7.0 EXERCISE PROCEDURES

Keystone's exercise program is designed to meet the exercise requirements as outlined in the National Preparedness for Response Exercise Program (PREP) Guidelines developed by the U.S. Coast Guard and adopted by the Pipeline and Hazardous Materials Safety Administration (PHMSA), the Minerals Management Service (MMS), and the U.S. Environmental Protection Agency (EPA). Participation in this program ensures that the Company meets all federal exercise requirements mandated by OPA '90.

The primary elements of the exercise program are notification exercises, table top 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 the government agencies.

Keystone will ensure that operating personnel participate in exercises or responses on an annual basis in order to ensure they remain trained and qualified to operate the equipment in the operating environment and to ensure the Oil Spill Response Plans are effective, if ever needed. However, personnel and equipment that are assigned to multiple Response Zones will participate in only one deployment exercise per year.

The exercise year for all Company facilities will be from January 1 to December 31.

In addition to the exercise program as outlined in Table 14, Keystone will also participate in both unannounced Federal Agency led exercises and Area exercises when requested.

Table 14: Exercise Program Type and Frequency

Exercise Type (for each Response Zone)	Exercises Conducted In Triennial Cycle
Qualified Individual Notification Exercises (one per year to be conducted during non-business hours)	12
Spill Management Team Tabletop Exercises (one must involve a worst case discharge scenario)	3
Equipment Deployment Exercises (using either internal and/or external)	3
Unannounced Exercise (any of the above Exercises, with the exception to the Qualified Individual Notification Exercise, if conducted unannounced, satisfy this requirement)	3

The terms referenced in the above Table are defined as follows:

- Tabletop exercise is an exercise of the response plan and the spill management team's response efforts without the actual deployment of equipment.
- Spill management team is the group of personnel identified to staff the appropriate organizational structure to manage spill response implementation in accordance with the response plan.

- Internal exercises are those that are conducted wholly within the plan holder's organization. Internal exercises include personnel such as the qualified individual and those affiliated with the plan holder's spill management team, including OSRO's. The internal exercises do not involve other members of the response community.

- External exercises are those that extended beyond the internal focus of the plan holder's organization, and involve other members of the response community. The external exercises are designed to examine the response plan and the plan holder's ability to coordinate with the response community to conduct an effective response to an incident.

7.1 Debriefing and Documentation

At the conclusion of an actual spill event or a field exercise, a debriefing will be conducted to evaluate the response, local procedures and the overall Emergency Management System (EMS). All company personnel involved in responding, managing, or performing a support function during an actual spill event or exercise will participate in their respective debriefing. This debriefing should take place the same day or as soon as practical thereafter. At the discretion of the Regional EOC Manager (QI), and when appropriate, debriefing sessions will be organized as follows:

- Internal Debriefings are to discuss all aspects of Keystone's emergency preparedness and response.
- External debriefings are designed to discuss only those aspects related to Keystone and agency interaction with respect to communications.
- Media debriefings will be held separately from all other debriefings. Media debriefings will focus on Keystone's interaction with the media.

Representatives from each of the debriefing sessions will then meet to discuss the results of their session and combine information, presenting a complete review of the event. When appropriate, the information derived from these debriefing sessions will be incorporated into the Oil Spill Response Plan.

Lists of exercises conducted, the objectives met, and the results of the debriefing sessions identified above will be documented. This documentation will be in writing and signed by the individual having responsibility for the facility conducting the exercise. All spill response exercise documentation records will be maintained on file at the facility for a minimum of five years.

8.0 RESPONSE PLAN REVIEW AND UPDATE PROCEDURES

All sections of the Oil Spill Response Plan will be reviewed at least annually and revised as required by the Keystone Emergency Management Specialist, or as required, based on new data, additions and modifications to the pipeline system or new government regulatory requirements.

Revisions will incorporate recommendations from training drills or actual spills, industry research into spill countermeasures, new equipment information and updated emergency contact information.

