that have potential emissions that exceed 25 tpy and are not excluded under ARM 17.8.744 (i.e., emergency back-up generators). The temporary diesel-fired generator engines at each camp in Montana would have potential emissions that exceed the preconstruction permit threshold of 25 tpy (see Table 3.12.1-5). Consequently, Project camps in Montana appear to trigger requirements for preconstruction permitting unless exemptions exist and are met for temporary nonroad engines.

General Conformity Rule

The General Conformity Rule was designed to require federal agencies to ensure that proposed projects conform to the applicable State Implementation Plan (SIP). General Conformity regulations apply to project-wide emissions of pollutants for which the project areas are designated as nonattainment (or, for ozone, its precursors NOx and VOC) that are not subject to NSR and that are greater than the significance thresholds established in the General Conformity regulations or 10 percent of the total emissions budget for the entire nonattainment area. Federal agencies are able to make a positive conformity determination for a proposed project if any of several criteria in the General Conformity Rule are met. These criteria include:

- Emissions from the project are specifically identified and accounted for in the SIP attainment or maintenance demonstration; or
- Emissions from the action are fully offset within the same area through a revision to the SIP, or a similarly enforceable measure that creates emissions reductions so that there is no net increase in emissions of that pollutant.

A General Conformity analysis is required for pollutant emissions that would occur in nonattainment areas not subject to NSR. For the Project, Liberty, Hardin, Jefferson, Harris, and Chambers counties in Texas are designated as nonattainment for the 8-hour federal ozone standard (precursors are NOx and VOC). Therefore, emissions of NOx and VOCs from Project-related sources would be considered under the General Conformity Rule. The required evaluation of the proposed Project under General Conformity includes an applicability analysis via a comparison of potential emissions to applicability threshold levels, as well as a conformity determination if the emissions are greater than applicability threshold levels. Each federal agency is required to make a Conformity Determination before the action is taken. For more details on Keystone's General Conformity analysis, see Section 3.12.1.3 and Appendix Q.

3.12.1.3 Potential Impacts and Mitigation

Two types of impacts on air quality were considered for this analysis: temporary impacts resulting from emissions associated with construction activities and long-term or permanent impacts resulting from emissions generated from continued operation of a stationary source.

Construction Impacts

Air quality impacts associated with construction of the proposed Project would include emissions from fugitive dust, fossil-fueled construction equipment, open burning, and temporary fuel transfer systems and associated storage tanks.

Fugitive Dust

Fugitive dust is a source of respirable airborne particulate matter, including PM_{10} and $PM_{2.5}$. Fugitive dust results from land clearing, grading, excavation, concrete work, blasting and dynamiting, and vehicle traffic (including construction camp traffic) on paved and unpaved roads. The amount of dust generated is a function of construction activities, silt, moisture content of the soil, wind speed, frequency of precipitation, vehicle traffic, vehicle types, and roadway characteristics. Emissions would be greater during drier summer and autumn months, and in fine-textured soils.

Emissions of particulate matter arising from fugitive dust are regulated by state and local agencies. Typically, the regulations require measures to prevent fugitive dust from becoming airborne and leaving the property boundary, such as application of dust suppressants. Specific requirements also can include development and approval of a fugitive dust control plan. The Project would affect approximately 23,768 acres of land in six states during the construction phase. The majority of pipeline construction activity would generally pass by a specific location within a 30-day period before final grading, seeding, and mulching takes place, thereby resulting in short-term and temporary impacts at any one location during construction.

As described in its CMR Plan (Appendix B), Keystone would implement proven dust-minimization practices to control fugitive dust emissions during construction, such as applying water sprays and surfactant chemicals, and stabilizing disturbed areas. Keystone would also place curtains of suitable material, as necessary, to prevent wind-blown particles from sand blasting operations from reaching any residence or public building. Additional dust control measures may be required by state or local ordinances. Keystone would comply with all applicable state and local regulations with respect to truck transportation and fugitive dust emissions.

Fossil-Fueled Construction Equipment

Construction camp generators, large earth-moving equipment, skip loaders, trucks, nonroad engines, and other mobile sources may be powered by diesel or gasoline and are sources of combustion emissions, including NOx, CO, VOCs, SO_2, PM_{10}, $PM_{2.5}$, and small amounts of HAPs. Gasoline and diesel engines must comply with the EPA mobile source regulations in 40 CFR Part 86 for onroad engines and 40 CFR Part 89 and 90 for nonroad engines; these regulations are designed to minimize emissions. Furthermore, to implement the CAA, EPA has established rules in 40 CFR 80 to require that sulfur content in onroad and offroad diesel fuel be significantly reduced. On June 1, 2006, 80 percent of diesel fuel for onroad use produced by U.S. refineries was required to be reduced from 500 to 15 ppm sulfur. Additionally, on June 1, 2007 diesel fuel for nonroad engines must be reduced from 5,000 to 500 ppm sulfur. By December 1, 2010, EPA would require that all on and offroad (nonroad) diesel fuel meets a limit of 15 ppm sulfur (i.e., ultra low sulfur fuel).

Keystone proposes to use the construction equipment listed in Table 3.12.1-8 in a typical construction spread. Keystone would construct the pipeline in 17 construction spreads or completed lengths (Section 2.2.5). Each spread would require 6 to 8 months to complete.

TABLE 3.12.1-8
Construction Equipment per Spread for the Project

Equipment Description	Units per Spread	Equipment Rating (hp)	Hours of Operation (hours/day)	Fuel Type
Automobile	50	500	2	Gasoline/ Diesel
Bus	7	190	3	Diesel
Pickup 4x4	100	500	5	Gasoline/Diesel
Welding Rig	30	400	10	Gasoline/Diesel
Winch Truck	3	650	8	Diesel
Dump Truck	1	650	8	Diesel
Flatbed Truck	8	650	9	Diesel
Fuel Truck	2	650	9	Diesel
Grease Truck	1	1	9	Diesel
Mechanic Rig	1	500	10	Diesel

TABLE 3.12.1-8
Construction Equipment per Spread for the Project

Equipment Description	Units per Spread	Equipment Rating (hp)	Hours of Operation (hours/day)	Fuel Type
Skid Truck	1	650	10	Diesel
Stringing Tr. and Tr.	15	650	10	Diesel
Truck and Float	9	650	10	Diesel
Truck and Lowboy	5	650	10	Diesel
D-7 Dozer	12	240	8	Diesel
D-8 Dozer	22	310	8	Diesel
D-8 Ripper	0	310	0	Diesel
D-5 Tow	2	90/120	8	Diesel
D-7 Tow	1	200/240	8	Diesel
D-6 Tack	3	200	8	Diesel
CAT 225	7	150	8	Diesel
CAT 235	26	250	8	Diesel
CAT 235 w/Hammer	1	260	8	Diesel
Bending Machine 22-36	1	159	8	Diesel
Crane LS-98A (35 ton)	2	230	8	Diesel
Farm Tractor	2	60	8	Diesel
Frontend Loader 977	2	190	8	Diesel
Motor Grader 14G	2	200	8	Diesel
Sideboom 571	1	200	8	Diesel
Sideboom 572	1	200/230	8	Diesel
Sideboom 583	22	300/310	8	Diesel
Sideboom 594	4	410	8	Diesel
Air Compressor 1750 cfm	9	50	8	Gasoline
Generators	9	10	8	Gasoline
Pump - 3"	1	20	8	Gasoline
Pump - 6"	9	40	8	Gasoline

Notes:
[a] In addition to the equipment listed above, ten 10-hp diesel or gasoline generators could be used per spread.
[b] Construction equipment listed in this table does not directly correlate to equipment listed in Table 2.4.2-1; however, total horsepower is similar for the purposes of the air emissions analysis. In addition, the list does not include generators proposed for construction camps.
Source: Keystone 2009c.

Keystone would also install four, 400-kW generator engines at construction camps near Nashua and Baker, Montana, and Union Center and Winner, South Dakota if line power is not acquired. If line power is acquired, one 400-kW emergency back-up generator may still be used at these locations.

Keystone would maintain all fossil-fueled construction equipment in accordance with manufacturer's recommendations to minimize construction-related emissions.

Open Burning

Burning cleared materials may be required along the route, and is fairly typical during pipeline construction. Open burning of cleared materials from construction activities has the potential to affect air quality. However, prior to construction it is unknown how much open burning would occur and in what quantities and locations, as excess materials may be burned, chipped, or hauled for disposal in a suitable landfill.

The states along the route of the proposed Project regulate open burning through local permitting, approval, and notification processes. Keystone would obtain all necessary open burning permits, approvals, and notifications prior to conducting any open burning of land clearing materials. Keystone would follow all open burning regulations during such activities, including restrictions on burn location, material, and time, as well as consideration of local air quality. In addition, burning would be done within the right-of-way (ROW) in small piles to avoid overheating of or damage to trees or other structures.

Temporary Fuel Transfer Systems and Associated Storage Tanks

Keystone proposes to locate temporary fuel storage systems at contractor yards and pipe yards. Temporary fuel transfer systems and tanks have the potential to release VOC emissions. However, because Keystone would be storing mainly diesel fuel with a low vapor pressure, releases of VOCs would be minimal. Fuel transfer is discussed further in New Source Performance Standards in Section 3.12.1.2.

Conclusion

Emissions for the Project from construction sources are provided in Table 3.12.1-9. Because pipeline construction moves through an area relatively quickly, air emissions typically would be localized, intermittent, and short term. Emissions from fugitive dust, construction equipment combustion, open burning, and temporary fuel transfer systems and associated tanks would be controlled to the extent required by state and local agencies as explained above. The Project may use temporary diesel-fired generator engines at construction camps near Nashua and Baker, Montana, and Union Center and Winner, South Dakota if line power is not acquired. If line power is acquired, emergency back-up generators may still be used at these locations. The camps in Montana appear to trigger requirements for a preconstruction permit and camps in South Dakota appear to trigger requirements for a minor operating permit unless exemptions exist and are met for temporary nonroad engines. If Keystone complies with applicable regulations, the Project emissions from construction-related activities would not significantly affect local or regional air quality.

TABLE 3.12.1-9
Estimated Direct Construction Emissions for the Project

Emission Source	NOx (tons)	CO (tons)	VOC (tons)	SO_2 (tons)	PM (tons)	PM_{10} (tons)	$PM_{2.5}$ (tons)	CO_2-e[a] (tons)
Construction emissions								
Construction camps[b]	494.40	432.56	46.39	33.04	24.72	24.72	24.72	108288.00
On-road vehicles	37.40	229.67	12.75	0.17	1.36	1.36	1.36	16008.56
Non-road equipment	590.92	391.34	43.35	24.65	24.65	24.65	24.65	82687.49
Open burning	19.72	1157.87	85.00	--	185.64	132.43	112.54	27393.87
Fugitive dust	--	--	--	--	1474.92	737.46	110.67	--
Paved road dust	--	--	--	--	116.79	18.36	1.87	--
Total construction emissions (3-yr combined)	**1142.44**	**2211.44**	**187.49**	**57.86**	**1828.08**	**938.98**	**275.81**	**234378.02**

[a] CO_2 equivalent is conservatively estimated by assuming all total organic compounds are methane and multiplying by 21 for the global warming potential (GWP) for methane.

[b] Construction camp emission estimates include four construction camps with four, 400-kW generator engines per camp operating for 2 years.

Notes:

NOx	=	Oxides of nitrogen.
CO	=	Carbon monoxide.
VOC	=	Volatile organic compounds.
SO_2	=	Sulfur dioxide.
PM	=	Particulate matter.
PM_{10}	=	Particulate matter less than 10 microns in diameter.
$PM_{2.5}$	=	Particulate matter less than 2.5 microns in diameter.
CO_2-e	=	Carbon dioxide equivalents.

Source: Keystone 2009c.

Operations Impacts

Emissions for the Project from operational sources are provided in Table 3.12.1-10. Air quality impacts associated with operation of the proposed Project would include minimal fugitive emissions from crude oil pipeline connections and pumping equipment at the pump stations, minimal emissions from mobile sources, and VOC and HAP emissions from the crude oil storage tank at the Steele City tank farm. Keystone proposes that all pipeline pumps would be electric.

The proposed Project includes construction of a tank farm in Steele City, Nebraska. The tank farm includes three crude oil storage tanks, each with a capacity of 350,000 barrels (14,700,000 gallons). Preliminary estimations assumed that each crude oil tank is 350,000 barrels, each crude oil tank would have an internal self supporting roof. Thirty-two turnovers would occur annually and each crude oil tank would have a mechanical shoe seal (primary) with no secondary seal. As a result, the Project would not cause or contribute to a violation of any federal, state, or local air quality standards. In addition, the proposed Project operations would not trigger the requirement for a Title V operating permit.

TABLE 3.12.1-10
Estimated Direct Emissions for the Project

Emission Source	NOx (tons)	CO (tons)	VOC (tons)	SO_2 (tons)	PM (tons)	PM_{10} (tons)	$PM_{2.5}$ (tons)	CO_2-e[a] (tons)
Operating emissions								
Tank farm	--	--	21.03	--	--	--	--	N/A
Pump station fugitives[b]	--	--	6.82	--	--	--	--	84.63
On-road vehicles[c]	6.7E-05	1.5E-03	7.2E-05	8.0E-07	3.7E-02	5.8E-03	5.7E-04	4.3E-02
Total operating emissions	**6.7E-05**	**1.5E-03**	**27.85**	**8.0E-07**	**3.7E-02**	**5.8E-03**	**5.7E-04**	**84.63**

[a] CO_2 equivalent is conservatively estimated by assuming all total organic compounds are methane and multiplying by 21 for the global warming potential (GWP) for methane.

[b] Pumping station emissions include combined emissions from 30 pumping stations along the Steele City and Gulf Coast Segments.

[c] The operational emissions noted from onroad vehicles include mobile emissions from the Steele City Tank Farm only and do not include the preliminary estimated VOC emissions from the storage tanks.

Notes:

NOx	=	Oxides of nitrogen.
CO	=	Carbon monoxide.
VOC	=	Volatile organic compounds.
SO_2	=	Sulfur dioxide.
PM	=	Particulate matter.
PM_{10}	=	Particulate matter less than 10 microns in diameter.

$PM_{2.5}$ = Particulate matter less than 2.5 microns in diameter.
CO_2-e = Carbon dioxide equivalents.
Source: Keystone 2009c.

General Conformity

Section 176(c) of the CAA prohibits federal actions in nonattainment or PSD maintenance areas that do not conform to the SIP for the attainment and maintenance of NAAQS. Therefore, the purpose of the General Conformity Determination is to ensure: (1) that federal activities do not interfere with the budgets in the SIPs; (2) that actions do not cause or contribute to new violations; and (3) attainment and maintenance of the NAAQS. Conformity can be demonstrated by showing: (1) that emission increases are allowed in the SIP; (2) that the state agrees to include emission increases in the SIP; (3) that no new violations of NAAQS, or that no increase in the frequency or severity of violations would occur; (4) offsets; and (5) mitigation. Some actions that are excluded from the General Conformity Determination include those already subject to NSR and those covered by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or other environmental laws.

The Project would cross five counties that are designated as nonattainment for the federal ozone standard. Liberty, Chambers, and Harris counties are located in the Houston-Galveston-Brazoria 8-hour ozone nonattainment area. The region is currently classified as severe nonattainment of the 1997 8-hour ozone standard with a maximum attainment date of June 15, 2019. Hardin and Jefferson counties are located in the Beaumont-Port Arthur 8-hour ozone nonattainment area. The region is currently classified as moderate nonattainment of the 1997 8-hour ozone standard with a maximum attainment date of June 15, 2010.

Emissions of ozone precursor compounds (NOx and VOCs) would be evaluated against the General Conformity applicability threshold levels and nonattainment area emissions budget. All Project emissions of NOx and VOCs emitted during construction and operation would be evaluated because no emissions would be covered under air permit programs. Written approval of conformance with the SIP would be necessary for the Project if estimated emissions are above the General Conformity applicability threshold levels. See Table 3.12.1-11 for estimated emissions.

TABLE 3.12.1-11
Estimated Emissions from Activities in Nonattainment Areas for the Project

Emission Source	NOx (tpy)	VOC (tpy)
Beaumont-Port Arthur 8-hour Moderate Ozone Nonattainment Area (Hardin and Jefferson Counties, Texas)		
Annual general conformity applicability threshold levels [a]	**100**	**100**
Construction emissions - 2011		
Onroad equipment	3.80	1.30
Nonroad equipment	60.57	4.47
Open burning	3.85	16.54
Total construction emissions	68.22	22.31
Below thresholds?	Yes	Yes
Houston-Galveston-Brazoria 8-hour Severe Ozone Nonattainment Area (Liberty, Harris, and Chambers Counties, Texas)		
Annual general conformity applicability threshold levels	**25**	**25**
Construction emissions - 2011		

TABLE 3.12.1-11 Estimated Emissions from Activities in Nonattainment Areas for the Project		
Emission Source	**NOx (tpy)**	**VOC (tpy)**
Onroad equipment	2.51	0.94
Nonroad equipment	35.95	2.84
Open burning	1.22	5.24
Total construction emissions	39.68	9.02
Below thresholds?	**No**	Yes
Construction emissions - 2012		
Onroad equipment	3.87	1.33
Nonroad equipment	56.29	4.15
Open burning	4.28	18.42
Total construction emissions	64.44	23.90
Below thresholds?	**No**	Yes
Operating emissions - 2012		
(Pump station No. 41)	--	0.01
Below thresholds?	Yes	Yes

Notes:
$PM_{2.5}$ = Particulate matter less than 2.5 microns in diameter.
NA = Not available at the time of publication of the draft EIS.
NOx = Oxides of nitrogen.
VOC = Volatile organic compounds.
tpy = Tons per year.
[a] The General Conformity Rule does not apply to operational emissions in the Beaumont-Port Arthur Nonattainment Area, which are limited to fugitive emissions.
Source: Keystone 2009d.

As shown in Table 3.12.1-11, NOx and VOC emissions for 2011 construction in the Beaumont-Port Arthur 8-hour ozone nonattainment area would be below the General Conformity significance thresholds of 100 tons per year. This completes the conformity determination for the portion of the pipeline that would be located in the Beaumont-Port Arthur nonattainment area and the proposed construction activity is presumed to conform to the SIP. As pipeline emissions are limited to fugitive emissions from valves and flanges at pump stations and as there are no crude terminals located along the portion of the project within the Beaumont-Port Arthur nonattainment area, the General Conformity Rule does not apply to these operational activities.

As shown in Table 3.12.1-11, NOx emissions for both 2011 and 2012 construction in the Houston-Galveston-Brazoria 8-hour ozone nonattainment area would exceed the general conformity threshold of 25 tons per year. The emissions calculations completed for the General Conformity Determination (Keystone 2009d) for nonroad mobile sources are conservative and based on EPA's Tier 2 engine standards. Additionally, various actions as part of the Texas SIP could be used to mitigate emissions during construction activity. These would include the following:

- Utilize construction contractors that participate in the Texas Emission Reduction Plan (TERP) grant program or require contractors to apply for TERP grant funds,
- Give preference through the bidding process to "Green/Clean" Contractors,

- Require construction contracts to use diesel fuels that meet the Texas Low Emission Diesel (TxLED) standards, and
- Require construction contractors to use Best Management Practices (BMP) in relation to air quality.

When determining if a project conforms with a SIP, the emissions from the project are compared to the allowable emissions inventory to determine if the expected emissions increase can be accommodated in the SIP emissions budget. As discussed in the General Conformity Determination (Keystone 2009d), TCEQ staff reviewed the May 23, 2007 revision of the Houston/Galveston Area SIP for 8-Hour Ozone and determined the 2011 and 2012 compliance year emission inventories for the construction emissions category. TCEQ staff compared the estimated Project construction emissions for both NOx and VOC to the SIP emissions budget for 2011 and 2012 and determined the emissions to be below the emissions budget allotted for this category. Therefore, construction emissions for the Project would be accounted for in the SIP emissions budget and the proposed activity within the Houston-Galveston-Brazoria nonattainment area is presumed to conform to the SIP.

Finally, Table 3.12.1-11 shows that NOx and VOC emissions for operation in the Houston-Galveston-Brazoria 8-hour ozone nonattainment area would be below the General Conformity significance thresholds of 25 tons per year. Since the operational emissions of NOx and VOC are well below the 25 tpy threshold, the General Conformity Rule does not apply to these operational activities.

3.12.1.4 Connected Actions

Power Distribution Lines and Substations

The following measures, and other BMPs, would be implemented by servicing electric cooperatives or their contractors in the modification or construction of electric distribution lines and substations:

- Servicing electric cooperatives or their contractors would utilize such practicable methods and devices as are reasonably available to control, prevent, and otherwise minimize atmospheric emissions or discharges of air contaminants. Dust control watering of access roads and work areas would occur during the project when air quality is compromised by construction activities. Disturbed areas would be scarified to facilitate natural revegetation, provide for proper drainage, and prevent erosion.
- Equipment and vehicles that show excessive emissions of exhaust gases due to poor engine adjustments, or other inefficient operating conditions, would not be operated until repairs or adjustments are made.

Lower Brule to Witten 230-kV Transmission Line

The following measures, and other BMPs, would be implemented by servicing electric cooperatives or their contractors in the construction of Lower Brule to Witten 230-kV transmission line:

- Servicing electric cooperatives or their contractors would utilize such practicable methods and devices as are reasonably available to control, prevent, and otherwise minimize atmospheric emissions or discharges of air contaminants. Dust control watering of access roads and work areas would occur during the project when air quality is compromised by construction activities. Disturbed areas would be scarified to facilitate natural revegetation, provide for proper drainage, and prevent erosion.

- Equipment and vehicles that show excessive emissions of exhaust gases due to poor engine adjustments, or other inefficient operating conditions, would not be operated until repairs or adjustments are made.

3.12.2 Noise

3.12.2.1 Environmental Setting

The ambient sound level of a region is defined by the total noise generated within the specific environment and is usually comprised of sound emanating from natural and artificial sources. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of the day and throughout the week. This variation is caused in part by changing weather conditions and the effects of seasonal vegetative cover.

The proposed Project would be constructed in primarily rural agricultural areas of Montana, South Dakota, Nebraska, Kansas, Oklahoma, and Texas. It is estimated that the existing ambient noise level in the Project area is in the range of 40 dBA (rural residential) to 45 dBA (agricultural cropland). Ambient (background) noise levels occur from roadway traffic, farm machinery on a seasonal basis, pets, and various other household noises. Project areas along major highways and interstates may experience higher ambient noise levels of approximately 68 dBA to 80 dBA (EPA 1978). These are assumed noise levels.

Noise Receptors near the Pipeline ROW

Keystone used aerial photography and field survey data to identify areas containing structures within 25 feet and 500 feet of the proposed pipeline centerline. These areas are summarized in Table 3.12.2-1. There are approximately 147 structures within 25 feet and 1,617 structures within 25 feet to 500 feet of the proposed ROW. Of those totals, there are approximately 41 residences (i.e., homes, mobile homes, cabins) within 25 feet and 747 residences within 25 feet to 500 feet of the proposed ROW. For additional discussion of structures close to the ROW, see Section 3.9.3.9.

TABLE 3.12.2-1
Structures near the Project Construction ROW

State	County	Number of Structures within 25 feet of the Construction ROW		Number of Structures ≤ 500 feet and > 25 feet from the Construction ROW	
		Structures[a]	Residences[b]	Structures[a]	Residences[b]
Steele City Segment					
Montana	Phillips	1	0	8	2
	Valley	0	0	33	2
	McCone	2	0	19	0
	Dawson	2	0	18	0
	Prairie	2	0	9	0
	Fallon	10	0	31	2
South Dakota	Harding	3	0	17	0
	Perkins	0	0	1	0

TABLE 3.12.2-1 Structures near the Project Construction ROW					
State	County	Number of Structures within 25 feet of the Construction ROW		Number of Structures ≤ 500 feet and > 25 feet from the Construction ROW	
		Structures[a]	Residences[b]	Structures[a]	Residences[b]
	Meade	5	0	32	1
	Haakon	3	0	30	0
	Jones	0	0	9	0
	Lyman	0	0	10	0
	Tripp	1	0	14	0
Nebraska	Keya Paha	2	0	6	0
	Rock	1	0	1	0
	Holt	0	0	23	0
	Garfield	0	0	5	0
	Wheeler	1	0	6	0
	Greeley	4	0	8	1
	Boone	0	0	2	0
	Nance	0	0	15	0
	Merrick	0	0	22	1
	Hamilton	1	0	6	0
	York	4	0	54	0
	Fillmore	1	0	24	0
	Saline	0	0	14	0
	Jefferson	0	0	16	0
Kansas	NA	0	0	0	0
Gulf Coast Segment					
Oklahoma	Lincoln	3	0	61	20
	Okfuskee	3	0	46	19
	Seminole	1	0	33	10
	Hughes	9	2	54	21
	Coal	2	0	36	11
	Atoka	4	0	32	16
	Bryan	2	0	23	9
Texas	Lamar	1	0	33	16
	Delta	1	0	21	13
	Hopkins	5	1	41	25
	Franklin	5	3	26	21
	Wood	4	2	83	55
	Upshur	1	0	18	11
	Smith	15	10	158	116

TABLE 3.12.2-1 Structures near the Project Construction ROW					
State	County	Number of Structures within 25 feet of the Construction ROW		Number of Structures ≤ 500 feet and > 25 feet from the Construction ROW	
		Structures[a]	Residences[b]	Structures[a]	Residences[b]
	Cherokee	0	0	15	6
	Rusk	8	3	24	14
	Nacogdoches	8	1	74	35
	Angelina	0	0	41	26
	Polk	7	5	49	42
	Liberty	0	0	45	34
	Hardin	0	0	5	5
	Jefferson	16	12	213	175
Houston Lateral					
Texas	Liberty	5	1	33	23
	Chambers	0	0	2	1
	Harris	4	1	18	14

[a] Structure totals include residences, homes, cabins, mobile homes, power poles, pools, wells, damns, bridges, barns, garages, churches, etc.

[b] Residence totals include residences, home, cabins, and mobile homes.

Source: Keystone 2009e.

In addition, recreational and special interest areas would be crossed by the proposed route (Keystone 2008). Section 3.9.5 and Table 3.9.5-1 provide information on recreational and special interests lands intersected by the Project. USFWS wetland easements in Montana, South Dakota, Nebraska, and Texas would be crossed by the Project (see Table 3.9.4-5). No National Parks or National Forests are crossed by the ROW.

Noise Receptors near Pump Stations

Table 3.12.2-2 summarizes the number of structures within 0.5 mile and 1 mile of each of the 30 proposed pump stations. There are approximately 101 structures within 0.5 mile of all pump stations for Project. Prior to construction, Keystone would verify the proximity of structures to the pump stations and determine if occupied by residences, or other noise sensitive receptors.

TABLE 3.12.2-2 Structures within 0.5 and 1 Mile of Pump Stations for the Project			
Pump Station No.	**Milepost (0 at US border)**	**Number of Structures within One-half Mile[a]**	**Number of Structures within One Mile[a]**
Steele City Segment			
Montana			
PS-09	1.1	5	11
PS-10A-1	49.3	0	4
PS-11	98.0	5	9
PS-12	148.6	0	9
PS-13A-2	199.3	0	2
PS-14A-1	236.8	0	6
South Dakota			
PS-15A-2	285.6	0	0
PS-16	333.3	0	0
PS-17A-2	386.9	0	7
PS-18	440.0	0	2
PS-19A-3	495.8	7	19
PS-20A-2	546.4	13	18
Nebraska			
PS-21A-1	591.7	0	23
PS-22	642.1	1	15
PS-23	694.0	8	24
PS-24A-1	751.1	5	19
PS-25A-1	799.7	1	3
PS-26	850.6	1	24
Keystone Cushing Extension			
Kansas			
PS-27A-1	49.0	6	29
PS-29A-2	144.5	0	11
Gulf Coast Segment			
Oklahoma			
PS-32A-1	0.0	6	7
PS-33A-4	49.2	2	15
PS-34A-1	95.4	1	7
PS-35A-1	147.0	2	11
Texas			
PS-36A-3	194.0	1	19
PS-37A-2	238.0	17	56
PS-38A-3	284.0	10	49
PS-39A-1	333.5	1	6
PS-40A-4	378.1	0	83
PS-41A-1	432.7	9	46

[a] Structure totals include residences, homes, cabins, mobile homes, power poles, pools, wells, damns, bridges, barns, garages, churches, etc.

Source: Keystone 2009c.

3.12.2.2 Regulatory Requirements

Two measurements used by federal agencies to relate the time-varying quality of environmental noise to its known effect on people are the 24-hour equivalent sound level (Leq(24)) and the day-night sound level (Ldn). The Leq(24) is the level of steady sound with the same total (equivalent) energy as the time-varying sound of interest, averaged over a 24-hour period. The Ldn is the Leq(24) with 10 decibels on the A-weighted decibel scale (dBA) added to nighttime sound levels between the hours of 10 p.m. and 7 a.m. to account for people's greater sensitivity to sound during nighttime hours.

In 1974, EPA published "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety." This document provides information for state and local agencies to use in developing their ambient noise standards. EPA identified outdoor and indoor noise levels to protect public health and welfare. An Leq(24) of 70 dB was identified as the level of environmental noise that would prevent any measurable hearing loss over a lifetime. An Ldn of 55 dBA outdoors and an Ldn of 45 dBA indoors were identified as noise thresholds that would prevent activity interference or annoyance. These levels are not "peak" levels but are 24-hour averages over several years. Occasional high levels of noise may occur. An Ldn of 55 dBA is equivalent to a continuous noise level of 48.6 dBA. Typical noise levels are as follows:

- Quiet room: 28–33 dBA
- Computer: 37–45 dBA
- Refrigerator: 40–43 dBA
- Forced hot air heating system: 42–52 dBA
- Microwave: 55–59 dBA
- Clothes dryer: 56–58 dBA

With regard to increases in decibels measured on the A-weighted noise level scale, the following relationships occur:

- A change of 1 dBA cannot be perceived by humans, except in carefully controlled laboratory environments;
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference by humans;
- A change in level of at least 5 dBA is required before any noticeable change in human response would be expected; and
- A 10-dBA change is subjectively heard as approximately a doubling in loudness and can cause an adverse response.

None of the states that would be traversed by the proposed Project have a different regulatory noise limit, although many have local ordinances governing noise from construction or industrial activities.

3.12.2.3 Potential Impacts and Mitigation

Noise impacts for a pipeline project generally fall into two categories: temporary impacts resulting from operation of construction equipment, and long-term or permanent impacts resulting from operation of the facility.

Construction Impacts

Construction of the proposed Project would be similar to other pipeline projects in terms of schedule, equipment used, and types of activities. Construction would increase noise levels in the vicinity of project activities, and the noise levels would vary during the construction period, depending on the construction phase. Construction noise levels are rarely steady in nature, but instead fluctuate depending on the number and type of equipment in use at any given time. There would be times when no large equipment is operating and noise would be at or near ambient levels. In addition, construction-related sound levels experienced by a noise sensitive receptor in the vicinity of construction activity would be a function of distance.

Pipeline construction generally proceeds at a rate of approximately 20 completed miles per calendar month per spread. However, due to the assembly-line method of construction, pipeline construction activities in any one area could last from 7 weeks to 30 days. Construction of all pump stations would take approximately 18 to 24 months complete, and construction of the Steele City tank farm would take approximately 15 to 18 months. In general, because construction moves through an area relatively quickly (several hundred feet to 1.5 miles or more per day [Keystone 2009b]), noise impacts typically would be localized, intermittent, and short term.

Residential, agricultural, and commercial areas within 500 feet of the ROW would experience short-term inconvenience from the construction equipment noise. Table 3.12.2-3 lists noise levels produced by typical construction machinery, measured at various distances.

TABLE 3.12.2-3
Typical Noise Levels for Construction Equipment

Equipment	Typical Noise Levels (dBA, at 50 feet)
Front loaders	85
Backhoes, excavators	80–85
Tractors, dozers	83–89
Graders, scrapers	85–89
Trucks	88
Concrete pumps, mixers	82–85
Cranes (movable)	83
Cranes (derrick)	88
Forklifts	76–82
Pumps	76
Generators	81
Compressors	83
Pneumatic tools	85
Jack hammers, rock drills	98
Pavers	89

TABLE 3.12.2-3 Typical Noise Levels for Construction Equipment	
Equipment	**Typical Noise Levels (dBA, at 50 feet)**
Compactors	82
Drill rigs	70–85

Source: Adapted from DOT 1995.

According to Table 3.12-2.1, there are approximately 41 residences within 25 feet of the proposed ROW, and 747 residences within 25 to 500 feet of the proposed ROW (Keystone, 2009e). Depending on actual distances between construction activity and receptors, construction noise levels could reach over 100 dBA. However, the exact value would depend on the number of sources operating at this close distance. These noise levels could be perceived as moderately loud with a significant to serious effect over existing levels, however, any peak noise levels would be temporary and intermittent, generally limited to daylight hours, and would be attenuated with distance.

Although individuals and livestock in the immediate vicinity of the construction activities may be temporarily disturbed, the impact on the noise environment at any specific location along the proposed pipeline route would be short term. Similarly, noise associated with construction of the proposed aboveground facilities would be intermittent during the construction period, but the overall impact would be temporary and is not expected to be significant. Further, nighttime noise levels would normally be unaffected because most construction activities would be limited to daylight hours. Potential exceptions include completion of critical tie-ins on the ROW; HDD operations if determined by the contractor to be necessary; and other work if determined necessary based on weather conditions, safety, or other project requirements. Keystone would conduct HDD activities in compliance with any applicable local noise ordinances.

Noise impacts from construction would be mitigated in accordance with Keystone's CMR Plan (Appendix B) to minimize effects on individuals, sensitive areas, and livestock. During permitting activities for the project, Keystone would determine whether state, county or local noise regulations exist for a given location. If local noise regulations exist, Keystone would develop site-specific noise mitigation plans to comply with any specific regulations and would seek any applicable authorizations or variances. Noise mitigation plans would be provided to the construction contractors for implementation and would be enforced by construction inspectors using portable sound meters. Because preliminary research has not yet identified any applicable state or county noise ordinances along the pipeline route, Keystone is not proposing any construction noise assessments or surveys at this time (Keystone 2009c).

To ensure that residential and commercial areas within 500 feet of construction activities are not affected by noise levels, Keystone would give advanced notice to landowners prior to construction, limit the hours during which construction activities with high-decibel noise levels are conducted, coordinate work schedules, and ensure that construction proceeds quickly through such areas. In the event that the contractor expects noise levels to exceed regulated noise standards—based on the types of construction equipment used or construction procedures, notice would be given to Keystone so that immediate noise attenuation could be achieved. To further reduce noise impacts to residential and commercial areas Keystone would set up a toll-free telephone line for landowners to report any construction noise-related issues.

It is understood that during occasional, short-term intervals, noise levels would exceed 55 dBa. There are no regulations in rural areas along the pipeline route applicable to construction noise, including noise from construction camps. In municipal areas, pipeline construction noise levels would comply with any applicable municipal regulations. In areas near residences and businesses where construction activities or noise levels may be considered disruptive, Keystone would coordinate work schedules to minimize disruption.

Operations Impacts

Noise impacts from operation of the pipeline would be from the pump stations. Material traveling through the buried pipeline would not emit audible noise above the surface or a perceptible level of vibration.

Concern has been expressed during scoping relative to the potential for noise generation by proposed pump stations, particularly given the generally rural nature of the area within which the pump stations would be constructed and operated. During operation of the pipeline, the noise associated with the electrically-driven pump stations would be limited to the vicinity of the facilities. Keystone prepared a preliminary noise assessment survey for a typical pump station, as illustrated in Table 3.12.2-4. The assessment assumed wind speeds of 8 miles per hour, a temperature of 75 ˚F, and three pumps operating at 3,000 kW cumulative (proposed installation is 2 to 6 pumps rated at 6,500 hp each per pump station).

TABLE 3.12.2-4
Sound Attenuation from Proposed Pump Stations for the Project

Distance (feet)	Sound Level (dBA)
Background	35
300	55
700	49
1,000	46
1,300	43
1,600	42
2,000	41
2,300	40
2,600	39
3,000	38
3,300	38
3,600	38
3,900	37
4,200	37
4,600	37
5,000	37

Source: Keystone 2009a.

Table 3.12.2-4 shows that sound levels would attenuate nearly to existing ambient noise levels (40 to 45 dBA) within 2,300 feet of the facility and would be considered minor. According to Table 3.12-2.2, there are approximately 101 structures within 0.5 mile (2,640 feet) of all pump stations for Project. Prior to construction, Keystone would verify the proximity of structures to the pump stations and determine if occupied by residences, or other noise sensitive receptors. Although noise impacts from the electrically-powered pump stations are projected to be minor, Keystone would perform a noise assessment survey during operations in locations where nearby residents express concerns about pump station noise. Those surveys would indicate the operational levels at that residence and would be used to determine any necessary noise abatement measures needed to reduce the noise levels at that residence (Keystone 2009a). Mitigation measures can include construction of berms around the facilities or planting vegetation screens. As such, Keystone would minimize noise impacts to ensure that project-related operations would not result in a significant effect on the noise environment.

3.12.2.4 Connected Actions

Power Distribution Lines and Substations

The following measures, and other BMPs, would be implemented by servicing electric cooperatives or their contractors in the modification or construction of electric transmission lines:

- Mitigation measures to reduce noise during construction as required by local, state, or federal regulations which may include 1) locating construction equipment as far from sensitive receptors as possible, 2) turning off equipment when not in use and reducing idling time, 3) use of temporary equipment enclosures and noise barriers, 4) limit haul trips and construction to daylight hours where feasible, and 5) use of best available noise control techniques such as mufflers, intake silencers, ducts, engine closures, and acoustically attenuating shields or shrouds for all construction equipment and trucks.
- Mitigation measures to reduce noise during operation, including but not limited to siting of power lines 500 feet or further from residences and the use of C-filters on communication systems. Additional mitigation, such as the use of lightning arrestors and assuring all hardware has a tight fit, are used to reduce Radio Frequency Interference (RFI), which also contributes to a reduction in corona noise.

Lower Brule to Witten 230-kV Transmission Line

The following measures, and other BMPs, would be implemented by servicing electric cooperatives or their contractors in the construction of Lower Brule to Witten 230-kV transmission line:

- Mitigation measures to reduce noise during construction as required by local, state, or federal regulations which may include 1) locating construction equipment as far from sensitive receptors as possible, 2) turning off equipment when not in use and reducing idling time, 3) use of temporary equipment enclosures and noise barriers, 4) limit haul trips and construction to daylight hours where feasible, and 5) use of best available noise control techniques such as mufflers, intake silencers, ducts, engine closures, and acoustically attenuating shields or shrouds for all construction equipment and trucks.
- Mitigation measures to reduce noise during operation, including but not limited to siting of power lines 500 feet or further from residences and the use of C-filters on communication systems. Additional mitigation, such as the use of lightning arrestors and assuring all hardware has a tight fit, are used to reduce Radio Frequency Interference (RFI), which also contributes to a reduction in corona noise.

3.12.3 References

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3.13 OIL SPILL RISK ASSESSMENT AND ENVIRONMENTAL CONSEQUENCE ANALYSIS

Transportation of crude oil by pipeline involves risk to the public and the environment in the event of an accident, incident, or an unauthorized action, and subsequent release[1] of oil. Releases of crude oil from the Project and appurtenant facilities, though very unlikely, could occur. Spill frequency, volumes, and causes can be estimated using historic spill data on other pipelines as determined from existing data bases and as supplemented by considerations of new pipeline system age and technological improvements compared with much older systems. Releases of crude oil or other petroleum products would affect the environment to varying degrees, and would be of concern to all stakeholders.

This section includes the following discussions:

- Regulatory and industry standards that apply to design, construction, operation, and maintenance of a crude oil pipeline;
- Safety history of onshore hazardous liquid pipeline operations in the United States, for the Applicant, and for all of the states that would be traversed by the Project;
- A risk assessment of the potential for a project-related oil spill;
- Potential impacts, including factors, assumptions, and classifications related to oil spills;
- Environmental variables that might affect the spilled oil fate, behavior, and magnitude of impacts;
- Resource-specific impacts; and
- Mitigation and conservation measures.

3.13.1 Safety Standards

This section describes the regulatory and industry standards for design, construction, operation and maintenance applicable to the Project pipeline system.

3.13.1.1 U.S. Department of Transportation Standards

The U.S. Department of Transportation (DOT) is mandated to provide pipeline safety under Title 49, USC Chapter 601. DOT's Pipeline and Hazardous Materials Safety Administration (PHMSA) Office of Pipeline Safety (OPS) administers the national regulatory program to ensure the safe transportation of hazardous liquids, including crude oil, by pipeline. PHMSA and OPS develop safety regulations and other approaches to risk management that address safety in the design, construction, testing, operation, maintenance, and emergency response for pipeline facilities. Many of the regulations are written as performance standards that set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve the required level of safety. PHMSA is responsible for regulations that require safe hazardous materials pipeline operations and thus provide protection to people and the environment from the risk of pipeline incidents.

[1] "Releases", in various documents, may also be referred to as "oil spills," "unauthorized releases," "uncontrolled releases," "leaks," "unintentionally discharged", or "accidental spills." This EIS uses the term both "release(s) and "oil spill(s)" [or just "spill(s)"] to include all of these terms, as well as any spill that results from sabotage or vandalism, and any other unauthorized release during construction, operation, abandonment, and restoration/rehabilitation of the proposed Project.

The rules governing pipeline safety are included in Title 49 Code of Federal Regulations (CFR), Parts 190–199. Of those, Parts 190, 194, 195, 198, and 199 are relevant to hazardous liquid (including crude oil) pipelines. Individual states are permitted to adopt additional or more stringent safety regulations for intrastate pipelines within state borders.

Part 190 describes the pipeline safety programs and rulemaking procedures used by OPS in carrying out their regulatory duties. This Part authorizes OPS to inspect pipelines and describes the procedures by which OPS can enforce the regulations. This part also describes the legal rights and options of the operating companies in response to OPS enforcement actions.

Part 194 contains requirements for onshore oil spill response plans. This Part is intended to reduce the environmental impact of oil unintentionally discharged from onshore oil pipelines.

Part 195 prescribes the safety standards and reporting requirements for transportation of hazardous liquids including crude oil by pipeline. These regulations include detailed requirements on a broad spectrum of areas related to the safety and environmental protection of hazardous liquid pipelines. Subpart A, Section 195.6 defines unusually sensitive areas (USAs), which are drinking water or ecological resource areas. Subpart F, Operations and Maintenance, includes requirements for marking, inspecting, and maintaining pipelines. 49 CFR 195.260 (e) requires a valve on either side of water crossings that are more than 100 feet across (as measured from high water marks). Subpart F, Section 195.452 specifies pipeline integrity management requirements in high-consequence areas (HCAs). HCAs are defined as:

- A commercially navigable waterway, which means a waterway where a substantial likelihood of commercial navigation exists;
- A high population area, which means an urbanized area—as defined and delineated by the U.S. Census Bureau—that contains 50,000 or more people and has a population density of at least 1,000 people per square mile;
- Any other populated area, which means a place—as defined and delineated by the U.S. Census Bureau—that contains a concentrated population, such as an incorporated or unincorporated city, town, village, or other designated residential or commercial area; and
- An unusually sensitive area (USA)—explicitly defined in 49 CFR Part 195.6 as drinking water or ecological resource areas that are unusually sensitive to environmental effects from hazardous liquid pipeline releases.

Drinking water USAs are a subset of all surface water intakes and groundwater-based drinking water supplies that provide potable water for domestic, commercial, and industrial uses, including public water systems, source water protection areas/wellhead protection areas, and sole-source aquifers (NPMS 2006). Specifically, drinking water USAs include:

- The surface water intakes for community water systems and non-transient non-community water systems that do not have an adequate alternative drinking water source;
- The source water protection areas for community water systems and non-transient, non-community water systems that obtain their water supply from a Class I or Class IIA aquifer (Pettyjohn et al. 1991) and do not have an adequate alternative drinking water source. If the source water protection area is not available, the wellhead protection areas (WHPAs) become the USA; and
- The aquifer recharge area for sole-source aquifers within karst terrains.

For a new hazardous liquid pipeline, the regulation requires that HCAs be identified prior to operation and that a written Integrity Management Plan (IMP) be in place within one year of the start of operation. The HCA regulation also requires that operators of new hazardous liquid pipelines complete baseline assessments by the start date for pipeline operation. Depending on the findings of the assessment, the operator must take preventive and mitigating measures to protect the HCA from the consequences of a pipeline failure and release of oil. These measures include conducting a risk analysis of the pipeline segment to identify additional actions that would enhance public safety or environmental protection. Such actions may include, but are not limited to, the following:

- Implementing damage prevention Best Management Practices (BMPs);
- Implementing more thorough programs to monitor cathodic protection where corrosion is a concern;
- Establishing shorter inspection intervals;
- Installing emergency flow restriction devices on the pipeline segment;
- Modifying systems that monitor pressure and detect leaks; and
- Providing additional training to personnel on response procedures, conducting drills with local emergency responders, and adopting other management controls.

Subpart G includes minimum requirements for operator qualification of individuals performing tasks required by the regulations. Subpart H specifies corrosion control requirements.

Another key section being considered as part of this Project is 49 CFR § 195.106, internal design pressure. Keystone submitted an application to PHMSA on October 10, 2008, for a special permit seeking relief from Federal pipeline safety regulations in 49 CFR § 195.106 for certain areas within the three segments of the proposed Keystone XL Pipeline. The special permit application seeks relief from PHMSA to allow Keystone to design, construct and operate the Keystone XL Pipeline using a 0.80 design factor in certain areas within the three pipeline segments in lieu of a 0.72 design factor as required in 49 CFR § 195.106. The existing regulations in § 195.106 provide the method used by pipeline operators to establish the maximum operating pressure (MOP) of a proposed pipeline by using the design formula contained in the section. The formula incorporates a design factor, also called a de-rating factor, which is fixed at 0.72 (or also commonly referred to as 72 percent of the Specified Minimum Yield Strength (SMYS)) for onshore hazardous liquid (including crude oil) pipelines.

Keystone requests the use of a 0.80 design factor (or 80 percent SMYS) ("Alternative MOP") in lieu of a 0.72 design factor, based on the justification that modern steel pipe manufacturing, construction practices, and operations and integrity management procedures would be implemented which were not available or consistently practiced during the development of most of the current pipeline safety regulations. If PHMSA grants Keystone the special permit for a 0.80 design factor, Keystone would be able to operate the pipeline at approximately 10 percent greater pressure than they could operate at a 0.72 design factor using the same pipe wall thickness and grade of steel strength.

PHMSA is still reviewing the special permit request, but is planning to issue a draft Special Permit Analysis and Findings (SPAF) document to:

- Describe the facts of the special permit application and to discuss any relevant public comments received with respect to the application;
- Present the engineering/safety analysis of the special permit application;

- Present preliminary findings regarding whether a special permit should be issued to Keystone for the Project; and if so

- Describe the conditions which PHMSA would impose to achieve an equivalent or better level of pipeline safety than would be achieved through compliance with the existing regulation.

PHMSA is also performing its own, separate environmental analysis (EA) of the potential impacts that could result from issuance of a special permit consistent with Keystone's request. The Keystone special permit request letter, FR notice, supplemental information, and other pertinent documents are available for review under Docket Number PHMSA-2008-0285, in the Federal Document Management System (FDMS) located on the internet at www.Regulations.gov. The PHMSA SPAF and EA will also be placed on the docket and will be available for review and public comment when completed.

Part 198 prescribes regulations for grants to aid state pipeline safety compliance programs.

Part 199 requires operators of gas, liquefied natural gas, and hazardous liquid pipeline facilities to establish programs for preventing alcohol misuse and to test employees for the presence of alcohol and prohibited drugs. It also provides the procedures and conditions for this testing.

Parts 194 and 195 specifically require Keystone to develop a comprehensive Emergency Response Plan (ERP) for the proposed pipeline, and for the ERP to be reviewed and approved by OPS prior to operation. OPS would also conduct periodic inspections of the proposed pipeline during operation, and would review the proposed pipeline's Integrity Management Plan for High-Consequence Areas that would be prepared by Keystone.

The ERP identifies emergency personnel and the logical sequence of actions that should be taken in the event of an emergency involving the Project system facilities during construction or operation. These actions include written emergency shutdown procedures, communication coordination, and cleanup responsibilities. The main points of the ERP, currently under development by Keystone, appear in Section 3.13.4.5. Keystone has prepared pipeline risk assessments and analyses of incident frequencies and potential spill volumes (Keystone 2009a, b, c) that serve as the risk analyses required for HCAs. More detailed analyses would be conducted by Keystone as part of the ERP process. The pipeline risk assessment summarizes Keystone's estimate of pipeline miles within various types of HCAs. Keystone has not submitted an Integrity Management Plan for HCAs but will need to complete the baseline assessment prior to the proposed pipeline's operation. The pipeline risk assessments and analyses of incident frequencies and spill volumes are discussed in more detail below.

3.13.1.2 Standards and Regulations for Affected States

The Project would be an interstate hazardous liquid pipeline. Oversight and inspections of interstate pipelines are carried out by OPS or by a state agency in the states where OPS and the state have an agreement. In all states that would be crossed by the proposed pipeline, OPS regulates, inspects, and enforces interstate liquid pipeline safety requirements.

States may adopt regulations with requirements that supplement or exceed federal requirements. For example, although it is not a federal requirement, all states that would be crossed by the proposed pipeline have adopted state one-call systems to reduce the potential for third-party damage to utilities, including pipelines, during projects that involve excavation or soil boring. Of the states crossed by the proposed pipeline, only the State of Oklahoma has pipeline health and safety procedures, for pipelines within their state boundaries that exceed federal requirements. In Oklahoma, Administrative Code 165 Chapter 20 provides regulations for gas and hazardous liquid pipeline safety. Oklahoma assesses an annual fee on pipeline operators, in addition to reporting requirements. Oklahoma also requires notices prior to construction.

The proposed pipeline would be required to participate in the one-call system in each state. Pipeline construction contractors would need to use the one-call system of each state to prevent damage to existing subsurface utilities. After construction, the Project would need to participate as an operator, as well as comply with additional requirements for assessments, reporting, and notifications, in Oklahoma.

Keystone has also filed an application with the National Energy Board (NEB) of Canada to construct and operate the Canadian portion of its proposed Keystone XL pipeline. Some regulations and standards referenced in this section pertain to Canadian pipelines. In general, operating stress levels for Canadian pipelines are defined in Canadian Standards Association (CSA) Z662, which is referenced in NEB regulations as an acceptable/preferred pipeline standard. Additional publicly available information pertaining to the Canadian portion of the pipeline and NEB's review can be viewed via the following link: http://www.neb.gc.ca/clf-nsi/rthnb/pplctnsbfrthnb/trnscndkystn/trnscndkystn_oh12009-eng.html#s1.

3.13.1.3 Industry Standards

The Project pipeline design will comply with pertinent industry standards, including the following:

- American Society of Mechanical Engineers (ASME)/American National Standards Institute (ANSI) Code B31.4, "Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia, and Alcohols". This standard addresses requirements for materials of construction welds, inspection, and testing for cross-country hazardous liquid pipelines. ASME B31.4 434.15.2 (a) requires mainline block valves on the upstream side of major river crossings and public water supply reservoirs, and either a block valve or a check valve on the downstream side. 49 CFR Part 195, "Transportation of Hazardous Liquids by Pipelines," has incorporated ASME/ANSI B31.4 code by reference.
- ANSI Standards CSA Z662-03 and Z662.1-03. This standard covers the design, construction, operation, and maintenance of oil and gas industry pipeline systems that convey various fluids, including crude oil.
- CSA/National Association of Corrosion Engineers (NACE) MR0175/ISO 15156. Materials for Use in H_2S-containing Environments in Oil and Gas Production. This 3-part document gives requirements and recommendations for the selection and qualification of carbon and low-alloy steels, corrosion-resistant alloys, and other alloys for service in equipment used in oil and natural gas production and natural gas treatment plants in H_2S-containing environments, the failure of which could pose a risk to the health and safety of the public and personnel or to the environment. NACE MR0175/ISO 15156 consists of three standards: general principles for selection of cracking-resistant materials; cracking-resistant carbon and low alloy steels and the use of cast irons; and cracking-resistant CRAs (corrosion-resistant alloys) and other alloys.
- American Petroleum Institute (API) 570, "Piping Inspection Code–Inspection, Repair, Alteration, and Re-Rating of In-Service Piping Systems". This code was developed for the petroleum refining and chemical processing industries but may be used for any piping system.
- API RP 1102, "Recommended Practices for Liquid Petroleum Pipelines Crossing Railroads and Highways". This recommended practice is a requirement of ASME/ANSI B31.4.
- API RP 1109, "Recommended Practice for Marking Liquid Petroleum Pipeline Facilities". ASME/ANSI B31.4 advises that this API RP 1109 shall be used as a guide.