In the event of a worst case discharge, the response will be reviewed and assessed against the Oil Spill Response Plan to evaluate and record the Plan's effectiveness.

The Oil Spill Response Plan will be resubmitted every 5 years from the date of last submission in accordance with 49CFR§194.121, for the areas of the pipeline that have been designated as potentially causing significant and substantial harm.

If a new or different operating condition or information would substantially affect the implementation of the Response Plan, Keystone will immediately modify its Response Plan to address such a change and resubmit to the Pipeline and Hazardous Material Safety Administration (PHMSA) within 30 days of making the change.

9.0 RESPONSE ZONE ONE APPENDIX

9.1 Information Summary

Response Area Location	Milepost (MP) = 0 at Canadian Border to MP = 535 in mid-Nebraska, south end of Colfax County
State	**North Dakota** (MP 0 to ≈ MP 215)
Counties	Pembina, Cavalier, Walsh, Nelson, Steele, Barnes, Ransom, and Sargent
State	**South Dakota** (MP 215 to ≈ MP 431)
Counties	Marshall, Day, Clark, Beadle, Kingsbury, Miner, Hanson, McCook, Hutchinson, and Yankton
State	**Nebraska** (MP 431 to ≈ MP 535)
Counties	Cedar, Wayne, Stanton, Platte, Colfax
Owner	Keystone
Emergency Telephone	1 (XXX) XXX-XXXX
Owner Location (Street)	450 - 1st Street SW
City: Calgary	Province: Alberta Postal Code: T2P 5H1

9.2 Qualified Individuals

The contact list is currently incomplete but identifies the key contact positions required for activation of the Oil Spill Response Plan. Specific data fields will be completed when Keystone's personnel organization structure is finalized.

Position	**Regional EOC Manager (QI)**
Name	
Address	
Emergency Telephone	Secondary Telephone
Position	**Alternate Regional EOC Manager**
Name	
Address	
Emergency Telephone	Secondary Telephone
Position	**Emergency Site Manager (QI)**
Name	
Address	
Emergency Telephone	Secondary Telephone
Position	**Alternate Emergency Site Manager**
Name	
Address	
Emergency Telephone	Secondary Telephone

9.3 Determination of Harm

The operator expects that Response Zone One will meet the "significant and substantial" harm criteria due to the proximity of high consequence areas. However, a final determination is reserved pending completion of the design details required to perform the analysis. For the purposes of this preliminary document, Keystone has assumed the aforementioned criteria will be met.

9.4 Notification Procedures

The Regional EOC Manager (QI) is the key individual responsible for evaluating and activating the Oil Spill Response.

9.4.1 Prioritized Notification Checklist for Key Individuals

First Responder

- ☐ Notification of potential spill and dispatch received from OCC
- ☐ SPILL VERIFIED
- ☐ Notification of Emergency Services, if required

  Verify with OCC:
  - ☐ Pipeline shutdown and status
  - ☐ Pipeline segment isolation
- ☐ Regional EOC Manager (QI) notified

Regional EOC Manager (QI)

- ☐ Notification received from OCC
- ☐ Notification of spill details received from First Responder
- ☐ OIL SPILL RESPONSE PLAN ACTIVATED
- ☐ Emergency Site Manager (QI) notified
- ☐ Regional EOC activated
- ☐ Mobilize response resources requested by Emergency Site Manager (QI)
- ☐ Corporate EOC Manager contacted
- ☐ Agency contacts initiated as per Section 2.3

Emergency Site Manager (QI)

- ☐ Notification received from Regional EOC Manager (QI)
- ☐ On site First Responder contacted to obtain briefing on spill
- ☐ On Site Command Post activated
- ☐ Regional EOC advised of resource requirements
- ☐ First Responder relieved

9.4.2 Notification Contacts

The contact list is currently incomplete but identifies the key contact positions required for activation of the Oil Spill Response Plan. Specific data fields will be completed when Keystone's personnel organization structure is finalized and State and Local requirements and contacts have been determined.