- NACE RP 0169, "Control of External Corrosion on Underground or Submerged Metallic Piping Systems". ASME/ANSI B31.4 refers to sections of this recommended practice as a guide for an adequate level of cathodic protection.

Other documents or portions thereof pertaining to transportation of hazardous liquids and incorporated by reference in 49 CFR Part 195 are listed in § 195.3.

PHMSA is considering the following additional standards and technical conditions specific to the special permit request to provide additional safety in the operation of the Project:

- API Specification 5L, Specification for Line Pipe, 44th Edition. API 5L and other specifications and standards address the steel pipe toughness properties needed to resist crack initiation, crack propagation and to ensure crack arrest during a pipeline failure caused by a fracture.
- ASTM International A578/A578M Level B or equivalent. Standard Specification for Straight-Beam Ultrasonic Examination of Rolled Steel Plates for Special Applications.
- API 1104, "*Welding of Pipelines and Related Facilities*". API 1104 covers the gas and arc welding of butt, fillet, and socket welds in carbon and low-alloy steel piping used in the compression, pumping, and transmission of crude petroleum, petroleum products, fuel gases, carbon dioxide, nitrogen and, where applicable, covers welding on distribution systems. It applies to both new construction and in-service welding. This standard also covers the procedures for radiographic, magnetic particle, liquid penetrant, and ultrasonic testing, as well as the acceptance standards to be applied to production welds tested to destruction or inspected by radiographic, magnetic particle, liquid penetrant, ultrasonic, and visual testing methods.
- API Recommended Practice 1165 *(First Edition), Recommended Practice for Pipeline SCADA Displays.*
- API Recommended Practice 1130, *Computational Pipeline Monitoring for Liquid Pipelines,* (API RP 1130, 1st Edition 2007)
- ASME Standard B31Q, *Pipeline Personnel Qualification Standard* (ASME B31Q), September 2006.
- API Recommended Practice 1162, *Public Awareness Programs for Pipeline Operators,* (API RP 1162 (1st edition, December 2003) or the most recent version incorporated in § 195.3).
- Canadian Standards Association, *Oil and Gas Pipeline Systems*, CSA Z662-03, Annex E, Section E.5.2, Leak Detection Manual.
- NACE International RP 0169 (2002 or the latest version incorporated by reference in § 195.3) and 0177 (2007 or the latest version referenced through the appropriate NACE standard incorporated by reference in § 195.3) (NACE RP 0169 and NACE RP 0177) for interference current levels. NACE RP 0169 was described earlier. NACE RP 0177 addresses mitigation of alternating current and lightning effects on metallic structures and corrosion control systems.
- NACE International RP 0502-2002 (NACE RP 0502-2002) Pipeline External Corrosion Direct Assessment Methodology, or the latest version incorporated by reference in § 195.3.
- PHMSA's "Interim Guidelines for Confirming Pipe Strength in Pipe Susceptible to Low Yield Strength for Liquid Pipelines" dated October 6, 2009.
- The Common Ground Alliance's damage prevention best practices applicable to pipelines.

3.13.2 Safety History

This section reviews the safety history of onshore hazardous liquid pipeline operations in the United States, including specific hazardous liquid pipeline operating experience in the states that would be traversed by the proposed pipeline.

3.13.2.1 PHMSA's Oil Pipeline Statistics

Spills are reported to DOT's PHMSA on standard forms in accordance with PHMSA 49 CFR Part 195.50. PHMSA maintains a database of pipeline incident reports (available online at: http://primis.phmsa.dot.gov/comm/reports/psi.html, accessed in April 2009). Pipeline incident reports encompass onshore and offshore natural gas and hazardous liquid pipelines. Hazardous liquid pipelines include crude oil, oil products, liquefied petroleum gas (LPG), anhydrous ammonia, and other hazardous liquids. In this section, the term "hazardous liquid pipelines" is used for information based on hazardous liquid pipeline data. Reference to "crude oil pipelines" is used for information based specifically on domestic onshore crude oil trunk lines.

Hazardous liquid pipeline incidents include those categorized as "serious" or "significant." A "serious" hazardous liquid pipeline safety incident is one involving a fatality or an injury requiring in-patient hospitalization. "Significant" hazardous liquid pipeline safety incidents include those that meet one or more of the following criteria: spills releasing 2,100 gallons (50 barrels [bbls])[2] or more; spills of 210 gallons (5 bbls) of highly volatile liquid; spills resulting in total costs of $50,000 or more (1984 dollars); or spills that include fire, explosion, injury, or death.

The PHMSA spill report data web site includes summary tables that provide overviews of serious and significant incidents reported over the last 20 years, ending in 2007. Because the PHMSA data set is truncated on the lower end at the reporting limit of 50 bbls[3], the data understate the actual number of incidents and overstate the average spill volumes.

Table 3.13.2-1 shows the average number of serious incidents in a year for hazardous liquid pipeline operators. The summary data show a decreasing temporal trend in the annual average number of serious pipeline incidents. These data include 113 "serious" incidents reported for 20 years, from 1988 to 2007.

TABLE 3.13.2-1
Nationwide Hazardous Liquid Pipeline Systems, Annual Averages for Serious Incidents (1988–2007)

Time Period	Annual Average Serious Incidents per Period
5-year average (2003–2007)	3
10-year average (1998–2007)	4
20-year average (1988–2007)	5

Source: PHMSA 2009 (PHMSA hazardous liquid incident files, April 2009).

Table 3.13.2-2 shows the number of significant incidents in a year for all hazardous liquid pipeline operators. The summary data show a decreasing trend in annual incident frequency, injuries, and spill volume.

[2] One barrel (bbl) equals 42 US gallons. Oil volumes are provided in gallons followed by barrels in this EIS.
[3] Of the 600 spills reported in the PHMSA database between 1998 and 2007, 16 percent were reported as less than 2,100 gallons (50 barrels).

Table 3.13.2-3 presents a summary of PHMSA significant pipeline safety incidents for hazardous liquid pipeline, by cause. It represents significant incidents for the 20-year period from 1988 through 2007 for hazardous liquid pipeline systems.

TABLE 3.13.2-2
Nationwide Hazardous Liquid Pipeline Systems, Annual Averages for Significant Incidents (1988–2008)

Period	Number of Incidents	Fatalities	Injuries	Property Damage [a, b]	Gross Barrels Lost	Barrels Recovered	Net Barrels Lost
5-year average (2003–2007)	119	2	7	$98,344,237	106,331	48,839	57,492
10-year average (1998–2007)	126	2	8	$92,695,580	115,041	48,624	66,417
20-year average (1988–2007)	143	2	12	$72,214,852	137,821	62,425	75,396

[a] The costs shown in the tables are in 2007 dollars. Costs are adjusted via the Bureau of Economic Analysis, Government Printing Office inflation values.

[b] For years 2002 and later, property damage was estimated as the sum of all public and private costs reported in the 30-day incident report, adjusted to 2007 dollars. For years prior to 2002, accident report forms did not include a breakdown of public and private costs; therefore, property damage for these years is the reported total property damage field in the report, adjusted to 2007 dollars.

Note: Totals for the period from 1988 through 2008: 2,965 incidents; 43 fatalities; 234 injuries; $1,540,131,011 property damage; 2,881,283 barrels lost; 1,277,622 barrels recovered, and 1,603,661 net barrels lost.

Source: PHMSA 2009.

TABLE 3.13.2-3
Nationwide Hazardous Liquid Pipeline Systems, Causes of Significant Incidents (1988-2008)

Cause	Number of Incidents	Percent of Total Incidents (%)	Fatalities	Injuries	Property Damage [a, b]	Percent of Property Damage (%)
All other causes	674	23	21	97	$309,859,968	20
Corrosion	697	24	1	17	$291,758,093	19
Excavation damage	640	22	14	87	$222,658,875	14
Human error	207	7	6	27	$40,663,171	3
Material failure	592	19	0	4	$336,430,359	22
Natural force damage	121	4	0	1[c]	$293,435,949	19
Other outside force damage	34	1	1	1	$45,324,593	3
Total	**2,965**	**100**	**43**	**234**	**$1,540,131,011**	**100**

[a] The costs shown in the tables are in 2007 dollars. Costs are adjusted via the Bureau of Economic Analysis, Government Printing Office inflation values.

[b] For years 2002 and later, property damage is estimated as the sum of all public and private costs reported in the 30-day incident report, adjusted to 2005 dollars. For years prior to 2002, accident report forms did not include a breakdown of public and private costs; therefore, property damage for these years is the reported total property damage field in the report, adjusted to 2007 dollars.

Note: Significant incidents are those incidents reported by pipeline operators that meet any of the following conditions: (1) fatality or injury requiring in-patient hospitalization; (2) $50,000 or more in total costs, measured in 1984 dollars; (3) highly volatile liquid releases of five barrels or more, or other liquid releases of 50 barrels or more; (4) liquid releases resulting in an unintentional fire or explosion

Source: PHMSA 2009.

Outside forces incidents listed in Table 3.13.2-3 include: excavation damage from mechanical equipment, such as bulldozers and backhoes (22 percent); natural force damage, including earth movements due to soil settlement, washouts, or geologic hazards and weather effects such as winds, storms, and thermal strains (5 percent); and other outside force damage (1 percent). Older pipelines have a higher frequency of outside forces incidents partly because their location may be less well known and less well marked than it is for newer lines. In addition, the older pipelines contain a disproportionate number of smaller diameter pipes with reduced wall thicknesses, and have a greater rate of incidents related to outside forces. These pipelines are more easily crushed or broken by mechanical equipment or earth movements.

Corrosion constitutes 24 percent of all hazardous liquid pipeline incidents over the past 20 years (Table 3.13.2-3). The frequency of incidents is strongly dependent on pipeline age. Older pipelines have a higher frequency of corrosion incidents, because corrosion is a time-dependent process. Also, new pipe generally uses more advanced coatings and cathodic protection to reduce corrosion potential. Significant improvements in corrosion control technology applied to pipelines installed since the 1950s have resulted in reduced corrosion-related incident frequencies. Accordingly, the oldest pipelines—pre-1950—experience a disproportionate frequency of corrosion-related failures (Keifner and Trench 2001).

It is important to consider pipeline age when assessing risk based on records of incident frequencies. In 2004, the Transportation Research Board (TRB 2004) published a review of pipelines that included "Pipeline Safety Data and Trends" as an appendix. The Appendix P summarizes a detailed analysis of API and DOT hazardous liquid pipeline incident data, and relies heavily on previous work done for API (Keifner and Trench 2001). The API work confirms that hazardous liquid pipeline age is a significant spill risk factor, for various reasons. The study grouped pipelines by decade of construction. The work shows that older pipelines not only suffer a higher frequency of spill incidents in general, but they also specifically suffer a higher frequency of third-party strike spill incidents. This is attributed to many factors, including poorer marking of older pipelines. Further, older pipelines tend to have smaller diameters and thinner pipe walls; consequently, if they are struck by excavation equipment, they are more likely to rupture. Several industry standards and practices, and DOT requirements would tend to reduce the potential for spill incidents associated with the proposed Project pipeline relative to industry experience. These safeguards include use of non-destructive testing during construction, standards for depth of cover, greater use of boring or directional drilling, more effective coatings, and improved identifying markers along the ROWs.

3.13.2.2 TransCanada Company-Specific Oil Pipeline Operating History

TransCanada is a well known and longstanding natural gas transportation company in Canada and the United States, with limited experience operating crude oil pipeline systems. Through a 50/50 joint venture, TransCanada and Alberta Energy Company (now EnCana Corporation) purchased the Platte pipeline in February 1996 and developed and constructed the Express pipeline in 1996. Together, the Express and Platte pipelines constitute a 1,700-mile system between Hardesty, Alberta and Wood River, Illinois. The system became operational in February 1997, with commercial deliveries beginning in April 1997. Alberta Energy Company operated the Express and Platte systems on behalf of the joint venture partnership until October 2000, when TransCanada divested its 50-percent interest to EnCana Corporation.

TransCanada's limited operating history with crude oil pipelines precludes comparison of accident and oil spill incident rates specific to TransCanada with the industry average rates. The extent of specific operating experience does not affect the regulatory requirements to be met by the operator.

PHMSA's SPAF will contain more detail on TransCanada's compliance history. A review of PHMSA enforcement actions was conducted on all natural gas pipelines operated by TransCanada, operator of the proposed crude oil pipeline Project. The pipelines reviewed, with dates TransCanada assumed control of the assets, are listed below:

- Gas Transmission Northwest Corp. – Operator ID # 15014 – November 2, 2004
- ANR Pipeline Co. – Operator ID # 405 – February 22, 2007
- Great Lakes Gas Transmission Co. – Operator ID # 6660 – February 22, 2007
- Northern Border Pipeline Company – Operator ID # 13769 – April 1, 2007
- Tuscarora Gas Transmission Co. - Operator ID # 30838 – December 19, 2006
- Portland Natural Gas Transmission – Operator ID # 31145 – August 3, 2004
- North Baja Pipeline – Operator ID # 31891 – November 2, 2004
- TC Oil Pipeline – Operator ID # 32334 – incorporated December 12, 2007, presently being constructed

Below is a listing of Keystone/TransCanada closed enforcement matters of all types in all PHMSA regions for the time period the above pipelines have been operated by TransCanada:

- All PHMSA Regions: 2 matters
- Notices of: Amendment (NOA) and Probable Violations (NOPV) – 2 matters, both closed cases
- Letters of: – Warning (WL) and Concern (LOC): None
- Civil Penalties: None

TransCanada's regulatory enforcement history from time of pipeline ownership to December 31, 2009 indicates two 49 CFR Part 192 compliance issues, no outstanding CAOs, and no civil penalties. All past compliance issues have been resolved with TransCanada and closed by PHMSA. All of TransCanada's pipelines are in 49 CFR Part 192 natural gas service with the exception of the TransCanada Keystone Oil Pipeline which is presently being constructed.

3.13.3 Risk Assessment

Risk of oil spills is expressed as a combination of spill frequency and spill volume. Risk of an oil spill was assessed using failure frequencies derived from the general hazardous liquid pipeline operating history. General incident frequencies and spill volumes were reviewed for relevance to the Project. Incidents occurring in Canada have been documented by regulatory agencies and popularly reported (e.g., the Glenavon oil spill; available online:<http://dogwoodinitiative.org/newsstories/ pipelineoilspillraisesquestions>). However, data on these incidents are not readily available in formats amenable to pooling with PHMSA data for analysis. For the proposed pipeline, the risk assessment approach was performed at different levels. Initially, a frequency–volume analysis was performed using PHMSA data to provide a general risk assessment. Subsequently, more specific risk assessments used PHMSA data specific to the states that would be crossed by the proposed pipeline. Keystone submitted a project-specific analysis that used various reference frequencies for different types of incidents and was adjusted for project-specific factors (Keystone 2009a, c). Use of these different approaches results in a range of spill frequencies that "bracket" the number of spills expected from the proposed pipeline.

3.13.3.1 Oil Pipeline Incident History in States that would be Traversed by Keystone XL

Incident frequency rates were not extracted from operational history, because the proposed pipeline has not been constructed and the Keystone Mainline and Keystone Cushing Extension are under construction but not operational as of December 2009. Baseline incident frequencies used in the Pipeline Risk Assessment (Appendix P) are historic (PHMSA 2008) but the majority of pipelines in the United States were constructed in the 1970s or earlier and do not necessarily meet current regulatory requirements or BMPs. Baseline frequencies were adjusted by a factor (0.1-1) to account for improved technologies and practices that would be utilized during construction. An adjustment factor less than 1 indicates a frequency less than that reflected in the PHMSA database. The result is that calculations continue to overestimate risk. Keystone completed a Pipeline Risk Assessment (Appendix P) which contains the detailed analysis of the potential incident frequency based on the worst-case spill volumes. Baseline frequencies are given for six threats based on PHMSA data and pipeline design parameters considered for the calculations to be viable for the Project: corrosion, excavation damage, materials and construction, hydraulic, ground movement and washout, and flooding. The occurrence interval, expressed in years, ranges from one incident every 3,400 years for corrosion to one incident every 87,800 years for washout and flooding.

3.13.3.2 Oil Spill Frequency and Spill Volume

Currently, there are approximately 170,000 miles of hazardous liquid pipelines, both offshore and onshore, in the United States (website: <http://primis.phmsa.dot.gov/comm/PipelineBasics.htm>, last accessed on July 28, 2009). That pipeline mileage can be combined with the incident frequencies and spill volumes in the tables below to yield frequency factors. The incident frequency (defined as incidents per mile of pipe per year), using 10 years of hazardous liquid pipeline incident data for the entire United States, is 126 per year (Table 3.13.2-2) over 170,000 miles, or 0.0007 incident per mile per year. Because the number of incidents per year has been decreasing because of better construction and spill prevention, the use of the 10-year average gives a lower and more accurate frequency. The 10-year national data set gives a loss rate of 16.4 gallons (0.3907 bbl) per mile per year.

State-by-state hazardous liquid pipeline incident data from the PHMSA web site were used to examine a more project-specific subset of the data. For each of the state-by-state analyses, incidents were selected from hazardous liquid pipelines located in a single state crossed by the proposed pipeline route. The state-by-state PHMSA data summaries included the 10 years from 1997 through 2008. That data subset gave a frequency of 0.0003 incident per mile per year and a loss rate of 18.9 gallons (0.033 bbl) per mile per year. The incident rate is slightly higher than that given by the national hazardous liquid pipeline data set, and the expected spill volume is about 15 percent larger. Use of state-specific data may not be a statistically reliable predictor of incident frequencies or release volumes for the proposed pipeline because of the relatively small number of incidents reported in most of the subject states in the last 10 years.

Approximately 55,000 miles of crude oil trunk lines are in the United States (website: http://www.pipeline101.com). The detailed incident report database available from the PHMSA web site was used to analyze incidents of crude oil spills that involved onshore hazardous liquid pipelines. The detailed PHMSA data cover the most recent 20 years; they were filtered down to the most recent 10 years. That data subset, including about 600 reported incidents, gave a frequency of 0.00109 incident per mile per year and a loss rate of 43.7 gallons 1.04 bbls (43.7 gallons) per mile per year. Ordinarily on average, onshore crude oil pipeline incidents have comparable frequencies but between two and three times the spill volume compared to all reported hazardous liquid pipeline incidents.

Spill frequencies and volumes estimated from PHMSA data and applied to the proposed pipeline are presented in Tables 3.13.3-1 and 3.13.3-2, respectively. The frequency factors give an overall frequency (for spills or leaks greater than 50 bbls) between 0.81 and 3.86 (1.79 if Oklahoma is used instead of Texas) spills per year, depending on which data set is used as the basis. The volume factors give an estimated annual gross spill volume between 18,000 and 60,000 gallons (429 and 1,420 bbls) per year, depending on the data set used as the basis.

This Pipeline Risk Analysis (Keystone 2009a) includes references to the Cushing Extension (currently under construction) and is therefore referred to in this section as it impacts the nominal throughput of the Project.

TABLE 3.13.3-1
Projected Spill Incidents (>50 Barrels) per Year for the Project

Spill Incidents per Year	Full PHMSA Hazardous Liquids Dataset [a]	PHMSA Data– Keystone States [b]	PHMSA Data– Crude Oil [c]
Incidents per mile per year	0.0007	0.0003	0.00109
Steele City (850)	0.15	0.007	0.71
Cushing Extension (298)	0.42	0.290	0.35
Gulf Coast (525)	0.24	0.760	1.14
Project total (1,673 miles)	**0.81**	**1.06**	**3.86**

[a] "Full" includes all hazardous liquid pipelines in the United States, onshore and offshore.
[b] "Keystone states" includes data only for onshore hazardous liquid pipelines in the states that would be crossed by the proposed pipeline.
[c] "Crude oil" includes data just for onshore crude oil pipeline incidents, all states. Gulf Coast Segment includes Texas with a much higher number of reported incidents.
Notes:
PHMSA = Pipeline and Hazardous Materials Safety Administration.
Any discrepancy between information for individual items and totals and subtotals is attributable to rounding error.
Source: PHMSA 2009.

The spill frequency analysis conducted by Keystone (Keystone 2009a, c) included a state-by-state spill frequency estimate. This analysis produced a Project leak frequency of one incident in 7,400 years per mile of pipeline. Detailed calculations and hazard-specific tables are available in Keystone's Pipeline Risk Assessment (Appendix P). Table 3.13.3-2 shows Keystone's projected spill occurrence along the proposed pipeline for a 10 year interval. Keystone has an additional 1,365 miles of pipeline (Keystone Mainline and Cushing Extension) under construction (permit issued in 2008). Even though the permit has been issued for the Keystone Cushing Extension, the nominal throughput would increase, based on the operation of the Project, from 591,000 barrels per day (bpd) to 900,000 bpd and, therefore, it is included in the table.

TABLE 3.13.3-2
Spill Occurrence Interval Associated with the Project over 10 Years – Applicant Analysis

	Conservative Number of Spills per 10 years
Steele City Segment (850 miles)	1.1
Keystone Cushing Extension (298 miles)	0.4
Gulf Coast Segment and Houston Lateral (525 miles)	0.6
Total (1,672 miles)	2.2

The PHMSA data produce a spill frequency based on historical spill incidents on existing pipeline systems in the Gulf Coast Segment that is higher than that produced by Keystone's project-specific analysis. While future events cannot be known with certainty, spill frequencies can be used to estimate the number of events that might occur. Actual frequency may differ from the predicted values of either analysis. In addition, PHMSA data reflect incidents on existing pipeline infrastructure. With implementation of the DOT's Integrity Management Rule, continually improving industry operating practices, and advancements in best available control technology (BACT), the number of spills is expected to decline from historical levels observed on older pipelines. Hazardous liquid pipeline *serious and significant incident* frequencies have been steadily decreasing, as indicated by the PHMSA trend using 5-year, 10-year, and 20-year incident frequency averages (Tables 3.13.3-1 and 3.13.3-2). The frequency of oil spills from the proposed pipeline and facilities is likely to be lower than the PHMSA data statistical frequency, which reflects past experience.

PHMSA shows that national hazardous liquid incidents (*serious and significant*) have dropped over a 10-year period. The first six months of 2009 show that pipeline incidents remain at the 2008 level. A state-by-state evaluation shows Texas to be considerably higher in number of incidents than 48 other states and second only to California in number. Both of these states have a greater number of pipelines and a higher proportion of pipelines that were constructed before improved materials and high standards were developed.

Keystone's risk analysis (Keystone 2009a) used an additive method that included specific types of incidents and their respective frequencies. The analysis did not include incidents that resulted from causes other than excavation, corrosion, human error, material failure, natural forces, and other outside forces. The PHMSA incident cause data (Table 3.13.2-3) provide an "*all other causes*" category to account for 23 percent of incidents, many of which are incidents for which a cause was not reported.

Even with the differences identified above, both the PHMSA data and the Keystone data tend to overestimate the likely Keystone spill frequency since over the life of the proposed pipeline, small spills would likely occur (i.e., the probability is ~1.0) but large to very large spills would be very unlikely to occur (i.e., the probability approaches 0). Nevertheless, as indicated by the PHMSA data, there are infrequent occurrences of large to very large spills; and their potential impacts need to be addressed. Keystone's Pipeline Risk Assessment projects that 50 percent of releases would be three barrels or less and that less than 0.5 percent of releases would be 10,000 barrels or greater (Keystone 2009a, c).

3.13.3.3 Construction Spills

The majority of construction spills are small, and composed of refined products (e.g., gasoline, diesel, and lubricating and hydraulic fluids). Most result from vehicle and construction equipment fueling and maintenance. Fueling operations may also be a source of frequent but very small to small spills. Construction staging areas may include portable fuel and oil storage tanks staged onsite during the course of the construction activity. The capacities of such tanks vary, depending on the duration of work and quantity of equipment to be fueled.

In addition to onsite fuel facilities, construction of the proposed pipeline would involve tanker trucks that deliver fuel and other fluids to operating equipment along the construction ROW. Tanker and fuel or maintenance truck accidents or fuel storage tank failures would be the most likely sources of larger construction spills. The potential maximum oil spill volume from these sources would be about 143 bbls (6000 gallons) for diesel or gasoline and about 8 bbls (330 gallons) for lubricating or hydraulic fluid (i.e., six 55-gallon barrels on a pallet). According to the Pipeline Risk Assessment (Appendix P) and in compliance with 49 CFR Part 112 for each staging area, oil storage tanks would have secondary means of containment (berms) for 110 percent of the capacity of the largest tank. In addition, portable oil storage containers would have berms that hold 110 percent of the total capacity of the containers inside the berm. The Environmental Inspector would inspect storage sites for compliance with a 100-foot setback from the water's edge.

Potential spills from construction activities are addressed by specific preventive and mitigating measures that will be included in the ERP. Additional measures are discussed in Section 3.13.4.5.

3.13.3.4 Operations and Maintenance Spills

The conservative analysis of potential oil spills during operation and associated maintenance is provided in the Keystone XL Project Pipeline Risk Assessment and Environmental Consequence Analysis (Appendix P). The analysis demonstrates that the predicted frequency of any and all operations spills is low, the probability of a large spill occurring is very low, and the risk of a spill that would impact sensitive habitats, especially aquatic habitats, is extremely low. Compliance with applicable state and federal regulations, including PHMSA requirements (see Section 3.13.1) application of Keystone's IMP and Emergency Response Plan (ERP), as well as adherence to safety procedures will help to ensure long-term, environmentally sound, and safe operation of the pipeline. However, there would be a very small chance that an oil spill from the pipeline may occur.

Operational spills may occur anywhere along a pipeline, including pump stations and within long runs of straight line pipe. Pipeline operation leaks, drips, and spills can occur due to corrosion, damage caused by third parties performing excavation or soil borings, external forces due to landslides or washouts, or other causes. Pump station operational leaks can occur due to circumstances similar to pipeline operational leaks, with additional risks related to filter change and pig launching or receiving operations.

Spills from the proposed pipeline, associated pump stations, valves, or pigging facilities could occur during Project operation at several general locations including the pipeline ROW, pump stations, and staging areas for major maintenance and other contractor activities. Although leak detection systems (addressed later in this section and in detail in the Pipeline Risk Assessment (Keystone 2009a)) would be in place; some leaks might not be detected by the system for an extended period of time. For example, a pinhole leak could potentially be undetectable for days or a few weeks especially if the release volume rate were small. Detection of oil from small pinhole leaks would most likely occur through visual or olfactory identification, either during regular pipeline aerial inspections, ambulatory patrols, or landowner or citizen observation.

A large spill is most likely to result from a large break in the pipeline. For most of the proposed pipeline route, some of the released oil could be contained in the immediate vicinity of the release point. The released oil would however affect the environment adjacent to the spill source. Keystone will prepare an ERP which will describe the response actions, equipment, procedures, and other required elements necessary to rapidly respond to and manage an oil spill response. In some instances, the point of release may be relatively remote and hard for responders to quickly access. Pipeline leak detection technology may identify a leak and shut down flow quickly, but actual response with containment equipment and cleanup crews may be delayed due to one or more of the following factors:

- If the leak is at a remote location, visual leak detection may be difficult and reporting may be delayed;
- Locating the leak may require significant time searching the area where the leak originates;
- Snow, light condition, or other natural factors may hinder visual detection;
- Weather conditions, natural disasters (e.g., floods, landslides, excessive snow fall, avalanches) may delay access to the spill location especially for larger equipment and supply vehicles, and

- Depending on spill volume, proximity, and season, the oil could reach wetlands, freshwater ponds and lakes, streams, or larger rivers (refer to Section 3.13.4.1, Factors Affecting Oil Spill Impacts).

3.13.4 Impacts Related to Oil Spills

Crude or refined oil released into the environment may affect natural resources, protected areas, human uses and services, and aesthetics to varying degrees, depending on the cause, size, type, volume, location, season, environmental conditions, and associated response actions. Small oil spills (e.g., intermittent leaks and drips from construction machinery and operating equipment that are typically very small volumes) would be almost certain to occur during construction and operation of the Project. There would also be a very limited potential for a spill of sufficient magnitude to significantly affect natural resources and human uses of the environment. The previous sections describe the risk or probability of spills of various sizes. In this section, it is assumed that a spill has occurred (probability =1.0) and the potential impacts are described for a range of potential oil spill scenarios associated with the proposed Project.

Most oil spills are unpredictable in cause, location, time of occurrence, size, and duration (J.L. Mach et al., Hart Associates, Inc. 2000). When an oil spill occurs, the resulting environmental impact depends on a number of factors, including the:

- Amount and duration of oil release, and location with respect to topography, infrastructure, and sensitive receptors;
- Fate and behavior of the spilled oil (i.e., the potential for a spill reaching an environmental receptor, persistence in the environment);
- Chemical composition and physical characteristics of the oil; and
- Toxicity and other adverse effects of the oil to the receptors.

Discussion of oil spill impacts requires a depiction of typical potential spill scenarios and environmental variables that might affect spilled oil fate and behavior. These descriptions are provided with the caveat that they are necessarily simplified and do not represent the entire spectrum of possible values or combinations of values and events that might be realized in actual spills. However, many of these factors and assumptions have been used in previous assessments, and all are based on the peer-reviewed literature, technical reports, and empirical experience of oil spill experts worldwide. Key factors are summarized in the following sections.

3.13.4.1 Factors Affecting Oil Spill Impacts

Impacts related to oil spills can be affected by the release location, type and volume of oil released, nearby receptors and resource uses, seasonal variations, response time and response actions, weather, water levels, and other factors that are described below.

Location of Spill

Most spills would occur and be contained within or in close association with the proposed pipeline ROW or the associated infrastructure such as construction yards, pump stations, and maintenance yards. These spills would typically be small (i.e., much less than a barrel) and would be promptly cleaned up as required by federal, state, and local regulations before they reach offsite lands or waterbodies. During construction, some refined product spills may occur from tank truck accidents along roads leading to the construction sites. Some of these spills may result in much or all of a load being spilled to the land, wetlands, ponds and lakes, or flowing waterbodies adjacent to the road or pad. The maximum volume of gasoline or diesel from a tank trunk would be about 6,000 gallons (~143 barrels) and the maximum lubricating or hydraulic oil would be about 330 gallons (~8 barrels), the contents of a typical pallet of six 55-gallon drums. These unlikely substantial and larger[4] spills would have limited distribution unless they occurred at or very near an open waterbody.

Almost all spills during operation and maintenance of the proposed pipeline would be crude oil. Most will likely be very small to small, and it is very unlikely that a large or very large spill would occur. Based on experience, spills would be more likely to occur in developing or agricultural areas where excavation activities are common, and at locations where, based on soil and other physical conditions, the corrosion potential is greatest[5]. The locations of greatest concern for potential oil spills would be those that are upgradient of HCAs and USAs, especially wetlands, flowing streams and rivers, and water intakes for drinking water or commercial/industrial users.

Type of Oil

For this EIS, the materials that could be spilled are categorized and described as follows:

- **Crude oil** which may be either diluted bitumen (heavy crude) or synthetic crude oil (light crude);
- **Refined oil** (e.g., diesel, gasoline, hydraulic fluid, transmission oil, lubricating oil and grease, waste oil, mineral oil, solvents, transformer oil, and other petroleum-based products); and
- **Other hazardous materials** (e.g., alcohol and petroleum-based solvents, antifreeze, battery acid, paint, field joint coating material, radiography source, water-soluble chemicals, corrosion inhibitors, scale inhibitors, drag-reducing agents, and biocides).

This EIS focuses on crude oil because of the potential for large-volume releases of crude oil into sensitive areas over the approximately 1,380-mile proposed pipeline route. The impacts of refined oil are assessed where appropriate. The volume of other hazardous materials spills typically is small and these spills are most likely to occur at the construction or operation/maintenance sites where materials would be stored in containers of discrete capacities that define worst case maximum spill quantities. Spill prevention, control, and containment (SPCC) plans, secondary containment requirements, and hazardous materials location restrictions would reduce the risk that a release from a hazardous materials container could affect surface waters. Spills of refined oil products and other hazardous materials from construction or operations/ maintenance sites would be much more likely to be contained and would be readily cleaned up. Therefore, the discussion of impacts of spills focuses on larger volume crude oil spills along the proposed pipeline ROW. For this EIS, the corrosion inhibitors, scale inhibitors, drag-reducing agents, and biocides are considered part of the crude oil spill.

Crude oil transported by the Project would be derived from the Alberta oil sands region. The oil extracted from the sands is a thick, black oil called bitumen. In order for bitumen to be transported by pipeline, it is either diluted with cutter stock (the specific composition of which is proprietary information to each shipper) or an upgrading technology is applied to convert the bitumen to synthetic crude oil[6]. The precise composition of synthetic crude would vary by shipper and is considered proprietary information. In general, the crude oils would be similar to Western Canada Select (WCS) as a heavy crude and Suncor Synthetic A (OSA) which is a light crude. The physical and chemical composition characteristics of these two types of crude are available at *http:/www.crudemonitor.ca/assays.html*.

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[4] See later sub-section titled Volume in this section for a definition of spill sizes.
[5] See section 3.13.1 for a compilation of the safeguards required of the Project to minimize the potential for corrosion to affect the pipeline.
[6] This EIS uses “crude oil” as the generic term to describe the diluted bitumen and synthetic crude oil (also called “syncrude”) derived from the Alberta oil sands.

Crude oils may differ in their solubility, toxicity, persistence, and other properties that affect their impact on the environment. The effects of a specific crude oil cannot be thoroughly understood without considering its composition and physical properties. Of particular importance are:

- Specific gravity, which determines whether the unweathered oil would sink or float upon release to an aquatic environment. A specific gravity of <1.0 means the unweathered oil will float on fresh water.
- Viscosity, which determines how readily the oil would flow when released, especially in an area with a down slope or downcurrent gradient to an HCA or USA. Typically, viscosity increases as temperature decreases. This may be an important consideration, as air temperatures along the length of the proposed pipeline corridor may range from well below freezing in winter to in excess of 100 ˚F in summer.
- Pour point, an indicator of the temperature at which the oil changes from liquid to a "solid" material that does not flow. Like viscosity, this is heavily influenced by ambient temperatures.
- Proportion of volatile and semi-volatile fractions, an indicator of (1) the amount of oil that would evaporate or volatilize (and thus not affect most resources); (2) the amount of oil that likely would physically persist in the environment as it weathers; and (3) the amount of potentially toxic material that could dissolve or disperse into an aquatic environment and cause toxicological impacts.
- Proportion and amount of polycyclic aromatic hydrocarbons (PAHs), many of which are considered the key toxic fraction of oils.

Information provided by Keystone on example oils similar to those expected to be transported (Western Canadian Select and Suncor Synthetic A) indicates that the Project crude oil may have the following general characteristics:

- Specific gravity <0.93;
- Pour point for heavy crude < -30 ˚C ; and
- Pour point for synthetic crude < -21 ˚C.

More characteristics of these example oils are reported in copyrighted assays by Crude Quality, Inc. (website: http://www.crudemonitor.ca/current.html,). Some characteristics could not be described or distilled from assay data for the example oils for this EIS, including viscosity profiles, proportion of volatile and semi-volatiles compounds, the amount or proportion of PAHs, and toxicity to aquatic organisms based on bioassays. In the discussions that follow, information on these characteristics is therefore drawn from the available literature in the public record.

Volume

To describe the impacts of spills in this EIS, spills are categorized as:

- Very small spills—less than 5 bbl (<210 gallons);
- Small spills—5–49.9 bbl (210–2,100 gallons);
- Substantial spills—50–499.9 bbl (2,100–21,000 gallons);
- Large spills—500–5,000 bbl (21,000–210,000gallons); and
- Very large spills—>5,000 bbl (>210,000 gallons).

This size classification is generally similar to the unofficial categories used by OPS for spill reporting. The very small spill and very large spill categories were added to facilitate discussion of the vast majority of spills (less than 210 gallons) and of the very rare spills (greater than 210,000 gallons). The model results from the worst-case discharge scenario for the Project-specific risk analysis (Appendix P; Keystone 2009b) indicates that this scenario would represent <0.1percent of all spills that might occur and it is extremely unlikely that a very large spill of >10,000 bbls (420,000 gallons) would occur from the Project.

Habitat, Natural Resources, and Human Use Receptors

The impact of an oil spill would be heavily influenced by the types of receptors (i.e., habitats, natural resources, and human uses) that might be exposed to the oil. For this EIS, these receptors are generally categorized and described as follows, in increasing order of likely actual environmental impacts and concern to the entire spectrum of stakeholders[7]:

- Terrestrial–agricultural land. Includes grazing, field and row crops, fallow fields, and similar land uses.
- Terrestrial–natural habitat. Includes native and second-growth forests, naturally restoring grasslands, and similar areas that are not being used directly by people for commercial purposes.
- Groundwater. Emphasis is on areas where the water table is close to the ground surface and/or is overlain by soils permeable to oil or by karst formations.
- Aquatic–wetland habitat. Includes all areas that meet the definition of wetlands.
- Aquatic–lake/pond habitat. Includes agricultural stock ponds, irrigation and drainage ditches, small and large lakes, reservoirs, and similar non-flowing waterbodies.
- Aquatic–stream/small river habitat. Includes smaller flowing waterbodies as well as those that are intermittent or ephemeral. These generally do not support commercial boat traffic and are not restricted with dams or major reservoirs. Some may support important recreational resources and activities or may be limited in beneficial uses.
- Aquatic–large river habitat. Includes large flowing waterbodies (e.g., Yellowstone River, White River, Niobrara River, Platte River, Missouri River, Loup River, Red River, and Canadian River) that are perennial, may support commercial traffic, and/or may be restricted by dams and major reservoirs.
- Threatened and endangered species and their critical habitat. Most are USAs and/or HCAs, and are a special case of resources that may be found in any of the habitats but are limited in population size or spatial distribution.
- Human use–residential. Areas where the proposed pipeline ROW is near rural, suburban, or urban populations.
- Human use–recreational. Areas, especially lakes, small and large rivers, and reservoirs and associated parks used by people for various recreational activities.
- Human use–commercial. Areas that may be closed to normal use during a spill response action and result in substantial economic impacts.

[7] The directly impacted stakeholders (e.g., ranchers, farmers, homeowners) likely will consider the impacts to his/her resources as very high concern regardless of the overall impact in an ecosystem context. Also, USAs and HCAs may be considered more sensitive to oil spill impacts on a local scale compared to the larger ecosystem scale, partly because of the designation and partly because of their local ecological or human use significance.

- Human use–water intakes. Most are USAs and/or HCAs, and are usually in reservoirs, large rivers, and some groundwater aquifers from which drinking water, industrial cooling water, and/or agricultural water supplies are obtained.

Season

The season in which a spill occurs could dramatically influence its behavior, impacts, and the cleanup response actions. Seasonal variations in potential spill behavior are addressed in this section.

Spring-Fall

When the spring-fall season begins and ends depends on the location along the proposed pipeline route and the weather regime of the year. For this EIS, this time period is generally defined as the period when the ground is mostly free of snow and access to the proposed pipeline ROW is not restricted by snow and ice. Most of the rivers and creeks are flowing; ponds, lakes, and reservoirs are open water; land is mostly snow-free; and biological use of land and waterbodies is high. Currents, winds, and passive spreading forces would disperse spills that reach the waterbodies. Spills to land would directly affect the vegetation, although dispersal of the spilled material is likely to be impeded by the vegetation. Spills to wetlands may float on the water or be dispersed over a larger area than would spills to dry land or to ice and/or snow-covered land and water bodies associated with the wetlands.

Winter

Winter is the period when waterbodies may be covered with ice and possibly snow, and the land surface may be partially to completely covered with snow. Dispersal of oil spilled to the land generally would be slowed, although not necessarily stopped, by the snow cover. Depending on the depth of snow cover as well as the temperature and volume of spilled material, the spill may reach the underlying dormant vegetation or wetlands, ponds, and lakes. Similarly, spills to flowing rivers and creeks generally would be restricted in area by the snow and ice covering the waterbody, compared to seasons with little or no snow and ice cover. Spills under the ice to creeks, rivers, and ponds/lakes might disperse slowly as the currents are generally slow to non-existent in winter. However, because of snow and ice, winter spills may be harder to detect and, when found, more difficult to contain and clean up.

Breakup or spring melt is the short transition period between winter and spring when thawing begins and river flows increase substantially and quickly, often to flood stages. Major floods may cause bank erosion and ultimately pipeline failure, with the oil entering the river and likely being widely dispersed and difficult to contain or clean up.

Weather and Water Levels

Weather, especially rapid warming periods and heavy rainfall, may cause rapid snowmelt and runoff. These could result in major flood flows that breech levees along larger rivers, erode river banks, alter channels, and expose the proposed pipeline to forces that may break or rupture it. This scenario, although a very low-probability event especially at HDD crossings, could occur at large or small stream or river crossings not spanned by HDD. If spilled oil is released to the flooded area, especially to flowing waters, oil could be distributed to adjacent terrestrial, wetland, and aquatic habitats that normally would not be exposed. These habitats and natural resources, as well as human uses of the habitats and resources, may be exposed to the spilled material.

Winds, especially high-velocity sustained winds, would result in widespread distribution of material released under pressure, primarily from hole(s) in the top hemisphere of an exposed portion of the pipeline[8]. Ejected material could become a cloud of mist and fine particles, and would be carried downwind. The extent of distribution would depend on wind velocity, direction of the released spray (e.g., downward into the ground, horizontal, or skyward), and characteristcs of the release (e.g., pressure in the pipeline, type of oil, size of hole). Under most scenarios, the pressure in the pipeline will drop quickly, the release will be highly visible, immediate pipeline spill control and shutdown actions will be taken by the CMP and SCADA as well as the onsite personnel; therefore, the areal extent of the plume would be limited to the immediate area of the pipeline right of way.

Major flooding or adverse weather conditions (e.g., high winds, tornados, blizzards, and extreme cold) may limit Keystone's ability to detect a suspected release and/or hinder or stop the spill response contractors from implementing timely and effective oil spill containment and cleanup operations.

3.13.4.2 Keystone Response Time and Actions

For spills ranging in magnitude from very small to substantial, response time and actions by Keystone and its response contractors would most likely prevent the oil from reaching sensitive receptors or would contain and clean up the spills before significant environmental impacts occurred. Most spills in this category are likely to occur on construction sites or at operations and maintenance facilities, and would not reach the natural environment.

For large spills, very large spills and potentially some substantial spills, especially those that reach aquatic habitats, the response time between initiation[9] of the spill event and arrival of the response contractors would influence the magnitude of impacts to the natural environment and human uses. This is particularly true if the oil reaches flowing waters in major rivers. Once the response contractors are at the spill scene, the efficiency, effectiveness, and environmental sensitivity of the response actions (e.g., containment and clean up of oil, and protection of resources and human uses from further oiling) would substantially influence the type and magnitude of additional environmental impacts.

3.13.4.3 Factors Affecting the Behavior and Fate of Spilled Oil

The primary and shorter-term processes that affect the fate of spilled oil are spreading, evaporation, dispersion, dissolution, and emulsification (Payne et al. 1987, Boehm 1987, Boehm et al. 1987, Overstreet and Galt 1995). These processes are called weathering. Weathering dominates during the first few days to weeks of a spill. A number of longer term processes also occur, including photodegradation and biodegradation, auto-oxidation, and sedimentation. These longer-term processes are more important in the later stages of weathering and usually determine the ultimate fate of the spilled oil.

The chemical and physical composition of oil changes with weathering. Some oils weather rapidly and undergo extensive changes in character, whereas others remain relatively unchanged over long periods. Because of evaporation, the effects of weathering are generally rapid (one to a few days) for hydrocarbons with lower molecular weights (e.g., gasoline, aviation gas, and diesel). Degradation of the higher weight fractions (e.g., crude oil, transmission and lube oil, and hydraulic fluid) is slower and occurs primarily through microbial degradation and chemical oxidation. The weathering or fate of spilled oil depends on the oil properties and on environmental conditions, both of which can change over time.

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[8] Oil released from a hole in the bottom hemisphere of the pipeline would impact the ground within a few feet of the pipeline and would behave like any release that flowed onto the ground surface. Also, an aerial release would only occur where the pipeline is above ground level or where it has been exposed during excavation. The most likely cause of a release in the top half of the pipeline would be from excavation equipment or similar accident.

[9] "Initiation of the event" means when the oil began to leak or spill to the environment, not when it is detected by either the SCADA or other means. There may be a substantial delay between initiation and detection, particularly for slow or pinhole leaks under snow or below ground.

Spreading

Spreading reduces the bulk quantity of oil present in the vicinity of the spill but increases the spatial area over which adverse effects could occur. Thus, oil in flowing systems (e.g., rivers and creeks) rather than contained systems (e.g., wetlands, ponds, and lakes) would be less concentrated in any given location but could cause impacts, albeit reduced in intensity, over a larger area. Spreading and thinning of spilled oil also increases the surface area of the slick; enhancing surface-dependent fate processes such as evaporation, biodegradation and photodegradation (see below), and dissolution.

Adsorption

Crude or refined oil dispersed in soil will adsorb or adhere to soil particles. Crude oil will usually bind most strongly with soil particles in organic soils and less strongly with soil particles in sandy soils. In water, heavy molecular weight hydrocarbons may bind to suspended particulates, and this process can be significant in highly turbid or eutrophic waters. Organic particles (e.g., biogenic material) in soils or suspended in water tend to be more effective at adsorbing oils than inorganic particles (e.g., clays). Sorption processes and sedimentation reduce the quantity of heavy hydrocarbons present in the water column and available to aquatic organisms. However, these processes also render hydrocarbons less susceptible to degradation. Oil in sediment tends to be highly persistent and can cause chronic impacts.

Evaporation

Evaporation is the primary mechanism for loss of low-molecular-weight constituents and light oil products. As lighter components evaporate, remaining petroleum hydrocarbons become denser and more viscous. Evaporation tends to reduce oil toxicity but enhance persistence. Hydrocarbons that volatilize into the atmosphere are broken down by sunlight into smaller compounds. This process, referred to as "photodegradation," occurs rapidly in air; the rate of photodegradation decreases as molecular weight increases. The crude oil to be transported in the proposed pipeline tends to have a relatively small proportion of constituents that evaporate rapidly, based on data provided by Keystone.

Dispersion

Dispersion of oil increases when water surface turbulence increases. Wind, gravity, tidal currents, or broken ice movement could cause the turbulence. Dispersion of oil into water increases the surface area of oil susceptible to dissolution and degradation processes, and thereby limits the potential for physical impacts. However, some of the oil could become dispersed in the water column or on the bottom as it adheres to particulate matter suspended in the water column. The presence of particulates, including organic matter, silt and clay, and larger sediment particles, is likely to be greatest during spring ice breakup, flood flows, and wind storms.

Dissolution

Dissolution[10] of oil in water is not the primary process controlling the fate of the oil in the environment (i.e., oil generally floats on rather than dissolves into water). However, to the extent that dissolution does occur, it is one of the primary processes affecting the toxic effects of a spill, especially in confined waterbodies. Dissolution increases with decreasing hydrocarbon molecular weight, increasing water temperature, decreasing water hardness or "salinity," and increasing concentration of dissolved organic matter. Under the same environmental conditions, components of gasoline (e.g., benzene, toluene, ethylbenzene, and xylenes) would dissolve more readily than the heavier fractions of crude oil or fuel oils.

[10] In this case, the definition of "dissolution" is to dissolve into water.

Emulsification

Emulsification is the incorporation of water into oil and is the opposite of dispersion. Small drops of water become surrounded by oil. External energy from wave or strong current action is needed to emulsify oil. In general, heavier oils emulsify more readily than lighter oils. The oil could remain in a slick, which could contain as much as 70 percent water by weight and could have a viscosity of a hundred to a thousand times greater than the original oil. Water-in-oil emulsions often are referred to as "mousse."

Photodegradation

Photodegradation of oil increases with greater solar intensity. It can be a significant factor controlling the disappearance of a slick, especially of lighter products and constituents, but it would be less important during cloudy days and could be almost nonexistent in winter months. Photodegraded petroleum product constituents tend to be more soluble and more toxic than parent compounds. Extensive photodegradation, like dissolution, could increase the biological impacts of a spill event.

Biodegradation

Biodegradation of oil by native microorganisms, in the immediate aftermath of a spill, would likely not be a significant process controlling the fate of oil in waterbodies previously unexposed to oil. Although oil-degrading microbial populations are ubiquitous at low densities, a sufficiently large population must become established before biodegradation can proceed at any appreciable rate. Biodegradation is typically a long term (weeks to years) process that reduces both the toxicity and volume of spilled oil.

3.13.4.4 Summary of Environmental Factors Affecting Fate of Spilled Oil

Overall, the environmental fate of released oil is controlled by many factors, and persistence cannot be predicted with great accuracy. Major factors affecting the environmental fate include the type of product, spill volume, spill rate, oil temperature, terrain, receiving environment, time of year, and weather. Crude oil would weather differently than diesel or refined products in that both diesel and refined products would evaporate at a faster rate than crude oil.

The characteristics of the receiving environment, such as the type of land cover, soil porosity, land surface topography and gradient, type of freshwater body, presence of ice and/or snow cover on water or land, and flowing water current velocity, would affect how the spill behaves. In ice-covered waters, many of the same weathering processes occur as in open water. However, ice changes the rates and relative importance of these processes (Payne et al. 1991).

The time of year when a spill occurs has a major effect on the fate of the crude oil. The time of year controls climatic factors such as temperature of the air, water, or soil; depth of snow cover; whether there is ice or open water; and the depth of the active (soil frost) layer. During winter, the air temperature can be so cold as to modify the viscosity of oil so that it would spread less and could even solidify. The lower the ambient temperature, the less crude oil evaporates. Frozen ground would limit the depth of penetration of any spill. Weather also could affect Keystone's ability to detect, contain, or clean up a spill.

3.13.4.5 Keystone Actions to Prevent, Detect, and Mitigate Oil Spills

In addition to the natural environmental factors affecting the fate and behavior of spilled oil, Keystone has designed and committed to a comprehensive slate of processes, procedures, and systems to prevent, detect, and mitigate potential oil spills that may occur during operation of the proposed pipeline. These are summarized below. The Final ERP would contain further detail and would be completed and reviewed by PHMSA-OPS as a condition for Keystone to operate the proposed pipeline.

Prevention

Keystone has conducted a pipeline threat analysis using the pipeline industry-published list of threats under ASME B31.8S and by PHMSA to determine the applicable threats to the proposed pipeline (see Section 2, Appendix P). Safeguards were then developed to protect against these potential threats, which have been identified as follows:

- Incorrect pipeline operations (e.g., overpressure of the pipeline);
- Materials and construction damage (e.g., flaws such as defective welds, dents, cracks, nicks in the coating that are a result of transport or construction, and flaws in the seam of the pipeline created during the manufacturing process);
- Corrosion (e.g., internal, external, and stress-corrosion cracking) including defects that develop over time during operation;
- Accidental damage such as external contact with the pipeline (e.g., third-party backhoes, excavators, and drills); and
- Facility damage from natural hazards (e.g., landslides, floods, and earthquakes).

Safeguards were implemented during the Project's design phase and would be implemented during construction and operations of the proposed pipeline. These include:

- Pipe specifications that meet or exceed applicable regulations;
- Use of the highest quality external pipe coatings (fusion bond epoxy or FBE) to prevent corrosion;
- Providing 4 feet of soil cover over the buried pipeline in most locations, which exceeds federal standards;
- Implementing a variety of pipeline system inspection and testing programs prior to operation, to prevent leaks. Examples of these programs include: an extensive pipeline quality assurance program for pipe manufacturing and coating; non-destructive testing of 100 percent of girth welds; and hydrostatic testing of the pipeline at 125 percent of the Maximum Operating Pressure (MOP);
- An operational pipeline monitoring system (Supervisory Control and Data Acquisition [SCADA]) that remotely measures changes in pressure and volume every 5 seconds on a constant basis. These data would be immediately analyzed to determine potential product releases anywhere on the pipeline system;
- Periodic pipeline integrity inspection and cleaning programs using internal inspection tools (pigs) to detect pipeline diameter anomalies indicating excavation damage, and loss of wall thickness from corrosion;
- Aboveground aerial and ground surveillance inspections. The aerial inspections would be conducted 26 times per year (not to exceed three weeks apart) to detect leaks and spills as early as possible, and to identify potential third-party activities that could damage the proposed pipeline; and

- Installing mainline valves and intermediate mainline valves and check valves along the proposed pipeline route to reduce or avoid spill effects to PHMSA-defined HCAs.

The implementation of all these measures, described in more detail in section 3.13.1, would ensure that the likelihood of spills to occur would be very small, and that the volume released, in the unlikely event of a spill, would be small.

The regulations require the use of a design safety factor contained in 49 CFR 195.106 to establish a maximum operating pressure for steel pipelines. In October 2008, TransCanada filed a request for a Special Use Permit to PHMSA that if approved would grant a waiver of 49 CFR 195.106 that would allow in certain areas of the pipeline corridor the use of a modified design specification (see section 3.13.1). The modification would allow the pipeline to operate at maximum Operating Pressure (MOP) that would develop internal hoop stresses less than or equal to 0.80 times the Specified Minimum Yield Strength (SMYS) of the steel used to construct the proposed pipeline. Without the waiver from 49 CFR 195.106, internal hoop stresses would not be allowed to exceed 0.72 times the SMYS. In effect, the waiver would allow a small reduction in pipe wall thickness in specified areas along the pipeline corridor given the design MOP of the proposed pipeline system. PHMSA noticed the application for this Special Use Permit in the Federal Register on January 23 2009. The permit request number is PHMSA-2008-0285-0001. PHMSA is considering the request at this time.

TransCanada requested a similar Special Use Permit and waiver for the Keystone Mainline and Cushing Extension in 2006 and the request was granted by PHMSA. In issuing that Special Permit, PHMSA found specifically that allowing Keystone to operate at 80 percent of SMYS is consistent with pipeline safety and that it “will provide a level of safety equal to or greater than that which would be provided if the pipelines were operated under existing regulations.” The Keystone Mainline and Cushing Extension Special Permit contains 51 conditions that Keystone must comply with, addressing such areas as steel properties, manufacturing standards, fracture control, quality control, puncture resistance, hydrostatic testing, pipe coating, overpressure control, welding procedures, depth of cover, SCADA, leak detection, pigging, corrosion monitoring, pipeline markers, in-line inspection, damage prevention program, and reporting. Failure to comply with any condition may result in revocation of the Special Permit. In addition, the Special Permit is not applicable to certain sensitive areas, including commercially navigable HCAs; high population HCAs; highway, railroad, and road crossings; and pipeline located within pump stations, mainline valve assemblies, pigging facilities, and measurement facilities. Issuance of the Special Permit was based on PHMSA’s determinations that the aggregate effect of Keystone’s actions and PHMSA’s conditions provide for more inspections and oversight than would occur on pipelines installed under the existing regulations, and that PHMSA’s conditions would require Keystone to more closely inspect and monitor its proposed pipeline over its operational life than similar pipelines installed without a Special Permit. The pipe is non-destructively examined, hydrostatically tested, and mechanically tested to prove strength, fracture control, and fracture propagation properties in the mill. All pipes are traceable. The pipe is also examined for fatigue-related defects when it is off-loaded from rail cars at stockpile sites.

During operations, Keystone would enforce a specification for sediment and water content in the commodities transported, in addition to implementing a comprehensive Integrity Management Plan that would use prevention tools such as in-line inspection, computational pipeline (CP) system surveys, geotechnical monitoring, corrosion coupons and associated testing, corrosion inhibitor and biocide injection, aerial patrol, and public awareness programs. Ground-level patrols would be undertaken in the event of a suspected leak but would not be routinely undertaken. Aerial patrols would be conducted at least 26 times per year.

Detection

Keystone would utilize a comprehensive SCADA system to monitor and control the proposed pipeline. Data provided by the SCADA system would alert the Operations Control Center (OCC) operator to an abnormal operating condition, indicating a possible spill or leak. A back-up communication system also would be available should SCADA communications fail between field locations and the OCC.

The SCADA system would continuously monitor pipeline conditions and update information provided to the OCC operator. Data received via the SCADA system also would be directed to the dedicated leak detection system, capable of independently sending an alarm to the OCC operator.

Keystone also would incorporate computer-based accumulated gain/loss volume trending to assist in identifying low rate or seepage releases below the 1.5- to 2-percent-by-volume detection threshold referenced in Appendix P, Section 5.0 bounded by flow measurement equipment. By accumulating these gain/loss results over a succession of time intervals, the cumulative imbalance, if any, of the segment can be determined. Once this cumulative imbalance exceeds a prescribed threshold, further investigation and evaluation is required. Thresholds would be established based on the accuracy and repeatability of flow measurement equipment and the extent to which flow imbalances generated by the normal operation of the proposed pipeline can be tuned out.

In the event that a volume imbalance is identified and warrants further investigation, Keystone would use measures such as the following to identify the leak location:

- Shut-in pressure testing between isolation valves to identify pressure loss within a pipeline segment;
- Aerial and ground patrols to provide direct observation and identification of leak location;
- Internal inspection surveys; and
- Other methods of external leak detection, including odorant-based.

Spill Response Procedures

Spill response procedures incorporated in the ERP and SPCC Plan that would be prepared by Keystone and reviewed by OPS prior to the start of system operations would be followed in the event of a spill. Procedures that are likely to be included in the final, approved, ERP and SPCC Plan are summarized in this section. ERP and SPCC standard operating and response procedures would be utilized by the OCC operator in responding to abnormal pipeline conditions, including leak alarms. The OCC operator would have the full and complete authority to execute a pipeline shutdown. Keystone’s OCC operator would follow prescribed procedures in responding to possible spills that may be reported from sources such as:

- Abnormal pipeline condition observed by the OCC operator;
- Leak detection system alarm;
- Employee reported abnormal conditions; and
- Third party reported abnormal conditions.

Upon receipt of an abnormal condition report, leak report, or leak alarm, the OCC operator would execute the following procedures:

- Follow prescribed OCC operating and response procedures for specific directions on abnormal pipeline condition or alarm response;
- Dispatch First Responders;
- Shut down the proposed pipeline within a predetermined time threshold if abnormal conditions or leak alarm cannot be positively ruled out as a leak; and
- Complete internal notifications.

All Keystone employees are authorized to communicate directly with the OCC should they observe conditions that may signify a possible spill.

Response Time

In the event of a potential pipeline leak or spill, the estimated time to complete an emergency pipeline shutdown and close remotely operable isolation valves is as follows:

- Stop pumping units at all pump station locations: approximately 9 minutes
- Close remotely operable isolation valves: approximately 3 minutes
- Total time: approximately 12 minutes

Consistent with industry practice and in accordance with regulations, including 49 CFR Part 194.115, Keystone's response time to transfer such additional resources to a potential leak site would follow an escalating or tier system. Dependent on the nature of site-specific conditions and resource requirements, Keystone would meet or exceed the requirements along the entire length of the proposed pipeline system (Table 3.13.4-1).

TABLE 3.13.4-1
Response Time Requirements along the Proposed Pipeline

49 CFR Part 194	Tier 1 Resources	Tier 2 Resources	Tier 3 Resources
High-volume area[a]	6 hours	30 hours	54 hours
All other areas	12 hours	36 hours	60 hours

[a] "High-volume area" indicates an area where an oil pipeline with a nominal outside diameter of 20 inches or more crosses a major river or other navigable waters; because of the velocity of the river flow and vessel traffic on the river, this area would require a more rapid response in the case of a worst-case discharge or the substantial threat of such a discharge.

Spill Response Equipment

In general, Tier 1 emergency response equipment would be pre-positioned for access by Keystone including: pick-up and vacuum trucks, containment boom, skimmers, pumps, hoses, fittings, and valves, communications equipment including cell phones, two-way radios, and satellite phones, containment tanks and rubber bladders, expendable supplies, including absorbent booms and pads, assorted hand and power tools, including shovels, manure forks, sledge hammers, rakes, hand saws, wire cutters, cable cutters, bolt cutters, pliers, and chain saws, personnel protective equipment, including rubber gloves, chest and hip waders, and air monitoring equipment to detect H2S, O2 Lower Explosive Level, and benzene concentrations.

Additional equipment, including helicopters, fixed-wing aircraft, all-terrain vehicles, snowmobiles, backhoes, dump trucks, watercraft, bull dozers, and front-end loaders also may be accessed depending on site-specific circumstances. Other types, numbers, and locations of equipment would be determined upon concluding the detailed design of the proposed pipeline and completing Keystone's final ERP (Oil Spill Emergency Response Plan). This plan would be completed in 2010 and submitted to PHMSA for review prior to commencing operations.

The primary task of the Tier 1 response team is to minimize the spread of product on the ground surface or water in order to protect the public and USAs, including ecological, historical, and archeological resources and drinking water locations. The Emergency Site Manager (also known as the Qualified Individual or "QI") would perform an initial assessment of the site for specific conditions, including the following:

- The nature and amount of the spilled product;
- The source, status, and release rate of the spill;
- Direction(s) of spill migration;
- Known or apparent impact of subsurface geophysical features that may be affected;
- Overhead and buried utility lines and pipelines;
- Nearby population, property, or environmental features and land or water use that may be affected; and
- Concentration of wildlife and breeding areas.

The QI would request additional resources in terms of personnel, equipment, and materials from the Tier 2 and if necessary, the Tier 3 response teams. Once containment activities have been successfully concluded, efforts would then be directed toward the recovery and transfer of free product. Site cleanup and restoration activities would then follow, all of which would be conducted in accordance with the authorities having jurisdiction, including development of a natural resource damage assessment in the event that it is required.

Spill Response Personnel and Training

The number of emergency responders comprising specific response teams would be determined upon completion of Keystone's ERP in 2010. Emergency responders would meet or exceed the requirements of 49 CFR Part 194.115, and would typically be comprised of Hazardous Waste Operations and Emergency Response ("HAZWOPER") trained personnel. The response organization would follow the industry-accepted Incident Command System (ICS) and would typically consist of personnel both onsite and within an established remote or Regional Emergency Operations Center (EOC).

Locations of Spill Responders

Keystone would base emergency responders consistent with industry practice and in compliance with applicable regulations, including 49 CFR Part 194 and 49 CFR Part 195. Consequently, emergency responders would be based in closer proximity to the following areas:

- Commercially navigable waterways and other water crossings;
- Populated and urbanized areas; and

- Unusually sensitive areas, including ecological, historical, and archeological resources and drinking water locations.

The specific locations of other emergency responders would be determined upon conclusion of the detailed location and design of the proposed pipeline, and completion of Keystone's ERP.

Spill Training Exercises and Drills

Keystone's spill training exercise and drill program would be designed to meet the requirements of the National Preparedness for Response Exercise Program Guidelines developed by the U.S. Coast Guard and adopted by the PHMSA, the Minerals Management Service (MMS), and EPA. Participation in this program would ensure that the Company meets all federal exercise requirements mandated by the Oil Pollution Act of 1990 (OPA 1990).

The primary elements of the exercise program are notification exercises, tabletop exercises, Company-owned equipment deployment exercises, contractor exercises, unannounced exercises by government agencies, and area-wide exercises up to and including actual field drills conducted by industry and government agencies.

Keystone would ensure that operating personnel participate in exercises or responses on an annual basis in order to ensure that they remain trained and qualified to operate the equipment in the operating environment and to ensure that the ERP is effective. However, personnel and equipment that are assigned to multiple Response Zones would participate in only one deployment exercise per year.

The exercise year for all Project facilities would be from January 1 to December 31.

In addition, Keystone would be required to participate in unannounced federal agency-led exercises, and in other area exercises when requested by appropriate authorities.

3.13.4.6 Types of Oil Spill Impacts

Physical Impacts

Physical impacts of oil spills to natural resources and human uses typically result from physical coating of soils, sediments, plants, animals, or areas used by people. Physical impacts include, but are not limited to:

- Smothering living organisms so they cannot feed or obtain oxygen;
- Coating feathers or fur, which reduces their insulating efficiency and results in hypothermia;
- Adding weight to the organism so that it cannot move naturally or maintain balance;
- Coating sediments and soils, which reduces water and gas (e.g., oxygen and carbon dioxide) exchange and affects subterranean organisms; and
- Coating beaches, water surfaces, wetlands, and other resources used by people which may result in offensive odors, visual impacts, as well as soiled livestock, crops, clothes, recreational equipment, pets, and hands/feet.

In aquatic areas with high energy (e.g., waves, turbulent river flows, and/or high sediment deposition), the oil may become buried under or mixed into the substratum where it may remain for extended periods of time and may be slowly released to the environment to re-oil downstream habitats and resources. In some cases, the buried oil would be in an anoxic environment and would resist weathering by physical or biological processes. Upon release to the environment, this “unweathered” oil may result in additional but delayed impacts.

Chemical and Toxicological Impacts

Toxicological impacts are the result of chemical and biochemical actions of petrogenic compounds (primarily PAHs and volatile/semi-volatile fractions) on biological processes of individual organisms. Results may include: various toxic effects to animals and birds as they try to remove the oil from their fur or feathers; direct and acute mortality; sub-acute interference with feeding or reproductive capacity; disorientation; narcosis; reduced resistance to disease; tumors; reduction or loss of various sensory perceptions; interference with metabolic, biochemical, and genetic processes; and a host of other acute or chronic effects. Fish and aquatic invertebrates in standing water habitats such as wetlands, lakes and ponds may be narcotized by exposure to dissolved fractions of crude or refined oil if the dose-response exposure is great enough.

Oil spills are not likely to have toxic effects on humans, livestock, and wildlife although fumes from spilled oil may make people sick if they are exposed long enough to high concentrations in the air. Other than response personnel, people generally are restricted from areas where fumes from spilled oil could pose a potential health threat and farmers and ranchers would be encouraged to move their livestock and assisted to do so if necessary in areas where fumes posed a threat to livestock.

Biological Impacts

The physical and chemical impact processes described previously are manifested at the organism level. Additional biological and ecological impacts may manifest in local populations, communities, or entire ecosystems depending on the location, size, type, season, duration, and persistence of the spill, as well as the type of habitats and biological resources exposed to spilled oil. Except for some endangered, threatened, or protected species, loss of a small fraction of a population of organisms would result in a minimal impact at a community to ecosystem level. Loss or reproductive impairment of a significant portion of a population or biological community from an oil spill could result in a significant environmental impact. The impact is likely to be greater if the species affected have long recovery times (e.g., low reproductive rates); limited geographic distribution in the affected area; are keystone species in the ecosystem; are key habitat formers; or are otherwise a critical component of the local biological community or ecosystem. Furthermore, if the species or community is a key recreational or commercial resource, biological impacts manifested at the population or community level may constitute a significant impact to human uses of the resource.

Oil Spill Scenarios

A range of spill scenarios is provided to facilitate the impact assessment. It is impractical to evaluate all reasonably likely, let alone possible, combinations of factors that are associated with and constitute an oil spill impact assessment. Most spills that may result in significant environmental impacts are likely to be large crude oil spills from the proposed pipeline. For that reason and because a key criterion for the OPS spill reporting system is volume of oil released, spill scenarios were based on the spill volumes discussed in Section 3.13.4.1. The volumes characterizing each of the five categories are meant to be a guide and are not official or fixed. One or more of the factors influencing a spill could change the impacts dramatically. For example, a small spill of 2,000 gallons (~48 bbl) into an inter-connected wetland system in spring where thousands of migrating waterfowl are resting could cause substantial impacts, whereas a very large spill of 230,000 gallons (~5,500 bbl) onto a frozen, snow-covered pasture in winter may result in minimal impact on the natural or human use environment.

The spill scenarios used in this EIS — especially for the large-volume spills — likely overestimate, and in some cases substantially overestimate, the potential spill impacts.

Very Small and Small Spills

The most common scenarios are the very small (<5 bbl) and small (5–49.9 bbl) spills of material—usually diesel, hydraulic fluid, transmission oil, or antifreeze—on work pads, roads, and facility parking or work areas. Some of these small spills may result from slow and small (pin hole) leaks of crude oil from the proposed pipeline. Most of these small spills would not reach non-facility land or waterbodies. However, some of the spills could reach natural or cultivated land, or could seep into the soil toward groundwater or into nearby waterbodies remote from the roads and pads. The few spills that could reach terrestrial habitats typically would affect a limited area adjacent to the road, ROW, or pad. Even those spills that do reach waterbodies generally would result in a limited impact because of the small volume of oil involved.

Substantial and Large Spills

Substantial (50–499.9 bbl) and large (500–5,000 bbl) spills would be much less likely to occur (see Section 3.13.2. and 3.13.3). Substantial spills would more likely:

- Relate to accidents at or in transit to construction and operation/maintenance sites;
- Comprise refined products (though they may be composed of crude oil from a small leak in the proposed pipeline or at a pump or metering station); and
- Occur on or near roads, construction pads, facility sites, or along the ROW.

Large spills would more likely be crude oil releases from the proposed pipeline and would likely occur in the ROW. Both substantial and large spills would likely result from tanker truck accidents (during construction), major failure of the fuel storage tanks at construction sites, outside forces such as excavators and major earth movement, or corrosion of the pipe. Substantial and especially large spills would be more likely than small ones to reach natural or agricultural lands, or waterbodies adjacent to the ROW, roads, and pads. For those spills that do reach waterbodies, especially flowing streams and rivers, the area of impact generally would be more extensive than for the small spills because of the larger volume of oil involved. Likewise, the potential for large spills to reach groundwater surfaces is greater than for small spills. Large spills that result from a rupture in the proposed pipeline, for whatever reason, would likely be detected quickly by the SCADA system; both automatic and manual responses would be quickly activated to stop and isolate the leak.

Very Large Spills

Avery large (>5,000 bbl) spill would be a very unlikely event (see Section 3.13.2 and 3.13.3) and would result from a major rupture or a complete break in the proposed pipeline that releases crude oil somewhere along the ROW. Causes might include: major earth movement resulting from slides; major earth movement resulting from an earthquake; major flood flows eroding river banks at non-HDD crossings; mechanical damage from third-party excavation or drilling work; or vandalism, sabotage, and terrorist actions. The actual volumes spilled could vary depending on a number of factors, including:

- Locations, activation methods, and activation delay times for valves;
- The amount of pressure in the line;
- Location of the break; and

- The extent to which the proposed pipeline follows topographic contours, and the location of low spots in the pipeline relative to the break.

Until final alignments are determined and proposed pipeline construction completed, the largest and most likely potential spill volumes cannot be estimated precisely or accurately.

A very large spill would be likely to reach both land and adjacent waterbodies, especially if it occurs in the ice-free seasons and near waterbodies. The proximity of the proposed pipeline to major streams and rivers may be the most important factor in spill scenarios. In general, if the spilled material flows to dry land, natural or agricultural, the oil probably would not disperse far. Crude oil is more viscous and would percolate downward through porous soil more slowly than gasoline, diesel fuel or other refined products. A substantial portion of crude oil may adhere to soil particles, thereby reducing the amount that could potentially reach the groundwater and/or nearby water wells (Section 3.3.1.1). Once at the upper groundwater surface, most crude oil would float and may move downgradient with the groundwater. However, if a very large spill reaches a flowing creek or river, the oil could be dispersed substantial distances downstream. Flood flows could distribute spilled oil over flooded natural, agricultural, or residential/commercial lands and could flow into ponds, reservoirs, and lakes. Whether a very large spill would reach these rivers or streams would depend on several variables, including the oil type, ambient water and air as well as oil temperature, and volume of oil spilled; the topographic relief and slope; presence of snow or vegetation; and response time and actions.

Assessment of Impact Magnitude

Based on the worldwide extensive experience and literature accumulated over the past 50 years by scientists, engineers, planners, economists, managers, and other stakeholders on oil spill impacts to ecosystems and human uses (e.g., API 1992, API 1997, NRC 1985, 2003a, 2003b), one can make the general statement that the magnitude of impact is primarily a function of size of the spill, type of oil, and sensitivity of the receptors affected.

For this EIS, the type of oil expected to have the greatest likelihood of significant impacts is crude oil (diluted bitumen or syncrude) from the proposed pipeline. These two versions of crude oil are similar enough that they are treated as one for purposes of this impact assessment. Therefore variations in spill size and receptor type are key variables for estimating the magnitude of environmental impacts of oil spills from the Project. Spill size can be measured or estimated within a reasonable margin of error in most cases. Receptor sensitivity is more subjective and is influenced by both the perspectives and biases of the evaluators, and the actual sensitivity of the receptors to the oil. For example, a farmer whose grain field is oiled is likely to consider impacts to his field more significant than spill related impacts on a major wetland that supports threatened and endangered species, recreational hunting, and other recreational opportunities. Conversely, a national wildlife refuge manager is likely to have a diametrically opposed evaluation. The relative sensitivities of receptors that could be affected by the Project are presented as a hierarchy in Table 3.13.4-1, based on historical spill sensitivity assessments and typical input from the range of stakeholders taken as a group.

The magnitude of environmental impacts generally increases within a receptor type as spill size increases (i.e., from left to right in the table). Within a spill size, the magnitude of impact increases with increasing sensitivity of the receptors (i.e., from top to bottom in the table). Combining size and sensitivity, the magnitude of impacts generally increases from top left to bottom right in the table. In many oil spills, there are clear differences in the way that stakeholders (e.g., general public, non-governmental organizations, natural resource management agencies, regulatory agencies, enforcement agencies, private businesses, municipal agencies, and others) value spill related impacts on natural resources and habitats compared to spill related impacts on human uses. Table 3.13.4-2 reflects a consensus on the ranking of these values, recognizing that the concept of "impact assessment and magnitude" is anthropogenic and not a component of ecosystem function.

For this EIS, five levels of environmental impact are considered and are entered into the table to indicate the generally expected magnitude of impacts from oil spills. The magnitude of impact may vary, up or down and possibly substantially, from these general trends—depending on a number of site-specific variables described previously. The five levels of impact are:

- **Negligible Impact –** Little to no detectable impact on most resources; may be some visible presence of oil on land, vegetation, or water. Zero to very few organisms apparently killed or injured. Temporary (days) and spatial distribution localized to spill site. No detectable effects on USAs and HCAs.
- **Minor Impact –** Measurable presence of oil and limited impacts on local habitats and organisms. Temporary (days to weeks) and local (acres). Some organisms, likely birds, fish, and aquatic macroinvertebrates, may be killed or injured in the immediate area. May have very limited effects on USAs and HCAs.
- **Substantial Impact –** Patchy to continuous presence of oil on terrestrial and aquatic habitats near the spill site. Impacts may be present for weeks to a few months and affect tens of acres or a few miles of stream/river habitat. May have local biological community and population level effects on organisms and human uses of the area. May have detectable effects on USAs and HCAs.
- **Major Impact –** Patchy to continuous and heavy presence of oil on terrestrial and aquatic habitats near the spill site and for substantial distances downgradient. Impacts may be present for weeks to months and potentially for a year or more. Area may include many acres to sections of land or wetlands, and several miles of riverine habitat. May have local biological community and population-level impacts on organisms and habitats, and disruption of human uses of local oiled areas. May have substantial effects on exposed USAs and HCAs.
- **Catastrophic Impact –** Mostly continuous or nearly continuous presence of oil on all habitats near and/or for substantial distances downgradient of the spill site. Impacts may be present for months to years. Area may include many acres to sections of land or wetlands, and several to numerous miles of river or other aquatic habitat. May be both local and regional disruption of human uses. May be both local and regional impacts to biological populations and communities. May have significant to catastrophic effects on exposed USAs and HCAs.

TABLE 3.13.4-2
Significance and General Relationship of Environmental Impacts of Crude Oil Spills with Increasing Oil Spill Size and Increasing Sensitivity of Receptors

	Size of Spill (in barrels)				
Type of Receptor [a]	**Very Small (<5)**	**Small (5-49.9)**	**Substantial (50-499.9)**	**Large (500-5000)**	**Very Large (>5000)**
Terrestrial–agricultural land	Negligible	Negligible to minor	Minor to substantial	Minor to substantial	Substantial
Terrestrial–natural habitat	Negligible	Minor	Minor to substantial	Substantial	Substantial
Groundwater	Negligible	Negligible	Negligible to minor	Minor to substantial	Substantial
Aquatic–wetlands	Negligible	Minor	Minor to substantial	Substantial	Major to catastrophic
Aquatic–lakes and ponds	Negligible	Negligible to minor	Minor to substantial	Substantial	Major
Aquatic–streams and small rivers	Negligible	Negligible to minor	Substantial	Major	Major to catastrophic
Aquatic–large rivers	Negligible	Negligible	Minor	Substantial to major	Major to catastrophic
Threatened and endangered species and habitat	Negligible to minor	Minor to substantial	Substantial	Substantial to major	Major to catastrophic
Human use–commercial	Negligible	Negligible to minor	Minor	Minor to substantial	Substantial to major
Human use–residential	Negligible	Negligible to minor	Minor	Minor to substantial	Substantial to major
Human use–recreational	Negligible	Negligible to minor	Minor to substantial	Substantial to major	Major to catastrophic

[a] In increasing order of sensitivity from top to bottom.

3.13.5 Resource-Specific Impacts

This section addresses potential impacts related to the resources described in Sections 3.1 through 3.12 from very small spills (less than 5 bbl and mostly less than 1 bbl) to very large spills (>5,000 bbl). The impact assessment is based on the past 60 years of nationwide experience and relevant literature. As discussed earlier (sections 3.13.3.3 and 3.13.3.4), the vast majority of historical pipeline-related spills have been:

- Very small or small;
- Contained within the boundaries of the secondary containment or at least on the ROW, pads, and roadways;
- Cleaned up expeditiously; and
- Characterized by natural resources impacts that are limited in area, duration, and size.

However, because large to very large spills from large oil pipelines have occurred or could occur, albeit with very low probability, the impacts of such spills are also discussed.

Additional or corroborative information on the potential impacts of oil spills is presented in Section 4.0 of the Keystone XL Project Pipeline Risk Assessment and Environmental Consequence Analysis (Keystone 2009d).

3.13.5.1 Air

Impacts on air quality from an oil spill would be localized and transient, even for very large spills. Evaporation of the lighter hydrocarbon fractions typically occurs within one to a few days, and the vapors are usually dissipated below risk levels within a short distance of the source. The oil spill response contractors or Keystone pipeline health and safety personnel would monitor air for hydrocarbon vapors. They would restrict public access to areas exceeding specified risk levels while also ensuring that authorized personnel within the restricted areas are equipped with and using appropriate personal protective equipment. They would also advise the nearby farmers and ranchers of potential hazards to livestock and other farm animals, and assist them in moving the livestock to protect the livestock from deleterious hydrocarbon concentrations.

Based on models by Hanna and Drivas (1993), the majority of volatile organic compounds (VOCs) from crude oil spills would likely evaporate almost completely within a few hours after the spill occurred, especially during late spring/early fall when air and soil surface temperatures are higher. Emissions of VOCs, such as benzene, ethylbenzene, xylene, and toluene, would peak within the first several hours after the spill starts and drop by two orders of magnitude after approximately 12 hours. The heavier compounds take longer to evaporate, particularly at the colder temperatures typical of the winter season, and might not peak until more than 24 hours after the spill. In the event of an oil spill on land, the air quality effects would be less severe than those for a spill on water because some of the oil could be absorbed by vegetation or into the ground. However, some effects might last longer on land before the VOC compounds are completely dissipated.

Diesel fuel oil, kerosene and similar hydrocarbons could be spilled during refueling, from a broken diesel pipeline, or from accidents involving vehicles or equipment. A diesel spill would evaporate faster than a crude oil spill. Ambient hydrocarbon concentrations would be higher than for a crude oil spill but also would persist for a shorter time. Also, because any such spill would probably be smaller than potential crude oil spills, any air quality effects from a diesel spill likely would be even lower than for other spills.

Gasoline and many of the solvents would evaporate and disperse very rapidly. Almost all the volume released would evaporate, except for small amounts that may seep into the upper soil and vegetation layers from which it would be released over a day to days. Gasoline vapors are generally not toxic at the concentrations experienced in spills but they may be subject to fires and explosions. Keystone and its contractors would restrict the public as well as cleanup personnel from potentially dangerous areas.

Impacts on air quality related to oil spills would be localized and short term. The associated VOC air emissions would result in little impact on the biological or physical resources of the project area.

3.13.5.2 Geology

The proposed Project does not involve geological features that have received state or federal protection. Consultation with Indian tribes along the proposed route is ongoing, and at this time none have identified any geological features of tribal significance along the route, although concerns related to paleontological resources have been identified. These and other geologic resources are addressed in the following sections.

Paleontological Resources

Most spills would be confined to a construction or facility pad, access roadway, or pipeline ROW, or to an adjacent area. The primary exceptions would be large to very large spills from pipelines that affect areas beyond the ROW. For example, a large to very large spill may enter a river crossing the ROW, and oil may be carried for several miles downstream. Any paleontological resources exposed along the river banks within the river reaches affected by the spill could be affected. Cleanup activities could also damage the paleontological resources. Keystone, in collaboration with appropriate local, state, and federal agencies and Indian tribes would develop a Paleontological Mitigation Plan and, in Montana, an MOU to identify and protect significant fossil resources that may be encountered during construction or damaged as the result of an oil spill.

Mineral and Fossil Fuel Resources

For surface and near-surface resources such as sand, gravel, clay and stone, small to substantial spills may result in localized reduction in resource availability and value depending on actions involved in the incident response and subsequent remedial activities. For large and very large spills, the impacts may be proportionally greater. However, the distribution of these mineral resources and their relatively undeveloped state along the ROW indicate that the overall potential for impacts to the resources and their associated industries would be small.

The proposed route would cross deposits of sand, gravel, clay, and stone; but the acreage of deposits covered by the proposed ROW is insignificant compared to the total acreage of deposits present in each state. The proposed route would not cross any currently active aggregate mining operations. Thus, impacts from spills in the vicinity of these resources would be negligible for small or even substantial spills that are rapidly contained. Even large spills would result in minor impact because of the wide spatial distribution of these resources and their current state of development.

The proposed Project route would not cross the well pads of any active or proposed oil or gas wells, although active oil and gas wells are located nearby the proposed ROW (Keystone 2009a) Impacts of spills of any size that are rapidly and effectively addressed would not be likely to result in any contamination or alteration of these oil and gas resources due to the proposed pipeline’s location and the depth and containment afforded by the extraction equipment, operations, and sites.

Geologic Hazards

The importance of geologic hazards in the context of oil spills is the potential that such hazards could be the source of external forces that could potentially damage the pipeline and increase the oil spill risk. The proposed pipeline would not be located within mountain belts but rather within the relatively flat and stable continental interior. Consequently, the potential for impacts from geologic hazards is lower than for facilities located in active mountain belts or coastal areas. Nonetheless, at some locations along the proposed route, seismic hazards, landslides, subsidence, or flooding may occur. Locations where such risks exist are presented in Section 3.1.4.1.

Seismic Hazards

As part of its National Pipeline Mapping System (NPMS) program, the DOT has compiled data from a variety of sources to identify areas of high geologic hazard potential for pipelines (DOT 1996). The Integrity Management Rule of 2002 states that segments of pipeline with a high geologic risk and the potential to affect HCAs must implement protective measures. HCAs are specific locales and areas where a release could result in more significant adverse consequences.

In accordance with federal regulations (49 CFR 195), Keystone would conduct an internal inspection of the proposed pipeline if an earthquake, resulting landslide, or soil liquefaction event was suspected of causing abnormal pipeline movement. Thus, any damage to the proposed pipeline would quickly be detected, and impacts resulting from crude oil releases would be minimized.

In the event that an oil spill is caused by an earthquake the oil would likely move downgradient on land and/or on the water, and impact habitat, biological resources, agricultural, commercial and/or recreational activities, and other activities as described in Section 3.1.

Landslides

Most of the proposed project route is not located in landslide-prone terrain, but the proposed route does cross areas of high landslide potential as described by the NPMS and presented in Table 3.1.4.1-10. Keystone has considered landslide potential in its routing work and has selected crossings of these areas where the landslide potential is considered minimal.

The Project would be designed and constructed in accordance with 49 CFR, Part 195. These specifications require that proposed pipeline facilities are designed and constructed in a manner to provide protection from washouts, floods, unstable soils, landslides, or other hazards that may cause the proposed pipeline facilities to move or sustain abnormal loads. Proposed pipeline installation techniques, especially padding and use of rock-free backfill, are designed to provide protection to the proposed pipeline from minor earth movements.

Keystone plans to limit the potential for increased landslide risk by preserving or improving the contour of native slopes; preserving or improving drainage patterns; and, in some circumstances, considering the use of light-weight granular material surrounding the pipe to protect it from small ground movements. Keystone has proposed erosion and sediment control and reclamation procedures in its CMR Plan (Appendix B) that are expected to limit the potential for erosion and enable slopes to remain in a stable configuration following construction. The proposed mitigation measures would reduce the risks to the proposed pipeline and environment due to landslide hazards.

The potential for landslide activity would be monitored during operations through aerial and ground patrols and through landowner awareness programs, which are designed to encourage reporting from local landowners of events that may suggest instability or other threats to the integrity of the proposed pipeline.

In addition to the landowner/tenant communication measures contained in Keystone's CMR Plan (Appendix B), Keystone would develop and implement a Landowner Awareness Plan that specifically addresses landslide awareness with landowners and complies with the recommendations in API Recommended Practice 1162 (Public Awareness Programs for Pipeline Operators).

In the event that an oil spill is caused by a landslide, the oil would likely move downgradient on land and/or on the water, and impact habitat, biological resources, agricultural, commercial and/or recreational activities, and other activities as described in Section 3.1.

Subsidence

Although a potential result of soil liquefaction during seismic events, subsidence hazard generally is a consequence of the presence of karst features, such as sinkholes and fissures. Keystone reviewed national karst maps (Tobin and Weary 2005) to determine areas of potential karst terrain (i.e., areas where limestone bedrock is near the surface) along the proposed pipeline route (see Section 3.1 for a Karst map). The overall risk to the Project and environment from karst-related subsidence is expected to be minimal.

In the event that an oil spill is caused by subsidence, the oil would likely collect in the subsided area. To the extent the volume exceeds that which could be retained in the subsided area, the surplus oil would likely move downgradient on land and/or on the water, and impact habitat, biological resources, agricultural, commercial and/or recreational activities, and other activities as described in Section 3.1.

Floods

Floods can cause lateral and vertical scour that could expose the proposed pipeline to damage. Keystone has not completed scour analysis for all stream crossings, but proposes to use HDD at major river crossings and to bury the proposed pipeline under at least 5 feet of cover for at least 15 feet (CMR Plan, Appendix B) on either side of the bank full width of all rivers, creeks, streams, ditches, and drains. Although there is a risk of pipeline exposure due to lateral or vertical scour at water crossings, Keystone's Site Specific Waterbody Crossing Plans (Appendix D) detail procedures that would be used at water crossings to reduce these potential risks.

In the event that an oil spill is caused by a flood, the oil would likely move downcurrent with the flood water and impact habitat, biological resources, agricultural, commercial and/or recreational activities, and other activities as described in Section 3.1.

3.13.5.3 Soils and Sediments

Soils

The impact of oil spills on soil is a function of several variables, including the type of oil (in this case, refined versus crude), permeability of the soil, type and amount of vegetation and other surface cover, and the release point (e.g., above or on the surface or below ground).

Crude oil, lubricating oil, and similar heavy oils would be somewhat less likely to reach the surface soil layers than refined oil (for example, gasoline or diesel), which could infiltrate through the vegetation, debris, and litter cover. Refined products would be more likely to reach the soil, especially in the warmer snow-free seasons, because their low viscosity would allow penetration into vegetation and even thin snow layers.

Once oil reaches the soil surface, the depth of penetration into the soil would depend on the porosity of the soil and the extent to which it is frozen or water saturated. The area affected would be limited to that area immediately adjacent to and covered by the spill. Porous soils (e.g., sand, gravel, and moraines) are more permeable than clays and silts. Karst areas, especially where the karst formations are close to the surface and the overlying soils are porous, may be especially vulnerable to impacts from a spill, if the oil reaches and moves through the karst.

Spills could affect soils indirectly by affecting the vegetation, which in turn could die and expose the soil to water and wind erosion or solar heating, even if the soil itself was not directly affected by the spilled material. Spill cleanup is more likely to affect the soils than the presence of the spilled material itself, unless the cleanup is well controlled and heavy traffic and digging are minimized (especially for summer spills). Oil that adsorbs to or is retained between soil grains may weather only slowly over one to several years and cause low-level chronic impacts to plants and subterranean animals.

Sediments

Sediments (defined here as submerged soils in wetlands and aquatic habitats) are typically fine grained, saturated with water and may be covered by or integrated with a substantial amount of organic material primarily from riparian and aquatic vegetation. The sediment may be more coarse-grained in fast-flowing streams and rivers, and in areas where glacial moraines dominate the soil types. Crude or refined oils typically do not penetrate beyond the surface layer in sediments unless (1) there is a substantial amount of turbulence that mixes the oil and sediments, followed by deposition of the mixture in low energy areas; (2) the interstitial spaces are large enough (e.g., in gravel and coarse sand) to allow for penetration of the oil as it sinks; or (3) physical activities associated with spill response actions mix the surface-deposited oil-sediment mixture into deeper subsurface levels of the sediment profile. Refined products also typically would not penetrate sediments because of the water content but may penetrate or be mixed further into the sediments under the same turbulent or cleanup actions as for crude oil.

Oil deposited on and remaining in the top sediment layer, especially in aerobic environments, may affect the benthic biological community but would be subject to biodegradation by microbes, which would eliminate long-term impacts. Oil that is incorporated into sediments, especially in the anaerobic subsurface levels, may weather very slowly. However, because the anaerobic surface levels are isolated from most of the biological community, this scenario would result in negligible environmental impacts.

3.13.5.4 Water Resources

Surface Water

Spills could affect surface freshwater quality if spilled material reaches waterbodies directly or from flowing over the land. However, the vast majority of spills would be confined to a pad, a road, or an area in or adjacent to the proposed pipeline ROW. The volumes of most spills would be very small to small (i.e., fewer than 50 bbl). In addition, for some portion of the winter months each year, spill responsders could remove almost all spilled material from frozen ground or ice-covered waterbodies prior to snowmelt. During the rest of the year, spills could reach and affect wetlands, ponds and lakes, as well as creeks and rivers before spill response is initiated or completed.

An oil spill that reached a freshwater body could cause reduced DO concentrations and increased toxicity to aquatic organisms. Because oil slicks are less permeable to oxygen than water, spilled material that reached wetlands ponds or small lakes could lower DO concentrations due to a decreased influx of atmospheric oxygen and the relatively high rate of natural sediment respiration in many shallow waterbodies. In small, shallow waterbodies with limited water movement and thus mixing of the water column (e.g., small lakes, farm reservoirs, stock ponds) and often with an already high organic load in the waterbody, the addition of oil may increase biodegradation rates to the point that oxygen levels are further reduced. The low DO levels may result in the death of fish, amphibians, macroinvertebrates, and vegetation in these waterbodies.

In winter, however, a small spill would not likely cause an oxygen deficit in most waters because biological abundance and activity are depressed, thus water column respiration rates are low to negligible. Furthermore, sediment respiration has less relative effect in lakes that are too deep to freeze solid. Such lakes tend to be supersaturated with DO in winter (BLM and MMS 1998). An exception to such conditions could occur if spilled material were introduced to a waterbody beneath the ice cover, in very restricted waters with depleted oxygen levels and a concentrated population of overwintering fish.

During open water periods in most waterbodies, especially larger lakes, rivers, and streams, spilled materials would result in no detectable impacts on DO levels. The high water volume (relative to the volume of oil) or the high rate of water flow would disperse oil before it affected DO concentrations.

The primary effect of an oil spill would be direct toxicity to aquatic plants and animals. Containment and cleanup response likely would recover the bulk of spilled oil, but sufficient oil could remain trapped in sediments or aquatic vegetation that some long-term, low-level toxicity might occur on a local basis. Long-term toxicity would be less likely to occur in larger lakes and rivers because oil would be diluted or dispersed within the sediment over large areas by currents and wind and wave action. Spills into larger rivers and creeks, especially during open water periods, might result in some toxicity within the water column itself. However, because of the large and rapid dilution of the oil relative to the flow volumes, these impacts would likely be limited to the first few back eddies, calm water regions and reservoir pools down current of where the spill entered the river. In the smaller flowing streams, an oil spill could cause direct toxicity impacts in the water column and sediments because of the lower relative volume and rate of water flow, and thus higher likelihood of direct contact between the biota and the dispersed oil. Some toxicity might persist in these streams for a few weeks to months, until toxic compounds trapped in the sediment were washed out or until oiled sediment was covered by cleaner sediment.

Most oil spills reaching larger lakes would result in minimal effects on water quality. DO levels would not be affected. Direct toxicity would be minimal because of the high dilution volume in these lakes. Spreading of the spill over the lake surface could be considered an effect on water quality. This effect could exist for days to a few weeks, until the slick was cleaned up or the oil was stranded on the shoreline.

Although spills are not considered a part of routine operations, there is the possibility of a crude oil release occurring with the potential to affect surface waterbodies. A large spill could affect drinking water sources and irrigation water supplies. Implementation of the procedures in Section 3 of Keystone's CMR Plan (Appendix B) would minimize the potential for spills and leaks to affect surface water resources. Keystone's ERP would describe actions to be taken to reduce the potential for crude oil releases to affect surface water and groundwater resources.

Minor temporary to short-term surface water quality degradation is possible from maintenance equipment and vehicle spills or leaks. During all construction activities, all refueling would be conducted at least 100 feet away from all surface waterbodies. Although washout-related spills are not considered a part of routine operations, in the event that channel migration or streambed degradation threatened to expose the proposed pipeline, protective activities such as reburial or bank armoring would likely be implemented. In its CMR Plan (Appendix B), Keystone has committed to a minimum depth of cover of 5 feet below the bottom of all waterbodies, maintained for a distance of at least 15 feet on each side of the edge of the waterbody (CMR Plan, Appendix B)

Control valves would be installed on both sides of larger perennial streams for the Project. In the event of a crude oil release, the presence of valves and enactment of Keystone's ERP and spill containment measures would minimize (though not eliminate) the potential for substantial crude oil releases to affect surface water resources.

Groundwater

Substantial spills of refined products, especially diesel, and substantial to very large spills of crude oil may reach groundwater where the overlying soils are porous and not water saturated, and the water table is relatively near the surface. Areas near major wetlands and meandering streams or rivers are key examples where the water table may be close to the surface and the soils are wet to saturated, depending on rainfall and snowmelt conditions. In some of these areas, it may be difficult to distinguish between groundwater and surface water.

Diesel fuel or gasoline has a low viscosity and likely would percolate toward the water table, where it would float on the water. It may move downgradient with the groundwater, although potentially at a lower rate than the groundwater. Some of the diesel may become dispersed in the groundwater, contaminating the groundwater for agricultural or domestic drinking supply uses. Some of the diesel may become adsorbed or adhere to soil grains and remain there for years as it very slowly weathers or degrades. The oil-contaminated groundwater may contaminate surface waters (e.g., wetlands, ponds and lakes, streams and rivers) if the groundwater surfaces and discharges into these surface water areas.

Crude oil is more viscous than refined products and would percolate downward more slowly. Furthermore, a substantial portion of the crude oil may adhere to the soil particles, thereby reducing the amount that reaches groundwater. Once crude oil reaches the groundwater surface, most of it would float and may move downgradient with the groundwater, although probably more slowly. The oil also would undergo some biodegradation, adsorption to soil particles, and dispersion into water, causing a natural attenuation and remediation of the contamination. Like diesel fuel, crude oil may reduce or eliminate agricultural or domestic use of the groundwater and may contaminate surface waterbodies if the contaminated groundwater discharges into these waters.

Overall, it is not anticipated that groundwater quality would be affected by disposal activities, spills, or leaks during construction activities. Many of the aquifers present in the subsurface beneath the Steele City segment of the proposed route are isolated by the presence of glacial till, which characteristically inhibits downward migration of water and contaminants into these aquifers. However, shallow or near-surface aquifers are also present beneath the proposed route. Temporary fueling stations would be used to refuel construction equipment. To prevent releases, fuel tanks or fuel trailers would be placed within secondary containment structures equipped with impervious membrane liners. Implementation of procedures outlined in Keystone's CMR Plan (Appendix B) would assure that (1) contractors would be prepared to respond to any spill incident; and (2) all contaminants would be contained and not allowed to migrate into the aquifer during construction activities, regardless of the depth of the underlying aquifer.

During the life of the Project, potential minor short to long-term groundwater quality degradation is possible from equipment and vehicle spills or leaks. Routine operation and maintenance is not expected to affect groundwater resources; however, if a crude oil release occurred, crude oil could migrate into subsurface aquifers and into areas where these aquifers are used for water supplies. Keystone's ERP would describe actions to be taken in the event of a crude oil release or other accident.

Wetlands

Impacts of crude oil spills or refined product spills on wetlands are influenced by the type of oil, the amount and proportion of water surface area covered, the type of vegetation present in the wetland, and cleanup response actions. Refined products tend to be more toxic than crude oil, while crude oil tends to cause more physical impacts (e.g., smothering). Because refined or crude oil tends to remain on the water surface, it may affect oxygen exchange between water and air, and may result in a low DO environment under the slick if the slick is large and continuous. Toxic components of a refined product slick may dissolve and disperse over a large area. Because the oil adheres to the vegetation, dense stands of emergent vegetation can act like oil booms and collect oil at the edges of the stands. As noted earlier, crude oil tends to infiltrate the vegetation stands less than refined products because the crude oil is more viscous. Aggressive and intrusive cleanup methods can mix oil with water and sediments (which are often anoxic below the surface layer), where the oil may have long-lasting impacts. Furthermore, these cleanup methods may have greater direct effects on vegetation, sediments, and animals than oil. Passive cleanup methods, especially natural attenuation and biodegradation processes, are likely to cause less impact on wetland resources.

Spills of refined product (e.g., diesel or gasoline) that affect wetlands would be more likely to occur during construction. The majority of these spills would be very small to small spills from construction pads or access roads. If the spills occur in winter, the wetland may be covered in ice and spilled product may be contained by snow or remain on top of the ice. In either case, the spilled oil would likely be recovered before it directly affected wetland habitat and associated organisms. For spills occurring during the rest of the year, most of the product would float on the water or wet soil surface, although some of the volatile fraction may dissolve or disperse in water where it could injure or kill organisms. Although gasoline spills evaporate quickly, there may be a short-term acute toxicological effect on animals in the wetland, and vegetation may be chemically "burned" from the water line up. Diesel spills tend to be more persistent, and diesel may infiltrate sediments as well as adhere to emergent vegetation. Potential impacts may include toxicological effects on plants and animals, smothering if oil is thick and/or continuous, and chemical burning of vegetation at water level (or over the tidal range in the southern portion of the Project in Texas).

Crude oil spills could occur only during operation. Most spills that could affect wetlands would occur in the ROW, either where the proposed pipeline would cross wetlands or waterbodies (e.g., ponds, lakes, reservoirs, streams, rivers, or adjacent riparian habitats) or where the spill site is on land but upgradient of the wetland. Crude oil spills that occur in winter may be restricted in the area affected, because the cold plus snow would increase the oil viscosity and the snow would act as a sorbent to slow the flow. In warmer seasons, large to very large spills of crude oil may flow into the wetlands, where oil would cover the water surface, coat plants and animals, and restrict oxygen exchange between air and water. Some of the crude oil may sink, become incorporated into the sediments, and remain there for years, depending on the amount of biodegradation and chemical or physical weathering that takes place.

Very small to substantial refined product or crude oil spills would generally cause negligible to minor impacts on wetlands unless the wetland is small and isolated from other waterbodies. In these cases, the ecological impacts may be substantial because the majority of the wetland may be exposed to the oil. Some substantial and many to most large to very large spills (likely of crude oil) could generally result in substantial to catastrophic ecological impacts on wetlands because of the large size of the spill and the proportion of the wetlands that would be affected. Impacts may approach a catastrophic level in areas where the wetlands are heavily used by migratory waterfowl and the spill occurs during the spring or fall migration.

3.13.5.5 Biological Resources

Vegetation

Most very small to substantial spills would occur during construction on maintenance pads, roads, or facility sites, and the spilled oil would not leave the construction sites. Most spills in the proposed pipeline ROW during construction and operation also reach land and not aquatic habitats. Consequently, the effects of most spills would not reach natural or agricultural terrestrial habitats and would negligibly affect the vegetation or associated animals. However, some of the substantial as well as large to very large spills could reach the adjacent vegetation and habitat by directly flowing from the facility or by spilling from a pipeline leak in the ROW.

For the winter months along much of the ROW, there may be sufficient snow cover to slow the flow of spilled oil and to allow spill cleanup efforts to occur before oil spreads substantial distances from the spill source. Thus, even a large spill would result in a limited impact to vegetation and habitat. However, cleanup operations could cause impacts on vegetation and habitat, if activities are not implemented carefully and with regard for minimal disturbance of the surface soils and vegetation. During the rest of the year when there is less to no snow cover, the spilled oil may flow farther on the land surface**.**

Most oil spills would cover less than an acre, but large to very large spills might cover several to tens of acres, depending on topography as well as the amount of water in and on the soil, and the density, rigidity, and structural complexity of grass/forb/shrub vegetation on the surface of the land. Overall, most past spills on terrestrial habitats have caused minor ecological damage, and ecosystems have shown a good potential for recovery, with wetter areas recovering more quickly (Jorgenson and Martin 1997, McKendrick 2000). The length of time that a spill persists depends on several factors, including oil and soil temperature, availability of oleophilic (oil-loving) microorganisms, soil moisture, and the concentration of the product spilled. For the most part, effects of land oil spills would be localized and are not expected to contaminate or alter the quality of habitat outside a limited area. Spills that occur within or near streams, rivers, and lakes could indirectly affect riparian vegetation and habitat along these waterbodies.

In the event that a large to very large spill occurred in an area that is “flooded”, especially if there were a downward gradient from the spill site, the oil may be transported over large areas and coat vegetation, including row crops, wild lands, seasonal wetlands, and grazing lands. The vegetation may be injured, killed or coated with oil but populations would suffer no significant adverse impacts. However, the vegetation may not be suitable for grazing animals and any commercial row or field crops would not be marketable.

Birds

Spills on or near the roads, pads, or facilities would not affect populations of birds, although a few individual shorebirds, waterfowl, raptors and very few passerine birds could be exposed to the spilled oil. These exposed individuals are likely to die from hypothermia or from the toxic effects of ingesting the oil. Potential similar impacts would be limited to a few individual birds, especially waterfowl and shorebirds, using the small ponds and creeks that could be affected by the very small to small spills. There may be a minor impact to scavenging birds and mammals if they eat the oiled carcasses. These spills would not cause a population-level impact.

A substantial to very large spill onto dry land could cause the mortality of shorebirds and passerines from direct contact with oil. If the spilled material entered local or interconnected wetlands, water-dependent birds and waterfowl and additional shorebirds could be exposed. The numbers of individuals oiled would depend primarily on wind conditions and the numbers and location of birds following entry of the spill into the water. Impacts may be detectable at the local population level, especially for resident species with limited geographic distribution.

If the spill entered a wetland, stream, or river, a variety of waterfowl and shorebird species could be present, particularly during the spring and fall migrations. Such losses are likely to cause negligible to minor impacts at the regional population level but may cause significant impacts at the local population level.

If raptors, eagles, owls, vultures, and other predatory or scavenging birds are present in the spill vicinity, they could become secondarily oiled by eating oiled birds. Mortality of breeding raptors likely would represent a minor loss for the local population but is not likely to affect the regional population.

If a large spill moved into the wetlands, adjacent riparian habitats, or the open water habitats of the major rivers along the ROW, several waterfowl species that breed, stage, or stop there during migration may be at risk. A spill entering a major river in spring, especially at flood stage, could significantly affect waterfowl in the short term by contaminating overflow areas or open water where spring migrants of several waterfowl and shorebird species concentrate before occupying nesting areas or continuing their migration.

Lethal effects would be expected to result from moderate to heavy oiling of any birds contacted. Light to moderate exposure could reduce future reproductive success because of pathological effects on liver or endocrine systems (Holmes 1985) that interfere with the reproductive process and are caused by oil ingested by adults during preening or feeding. Oiled individuals could lose the water repellency and insulative capacity of their feathers and subsequently die from hypothermia. Stress from ingested oil can be additive to ordinary environmental stresses, such as low temperatures and metabolic costs of migration. Oiled females could transfer oil to their eggs, which at this stage could cause mortality, reduced hatching success, or possibly deformities in young. Oil could adversely affect food resources, causing indirect, sub-lethal effects that decrease survival, future reproduction, and growth of the affected individuals.

In addition to the expected mortality due to direct oiling of adult and fledged birds, potential effects include: mortality of eggs due to secondary exposure by oiled brooding adults; loss of ducklings, goslings, and other non-fledged birds due to direct exposure; and lethal or sub-lethal effects due to direct ingestion of oil or ingestion of contaminated foods (e.g., insect larvae, mollusks, other invertebrates, or fish). Taken together, the effects of a large spill may be particularly significant for individual waterfowl and their post-spill brood. Population depression at the local or regional scale would be greater than for smaller spills. However, the effects of even a large spill would be attenuated with time as habitats are naturally or artificially remediated and populations recover to again utilize them.