Keystone

Table 15: Response Zone One Keystone Notification

Position Making Call	Keystone Contacts	Primary Telephone No.	Secondary Telephone No.
OCC	First Responder		
	Regional EOC Manager (QI)		
	- Primary		
	- Alternate		
	Corporate EOC		
Regional EOC Manager (QI)	Emergency Site Manager (QI)		
	- Primary		
	- Alternate		
	Corporate EOC Manager		

Agency

Table 16: Response Zone One Agency Notification

Position Making Call	Agency Contact List	Telephone	Other Telephone/Fax
Regional EOC Manager (QI)	Federal		
	National Response Center	1-800-424-8802	
	State		
	Local		

Emergency Services

Table 17: Response Zone One Emergency Services Notification

Position Making Call	Emergency Contact List	Telephone	Other Telephone/Fax
Emergency Site Manager (QI)	Emergency Services		
	Fire/Ambulance		
	Police/Sheriff		
	Hospital		

9.4.3 Information Reported to Agencies

Communication Report (Call) Record

Regional EOC Manager (QI)

The following agency mandatory information, ***as identified in bold italic***, will be provided initially with subsequent notifications to complete the required mandatory criteria or advise of any changes.

Name of Pipeline:_____

Time of Discharge:_____

Location of Discharge (MP):_____

(GPS):_____

Type of Oil:_____

Reason of Discharge:_____

Estimated Volume of Oil Spill:_____

Weather Condition on Scene: _____

Action taken/ Planned by Person on Scene: _____

Injuries: _____

Extent of Injuries: _____

Evacuation: _____

Public Consequence: _____

9.5 Spill Detection and Mitigation Procedures

Response Zone specific procedures will be identified and described following completion of the necessary design details.

9.6 Oil Spill Response Organizations and Contractors, Services and Resources

The contact lists below are currently incomplete and will be updated as Keystone identifies contract resources and contact information.

Table 18: Response Zone One OSRO Contacts

OSRO/Contractor	Contractor Responsibility	Resource Capability for First 7 Days	Quantity of Equipment or Service Available
Name:			
24 Hour Contact No.:			
Address:			
Response Time:			

9.7 Oil Transportation and Reclamation Facilities and Services

The contact lists below are currently incomplete and will be updated as Keystone identifies contract resources and contact information.

Table 19: Response Zone One Oil Transportation and Reclamation Facilities

Contractor	Service Provided	Capacity	Availability
Name:			
24 Hour Contact No.:			
Address:			

9.8 Type of Oil, Volume and Calculation Method for Worst Case Discharge Volume

Pending completion of the necessary engineering design details a worst case discharge calculation will be undertaken.

Keystone expects to transport crude oils in the range of 12 to 45° API.

9.9 Maps and Drawings

9.9.1 Location of Worst Case Discharge

Pending completion of engineering design details this information will be provided.

9.9.2 Location of Potentially affected Public Drinking Water Intakes

Pending completion of engineering design details this information will be provided.

9.9.3 Potentially affected environmentally sensitive areas

Pending completion of engineering design details this information will be provided.

9.9.4 Control Points and access descriptions

Pending completion of engineering design details this information will be provided.

9.10 Piping Diagram and Plan Profile

Pending completion of engineering design details this information will be provided.

10.0 RESPONSE ZONE TWO APPENDIX

10.1 Information Summary

Response Area Location	(MP) = MP 535 to MP 634 and Cushing Extension (CE), CE MP 0 to CE MP 291
State	**Nebraska** (MP 535 to ≈ MP 634) and Cushing Extension (CE) MP 0 to ≈ MP 4
Counties	Butler, Seward, Saline and Jefferson
State	**Kansas** (CE MP 4 to ≈ CE MP 212)
Counties	Washington, Clay, Dickinson, Marion, Butler, and Cowley
State	**Oklahoma** (CE MP 212 to ≈ CE MP 291)
Counties	Kay, Noble, and Payne
Owner	Keystone
Emergency Telephone	1 (XXX) XXX-XXXX
Owner Location (Street)	450 - 1st Street SW
City: Calgary	Province: Alberta Postal Code: T2P 5H1

10.2 Qualified Individuals

The contact list is currently incomplete but identifies the key contact positions required for activation of the Oil Spill Response Plan. Specific data fields will be completed when Keystone's personnel organization structure is finalized.

Position	**Regional EOC Manager (QI)**
Name	
Address	
Emergency Telephone	Secondary Telephone
Position	**Alternate Regional EOC Manager**
Name	
Address	
Emergency Telephone	Secondary Telephone
Position	**Emergency Site Manager (QI)**
Name	
Address	
Emergency Telephone	Secondary Telephone
Position	**Alternate Emergency Site Manager**
Name	
Address	
Emergency Telephone	Secondary Telephone

10.3 Determination of Harm

The operator expects that Response Zone Two will meet the "significant and substantial" harm criteria due to the proximity of high consequence areas. However, a final determination is reserved pending completion of the design details required to perform the analysis. For the purposes of this preliminary document, Keystone has assumed the aforementioned criteria will be met.

10.4 Notification Procedures

The Regional EOC Manager (QI) is the key individual responsible for evaluating and activating the Oil Spill Response.

10.4.1 Prioritized Notification Checklist for Key Individuals

First Responder

- ☐ Notification of potential spill and dispatch received from OCC
- ☐ SPILL VERIFIED
- ☐ Notification of Emergency Services, if required

  Verify with OCC:
  - ☐ Pipeline shutdown and status
  - ☐ Pipeline segment isolation
- ☐ Regional EOC Manager (QI) notified

Regional EOC Manager (QI)

- ☐ Notification received from OCC
- ☐ Notification of spill details received from First Responder
- ☐ OIL SPILL RESPONSE PLAN ACTIVATED
- ☐ Emergency Site Manager (QI) notified
- ☐ Regional EOC activated
- ☐ Mobilize response resources requested by Emergency Site Manager (QI)
- ☐ Corporate EOC Manager contacted
- ☐ Agency contacts initiated as per Section 2.3

Emergency Site Manager (QI)

- ☐ Notification received from Regional EOC Manager (QI)
- ☐ On site First Responder contacted to obtain briefing on spill
- ☐ On Site Command Post activated
- ☐ Regional EOC advised of resource requirements
- ☐ First Responder relieved

10.4.2 Notification Contacts

The contact list is currently incomplete but identifies the key contact positions required for activation of the Oil Spill Response Plan. Specific data fields will be completed when Keystone's personnel organization structure is finalized and State and Local requirements and contacts have been determined.

Keystone

Table 20: Response Zone Two Keystone Notification

Position Making Call	Keystone Contacts	Primary Telephone No.	Secondary Telephone No.
OCC	First Responder		
	Regional EOC Manager (QI)		
	- Primary		
	- Alternate		
	Corporate EOC		
Regional EOC Manager (QI)	Emergency Site Manager (QI)		
	- Primary		
	- Alternate		
	Corporate EOC Manager		

Agency

Table 21: Response Zone Two Agency Notification

Position Making Call	Agency Contact List	Telephone	Other Telephone/Fax
Regional EOC Manager (QI)	Federal		
	National Response Center	1-800-424-8802	
	State		
	Local		

Emergency Services

Table 22: Response Zone Two Emergency Services Notification

Position Making Call	Emergency Contact List	Telephone	Other Telephone/Fax
Emergency Site Manager (QI)	Emergency Services		
	Fire/Ambulance		
	Police/Sheriff		
	Hospital		

10.4.3 Information Reported to Agencies

Communication Report (Call) Record

Regional EOC Manager (QI)

The following agency mandatory information, ***as identified in bold italic***, will be provided initially with subsequent notifications to complete the required mandatory criteria or advise of any changes.