Mammals

Most oil spills, even large to very large ones, would result in a limited impact on most of the terrestrial mammals found in the proposed pipeline area. The extent of impacts would depend on the type and amount of oil spilled; the location and terrain of the spill; the type of habitat affected; the mammals' distribution, abundance, and behavior at the time of the spill; and the effectiveness of the spill cleanup response. The proportion of habitat affected would be very small relative to the size of the habitat utilized by most of the mammals. In addition, most of the mammals would not be present or would be limited in abundance and distribution in the project area during the winter months.

A large to very large spill that reaches the land in or adjacent to the proposed pipeline ROW could affect terrestrial mammals directly or indirectly through impacts to their habitat or prey. For example, a large spill likely would affect vegetation, the principal food of the larger herbivorous mammals—both wild (e.g., ungulates) and domestic (i.e., cattle, sheep, and horses). Some to most of these animals probably would not ingest oiled vegetation, because they tend to be selective grazers and are particular about the plants they consume. Many of the predators and scavengers (e.g., bears and raccoons) may feed on birds, other mammals, reptiles, and fish that are killed or injured by exposure to oil and thus become exposed themselves to oil toxicity impacts. However, these effects would not generally be life threatening or long term for the predator/scavenger (White et al. 1995). For most spills, control and cleanup operations (ground traffic, air traffic, and personnel) at the spill site would frighten wild animals away from the spill and reduce the possibility of these animals grazing on the oiled vegetation. Nevertheless, the spilled oil could affect the vegetation and reduce its availability as food for several years. This impact would be limited in area and would not affect the overall abundance of food for the grazing mammals in the project vicinity.

For large spills that are not immediately or successfully cleaned up, the potential for contamination would persist for a longer time and the likelihood of animals being exposed to the weathered oil would be greater. Cleanup success could vary, depending on the environment. Over time, any remaining oil would gradually degrade. Although oiling of animals would not likely remain a threat after cleanup efforts, some toxic products could remain in soil, aquatic sediments, or in or on plant tissues for some time. Depending on the spill environment, part of the oil could persist for up to 5 years.

Small mammals and furbearers could be affected by spills due to oiling or ingestion of contaminated forage or prey items. These impacts would be localized around the spill area and would not cause population-level impacts.

Fish and Other Aquatic Species

If the oil reached aquatic habitats, spills could affect fish, macroinvertebrates (e.g., mussels, crustaceans, insects, and worms), algae and other aquatic plants, amphibians, and reptiles. Aquatic habitats include wetlands (Section 3.4) as well as ponds, lakes, reservoirs, drainage ditches, streams and rivers, (Section 3.7). There are about 30 miles of pipeline ROW over karst formation in Oklahoma and another 21 miles in Texas where there are potential aquatic resources; however, these karst formations are typically overlain with at least 50 feet of sediment and are unlikely to be impacted by an oil spill (Section 3.1.4.1)

The vast majority of spills would be very small to substantial and the impacts would likely be negligible to minor. Most spills would be confined to a construction or maintenance pad, road, facility site, adjacent area, or the proposed pipeline ROW. Spill response would contain and remove almost all of the oil from ice-covered waterbodies prior to snowmelt during winter. During the rest of the year, spills could reach and affect waterbodies and aquatic habitats before spill response is initiated or completed.

The effects of oil spills on freshwater fish, macroinvertebrates, and other aquatic organisms have been documented and discussed in numerous previous spills (Poulton et al. 1997, Taylor and Stubblefield 1997, Vandermulen et al. 1992, API 1992a, 1992b, and 1997). Specific effects would depend on the concentration of petroleum present, the length of exposure, and the stage of development involved (larvae and juveniles are generally most sensitive). If lethal concentrations are encountered (or sub-lethal concentrations over a long enough period), mortality of aquatic organisms might occur. However, extensive mortality caused by oil spills is seldom observed except in small, enclosed waterbodies and in the laboratory environment. Most acute-toxicity values (96-hour lethal concentration for 50 percent of test organisms [LC50]) for fish are generally from 1 to 10 parts per million (ppm) of the toxic hydrocarbons. Concentrations observed under the oil slick of oil spills have usually been less than the acute values for fish, macro invertebrates, and plankton. For example, extensive sampling following the Exxon Valdez oil spill (approximately 11,000,000 gallons in size) revealed that hydrocarbon levels were well below those known to be toxic or to cause sub-lethal effects in fish and plankton (Neff 1991). The low concentration of hydrocarbons in the water column following even a large oil spill appears to be the primary reason for the lack of lethal effects on fish and plankton. The concentration in flowing rivers and creeks in the project area also would be relatively low, even for most substantial to large oil spills.

If an oil spill of sufficient size occurred in a small water body with restricted water exchange (e.g., ponds and small, slow-flowing creeks) that contained fish or other sensitive aquatic species, lethal and sub-lethal effects could occur for the fish and food resources in that water body. Toxic concentrations of oil in a confined area would result in greater lethal impacts on larval/juvenile fish than adults. Larval/juvenile fish are generally more sensitive than adults (Hose et al. 1996, Heintz et al. 1999). Sub-lethal effects include changes in overwintering and spawning behavior, reduction in food resources, consumption of contaminated prey, and temporary displacement (Morrow 1974, Brannon et al. 1986, Purdy 1989). If a large to very large spill reached a slow-flowing, small to moderate size river in summer, the impacts due to toxic exposures may be greater than in the same river when flows are higher and water temperatures are cooler.

McKim (1977) reviewed results from 56 toxicity tests and found that, in most instances, larval and juvenile stages were more sensitive than adults or eggs. Increased mortality of larval fish is expected because they are relatively immobile and are often found at the water's surface, where contact with oil is most likely. Adult fish would be able to avoid contact with oiled waters during a spill in the open water season, but survival would be expected to decrease if oil were to reach an isolated pool of ice-covered water.

An example of potential impacts on fish food resources is provided by Barsdate et al. (1980), who studied the limnology of an arctic pond near Barrow with no outlet, after an experimental oil spill. They found that half of the oil was lost during the first year. The remaining oil was trapped along the edge of the pond; most of it sank to the bottom by the end of summer. Researchers found no change in pH, alkalinity, or nutrient concentrations. Photosynthesis was briefly reduced and then returned to normal levels after several months. *Carex aquatilis*, a vascular plant, was affected after the first year because of emerging leaves encountering oil. Certain aquatic insects and invertebrates that lived in these plant beds were reduced in numbers, presumably from entrapment in the oil on plant stems. Some of the insects were still absent six years after the spill. There were no fish in this pond; therefore, the impact of the loss of a prey base to the fish could not be measured. Reducing food resources in a closed lake or pond, as described above, would decrease fitness and potentially reduce reproduction until prey species recovered.

Another potential impact could occur if oil that spilled before or during the spring floods from spring snowmelt or extremely high rainfall was dispersed into some of the adjacent wetlands or lakes with continuous or ephemeral connection to the rivers and large creeks. This oil may be left stranded when the water recedes and the oil may cause limited toxic or physical smothering effects to riparian, terrestrial and aquatic plants and animals in the flooded area. Lethal effects to fish in streams and some lakes would be unlikely during high-water events such as floods, because toxic concentrations of oil would be unlikely to be reached. However, toxic levels may be reached in lakes that are normally not connected to the river/creek system except during the high-water periods. If the oil concentrations in the water column reach toxic levels, these fish could suffer mortality or injury.

Although lethal effects of oil on fish have been established in laboratory studies (Rice et al. 1979, Moles et al. 1979), large kills following oil spills are not well documented. This is likely because toxic concentrations are seldom reached. In instances where oil does reach the water, sub-lethal effects are more likely to occur, including changes in growth, feeding, fecundity, survival rates, and temporary displacement. Other possibilities include interference with movements to feeding, overwintering, or spawning areas; localized reduction in food resources; and consumption of contaminated prey.

Most oil spills are not expected to measurably affect fish populations in the project area over the life of the Project. Oil spills occurring in a small body of water containing fish with restricted water exchange might be expected to kill a small number of individual fish but are not expected to measurably affect fish populations. The same assessment is generally applicable to many of the macroinvertebrates, amphibians, and reptiles because they are motile and generally have a wide geographic distribution. However, freshwater mussels, all of which are sedentary and many of which have limited geographic distribution could be affected at a population level in large to very large spills that affect a substantial segment of a stream or river.

Although very unlikely, a potential large to very large spill under or adjacent to a river could affect water quality, aquatic resources, and other water-associated resources (e.g., birds and riparian habitats), as well as subsistence and recreational uses of the downcurrent areas. The spill would take some time to work its way from the proposed pipeline to the sediment surface and, in a large to very large spill, the spill could be detected before it reaches the river or other waterbody. If the spill went undetected, especially under ice, it likely would not be detected for an extended period, and the volume of oil could be substantial compared to the volume of the receiving water downcurrent from the spill. Fish and macroinvertebrates in the deeper pools may be exposed and likely would die. Early-arriving birds may be exposed in any open water pools and cracks in the river ice. A catastrophic failure of the proposed pipeline would be more easily and rapidly detected. Depending on the season of occurrence (e.g., winter freezeup compared to spring breakup or summer open water), however, containment and cleanup of a large or very large oil spill could be difficult. The energized fluid released would mix with water and the oil is likely to emulsify, dissolve, disperse, and adhere to sediment particles. Fish, birds, other aquatic animals and plants, and riparian habitats could be affected for a substantial portion of the downcurrent channel.

Sensitive, Threatened and Endangered Species

Most of the potential impacts to the habitats used by threatened, endangered, and protected species are included in the previous discussions of impacts on biological resources. The important additional consideration for these species is that, by definition, they have limited distribution and/or population sizes. Although exposure to oil may adversely affect only a few individuals or a small, localized population of individuals, such a loss may represent a significant portion of the population and its gene pool. Consequently, even a very small or small spill could substantially affect a threatened or endangered species. The probability of impacts on threatened, endangered, and protected species would be low because spills would typically occur on pads, on roads, or at facility sites that have been located to avoid or minimize any impacts on these habitats and species.

Spilled oil is more likely to affect species that heavily use or completely depend on aquatic and wetland habitats than those in terrestrial habitats. The oil may be transported over substantial distances into flowing streams and rivers, especially with substantial to very large spills, and thus affect a substantial portion of some populations of aquatic species (i.e., freshwater mussels, fish, herptiles, and water birds).

In the event of a spill sufficiently large to affect the habitat or individuals of any sensitive, threatened or endangered species, Keystone would implement provisions of the ERP to protect these habitats and species from oiling and conduct such cleanup operations as required by local, state, and federal agencies to return the impacted areas to a baseline condition. In addition, the state, tribal, and federal natural resource trustee agencies may require a Natural Resource Damage Assessment (NRDA) to assess the magnitude of the impacts and the type/amount of suitable restoration actions to offset the loss of natural resource services.

3.13.5.6 Land Use, Recreation and Special Interest Areas, and Visual Resources

Agricultural land and rangeland is the predominant land use along the proposed pipeline corridor, comprising about 78 percent of land crossed by the Project. A large to very large spill could affect agricultural activities; including irrigation water supplies (see Section 3.9). Potential effects would be minimized by implementing Keystone's CMR Plan and ERP.

Most spills—very small to very large—would be confined to construction and maintenance pads, roads, facility sites, or the immediate vicinity of the proposed pipeline ROW. Therefore, impacts from spills on recreational uses and wilderness-type values of scenic quality, solitude, naturalness, or primitive/unconfined recreation likely would be confined to the same areas and would be negligible to minor.

For some substantial to very large spills, most likely from the proposed pipeline in the ROW, and especially those that reach a stream or river, the impacts may be substantial to catastrophic. The spilled oil might be visible and thus could result impact on recreation values for weeks for most spills to a few years in a very large spill. Fishing, boating, kayaking, tubing, camping, scenic values, and other recreational pursuits could be affected by an oil spill in a riverine environment that is used by recreationists. The obvious short-term effects, including visual, odor, physical soiling of clothes, equipment, and person, and adverse publicity could result from the oil residues in areas of use. The long-term effects would possibly be reduction or loss of fishing and diminished scenic value of the area, as oil residue could take one to several years to weather and not be detectable.

3.13.5.7 Cultural Resources

Most spills would likely be confined to maintenance or construction pads, roadways, facility sites, the proposed pipeline ROW, or an adjacent area. Avoidance of known cultural resources which have been previously identified is planned as part of project design at this time. Cultural resources that can not be avoided due to unanticipated spills will be mitigated through documentation and/or data recovery excavations. A plan for unanticipated discovery of cultural resources will be included within an Unanticipated Discoveries Plan within the PA. As a result of these avoidance and construction mitigation efforts, it is anticipated that cultural resources in the ROW would be adversely impacted by small spills or by subsequent small spill cleanup. The proposed pipeline route and location of pump stations and other facilities have been selected to minimize proximity to and therefore any conflicts with, identified cultural and historical resources

For large spills off of the facility sites or roadways, there is a chance that cultural resources could be impacted. Some of these resources may not have been identified during the survey process as they may fall outside of the APE. Measures to avoid the potential harm to historic properties should be undertaken as part of the spill clean up. Mitigation measures will be undertaken as part of this process. Previously unidentified historic properties which could be discovered as part of the spill clean up should be reviewed under the Unanticipated Discoveries Plan within the PA.

The proposed pipeline corridor also crosses a number of National Historic Trails administered by the NPS. In these areas, special care would be required during any cleanup or remediation activities to limit damage to the historic values of the trail systems. Because occurrence of most of the surface and subsurface cultural resources near the proposed facilities and pipeline ROW would have been documented, the risk of impact is low.

Depending on where the spill occurs, Keystone’s Unanticipated Discoveries Plan would address protocols for any potential cultural resources encountered during a spill or associated cleanup activities. Implementation of the plan(s) would avoid spill impacts on inadvertently encountered cultural resources.

3.13.5.8 Socioeconomics

Oil spills, especially low-probability large or very large spills, may affect one to several components of the socioeconomic environment, including:

- Agricultural activities including farming, ranching, and livestock grazing on wild land;
- Water intakes and water supplies (e.g., drinking water and agricultural irrigation water);

- Other commercial activities;
- Native American traditional or historically-significant areas; and
- Populated areas, especially residential areas, and other HCAs.

The risk to populated areas and HCAs along the Project's proposed pipeline can be compared with the historical average risk to the general population per year associated with hazardous liquids transmission pipelines; that risk is 1 in 27,708,096 (DOT 2006). The predicted risk of fatality to the public from incidents associated with the proposed pipeline over and above the normal United States death rate would be negligible (approximately 0.000004 percent).

Short-term disruption in local agricultural production could result from a spill that enters agricultural lands or wild lands used by grazing livestock. The extent of the economic impact would depend on the number of productive acres affected. Spills that affect farmed areas may result in loss of the crop, which would be reimbursed by Keystone. The oil would weather and likely have minimal impact on the next season's crop. Therefore, the short-term economic impact to agricultural interests would be minor.

If a spill affected recreational lands, businesses relying on hunting, fishing, and sightseeing activities could experience a short-term negative impact. If the spill impacted commercial facilities or water intakes that provide cooling water to commercial or agricultural operations, there may be a short-term (usually a few hours to a day or so) economic impact until the water supply is restored to operation.

Response to oil spills could generate positive local economic activity for the duration of the spill response activity.

3.13.6 Mitigation Measures

The Project's pipeline system would be designed, constructed, and maintained in a manner that meets or exceeds industry standards and regulatory requirements (see section 3.13.1). The Project would be built within an approved ROW. Signage would be installed at all road, railway, and water crossings, indicating that a pipeline is located in the area, to help prevent third-party damage or impact to the proposed pipeline. Keystone would manage a crossing and encroachment approval system for all other operators. Keystone would ensure safety near its facilities through a combination of programs encompassing engineering design, construction, and operations; public awareness and incident prevention programs; and emergency response programs.

To prevent or mitigate potential oil spills during construction of the proposed pipeline, measures would be implemented at each construction or staging area where fuel, oil, or other liquid hazardous materials are stored, dispensed, or used. SPCC plans and other required hazardous material management plans would be required of all the contractors working on construction of the Project (Appendix C). Implementation of the procedures in Section 3 of Keystone's CMR Plan (Appendix B) would minimize the potential for spills and leaks to affect surface water resources. Keystone's ERP would describe actions to be taken to reduce the potential for crude oil releases to affect surface water and groundwater resources.

To prevent or mitigate potential oil spills during construction of the proposed pipeline, measures would be implemented at each construction or staging area where fuel, oil, or other liquid hazardous materials are stored, dispensed, or used. In addition to the mitigation included in the CMR Plan (Appendix B), Keystone has agreed to the following mitigation measures:

- For all locations subject to CWA Section 311, Keystone would prepare a site-specific oil SPCC Plan that contains all requirements of 40 CFR Part 112 for every location used for staging fuel or oil storage tanks and for every location used for fuel or oil transfer. Each SPCC Plan would be prepared prior to introducing the subject fuel, oil, or hazardous material to the subject location.
- Prior to construction, all project personnel would be given an orientation outlining the environmental permit requirements and environmental specifications including the requirement that fuel or oil storage tanks cannot be placed closer than 100 feet to wetlands or waterbodies.
- Environmental inspectors would place signs a minimum of 100 feet from the boundaries of all wetlands and waterbodies prior to construction. The construction contractor would not be allowed to place a fuel or oil storage tank without first getting the environmental inspector to inspect the tank site for compliance with the 100-foot setback requirement and receiving approval of the tank site from the environmental inspector.
- During construction, no fuel or storage tank would be allowed to be relocated within or to a new construction yard by the contractor without first getting the environmental inspector to inspect the tank site for compliance with the 100-foot setback requirement and receiving approval of the tank site from the environmental inspector.
- Fuel and storage tanks would be placed only at contractor yards. No fuel and storage tanks would be placed on the construction ROW.
- No oil or hazardous material storage, staging, or transfer (with the exception of refueling stations) would occur within 50 feet of any surface waterbody, surface drainage, storm drain drop inlet, USA, or HCA. As described previously, refueling stations would not be located within 100 feet of these areas.
- Any fuel truck that transports and dispenses fuel to construction equipment or project-related vehicles along the construction ROW or within equipment staging and material areas would carry an oil spill response kit and spill response equipment onboard at all times. In the event that response materials are depleted through use, or their condition is deteriorated through age, the materials would be replenished prior to placing the fueling vehicle back into service.
- Fixed fuel dispensing locations would be provided, with a means of secondary containment to capture fuel from leaks, drips, and overfills.
- In the event of an unanticipated spill or leak, remedial actions to soil resources 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 would 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.

Historically, the most significant risk associated with operating a crude oil pipeline is the potential for third-party excavation damage. Keystone would mitigate this risk by implementing a comprehensive Integrated Public Awareness Program focused on education and awareness. The program would provide awareness and education that encourages use of the state one-call system before people begin excavating. Keystone’s operating staff also would complete regular visual inspections of the ROW and monitor activity in the area.

Keystone’s preventative maintenance, inspection, and repair program would monitor the integrity of the proposed pipeline and make repairs if necessary. Keystone’s pipeline maintenance program would include routine visual inspections of the ROW, regular inline inspections, and collection of predictive data. Data collected in each year of the program would be fed back into the decision-making process for development of the following year's inspection, maintenance, and repair program. The pipeline system would be monitored 24 hours a day, 365 days a year.

In compliance with applicable regulations governing the operation of pipelines, periodic inline inspections would be conducted to collect information on the status of pipe for the entire length of the system. Inline inspections would be used to detect internal and external corrosion, a major cause of pipeline spills. From this type of inspection, suspected areas of corrosion or other types of damage (e.g., a scratch in the pipe from third-party excavation damage) can be identified and proactively repaired. Additional types of information collected along the proposed pipeline would include cathodic protection readings, geotechnical investigations, and aerial patrol reports. In addition, line patrol, leak detection systems, SCADA, fusion-bond epoxy coating and construction techniques with associated quality control would be implemented.

In summary, the reliability and safety of the Project can be expected to be well within industry standards. Further, the low probability of large, catastrophic spill events and the routing of the proposed pipeline to avoid most sensitive areas suggest a low probability of impacts to human and natural resources. Nevertheless, the potential for construction and operation-related spills exists. The commitments and procedures described for reliability and safety in this section and in Appendices B and C are intended to mitigate risks and spill effects, particularly when considered in combination with rapid and effective response and cleanup procedures**.**

3.13.7 References

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3.14 CUMULATIVE IMPACTS

The analysis of cumulative impacts in this EIS employs the definition of cumulative impacts found in the Council on Environmental Quality's (CEQ) regulations implementing NEPA: "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions" (40 CFR 1508.7). Not all actions identified in this chapter would have cumulative impacts in all discipline areas. Potential impacts for such actions are discussed for the appropriate discipline areas. In some instances for which an action is reasonably foreseeable, quantitative estimates of impacts are not possible because the action is in its early stages.

Although rare in occurrence, it is plausible that accidental or emergency events may arise due to an unforeseen chain of events during the Project's operational life. As a result of the rarity and magnitude of such events, they have not been assessed here, as they are extreme in nature when compared to the effects of normal operation and maintenance activities, and require separate response plans. For an assessment of the potential short- and long-term effects of oil releases to the environment, see Section 3.13 (Risk Assessment and Environmental Consequences Analysis).

3.14.1 Methods

Cumulative impacts were assessed by combining the potential environmental impacts of the Project with the impacts of projects that have occurred in the past, are currently occurring, or are proposed in the future within the Project corridor or in the vicinity of the Project right-of-way (ROW). The actions considered in the cumulative impact analysis may vary from the proposed Project in nature, magnitude, and duration. These actions are included based on their likelihood of occurrence, and only projects with either ongoing or reasonably foreseeable impacts are identified.

The anticipated cumulative impacts of the proposed Project and these other actions are discussed below, along with any pertinent mitigation actions. In general, the analysis of cumulative impacts in this chapter follows the process recommended in the Council on Environmental Quality (CEQ) handbook *Considering Cumulative Effects Under the National Environmental Policy Act* (DIRS 103162-CEQ 1997, all). This process includes the identification, through research and consultations, of Federal, non-Federal, and private actions with possible effects that would be coincident with those of the Project on resources, ecosystems, and human communities. Coincident effects would be possible if the geographic and time boundaries for the effects of the Project and past, present, and reasonably foreseeable future actions overlapped.

3.14.1.1 Scope of the Cumulative Impacts Analysis

For the purposes of this cumulative impacts analysis, the Project area encompasses not only the area of physical disturbance along the Project construction ROW, but adjacent areas that could have localized impacts associated with temporary access roads and aboveground facilities. In addition, the Project area extends approximately 1 mile from the Project ROW to account for potential impacts of noise and dust and potential impacts to visual resources. The Project area boundary is beyond the zone of influence of pipeline construction and operation activities (e.g., dust and noise), and consequently, it is expected that the identified effects will diminish to background levels within the Project area (also known as the Project corridor). As described in Section 3.14.3.14, the cumulative impacts of emissions, including greenhouse gases, are considered at a regional or national level. Any analysis of cumulative impacts from activities in territory under the jurisdiction of another nation, or on the environment in the territory of another nation, are not required by DOS regulations, 22 CFR 161.12, or by Executive Order 12114, Environmental Affects Abroad of Major Federal Actions.

The temporal boundaries for this analysis reflect the nature and timing of Project activities and the availability of information surrounding future projects that have a high probability of proceeding. The Project schedule identifies two key milestone activities that is considered in this cumulative impacts assessment; including, i) construction – 2011-2012[1]; and, ii) operation – 2011 through 2061. Fifty years of Project operation is used as an assumption for the purpose of this analysis, although the pipeline system may be operational beyond fifty years. There currently is no plan for abandonment of the project at this time. The period 2011-2012, covering construction and post-construction clean-up activities, was selected to represent the construction and reclamation period. Forecasting beyond 2013 increases the uncertainty in predicting whether future projects would proceed, and the effects associated with these unrelated projects. For the purpose of this analysis, short-term effects are those that would occur during the construction period, and long-term impacts are those that would occur over the operational lifetime of the Project.

3.14.2 Past, Present, and Reasonably Foreseeable Projects

The Project area includes numerous existing, under construction, and planned linear energy transportation systems, including natural gas pipelines, crude oil pipelines, and electric transmission lines. Additionally, the Project area supports a major water delivery project and a number of energy development projects, including producing oil and natural gas well fields (with associated collection piping systems), coal mines, and wind power facilities.

The projects to be considered in the cumulative impact analysis were identified through comments, scoping, and independent research including queries to the PHMSA National Pipeline Mapping System (https://www.npms.phmsa.dot.gov/). Table 3.14.2-1 below outlines multiple existing, under construction, or proposed projects that may contribute to cumulative impacts within the Project area. While Table 3.14.2-1 may not include an exhaustive list of projects that may contribute to regional cumulative impacts, the analysis of the cumulative impact of these projects are representative of the effects that could arise from any other existing or future projects that have not yet been identified. Those projects that are considered to have the greatest potential to contribute to cumulative impacts in the Project area are discussed in more detail in the Sections 3.14.2.1 through 3.14.2.5. The potential impacts associated with these projects that are most likely to be cumulatively significant are related to wetlands and waterbodies, vegetation and wildlife, land use, air quality, noise, and socioeconomics. A detailed description of potential cumulative impacts by resource category is presented in Section 3.14.3.

TABLE 3.14.2-1
Existing, Under Construction or Proposed Projects That Could Cumulatively Impact Environmental Resources in the Project Area

Project Name (Status)	Description	States Crossed	Relationship to KXL
Crude Oil Pipelines			
Express Pipeline System (Express Pipeline and Platte Pipelines; Existing)	Approximately 1,700—mile-long crude oil pipelines that are 20- and 24-inches in diameter.	Montana, Wyoming, Nebraska, Missouri, and Illinois.	Portions of this pipeline would likely intersect the Project area in southern Nebraska.
Keystone Mainline Oil	Approximately 1,379–mile-	North Dakota, South	Portions of the pipeline

[1] The Project is planned to be placed into service in phases. The Gulf Coast Segment and the Houston Lateral are planned to be in service in 2011, and the Steele City Segment is planned to be in service in 2012.

TABLE 3.14.2-1 Existing, Under Construction or Proposed Projects That Could Cumulatively Impact Environmental Resources in the Project Area			
Project Name (Status)	**Description**	**States Crossed**	**Relationship to KXL**
Pipeline (Existing)	long crude oil pipeline has a design capacity between 435,000 bpd to 591,000 bpd.	Dakota, Nebraska, Kansas, Missouri and Illinois.	contained in the Project area near Steel City, Nebraska.
Keystone Cushing Extension (Under Construction)	296-miles–long crude oil pipeline. The target in-service date for this pipeline is 2010.	Nebraska, Kansas and Oklahoma.	The proposed Project area would overlap with both ends of the Keystone Cushing Extension near Steele City, Nebraska, and Cushing, Oklahoma.
Natural Gas Pipelines			
Williston Basin Interstate Pipeline System (Existing)	A 3,364-mile-long natural gas pipeline transmission system.	Montana, North Dakota, South Dakota, Wyoming, Colorado, and Kansas	Portions of this pipeline system may intersect the Project area in Montana and South Dakota.
Northern Border Pipeline (Existing)	A 1,249-mile-long interstate natural gas pipeline with a design capacity of approximately 2.4 billion cubic feet of gas per day.	Montana, North Dakota, South Dakota, Minnesota, Iowa, Illinois, and Indiana.	Portions of this pipeline would be within the Project area in northeastern Montana and would be collocated with the proposed Project for approximately 21.5 miles.
Enterprise Product Onshore Pipeline System (Existing)			Portions of the system may intersect and be located within the Project corridor in Texas.
Northern Natural Gas (Existing)	Operates a network of approximately 15,141 miles of natural gas pipelines.	Minnesota, Wisconsin, Michigan, Iowa, South Dakota, Illinois, Nebraska, Kansas, Oklahoma, and Texas.	Portions of this pipeline network would be in the Project area in Nebraska, South Dakota, and Montana.
Natural Gas Pipeline of America (Existing)	Approximately 9,800 miles of natural gas transmission system	Illinois, Iowa, Nebraska, Kansas, Oklahoma, Texas, New Mexico, Missouri, and Arkansas.	Portions of this pipeline would be located within the Project corridor in Texas and Oklahoma.
Oklahoma Natural Gas Company System (Existing)	Approximately 2,500 miles of transmission pipeline.	Oklahoma.	Portions of the system may intersect and be located within the Project corridor in Oklahoma.
Lone Star Pipeline System (Existing)	Approximately 7,746 miles of gathering and transmission pipelines.	Texas.	Portions of the system may intersect and be located within the Project corridor, but a majority of the pipeline system would be located outside of the Project area.

TABLE 3.14.2-1
Existing, Under Construction or Proposed Projects That Could Cumulatively Impact Environmental Resources in the Project Area

Project Name (Status)	Description	States Crossed	Relationship to KXL
Transco Pipeline System (Existing)	Approximately 10,560 miles of transmission pipeline with a system design capacity of approximately 8.1 billion cubic feet per day.	Texas, Louisiana, Mississippi, Alabama, Georgia, South Carolina, North Carolina, Virginia, Maryland, Pennsylvania, New Jersey, and New York.	Portions of the system may intersect with and be located in the Project corridor in Texas.
Gulf Crossing Pipeline (Existing)	Approximately 374-mile-long, 42-inch-diameter, interstate natural gas pipeline with a capacity of approximately 1.73 billion cubic feet per day.	Oklahoma, Texas, Louisiana, and Mississippi.	Portions of this pipeline would be within the Project area in Oklahoma and Texas and the Gulf Crossing Pipeline would be collocated with the proposed Project between Lamar County, Texas, and Bryan County, Oklahoma.
Golden Pass Pipeline (Existing)	Approximately 69 miles of 42-inch-diameter pipeline with a transportation capacity of approximately 2.5 billion cubic feet per day.	Texas, Louisiana.	Portions of the pipeline would be located within the Project corridor along the Gulf Coast Segment in Texas.
Bison Natural Gas Pipeline (Proposed)	Proposed 301-mile, 30-inch-diameter pipeline system, capacity 500 MMcf/d, The projected in-service date is late 2010.	Wyoming, Montana, and North Dakota.	Portions of the pipeline would be located within the Project corridor in Fallon County, Montana.
Bakken Formation connection pipeline to Keystone XL (Future)	Potential connection between the Bakken Formation and the proposed Project that would transport 50,000 to 100,000 barrels.	Montana, North Dakota	The location of this pipeline is unknown, but because it would connect to the proposed Project, a portion of the connection pipeline would be located in the Project corridor.
Carbon Dioxide Pipeline			
Green Pipeline (Under Construction)	Approximately 320–mile-long, 24-inch-diameter pipeline. Transport capacity will be 800 million standard cubic feet per day. Anticipated in-service date is late 2010.	Louisiana, Texas.	Portions of this pipeline would be within the Project area in Texas and would be collocated with the proposed Project for approximately 46 miles between Beaumont, Texas, to the start of the Houston Lateral.
Water Delivery Systems			
Dry Prairie Rural Water System (Under Construction)	The System will provide drinking water to approximately 27,434 people in eastern Montana. The water delivery system will consist of 12- to 15-inch-diameter PVC water delivery pipelines throughout the service	Montana.	Portions of the system may intersect and be located within the Project corridor in northeastern Montana.

TABLE 3.14.2-1
Existing, Under Construction or Proposed Projects That Could Cumulatively Impact Environmental Resources in the Project Area

Project Name (Status)	Description	States Crossed	Relationship to KXL
	area.		
Electric Transmission Lines			
Mountain States Intertie Project (Proposed)	Approximately 430 miles of 500-kV line from Townsend, Montana to Midpoint, Idaho. Estimated in-service date is 2013.	Montana, Idaho.	Mountain States Intertie Project would be located in western Montana; therefore, the project would not be located in the Project area.
Nebraska Public Power District (Proposed)	Upgrade existing transmission system by building more than 140 miles of 345-kV and 115-kV transmission lines to increase system reliability, connect to new crude oil pumping stations, and interconnect proposed wind farms. Anticipated to be completed in the summer of 2012.	Nebraska, Kansas.	Potential transmission line would be located within the Project corridor. A portion of the expansion lines would be used to power some of the Project pump stations in Nebraska.
Zephyr and Chinook Projects (Proposed)	Two 500-kV power transmission lines that would each be over 1,000-miles-long in length. Completion of construction anticipated in 2015.	Montana, Wyoming, Idaho, Nevada	The Zephyr and Chinook Projects would likely be located in west central Montana; therefore, the project would not be located in the Project area.
Kansas V-Plan (Proposed)	Approximately 180 miles of 765-kV transmission line. Anticipated to be completed in 2013.	Kansas.	The Kansas V-Plan would be located west of Wichita, Kansas; therefore, the project would not be located in the Project area.

3.14.2.1 Cumulative Impacts from Oil Pipelines

The Project would contribute to regional cumulative impacts associated with currently operating oil pipeline systems, newly constructed and soon to be operating pipeline systems, and future oil pipeline systems that are more speculative in nature.

Currently Operating Oil Pipelines

A map of existing oil and gas pipeline systems of the U.S. is shown in Figure 3.14.2-1. Several existing pipelines transport petroleum products across Montana, South Dakota, Nebraska, Kansas, Oklahoma, and Texas. For example, the Express and Platte pipelines deliver WCSB crude oil through central Montana and Wyoming and then travels east-southeast through eastern Wyoming, Nebraska, northeastern Kansas, and Missouri before it terminates at the Wood River refinery in western Illinois. These pipelines intersect the Project area in southern Nebraska.

Operation of existing oil pipeline systems, such as the Express and Platte Crude Oil Pipelines, have resulted primarily in alterations to land uses, terrestrial vegetation, and wildlife habitat. Cumulative impacts associated with existing oil pipelines within the Project area would be primarily related to noise emanating from pump stations and the cumulative increases in the width of ROWs in areas where the proposed Project would be adjacent to existing ROWs. In those areas where the proposed Project is not directly adjacent to existing ROWs, but are located within the Project area, there would be a cumulative change in vegetative resources, wildlife habitat, and land uses associated with ROWs operation. The impacts of existing ROWs in the context of the proposed Project have largely been included in Section 3.0.

Newly Constructed Oil Pipelines

Construction on the Keystone Mainline Pipeline is completed and construction on the Keystone Cushing Extension Pipeline (Keystone Cushing Extension) is currently underway. These pipelines will transport crude oil from Canada to U.S. markets. The Keystone Mainline Pipeline crosses North Dakota, South Dakota, Nebraska, Kansas, Missouri, and Illinois and would overlap the proposed Project corridor near Steele City, Nebraska. The Keystone Cushing Extension will also be constructed from Steele City, Nebraska to Cushing, Oklahoma and will be completed in 2010. As part of the proposed Project, two new pump stations would be constructed along the Keystone Cushing Extension to support the increased crude oil flow rates. In the portions of the Project corridor where Project pump stations near the Keystone Cushing Extension would be located, local impacts created by the construction of the Cushing Extension would experience additive effects from Project pump station construction. Additionally, in the Steele City, Nebraska, area, a tank farm would be constructed to support the Project in an area already impacted by the upcoming construction of the Keystone Cushing Extension. Cumulative effects from the Keystone Cushing Extension and the proposed Project would primarily be additive and minor relative to the overall environmental resource base in the region. For the rest of the Keystone Cushing Extension alignment, because there is no overlap of the Keystone Cushing Extension project area with the Project corridor, potential cumulative impacts would be minimized.

Future (Speculative) Oil Pipelines

In addition, Keystone recently announced that it would consider an interconnection to the Project in eastern Montana that would allow transport of oil production from the Williston Basin in Montana, North Dakota, and Saskatchewan. The Williston Basin is experiencing increased oil production, particularly associated with the development of the Bakken shale formation. This currently speculative interconnection, should it become economically feasible in the future, would require that the crude oil producers construct an additional pipeline and appurtenant facilities, including:

- An interconnecting “on-ramp” pipeline including pump stations and valves would be required to transfer volumes from the oil production facilities to the pipeline injecting station. The pipeline would have a receive trap and a pressure control valve/skid located at the receipt facility in Montana;

- A receipt/injection facility (approximately 8 to 9 acres or larger, depending on final number of tanks) would be required, including the following equipment or facilities:

    - A custody transfer system (approximately 0.7 acres**)** that would include a meter bank with at least two meter runs, a static mixer, flow meters, strainers, flow control valves and associated piping; a meter prover complete with launching chambers, four-way valve, and associated piping and instrumentation; a pressure relief skid consisting of two nitrogen-loaded pressure safety valves and associated piping; a sump system complete with sump tank, sump pump, sump injection pump and associated piping; a quality

- Storage facilities (approximately 7 acres) would be required in Montana near the point of interconnection with the Project including one or two 300,000 barrel storage tanks to accumulate production received at the facility for batch preparation. Recommended minimum batch size to be injected into Keystone pipeline would be between 200,000 to 300,000 barrels thus allowing enough flexibility for mainline scheduling. Tanks would be supplied with an external floating roof and mixers for bottom sediment & water control.

- Booster pump system (approximately 0.6 acres) would be required including 3 in-line booster pumps to transfer product from the storage tank to the nearest Keystone pump station. These pumps would be sized to meet the base case pipeline flow rate of 700,000 BOPD.

- Electrical controls and instrumentation (approximately 0.2 acres) would be required to supply the expected additional 4 megavolt-ampere (MVA) demand for the injection facility which would require an electrical substation and a new electrical building that would provide power and would house: booster pumps, meter/prover skids, tank mixers, manifolds/tank (valves & instruments), and a cathodic protection system

In addition, Keystone would have to modify an existing Keystone XL Project pump station (no additional land anticipated) where the oil would be sent for injection into the Keystone XL Project pipeline. This would include a connection to the pump station, two block valves, and two check valves.

Potential impacts from this pipeline and oil storage system would be similar in nature to the impacts described previously for the Project, although the extent of impact would depend on the actual design and size of the facilities. Key issues would include visual resources in the vicinity of the storage tanks and pump stations, cultural resources, changes in land use, increased tax revenues, increased employment, and potentially accelerating the development of crude oil resources in Montana and North Dakota. An on-ramp project at some future time would require its own permits and environmental analysis. At the time of the publication of this DEIS, there were no active applications before any federal or state regulatory agencies in support of this potential pipeline and oil storage system. In addition, Enbridge, Inc. is considering a reversal of its existing Portal Link pipeline in North Dakota that would provide an on-ramp for Williston Basin oil production to its existing Enbridge Mainline pipeline in Saskatchewan. The "open season" for this proposed pipeline reversal is scheduled for the spring of 2010 to gauge shipper interest in the proposed project. Should this proposed project receive sufficient shipper support and become operational at a later date, it would potentially reduce interest in a Williston Basin on-ramp project in Montana.

No other proposed oil pipelines have been identified within the Project area. However, should additional oil pipelines be constructed within the Project area, they would likely contribute to potential cumulative impacts associated with habitat fragmentation, land use issues, and viewshed degradation.

3.14.2.2 Cumulative Impacts from Natural Gas and Carbon Dioxide Pipelines

A map of existing oil and gas pipeline systems of the U.S. is shown in Figure 3.14.2-1. Several existing pipelines transport natural gas across Montana, South Dakota, Nebraska, Kansas, Oklahoma, and Texas. For example, the Williston Basin Intestate Pipeline System transports natural gas through southeastern

Montana and western South Dakota and would likely intersect the Project area in Montana and South Dakota.

Portions of the Northern Border Pipeline would be located within the Project area in northeastern Montana. The Project corridor would parallel the Northern Border Pipeline for approximately 21.5 miles along the Steele City Segment, beginning at the U.S./Canada border near Morgan, Montana. The Northern Border Pipeline is an existing natural gas pipeline that has been in service since 1982. The existing permanent ROW has been reclaimed and routine maintenance and refurbishment activities would continue along the ROW during construction and operation of the proposed Project. Parallel placement of the Project along the Northern Border ROW in this segment would potentially reduce ROW requirements and land disturbance. However, impacts such as habitat fragmentation and wetlands disruption would potentially be exacerbated with parallel pipeline placement.

The Gulf Crossing Pipeline would parallel the Project area along the Gulf Coast Segment between Bryan County, Oklahoma and Lamar County, Texas. The Gulf Crossing Pipeline is a recently completed, 374-mile-long, 42-inch-diameter, interstate natural gas pipeline extending from Grayson County, Texas and Bryan County, Oklahoma to Madison Parish, Louisiana. As construction of the Gulf Crossing Pipeline has been completed, many of the potential short-term cumulative impacts associated with concurrent construction schedules, such as demand for housing and services from the construction workers, construction traffic, and noise, would be avoided. Also, because the construction of the Gulf Crossing Pipeline has been completed, cumulative impacts of the proposed Project and the Gulf Crossing Pipeline would be limited to a cumulative long-term conversion of forested vegetation and land uses to herbaceous, open lands within each project's permanent ROWs.

The Project would be collocated with the Golden Pass Pipeline in the Beaumont, Texas area. The Golden Pass Pipeline, which was completed in April of 2009, is a 42-inch-diameter pipeline that will transport natural gas approximately 69 miles from an LNG receiving terminal near Sabine Pass, Texas, to existing interstate natural gas pipeline interconnections near Starks, Louisiana. Construction of the Golden Pass Pipeline has been completed; therefore, many of the potential short-term cumulative impacts associated with concurrent construction schedules would be avoided. Also, because the construction of the Golden Pass Pipeline has been completed, cumulative impacts of the proposed Project and the Golden Pass Pipeline would be limited to a cumulative long-term conversion of forested vegetation and land uses to herbaceous, open lands within each project's permanent ROWs.

Multiple natural gas pipelines comprise the Enterprise Product Onshore Pipeline System, which is owned by Enterprise Product, LP. Portions of this pipeline system may parallel the Project corridor in Texas. In Oklahoma, Texas, Nebraska, South Dakota, and/or Montana, other existing pipeline systems of note are operated by Northern Natural Gas System, NGPL of America, Oklahoma Natural Gas Company System, and the Lone Star Pipeline System. Portions of these pipelines may parallel or cross the Project corridor in some areas, but most are well outside of the Project area, as shown in Figure 3.14.2.-2.

The Texas Intrastate System, which is operated by Enterprise Product LP, is a network of natural gas pipelines in Texas. These pipelines may intersect the Project corridor in southeastern Texas. The Transco Pipeline System is a 10,560-mile natural gas pipeline transportation and distribution system that extends from Texas up the east coast of the U.S. to New York. Portions of the Transco Pipeline System would likely be located within the Project corridor in eastern Texas.

The construction and operation of these existing pipeline systems has resulted in impacts to the human and natural environment typical for such linear facilities. Some older pipeline systems may have greater impacts to the natural environment than those recently constructed due to less stringent environmental regulation in the past. Cumulative impacts associated with existing natural gas pipelines are primarily related to noise emanating from operating compressor stations and loss of vegetative cover and habitat fragmentation to the degree such fragmentation is not mitigated through ROW restoration.

The Steele City Segment of the Project would cross the proposed Bison Pipeline Project in Fallon County, Montana. The Bison Pipeline is a proposed 301-mile-long, 30-inch-diameter, natural gas pipeline extending from Campbell County, Wyoming to Morton County, North Dakota. The Bison Project is proposed to be constructed in 2010, pending federal and state permitting. The Bison Project would be built before the proposed Project, thereby avoiding a conflict of resources at the time of construction. However, in the areas where the Bison Pipeline would be located in the Project corridor in Fallon County, Montana, there would be sequential impacts to environmental resources in the crossing area. In the context of the regional resource base, it is likely that the local impacts from the close proximity of these two proposed pipelines would be minor.

The Green Pipeline would parallel the Project area in the Gulf Coast Segment. It is a proposed 320-mile-long, 24-inch-diameter pipeline that would transport carbon dioxide from Donaldsville, Louisiana to the Hastings Field, which is located south of Houston, Texas. The Green Pipeline and the Gulf Coast Segment of the Project would be roughly parallel for a distance of approximately 46 miles between Beaumont, Texas to the connection point with the Houston Lateral. Potential overlapping or successive construction timeframes would increase the time period over which short-term impacts would occur, resulting in cumulative impacts to some resources such as soils, wetlands, wildlife, vegetation, and land use. Along the Houston Lateral, the Project would roughly parallel the Green Pipeline for a distance of approximately 47 miles from Houston, Texas to the proposed Project's intersection point with the Gulf Coast Segment. As construction of the Green Pipeline would be completed in late 2010, and work on the Houston Lateral would not begin until 2012, most of the cumulative impacts from construction during the same time period would be avoided. However, successive construction timeframes would increase the time period over which short-term impacts would occur, resulting in cumulative impacts to some resources such as soils, wetlands, wildlife, vegetation, and land use.

Potential cumulative impacts associated with these proposed pipelines would be habitat fragmentation, land use issues and viewshed degradation. Should these or other unidentified pipelines be under construction at the same time as the Project, there may also be impacts to noise and air quality (see Section 3.14.3).

3.14.2.3 Cumulative Impacts from Electrical Power Distribution and Transmission Lines

The electrical power distribution and transmission grid in the Project area includes multiple existing interstate and local electric power distribution and transmission lines. These distribution and transmission lines represent existing linear facilities that transect each of the states that the Project would cross if permitted and constructed. Figure 3.14.2-3 is a map of the U.S. electrical power grid.

Due to advances in engineering, construction methods, and environmental regulation, the construction and operation of these existing electrical power lines typically encumber additional lands, compared to more recent projects and, therefore, the impacts from these lines may be greater than a line of similar length and energy capacity constructed in the recent past or future.

Table 3.14.2-1 includes planned electrical power distribution and transmission lines that may be constructed in the general Project area, but of these proposed transmission lines, only the Nebraska Public Power District would be located within the Project corridor. The proposed MSTI (Mountain States Intertie) Project which would run from Townsend, Montana to Midpoint, Idaho and the Zephyr and Chinook Projects would extend from west-central Montana to Nevada. The Nebraska Public Power District plans to build more than 140 miles of 345-kV and 115-kV power distribution lines in Nebraska and Kansas to connect new crude oil pumping stations for the proposed Project pipeline and also to interconnect proposed wind farms and increase system reliability. The Kansas V-Plan is a proposed electrical power line to connect Marysville, Kansas and the Steele City Substation near Steele City, Nebraska. These proposed projects would contribute to cumulative impacts in the Project area as the proposed Project would require power distribution lines to serve pump stations and the tank farm associated with the Project. Cumulative impacts which may arise include impacts to avian wildlife and viewshed degradation. In addition, if the construction of future power distribution or transmission lines in the Project corridor overlaps with the proposed Project construction schedule, short-term cumulative impacts associated with noise, dust, and general construction activity could occur in those areas where they would be constructed within the proposed Project corridor.

3.14.2.4 Cumulative Impacts from Wind Power

Wind Power is increasing in the United States. Wind power accounted for 42 percent of all new electrical capacity added to the United States electrical system in 2008, although wind continues to account for a relatively small fraction of the total electricity-generating capacity (25.4 GW of a total of 1,075 GW) (AWEA 2009). The Global Wind Energy Council (2008) projected the possibility of a 17-fold increase in wind-powered generation of electricity globally by 2030.

Wind resources in the contiguous U.S., specifically in the central plains states, could accommodate as much as 16 times total current demand for electricity in the U.S. Potential wind-generated electricity available from onshore facilities on an annually averaged state-by-state basis is provided in Figure 3.14.2-4. It shows a high concentration of wind resources in the central plains region extending northward from Texas to the Dakotas, westward to Montana and Wyoming, and eastward to Minnesota and Iowa. The wind resources in this region could achieve significantly greater electricity production than current local demand (Lu et al. 2009). Exploitation of these wind resources would require significant extension of the existing power transmission grid. Expansion and upgrading of the grid will be required in any case to meet anticipated future growth in U.S. electricity demand (Lu et al. 2009). It is therefore reasonable to assume that there will be upgrades and extensions to the existing electrical power transmission grid to support wind power development within the Project area in the future. The magnitude of impacts from these transmission line extensions will be dependant somewhat upon the extent of new lines required to meet the needs of new and existing wind farms. Likely cumulative impacts from future construction and operation of transmission lines originating from wind farms may include viewshed degradation and disruption to land uses, vegetation, and avian wildlife. Should the construction of future transmission lines occur concurrent with the proposed Project construction schedule and within the Project corridor, short-term cumulative impacts associated with noise, dust, and general construction activity could occur.

3.14.2.5 Connected Actions to the Project

Several connected actions to the proposed Project would occur to provide electricity to the proposed Project pump stations. These actions would be a result of the proposed Project; therefore, the impacts of these actions have been incorporated in the environmental review described in Section 3.0.

Connected actions to the Project include:

- The construction and operation of electrical power distribution lines and substations by local power providers running from existing power delivery infrastructure along the route to power the pumps at each pump station location and to power the tank farm; and
- A major new approximately 70-mile-long 230-kV transmission line to be constructed and operated by Basin Electric Power Cooperative (BEPC) in South Dakota as a result of a system reliability study

Power Distribution Lines and Substations

The power requirements and line miles of each power distribution line for pump stations and tank farms are presented in Section 2.0 (Table 2.3.1-1 Summary of Power Supply Requirements for Pump Stations and Tank Farm). The duration of construction for these lines would be relatively short in any one location. Where possible, power lines would parallel other ROWs (i.e., roadways, pipeline corridors, and existing power lines). Power distribution lines would likely be installed along field edges or section lines to reduce the overall amount of habitat fragmentation and interference with agricultural operations. Limited clearing would be required along existing roads in native and improved grasslands and croplands. Some trees may be removed to provide adequate clearance between the conductors and underlying vegetation. Trimming instead of tree removal could be employed in some locations. Land disturbance and vegetation clearing for the electrical distribution lines and substations would affect only a small fraction of the native vegetation present in the region.

The most notable impacts associated with electrical power distribution line construction would be the effects on land use and visual quality. Proposed power distribution lines would cross a variety of land use types including developed land, agriculture/cropland, rangeland/grassland, forestland, and undeveloped greenfield areas. The largest permanent acreage impacts would be to rangeland/grassland areas (640 acres). Acreage impact totals would be less for agriculture/cropland (271 acres), forest land (105 acres) and developed areas (85 acres). Depending on location, size, and configuration, new electrical power distribution lines could negatively affect visual resources, especially in undeveloped areas with relatively high scenic values. Additional minor cumulative impacts to soils (compaction and erosion), vegetation, wetlands, and wildlife could also be expected. In addition, indirect air quality impacts are associated with the generation of electricity that would be transmitted through power lines to pump stations and the tank farm. Future electricity sources in the region would likely include renewable energy sources (e.g., wind power).

Lower Brule to Witten 230-kV Transmission Line

The new approximately 70-mile-long Lower Brule to Witten 230-kV transmission line in South Dakota would create a new power transmission corridor across terrain that is currently relatively undisturbed. The impacts of this transmission line would be additive to the impacts generated by the construction of the Project pipeline and appurtenant facilities, and additive to the impacts associated with existing linear facilities within the area. Primary impacts associated with construction and operation of the Lower Brule to Witten 230-kV transmission line would be to land use and visual quality, with minor impacts to soils, vegetation, wetlands and wildlife (potential impacts to raptors and other avian species would be of particular concern).

3.14.3 Cumulative Impacts by Resource

This section describes the potential cumulative effects of constructing the Project and other past, present and reasonably foreseeable projects on individual resources. Resources potentially sensitive to cumulative effects from existing and reasonably foreseeable future projects are addressed in this section. Table 3.14.3-1 below provides a summary of the impacts to each resource, which are discussed in more detail in the sub-sections that follow.

TABLE 3.14.3-1 Summary of Cumulative Impacts to Resources			
Resource Area	**Past Actions**	**Present Actions and Proposed Project**	**Future Actions**
Geology	Existing oil and natural gas ROWs limit the area available for extraction of mineral resources within their permanent ROW. In those areas where existing ROWs are present within the Project area, there would be a minor cumulative decrease in the access to mineral resources within the ROWs.	The proposed Project does not involve substantial long- or short-term alteration of topography. Potential cumulative impacts to paleontological resources during construction within the Project corridor include damage to or destruction of fossils due to excavation activities and/or blasting, erosion of fossil beds due to grading, and unauthorized collection of fossils by construction personnel or the public.	Due to the small area that would be impacted by the proposed and future projects, relative to available mineral resources within the proposed Project area, encumbered by the Project right-of-way, the proposed Project in conjunction with future actions would represent a minor cumulative effect on the accessibility of mineral resources in the Project area.
Soils and Sediments	Soils that have previously been subject to a one-time or frequent disturbance would be subject to a minor cumulative impact. Aboveground facilities that are located in prime farmland soils result in a cumulative decrease in the availability of prime farmland soils within the proposed Project area.	Construction activities (such as clearing, grading, trench excavation, backfilling, heavy equipment traffic) and restoration along the Project corridor may contribute to cumulative impacts on soil and sediment resources. Impacts may include: temporary and short-term soil erosion, loss of topsoil, permanent increases in the proportion of large rocks in the topsoil, and short-term to permanent soil/sediment contamination from accidental spills and short-term to long-term soil compaction. Soil compaction could reduce soil porosity and percolation rates, which can increase the potential of stormwater runoff. Soil erosion and revegetation best management practices would be applied to areas subject to soil disturbance to minimize construction-related erosion.	Most impacts to soils and sediments through the construction of future projects would be short-term and minor due to the implementation of best management practices to reduce soil erosion and the introduction of contaminants. However, long-term, cumulative soil compaction may occur in areas with repeated disturbance of soils in the Project area.
Surface Water	Previous construction of existing projects would tend to have had localized and short-term effects on surface waters. Where the Project area would contain existing ROWs, the selection of appropriate construction techniques and oversight by relevant regulatory authorities would reduce the short-term impacts	The effects from linear facility construction within the Project area are considered short-term. Major pipeline crossings of sensitive waterbodies along the route would utilize the HDD method, further limiting to these waterbodies. Open-cut crossings would have a cumulative effect on waterbodies that are crossed	No long-term diversions or installation of in-stream structures are proposed for the Project; therefore, the proposed Project would result in primarily temporary surface water impacts. If future projects were to cross within the same watershed or waterbody, there would be a minor cumulative impact to the

TABLE 3.14.3-1 Summary of Cumulative Impacts to Resources			
Resource Area	**Past Actions**	**Present Actions and Proposed Project**	**Future Actions**
	to acceptable levels and would result in a minor potential cumulative impact.	more than once or in multiple locations within the same watershed. Temporary cumulative impacts from the proposed Project could include increased TSS, increased sedimentation and reduced flow. In addition, channel stability may decrease in the short-term as waterbodies return to pre-construction conditions.	subject waterbody.
Wetlands	Past disturbance to herbaceous and scrub shrub wetlands in existing pipeline or transmission ROWs have primarily transitioned back to pre-construction wetland vegetation communities. Recovery of herbaceous vegetation in emergent wetlands where disturbance would occur again would be 3 to 5 years; recovery of forested wetlands would take longer (20 to 50 years) to regenerate into a mature wetland forest community. Past effects on wetlands in the Project area may still be evident if previous construction activity occurred within the past 5 to 10 years. Also, previously-installed linear pipeline or transmission projects would have resulted in a permanent conversion of forested wetland vegetation type in their permanent ROWs. Presently, cumulative impacts on wetlands would occur in locations where the Project area contains other linear ROWs that have resulted in the conversion of forested wetlands to herbaceous or scrub-shrub wetlands or in areas where wetlands have been permanently encumbered by facilities.	Construction would affect herbaceous and scrub-shrub wetlands and wetland functions primarily during and immediately following construction activities, but permanent changes could also occur. In most herbaceous and scrub-shrub areas, disturbed wetland vegetation would eventually transition back to a vegetation community similar pre-construction conditions, assuming such as elevation, grade, and soil structure are successfully restored. Forested wetlands located in the permanent ROW would be converted to a herbaceous or scrub-shrub wetland type and forested wetlands located outside of the permanent ROW would require a long time period to return to pre-Project conditions. Implementation of appropriate compensatory mitigation would ensure no net-loss of wetlands from the proposed Project.	Future projects, such as town expansions, future oil and gas pipelines, transmission lines, new roads and highways, and other industrial facilities could affect wetlands in the Project area. None of the wetlands crossed by the Project would likely be permanently filled or drained, and if they were, compensatory mitigation would be required. The contribution of the Project to future cumulative effects to wetlands in the Project area would be minor.
Terrestrial Vegetation	Past disturbance to terrestrial vegetation has resulted from previous linear and non-linear projects. The degree of cumulative impact from past projects depends upon the	Construction would effect terrestrial vegetation primarily through cutting, clearing, or removal of vegetation and the potential introduction of noxious weeds. The degree of	Future actions in the Project corridor that would result in greatest cumulative impact to vegetative resources would be in those portions of the Project corridor that would require a

TABLE 3.14.3-1 Summary of Cumulative Impacts to Resources			
Resource Area	**Past Actions**	**Present Actions and Proposed Project**	**Future Actions**
	type and amount of vegetation affected, the rate at which the removed vegetation regenerated after construction, and the frequency of vegetation maintenance conducted during operation.	impact would depend on the type and amount of vegetation affected, the rate at which removed vegetation would regenerate after construction, and the frequency of vegetation maintenance conducted on the ROW during pipeline operation. Impacts on pastures, rotated croplands, and open grasslands would generally be short-term with vegetation typically becoming reestablished within 1 to 5 years after construction is complete. Short-grass prairie and mixed-grass prairie areas often take 5 to 8 years to become reestablished due to poor soil conditions and low moisture levels. Construction in these areas would also remove woody shrubs in sagebrush grasslands. Although native grasslands would be restored, the effects of land clearing on previously untilled native prairies may be irreversible. Long-term to permanent loss of forested vegetation and a small increase in forest fragmentation would occur in non-herbaceous areas.	prolonged recovery time or would result in a permanent change in vegetation type. Land clearing in the Project area in northern Montana would impact native grasslands and would represent a cumulative loss of native grassland areas. The permanent ROW in this area would be kept free of woody vegetation, including sagebrush, with periodic mowing and brush clearing. Sagebrush vegetation can take 20 to 50 years to become reestablished to pre-construction levels; therefore, removal of sagebrush vegetation in the Project areas would be a long-term cumulative impact. Removal of trees in upland and riparian forest communities would result in long-term impacts on these vegetation communities because of the long time periods required for these vegetation communities to mature to pre-construction conditions, e.g., 20 to 50+ years for reestablishment of bottomland forests. The proposed Project and future projects would likely implement mitigation measures designed to minimize the potential for erosion, revegetate disturbed areas, increase the stabilization of site conditions, and control the spread of noxious weeds, thereby minimizing the degree and duration of the cumulative impact on vegetation from these projects.
Wildlife	Prior fragmentation of sagebrush shrublands in Montana in conjunction with fragmentation of habitat from clearing could incrementally increase mortality rates for species dependent on sagebrush cover. Forestlands in the Project area along the Gulf Coast Segment and	Additional incremental habitat fragmentation from construction would be most pronounced in forested and shrubland habitats. Impacts to wildlife in these areas include: habitat loss, alteration, and fragmentation; direct morality during construction and operation; indirect mortality	Future actions in the Project corridor that would impact wildlife habitat would primarily be additive to wildlife habitat impacts associated with the proposed Project. Cumulative effects on wildlife in the Project area would include the incremental loss and alteration of grasslands, rangelands,

TABLE 3.14.3-1 Summary of Cumulative Impacts to Resources			
Resource Area	**Past Actions**	**Present Actions and Proposed Project**	**Future Actions**
	Houston Lateral have been previously fragmented by ROWs and would experience additional fragmentation from the proposed Project.	and reduced breeding success from stress and effects on feeding due to noise and human activity; and reduced survival or reproduction due to decreased abundance of forage species.	forested habitat, and wetland habitats; including portions of several habitat areas specifically set aside for wildlife conservation. Implementation of appropriate mitigation measures, including habitat restoration, would minimize most long-term cumulative impacts on wildlife. Long-term cumulative impacts on wildlife would occur in areas where habitat is not allowed to return to preconstruction conditions and in areas where long time periods are required for wildlife habitat to become re-established.
Fisheries	Prior removal of riparian vegetation and instream disturbance due to existing projects, have occurred at various capacities within streams crossed by the Project area. Potential cumulative effects on fisheries due to instream and riparian disturbance include habitat alteration resulting in potential disruption to feeding, breeding and other life stage habitats.	Contribution to cumulative Impacts on aquatic species would be avoided where the HDD crossing method is utilized. Impacts on aquatic species at stream crossing locations where non-HDD crossing methods are used would include additional alteration of bottom substrates, temporary increased sedimentation, and possible removal of riparian vegetation. While adult fish are likely to move away from areas of construction, younger fish would be more vulnerable to additional stream alteration impacts. General reclamation objectives to restore ecological function to pre-construction conditions would reduce cumulative effects during the construction and post-construction phases.	Future projects that would be constructed in the Project area shortly after the construction of the proposed Project may result in a small cumulative impact on fisheries resources. Those future projects that would occur after the streams in the Project area have recovered from activities associated with the proposed Project would not contribute to a significant cumulative impact on fisheries.
Threatened and Endangered Species	Habitat modifications through the alteration of threatened and endangered species habitat along existing projects in the Project area could have previously occurred. The proposed Project could cumulatively contribute to impacts on T&E species habitat in areas already impacted by existing projects. Of particular concern is the	Impacts in the Project area could result in a cumulative short-term disturbance to protected species and a potential long-term impact to habitat. Through coordination with the FWS, the proposed Project impact to protected species would be minimized through avoidance, minimization, and mitigation measures.	The potential for cumulative impacts on threatened and endangered species from the future projects could occur if they were to impact the same habitats as the proposed Project. Future projects would adhere to federal and state permitting and regulatory requirements; therefore, impacts to these species would be reduced or

TABLE 3.14.3-1 Summary of Cumulative Impacts to Resources			
Resource Area	**Past Actions**	**Present Actions and Proposed Project**	**Future Actions**
	area near the Red River where the Project would parallel the Gulf Crossing Pipeline. The FWS has recommended that a 300-foot-construction activity buffer be put in place at the Red River HDD crossing for the proposed Project to minimize impacts to nesting interior least terns (a federally-listed endangered bird) and the Arkansas river shiner (a federally-listed threatened fish). Gulf Crossing had also crossed the Red River via HDD to minimize the loss of riparian and aquatic T&E habitat in the area. The Louisiana black bear (a federally-listed endangered species) may also be present in southern Oklahoma and northeast Texas where the Project would contain other pipeline routes in the Project area. Project-related impacts to forested habitat in these areas may cumulatively contribute to a change in potential forested habitat.		eliminated through avoidance, minimization, and mitigation measures.
Noise	Cumulative increases in noise levels resulting from the operation of the pump stations and other existing noise generating infrastructure in the Project area would be minimal due to the spatial distance between pump station or tank farm locations.	Construction noise impacts would be localized, temporary, and short-term along each construction spread. Impacts on regional ambient noise levels resulting from operation of the pump stations would be minimal due to the spatial distance between pump station or tank farm locations.	Cumulative impacts on noise levels resulting from the operation of the pump stations for the Project and any future noise-producing projects in the Project area would depend upon the location, duration, and noise levels associated with future projects in the context of ambient noise levels at the proposed Project pump stations.
Land Use	Cumulative impacts on land use from existing projects are generally small. Herbaceous, agricultural, and scrub-shrub land uses are allowed to return to pre-project condition at the end of the construction period in existing ROWs. Long-term land use impacts have occurred in forested areas contained within permanent ROWs, which may result in the potential for cumulative land use impacts in portions of the	Construction could increase the temporary encumbrance of lands used for construction activities. The development of aboveground facilities and the conversion of land uses to industrial for the Project and other projects in the Project corridor would cumulatively contribute to a permanent change in land use.	Construction-related cumulative impacts on land use would be low because the temporary displacement of most land uses associated with the Project would have ended by the time future projects are implemented. Landowners may experience cumulative effects from having to accommodate multiple easements (temporary and permanent) across their land. The development of

TABLE 3.14.3-1 Summary of Cumulative Impacts to Resources			
Resource Area	**Past Actions**	**Present Actions and Proposed Project**	**Future Actions**
	Project area that is currently used as forest lands. Landowners may experience cumulative effects from having to accommodate multiple easements (temporary and permanent) across their land. The development of aboveground facilities for the past project would cumulatively contribute to permanent industrial land use conversion within the Project area. Development of the Project in conjunction with previous projects could contribute to a cumulative decline in lands participating in regional conservation programs, such as the CRP.		aboveground facilities for the Project would cumulatively contribute to permanent land use conversion impacts associated with future projects. Development of the Project and future projects could cumulatively contribute to a decline in lands participating in regional conservation programs, such as the CRP, resulting from future projects.
Visual Resources	Existing projects may have already altered the viewshed from within and outside of the Project corridor. Over the long-term, facilities could cumulatively contribute to an intensified industrial character in portions of the Project area with previous development.	Construction could have an impact on visual resources through the presence of construction equipment, electrical transmission lines, a loss of vegetation, and development of aboveground facilities for the proposed Project and current projects. These actions would result in the degradation of the visual quality of the area.	Future aboveground facilities for other projects in the Project area would cumulatively contribute to a minor degradation of visual resources. The addition of similar aboveground facilities from future projects to the Project area could contribute to an intensified industrial character.
Socio-economics	Past construction of pipelines and other industrial facilities likely would have required temporary construction workers, population, housing, municipal services, or traffic in the Project area.	Short-term, socioeconomic effect may occur. Due to the quick moving nature of most Project construction schedules, the socioeconomic impacts associated with construction would not result in a major impact to cumulative socioeconomic impacts in the Project area.	Operation of the proposed Project facilities would require relatively few permanent employees; thus, there would be minor long-term cumulative or additive impacts on population, housing demands, municipal services, or traffic in the Project area. The increased tax revenue paid to the state and local governments over the life of the proposed Project and future projects in the Project area would result in beneficial long-term cumulative economic impacts.
Cultural Resources	Cumulative impacts to cultural resources from past projects include disturbance to aboveground and belowground resources within the area of potential effect for existing projects. Most	Disturbance of belowground resources within the area of potential effect for the projects would occur. To limit effects to historic properties and cultural resources, the Project would be constructed in accordance	Future pipelines located in the Project corridor may potentially disturb currently known or unknown archaeological sites and historic properties. This may result in a negative cumulative impact on cultural

TABLE 3.14.3-1 Summary of Cumulative Impacts to Resources			
Resource Area	**Past Actions**	**Present Actions and Proposed Project**	**Future Actions**
	federally- or state-regulated project would be constructed in accordance with requirements under Section 106 NHPA and other relevant federal, state and local regulations. Additional disturbance to cultural resources from construction in the Project area would be limited through avoidance and mitigation when avoidance is not achievable.	with requirements under Section 106 NHPA and the associated programmatic agreements and other relevant federal, state and local regulations. Additional disturbance to cultural resources from construction in the Project area would be limited through avoidance and mitigation when avoidance is not achievable.	resources. However, cultural resources have been or are undergoing surveys and are being identified for the proposed Project. The proposed Project would be constructed in accordance with requirements under Section 106 NHPA and other relevant federal, state and local regulations. Additional disturbance to cultural resources from future projects in the Project area would likely be subject to federal or state regulations that would require surveys, avoidance, and mitigation be conducted prior to installation, so it is likely that portions of the Project corridor with cultural sites would be subject to mitigation and avoidance measures during future projects.
Air Quality	There would be no contribution to cumulative impacts generated by the Project from the construction of past projects since the impacts of these projects would have been short-term (e.g., dust and emissions from construction vehicles). Impacts from ongoing operations of past projects would be additive to short-term construction impacts of the Project. These are limited to emissions from vehicles and aircraft used during ROW inspection and inspection and maintenance of project facilities.	The primary impacts on air quality from the Project would be from construction activities that generate dust (e.g., excavation and materials handling) and air emissions (e.g., fueling and operation of construction equipment and open burning). Contractors would be required to implement dust-minimization practices to control fugitive dust emissions during construction, such as applying water sprays and surfactant chemicals, and stabilizing disturbed areas. Mitigation measures implemented during construction would limit dust and VOC emissions from fuel handling to minimize any localized impacts.	During operations, Project impacts would be limited to emissions from vehicles and aircraft used during ROW inspection and maintenance of pump stations. Since ROW and project facilities are inspected roughly twice monthly, the cumulative impacts from inspection and maintenance, in addition to impacts from future projects are considered minor. In addition, indirect impacts are associated with the generation of electricity that would be transmitted through power lines to pump stations and the tank farm. While much of the oil transported by the Project could be replacing dwindling supplies, there could be an incremental increase in emissions from the processing of heavy crude oil at refineries. However, all refining would be required to adhere to refinery-specific air permits designed to avoid significant cumulative impacts to air quality. Future electricity sources in the region would likely include renewable

TABLE 3.14.3-1 Summary of Cumulative Impacts to Resources			
Resource Area	**Past Actions**	**Present Actions and Proposed Project**	**Future Actions**
			energy sources (e.g., wind power).
Greenhouse Gases, and Climate Change	Crude oil delivered to PADD III refineries by the Project would likely be replacing heavy crude oil from other less reliable and diminishing sources. Assuming constant demand for refined oil products, the incremental impact of the Project on GHG emissions would be minor.	Indirect GHG-related emissions during operation would be associated with electrical generation for the pump stations (approximately 2.6 to 4.4 million tons of CO_2 per year for a proposed initial capacity of 700,000 bpd and a potential capacity of 900,000 bpd, respectively). In addition, refining the quantity of crude oil that would be delivered by the Project would produce an estimated 1.3 to 1.7 million tons of CO_2 per year. However, since the crude oil delivered by the Project would be replacing similar crude oils from other sources, the incremental impact of these emissions would be minor.	Future refinery upgrades and expansions could potentially increase the annual production of GHG in the PADD II and PADD III areas. Should such upgrades and expansions occur, generation of GHG in these areas could potentially increase. The cumulative impact of increased GHG emissions in this area would depend upon the potential for reductions in GHG emissions elsewhere, consistent with developing regulatory frameworks in the U.S., Canada and worldwide.

3.14.3.1 Geology

The proposed Project would cross deposits of sand, gravel, clay, stone, and coal bearing formations in multiple states, such as South Dakota and Oklahoma. Existing oil and natural gas ROWs limit the area available for extraction of mineral resources within their permanent ROW. In those areas where existing ROWs are present within the Project area, there would be a minor cumulative decrease in the access to mineral resources within the ROWs. The proposed Project would limit the extraction of these mineral resources in the permanent ROW; therefore, the proposed Project would represent a small decrease in area available for mineral extraction. The quantity of land containing mineral resources that would be encumbered by the proposed Project would be minimal when compared to the quantity of mineral extraction sites that are located outside of the permanent ROW throughout the Project area. Extraction of oil and gas resources would not be affected by operation of the proposed pipeline. The proposed Project would have minor effects on mineral resources; mineral extraction would also be limited in existing ROWs that are within the Project area, but cumulatively, the quantity of lands containing mineral resources encumbered by permanent ROWs would be minor compared to the overall quantity of lands available.

The proposed Project does not involve substantial long- or short-term alteration of topography. Most of the proposed route is within areas where bedrock is buried by unconsolidated sediments consisting of glacial till, alluvium, colluvium, loess and/or aeolian deposits. In these areas, impacts to bedrock are expected to be minimal, and limited to areas where bedrock is within 8 feet of the surface. Over the entire proposed project route, approximately 9 miles cross areas identified as potential blasting locations and approximately 166 miles cross areas identified as potential ripping locations (areas that contain dense material). Accordingly, the proposed Project would have a minor effect on potential impacts to existing bedrock, but it would contribute to a minor cumulative effect on bedrock in those portions of the Project corridor that would be subject to bedrock that would require blasting.

Potential impacts to paleontological resources during construction of the proposed Project and foreseeable projects may occur. During construction, damage to or destruction paleontological resources due to excavation activities and/or blasting, erosion of fossil beds due to grading, and unauthorized collection of fossils by construction personnel or the public may occur. Consultation with appropriate state and federal agencies during proposed Project planning has minimized the potential for the proposed Project crossing scientifically-significant paleontological resources. As stated in Section 3.1.2.2, operation of the proposed Project is not expected to affect paleontological resources; however, collection of these resources for scientific purposes would not be possible within the permanent ROW. Therefore, the proposed Project combined with past, present, and foreseeable actions would have a minor effect on the potential loss of the availability of paleontological data for scientific purposes.

3.14.3.2 Soils and Sediments

Potential cumulative effects to soils and sediments could occur where soils are subject to a one-time or frequent disturbance if construction disturbances overlap or are located adjacent to each other. The Project area has already experienced the effects of the construction and operation of numerous pipeline and transmission line projects. These areas may have experienced disruption to soils and sediments through clearing, grading, trench excavation, backfilling, heavy equipment traffic and restoration. Most impacts to soils and sediments through construction of oil pipelines and transmission lines would be short-term, with no impacts outside of the permanent ROW. Limited impacts to soils or sediments have been identified from past activities in the Project area.

Construction activities associated with Project pipeline and appurtenant facilities such as clearing, grading, trench excavation, backfilling, heavy equipment traffic, and restoration along the construction ROW may adversely affect soil resources. Potential impacts include temporary and short-term soil erosion, loss of topsoil, short-term to long-term soil compaction, permanent increases in the proportion of large rocks in the topsoil, and short-term to permanent soil contamination from accidental spills. Soil compaction can reduce soil porosity and percolation rates, which can increase the potential of stormwater runoff. Additional impacts could include reduced productivity in disturbed farmland and rangeland areas until soil reclamation efforts are successful. Over the long-term, soil productivity of the proposed Project is not expected to be significantly impaired due to the use of soil erosion control methods during construction and post-construction restoration.

Most impacts to soils and sediments through construction of future oil and gas pipelines, transmission lines or other projects would be short-term, with limited cumulative impacts in the Project corridor. However, long-term soil compaction may occur through repeated disturbance of soils in the immediate area, resulting in reductions in soil porosity and percolation rates, increasing the potential of stormwater runoff.

3.14.3.3 Surface Water

Previous construction of pipelines would typically be localized and short-term. Cumulative effects could occur where projects cross waterbodies more than once or where multiple crossings occur in the same watershed from the Project may occur in waterbodies that are crossed more than once or where multiple crossings occur in the same watershed. Where the Project area would contain multiple crossings of the same waterbody, the selection of appropriate construction techniques and oversight by relevant regulatory authorities would reduce short-term cumulative impacts to acceptable levels.

Streams that would be crossed by the proposed Project in Montana, South Dakota, and Oklahoma are listed as impaired for siltation, TSS and turbidity, respectively. Where conditions warrant the use of the HDD crossing method, waterbody impacts of construction will be minimal since no direct contact would occur with stream banks, channel bed or waters. Where non-HDD crossing methods are used, or in the event that a frac-out were to occur, the simultaneous construction of other projects within the proposed Project corridor would temporarily result in a cumulative increase in sediment loads delivered to the crossed waterbodies. The proposed Project and the other projects that may result in cumulative impacts to water resources would adhere to applicable local, state, and federal regulations and permitting that would require the use of appropriate best management practices to minimize the introduction of sediments and impacts to waterbodies within the proposed Project corridor. After construction, channel stability may decrease and aquatic habitat may be degraded in the short-term as waterbody systems return to pre-construction conditions. Non-HDD crossings in sensitive systems may aggravate contaminated or impaired conditions or negatively impact protected waterbodies. The impacts to surface waters from routine pipeline operation are limited to accidental crude oil spills as described in Section 3.13.

Future pipeline construction activities are not likely to contribute to cumulative impacts if they occur after Project construction is complete. Long-term cumulative impacts would occur if stream channels cannot return to pre-construction conditions before future construction takes place, particularly where channel stability has been adversely affected. In areas where the Project area would contain either existing or proposed new pipeline systems, the selection of the appropriate construction technique and oversight by relevant local, state, and federal regulatory authorities would reduce short-term impacts to acceptable levels.

3.14.3.4 Wetlands

Past and current wetland disturbance in the project area includes farmed wetlands and wetlands within grazed rangelands (Keystone 2009c). Past pipeline construction in the Project area that has impacted herbaceous or scrub-shrub wetland resources would have affected wetland functions, but most areas, the wetlands have transitioned back to pre-construction vegetation communities. Recovery time required for herbaceous or scrub-shrub vegetation in wetlands where disturbance would occur again is 3-5 years. Where vegetation would not be continually affected during Project operations, forested wetlands would have regeneration periods of 20 to 50 years to accommodate tree species height potential. Depending on the vegetation types, past effects on wetlands in areas where the Project area contains previously-completed projects may still be evident. Also, previously-installed linear pipeline or transmission projects would have resulted in a permanent conversion of forested wetland vegetation type in their permanent ROWs. Presently, cumulative impacts on wetlands would occur in locations where the Project area contains other linear ROWs that have resulted in the conversion of forested wetlands to herbaceous or scrub-shrub wetlands or in areas where wetlands have been permanently encumbered by facilities.

The proposed Project would encumber approximately 554 acres of wetland (Section 3.4.3). The majority of cumulative wetland impacts would occur in those areas where the proposed Project and other planned projects would impact the same wetland features within the Project corridor. Applicable local, state, and federal permitting would be completed in support of the proposed Project and other projects in the Project corridor. Under the current applicable regulations, mitigation for any permanent loss or conversion of wetland resources would be required.

None of the wetlands crossed by the Project would likely be permanently filled or drained, and the proposed Project's temporary and permanent impact on wetland resources would be accounted for through compensatory mitigation. Therefore, the contribution of the Project on cumulative effects to wetlands in the Project area would be minor. Additional provisions for maintaining wetland areas of concern and thus reducing cumulative impacts are included in the Project CMR Plan (Appendix B).

3.14.3.5 Terrestrial Vegetation

Past disturbance to terrestrial vegetation has resulted from previous pipeline and/or electrical power transmission and distribution line construction and maintenance of low-height vegetation. The degree of cumulative impact from past projects depends upon the type and amount of vegetation affected, the rate at which the removed vegetation regenerated after construction, and the frequency of vegetation maintenance conducted on the ROW during project operation.

The primary Project contribution to cumulative impacts on vegetation would be the cutting, clearing, or removal of vegetation within construction work areas, the maintenance of herbaceous vegetation in the permanent ROW, and the potential introduction of noxious weeds in cleared areas. The degree of Project impact would depend on the type and amount of vegetation affected, the rate at which removed vegetation would regenerate after construction, and the frequency of vegetation maintenance in the permanent ROW. In non-agricultural areas, construction of the proposed Project would result in the permanent loss of forested and scrub-shrub vegetation. Also, this clearing would cause a small incremental increase in forest fragmentation in forested areas.

Clearing of native grasslands along portions of the Project area along the Steele City Segment would contribute to the cumulative decline of native grasslands. Although native grasslands would be restored, the effects of land clearing on previously untilled native prairies may be irreversible. Short-grass prairie and mixed-grass prairie areas often take 5 to 8 years to become reestablished due to poor soil conditions and low moisture levels. Construction areas along this segment would also remove woody shrubs in sagebrush grasslands. The permanent ROW would be kept free of woody vegetation. Sagebrush vegetation can take 20 to 50 years to become reestablished to pre-construction; therefore, removal of sagebrush vegetation would be a long-term cumulative impact.

Cumulative vegetation impacts within the Gulf Coast and Houston Lateral segments of the Project corridor would result from clearing activities that would affect upland forests, riparian areas, and bottomland forests. Removal of trees in upland and riparian forest communities would result in long-term impacts because of the long periods required for these vegetation communities to mature to pre-construction conditions. Long-term cumulative impacts to vegetation would occur within permanent ROW areas where cleared vegetation would be prevented from becoming reestablished. Vegetation regrowth in these areas would be controlled by periodic mowing and brush clearing within a 30-foot-wide permanent easement in upland areas and a 10-foot-wide permanent easement in riparian areas. Clearing of forest vegetation along these segments would represent a long-term cumulative impact.

Cumulative impacts on annually tilled croplands would be short-term and limited to the current growing season, provided that topsoil segregation was maintained and soils were not compacted during construction. Cumulative impacts on pastures, croplands, and open grasslands would generally be short-term and minor with vegetation typically becoming reestablished within 1 to 5 years after construction is complete. Long-term impacts on these types of vegetation would be minimal because these areas would be allowed to recover following construction and typically would not require maintenance mowing.

The total amount of vegetation that may be affected by all of the reasonably foreseeable projects, including the Project, is relatively small compared to the abundance of similar vegetation in the Project area. Cumulative impacts would result in the long-term and permanent loss of non-herbaceous vegetation, which would cause a small incremental increase in fragmentation of forested areas. Future projects would likely implement mitigation measures designed to minimize the potential for erosion, revegetate disturbed areas, implement site stabilization procedures, and control the spread of noxious weeds, which would minimize the degree and duration of the cumulative impact on vegetation from these projects.

3.14.3.6 Wildlife

The Project area contains a diversity of wildlife, including big game animals, small game animals and furbearers, waterfowl and game birds, and other nongame animals. Wildlife habitats in these areas include: grasslands/rangelands, shrublands, croplands/pasturelands, upland forests and wetlands. These vegetation communities provide a wide variety of foraging, cover, and breeding habitats for wildlife. Migratory birds also use many of these habitat types for nesting, migration, and overwintering. Large numbers of bird species nest in the Project area in northern Montana and winter in the vicinity of the Project area in south Texas.

Past disturbance to habitats contribute to potential cumulative impacts to wildlife including habitat loss, alteration, and fragmentation; direct mortality during construction and operation; indirect mortality and reduced breeding success from stress and effects on feeding due to noise and human activity; and reduced survival or reproduction due to decreased abundance of forage species. Cumulative effects on wildlife include the incremental loss and alteration of grasslands, rangelands, forested habitat, and wetland habitats; including portions of several habitat areas specifically set aside for wildlife conservation.

Many grasslands/rangelands and shrubland habitats in the Project area have not been previously fragmented by road and/or electrical power line networks. However, forestlands and croplands in many areas along the Gulf Coast Segment and Houston Lateral have been previously fragmented by road and electrical power line networks. Additional incremental habitat fragmentation from pipeline construction would be most pronounced in forested and shrubland habitats. Prior fragmentation of sagebrush shrublands in Montana in conjunction with fragmentation of habitat from clearing could incrementally increase mortality rates for species dependent on sagebrush cover. Forestlands in the Project area along the Gulf Coast Segment and Houston Lateral have been previously fragmented by ROWs and would experience additional fragmentation from the proposed Project.

Construction and operation of the proposed Project, along with the reasonably foreseeable projects, would result in short-term disturbance to wildlife species and long-term wildlife habitat modification. The Project would incrementally add to the area of habitat disrupted and to the disturbance of resident and migrating species, causing associated impacts on these species as they adjust to the changes brought about by the proposed projects in the Project corridor. Increased movement or displacement of species dependent on the disturbed habitats could reduce carrying capacities, reproductive effort, or survival. This potential is greater for species for which suitable habitat is limited in the Project area or that are otherwise sensitive to disturbance.

Long-term cumulative impacts on wildlife would occur in areas where habitat is not allowed to return to preconstruction conditions and in areas where long time periods are required for wildlife habitat to become re-established. Implementation of appropriate mitigation measures, including habitat restoration, would minimize most long-term cumulative impacts on wildlife.

3.14.3.7 Fisheries

Prior removal of riparian vegetation and instream disturbance due to existing projects, have occurred at various levels within streams crossed by the Project area. Potential cumulative effects on fisheries due to instream and riparian disturbance include habitat alteration resulting in potential disruption to feeding, breeding and other life stage habitats.

Several portions of the Project area would cross streams or rivers that contain known or potential habitat for special-status fish species. Special-status fish species include those listed by a state or listed under the federal ESA as threatened, endangered, or as species of conservation concern. Special-status fish species are known to be present in the Red River on the Oklahoma/Texas border. Special-status fish species are also present in the Trinity River and San Jacinto River along the Houston Lateral. Impacts to special-status fish species in these locations would be avoided where the HDD crossing method is utilized. Other streams in these areas would be surveyed to determine species presence, or species presence would be assumed and construction timing or other methods would be developed to minimize cumulative impacts.

Current disturbance to fisheries resources from projects in the Project area include sediment release during instream construction and loss of overhead shade and nutrient input. For the currently proposed Project in non-HDD stream crossings, these conditions can cause short-term changes to downstream aquatic life and their habitats (Levesque and Dube 2007, Wood and Armitage 1997). Other potential effects from construction include alterations to streambed conditions; reductions in the abundance and diversity of benthic invertebrate communities; and reductions in the abundance of fish populations in cases of large-scale sediment releases. Impacts to fisheries would be greater in areas where important fish spawning or rearing habitat would be altered by construction. While adult fish are likely to move away from areas of construction, younger fish would be more vulnerable to stream alteration impacts. Small-scale effects are typically non-residual, and recovery of streambeds and benthic invertebrate productivity to pre-construction conditions is expected within approximately 1 year (Crabtree et al. 1978, Tsui and McCart 1981, Gowdy et al. 1994, Anderson et al. 1998). Larger scale disturbances that include post-construction impacts can take longer to recover (Crabtree et al. 1978).

Future projects that would be constructed in the Project area shortly after the construction of the proposed Project may result in a small cumulative impact on fisheries resources. Those future projects that would occur after the streams in the Project area have recovered from activities associated with the proposed Project would not contribute to a significant cumulative impact on fisheries. These impacts would likely be short-term and minor due to implementation of mitigation measures and the requirements of any individual state permits to minimize impacts while crossing waterbodies.

3.14.3.8 Threatened and Endangered Species

In general, past cumulative impacts to threatened and endangered species potentially occurring in the Project corridor have included loss of habitats, habitat fragmentation, effects on water quality from agriculture and stormwater runoff, and riparian area encroachment for development or vegetation management purposes. Such cumulative impacts could lead to species decline in some cases.

Federally-protected threatened or endangered species potentially occurring in the Project area include seven birds, four mammals, three fish, one mollusk, and four plants (Section 3.8). Most of the identified species would not be present in areas where the Project area would contain other potential new or existing pipeline routes. One exception is the area near the Red River where the Project would parallel the Gulf Crossing Pipeline. The FWS has recommended that a 300-foot construction activity buffer be put in place at the Red River HDD crossing to minimize impacts to nesting Interior least terns (a federally-protected bird) and the Arkansas river shiner (a federally-protected fish). The Gulf Crossing Pipeline Project crossed the Red River via HDD and the proposed Project has committed to use a similar crossing method.

Current disturbances to federally-listed threatened and endangered species from projects in the Project area include temporal and localized disturbances that would have displaced wildlife and fish species through construction noise, terrain or vegetation disturbance or water quality impacts. The required construction buffer at the Red River crossing for the Project would benefit other sensitive species known to be in the area, including the Quachita Rock Pocketbook (a federally protected freshwater mussel found in the area) and Whooping Crane (a federally protected species). The Louisiana Black Bear (a federally protected species) may also be present in southern Oklahoma and northeast Texas where the Project area would contain other pipeline routes.

Construction activities near the Red River would be completed before the bird nesting season. If construction occurs in these areas during the breeding season, additional surveys for nesting Interior Least Terns would be conducted. If active nests are discovered, USFWS would be notified and appropriate mitigation measures would be taken, such as creating a 0.25-mile-wide buffer zone around each active nest to minimize impacts to nesting birds.

The Project pipeline would parallel other linear facilities; therefore, many of the state- and federally-listed threatened and endangered species could potentially be affected by construction (future) and operation (existing and future) of these projects. Implementation of appropriate mitigation measures for the Project and for future projects, including habitat restoration, would avoid or minimize most long-term cumulative impacts. In addition, each project is required to consult with federal, state, and local agencies to determine which species may occur within each individual project area; evaluate potential impacts on those species during construction and operation; and implement measures to avoid, minimize, or mitigate impacts on special-status species and their habitats. The species analysis for the Project included species impacts from previous projects as a baseline condition. Since Project reclamation requirements include restoring native vegetation and soil conditions except in places where vegetation height is managed either for inspection or safety purposes, future projects that occur 5 years from the present will encounter conditions in some areas where shrub type habitats have been restored and future projects that occur longer than 20 years from the present will encounter conditions in some areas where trees have re-established.

3.14.3.9 Noise

Cumulative increases in noise levels resulting from the operation of the pump stations and other existing noise generating infrastructure in the Project area would be minimal due to the spatial distance between pump station or tank farm locations.

Construction equipment during Project construction and pump stations during Project operations would be the primary sources of noise from the Project. Project construction noise impacts would be localized, temporary, and short-term along each construction spread. The Project would be constructed after other pipeline projects in the vicinity have been completed; therefore, cumulative effects on ambient noise levels would be avoided. Impacts on regional ambient noise levels resulting from the Project pump stations would be minimal given the long distances between pump stations and associated facilities.

Cumulative impacts on noise levels resulting from the operation of the pump stations for the Project and any future noise-producing projects in the Project area would depend upon the location, duration, and noise levels associated with future projects in the context of ambient noise levels at the proposed Project pump stations.

3.14.3.10 Land Use

In locations where linear projects have already been constructed and are operational in the Project corridor, the potential for short-term Project-related cumulative impacts on land use is low. For example, there would be a negligible cumulative impact of the Project on agricultural production as farmland affected by past projects has most likely already been reclaimed and is back in production.

Construction of the Project would result in a range of temporary land use impacts including the displacement of agricultural, forest and rangeland production within the Project corridor; potential damage to agricultural infrastructure (e.g., drain tiles or irrigation systems) that would diminish agricultural productivity; and indirect effects on surrounding land uses along the pipeline route from construction-related nuisances (e.g., increased noise and dust). Most acreage disturbed during construction would be returned to preconstruction uses. Generally, agricultural land would become productive during the next planting season. Disturbed pastures and rangelands would require revegetation that may take 1 to 5 years to recover to preconstruction levels. Forestland could take 20 or more years to recover. Permanent conversion of forest land uses would occur within the permanent ROW and at aboveground facilities. Aboveground facilities (e.g., pump stations and valves) required for operations would permanently convert the land associated with these facilities to an industrial use. In addition, some agricultural lands currently enrolled in the Conservation Reserve Program (CRP) or other conservation programs may not qualify for continued participation in these programs potentially resulting in the land converting back to active agricultural uses.

Longer term cumulative impacts are possible for land uses that require a longer time period to return to their original use, such as forest land. For reasonably foreseeable projects, the temporary displacement of most land uses, other than forested land uses, associated with the Project would have ended by the time future projects are implemented. Easement restrictions associated with the Project may be unique, and therefore cumulative, to existing and/or anticipated land use restrictions imposed by easements from other projects within the Project area. These types of cumulative effects are not expected to be substantial because linear projects typically impose similar long-term land use restrictions as part of easement negotiations with landowners.

Construction of aboveground facilities for the Project would cumulatively contribute to permanent land use conversion impacts. For example, losses in land available for agricultural production may be exacerbated by additional constraints on agricultural production imposed by other projects in the Project area. The development of pump stations and valves as part of the Project would represent an industrial land use conversion that is cumulative to similar facilities that would be built as part of future projects. The cumulative effect would be a permanent conversion of land to industrial uses.

Depending on the location of other past and future projects and the conservation status of affected lands, development of the Project could cumulatively contribute to the decline in lands participating in regional conservation programs, such as the CRP. Reduction in conservation lands represents a potential long-term cumulative impact of the Project.

3.14.3.11 Visual Resources

Cumulative impacts on visual resources could occur in areas where multiple projects remove large swaths of vegetation and in areas where permanent aboveground facilities are constructed. In portions of the Project area where existing projects have already altered the viewshed, the additional impact resulting from belowground pipeline construction of the proposed Project would be minor. In those areas where the Project would add new aboveground visual components (e.g., pump stations, tank farm, MLVs) cumulative visual impacts would include contributions to an intensified industrial character.

Visual impacts due to Project construction activities would be temporary and would include removal of existing vegetation, exposure of bare soils, earthwork and grading scars, and landform alterations. In addition, the visual quality of the area surrounding the Project corridor may be temporarily degraded due to the presence of construction crews and equipment. During operations, the presence of aboveground facilities that are industrial in character could also diminish the visual quality of the affected area depending on surrounding land uses. The Project would implement mitigation measures to reduce long-term visual impacts.

Over the long-term, Project aboveground facilities would cumulatively contribute, in the presence of similar facilities from future projects, to an intensified industrial character within the Project corridor that would adversely affect the visual quality of the area. Project aboveground facilities would be dispersed along a linear corridor, when combined to future changes in the visual character of the Project area could lead to a general cumulative impact on visual resources throughout the Project area.

3.14.3.12 Socioeconomics

Past construction of pipelines and other industrial facilities likely would have required temporary construction workers in the Project area. Therefore, the proposed Project would not contribute to cumulative change in population, housing, municipal services, or traffic in the Project area.

The Project area is predominantly rural and sparsely populated, with the population tending to increase from north to south along the Project corridor. The population density in northern Montana is less than one person per square mile. In the southern Oklahoma/northeastern Texas area, population density ranges from 35 to 40 people per square mile. In areas in southern Texas, population densities range from 50 to 280 people per square mile along the Gulf Coast Segment to nearly 2,000 people per mile in the urbanized areas at the western end of the Houston Lateral. Concentrations of minority populations in Jefferson, Lamar and Harris Counties in Texas and Bryan County in Oklahoma are more than 50 percent higher than the corresponding state-wide averages. However, no area exceeds the 50 percent benchmark under the Environmental Justice Executive Order #12898 for minority or poor populations.

The presence of construction workers requiring housing and other services is the primary socioeconomic impact of the proposed Project. Construction workers are expected to utilize the closest available local rental, motel/hotel, RV and camping facilities during the construction of each spread. Adequate temporary housing and services appear to be present along the Gulf Coast Segment and the Houston Lateral, but shortages exist along portions of the Steele City Segment. Housing inadequacy in Montana and South Dakota would be mitigated through the construction and operation of 4 temporary construction camps.

Potential short-term socioeconomic impacts from the Project would include temporary changes in population levels or local demographics, changes in the demand for housing and public services, disruption of local transportation corridors, increased employment opportunities and related labor income benefits, and increased government revenues associated with sales and payroll taxes. The primary long-term socioeconomic impacts in these areas would include limited employment and income benefits resulting from a very small permanent Project operations staff and some local Project expenditures, as well as an increased property tax base and associated tax revenues. Operation of the Project would require relatively few permanent employees; thus, there would be no long-term cumulative impacts on population, housing, municipal services, or traffic in the Project area. The increased tax revenue paid to the state and local governments over the life of the spectrum of projects in the Project vicinity would result in beneficial long-term cumulative economic impacts. Keystone estimates that $138.4 million in annual property tax revenues would be generated by the Project in the region of influence. This estimate is based on 2006 tax rates and an estimated $7.0 billion of capital costs.

3.14.3.13 Cultural Resources

Cumulative impacts to cultural resources from past projects include disturbance to aboveground and belowground resources within the area of potential effect (APE) for those projects that would be contained within the Project corridor. The proposed Project would be constructed in accordance with requirements under Section 106 NHPA and other relevant federal, state and local regulations. Additional disturbance to these resources from construction of the Project would be limited through avoidance and mitigation when avoidance is not achievable.

The types of impacts to cultural resources that could occur from the Project include the physical destruction or damage to historic properties; introduction of visual, atmospheric, or audible elements that would diminish the integrity of a historic property's significant historic features; and changes to the character of the historic property's use or changes to physical features within the historic property's setting that contribute to its significance. To limit effects to historic properties within the Project area, the Project would avoid impacts to historic properties that have been found eligible for listing in the NRHP or that are unevaluated. Cultural resource avoidance would be achieved through pipeline route variations, avoiding NRHP-eligible properties, or digging underneath the cultural deposits by boring or HDD construction methods. Additionally, a Programmatic Agreement (PA) is being negotiated between the Consulting Parties under Section 106 NHPA. The PA would provide the methodology to provide protection of historic resources during Project construction.

New pipelines located within the Project area may potentially disturb currently mitigated or unidentified archaeological sites and historic properties. This may result in a negative cumulative impact on cultural resources. However, cultural resource areas have been surveyed and identified or will be surveyed and identified prior to the publication of the final EIS or later under the Programmatic Agreement for this Project, so it is likely that these areas would be subject to mitigation and avoidance measures during future projects.

3.14.3.14 Air Quality, Greenhouse Gases, and Climate Change

Potential cumulative impacts to air quality associated with construction and operation of the Project in addition to other large-scale projects in the Project area are discussed. In addition, potential cumulative impacts to air quality associated with refining the heavy crude oil that would be transported via the Project and the air quality impacts associated with the end use of the refined product are also discussed.

Air Quality

Pipeline Construction & Operation

The primary impacts on air quality from the Project would be from construction activities that generate fugitive dust (e.g., excavation and materials handling) and air emissions (e.g., fueling and operation of construction equipment and open burning). The majority of pipeline construction activity would generally pass by a specific location within a 30-day period before final grading, seeding, and mulching takes place, thereby resulting in short-term and temporary impacts in any one area. Contractors would be required to implement dust-minimization practices to control fugitive dust emissions during construction, such as applying water sprays and surfactant chemicals, and stabilizing disturbed areas. Additional dust control measures may be required by state or local ordinances. All fossil-fueled construction equipment would be maintained in accordance with manufacturer's recommendations to minimize construction-related emissions.

There would be no contribution to cumulative impacts from the construction of past projects since the impacts of these projects would have been short-term (e.g., dust and emissions from construction vehicles). Impacts from ongoing operations of past projects would be additive to short-term construction impacts of the Project as well as impacts from ongoing operations of the Project. Existing oil and natural gas pipeline impacts would likely be limited to emissions from vehicles and aircraft used during ROW inspection and inspection and maintenance of project facilities. During operations, Project impacts would be limited to emissions from vehicles and aircraft used during ROW inspection and maintenance of pump stations. Since ROW and project facilities are inspected roughly twice monthly, the cumulative impacts from inspection and maintenance, in addition to impacts from foreseeable future projects are considered minor. Emissions for the Project from construction and operational sources are provided in Table 3.14.3-2 below. The construction emissions represent a 3-year combined total of emissions from construction of the 17 spreads.

TABLE 3.14.3-2
Estimated Direct Emissions for the Project

Emission Source	NOx (tons)	CO (tons)	VOC (tons)	SO_2 (tons)	PM (tons)	PM_{10} (tons)	$PM_{2.5}$ (tons)	CO_2-e[a] (tons)
Construction emissions								
Construction Camps[b]	494.40	432.56	46.39	33.04	24.72	24.72	24.72	109915.79
On-road vehicles	37.40	229.67	12.75	0.17	1.36	1.36	1.36	18623.42
Non-road equipment	590.92	391.34	43.35	24.65	24.65	24.65	24.65	80519.11
Open burning	19.72	1157.87	85.00	--	185.64	132.43	112.54	26319.70
Fugitive dust	--	--	--	--	1474.92	737.46	110.67	--
Paved road dust	--	--	--	--	116.79	18.36	1.87	--
Total construction emissions (3-year combined)	**1142.44**	**2211.44**	**187.49**	**57.86**	**1828.08**	**938.98**	**275.81**	**235378.02**
Operating emissions								
Tank farm	--	--	21.03	--	--	--	--	N/A
Pump station fugitives[c]	--	--	6.82	--	--	--	--	84.63
On-road vehicles[d]	6.7E-05	1.5E-03	7.2E-05	8.0E-07	3.7E-02	5.8E-03	5.7E-04	4.3E-02
Total operating emissions (annual)	**6.7E-05**	**1.5E-03**	**27.85**	**8.0E-07**	**3.7E-02**	**5.8E-03**	**5.7E-04**	**84.63**

[a] CO_2 equivalent is conservatively estimated by assuming all total organic compounds are methane and multiplying by 21 for the global warming potential (GWP) for methane.

[b] Construction camp emission estimates include four construction camps with four, 400-kW generator engines per camp operating for 2 years.

[c] Pumping station emissions include combined emissions from 30 pumping stations along the Steele City and Gulf Coast Segments.

[d] The operational emissions noted from onroad vehicles include mobile emissions from the Steele City Tank Farm only and do not include the preliminary estimated VOC emissions from the storage tanks.

Notes:

NOx = Oxides of nitrogen.
CO = Carbon monoxide.
VOC = Volatile organic compounds.
SO_2 = Sulfur dioxide.
PM = Particulate matter.
PM_{10} = Particulate matter less than 10 microns in diameter.
$PM_{2.5}$ = Particulate matter less than 2.5 microns in diameter.
CO_2-e = Carbon dioxide equivalents.

Source: Keystone 2009c.

Refineries

The proposed Project would serve as a crude oil common carrier pipeline system. While the refineries that could receive crude oil are not part of the Project, refinery operations could potentially result in cumulative impacts to air quality in the general Project area or beyond if changes in the type or quantity of emissions occurred in the future. While it is not possible to meaningfully estimate, much less quantify, the specific volumes of oil that would be delivered to specific refineries over time, deliveries of oil via the

Project could theoretically either replace dwindling oil processed at these refineries, supplant existing supplies that are less stable or more costly, increase the total volume of oil processed, or result in a combination of these scenarios. The availability of additional heavy crude oil could theoretically result in expansion of existing refineries or even the construction of new refineries. DOS thinks that any attempt to quantify how the availability of this new source of oil may influence actions and subsequent emissions at existing, expanded, or future refineries is in many ways speculative and not required as part of this NEPA analysis; however, the potential for replacement and additional oil volumes as well as refinery expansions are discussed below to provide some context as to possible effects.

Oil pipeline infrastructure, deliveries, and refining in the U.S. are geographically categorized into Petroleum Administration for Defense Districts (PADDs). There are five PADDs in the U.S. and the proposed Project would deliver oil to two of them, PADD II and PADD III. Deliveries at the Cushing terminal in Oklahoma would generally serve refineries in PADD II, which includes 15 states in the Midwest from North Dakota to Oklahoma and east to Ohio. Table 3.14.3-3 identifies the crude oil refineries in those 15 states including the crude oil capacity for each refinery.

TABLE 3.14.3-3
PADD II Refinery Crude Capacity: 2008

Refineries	Crude Oil Capacity (thousand bpd)
ExxonMobil, Joliet, IL	250
Marathon, Robinson, IL	214
PDV Midwest Refining, Lemont, IL	171
WRB Refining, Wood River, IL	322
BP Whiting, IN	420
Countrymark, Mount Vernon, IN	27
Coffeyville Resources, Coffeyville, KS	120
Frontier, El Dorado, KS	135
NCRA, McPherson, KS	88
Marathon, Catlettsburg, KY	250
Somerset. Energy, Somerset, KY (idle)	0
Marathon, Detroit, MI	114
Flint Hills, Saint Paul, MN	330
Marathon, Saint Paul, MN	84
Tesoro, Mandan, ND	60
BP-Husky, Toledo, OH	160
Lima Refining, Lima, OH	170
Marathon, Canton, OH	85
Sunoco, Toledo, OH	175
ConocoPhillips, Ponca City, OK	210
Sinclair, Tulsa, OK	75
Sunoco, Tulsa, OK	90
Valero. Ardmore, OK	92

TABLE 3.14.3-3 PADD II Refinery Crude Capacity: 2008	
Refineries	**Crude Oil Capacity (thousand bpd)**
Ventura, Thomas, OK (idle)	0
Wynnewood Refining, Wynnewood, OK	75
Premcor, Memphis, TN	182
Murphy Oil, Superior, WI	35
PADD II GRAND TOTAL	**3,934**

Source: U.S. Energy Information Administration (EIA), Refining Capacity 2009.

Deliveries to the Gulf Coast would likely serve refineries in PADD III, which covers six states from New Mexico to Alabama. Delivery points of the proposed Project in PADD III are in Texas and would likely serve refineries in Texas and possibly Louisiana. Table 3.14.3-4 identifies the crude oil capacity for each refinery in PADD III, and specifies those refineries directly accessible to the Project, those refineries without direct access to the Project, and those refineries with possible pipeline connection to the Project. In general, the information provided on refineries was obtained from EIA (2009).

TABLE 3.14.3-4 PADD III Refinery Crude Capacity: 2008	
Refineries	**Crude Oil Capacity (thousand bpd)**
Gulf Coast Refineries with Direct Pipeline Access to the Proposed Project	
Motiva Enterprises LLC; Port Arthur, TX	285
Total Petrochemicals; Port Arthur, TX	232
Valero Energy Corp.; Port Arthur, TX	289
Exxon Mobil; Beaumont, TX	349
Pasadena Refining; Pasadena, TX	100
Houston Refining (Lyondell); Houston, TX	271
Valero Energy Corp.; Houston, TX	83
Deer Park Refining; Deer Park, TX	330
Exxon Mobil; Baytown, TX	567
BP; Texas City, TX	478
Marathon Oil; Texas City, TX	76
Valero Energy Corp.; Texas City, TX	200
Calcasieu Refining; Lake Charles, LA	53
CITGO; Lake Charles, LA	430
ConocoPhillips; Lake Charles/Westlake, LA	239
Sub-Total Group I	**3,981**
Gulf Coast Refineries in PADD II Without Direct Pipeline Access to the Proposed Project	
Hunt Refining Co.; Tuscaloosa, AL	35

TABLE 3.14.3-4 PADD III Refinery Crude Capacity: 2008	
Refineries	**Crude Oil Capacity (thousand bpd)**
ConocoPhillips; Belle Chasse, LA	247
Exxon Mobil; Baton Rouge, LA	503
Valero Energy Corp.; Krotz Springs, LA	80
Valero Energy Corp.; St. Charles, LA	185
Marathon Oil; Garyville, LA	256
Chalmette Refining; Chalmette, LA	193
Murphy Oil; Meraux, LA	120
Motiva Enterprises LLC; Norco, LA	236
Motiva Enterprises LLC; Convent, LA	235
Placid Refining; Port Allen, LA	56
Shell Chemical; Saint Rose, LA	55
ChevronTexaco; Pascagoula, MS	330
ConocoPhillips; Sweeny, TX	247
CITGO; Corpus Christi, TX	156
Valero Energy Corp.; Three Rivers, TX	96
Flint Hills Resources; Corpus Christi, TX	288
Valero Energy Corp.; Corpus Christi, TX	142
Sub-Total Group 2	**3,460**
Inland PADD III Refineries with Possible Pipeline Connection to the Proposed Project	
Navajo Refining; Artesia, NM	84
WRB Refining; Borger, TX	416
Valero Energy Corp.; Sunray/McKee, TX	171
Alon USA; Big Spring, TX	67
Delek; Tyler, TX	58
Sub-Total Group 3	**526**
Inland PADD III Refineries without Pipeline Access to the Proposed Project	
Other Refineries without Access	449
Sub-Total Group 4	**449**
PADD III GRAND TOTAL	**8,416**

Source: U.S. Energy Information Administration (EIA), Refining Capacity 2009.

The Project would supply up to 200,000 bpd to the Cushing terminal in PADD II and 700,000 bpd to customers along the Gulf Coast in PADD III. The exact proportion of heavy crude oil in these deliveries is not certain, but Keystone representatives have indicated it to be approximately 2/3 of the total volume (Purvin & Gertz 2009). In addition, there are no commitments for deliveries to specific refineries, although there are some refineries or geographic areas proximal to the Project that would be more likely to receive the oil. There are 27 refineries in PADD II that have a capacity to process over 3.9 million bpd of crude oil (Table 3.14.3-3). The heavy crude oil deliveries to these refineries totaled at least 900,000 bpd in 2008. The majority of the heavy crude oil supply to PADD II is provided via pipelines from Canada.

The Project would supply up to 500,000 bpd of crude oil to PADD III, an area that includes the U.S. Gulf Coast and extends from New Mexico to Alabama. There are 58 refineries in PADD III with a refining capacity of 8.4 million bpd (Table 3.14.3-4). Currently, over 3/4 of this volume is imported and the proportion of imported oil to PADD III is expected to increase by 600,000 bpd by 2020 as domestic production decreases (Purvin & Gertz 2009). Heavy crude oil accounts for approximately 2.5 million bpd of the crude oil refined in PADD III and the proportion of heavy crude oil refined is expected to grow as the availability of light crude decreases. As described in Section 1.2.2, the availability and supply of domestic and foreign light crude oil to the U.S. and PADD III has decreased and will continue to decrease, which has resulted in an increase in the proportion of heavy crude oil imported. However, the imports of heavy crude oil from three of the top four foreign suppliers to PADD III are decreasing or unstable. As of early 2010, Canada provides less than 2 percent of the crude oil supply to PADD III.

As identified in Table 3.14.3-4, a total of 15 refineries in PADD III would be connected directly to the Project, and they have a total crude oil capacity of almost 4 million bpd including over 1.4 million bpd of heavy crude oil (EIA 2009, Purvin & Gertz 2009). Oil transported via the proposed Project could be delivered to other refineries in PADD III, but it would require a secondary mode of transportation (e.g., other pipelines, ships, etc). These other refineries in PADD III have a total crude oil refining capacity of 4.4 million bpd including approximately 1.1 million bpd of heavy crude oil.

The existing refineries processing heavy crude oil in PADD II and PADD III are designed and permitted to refine heavy crude oil and the processing of heavy crude oil transported via the proposed Project is not expected to influence the exceedance of any permitted thresholds. EPA is the federal agency with the authority to implement and enforce requirement of the Clean Air Act. State agencies with approved State Implementation Plans (SIPs), including Texas and Louisiana, have been delegated authority by the EPA to administer an air quality permitting program. The permitting process is designed to avoid significant cumulative impacts to regional air quality associated with emissions.

While there are some recent, current, or planned refinery expansions occurring in PADD II and PADD III, there is no indication that the availability of oil transported via the Project would directly result in specific expansions of existing refineries and development of new refineries (none have been built in the U.S in 30 years). Refinery expansions and upgrades are primarily focused on increasing the capacity to refine heavy crude oil as the availability of light crude supplies to the U.S. decreases.

In recent years, a variety of refineries in PADD II and PADD III have initiated expansions or upgrades to increase their capacity for refining heavy crude oil. In PADD II, expansions and upgrades have been proposed or implemented in Oklahoma (Sinclair), Illinois (WRB Refining and ConocoPhillips Refinery), Michigan (Marathon), and Indiana (Whiting). There are several current or planned expansions of refineries in PADD III including Motiva (Port Arthur, Texas), Valero (Houston, Texas), Total (Port Arthur, Texas), Marathon (Garyville, Louisiana), and WRB (Borger, Texas) among other smaller expansions. Of these, the Motiva, Valero, and Total refineries would be directly connected to the Project. Valero has announced that they expect to be one of the largest recipients of heavy crude oil transported by the Project.

It is not possible to predict with certainty how refining the heavy crude oil transported via the proposed Project would impact air quality, or even where those impacts would occur. The potential refinery expansions are in various stages of planning and implementation, and each refinery is unique in regard to the size and type of expansion or upgrade, the type of best available control technology (BACT) that has been or would be implemented, the status of the expansions, the availability of air emissions modeling, and the resulting impact of associated emissions relative to existing conditions. It is possible to assess, however, the potential emissions of additional refining of oil transported by the proposed Project by evaluating a cross-section of available information on air emissions associated with refinery upgrades/expansions to increase the capacity for processing heavy crude oil.

It should be noted that federal regulations require that refineries that undergo substantial modification must integrate BACT into their design and methods and emission offsets, which may increase, decrease, or have little influence on baseline emission rates even though the volume of oil increases. That is that expansions in the volume of oil that can be refined may decrease overall emissions, which is especially true for older refineries that use outdated emission controls.

DOS (2009) provided a review of various refinery expansions and upgrades in PADD II associated with increasing the capacity of heavy crude oil processing. Specifically, DOS quantitatively reported on the change in emissions of criteria pollutants associated with proposed refinery expansions in Illinois, Indiana, and Michigan. While these locations are geographically removed from the Project area, the oil transported by the Project could be transported to remote refineries, and any refinery expansions or upgrades at refineries that would receive crude oil from the Project would likely be required to adhere to the same or comparable regulatory standards. As a result of improvements in control technologies and the use of offsets, these refinery upgrades and expansions generally resulted in an overall increase in carbon monoxide, and a decrease in emissions of particulate matter, sulfur dioxide, and nitrogen dioxides. Volatile organic emissions tended to decrease slightly, but not consistently. These results indicate that current BACT requirements for expansion of existing refineries with outdated control technologies can actually result in an overall reduction in emissions relative to baseline conditions for some criteria pollutants.

In PADD III, the largest permitted refinery expansion for processing heavy oil in recent years is for the Motiva refinery in Port Arthur, Texas. This expansion would increase the heavy oil refining capacity of Motiva by 325,000 bpd (from 275,000 to 600,000 bpd). The Motiva refinery would have direct access to the Project and would have the largest heavy oil refining capacity in PADD III. This expansion would result in increases in most criteria pollutants, although there would be a reduction in VOCs (Table 3.14.3-5). The likely reasons that this expansion would result in net increases in most emissions include the overall size of the expansion and the fact that the existing refinery was already using relatively modern emission controls. Any modification to the existing refining processes would therefore not produce emission reductions in the same proportion as those for more outdated refineries. We do not have any specific emission estimates for other refinery expansions under consideration in PADD III.

TABLE 3.14.3-5
Net Emissions for the Motiva Refinery Expansion

NO_x (tons)	CO (tons)	VOC (tons)	SO_2 (tons)	PM (tons)	C_6H_6 (tons)	H_2SO_4 (tons)	H_2S (tons)	NH_3 (tons)	Cl_2 (tons)
592.74	1,489.53	-116.73	1679.73	464.37	-0.47	22.24	4.33	125.69	3.77

NOx = Oxides of nitrogen.
CO = Carbon monoxide.
VOC = Volatile organic compounds.
SO_2 = Sulfur dioxide.
PM = Particulate matter.
C_6H_6 = Benzene.
H_2SO_4 = Sulfuric acid.
NH_3 = Ammonia.

Cl_2 = Chlorine.

Source: TCEQ 2009.

While there are no new refineries proposed within about 500 miles of a proposed delivery point for the Project, there is one refinery proposed in the northern portion of PADD II: the Hyperion Energy Center in South Dakota. While no new refinery has been permitted and built in the U.S. in the past 30 years, the permitting process for the proposed Hyperion project can be referenced to allow quantification of potential emissions from a potential refinery that would use modern technology to process up to 400,000 bpd of heavy crude oil. The calculated emissions from the proposed Hyperion refinery are generally comparable to those calculated for the 325,000-bpd Motiva expansion. The calculated emissions for the proposed Hyperion refinery (SDNR 2008) are:

- 773 tons of NO_X;
- 1,999 tons of CO;
- 863 tons of SO_2;
- 828 tons of VOCs; and
- 1,046 tons of particulate matter (PM).

Commercial, economic, and political forces would largely determine the quantity, type, and processing destination of the oil transported via the Project. These forces are likely to evolve on a day-to-day basis and from year-to-year for the life of the Project. It is expected that most of the oil transported by the Project would replace historic crude oil supplies or supplant supplies from less stable or more costly sources for the following reasons:

- The volume of oil that would be transported by the Project (900,000 bpd) represents 7.5 percent of the overall crude oil refining capacity of PADD II and PADD III (over 12 million bpd);
- The supply of domestic crude oil is substantially diminished and depleting rapidly;
- The supply of heavy crude oil delivered to PADD III from overseas sources is either depleting or at risk for political reasons; and
- There is a well developed regional and local infrastructure to facilitate distribution of Project crude oil among existing regional refineries.

Since light crude supplies are decreasing, refinery upgrades and expansions that allow for the refining of heavy crude oil, especially along the Gulf Coast, are occurring and would continue to occur whether or not the Project is constructed. If the Project is not constructed, shipment of heavy crude oil to the region could occur through other pipelines or through tanker shipments from other oil producing areas. If the Project is constructed, it is likely that some oil transported by the Project could be transported to expanded or upgraded refineries. As stated previously, the emissions associated with upgrades to existing refineries currently using older technologies may result in a decrease in some types of emissions based on refinery-wide improvements in refining processes and emission controls. However, recent and future refinery expansions that implement BACT could result in an incremental increase in emissions above relevant baseline conditions even though those emissions would likely be less on a barrel-to barrel basis than those at older refineries.

It is highly unlikely under any reasonable scenario that all of the crude oil transported through the Project would be received by recently upgraded or new refineries in the PADD II and PADD III areas. It is also expected that approximately 1/3 of the volume transported by the project will not be heavy crude oil. However, assuming that the entire volume is heavy crude oil and that it would be refined at upgraded or new refineries can be used to develop a hypothetical worst case scenario for the incremental increase in emissions related to the Project. In this hypothetical worst case scenario, the maximum volume of the proposed Project (900,000 bpd) would be multiplied by the emission rates per barrel reported for Motiva or Hyperion since these are assumed to be typical for new or recently upgraded refineries implementing BACT. In this hypothetical case, worst case total annual emissions of NO_X would range between about 1,639 and 1,736 tons, worst case CO emissions would range between about 4,114 and 4,500 tons; worst case SO_2 emissions would range between about 1,941 and 4,654 tons, worst case particulate matter emissions would range between 1,286 and 2,353 tons, and worst case VOC emissions would be about 1,061 tons. Even in this scenario, the emissions would be distributed across portions of PADD II and PADD III, and required air permitting for any upgraded or new refining facilities would avoid significant cumulative impacts to air quality.

The most realistic scenario for the disposition of oil transported by the Project is that some of the oil would replace declining feedstock at existing refineries in PADD II and PADD III, and some of the oil would supply newly upgraded or expanded facilities in PADD II and PADD III that have implemented BACT. The type and volume of oil refined in PADD II and PADD III are market driven. The refinery air emissions are regulated through air permits that define acceptable emission rates. There would potentially be some increase in air emissions associated with crude oil refined in PADD II and PADD III, but the increases would not likely be major.

Depending upon the source, heavy crude oils may contain higher concentrations of heavy metals, nitrogen, and sulfur compared to light oil. Processing the heavy crude oil may require upgrades to the refineries' wastewater treatments systems to meet discharge limitations of the NPDES permits under which wastewater discharges are permitted.

Recent refinery upgrades have required reassessment of NPDES permits, which has included expansion of stormwater capacity, installation of water strippers, more efficient final water filters, and other wastewater reduction projects. These measures are designed to ensure that wastewater and stormwater discharges meet NPDES permit limitations and protect the quality of the receiving waters.

As a result, existing refineries that upgrade to increase their capacity to refine heavy crude oil can do so without increasing pollutants in water discharges. New refineries or other existing refineries that propose upgrades would be required to satisfy NPDES discharge requirements to avoid significant impacts to water quality.

End Use

The end use of refined petroleum products could include combustion (e.g., vehicles, power generation, or other industrial facilities) or non-combustion uses (e.g., motor oils, lubricants, or other industrial uses). The volume of crude oil that would be transported to PADD III via the Project would total about 8.3 percent of the crude oil refining capacity in the PADD III region. The destination of the crude oil and the products refined from it are not determined by the Project. It is expected that neither the source nor the volume of oil transported via the Project would influence the ultimate type(s) of petroleum products refined. As a result of the refining process, the emissions associated with the end use of the oil by the consumer are not expected to be influenced by the source oil. Thus, the emissions associated with the ultimate use of the refined product would not differ from those end use emissions from other source oils. Independent of source, the criteria pollutant emissions from consumer and manufacturing use of refined petroleum products are regulated under permits for some uses (e.g., mass transportation vehicles and petrochemical processing) and not for others (e.g., private vehicles) beyond standard quality rules designed to reduce pollutants (e.g., oxygenated fuels and low-sulfur diesel).

The Corporate Average Fuel Economy (CAFE) regulations in the United States, first enacted by Congress in 1975, are federal regulations intended to improve the average fuel economy of cars and light trucks (trucks, vans and sport utility vehicles) sold in the U.S. In 2011, the standard will change to include many larger vehicles. In addition, while there is no basis to expect that GHG emissions by end users would be influenced by the source oil, GHG emissions from end uses of refined products are not yet regulated by the federal government or most states.

Greenhouse Gases and Climate Change

The principal GHGs are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone, and water vapor. CO_2 is the reference gas for climate change; therefore, measures of non-CO_2 GHGs are converted into CO_2-equivalent values based on their potential to absorb heat in the atmosphere. The principal GHG of concern related to crude oil pipeline construction and operation is CO_2, which enters the atmosphere through the burning of fossil fuels (e.g., oil, natural gas, and coal), solid waste, and trees and wood products, and as a result of other chemical reactions (e.g., manufacture of cement). CO_2 is removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biological carbon cycle.

Climate change is defined by the United Nations Framework Convention on Climate Change as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" (EPA 2008). Natural processes (including changes in the sun's intensity, slow changes in the Earth's orbit around the sun, or changes in ocean circulation) and human activities (including fossil fuel combustion, deforestation, reforestation, and urbanization) emit GHGs. The accumulation of GHGs in the atmosphere affects the Earth's temperature; however, emissions from human activities have caused the concentrations of heat-trapping GHGs to increase significantly in the atmosphere. These gases prevent heat from escaping to space, somewhat like the glass panels of a greenhouse. This accumulation has contributed to an increase in the temperature of the Earth's atmosphere and to climate change. If GHGs continue to increase, climate models predict that the average temperature at the Earth's surface could increase from 3.2 to 7.2 ºF above 1990 levels by the end of this century. Most scientists agree that human activities are changing the composition of the atmosphere, and that increasing the concentration of GHGs affects climate change. The rate, intensity, and effects of climate change continue to be assessed.

The increased concentration of CO_2 in the atmosphere has also increased ocean acidity since pre-industrial times (EPA 2009). The extent of ocean acidification is correlated with atmospheric CO_2 concentration. Ocean acidification affects future climate change by diminishing the ocean's capacity to absorb increasing atmospheric CO_2.

Regulations relating to Greenhouse Gases

On September 22, 2009 the EPA promulgated the first comprehensive national system for reporting emissions of carbon dioxide and other GHGs produced by major sources in the United States. Through this new reporting, EPA will have comprehensive and accurate data about the production of GHGs in order to confront climate change. Approximately 13,000 facilities, accounting for about 85 to 90 percent of GHGs emitted in the United States, would be covered under the proposed reporting system. The new reporting requirements would apply to suppliers of fossil fuel and industrial chemicals, manufacturers of motor vehicles and engines, and large direct emitters of greenhouse gases with emissions equal to or greater than a threshold of 25,000 metric tons per year. This threshold is roughly equivalent to the annual GHG emissions from just over 4,500 passenger vehicles. The direct emission sources covered under the reporting requirement would include energy intensive sectors such as cement production, iron and steel production, and electricity generation, among others. The gases covered by the proposed rule are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFC), perfluorocarbons (PFC), sulfur hexafluoride (SF_6), and other fluorinated gases, including nitrogen trifluoride (NF_3) and hydrofluorinated ethers (HFE). The first annual report would be submitted to EPA in 2011 for the calendar year 2010, except for vehicle and engine manufacturers, which would begin reporting for model year 2011.

According to the preamble of the rule, the U.S. petroleum and natural gas industry encompasses hundreds of thousands of wells, hundreds of processing facilities, and over a million miles of transmission and distribution pipelines. Crude oil is commonly transported by barge, tanker, rail, truck, and pipeline from production operations and import terminals to petroleum refineries or export terminals. Typical equipment associated with these operations includes storage tanks and pumping stations. The major sources of CH_4 and CO_2 fugitive emissions include releases from tanks and marine vessel loading operations. EPA does not propose to include the crude oil transportation segment of the petroleum and natural gas industry in this rulemaking due to its small contribution to total petroleum and natural gas fugitive emissions, accounting for much less than 1 percent, and the difficulty in defining a facility. The responsibility for reporting will instead be placed on the processing plants and refineries.

In addition, on September 30, 2009, EPA announced a proposal that is focused on large facilities emitting over 25,000 tons of greenhouse gases a year. These facilities would be required to obtain permits that would demonstrate they are using the best practices and technologies to minimize GHG emissions. The rule proposes new thresholds for GHG emissions that define when the Clean Air Act (CAA) permits under the New Source Review (NSR) and the Title V operating permits programs would be required for new or existing industrial facilities. The proposed thresholds would "tailor" the permit programs to limit the facilities that would be required to obtain NSR and Title V permits. The program would cover nearly 70 percent of the national GHG emissions that come from stationary sources, including those from the nation's largest emitters (e.g., power plants, refineries, and cement production facilities).

On April 2, 2007, in Massachusetts v. EPA, 549 U.S. 497 (2007), the Supreme Court found that GHGs are air pollutants covered by the CAA. The Court held that the EPA Administrator must determine whether or not emissions of GHGs from new motor vehicles cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare, or whether the science is too uncertain to make a reasoned decision. In making these decisions, the Administrator is required to follow the language of section 202(a) of the CAA. The Supreme Court decision resulted from a petition for rulemaking under section 202(a) filed by more than a dozen environmental, renewable energy, and other organizations. As a result of this decision, on April 24, 2009, the EPA proposed the Endangerment and Cause or Contribute Findings for Greenhouse Gases under the CAA to find that the current and projected concentrations of the mix of six key GHGs (CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6) in the atmosphere threaten the public health and welfare of current and future generations. This is referred to as the endangerment finding. The Administrator is further proposing to find that the combined emissions of CO_2, CH_4, N_2O, and HFCs from new motor vehicles and motor vehicle engines contribute to the atmospheric concentrations of these key greenhouse gases and hence to the threat of climate change. This is referred to as the cause or contribute finding. This proposed action, as well as any final action in the future, would not itself impose any requirements on industry or other entities. An endangerment finding under one provision of the CAA would not by itself automatically trigger regulation under the entire Act.

Programs for GHG emissions are being adopted by some states along the Project corridor. Montana is a member of the Western Climate Initiative (WCI). The WCI is a collaborative effort of seven U.S. states and four Canadian provinces to identify, evaluate, and implement measures to reduce GHG emissions in participating jurisdictions. The WCI has a regional GHG target of 15 percent below 2005 levels by 2020 that will be met through a regional market-based multi-sector mechanism, as well as other policies. The recommended cap-and-trade program has a broad scope that includes six GHGs (CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6) and will cover 90 percent of GHG emissions from the region when fully implemented. The cap-and-trade program will begin January 1, 2012.

The Governor of Nebraska, along with ten other Midwestern Governors and one Canadian province Premier, is a member of the Energy Security and Climate Stewardship Platform for the Midwest. The Platform lists goals for energy efficiency improvements, low-carbon transportation fuel availability, renewable electricity production, and carbon capture and storage development. In addition to goals related to energy efficiency, renewable energy sources, and biofuel production, the Platform lays out objectives with respect to carbon capture and storage (CCS). Members agree to have in place a regional regulatory framework for CCS by 2010, and by 2012 to have sited and permitted a multi-jurisdiction CO_2 transport pipeline and have in operation at least one commercial-scale coal-powered integrated gasification combined cycle (IGCC) power plant with CCS, with additional plants to follow in succeeding years. By 2020, all new coal plants in the region will capture and store CO_2 emissions. Numerous policy options are described for states to consider as they work towards these goals. The Platform also lays out six cooperative regional agreements. These resolutions establish a Carbon Management Infrastructure Partnership, a Midwestern Biobased Product Procurement System, coordination across the region for biofuels development, and a working group to pursue a collaborative, multi-jurisdictional transmission initiative. States adopting all or part of the Platform include Wisconsin, Minnesota, South Dakota, Illinois, Indiana, Iowa, Kansas, Michigan, Missouri, Nebraska, North Dakota, and Ohio, as well as the Canadian Province of Manitoba.

Kansas, on November 15, 2007, joined five other states and one Canadian province to establish the Midwestern Regional Greenhouse Gas Reduction Accord. Under the Accord, members agree to establish regional GHG reduction targets, including a long-term target of 60 to 80 percent below current emissions levels, and develop a multi-sector cap-and-trade system to help meet the targets. Participants also establish a GHG emissions reductions tracking system and implement other policies, such as low-carbon fuel standards, to aid in reducing emissions.

In South Dakota, on February 21, 2008, Governor Mike Rounds signed into law HB 1272, which established a voluntary Renewable Portfolio objective of 10 percent by 2015. Oklahoma and Texas currently do not have state initiatives addressing the reduction in greenhouse gases, although Senate Bill 184 calls on the Texas Commission on Environmental Quality (TCEQ) to develop and present a report to the legislature by December 31, 2010, recommending strategies to reduce the greenhouse gas emissions by businesses and consumers of the state.

Environmental Consequences and Mitigation

Neither the federal government nor states crossed by the proposed Project have established thresholds for determining the significance of GHG emissions. While no thresholds currently exist, this assessment of GHG emissions was conducted in accordance with CEQ guidance including CEQ's draft guidance for GHG (CEQ 2010).

There is a general scientific consensus that the cumulative effects of GHG have led to climate change on a global scale, which is considered a significant cumulative effect. As demonstrated in Table 3.14.3-2, GHG emissions during construction of the Project would total approximately 235,378.0 tons of CO_2-equivalent over the 3-year construction period, primarily associated with the operation of diesel-powered equipment (indirect emissions cannot be meaningfully quantified). GHG construction emissions estimates for each state that would be crossed by the Project are presented in Table 3.14.3-6.

As demonstrated in Table 3.14.3-2, direct GHG emissions during operation of the Project would total approximately 85 tons per year of CO_2-equivalent.

TABLE 3.14.3-6
Estimated GHG Emissions for the Project

State	3-Year Construction CO2-e a (tons)
Montana	67787.85
South Dakota	93419.58
Nebraska	22251.18
Kansas	0
Oklahoma	7417.06
Texas	44502.36
Total	**235378.02**

[a] CO_2 equivalent is conservatively estimated by assuming all total organic compounds are methane and multiplying by 21 for the global warming potential (GWP) for methane.

CO_2-e = Carbon dioxide equivalents.

Source: Keystone 2009

Indirect GHG-related emissions during operation would be associated with electrical generation for the pump stations (approximately 2.6 to 4.4 million tons of CO_2 per year for a proposed initial capacity of 700,000 bpd and a potential capacity of 900,000 bpd, respectively, as calculated using EPA's AP-42 emission factor for large diesel engines and assuming 30 pump stations with 79 to 132 pumps rated at 6,500 hp).

Refining of the oil transported by the Project would also indirectly emit GHGs. Refining at existing refineries that are not upgrading to increase their capacity for processing heavy crude oil would not be expected to cause a substantial increase in GHG emissions relative to those associated with currently permitted heavy crude oil refining. GHG emissions from upgraded refineries or new refineries would represent an incremental increase in GHG. Comprehensive information on GHG emissions from refineries in general is not available, but there is some information on the relative magnitude of incremental GHG emissions associated with refinery upgrades and literature on the carbon emissions for refining a barrel of oil.

For the BP Whiting Indiana Refinery in PADD II, BP reports that the 260,000 bpd upgrade project will result in a 30- to 40-percent increase in CO_2 emissions for the refinery, resulting in an incremental increase in CO_2 emissions up to 0.5 million tons per year. The Motiva Refinery in PADD III is expanding to increase its capacity by an additional 325,000 bpd. Although specific emissions would vary among refinery expansions, the expansion of the Motiva Refinery could be expected to increase emissions by 0.6 million tons per year if it resulted in the same rate of emissions per barrel as the BP Whiting refinery upgrade. Further, applying this value to the volume transported by the Project (initial capacity of 700,000 bpd and a potential capacity of 900,000 bpd) indicates that the incremental increase in GHG emissions represented by the Project could be approximately 1.3 to 1.7 million tons of CO_2 per year. This also assumes that the entire volume of oil transported by the Project would be heavy crude oil. As mentioned previously, emission estimates are refinery specific, and emission rates at different refineries could vary broadly.

Information is also available on the total GHG emissions associated with refining a single barrel of heavy crude oil independent of a specific refinery. A report by the University of Toronto (2008) estimates that refining one barrel of heavy crude oil from oil sands emits a total of 47.4 kilograms of CO_2, including the refining process itself and energy generation for the refining process. Applying these values to the volume transported by the Project indicates that CO_2 emissions from refining could total 13.3 to 17.2 million tons per year. Similarly, preliminary estimates by the Natural Resources Defense Council (NRDC 2008) indicate that GHG emissions from refining heavy crude oil from oil sands would range from approximately 9.4 to 31.5 kilograms per barrel. Applying these values to the Project and assuming that the entire volume was heavy crude oil indicates that total GHG emissions for refining the volume transported by the Project could range from 2.6 to 8.9 million tons of CO_2 per year at 700,000 bpd and from 3.4 to 11.4 million tons of CO_2 per year at 900,000 bpd. As a third example, Marathon reports that GHG emissions for all their refining operations total approximately 33 kilograms per barrel of oil (Marathon 2006), which falls between the range of values reported by the University of Toronto and NRDC. Applying the Marathon value to the Project volume indicates that GHG emissions could total 9.3 to 11.9 million tons of CO_2 per year.

Based on these values, refining the oil transported by the Project would result in total emissions in the range of 1.3 to 17.2 million tons of CO_2 per year. In reality, the incremental increase in GHG emissions due to refining the oil transported by the Project would likely be much less since it is expected to be primarily replacing the existing supply of heavy crude oil from other sources as the availability of oil from those sources continues to diminish. If, however, the heavy crude oil transported by the project replaced existing light crude oil, there could be some incremental increases in emissions and emission rates would be dependent on refinery-specific permitted thresholds, potential upgrades, and implementation of BACT. From a global perspective, it is expected that the oil sands in Canada would continue to be developed and the refinery emissions from that oil would still occur whether the oil was refined or used in the Canada, the United States, or overseas even if the Project were not built. In that case, the Canadian oil would produce emissions during transportation whether by rail, ship, or truck. The impacts associated with oil transportation and refining outside the United States would not be regulated by the United States nor analyzed under NEPA.

The total GHG emissions for the United States (CO_2 equivalents from anthropogenic activities) totaled 7,054 million tons in 2006, and global CO_2 emissions totaled 28,193 million tons in 2005 (CO_2 equivalents from fuel combustion) (EPA 2008). Indirect and direct annual operations activities associated with the proposed Project represent 0.06 to 0.31 percent of the national and 0.01 to 0.08 percent of the global GHG emissions. Construction activities associated with the proposed Project for each year represent less than 0.002 percent and 0.0005 percent of the national and global GHG emissions, respectively. While the EPA has released proposed regulations that would require approximately 13,000 facilities nationwide to monitor and report their carbon dioxide and other greenhouse gas emissions, the proposed Project would not satisfy the definition of these regulated facilities and there are no federal regulations or guidance to definitively identify the significance of the GHG emissions associated with operation of the Project. It is estimated that the amount of GHG emissions from Project construction and operations should not constitute a substantial contribution to the U.S. or global emissions due to the low percentage emission presented above, as compared with national and global emissions.

The mitigation measures implemented as part of the Project as discussed in the draft CMR Plan (Appendix B) would serve to offset some of the GHG emissions associated with the proposed Project. These measures would include revegetation of the construction work areas, restoration of wetland functions, and compensatory wetland mitigation for wetland impacts. Specific revegetation measures would be coordinated with land managers, NRCS, and landowners. Minimal direct GHG emissions would be associated with operation (e.g., vehicle operation and fugitive emissions), and indirect emissions would be associated with electrical generation for the pump stations and refineries.

The potential impacts of climate change would not be expected to affect the proposed Project. An increase in temperatures may increase wildfires in the Project area. An increased intensity of storm events, should this occur, may result in additional flooding in some areas near the Project, particularly in the Gulf Coast Segment and Houston Lateral should hurricane activity increase as a result of oceanic temperature conditions. The Project would be designed and constructed to be consistent with applicable federal, state, and local standards, and therefore should be resistant to forces associated with reasonably likely climate conditions during the lifetime of the pipeline system. Other effects of climate change, such as air quality degradation, health effects, reduced snow pack, and agricultural issues, would not likely impact the proposed Project.

3.14.4 Extraterritorial Concerns

While the Project analyzed in this draft EIS begins at the international boundary where the pipeline would exit Saskatchewan, Canada and enter the United States through Montana, the origination point of the pipeline system would be in Alberta, Canada. Neither DOS regulations (22 CFR 161.12) nor Executive Order 12114, Environmental Effects Abroad of Major Federal Actions, require this draft EIS to analyze the environment or activities outside of the United States. As a matter of policy, however, DOS has included information in this draft EIS regarding the environmental analysis conducted in Canada.

The analysis of environmental effects from the proposed Project is occurring on both sides of the international border under the appropriate regulatory authorities, as discussed in Section 1 of this DEIS. In Canada, the Canadian National Energy Board (NEB) conducted that analysis, held public hearings in September 2009, and issued its findings in March 2010.

The NEB identified the nine key issues listed below relative to the proposed Project:

- The need for the proposed facilities;
- The economic feasibility of the proposed facilities;
- The potential commercial impacts of the proposed Project;
- The potential environmental and socio-economic effects of the proposed facilities, including those to be considered under the Canadian Environmental Assessment Act (the Scope of which is set out in Appendix R);
- The appropriateness of the general route of the pipeline;
- The method of toll and tariff regulation;
- The suitability of the design of the proposed facilities;
- The terms and conditions to be included in any approval the Board may issue; and
- Potential impacts of the project on Aboriginal interests.

Relative to impacts to aboriginal or indigenous peoples, the NEB granted intervener status to the following aboriginal groups in Canada:

- Moosomin First Nation;
- Neekaneet First Nation No. 380;
- Red Pheasant Band No. 108; and
- Sweetgrass First Nation.

In the March 2010 finding, the NEB determined that the proposed Project is required in Canada to meet the present and future public convenience and necessity, provided that the NEB terms and conditions outlined in the Project certificate are met, including all commitments made by Keystone during the hearing process.

Due to the limitations on available data at this time, cumulative impacts to Canadian resources are confined to the above discussion. However, as both the NEPA and NEB processes proceed, additional information on potential cross international boundary cumulative impacts would likely become available and would be assessed to the degree possible for inclusion in the FEIS. Pertinent NEB documents are provided in Appendix R.

3.14.5 Summary of Cumulative Impacts

The Project area includes numerous existing, under construction, and planned linear energy transportation systems, including natural gas pipelines, crude oil pipelines, and electric transmission lines. Additionally, the Project area supports a major water delivery project and a number of energy development projects, including wind power facilities. In some cases, these existing facilities either transect or are located within the proposed Project corridor. Additional oil and natural gas pipelines and electricity transmission lines are proposed or are known to be in the planning or permitting stage and may cross the Project corridor. It is also reasonably foreseeable that additional linear facilities would be considered in the future given the national focus on the reconfiguration of the electrical grid system to access stranded renewable energy resources, particularly with regard to wind power in the central plains region. Construction and operation of the Project would result in additional environmental impacts to those associated with these existing and future projects, although the majority of these would be localized and short-term. Short-term construction impacts could be additive to other proposed construction projects depending on the actual construction timing of individual projects, although at this time, proposed construction schedules would not coincide in the Project corridor. The overall contribution of cumulative impacts associated with existing and future facilities is considered minor. In addition, long-term cumulative economic benefits would be realized in communities that receive tax revenues from the Project and other projects in the area.

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4.0 ALTERNATIVES

As required by NEPA, DOS and the cooperating agencies conducted an analysis of a range of reasonable alternatives to the proposed Project, based on the defined purpose and need for the Project. The alternatives assessed in this section have been derived based on information provided to the agencies in various applications and submittals by the Project sponsors, information and suggestions provided to the agencies during public and agency scoping for the proposed Project, and through research and analysis of available data bases and literature that address the general Project area by DOS and its third-party contractor A reasonable range of alternatives to the Project was defined and each alternative was analyzed to determine whether or not it would achieve the following objectives:

- Meet the Project's purpose and need;
- Provide a feasible alternative to the proposed action; and
- Provide at least an equivalent level of Project benefit given the potential environmental consequences.

Several potential pipeline routes from the U.S./Canada border near Morgan, Montana to the Port Arthur and the east Houston areas of Texas were considered. Factors considered during the alternatives analysis include the following:

- The Project's purpose and need;
- The locations of crude oil receipt and delivery points along the proposed route;
- Existing developed linear corridors and aboveground facilities that if paralleled might reduce the Project environmental effects;
- The presence of sensitive environmental and human use features along alternative pipeline routes; and
- The engineering, technical, and practical feasibility of constructing and operating the Project along alternative routes.

The following alternatives were assessed by DOS:

- No Action Alternative (Section 4.1) − the proposed Project would not be built;
- System Alternatives (Section 4.2) − use of other pipeline systems or other methods of providing crude oil supplies to the U.S. Gulf Coast market;
- Major Route Alternatives (Section 4.3) − other pipeline routes for transporting crude oil from the U.S./Canada border near Morgan, Montana to the Port Arthur and the east Houston areas of Texas; and
- Alternative Routes for the Electrical Transmission Line (Section 4.4) − preliminary alternative routings for the proposed 230-kV transmission line in South Dakota that is needed to ensure power system stability given the loads required for providing electrical power to the pump stations in South Dakota.

As noted in Section 1.2.2.1, the Energy Information Administration (EIA) evaluated the future need for crude oil in relation to many variables, including the cost and availability of substitute forms of energy. These substitute forms include many alternative energy sources such as wind power, biofuels, hydroelectric power, and nuclear power. The EIA evaluations indicate that there is a general consensus that the volume of crude oil consumed world wide, as well as the volume consumed domestically, is unlikely to decrease substantially over the next 30 years (EIA 2009a, EIA 2009b), and that the mix of crude oil consumed in the future will include an increased proportion of heavy crude. Further, the use of alternative forms of energy would not meet the needs of refiners in PADD III or the purpose of the proposed Project. As a result, the use of alternative forms of energy in place of the proposed Project was not considered in the environmental review of the Project.

4.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, the Project would not be constructed and operated as described in Section 2.0. Therefore, selection of the No Action Alternative would not require issuance of a DOS Presidential Permit for the specific action of building and operating the Project (the proposed action).

Under the No Action Alternative, the environmental effects associated with the Project discussed in this EIS would not occur; however, the development of oil sands in Canada and their refining in the U.S. would still occur. While this alternative would eliminate the environmental impacts associated with the Project, it would not meet the purpose and need for the proposed action. As stated in Section 1.2.1, the primary purpose of the proposed Project is to transport WCSB crude oil from Canada to (1) existing delivery points in PADD III that provide connections to existing refineries, and (2) the existing Cushing Oil Terminal in Cushing, Oklahoma. The Project would counteract insufficient domestic crude oil supply while reducing U.S. dependence on less reliable foreign oil sources.

4.1.1 Crude Oil Demand and Supply Under the No Action Alternative

As described in Section 1.2.2, U.S. demand for petroleum products has increased and is likely to continue increasing for the foreseeable future. At the same time, the overall domestic U.S. crude oil supplies continue to decline and many of the major suppliers of crude oil to PADD III refiners face declining or uncertain production horizons (see Section 1.2.3). In 2008, PADD III refineries imported 2.2 million bpd of heavy crude oil from 43 different countries. The top four suppliers were Mexico (22 percent), Saudi Arabia (17 percent), Venezuela (17 percent), and Nigeria (11 percent) (CAPP 2009). While the supply of crude oil from Saudi Arabia to the U.S. appears to be fairly stable, the remaining major suppliers each face declining or uncertain production horizons (see Section 1.2.2.3).

Reasonably foreseeable projects, energy conservation efforts, and the development of renewable energy resources represent a small fraction of the projected energy demand in the PADD III service area, and it is unlikely that this would offset the projected demand for crude oil to produce refined petroleum products to meet the needs of end users over the lifetime of the Project. Under the No Action Alternative, the PADD III refineries would continue to acquire crude oil primarily from sources other than Canada to fulfill this demand and/or find alternative methods of delivery of Canadian oil sands. This crude oil would be transported to PADD III primarily from countries outside of North America by tankers or from Canada through the construction of an alternative pipeline, tankers, trucks or rail or a combination thereof from the WCSB.

The No Action Alternative would not provide the United States with a relatively stable and secure source of North American crude oil for the PADD III market. As a result, PAD III and other areas of the U.S. would continue to be dependent on less reliable foreign oil supplies from the Mideast, Africa, Mexico, and South America. In comparison, the proposed Project would provide the United States with a relatively stable and secure source of North American crude oil for the PADD III market and reduce U.S.

dependence on less reliable foreign oil supplies.

4.1.2 PAD III Crude Oil Supplies Under the No Action Alternative

The declining and uncertain supply horizons of lighter crude oils from foreign countries have prompted some PADD III refineries to modify their existing facilities to allow the refinement of heavy crude oil (Gunaseelan and Buehler 2009, Sword 2008). This diversification strategy could increase the reliability of the supply to PADD III and put downward pressure on PADD III crude oil prices provided that sufficient transportation capacity is available for heavy crude oil. Major refinery upgrades representing a total of 365,000 bpd of new capacity are planned at Port Arthur, Texas refineries that would have direct pipeline access to oil transported through the proposed Project, and several PADD III refineries without direct pipeline access (Borger, Texas; Artesia, New Mexico; and Garyville, Louisiana) are also planning upgrades to increase bitumen and heavy oil refining capacity (CAPP 2009). However, as noted above, under the No Action Alternative, the PADD III refineries would continue to acquire crude oil primarily from sources other than Canada to fulfill this demand. The refineries would also continue to receive Canadian crude oil from the 96,000-bpd ExxonMobil Pegasus Pipeline, which is the only pipeline that provides PADD III refineries direct access to WCSB crude (CAPP 2009). The limited capacity of this pipeline constrains the supply of WCSB crude oil to PADD III (CAPP 2009, Purvin & Gertz 2009), which represents the largest refining capacity in the U.S. This in turn tends to put upward pressure on the price of crude oil shipped from Canada and other sources into PADD III and on the prices of refined products shipped out of PADD III. Therefore, the No Action Alternative could result in more expensive and less reliable crude oil supplies for Gulf Coast refineries; this would increase the costs and availability of the refined products for end-users. In contrast, under the proposed Project, the U.S. would be able to obtain reliable and cost efficient source of oil from the WSCB region into the later part of the 21st century.

In the near term, the current sources of supply would likely continue to provide crude oil to PADD III under the No Action Alternative; i.e., the vast majority of the crude oil would be transported from countries outside of North America by tankers. In the future, a crude oil pipeline system other than the proposed Project could be constructed and provide WCSB crude oil to PADD III refineries. That system would have to obtain a Presidential Permit and all other required federal, state, and local environmental permits and would likely have environmental impacts that are similar to those of the proposed Project.

Oil shocks (unanticipated supply reductions that result in price spikes) reduce the amount of goods and services the U.S. can produce given a fixed amount of other inputs and cause some inputs (e.g., land, labor, and capital) to be under-utilized. Oil shocks arise through unstable crude oil supplies and would be more likely to occur under the No Action Alternative, as compared to the proposed Project, since crude oil supplies would continue to be sought from unstable foreign sources in the near term. In contrast, projects which stabilize crude oil supply through diversification and increased access to politically stable regions, such as the proposed Project, benefit the U.S. economy.

Under the No Action Alternative, positive socioeconomic impacts associated with construction and operation of the Project would not be realized along the proposed route and elsewhere in the U.S. No annual property tax revenues would be generated, as opposed to an estimated $138.4 million in annual property tax revenues that would be generated by the proposed Project in the region of influence. The generation of local employment as well as substantial expenditures on goods and services would also not occur under the No Action Alternative. However, if an alternative pipeline is constructed elsewhere, socioeconomic benefits would be realized as a result of construction and operation of that alternative at a later time.

4.1.3 Potential WCSB Markets Under the No Action Alternative

At the current and projected rates of annual production, production from the estimated proven reserves in the WCSB could continue into the later part of the 21st century. Under the No Action Alternative, crude oil from the WCSB would not have a ready conduit for export to available refineries and markets in the United States and it is likely that alternative transportation systems to move this oil to market would emerge. Crude oil would be transported by other planned or existing pipelines or alternative transportation methods (such as tank trucks, barges, or crude oil tankers) to markets in the U.S. Gulf Coast or to the global marketplace.

Producers in Canada have indicated that if the U.S. market is not available to them, much of the crude would be shipped outside of North America, particularly to Japan, China, and India which are the world's third, fourth, and eighth largest importers of oil, respectively (CIA 2010). To accomplish that, oil would be transported via tanker to countries outside of North America. Within Canada this would require construction of a new pipeline from the WCSB production area to a port on the Canadian coast; if there is not a port that can accommodate the volume of oil that would be shipped or the size and number of tankers, an existing port would have to be modified or a new port would have to be constructed. Construction of the pipeline and either modification to an existing port or construction of a new port would produce adverse environmental impacts within Canada that would be similar in nature to those of the proposed Project. In addition, the transport of crude oil by tanker would result in impacts in Canada and elsewhere along the tanker routes. The construction of a new pipeline and a new or modified port may produce more or less greenhouse gases than the proposed Project; however, shipment of the oil by tanker would produce substantially more greenhouse gases than would transportation of crude oil by pipeline to the U.S.

Under the proposed Project, much of the crude oil imports from the WCSB to PADD III would be supplied along a transportation pathway that would be shorter than that of most other sources. Crude oil supplies in Western Canada represent the closest foreign supply source for PADD III refineries, other than Mexico and Venezuela, and do not require many days or weeks of marine transportation, in contrast to most other suppliers. The No Action Alternative would not therefore necessarily result in a reduction in physical, biological, and human resource impacts as compared to the proposed Project, and may actually result in an increase in adverse environmental impacts if alternative methods of transportation were developed.

4.1.4 Summary

The increasing demand for crude oil in the U.S. cannot be entirely met by efforts to conserve use of refined petroleum products or the increased use of renewable energy. As crude oil demand increases, the overall domestic supplies of crude oil are declining. At the same time, only a small volume of WCSB crude oil can be shipped to PADD III through a single pipeline, and a substantial portion of the oil imported from outside of North America originates in countries with decreasing or undependable oil supplies. Under the No Action Alternative, it is likely that other projects would be proposed to meet the increased demand. Although it is not possible to identify the specific impacts of such projects, it is likely that they would be similar in nature to those of the proposed Project and either smaller, greater than, or equal to the magnitude of impacts of the proposed Project.

Under the No Action Alternative, the U.S. would not receive a reliable and cost efficient source of crude oil from the WSCB region and would remain dependent upon unstable foreign oil supplies from the Mideast, Africa, Mexico, and South America. Further, the WCSB crude oil would likely be shipped to countries outside of North America, which would require new infrastructure that would result in environmental impacts at least as great as those of the proposed Project. In addition, the transport of crude oil by tanker would likely result in greater GHG emissions than those that would occur as a result of the proposed Project. Finally, the No Action Alternative would not meet the purpose and need of the proposed Project.

Therefore, the No Action Alternative is not considered preferable to the proposed Project.

4.2 SYSTEM ALTERNATIVES

System alternatives to the proposed Project would make use of other existing, modified, or proposed pipeline systems—or non-pipeline systems—to meet the purpose and need of the proposed Project. A system alternative would render the construction of the proposed Project unnecessary, although some modifications or additions to other existing pipeline systems would be required to increase the current delivery capacity of those systems. Such modifications or additions would result in environmental impacts that are less than, similar to, or greater than those associated with construction of the proposed Project. After identifying systems alternatives, DOS evaluated the systems to determine whether or not the anticipated environmental effects of construction and operation of the Project could be avoided or reduced by using a system alternative. This system alternatives analysis addresses existing and proposed crude oil pipeline systems that currently or eventually could serve the PADD III market, as well as alternative transportation systems that are not wholly reliant on pipelines. The analysis considers whether these systems could meet the proposed Project objectives while offering an environmental advantage over the proposed Project. The system alternatives assessed include the following:

- Use of existing or expanded pipeline systems (ExxonMobil Pegasus Pipeline);
- Transport of oil in proposed pipeline systems (Altex, Chinook/Maple Leaf, Trailbreaker, and Enbridge/BP); and
- Alternative modes of transportation.

4.2.1 Existing Pipeline Systems

There is currently only one existing pipeline system that extends from the Midwest to the Gulf region. The ExxonMobil Pegasus pipeline is a system that transports Canadian crude oil from Patoka, Illinois to Nederland, Texas. In mid 2009, ExxonMobil completed an expansion of the system that increased capacity from 66,000 bpd to 96,000 bpd. Even with the expansion, the Pegasus pipeline does not meet the demand of the PADD III market. The Project's current binding contractual commitments of 380,000 bpd in the PADD III market far surpass the existing or proposed expansion capacity of the Pegasus pipeline. The proposed Project's ultimate potential capacity of 900,000 bpd is well beyond the capacity of the Pegasus system under any realistic expansion scenario. Given the inability of this system to deliver crude oil in volumes necessary to meet the Project's purpose and need, DOS does not consider it to be a feasible alternative to the proposed action.

4.2.2 New Pipeline System Alternatives

Other new pipeline system alternatives have been proposed or planned by proponents, and if successfully designed, permitted, and constructed, they could transport crude oil from the oil sands of the WCSB to the PADD III market. For a potential new pipeline system to be considered a viable alternative to the Project, it must meet the purpose and need of the Project as described in Section 1.0, including meeting U.S. demand in delivery volume and within the planned timeframe. As proposed, the Project would be operational on its Gulf Coast Segment by 2011 and operational on the Steele City Segment by 2012, with an ultimate system capacity of up to 900,000 bpd. The Project has gone through a successful open season with a sufficient binding commitment for crude oil deliveries to PADD III to economically justify Project construction. The potential system alternatives discussed in this section have not solidified commercial commitments through open seasons or announced the submittal of permit applications. At this time, the possibility of their existence is speculative. Nonetheless, these potential projects have been assessed relative to their potential to meet the proposed Project's purpose and need. These potential pipeline system alternatives include the following:

- Altex Pipeline System: Plans for the Altex (Alberta-Texas) Pipeline System were initially announced in 2005 by Calgary-based energy infrastructure-development company, Altex Energy Ltd. The Altex Pipeline System would include a 2,360-mile-long greenfield pipeline system that would originate north of Fort McMurray, Canada, extend to the Redwater-Fort Saskatchewan area and from there to Hardisty, Alberta. It would cross the international border in Montana and head southeast through Montana, Wyoming, South Dakota, Nebraska, Kansas, Oklahoma, and Texas on a relatively straight line to the Houston area in PADD III. DOS anticipates that Altex is refining a route for the project, conducting preliminary design studies, and attempting to secure contract volumes from potential shippers (altex-energy.com). As initially planned, service would start no sooner than 2013, with a proposed initial crude oil capacity of 425,000 bpd. However, at this time Altex has not applied for a Presidential permit or other permits in the U.S. and therefore a NEPA environmental review has not been initiated.
- Chinook-Maple Leaf Pipeline System: The Chinook-Maple Leaf Pipeline System (Figure 4.2.2-1) is a project considered by KinderMorgan and TEPPCO (now merged with Enterprise Products Partners, LP). This 2,050-mile-long pipeline system would originate near Hardisty, Alberta and cross the international border from Alberta into Montana. It would then traverse Montana, Wyoming, Colorado, Kansas, Oklahoma, and Texas to deliver crude oil to the Houston area within PADD III. The system would have a capacity of 440,000 bpd between Hardisty and Cushing (Chinook), and 550,000 bpd between Cushing and PADD III (Maple Leaf). The proponents initially indicated a planned in-service date of late 2011 or early 2012 (Canadian Association of Petroleum Producers (CAPP) 2008); however, the proponents have not applied for a Presidential permit or other permits in the U.S. and the project could not be in service at that time.
- Trailbreaker Transportation System: Enbridge has proposed The Trailbreaker Transportation System as an option for supplying crude oil to PADD II and PADD III. Enbridge's proposed Trailbreaker project would involve shipping crude oil to the northeast U.S., and then transporting crude oil by tanker from that area to PADD III as early as mid 2010. This project would allow for the transport of WCSB oil production to refineries in Ontario, Quebec, the Canadian maritime provinces, and U.S. markets. It includes an expansion of existing Enbridge Line 6B from Chicago, Illinois to Sarnia, Ontario, as well as terminal expansions and upgrades, increasing the capacity of existing Enbridge Line 7 between Sarnia and Westover, Ontario, and the reversal of existing Enbridge Line 9 to flow from Sarnia east to Montreal, Quebec. Another component of the project would be the proposed reversal of the pipeline owned by Portland-Montreal Pipe Line (PMPL), which currently transports product from Portland, Maine to Montreal. In late 2008, PMPL completed an open season to gauge shipper interest in the proposed reversal; however, they did not receive the level of firm volume commitments required to proceed at this time. PMPL will continue to monitor market conditions and may resume work on the project when market conditions warrant. In addition, CAPP decided not to support the proposed Trailbreaker project at this time as a result of the PMPL open season. The Trailbreaker project is therefore on hold and timing for the project is being reviewed. As currently planned, the Trailbreaker proposal would deliver approximately 200,000 to 230,000 bpd of heavy crude oil to the PADD III market.

- Enbridge-BP Delivery System: Enbridge and BP have entered into an agreement to develop the Enbridge-BP Delivery System (Figure 4.2.2-2) to transport WCSB heavy crude oil from Flanagan, Illinois, to Houston and Texas City, Texas, using a combination of existing facilities and new pipeline and looped pipeline construction where required. The project would traverse parts of Illinois, Missouri, Kansas, Oklahoma, and Texas and would be in service by late 2012, with an initial total system capacity of 250,000 bpd into the Gulf Coast. Enbridge and BP intend to use the BP #1 System and other existing pipelines north of the Cushing, Oklahoma, crude oil hub with some new pipeline construction south of Cushing to connect to markets in Houston and possibly in Nederland, Texas. Initial receipts at Flanagan, where the system would interconnect with Enbridge Energy Partners' Southern Access pipeline, would be approximately 140,000 bpd for transport to Gulf Coast markets. The remaining 110,000 bpd would originate from interconnecting pipelines at Cushing.

Part of the purpose and need of the proposed Project is to provide up to 900,000 bpd of crude oil to PADD III in as short a timeframe as possible; as currently proposed, operation of the Gulf Coast Segment would begin in 2011, and the Steele City Segment would be in service in 2012. None of the proposed system alternatives would provide the delivery capacity of the proposed Project alone. Further, Keystone has already filed for regulatory approvals in the U.S. and Canada and conducted environmental and cultural resource studies in advance of those filings that could allow the proposed service delivery dates to be met. None of the other potential systems alternative have progressed that far and could not provide WCSB crude oil to PADD III in the same time frame as the proposed Project. In summary, none of the systems alternatives considered can meet the purpose and need of the proposed Project, and none of them offer a significant environmental advantage over the proposed Project.

4.2.3 Alternative Modes of Transportation

Surface transportation modes of crude oil delivery from the U.S./Canada border near Morgan, Montana to the Port Arthur and the east Houston areas of Texas were considered as an alternative to the proposed Project. Use of those modes, which include delivery by truck, railroad cars, and barges, is assessed below.

4.2.3.1 Trucking

Hauling crude oil by truck from Morgan, Montana to the PADD III area is not a feasible potential alternative to constructing the proposed Project. Important considerations are safety, traffic congestion, fuel demands, and delivery interruptions. Table 4.2.3-1 summarizes accident statistics by method of transport compiled by Association of Oil Pipe Lines (AOPL). Pipelines are a safer method of transporting crude oil than trucking. AOPL reports that trucking is 87 times more likely than pipeline transport to result in a human fatality. In similar findings, fire and/or explosions are 35 times more likely when transporting crude oil via truck. Vehicle accidents and accidental releases are also concerns with surface transportation crude oil delivery. According to DOT safety statistics, pipeline transport of liquids is safer than vehicle transport. The Bureau of Transportation Statistics (2009) reported that the transport of hazardous liquids (including crude oil) on highways resulted in five times as many fatalities as transportation of hazardous liquids by pipeline between 1975 and 2007. It is estimated that transport of the equivalent daily crude oil capacity of the Project pipeline would require 4,000 trucks per day from the U.S./Canadian border to Texas (Keystone 2009).

The trucking alternative would add congestion to highways in all states where the best transport route was determined. These trucks would consume millions of gallons of fuel per year, with subsequent exhaust emissions (including GHG) and other negative environmental effects. Trucking would likely be subject to interruptions due to unfavorable weather and road conditions, especially in Montana and other northern states. At the Gulf Coast delivery points, surface transportation would necessitate significant refinery transfer facilities, personnel, and a delivery fleet. Truck transportation would not be a practical way to meet the Project's purpose and need.

4.2.3.2 Railroad

There is not an existing direct rail line from Morgan, Montana, to Port Arthur, Texas and the east Houston areas of Texas. Developing such a rail system would require construction of spur lines, terminal facilities, and upgrades to existing rail lines with corresponding environmental impacts. The impacts of such a system development would be considerable, and would not provide the same level of operational safety as the pipeline system included within the Project. Should such a train-dependent alternative system be developed, crude oil would move south into the PADD III area by rail. To provide the potential capacity for oil delivery consistent with the Project's purpose and need, this system would require approximately 40 unit trains per day, each with 100 tank cars, and each traveling 1,300 miles daily (Keystone 2009). It is expected that this configuration would result in significantly more environmental impact during construction and operation than the Project. Impacts on the existing multi-model rail system throughout the Midwest from the Canadian border to Texas would be substantial. For these reasons, railroad delivery of WCSB crude oil is not considered a feasible system alternative to the Project.

4.2.3.3 Barging/Shipping

Barging the oil would not be feasible due to the lack of a large waterway system between Morgan, Montana, and the PADD III area capable of supporting barge traffic. Crude oil would first have to be transported to a large waterway system before barging could be feasible. The Enbridge Trailbreaker, discussed in Section 4.2.2 as a system alternative, is an example of such an undertaking. The proposal would involve shipping crude oil to the northeast U.S., and then transferring crude oil by ship to the PADD III area. As with the trucking alternative discussed above, the need for transport by internal combustion engine powered vehicles, in this case either barges or tankers, would increase operational emissions, including the emission of GHG. As stated previously, the proposed Trailbreaker project has not received firm shipper volume commitments to render it economically feasible, it is not supported by CAPP, which can be seen as an indication that it is not a feasible alternative to pipeline transport of crude oil from the WCSB to the U.S., and the proposal is currently on hold. As with other alternative modes of transport, barging has more reported fire/explosion incidents and injuries than that of pipelines. Therefore, delivery of WCSB crude oil by barge was not considered a reasonable alternative and was not further evaluated.

TABLE 4.2.3-1
Reported Incident Rates for Alternative Methods of Liquids Transport

Method of Transport [1]	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

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

4.2.4 Conclusion

Approximately 66 percent of petroleum and petroleum products shipped are shipped by pipeline in the U.S., or about 12.9 billion barrels annually (AOPL 2004). As described above, the alternative modes considered would be less safe, would require construction of substantially more infrastructure, have greater atmospheric emissions (including GHG), and/or pose greater safety hazards than the proposed Project. Therefore, none of the alternative modes of transportation have been evaluated further.

4.3 PIPELINE ROUTE ALTERNATIVES

4.3.1 Introduction

DOS assessed available information to identify alternatives to the route proposed by the Applicant that would potentially reduce environmental effects while still meeting the Project's purpose and need. In identifying route alternatives, consideration was given to suggestions by tribes, agencies, and the public where feasible.

4.3.2 Approach

To be considered, most alternative routes were required to connect to several Project control points to meet the Project's purpose and need. These fixed control points, which placed constraints on potential geographic alternatives to achieve the Project's purpose and need, consist of the following:

- The international border crossing between Saskatchewan and Montana near the town of Morgan, Montana (northern end of the Steele City Segment);
- The northern end of the previously permitted and now under construction Cushing Extension to the Keystone Mainline pipeline near Steele City, Nebraska (southern end of the Steele City Segment);
- The southern end of the previously permitted and now under construction Cushing Extension to the Keystone Mainline pipeline in Cushing, Oklahoma (northern end of the Gulf Coast Segment);
- The two crude oil delivery points in PADD III, one at Nederland, Texas (southern end of the Gulf Coast Segment) and one at Moore Junction, Texas (southwestern end of the Houston Lateral).

These control points define the three pipeline segments (Steele City Segment, Gulf Coast Segment, and Houston Lateral) and provide the framework for identifying alternatives. However, as described below (Section 4.3.3), alternatives that originated at Hardisty, Canada and extended into the U.S. at a point other than near Morgan, Montana were considered in response to agency scoping comments regarding alternatives.

The second phase of considering potential alternative routes involved developing routes that would, to the extent practical, avoid or minimize extending through key areas of environmental concern. The primary areas to be avoided or used minimally are listed below.

- Public lands (except in Montana, where there is a state regulatory preference for the use of public lands; this issue is addressed in Appendix I);
- Crossings of large waterbodies and water control structures;
- Rugged, terrain that could impact constructability;

- Crossings of large wetland complexes;
- Highly developed urban areas and urban infrastructure;
- Properties listed on the NRHP;
- Wildlife refuges and management areas;
- Key waterfowl use or nesting areas;
- Irrigated croplands;
- Forested areas, including commercial forest lands; and
- Close approaches to residences and outbuildings.

In addition, the overall constructability of the pipeline and associated facilities along the potential alternatives was considered. Development of alternatives also considered the desire to reduce the line miles of pipeline that would be required to reach the Project terminus. As a general rule, each mile of the proposed Project would impact approximately 13.3 acres during construction and 6.0 acres during operation (the exact acreage is dependent on such factors as the construction methods, workspaces, and access roads). As a result, there generally are environmental advantages to keeping the length of pipe required to reach the Project destination as low as possible while considering all other issues of concern.

The extent, shape, and prevalence of many resources (e.g., rivers, historical trails, wetlands, and farmlands) preclude completely avoiding impacts to them on any selected route, particularly on a Project with an overall length of approximately 1,375 miles in the U.S. In determining potential route alternatives, there is consideration given to routes that would have all or part of their length parallel existing linear facility ROWs. For the purposes of this EIS, we considered routes to be parallel to existing ROWs if they were overlapping, directly adjacent to, or within 150 feet of an existing ROW. The industry standard for new pipeline centerline separation from existing pipelines is 25 feet to provide room for maintenance and abide by construction restrictions; therefore there is a limit to how close a new ROW can be to an existing one.

The rationale for siting a new pipeline parallel to an existing ROW is that concentrating linear developments in or near existing linear corridors may reduce to some degree the need for impacting resource areas that are not currently disturbed by major linear project construction. However, in some cases it may be advantageous to select a new pathway, depending on the number of miles of new construction that may be required to capitalize on these existing development corridors and the specific effects of corridor expansion in areas with important human development, cultural resources, or environmental resources. As an example, while a new corridor may contribute to habitat fragmentation in areas with currently uninterrupted species use areas, the expansion of an existing corridor laterally across existing ROW and new ROW may exacerbate the problem along that linear corridor.

The following sections identify the alternatives developed for the three pipeline segments:

- Steele City Segment Alternatives (Section 4.3.3);
- Alternatives to Using the Cushing Extension (Section 4.3.4);
- Gulf Coast Segment Alternatives (Section 4.3.5); and
- Houston Lateral Alternatives (Section 4.3.6).

4.3.3 Steele City Segment Alternatives

For the Steele City Segment, five alternatives were considered:

- Express-Platte Alternative (Section 4.3.3.1);
- Steele City Segment (SCS) Alternative A (Section 4.3.3.2);
- SCS Alternative A1A (Section 4.3.3.3);
- SCS Alternative B (the proposed Project; Section 4.3.3.4); and
- Baker Alternative (Section 4.3.3.5).

These alternatives are depicted in Figures 4.3.3-1 and 4.3.3-2, and Section 4.3.3.6 provides a summary of the comparison of the Steele City Segment Alternatives.

As a cooperating agency, the Montana Department of Environmental Quality (MDEQ) considered the alternatives as described below. To comply with the requirements of the state's Major Facility Siting Act (MFSA), MDEQ also considered two other route alternatives in Montana as well as minor route variations in Montana. The development and analysis of those alternatives and variations are described in Appendix I of this EIS and summarized below in Section 4.3.3.7.

4.3.3.1 Express-Platte Alternative

The Express-Platte Alternative is a 1,049 mile route that would cross the border from Saskatchewan, Canada into the U.S. near the Port of Wild Horse, Montana. From there it would extend parallel to the Express and Platte Pipeline Systems ROW until it deviated from the alignment in its southern extent to allow a tie-in to the Project control point at Steele City, Nebraska. A potential advantage for the Express-Platte Alternative is that it would parallel a developed utility corridor through Montana, Wyoming, Nebraska, and Kansas before diverting to connect with the Cushing Extension at Steele City. However, the northern section of the alternative in Montana would run primarily through agricultural and densely populated areas. In Carbon County, Montana, both the Yellow River and its tributaries and the Pryor Mountain ranges would be difficult terrain to traverse during construction. Although it would parallel the existing pipeline corridor, the existing easements along that corridor are in the control of a different company and therefore it cannot be assumed that there would be any less acreage disturbed by an adjoining ROW than for a ROW that would not parallel the existing pipelines. Additionally, it is likely that landowner or land manager negotiations would be difficult given that for many affected parties the ROW requirements would mean more of their land would be affected by an adjoining pipeline system. With the additional length of the Express-Platte Alternative as compared to the other Steele City Segment alternatives, more wetlands, developed land, forested lands, and federal lands would be impacted than for the other alternatives and more streams/rivers crossings would be required than the other alternatives considered (see Table 4.3.3-1). In summary, the greater length of the Express-Platte Alternative, and the associated greater area of impacts and the likely requirement for construction along a new ROW along its length indicate that this alternative would not be environmentally preferable to the proposed route.

TABLE 4.3.3-1 Summary Impact Statistics for Steele City Segment Alternatives by Acres				
Parameter	**SCS-B**	**SCS-A**	**SCS-A1A**	**Express-Platte**
Total Length (Miles)	851.3	923.3	954.7	1,049.0
Land Use (Acres)[1]				
Agricultural Land	3,000.9	7,009.7	7762.0	5,240.8
Barren Land	5.9	9.2	11.5	66.1
Developed Land	162.9	367.3	367.4	432.6
Forested	37.2	54.8	55.1	93.1
Rangeland/Grassland	7,991.9	4,305.3	4,366.3	7,841.0
Wetlands	135.7	119.1	118.7	290.3
Open Water	15.6	45.5	48.6	23.3
Total	11,350.2	12,310.9	127,29.6	13,987.2
Federal Land Ownership (Acres)[2]				
Bureau Land Management	583.3	271.9	283.4	1,380.7
Bureau of Reclamation	0.0	0.0	0.0	286.8
Department of Defense	0.0	16.5	16.5	0.0
Fish and Wildlife Service	0.0	0.0	2.9	0.0
Forest Service	0.0	97.5	97.5	0.0
National Park Service	0.0	20.4	20.4	0.0
Total	584.9	1,606.5	420.8	1,667.4
Fort Peck Indian Reservation[3]	0.0	1200.0	0.0	0.0
Number of Streams/Rivers crossed[4]	443	544	538	745

[1] Land use from National Land Cover Database, 2001. Acres based off (110-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).

[2] Federal lands from ESRI, 2004. Acres based off (110-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).

[3] Fort Peck Indian Reservation from ESRI Federal Lands, 2004. Acres based off (110-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).

[4] Streams/Rivers from ESRI, 2004.

4.3.3.2 Steele City Segment Alternative A

Steele City Segment Alternative A would parallel the existing Northern Border Pipeline ROW in its northernmost section for approximately 555 miles and the currently under construction Keystone Mainline pipeline for approximately 368 miles until it reaches the control point at the northern end of the Cushing Extension. Alternative SCS-A would cross parts of Montana, North Dakota, South Dakota, and Nebraska in order to reach this control point. This alternative would cross 90 miles of the Fort Peck Indian Reservation in Montana and would affect approximately 1,200 acres, assuming a 110-foot-wide construction ROW. In Montana, Alternative SCS-A would cross the BLM-managed Bitter Creek Wilderness Study Area, an area designated under the Federal Land Policy and Management Act as having wilderness characteristics consistent with the provisions of the Wilderness Act of 1964.

In North Dakota, Alternative SCS-A would cross the Little Missouri National Grassland, lands managed by the USFS. It would also cross the Missouri River along the South Dakota-Nebraska border and the

Missouri River National Recreational Area administered by the NPS. A listing of approximate acres that would be affected by Alternative SCS-A is presented in Table 4.3.3-1 and mileage along land use categories is listed in Table 4.3.3-2. Alternative SCS-A would cross significantly more agricultural and developed land, and streams/rivers than the preferred alternative. Therefore, this alternative would have greater environmental impacts than those of the proposed Project and has been eliminated from further consideration.

TABLE 4.3.3-2
Summary Impact Statistics for Steele City Segment Alternatives by Miles

	SCS-B	SCS-A	SCS-A1A
Alternative Length (Miles)	850.7	919.8	951.2
Land Use			
Agriculture	411.9	704.0	729.3
Barren	2.1	0.7	0.7
Developed	0.2	0.5	0.5
Forest/Woodlands	1.7	1.6	1.1
Rangeland/Grassland	375.5	149.1	161.4
Wetlands	1.9	7.7	5.2
Water	0.3	2.1	2.1
Shrubland	56.9	56.1	51.0
Stream Crossings (ESRI)			
Artificial Path/Canal/Ditch	10	21	18
Intermittent	405	498	489
Perennial	38	48	51

Source: Keystone 2009.

4.3.3.3 Steele City Segment Alternative A1A

Steele City Segment Alternative A1A is similar to Alternative A in that it parallels a portion of the Northern Border Pipeline and also parallels a portion of the Keystone Mainline pipeline that is now under construction. However, Alternative SCS-A1A deviates from Alternative SCS-A to avoid affecting lands within the Fort Peck Indian Reservation. The deviation from Alternative SCS-A begins in central Valley County, Montana, extending east to pass north of the reservation, then turns south to the eastern edge of the reservation in Sheridan County, Montana. The route would then cross into Roosevelt County, Montana, turning to the southeast and crossing into Williams County, North Dakota where it would follow the same route as Alternative SCS-A to reach the control point at the northern end of the Cushing Extension.

Alternative SCS-A1A would extend through the USFWS managed Medicine Lake National Wildlife Refuge (NWR) and prairie potholes east of the Fort Peck Indian Reservation. Medicine Lake NWR is a 31,660-acre refuge established to provide breeding habitat for migratory birds and other wildlife. This alternative would traverse Diversion Ditch No. 1 in the NWR, a canal that connects the refuge to Big Muddy Creek in Sheridan County, Montana. Prairie potholes are depressional wetlands (primarily freshwater marshes) often found in the Upper Midwest, including northeastern Montana and North Dakota. These permanent or temporary potholes provide breeding and habitat for migratory birds and help prevent downstream flooding. These sensitive habitats are more prominent in the eastern portion of

Alternative A1A than other Steele City Segment alternatives. Like Alternative SCS-A, Alternative SCS-A1A would cross significantly more agricultural and developed land, and streams/rivers than the preferred alternative. A summary of approximate acres that would be affected by Alternative SCS-A1A is presented in Table 4.3.3-1 and mileages along land use categories are listed in Table 4.3.3-2. Similarly to Alternative SCS-A, Alternative SCS-A1A does not offer an environmental advantage as compared to the proposed Project and has therefore been eliminated from further consideration.

4.3.3.4 Steele City Segment Alternative B (Proposed Project)

Steele City Segment Alternative B is the Applicant's preferred alternative and is addressed in Sections 2.0 and 3.0 of this EIS. This alternative would enter the U.S. parallel to the Northern Border Pipeline in Philips County, Montana and continue along that route until diverging west of the Fort Peck Indian Reservation at the crossing of the Missouri River. The USACE administers property on the south and southeastern side of the Missouri River where the alternative crosses. This crossing would require an easement from the USACE and/or the BLM, and, because the proposed pipeline is greater than 24 inches in diameter, a Congressional notification of the intent to grant an easement is also required. At the Missouri River crossing, Alternative SCS-B passes just east of the Charles M. Russell NWR which is administered by USFWS. While the proposed pipeline would not directly impact the refuge, transmission lines needed to provide electrical power to pump stations potentially could cross the area near the Fort Peck Dam. Approximately 3.6 linear miles of the refuge would be impacted by a transmission line coming in from the north, and a transmission line would also parallel, but not enter, the refuge to the east. After crossing the Missouri River, the alternative extends southeast through Harding County, South Dakota into Nebraska. At Keya Paha County, Nebraska, the alternative would cross the Niobrara River east of the reach designated under the federal Wild and Scenic River program. Alternative SCS-B parallels the Keystone Pipeline ROW for 7.4 miles in Jefferson County, Nebraska before connecting with the control point at the northern end of the Keystone Mainline's Cushing Extension near Steele City. Table 4.3.3-1 summarizes the acres of land by land use that would be affected by the construction ROW of Alternative SCS-B and mileage along land use categories is presented in Table 4.3.3-2. The majority of lands being crossed by Alternative SCS-B are rangeland/grassland rather than agricultural and developed land. The Applicant's preferred alternative crosses significantly fewer streams/rivers than the other alternatives (the closest being Alternative SCS-A1A with approximately 95 more crossings).

4.3.3.5 Baker Alternative

As part of the proposed route development and selection process, a deviation for Steele City Segment Alternative B was identified and assessed. The Steele City Segment Baker Alternative was developed based on an agency scoping comment. Tables 4.3.3-3 and 4.3.3-4 summarize impacts of the Baker Alternative and Alternative SCS-B.

The Baker Alternative would deviate for 62.1 miles from Alternative SCS-B paralleling an existing pipeline ROW near Baker, Montana in Fallon County through southwest North Dakota in Bowman County. The alternative would rejoin Alternative SCS-B in northeastern South Dakota in Harding County and reduce the total length of the Project by 2.1 miles (Tables 4.3.3-3 and 4.3.3-4). This alternative could impact Baker Lake by being routed through its watershed. It would also cross an existing oil and gas field, southeast of Baker. At the oil and gas fields, the alternative would require special crossing techniques, which could potentially offset cost savings from reducing pipeline length. Construction of the alternative could also result in an interruption to access and collection from existing wells and an increase in the potential for environmental impact through damage to gathering system pipelines or injury to workers and the public due to proximity to wells, particularly those with potential to release hydrogen sulfide. The Baker Alternative would cross more developed areas and streams/rivers and a significant amount of BLM property in Montana.

The initial assessment of the Baker Alternative indicates that it does not offer a significant environmental advantage over the proposed Project (Alternative SCS-B) and represents a higher risk of spills due to construction through an existing oil and gas field that includes gathering pipelines. Therefore, this alternative was eliminated from further consideration.

TABLE 4.3.3-3
Summary Impact Statistics for Alternative SCS-B and Baker Alternative by Acres

Parameter	Alternative SCS-B	Baker Alternative
Total Length (Miles)	64.5	62.1
Land Use (Acres)[1]		
Agricultural Land	101.7	34.5
Barren Land	0.0	1.2
Developed Land	1.8	7.8
Forested	3.0	0.9
Rangeland/Grassland	747.6	781.1
Wetlands	5.3	2.2
Open Water	0.0	0.0
Total	859.4	827.7
Federal Land Ownership (Acres)[2]		
Bureau of Land Management	2.7	163.8
Number of Streams/Rivers crossed[2]	37	47

[1] Land use from National Land Cover Database, 2001. Acres based off (110-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).
[2] Federal lands from ESRI, 2004. Acres based off (110-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).
[3] Streams/Rivers from ESRI, 2004.

TABLE 4.3.3-4 Summary Impact Statistics for Alternative SCS-B and Baker Alternative by Miles		
	Alternative SCS-B	**Baker Alternative**
Alternative Length (Miles)	850.7	848.6
Land Use		
Agriculture	411.9	400.5
Barren	2.1	2.5
Developed	0.2	0.2
Forest/Woodlands	1.7	1.7
Rangeland/Grassland	375.5	384.5
Wetlands	1.9	1.9
Water	0.3	0.3
Shrubland	56.9	56.9
Stream Crossings (ESRI)		
Artificial Path/Canal/Ditch	10	10
Intermittent	405	413
Perennial	38	37

Source: Keystone 2009.

4.3.3.6 Comparison of Steele City Segment Alternatives

Tables 4.3.3-1 through 4.3.3-4 summarize the key impacts of the alternatives assessed for the Steele City Segment. Except for the Baker Alternative, Steele City Alternative SCS-B is the shortest route and requires less new pipeline construction than the other alternatives under consideration and would therefore have the least overall environmental impact. The Baker Alternative would affect key resources and would have a greater risk to health and safety. In addition, the fewer line miles of construction that are necessary would typically translate to lower overall construction capital costs and lifetime operating costs of the system. In addition, Alternative SCS-B crosses fewer rivers/streams, fewer miles of either developed or agricultural lands, and fewer environmentally sensitive federal lands. As a result, the initial assessment of the Steele City Segment Alternatives indicates that the alternatives considered do not offer an environmental advantage over the Applicant's proposed route (Alternative SCS-B), and they are eliminated from further consideration.

4.3.3.7 Alternatives and Variations in Montana

Keystone applied to MDEQ for a Certificate of Compliance under the MFSA for the proposed construction, operation, and maintenance of the Montana portion of the Keystone XL Pipeline Project. Before MDEQ can approve the Project as proposed or an alternative, it must find and determine the basis of the need for the facility and determine whether or not the facility would serve the public interest, convenience, and necessity.

MFSA regulations also require that MDEQ identify the route that minimizes adverse environmental impacts and uses public land (which may include federal land) whenever the use of public lands is as economically practicable as the use of private land. As a cooperating agency in the preparation of this EIS, MDEQ considered the alternatives described above and also required Keystone to identify and provide assessments of two additional routes in Montana that would increase the use of public lands in comparison to Alternative SCS-B (the proposed route). The alternatives were established using a route development model based on GIS data (i.e., ground surveys were not conducted) that incorporated a set of weighted environmental factors, including both preferred attributes and less desirable attributes. With that approach, the Canada to North Dakota (CND) and Canada to South Dakota (CSD) alternatives were developed and compared to Alternative SCS-B relative to environmental impacts and the use of public lands. Although both routes were eliminated in the initial screening process, portions of the CSD Alternative cross more public land as compared to the segments of Alternative SCS-B in those areas. As a result, MDEQ further evaluated those portions of the CSD Alternative as "variations" to segments of Alternative SCS-B along with other route variations it developed to avoid or minimize impacts to specific resources, to minimize conflicts with existing or proposed residential and agricultural land uses, and in response to requests submitted by concerned landowners.

MDEQ identified a total of 19 variations in Montana and preliminarily selected 9 variations as preferable to the segments of Alternative SCS-B they would replace. In summary, in its review of the Project for compliance with MFSA, MDEQ selected Alternative SCS-B as modified by the 9 variations as its "tentative preferred route" in Montana. The variations ultimately selected by MDEQ would replace short segments of the overall proposed Project, are relatively close to the proposed route (Alternative SCS-B) in Montana, address specific issues relevant to MDEQ, and will be reviewed in detail by MDEQ under MFSA and the Montana Environmental Policy Act, which has essentially the same requirements as those of NEPA. In addition, both DOS and MDEQ have conducted the appropriate environmental reviews of Alternative SCS-B in Montana as reported in this EIS, including in Appendix I.

4.3.4 Alternative to Using the Cushing Extension

One alternative was identified that would avoid using the Cushing Extension. This alternative, termed the Western Alternative, was initially considered as a potential alternative to the Steele City Segment. Rather than using the control point at the north end of the Cushing Extension of the Keystone Mainline pipeline, the Western Alternative would enter the U.S. at Morgan, Montana and run southwest through Montana, South Dakota, Nebraska, Kansas, and Oklahoma to the control point at the south end of the Cushing Extension. The Western Alternative would parallel the existing Northern Border Pipeline corridor in its northernmost extent but otherwise would involve the development of an entirely new linear utility corridor for the rest of its 1,110 mile length. Since this alternative would not tie in to the control point at the north end of the Cushing Extension, it would increase the required length of new pipeline construction by at least 300 miles. Potential positive attributes of this alternative include the avoidance of the Missouri River crossing just to the east of the Fort Peck Reservoir and avoidance of crossings of reaches of the Niobrara River that have been included within the federal Wild and Scenic River program. The addition of 300 miles of new pipeline corridor beyond that required of the northern intermediate control point at Steele City is a significant disadvantage to this proposed route. The additional pipeline miles add considerable potential environmental impact to the Project due to the new ROW development required. While somewhat offset by paralleling the Northern Border ROW in the north, there would still be additional disturbance in the parallel ROW, and in aggregate, the potential benefit is not enough to offset the additional disturbances associated with 300 miles of additional required pipeline ROW. Therefore, the Western Alternative does not offer an environmental advantage over the proposed Project and was eliminated from further analysis.

4.3.5 Gulf Coast Segment Alternatives

Two geographical alternatives were assessed to meet the purpose and need of the Project's Gulf Coast Segment from the control point at the southern end of the Keystone Mainline pipeline's Cushing Extension to the control point near Nederland, Texas. These alternatives are designated as Gulf Coast

Segment (GCS)-A (proposed Project) and GCS-B. These alternatives are depicted on Figure 4.3.5-1.

4.3.5.1 Alternative GCS-A

GCS-A is the Applicant's preferred alternative. GCS-A would be approximately 480 miles in length, which is approximately 6 miles shorter than GSC-B (see Table 4.3.5-1). This route was initially identified because it parallels an existing natural gas pipeline corridor (Texoma) from Cushing to Nederland. Approximately 82 percent of this alternative would parallel the existing ROWs of other linear facilities, including 16 pipelines and electric transmission lines. While a construction ROW would still be required to build the pipeline and its associated facilities along this route, there could potentially be some reduction in the amount of new clearing required in that ROW and disturbances would for the most part occur in areas that had already been disturbed to some degree by the existing ROWs of the parallel facilities.

This route avoids to the degree feasible currently developed urban areas, including the areas of Longview, Nacogdoches, and Tyler, Texas. The predominant ownership along GCS-A is private land. Less than 1 percent of lands are owned by either the State of Oklahoma or Texas. The alternative was also routed to avoid crossing the Angelina National Forest, which is located in Angelina, Nacogdoches, San Augustine, and Jasper counties in east Texas on the shores of the Sam Rayburn Reservoir. The 153,179-acre Angelina National Forest is one of four national forests in Texas and is dominated by pine cover (USFS). Oil and gas activity and abandoned fields were also considered in routing this alternative. Active and inactive oil and gas fields may have recorded or unrecorded occurrences of contamination along the initial 100 miles from Cushing, Oklahoma. GCS-A avoids the Big Thicket Natural Preserve in Liberty County, Texas by routing the pipeline along the Texas highway. GCS-A crosses more wetlands than GCS-B, for the most part located along the southern portion of the route. A summary of pertinent statistics for Alternative GCS-A is presented in Table 4.3.5-1.

TABLE 4.3.5-1
Summary Impact Statistics for Gulf Coast Segment Alternatives

Parameter	GCS-A	GCS-B
Total Length (Miles)	480	486
Land Use (Acres)[1]		
Agricultural Land	1651.5	1975.3
Barren Land	1.7	5.0
Developed Land	321.8	373.5
Forested	2034.9	1173.3
Rangeland/Grassland	1552.7	2377.5
Wetlands	853.3	573.3
Open Water	7.1	20.3
Total	6422.9	6498.2
Federal Land Ownership (Acres)[2]		
National Park Service	5.2	7.2
Number of Streams/Rivers crossed[3]	246	255

[1] Land use from National Land Cover Database, 2001. Acres based off (110-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).

[2] Federal lands from ESRI, 2004. Acres based off (110-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).

[3] Streams/Rivers from ESRI, 2004.

4.3.5.2 Alternative GCS-B

Alternative GCS-B would be approximately 486 miles in length, or about 6 miles longer than the GCS-A. Approximately 97.8 percent of this alternative would parallel the existing ROWs of other linear facilities, including pipelines and electric utility transmission lines. GCS-B parallels the Seaway Pipeline for approximately 190 miles south of Cushing before diverting east of Lake Texoma and Durant, Oklahoma. As with GCS-A, a construction ROW would still be required to build the pipeline and its appurtenant facilities. Nonetheless, there could potentially be some reduction in the amount of clearing required and disturbances would once again occur in areas that had already been disturbed to some degree by the ROWs of the existing facilities.

GCS-B would also cross the Big Thicket Natural Preserve. The preserve is a combination of pine and cypress forest, hardwood forest, meadow, and blackwater swamp. In 2001, the American Bird Conservancy designated the Big Thicket National Preserve as a Globally Important Bird Area. This alternative encounters more developed land areas along its route, encounters more agricultural land, and crosses more streams/rivers. Table 4.3.5-1 summarizes acres of land use that would be affected by GCS-B. As a result of its greater length and associated greater area of impact and the crossings described above, the initial assessment of Alternate GCS-B indicates that it does not offer an environmental advantage of the proposed Project and therefore it is eliminated from further analysis.

4.3.5.3 Comparison of Gulf Coast Segment Alternatives

GCS-A is the Applicant's preferred route. This shorter pipeline alternative for the Gulf Coast would likely mean lower overall construction and operating costs, along with fewer overall resource disturbances. Table 4.3.5-1 summarizes the alternatives under consideration for the Gulf Coast Segment. GCS-A bypasses a sensitive NPS land, the Big Thicket Natural Preserve. While GSC-A would cross more wetlands as compared to CGS-B, it would affect less overall agricultural land, developed land, and crosses less streams/rivers. For these reasons, GCS-A was determined to be the environmentally preferred alternative.

4.3.6 Houston Lateral Alternatives

Alternatives identified for the Houston Lateral included Alternative HL-A (the proposed Project) and Alternative HL-B. Figure 4.3.6-1 depicts the alternatives and Table 4.3.6-1 summarizes the key areas affected by the alternatives. While alternatives for the Houston Lateral begin at different locations along the Gulf Coast Segment, the crude oil delivery control point in PADD III for both Houston Lateral alternatives would be near Moore Junction, Texas.

TABLE 4.3.6-1 Summary Impact Statistics for the Houston Lateral Alternatives		
Parameter	**Alternative HL-A**	**Alternative HL-B**
Total Length (Miles)	48.6	77.4
Land Use (Acres)[1]		
Agricultural Land	286.1	438.5
Barren Land	0.0	0.3
Developed Land	27.4	208.5
Forested	27.1	11.7
Rangeland/Grassland	66.6	182.4
Wetlands	236.5	165.5
Open Water	3.9	24.9
Total	647.7	1031.9
Number of Streams/Rivers crossed[2]	12	28

[1] Land use from National Land Cover Database, 2001. Acres based off (110-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).

[2] Streams/Rivers from ESRI, 2004.

4.3.6.1 Houston Lateral Alternative A

Houston Lateral Alternative A is the Applicant's preferred route. Alternative HL-A is a 49-mile-long route and would divert from the Gulf Coast Segment in central-east Liberty County and pass southwest through Chambers County to Harris County near the Moore Junction. This alternative would parallel other utility corridors for 40 percent of the route. Paralleling other ROWs could reduce the amount of clearing required, but disturbances would still be expected due to construction along the ROWs of the existing facilities (see Table 4.3.6-1). Alternative HL-A would likely encounter heavily developed urban areas on the southwest end in the east Houston area. This alternative would likely necessitate the construction of breakout tanks, which temporarily receive and store crude oil as a means of providing a steady supply of oil.

Alternative HL-A extends approximately 4 miles through land designated as being under the jurisdiction of the Coastal Zone Management Act (CZMA) along the Gulf Coast; assuming a 110-foot-wide ROW, there would be approximately 50 acres affected within the coastal zone management area in Harris County. According to the EPA, the CZMA encourages states to preserve, protect, develop, and where possible, restore or enhance valuable natural coastal resources through a comprehensive management program. Any project that may affect land or water in the Texas coastal zone and that requires a federal license or permit must be reviewed for consistency with the Texas Coastal Management Program.

Alternative A would parallel fewer miles of existing utility corridors and impact more acres of wetlands than Alternative B.

4.3.6.2 Houston Lateral Alternative B

Houston Lateral Alternative B, also referred to as the southern alternative, is approximately 77 miles in length with 97 percent of the route paralleling other utility corridors. Alternative HL-B diverts from the Gulf Coast Segment near Nederland in Jefferson County, Texas. The alternative continues west through Jefferson, Liberty, Chambers, and Harris counties before ending near Moore Junction. No break out tanks would be required for Alternative HL-B. This alternative would extend through heavily developed urban areas at the beginning and end of the proposed route. Table 4.3.6-1 summarizes the area of land use that would be impact for Alternative HL-B. This longer alternative would impact significantly more agricultural land and developed land and streams/rivers crossings.

Alternative B would likely encounter greater regulatory barriers than Alternative HL-A due to its proximity to the Gulf Coast and due to the length of pipeline that would reside within the CZMA. Approximately 31 miles (approximately 417 acres, assuming a 110-foot-wide ROW) of Alternative HL-B would cross land within the Texas Coast Management Program in Harris County and Chambers County. That is a substantially greater area of land that would be affected in the Texas Coastal Management Program as compared to Alternative HL-A. As a result of coastal zone concerns, the greater length of the pipeline, and the larger amount of acreage that would be impacted by pipeline construction, this alternative does not offer an environmental advantage over HL-A and was eliminated from further consideration.

4.3.6.3 Comparison of Houston Lateral Alternatives

Table 4.3.6-1 summarizes the key effects of the alternatives under consideration for the Houston Lateral. Alternative HL-A is the shorter route and would require fewer miles of new pipeline and would have a lesser area of impact. Overall construction capital costs and lifetime operating costs for the Houston Lateral are likely to be less with the shorter pipeline alternative. While Alternative HL-A would intersect more wetlands, it would impact fewer acres of agricultural land and developed land, and fewer streams/rivers crossings. Alternative HL-B would intersect 27 more miles or 367 more acres within a 110-foot-wide ROW of land that is within the authority of the Texas Coastal Management Program and that is encumbered with the restrictions of the CZMA than would Alternative HL-A, the Applicant's preferred route. For these reasons, Alternative HL-B does not offer an environmental advantage over the proposed Project and was eliminated from further analysis.

4.3.7 Summary of Pipeline Route Alternatives Analysis

DOS identified alternatives to the proposed Project within three segments established by control points required to meet the purpose and need of the proposed Project. The three segments are the Steele City Segment, the Gulf Coast Segment, and the Houston Lateral. DOS developed the alternatives based on information provided by the Applicant and the cooperating agencies, and obtained by DOS and its third-party contractor. After identifying reasonable alternatives, DOS evaluated each alternative in comparison to the purpose and need of the Project and the potential environmental impacts of each alternative as compared to the proposed pipeline route. The analysis was based on data provided in the Project application, information obtained from the cooperating agencies, and data obtained through the research of DOS and its third-party contractor.

Based on the assessment of alternatives conducted, DOS determined that none of the identified alternatives offered an environmental advantage over the Applicant's preferred route. Therefore, the DOS preferred route consists of the following alternatives by segment:

- Steele City Segment Alternative B (SCS-B);
- Gulf Coast Segment Alternative A (GCS-A); and
- Houston Lateral Alternative A (HL-A).

4.4 ALTERNATIVE 230-KV ELECTRICAL TRANSMISSION LINE ROUTES

The 230-kV Lower Brule to Witten transmission line would be needed as a result of transmission system reliability requirements due to the expected load demands at full pipeline operational capacity in southern South Dakota. A systems analysis conducted by the Western Area Power Authority (Western) determined that a 230-kV electrical transmission line would be needed between the Lower Brule substation and the Witten substation to achieve desired system reliability under the anticipated load conditions at high throughput. The transmission line would transfer electricity from the proposed Lower Brule Substation near Big Bend Dam in Lyman County, to an existing substation near Witten in Tripp County.

To meet these requirements, the existing Big Bend-Fort Thompson No. 2, 230-kV transmission line turning structure would be converted to a double-circuit structure. Western would construct 2.1 miles of new double-circuit transmission line south of the dam to the new Lower Brule Substation and would own and operate the 2.1 mile line. Ownership of the Lower Brule Substation would be transferred to the Basin Electric Power Cooperative (BEPC). BEPC would construct and operate the new 230-kV transmission line from the Lower Brule Substation to the existing Witten Substation, which is owned by Rosebud Electric Cooperative. The approximately 70-mile-long transmission line would be built, owned, and operated by BEPC.

Western and BEPC developed alternative corridors and alternative routes within those corridors for the project. Those alternatives are described below.

Initially, a 6-mile-wide corridor, Alternative Corridor A, was identified by Western for the Lower Brule to Witten transmission line between an existing substation on the transmission grid and a proposed new substation at Lower Brule. BEPC and Western then identified five preliminary alternative routes for the transmission line within Corridor A (Figure 4.4-1); the five alternatives are the Western Alternative and Alternatives BEPC-A through BEPC-D.

The Western Alternative, the shortest alternative, would cross the most agricultural land, barren land, forested land, open water, and wetlands (Table 4.4-1). The BEPC alternatives range from 69.7 to 72.0 miles in length and cross more rangeland/grassland than the Western Alternative. Alternative BEPC-B crosses the most perennial/intermittent stream crossings while BEPC-D crosses the most developed land and is the longest alternative.

BEPC, Western, and the Lower Brule Reservation also identified Alternative Corridor B, which is also a 6-mile-wide corridor. This corridor follows a similar path from the existing Witten Substation to the proposed Lower Brule Substation but with deviations in the southeast near Winner and the northeast near Reliance. Corridor B was further developed into four preliminary alternative routings for the transmission line (Figure 4.4-1); the four alternatives are Alternatives BEPC-E through BEPC-H.

The Corridor B preliminary alternatives range from 73.9 to 75.2 miles in length (Table 4.4-2). Alternative BEPC-G crosses the most agricultural land, wetlands, and perennial/intermittent stream crossings. BEPC-H crosses the most developed land and forested areas and is the longest of the four alternatives in Corridor B.

The alternatives within both Corridor A and Corridor B cross the Lower Brule Reservation and connect with an existing transmission line near the Big Bend Dam.

The key impacts of the transmission line alternatives are listed in Tables 4.4-1 and 4.4-2 for comparison purposes. In addition, the impacts of construction and operation of the transmission line alternatives are generally addressed in Section 3.0 the EIS. However, DOS, Western, and the other cooperating agencies do not have sufficient design and construction information to establish an agency preferred alternative for the proposed transmission line project. An additional and separate NEPA environmental review of the alternatives to the proposed transmission line will be conducted after the alternative routes are further defined. The design and environmental review of the proposed 230-kV transmission line are on a different schedule than the pipeline system itself. Regional transmission system reliability concerns are not associated with the initial operation of the proposed pipeline pump stations, but rather with later stages of proposed pipeline operation at higher levels of crude oil throughput.

TABLE 4.4-1
Summary of Key Impacts for the Lower Brule to Witten Transmission Line Alternatives in Corridor A

	Alternative				
Characteristic	**Western**	**BEPC-A**	**BEPC-B**	**BEPC-C**	**BEPC-D**
Total Length (Miles)	67.2	69.7	70.1	71.7	72.0
Land Use (Acres)[1]					
Agricultural Land	501.5	389.5	404.3	427.7	398.6
Barren Land	0.5	0.0	0.0	0.0	0.0
Developed Land	40.1	27.4	27.3	69.3	76.9
Forested	1.6	0.7	0.7	0.7	0.7
Rangeland/Grassland	458.9	627.0	620.5	576.6	608.2
Wetlands	10.7	7.0	4.6	7.9	3.2
Open Water	5.2	4.8	4.1	4.1	4.0
Total	1,018.5	1,056.4	1,061.5	1,086.3	1,091.6
Lower Brule Reservation (Acres)[2]	103.1	106.0	106.0	106.0	106.0
Number of Streams/Rivers Crossed[3]					
Perennial	1	4	4	4	4
Intermittent	33	34	36	35	26
Total	34	38	40	39	30

[1]Land use from National Land Cover Database, 2001. Acres based off (125-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).
[2]Lower Brule Reservations from ESRI Federal Lands, 2004. (125-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).
[3]Streams/rivers from ESRI, 2004.

TABLE 4.4-2 Summary of Key Impacts for the Lower Brule to Witten Transmission Line Alternatives in Corridor B				
	Alternative			
Characteristic	**BEPC-E**	**BEPC-F**	**BEPC-G**	**BEPC-H**
Total Length (Miles)	73.9	74.6	74.5	75.2
Land Use (Acres)[1]				
Agricultural Land	346.4	348.8	433.5	374.7
Barren Land	0.0	0.0	0.0	0.0
Developed Land	66.9	61.5	66.5	107.1
Forested	2.4	0.6	1.8	2.6
Rangeland/Grassland	692.7	712.3	611.8	645.8
Wetlands	5.2	4.8	12.2	6.3
Open Water	5.7	2.7	2.5	2.5
Total	1,119.3	1,130.7	1,128.3	1,139.0
Lower Brule Reservation (Acres)[2]	132.8	131.4	131.4	136.7
Number of Streams/Rivers Crossed[3]				
Perennial	3	4	7	7
Intermittent	23	25	31	20
Total	26	29	38	27

[1]Land use from National Land Cover Database, 2001. Acres based off (125-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).
[2]Lower Brule Reservations from ESRI Federal Lands, 2004a. (125-foot ROW x lines miles x 5280 feet) divided by (43560 feet/acre).
[3]Streams/rivers from ESRI, 2004b.

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5.0 SUMMARY AND RECOMMENDATIONS

The information provided in Section 3.0 of this draft EIS and summarized below for each resource category indicates that the proposed Keystone XL Project would result in limited adverse environmental impacts during both construction and operation, assuming that the Project would be constructed and operated in compliance with:

- All applicable laws and regulations;
- The provisions in Keystone's proposed CMR Plan (Appendix B);
- The environmental specifications and water quality protection requirements mandated by MDEQ for Montana, as part of the MFSA certification process and presented in Attachments 1 and 2 to Appendix I; and
- Other mitigation measures presented in this draft EIS.

The following subsections summarize the impacts expected to each resource area, the measures Keystone would incorporate into the Project to avoid or minimize impacts, as well as the recommended additional mitigation measures for each resource category.

Impacts and mitigations associated with potential leaks and spills of fuel, lubricating fluids, and crude oil during construction and operations are summarized in Section 5.13.

5.1 GEOLOGY

5.1.1 Summary

The proposed Project would not result in substantial long- or short-term, large scale alteration of topography. Routine pipeline operation and maintenance activities would not be expected to affect physiography or surface or bedrock geology.

Potential impacts to paleontological resources that could occur during construction of the Project and its connected actions include:

- Damage to or destruction of fossils due to excavation activities and/or blasting;
- Erosion of fossil beds due to grading; and
- Unauthorized collection of fossils by construction personnel or the public.

Routine pipeline operations and maintenance activities are not expected to affect paleontological resources. However, collection of these resources for scientific or other purposes would not be possible within the permanent ROW during project operations.

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

During construction activities, vegetation clearing and alteration of surface-drainage patterns could increase landslide risk. There is a risk of subsidence where the proposed route crosses karst formations in Nebraska, Oklahoma, and Texas. However, the overall risk to the pipeline from karst-related subsidence is expected to be minimal.

During Project operations, there could be risks associated with pipeline exposure due to lateral or vertical scour at water crossings during floods.

5.1.2 Planned Mitigation Measures

Keystone would prepare a Paleontological Mitigation Plan to be included in the FEIS, prior to beginning construction on federal and certain state and local government lands because there is potential for discovery of fossils during trench excavation and pipeline installation activities. Keystone would consult with the appropriate regulatory agencies in each state on the requirements for the Paleontological Mitigation Plan for federal and state lands.

To reduce landslide risk, Keystone would employ erosion and sediment control and reclamation procedures described in Section 4.11 of its CMR Plan (Appendix B). These procedures are expected to limit the potential for erosion, and maintain slope stability during the construction and operational phases of the Project.

Keystone would implement an Integrated Public Awareness (IPA) Plan which includes the distribution of educational materials to inform landowners of potential threats and information on how to identify threats to the pipeline including the potential for landslides.

To reduce the risk of subsidence, Keystone would conduct site-specific studies as necessary to characterize karst features, and would evaluate and modify construction techniques as necessary in these areas.

5.1.3 Additional Agency Proposed Mitigation Measures

There is currently an effort between DOS, BLM, and MDEQ and other agencies to develop a Memorandum of Understanding (MOU) for the identification, evaluation and protection of paleontological resources. This MOU will be completed prior to the ROD and will be added to the final EIS as an Appendix.

5.2 SOILS

5.2.1 Summary

Pipeline construction activities, including clearing, grading, trench excavation, backfilling, heavy equipment traffic, and restoration along the construction ROW could adversely affect soil resources. In addition, the construction of pump stations, access roads, construction camps and the tank farm could also affect soil resources. Potential impacts from the Project and its connected actions include:

- Temporary and short-term soil erosion;
- Loss of topsoil;
- Short-term to long-term soil compaction; and
- Permanent increases in the proportion of large rocks in the topsoil.

Pipeline construction also could result in damage to existing tile drainage systems. Special considerations and measures would be undertaken in the Sand Hills region due to the highly erodible nature of the soils in this area.

During the operational phase of the Project, small scale, isolated surface disturbance impacts could occur from pipeline maintenance traffic and incidental repairs. This could result in accelerated erosion, soil compaction and related reductions in the productivity of desirable vegetation or crops. Impacts related to excavation and topsoil handling would be limited to small areas where certain pipeline maintenance activities take place.

5.2.2 Planned Mitigation Measures

The CMR Plan proposes procedures designed to reduce the likelihood and severity of Project impacts, and mitigation where impacts are unavoidable. These include:

- Reducing soil erosion by installing sediment barriers (silt fencing, straw or hay bales, sand bags), trench plugs, temporary slope breakers, drainage channels or ditches, and mulching;
- Assigning an Environmental Inspector (EI) to each construction spread. The EI would have the authority to stop work and/or order corrective action in the event that construction activities violate the measures outlined in the CMR Plan, landowner requirements, or any applicable permit;
- Segregate and salvage all topsoil up to a maximum of 12 inches of topsoil from the area disturbed by trenching where practicable and restore topsoil to its approximate original stratum after backfilling is complete;
- Developing soil discovery procedures in consultation with relevant agencies to accommodate potential discoveries of pre-existing contaminated soils;
- Halting construction activities during the winter months on the Steele City Segment to prevent the need for winter construction techniques;
- Halting construction during wet weather periods, or implementing methods to mitigate impacts when construction activities are conducted in wet conditions;
- Repairing any ineffective erosion control measures within 24 hours of detection, where possible. If substantial precipitation or snowmelt events create erosion channels in areas where soil is exposed, additional sediment control measures would be implemented;
- Ripping to relieve soil compaction in particular areas from which topsoil has been removed;
- Scheduling construction during drier months of the year to reduce the potential for precipitation induced soil erosion impacts; and
- Identifying and avoiding or, where necessary, repairing or replacing drainage tiles that could be damaged by pipeline construction.

Additionally, Keystone is negotiating easement agreements with landowners and agencies that would require Keystone to restore the productivity of the ROW on pasture and range lands and provide compensation for demonstrated losses from decreased productivity resulting from pipeline operations.

5.2.3 Additional Agency Proposed Mitigation Measures

The following additional potential mitigation measures have been suggested by regulatory agencies:

- The creation of a site specific erosion control and revegetation plan for agency approval prior to the start of construction (MDEQ);
- Ripping of subsoils on range and pasture lands if requested by the landowner or land management agency (MDEQ); and
- Conduct ground patrols to detect and repair any differential settling or subsidence holes that develop over the life of the Project (MDEQ).

5.3 WATER RESOURCES

5.3.1 Summary

It is not anticipated that surface water or groundwater quality would be significantly affected by normal disposal activities such as disposal of hydrostatic test water. Floodplain terraces and low floodplains are found along the Project route. Two pump stations and 10 MLVs would be in the 100-year floodplain as currently proposed, but the effect of those facilities on floodplain function is expected to be minor.

Potential impacts to groundwater during construction activities of the Project and its connected actions include:

- Groundwater quality degradation during or after construction resulting from disposal of materials and equipment;
- Temporary increases in TSS concentrations where the water table is disturbed during trenching and excavation activities (drawdown of the aquifer is possible where dewatering is necessary);
- Increased surface water runoff and erosion from clearing vegetation in the ROW;
- Degradation of groundwater quality due to potential blasting; and
- Temporary increases in local groundwater levels due to infiltration of hydrostatic testing waters.

Potential impacts on surface water resources during construction activities include:

- Temporary to long-term surface water quality degradation during or after construction from disposal of materials and equipment;
- Temporary increases in TSS concentrations and increased sedimentation during stream crossings;
- Temporary to short-term degradation of aquatic habitat from in-stream construction activities;
- Changes in channel morphology and stability caused by channel and bank modifications;
- Temporary to long term decrease in bank stability and resultant increase in TSS concentrations from bank erosion as vegetation removed from banks during construction is re-establishing;

- Temporary reduced flow in streams and potential other adverse effects during hydrostatic testing activities; and
- Temporary degradation of surface water quality and alteration of aquatic habitat from blasting activities within or adjacent to stream channels.

5.3.2 Planned Mitigation Measures

To protect floodplain functions, the pipeline would be constructed under river channels with potential for lateral scour. In floodplain areas adjacent to waterbodies, the contours would be restored to as close to previously existing contours as practical and the construction ROW would be revegetated so that after construction, the pipeline would not obstruct flows over designated floodplains.

Keystone has committed to the following mitigation measures to protect water resources:

- Implementation of measures designed to reduce erosion and control surface water runoff during vegetation clearing in the ROW;
- File a blasting plan with applicable state or local jurisdictions, where required. Keystone's blasting plan would include provisions to avoid impacts to groundwater and to incorporate post-blasting testing for surface water and water wells within 150 feet of the centerline;
- Discharge waters would meet all water quality requirements prior to discharge. All applicable water withdrawal and discharge permits would be acquired prior to hydrostatic testing;
- Open-cut methods would be used at 38 major and sensitive waterbody crossings and as determined by the appropriate regulatory authority;
- Use the general river crossing procedures and mitigations included in the CMR Plan. The CMR Plan would be revised prior to construction to incorporate additional mitigations, as well as any other mitigations or conditions that the U.S. Army Corps of Engineers (USACE) imposes during final permit negotiations;
- Where the HDD method is not used for major waterbody crossings or for waterbody crossings where important fisheries resources could be impacted, Keystone would develop a site-specific plan addressing proposed additional construction and mitigation procedures;
- Prior to commencing any stream crossing construction activities, Keystone would obtain a permit under Section 404 of the Clean Water Act (CWA) through the USACE and Section 401 water quality certification as per state regulations;
- If required, Keystone would work with the applicable permitting agency to develop specific crossing and sediment handling procedures for contaminated or impaired waters.
- Keystone would develop specific construction and crossing methods for sensitive/protected waterbodies in conjunction with USACE and U.S. Fish and Wildlife Service (USFWS) consultation.
- Keystone would develop a frac-out plan in consultation with the regulatory agencies for HDD crossings.
- All contractors would be required to follow the identified procedures to limit erosion and other land disturbances including the use of buffer strips, drainage diversion structures, sediment barrier installations, and clearing limits, as well as procedures for waterbody restoration at crossings.

- Following completion of waterbody crossings, waterbody banks would be restored to preconstruction contours, or at least to a stable slope. Banks would be seeded with native vegetation, mulch, or erosion control fabric, where possible. If necessary, additional erosion control measures would be installed in accordance with permit requirements.
- All waterbody crossings would be assessed by qualified personnel in the design phase of the Project with respect to the potential for channel aggradation/degradation and lateral channel migration.
- All construction activities would comply with the National Pollutant Discharge Elimination System (NPDES) permit and other applicable permitting, including following the procedures in a Stormwater Pollution Prevention Plan.
- Hydrostatic test manifolds would be located more than 100 feet away from wetlands and riparian areas to the maximum extent possible.
- All surface water resources utilized for hydrostatic testing would be approved by the appropriate permitting agencies prior to initiation of any testing activities. Planned withdrawal rates for each water resource would be evaluated and approved by these agencies prior to testing.
- The water withdrawal methods described in the CMR Plan would be implemented and followed. These procedures include screening of intake hoses to prevent the entrainment of fish or debris, keeping the hose at least 1 foot off the bottom of the water resource, prohibiting the addition of chemicals into the test water, and avoiding discharging any water that contains visible oil or sheen following testing activities.
- Hydrostatic test water would be discharged to the source water at an approved location along the waterway or to an upland area within the same drainage as the source water where it may evaporate or infiltrate. Discharged water would be tested to ensure it meets applicable water quality standards imposed by the discharge permits for the permitted discharge locations.

5.3.3 Additional Agency Proposed Mitigation Measures

The following additional potential mitigation measures have been suggested by regulatory agencies:

- In Montana, avoid crossing water ponds and/or reservoirs (MDEQ);
- Avoid wet crossings of any stream, lake, reservoir, or pond in the state of Montana (MDEQ); and
- In Montana, any construction equipment and construction-related vehicles crossing a water body should use a crossing location that is within the dewatered reach created by the selected dry crossing construction method (MDEQ).

5.4 WETLANDS

5.4.1 Summary

The Project would disturb a total of 554 acres of wetlands, primarily forested wetlands (271 acres) and emergent wetlands (262 acres) as well as some scrub-shrub wetlands (21 acres). While emergent wetlands would regenerate quickly after disturbance (within 3–5 years generally), forested and scrub-shrub wetlands would potentially experience long-term effects. Wetlands in parks or reserves have high conservation value.

Potential impacts to wetlands during construction and operation of the Project and its connected actions include:

- Loss of wetlands due to backfilling or draining;
- Modification in wetland productivity due to modification of surface and subsurface flow patterns;
- Temporary and permanent modification of wetland vegetation community composition and structure from clearing and operational maintenance (clearing temporarily affects the wetland's capacity to buffer flood flows and/or control erosion);
- Wetland soil disturbance (mixing of topsoil with subsoil with altered biological activities and chemical conditions that could affect reestablishment and natural recruitment of native wetland vegetation after restoration);
- Compaction and rutting of wetland soils from movement of heavy machinery and transport of pipe sections, altering natural hydrologic patterns, inhibiting seed germination, or increasing siltation;
- Temporary increase in turbidity and changes in wetland hydrology and water quality;
- Permanent alteration in water-holding capacity due to alteration or breaching of water-retaining substrates in the Prairie Pothole and Rainwater Basin regions;
- Alteration in vegetation productivity and life stage timing due to increased soil temperatures associated with heat input from the pipeline; and
- Alteration in freeze-thaw timing due to increased water temperatures associated with heat input from the pipeline.

5.4.2 Planned Mitigation Measures

Keystone has committed to the following measures to protect wetlands in its CMR Plan:

- Avoid placement of aboveground facilities in a wetland, except where the location of such facilities outside of wetlands would preclude compliance with DOT pipeline safety regulations;
- Clearly mark wetland boundaries with signs and/or highly visible flagging during construction and maintain markers until permanent seeding is completed;
- Limit the width of the construction zone to 85 feet through standard wetlands, unless soil conditions require a greater width;
- Locate extra work spaces at least 10 feet away from wetland boundaries, where topographic conditions permit;
- Limit clearing of vegetation between extra work areas and the edge of the wetland to the construction right-of-way and limit the size of extra work areas to the minimum needed to construct the wetland crossing;
- Clear the construction right-of-way, dig the trench, fabricate and install the pipeline, backfill the trench, and restore the construction right-of-way using wide-track or balloon-tire construction equipment and/or conventional equipment operating from timber and slash (riprap) cleared from the right-of-way, timber mats, or prefabricated equipment mats;
- Install and maintain sediment barriers at all saturated wetlands or wetlands with standing water across the entire construction right-of-way upslope of the wetland boundary and where saturated

- Limit the duration of construction-related disturbance within wetlands to the extent practicable;
- Use no more than two layers of timber riprap to stabilize the construction right-of-way;
- Cut vegetation off at ground level leaving existing root systems in place and remove it from the wetland for disposal;
- Limit pulling of tree stumps and grading activities to directly over the trench line unless safety concerns require the removal of stumps from the working side of the construction right-of-way;
- Segregate and salvage all topsoil up to a maximum of 12 inches of topsoil from the area disturbed by trenching in dry wetlands, where practicable and restore topsoil to its approximate original stratum after backfilling is complete;
- Dewater the trench in a manner to prevent erosion and to prevent heavily silt-laden water from flowing directly into any wetland or waterbody;
- Remove all timber riprap and prefabricated equipment mats upon completion of construction;
- Locate hydrostatic test manifolds outside wetlands and riparian areas to the maximum extent practicable;
- Perform all equipment maintenance and repairs in upland locations at least 100 feet from waterbodies and wetlands, if possible;
- Avoid parking equipment overnight within 100 feet of a watercourse or wetland, if possible;
- Prohibit washing equipment in streams or wetlands;
- Install trench breakers and/or seal the trench to maintain the original wetland hydrology, where the pipeline trench may drain a wetland;
- Avoid sand blasting in wetlands to the extent practicable, if unavoidable place a tarp or suitable material to collect as much waste shot as possible, clean up all visible wastes, and dispose of collected waste at an approved disposal facility.
- Remove all timber riprap, timber mats, and prefabricated equipment mats and other construction debris upon completion of construction;
- Replace topsoil, spread to its original contours with no crown over the trench;
- Remove any excess spoil, stabilize wetland edges and adjacent upland areas using permanent erosion control measures and revegetation;
- For standard wetlands, install a permanent slope breaker and trench breaker at the base of slopes near the boundary between the wetland and adjacent upland areas where necessary to prevent the wetland from draining;
- Apply temporary cover crop at a rate adequate for germination and ground cover using annual ryegrass or oats unless standing water is present (in the absence of detailed revegetation plans or until appropriate seeding season);
- Apply seeding requirements for agricultural lands or as required by the landowner for farmed wetlands;
- No application of fertilizer, lime, or mulch unless required by the appropriate land management or state agency;

- Restore wetland areas within conservation lands or easements to a level consistent with any additional criteria established by the relevant managing agency;
- Complete topographic surveys for USFWS easement wetlands prior to construction through the wetland, restoring final grades to within 0.1 foot of original elevations; and
- Prohibit use of herbicides or pesticides within 100 feet of any wetland (unless allowed by the appropriate land management or state agency).

5.4.3 Additional Agency Proposed Mitigation Measures

The following additional potential mitigation measures have been suggested by regulatory agencies:

- Wetland construction monitoring plans should be developed both before and after construction for depressional wetlands of the Prairie Potholes region in Montana and wetlands that no longer pond water after the pipeline is installed should receive additional compaction, replacement, or at the landowner's or managing agency's discretion compensatory payments should be made for drainage of the wetland (MDEQ).
- In areas of concern to NPS, any loss or impact to wetlands from pipeline construction should be fully mitigated by replacement or restoration of an equal or greater acreage in the immediate locale of the impact (NPS).
- Permanent impacts to forested wetlands in Texas should be calculated to include the total width of area where trees would be removed during long-term maintenance including any removal areas beyond the 10-foot wide maintained area. All forested wetland clearing is considered a permanent impact that would require compensatory mitigation (Texas Parks and Wildlife, TPW).
- The wetland mitigation plan should be developed in consultation with TPW, and TPW requests that Keystone address impacts to all wetland types in the wetland mitigation plan and mitigate for these impacts (TPW).

5.5 TERRESTRIAL VEGETATION

5.5.1 Summary

Terrestrial vegetation classes include all the wetland classes in addition to grasslands, upland forest, and developed land. Grassland impacts due to pipeline construction are expected to be minimal, and affected vegetative communities generally are expected to reestablish within 2 years. Impacts on upland forest and shrubland would be longer term than those anticipated for grassland because of the time required for these plant communities to reestablish and reach mature pre-construction conditions.

Potential impacts to terrestrial vegetation during construction and operation of the Project and its connected actions include:

- Temporary and permanent modification of vegetation community composition and structure from clearing and operational maintenance;
- Increased risk of soil erosion due to lack of vegetative cover;
- Expansion of invasive and noxious weed populations along the pipeline ROW as a result of construction and operational vegetation maintenance;

- Soil and sod disturbance (mixing of topsoil with subsoil with altered biological activities and chemical conditions that could affect reestablishment and natural recruitment of native vegetation after restoration);
- Compaction and rutting of soils from movement of heavy machinery and transport of pipe sections, altering natural hydrologic patterns, inhibiting water infiltration and seed germination, or increasing siltation; and
- Alteration in vegetation productivity and lifecycle due to increased soil temperatures associated with heat input from the pipeline.

5.5.2 Planned Mitigation Measures

To reduce impacts on vegetation within the construction and permanent ROW and to improve the probability of successful revegetation of disturbed areas, Keystone would implement the following measures in its CMR Plan:

- Limit construction traffic to the construction ROW, existing roads, and approved private roads;
- Clearly stake construction ROW boundaries including pre-approved temporary workspaces to prevent disturbance to unauthorized areas;
- Mow or disc crops if present to ground level unless an agreement is made for the landowner to remove for personal use;
- Prohibit burning on cultivated lands, as well as on rangelands and pastures when recommended by regulatory agencies;
- Limit the width of the construction ROW at timber shelterbelts in agricultural areas to the minimum necessary to construct the pipeline;
- Strip topsoil in cultivated and agricultural lands up to a maximum depth of 12 inches;
- Stockpile stripped topsoil in a windrow along the edge of the ROW, such that the potential for subsoil and topsoil mixing is minimized;
- Prohibit the use of topsoil as construction fill;
- Increase adhesion in topsoil piles by using water or an alternative adhesive agent if required to prevent wind erosion;
- Leave gaps in rows of topsoil and subsoil and prevent obstructions in furrows, furrow drains, and ditches to allow drainage and prevent ponding of water next to or on the ROW;
- Install flumes and ramps in furrows, furrow drains, ditches, and for any watercourse where flow is continuous during construction to facilitate water flow across the trench;
- Ramp bar ditches with grade or ditch spoil to prevent damage to the road shoulder and ditch;
- Restore original contours and drainage patterns to the extent practicable after construction;
- Survey agricultural areas with terraces such that pre-construction contours may be restored after construction;
- Use timber mats, timber riprap, or other methods to stabilize surface conditions when the construction surface is inadequate to support equipment and remove these mats or riprap when construction is complete;

- Provide and maintain temporary and permanent erosion control measures on steep slopes or wherever erosion potential is high;
- Install sediment barriers below disturbed areas where there is a hazard of offsite sedimentation;
- Install slope breakers (water bars) on slopes greater than 5 percent on all disturbed lands to prevent erosion;
- Apply temporary mulch on disturbed construction work areas that have been inactive for one month or are expected to be inactive for a month or more, using only weed free mulch;
- Limit vehicular soil compaction, and dig ditches to improve surface drainage, using timber riprap, matting or geotextile fabric overlain with soil, and stop construction when necessary to further limit soil compaction;
- Test topsoil and subsoil for compaction at regular intervals in agricultural and residential areas;
- Relieve soil compaction on all croplands by ripping a minimum of three passes at least 18 inches deep, and on all pastures by ripping or chiseling a minimum of three passes at least 12 inches deep;
- Relieve subsoil compaction on areas stripped for topsoil salvage by ripping a minimum of three passes at 18 inches or less followed by grading and smoothing (disc and harrow) to avoid topsoil mixing;
- Replace topsoil to pre-existing depths once ripping and discing of subsoil is complete up to a maximum of 12 inches;
- Alleviate compaction on cultivated fields by cultivation;
- Consult with NRCS if there are any disputes between landowner and Keystone as to areas where compaction should be alleviated;
- Plow under organic matter, including wood chips, manure, or planting a new crop such as alfalfa, to decrease soil bulk density and improve soil structure or any other measures in consultation with the NRCS if mechanical relief of compaction is deemed unsatisfactory;
- Inspect the ROW in the first year following construction to identify areas of erosion or settling;
- Apply soil amendments if agreed to by the landowner, such as fertilize and soil pH modifiers in accordance with written recommendations from local soil conservation authorities, land management agencies, or landowners and incorporate into the normal plow layer as soon as possible after application;
- Reseed the reclaimed construction ROW following cleanup and topsoil replacement as closely as possible using seed mixes based on input from the local NRCS and specific seeding requirements as requested by the landowner or the land management agency;
- Use certified seed mixes to limit the introduction of noxious weeds within 12 months of seed germination testing, and adjust seeding rates based on test results;
- Remove and dispose of excess mulch prior to seedbed preparation to prevent seed drills from becoming plugged and to ensure that seed incorporation can operate effectively;
- Re-apply and anchor temporary mulch, such as erosion control blankets, on the construction ROW following seeding;
- Seed at a rate appropriate for the region and for the stability of the reclaimed surface based on pure live seed;

- Use seeding methods appropriate for weather conditions, construction ROW constraints, site access, and soil types using drill seeding unless the ROW is too steep. Temporary cover crop seed shall be broadcast;
- Delay seeding until soil is in an appropriate condition for drill seeding;
- Use Truax or an equivalent-type drill seeder equipped with a cultipacker;
- Operate and calibrate drill seeders so that the specified seeding rate is planted using seed depths consistent with local or regional agricultural practices and row spacing that does not exceed 8 inches;
- Use broadcast or hydro-seeding in lieu of drilling at double the recommended seeding rates and use a harrow, cultipacker, or other equipment immediately following broadcasting to incorporate the seed to the specified depth and to firm the seedbed;
- Delay broadcast seeding during high wind conditions and when the ground is frozen;
- Hand rake all areas that are too steep or otherwise cannot be safely harrowed or cultipacked to incorporate broadcast seed to the specified depth;
- Use hydro-seeding on a limited basis, where the slope is too steep or soil conditions do not warrant conventional seeding methods; and
- Work with landowners to discourage intense livestock grazing of the construction ROW during the first growing season by using temporary fencing, deferred grazing, or increased grazing rotation frequency.

5.5.3 Additional Agency Proposed Mitigation Measures

No additional measures have been suggested by agencies regarding terrestrial vegetation.

5.6 WILDLIFE

5.6.1 Summary

Pipeline construction would result in short-term disturbance and long-term modification to wildlife habitats. Pipeline construction and associated access roads would increase habitat fragmentation by reducing the size of contiguous patches of habitat and by loss of habitat or changes in habitat structure. The pipeline ROW through native grassland, shrub, and forest communities would remove vegetation including sagebrush and native grasses, creating an unvegetated strip over the pipeline trench and adjacent construction areas. Subsequent revegetation may not provide habitat features comparable to pre-project conditions. Typically, seed mixes for reclamation include non-native species that quickly become established. Sagebrush often does not quickly become established on disturbed sites, especially if these sites are seeded with grasses and other species that more-rapidly germinate and grow. Management actions on the ROW include removal of trees and shrubs, likely including sagebrush. Loss of shrublands and wooded habitats would be long term (5 to 20 years) in reclaimed areas of the construction ROW. The total habitat loss is expected to be small in the context of total available habitat.

Potential impacts to wildlife during construction and operation of the Project and its connected actions include:

- Habitat loss, alteration, and fragmentation;
- Direct mortality during construction;
- Stress or avoidance of feeding due to exposure to construction and operations noise, and from increased human activity;
- Reduced breeding success from exposure to construction and operations noise, and from increased human activity;
- Reduced survival or reproduction due to decreased abundance of forage species or reduced cover;
- Direct mortality due to collision with or electrocution by electrical distribution lines; and
- Reduced survival and reproduction for ground nesting birds due to the creation of perches for raptors in grassland and shrubland habitats.

5.6.2 Planned Mitigation Measures

Keystone, power providers, and power transmission entities have committed to implementing the following measures to protect wildlife:

- Remove shavings produced during pipe bevel operation immediately to ensure that wildlife do not ingest this material;
- Collect and remove litter and garbage that could attract wildlife from the construction site at the end of the day's activities;
- Prohibit feeding or harassment of wildlife;
- Prohibit construction personnel from having firearms or pets on the construction ROW;
- Ensure all food and wastes are stored and secured in vehicles or appropriate facilities;
- Reseed disturbed native range with native seed mixes after topsoil replacement;
- Control unauthorized off road vehicle access to the construction ROW through the use of signs and access barriers;
- Develop a Migratory Bird Mitigation Plan in consultation with USFWS to avoid, minimize, and mitigate for impacts to migratory birds and migratory bird habitats;
- Develop construction timing restrictions and buffer zones through consultation with regulatory agencies;
- Prohibit cutting of active raptor nest trees during the nesting season;
- If construction would occur during the raptor nesting season during January to August, pre-construction surveys would be completed to locate active nest sites to allow for appropriate construction scheduling;
- Incorporate standard, safe designs, as outlined in Suggested Practice for Avian Protection on Power Lines into the design of electrical distribution lines in areas of identified avian concern;
- Incorporate standard raptor-proof designs, as outlined in Avian Protection Plan Guidelines into the design of the electrical distribution lines to prevent collision by foraging and migrating raptors; and

- Route electrical distribution lines and the 230-kV electrical transmission line such that they avoid areas with grouse leks, brood-rearing habitat, and wintering habitats that also support wintering raptors.

5.6.3 Additional Agency Proposed Mitigation Measures

The following additional potential mitigation measures have been suggested by regulatory agencies:

- Avoid ground disturbing activities or infrastructure placement within 1 mile of lek sites in Montana unless the lek is located along an existing road or corridor (Montana Fish Wildlife and Parks);
- Prior to construction through rocky outcrops in Montana, evaluate these habitats for bird, bat or reptile use including an evaluation for reptile hibernacula (Montana Fish Wildlife and Parks);
- Use a specialist that would be able to handle hibernating snakes in the event that they are overturned during construction activities on BLM lands in Montana (BLM);
- Consult with appropriate state wildlife agencies prior to initiation of maintenance activities beyond standard inspection measures or outside of the permanent ROW (DOS);
- Clean and/or decontaminate all equipment before entering areas either identified as sensitive habitats or new ROW (USFWS);
- On BLM managed lands, reclaim areas of previous shrub cover within the construction ROW and in temporary use areas with shrub cover (BLM); and
- Reduce the maximum maintained ROW through areas with big sagebrush, greasewood, and saltbush habitats (BLM).

5.7 FISHERIES

5.7.1 Summary

Possible impacts to fisheries could occur through siltation and disturbance of streams crossed by the proposed pipeline. Following the proposed mitigation procedures during construction would result in minor short-term impacts to aquatic habitats and organisms. Any short-term disturbance caused by instream activities likely would resemble natural high-flow events in the stream.

Possible impacts to fisheries resources through construction and operation of the Project and its connected actions include:

- Habitat loss, alteration, and fragmentation;
- Changes in the benthic invertebrate community;
- Increased water temperature through removal of vegetation and subsequent increased solar input;
- Introduction of non-native aquatic species which can compete with native species and transmit diseases;
- Direct mortality to fishery and aquatic resources during construction;

- Gill irritation, avoidance behaviors, and stress through the addition of suspended sediments to waterbodies;
- Interference with respiration in fish and invertebrates, leading to mortality or reduced productivity in rearing and spawning though excessive suspended sediments;
- Reduced population growth through sediment burial of eggs or young fish;
- Blockage or delays to normal fish movements through dam and pump crossing methods;
- Entrainment of eggs, small fish, and drifting macroinvertebrates during water withdrawals for hydrostatic testing; and
- Excessive noise, vibrations, and alteration of channel morphology through blasting.

5.7.2 Planned Mitigation Measures

To reduce the potential impacts to fisheries, Keystone would implement the following measures:

- Further define fish spawning periods and construction schedules to avoid, to the extent practicable, in-stream activities during sensitive periods;
- Use the HDD method to prevent direct disturbance to larger river habitats and the aquatic species that occupy those habitats;
- Complete most minor and intermediate waterbody crossings within 2 to 3 days;
- Cut vegetation off at ground level, leaving the existing root systems in place to provide streambank stability;
- Stabilize the stream and river banks with temporary sediment barriers within 24 hours of completing construction activities;
- Restore riparian vegetation with native plant species;
- Prevent use of herbicides within 100 feet of a wetland or waterbody;
- Restore stream channels and banks disturbed during construction; and
- Rehabilitate vegetative areas disturbed during construction.

5.7.3 Additional Agency Proposed Mitigation Measures

No additional measures have been suggested by agencies regarding fisheries resources.

5.8 THREATENED AND ENDANGERED SPECIES

5.8.1 Summary

There are 28 federally-protected threatened or endangered species and federal candidate species with the potential to occur in the Project area, including three mammals, seven birds, one amphibian, six reptiles, four fish, two invertebrates, and five plants. Of these, the Project is expected to have no effect to 14 species, and the Project may affect, but is not likely to adversely affect eight species. Only one species has the potential to be adversely affected by the Project, the American burying beetle. Additional mitigation measures have been proposed to protect this species including setting up a compensatory mitigation plan for potential impacts to the American burying beetle by contributing to habitat conservation.

Possible impacts to threatened and endangered species through construction and operation of the Project and its connected actions include:

- Habitat loss, alteration, and fragmentation;
- Direct mortality during construction and operation;
- Stress or avoidance of feeding due to exposure to construction and operations noise, and from increased human activity;
- Reduced breeding success from exposure to construction and operations noise, and from increased human activity;
- Reduced survival or reproduction due to decreased abundance of forage species or reduced cover; and
- Direct mortality due to collision with or electrocution by electrical distribution lines or the 230-kV transmission line.

5.8.2 Planned Mitigation Measures

To reduce the potential impacts to threatened and endangered species, Keystone would implement where applicable of the following measures:

- Additional surveys for many species to discover the presence of the species themselves, or their nests/dens/habitat;
- If certain species were documented to be present within the Project area, additional mitigation measures would be developed in coordination with relevant agencies;
- Construction timing to occur outside of the breeding/denning/spawning season;
- If construction were to occur during the breeding season, for some species construction would be prohibited within a certain distance of active nest/den sites;
- Document the presence of some rare species that occur within the Project area;
- Construction workers would not be allowed to keep domestic pets in construction camps and/or worksites;
- Construction workers will not be allowed to feed wildlife;
- Use the HDD method to cross rivers with some listed species;
- Screen water intakes during water withdrawal for hydrostatic testing using an appropriate mesh size to prevent entrainment or entrapment of adult, juvenile and larval fish or other aquatic organisms;
- Control water withdrawal amounts and rates;
- Return the water used for hydrostatic testing to the original drainage;

- Limit the amount of vegetation clearing in sensitive areas;
- Implement erosion control measures;
- Reduce the width of the construction ROW in areas where listed plant populations have been identified, to the extent possible;
- Salvage and segregate topsoil appropriately where plant populations have been identified to preserve native seed sources in the soil for use in re-vegetation efforts in the ROW;
- Restore habitat by using an approved seed mix provided by the NRCS or appropriate state agency; and
- Collect seed to repopulate the ROW or an appropriate offsite location, or for creation of a nursery population until viable natural plant populations have established themselves; and
- Keystone would inform electrical power providers of the requirements for ESA consultations with the USFWS for the electrical infrastructure components constructed for electrical distribution lines serving the Project as well as the 230 kV transmission line to prevent impacts to threatened and endangered species.

5.8.3 Additional Agency Proposed Mitigation Measures

The following additional potential mitigation measures have been suggested by regulatory agencies:

- For the Steele City Segment, if construction occurs after April 15, pre-construction surveys would occur no more than 2 weeks prior to construction within 0.25 mile from suitable breeding habitat for interior least terns at the Platte, Loup, and Niobrara rivers in Nebraska; the Cheyenne River in South Dakota; or the Yellowstone River in Montana (USFWS);
- For the Gulf Coast Segment, if construction occurs after April 15, -construction surveys would occur no more than 2 weeks prior to construction within 0.25 mile from suitable breeding habitat for interior least terns at the North Canadian River and South Canadian River in Oklahoma and the Red River at the Oklahoma/Texas border (USFWS);
- Construction would not be permitted within 0.25 mile from an occupied interior least tern nest site during the breeding season (April 15 though August 15) or until the fledglings have left the nesting area (USFWS);
- If construction were to occur during the piping plover breeding season (April 15 through August 15), Keystone would conduct pre-construction surveys within 0.25 mile from suitable breeding habitat at the Niobrara, Loup, and Platte rivers in Nebraska, no more than 2 weeks prior to construction (USFWS);
- If occupied piping plover nests are found, then construction within 0.25 mile of the nest would be suspended until the fledglings have left the nest area (USFWS);
- If a piping plover lands in close proximity to the construction ROW during construction, its presence would be documented (USFWS);
- If a whooping crane lands in close proximity to the ROW during construction, its presence should be documented and appropriate mitigation measures implemented to prevent direct impacts (USFWS);
- Recommended mitigation measures for American burying beetle impacts include setting up a compensatory mitigation plan for potential impacts to the American burying beetle in Tripp

- If surveys on route changes indicate the presence of the American burying beetle along the Project ROW in Nebraska, Keystone would implement trap and relocate measures in those areas prior to construction activities (USFWS);
- If the route changes and future surveys indicate the presence of the American burying beetle in Lamar County, Texas, bait away or trap and relocate efforts would be undertaken prior to construction activities (USFWS);
- The construction camp near Winner, South Dakota, should be built on cropland very close to Winner, and/or north of Highway 18 in Tripp County (Pierre, South Dakota USFWS Field Office);
- The two pipe stockpile sites planned for Tripp County should be placed on cropland, or north of Highway 18 (Pierre, South Dakota USFWS Field Office);
- The Gregory County, South Dakota contractor yard should be built on cropland, or north of Highway 18 (Pierre, South Dakota USFWS Field Office); and
- Because the American burying beetle is attracted to light at night, working at night with lights in southern Tripp County should be avoided. If working at night cannot be avoided, lighting should only be used between September 1 and June 1 (Pierre, South Dakota USFWS Field Office).

5.9 LAND USE, RECREATION AND SPECIAL INTEREST AREAS, AND VISUAL RESOURCES

5.9.1 Summary

Agricultural, rangeland, forestland, recreational/special use, commercial, and residential land use classes would be affected in areas intersected by the proposed ROW. The largest amount of acreage that would be affected by the Keystone Project would be agricultural land, followed by rangeland.

Possible impacts to land use through construction and operation of the Project and its connected actions include:

- Loss of agricultural productivity and crop loss;
- Impacts to soil profiles including topsoil degradation, soil compaction, and rock introduction or redistribution;
- Potential damage to drain tiles or other irrigation systems;
- Livestock harassment or injury;
- Fence damage or removal;
- Removal of trees in forested areas;
- Introduction of slash along the Project ROW;
- Changes to flow rates within affected waterbodies;
- Changes to hydrological and vegetation characteristics of wetland areas;

- Increases in turbidity within waterbodies as a result of construction;
- Introduction of fill materials into wetland areas; and
- Some current land uses would be converted to long-term utility use.

Possible impacts to recreation and special interest areas and visual resources through construction and operation of the Project and its connected actions include:

- Visual impacts from the removal of vegetation within the ROW, pipeline excavation, and general construction activity;
- Increased noise and dust;
- Construction activities would temporarily affect recreational traffic and use patterns in special management and recreational areas;
- Sightseers, hikers, wildlife viewers, fishers and hunters, and other recreationists would be temporarily dislocated; and
- The proposed electrical distribution lines and 230-kV transmission line could generate adverse impacts on visual resources due to their high visibility.

5.9.2 Planned Mitigation Measures

To reduce the potential impacts to land use, Keystone, power providers and power transmission entities would implement the following measures:

- Implement soil protection measures listed in Sections 5.2. and 5.5;
- Prevent stoppage or obstruction of irrigation systems except during pipeline installation periods through irrigated areas;
- Keep pipeline installation periods in irrigated areas as short as practicable;
- Repair or restore drain tiles;
- Restore farm terraces to their pre-construction functions;
- Restore disturbed areas with custom seed mixes (approved by landowners and land managers) to match the native foliage;
- Provide access to rangeland during construction to the extent practicable;
- Install temporary fences with gates around construction areas to prevent injury to livestock or workers;
- Leave in place hard plugs install soft plugs to allow livestock and wildlife to cross the trench safely;
- Remove litter, garbage, and any pipeline shavings at the end of each construction day, to protect livestock from accidental ingestion;
- Prohibit construction personnel from feeding or harassing livestock;
- Prohibit construction personnel from carrying firearms or pets into the construction area;
- Secure rangeland fences to prevent drooping;

- Close any openings in the fence at the end of each day to prevent livestock escape;
- Maintain all existing improvements such as fences, gates, irrigation ditches, cattle guards, and reservoirs to the degree practicable;
- Return any damaged improvements to at least their condition prior to construction;
- Repair fences either using original material or high quality new material;
- Compensate landowners for demonstrated decreases in land productivity resulting from Project-related soil degradation;
- Compensate land owners for yields less than those on unaffected lands that result from Project impacts;
- Wherever practical, place new power distribution lines along existing county roads, section lines, or field edges to minimize interference with adjacent agricultural lands;
- Protect waterbodies and wetlands using the measures outlined in Sections 3.3 and 3.4;
- Protect forest resources using the measures outlined in Section 3.5;
- Before construction begins, Keystone would conduct surveys to confirm the location of buildings relative to the pipeline and to ascertain whether the buildings are occupied residences or businesses;
- Create site-specific protective constructions plans for residential and commercial/industrial structures within 25 feet of the construction ROW;
- Control noise levels during non-daylight hours in compliance with any applicable noise regulations around residential and commercial/industrial areas;
- Limit the hours that activities with high noise levels occur;
- Coordinate schedules to expedite the construction work through the area;
- Provide vehicle access and assist in traffic flows in construction areas (including emergency vehicles); and
- Install plating to cover open trenches during non-construction times in developed areas.

To reduce the potential impacts to recreation and special interest areas and visual resources, Keystone, power providers and power transmission entities would implement the following measures:

- Consider preserving landscaping and mature trees in some cases;
- Cooperate with local agencies to reduce the conflict between recreational users and Project construction;
- Adjust routing to reduce adverse aesthetic features where possible;
- Implement measures to reduce long term visual impacts;
- Paint aboveground facilities in accordance with standard industry painting practices
- Consult with landowners to address any visual aesthetic issues; and
- Consult with the Lower Brule Tribe regarding the location of the new 230-kV transmission line.

5.9.3 Additional Agency Proposed Mitigation Measures

There are no additional mitigation measures proposed by agencies with regard to land use, recreation and special interest areas and visual resources.

5.10 SOCIOECONOMICS

5.10.1 Summary

The proposed pipeline has the potential to generate substantial direct and indirect economic benefits for local and regional economies along the pipeline route. During construction, these benefits are derived from the construction labor requirements of the Project and spending on construction goods and services that would not otherwise have occurred if the Project was not built. At the local level, these benefits would be in the form of employment of local labor as part of the construction workforce and related income benefits from wage earnings, construction expenditures made at local businesses, and construction worker spending in the local economy.

A peak workforce of approximately 5,000 to 6,000 personnel would be required to construct the entire Project and it is estimated that 4,500 to 5,100 non-local residents would temporarily move into the region of influence, resulting in short-term population increases during the construction period. Keystone is expected to utilize temporary local construction labor where possible and it is estimated that approximately 10 to 15 percent (50 to 100 people per spread) could be hired from the local work force for each spread, although this may not be possible in rural areas. Non-local construction workers moving into the region of influence would require short-term accommodations such as hotels/motels, RV sites and campgrounds. In remote areas there may be a need to construct temporary construction camps to house workers, which would be permitted, constructed, and operated in compliance with applicable county, state, and federal regulations.

Potential impacts to socioeconomic resources during construction and operation of the Project and its connected actions include:

- Possible increased demands for permits for vehicle load and width limits;
- Short-term impacts to traffic and transportation infrastructure: some temporary traffic delays likely;
- Short-term population increases during construction with the influx of construction workers and Project staff;
- Short-term shifting in local job distribution may occur in all areas;
- Possible short-term labor shortages in other areas of local economies due to workers leaving existing jobs for jobs on the Project;
- Generation of substantial expenditures on goods and services, both inside and outside of the region of influence;
- Secondary short-term benefits of increased business to local and statewide businesses including equipment suppliers, restaurants, gas stations and hotels;
- “Multiplier effects,” resulting from businesses buying from other businesses generating additional economic benefits within the region of influence;

- Short-term tax revenues generated during construction;
- Long-term tax revenues associated with property tax payments;
- Temporary increase in demands for emergency response, medical, police, and fire protection services during the construction period; and
- Possible additional demands on local public services;
- Generation of long-term property tax revenues for the states and counties traversed by the pipeline, in accordance with applicable tax structures; and
- An estimated $138.4 million in annual property tax revenues would be generated by the Project in the region of influence.

The Project is not expected to result in adverse impacts that would fall disproportionately on minority or low-income populations located along the pipeline route.

5.10.2 Planned Mitigation Measures

The following measures would be implemented to reduce impacts to socioeconomic resources:

- Carry out public outreach throughout the life of the Project, including in areas where low-income populations and/or minority populations have the potential to be affected;
- Provide vehicle access and assist traffic flows in construction areas including emergency vehicles;
- Comply with the requirements of road crossing permits and approvals for construction across roads and highways;
- Attempt to hire temporary construction staff from the local population;
- Work with local law enforcement, fire departments, and emergency services providers, including medical aid facilities, to establish appropriate measures that would ensure effective emergency response and provision of related services;
- Compensate property owners for any damages caused by Project construction;
- Repair or restore drain tiles, fences, and land productivity if these are damaged or adversely affected during construction;
- Use detours for traffic or keep one lane of traffic open other than when it would be necessary to close the road completely to install the pipeline to prevent undue disruption to traffic movements; and
- Post signs and utilize other measures as required by federal, state, and local transportation agencies to minimize traffic disturbances and ensure safety.

5.10.3 Additional Agency Proposed Mitigation Measures

No additional measures have been suggested by agencies regarding socioeconomic resources.

5.11 CULTURAL RESOURCES

5.11.1 Summary

Section 106 of the NHPA, as amended, requires the lead federal agency to assess effects to historic properties within the area of potential effect for the Project before that undertaking occurs. A historic property is defined as a cultural resource, such as a district, archeological site, building, structure, or object (including a traditional cultural property and/or sites of cultural and religious importance) that is listed, or eligible for listing, in the NRHP. Keystone, through its contractors, has examined those portions of the Project for which survey permission was obtained. There is a Programmatic Agreement that has been drafted to provide further protection of historic properties that the Applicant has not completed field surveys for, after the FEIS is completed (See Appendix S).

Through July 2009, 190 cultural resources were identified during the cultural resource inventory in Montana, of which 134 were archaeological sites, 15 were historic structures, and 41 were isolated finds. In South Dakota, 71 cultural resources were identified during the cultural resource inventory including 71 cultural resources, 31 archaeological sites, 9 historic structures, and 31 isolated finds. In Nebraska the number of cultural resources identified was 68 of which 50 were archaeological sites, 17 were historic structures, and one was an isolated find. No new sites were identified at the proposed pump station locations in Kansas. Through July 2009, 81 cultural resources were identified in Oklahoma, including 41 archaeological sites, 22 historic structures, and 18 isolated finds. Since then, additional cultural resource surveys have been conducted in Oklahoma but the reports have not yet been received by DOS. In Texas, as of July 2009, 80 cultural resources were identified, of which 42 were archaeological sites, 16 were historic structures, and 22 were isolated finds. No cultural resources were identified in the Houston Lateral section. Since then, additional cultural resource surveys have been conducted in Texas but the reports have not yet been received by DOS.

Potential impacts to cultural resources during construction and operation of the Project and its connected actions include:

- Physical destruction or damage to all or part of a property caused by pipeline trenching or related excavations or boring;
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of a property's significant historic features by short-term construction or construction of above ground appurtenant facilities and roads; and
- Change of the character of a property's use or of physical features within the property's setting that contribute to its significance.

5.11.2 Planned Mitigation Measures

To reduce impacts to cultural resources, Keystone, power providers and power transmission entities would implement the following measures:

- Further assess cultural resources that are considered "unevaluated" through NRHP evaluation procedures;
- Avoid a property through route variation or feature relocation, abandonment, bore or HDD, by narrowing the construction corridor, or by limiting impacts along access roads to the existing roadway;

- Implement measures such as the use of construction mats to reduce short-term construction-related impacts to properties;
- Develop a Memorandum of Agreement (MOA) during consultation that includes a mitigation plan for adversely affected historic properties;
- Prepare Unanticipated Discovery Plans for Montana, South Dakota, Nebraska, Kansas, Oklahoma, and Texas and the Lower Brule Sioux Reservation;
- Hold public and agency meetings to keep agencies, tribes and the public informed throughout the EIS process. Also hold Section 106 Government-to-Government Consultation meetings and
- Consult with the Lower Brule Tribe and Basin Electric and Western regarding the location of the new 230-kV transmission line.

5.11.3 Additional Agency Proposed Mitigation Measures

No additional measures have been suggested by agencies regarding cultural resources.

5.12 AIR AND NOISE

5.12.1 Summary

Air emissions typically would be localized, intermittent, and short term since Project construction would move through an area relatively quickly. Emissions from fugitive dust, construction equipment combustion, open burning, and temporary fuel transfer systems and associated tanks would be controlled to the extent required by state and local agencies. Emissions from construction-related activities would not significantly affect local or regional air quality. Project operations would not produce significant air quality impacts, and only minor emissions from the backup gasoline generator and fugitive emissions from valves, tanks, and pumping equipment would occur.

Potential impacts to air quality during construction and operation of the Project and its connected actions include:

- Release of fugitive dust resulting from land clearing, grading, excavation, concrete work, blasting and dynamiting, and vehicle traffic (including construction camp traffic) on paved and unpaved roads;
- Emissions from fossil-fueled (diesel or gasoline) construction equipment such as construction camp generators, large earth-moving equipment, skip loaders, trucks, non-road engines, and other mobile sources;
- Combustion emissions including NOx, CO, VOCs, SO_2, PM_{10}, $PM_{2.5}$, and small amounts of HAPs;
- Emissions from open burning;
- VOC emissions from temporary fuel transfer systems and associated storage tanks;
- Minimal fugitive emissions from crude oil pipeline connections and pumping equipment at the pump stations;
- Minimal emissions from mobile sources; and

- VOC and HAP emissions from the crude oil storage tank at the Steele City tank farm.

Construction would increase noise levels in the vicinity of Project activities. Noise levels would vary during the construction period, depending upon the construction phase. Residential, agricultural, and commercial areas within 500 feet of the Project ROW would experience short-term inconvenience from construction equipment noise.

During operation of the pipeline, the noise associated with the electric pump stations would be limited to the immediate vicinity of the facilities and are projected to be minor. Project-related operations are not expected to result in a significant effect on the noise environment.

Potential impacts to noise during construction and operation include:

- Increased noise levels in the vicinity of Project activities;
- Short term, localized, and intermittent construction noise;
- Short-term inconvenience from construction equipment noise to residential, agricultural, and commercial areas within 500 feet of the ROW;
- Temporary and intermittent construction noise levels generally limited to daylight hours that would attenuate with distance; and
- Minor noise levels associated with the operation of pump stations that would attenuate to existing ambient noise levels (40 to 45 dBA) within approximately 2,300 feet of the facility.

5.12.2 Planned Mitigation Measures

To reduce impacts to air quality, the following measures would be implemented:

- Apply water sprays and surfactant chemicals, and stabilize disturbed areas to control fugitive dust;
- Place curtains of suitable material to prevent wind-blown particles from sand blasting operations from reaching any residence or public building;
- Comply with the EPA mobile source regulations in 40 CFR Part 86 for onroad engines and 40 CFR Part 89 and 90 for nonroad engines;
- Maintain all fossil-fueled construction equipment in accordance with manufacturer’s recommendations;
- Obtain all necessary open burning permits, approvals, and notifications prior to conducting any open burning of land clearing materials;
- Follow all open burning regulations including restrictions on burn location, material, and time, as well as consideration of local air quality;
- Carry out burning within the ROW in small piles to avoid overheating of or damage to trees or other structures;
- Store and use diesel fuel with a low vapor pressure, minimizing releases of VOCs; and
- Evaluate emissions of ozone precursor compounds (NOx and VOCs) against the General Conformity applicability threshold levels and nonattainment area emissions budget.

Additionally, various actions could be used to mitigate emissions during construction activity in Texas. These may include the following:

- Utilize construction contractors that participate in the Texas Emission Reduction Plan (TERP) grant program or require contractors to apply for TERP grant funds;
- Give preference through the bidding process to "Green/Clean" Contractors;
- Require construction contracts to use diesel fuels that meet the Texas Low Emission Diesel (TxLED) standards; and
- Require construction contractors to use Best Management Practices (BMP) in relation to air quality.

The following measures would be implemented to reduce noise impacts:

- Develop site-specific noise mitigation plans to comply with any specific regulations and obtain any applicable authorizations or variances, if local noise regulations exist;
- Provide noise mitigation plans to the construction contractors for implementation and enforcement by construction inspectors using portable sound meters;
- Give advanced notice to landowners prior to construction;
- Limit the hours during which construction activities with high-decibel noise levels are conducted in residential areas;
- Coordinate work schedules to minimize disruption in residential areas;
- Plan for expedited construction through residential areas;
- Set up a toll-free telephone line for landowners to report any construction noise-related issues;
- Perform a noise assessment survey during operations in locations where nearby residents express concerns about pump station noise;
- Construct berms or plant vegetation screens around the facilities as noise abatement measures, if needed.
- Turn off equipment when not in use and reduce idling time;
- Use temporary equipment enclosures and noise barriers;
- Limit haul trips and construction to daylight hours where feasible;
- Use best available noise control techniques such as mufflers, intake silencers, ducts, engine closures, and acoustically attenuating shields or shrouds for all construction equipment and trucks;
- Use C-filters on communication systems; and
- Additional Agency Use lightning arrestors and assure all hardware has a tight fit to reduce Radio Frequency Interference (RFI).

5.12.3 Proposed Mitigation Measures

No additional measures have been suggested by agencies regarding air quality or noise.

5.13 RELIABILITY AND SAFETY

5.13.1 Summary

The pipeline system would be designed, constructed, and maintained in a manner that meets or exceeds industry standards and regulatory requirements and would be built within an approved ROW. To prevent potential oil spills during pipeline construction, measures would be implemented at each construction or staging area where fuel, oil, or other liquid hazardous materials are stored, dispensed, or used.

Signage would be installed at all road, railway, and water crossings indicating that a pipeline is located in the area to help prevent third-party damage or impact to the pipeline. Keystone would ensure safety near its facilities through a combination of programs encompassing engineering design, construction, and operations, public awareness and incident prevention programs, and emergency response programs.

The reliability and safety of the Project can be expected to be well within industry standards. Further, the low probability of large, catastrophic spill events and the routing of the pipeline to avoid most sensitive areas suggest a low probability of impacts to human and natural resources. Nevertheless, some potential for construction- and operations-related spills can be expected. Oil spills can occur through the following ways:

- Construction spills: these are generally small, and composed of refined products (e.g., gasoline, diesel, and lubricating and hydraulic fluids). Most result from vehicle and construction equipment fueling and maintenance;
- Tanker and fuel or maintenance truck accidents or fuel storage tank failures: these would be the most likely sources of larger construction spills. The potential maximum oil spill volume from these sources would be about 143 bbls (6000 gallons) for diesel or gasoline and about 8 bbls (330 gallons) for lubricating or hydraulic fluid (i.e., six 55-gallon barrels on a pallet);
- A pipeline or storage tank pinhole leak: a small leak could potentially be undetectable for days or weeks. Although leak detection systems would be in place, some leaks might not be detected by the system;
- A pipeline or storage tank break: the point of release may be relatively remote and hard for responders to quickly access. Spill locations could include the pipeline ROW, pump stations, tank farm, and construction and contractor staging areas; and
- Pipeline operation leaks, drips, and spills: these can occur due to corrosion, damage caused by third parties performing excavation or soil borings, external forces due to landslides or washouts, or other causes.

When an oil spill occurs, the resulting environmental impact depends on a number of factors, including the fate and behavior of the spilled oil (i.e., the potential for a spill reaching an environmental receptor); the concentration, chemical composition, and physical characteristics of the oil; and the toxicity of the oil to the receptor. Impacts related to oil spills can be affected by the release location, type of oil released, volume of oil released, nearby receptors and resource uses, seasonal variations, response time and response actions, weather, water levels, and other factors.

Potential impacts from oil spills during construction and operation of the Project and its associated actions include:

- Smothering living organisms so they cannot feed or obtain oxygen;

- Coating feathers or fur, which reduces insulating efficiency and results in hypothermia;
- Adding weight to an organism so that it cannot move naturally or maintain balance;
- Coating sediments and soils, which reduces water and gas (e.g., oxygen and carbon dioxide) exchange and affects subterranean organisms;
- Coating beaches, water surfaces, wetlands, and other resources used by people which may result in offensive odors, visual impacts and soiling of humans, animals, habitats and equipment;
- Toxicological impacts including direct and acute mortality; sub-acute interference with feeding or reproductive capacity; disorientation; narcosis; reduced resistance to disease; tumors; reduction or loss of various sensory perceptions; interference with metabolic, biochemical, and genetic processes; and a host of other acute or chronic effects;
- Loss or reproductive impairment of a significant portion of a population or biological community from an oil spill;
- Localized and transient effects to air quality through evaporation of the lighter hydrocarbon fractions including escapement of volatile organic compounds (VOCs);
- Damage to paleontological resources through oil spill or clean up;
- Localized reduction in mineral and fossil fuel resource availability;
- Contamination of soil resources through oil spill or clean up;
- Oil deposited on and remaining in the top sediment layer, especially in aerobic environments, potentially affecting the benthic biological community until biodegradation by microbes reduces long-term impacts;
- Spills reaching and affecting wetlands and ponds, as well as creeks and rivers before spill response is initiated or completed causing reduced DO concentrations and increased toxicity to aquatic organisms;
- Spills reaching larger rivers and lakes resulting in minimal effects on water quality since DO levels would not be affected and direct toxicity would be minimal because of the high dilution volume in these waterbodies;
- Affects to drinking water sources and irrigation water supplies;
- Minor short to long-term surface water and/or groundwater quality degradation from sporadic equipment and vehicle spills or leaks;
- Diesel fuel dispersal in the groundwater, contaminating the groundwater for agricultural or domestic drinking supply uses;
- Aggressive and intrusive cleanup methods that mix oil with water and sediments where the oil may have long-lasting impacts on wetlands;
- Vegetation injury, mortality or coating with oil;
- Direct mortality to wildlife and damage to its habitat from exposure to toxic materials or crude oil releases;
- Bird mortality or hypothermia from direct contact with oil;
- Mortality of bird eggs due to secondary exposure by oiled brooding adults; loss of ducklings, goslings, and other non-fledged birds due to direct exposure; and lethal or sub-lethal effects due to direct ingestion of oil or ingestion of contaminated foods;

- Direct or indirect impacts to mammals through impacts to their habitat or prey;
- Impacts to fish, macroinvertebrates (e.g., mussels, crustaceans, insects, and worms), algae and other aquatic plants, amphibians, and reptiles through changes in overwintering and spawning behavior, reduction in food resources, entrapment in oil; toxic or physical smothering; consumption of contaminated prey, temporary displacement, and changes in growth, feeding, fecundity, and survival rates;
- Loss of individuals of threatened and endangered species and habitat damage due to exposure to toxic materials or crude oil releases;
- Short-term disruption in local agricultural production resulting from a spill that enters agricultural lands or wild lands used by grazing livestock;
- Affects to fishing, boating, kayaking, tubing, camping, scenic values, and other recreational pursuits due to an oil spill in a riverine environment that is used by recreationists;
- Long-term effects to recreation resources possibly including reduction or loss of fishing and diminished scenic value of the area, as oil residue could take one to several years to weather;
- Damage to the historic values of National Historic Trail systems; and
- Response to oil spills generating positive local economic activity for the duration of the spill response activity.

5.13.2 Planned Mitigation Measures

Keystone has designed and committed to a comprehensive slate of processes, procedures, and systems to prevent, detect, and mitigate potential oil spills that may occur during operation of the proposed pipeline. The Final ERP would contain further detail and would be approved by PHMSA-OPS prior to their grant of permission to Keystone to operate the proposed pipeline.

- Keystone has developed and implemented safeguards after conducting a pipeline threat analysis using the pipeline industry-published list of threats under ASME B31.8S and also using threats identified by PHMSA to determine the applicable threats to the proposed pipeline.
- Keystone would utilize a comprehensive SCADA system to monitor and control the proposed pipeline. Data provided by the SCADA system would alert the Operations Control Center (OCC) operator to an abnormal operating condition, indicating a possible spill or leak. A back-up communication system also would be available should SCADA communications fail between field locations and the OCC.
- ERP and SPCC standard operating and response procedures would be utilized by the OCC operator in responding to abnormal pipeline conditions, including leak alarms. The OCC operator would have the full and complete authority to execute a pipeline shutdown.
- Keystone has designed the Project to either meet or exceed applicable federal pipeline safety standards.

To reduce the potential for and impacts of spills, the following measures would be implemented:

- Provide a secondary means of containment (berms) for 110 percent of the capacity of the largest oil storage tank;

- Inspect storage sites for compliance with a 100-foot setback from the water's edge (carried out by the EI);
- Address specific preventive and mitigating measures for potential spills from construction activities in the ERP;
- Store materials in containers with discrete capacities that define worst case maximum spill quantities;
- Carry out spill prevention, control, and containment (SPCC) plans;
- Restrict the locations of hazardous materials;
- Place signs a minimum of 100 feet from the boundaries of all wetlands and waterbodies prior to construction to ensure compliance with the 100-foot setback requirement for placement of fuel or oil storage tanks unless otherwise authorized by the EI;
- Carry out aerial and ground patrols to provide direct observation and identification of potential leak locations;
- Carry out internal pipeline inspection surveys (pigging operations);
- Inspect construction equipment for fluid leaks prior to entering or crossing over waterbodies;
- Conduct refueling and lubricating of construction equipment in upland areas at least 100 feet away form perennial streams and wetlands;
- Place stationary equipment within a secondary containment if it would be operated or refueled within 100 feet of a wetland or waterbody boundary;
- Place fuel tanks or fuel trailers within secondary containment structures equipped with impervious membrane liners;
- Prohibit storage of hazardous materials, chemicals, fuels, lubricating oils, and any concrete coating activities within a wetland or within 100 feet of any wetland boundary, if possible;
- Base emergency responders and store adequate spill clean up equipment in appropriate locations;
- Carry an oil spill response kit and spill response equipment onboard any fuel truck that transports and dispenses fuel to construction equipment or Project-related vehicles at all times;
- Carry out regular spill training exercises and drill programs for personnel;
- Clean up any incidental spills consistent with the SPCC plans; and
- Carry out protocols defined in the Section 106 NHPA PA for any potential cultural resources encountered during a spill or associated cleanup activities.

5.13.3 Additional Agency Proposed Mitigation Measures

Perform any other procedures mandated by PHMSA in the event that PHMSA approves a special permit related to maximum operating pressures for the pipeline system.