Name of Pipeline: _____

Time of Discharge: _____

Location of Discharge (MP): _____

(GPS): _____

Type of Oil: _____

Reason of Discharge: _____

Estimated Volume of Oil Spill: _____

Weather Condition on Scene: _____

Action taken/ Planned by Person on Scene: _____

Injuries: _____

Extent of Injuries: _____

Evacuation: _____

Public Consequence: _____

10.5 Spill Detection and Mitigation Procedures

Response Zone specific procedures will be identified and described following completion of the necessary design details.

10.6 Oil Spill Response Organizations and Contractors, Services and Resources

The contact lists below are currently incomplete and will be updated as Keystone identifies contract resources and contact information.

Table 23: Response Zone Two OSRO Contacts

OSRO/Contractor	Contractor Responsibility	Resource Capability for First 7 Days	Quantity of Equipment or Service Available
Name:			
24 Hour Contact No.:			
Address:			
Response Time:			

10.7 Oil Transportation and Reclamation Facilities and Services

The contact lists below are currently incomplete and will be updated as Keystone identifies contract resources and contact information.

Table 24: Response Zone Two Oil Transportation and Reclamation Facilities

Contractor	Service Provided	Capacity	Availability
Name:			
24 Hour Contact No.:			
Address:			

10.8 Type of Oil, Volume and Calculation Method for Worst Case Discharge Volume

Pending completion of the necessary engineering design details a worst case discharge calculation will be undertaken.

Keystone expects to transport crude oils in the range of 12 to 45° API.

10.9 Maps and Drawings

10.9.1 Location of Worst Case Discharge

Pending completion of engineering design details this information will be provided.

10.9.2 Location of Potentially affected Public Drinking Water Intakes

Pending completion of engineering design details this information will be provided.

10.9.3 Potentially affected environmentally sensitive areas

Pending completion of engineering design details this information will be provided.

10.9.4 Control Points and access descriptions

Pending completion of engineering design details this information will be provided.

10.10 Piping Diagram and Plan Profile

Pending completion of engineering design details this information will be provided.

11.0 RESPONSE ZONE THREE APPENDIX

11.1 Information Summary

Response Area Location	Milepost (MP) = MP 634 to MP 1073
State	**Nebraska** (MP 634 to ≈ MP 649)
Counties	Jefferson, Gage
State	**Kansas** (MP 649 to ≈ MP 743)
Counties	Marshall, Nemaha, Brown, and Doniphan
State	**Missouri** (MP 743 to ≈ MP 1016)
Counties	Buchanan, Clinton, Caldwell, Carroll, Chariton, Randolph, Audrain, Montgomery, Lincoln, and St. Charles
State	**Illinois** (MP 1016 to ≈ MP 1073
Counties	Madison, Bond, Fayette, and Marion
Owner	Keystone
Emergency Telephone	1 (XXX) XXX-XXXX
Owner Location (Street)	450 - 1st Street SW
City: Calgary	Province: Alberta Postal Code: T2P 5H1

11.2 Qualified Individuals

The contact list is currently incomplete but identifies the key contact positions required for activation of the Oil Spill Response Plan. Specific data fields will be completed when Keystone's personnel organization structure is finalized.

Position	**Regional EOC Manager (QI)**	
Name		
Address		
Emergency Telephone		Secondary Telephone
Position	**Alternate Regional EOC Manager (QI)**	
Name		
Address		
Emergency Telephone		Secondary Telephone
Position	**Emergency Site Manager (QI)**	
Name		
Address		
Emergency Telephone		Secondary Telephone
Position	**Alternate Emergency Site Manager**	
Name		
Address		
Emergency Telephone		Secondary Telephone

11.3 Determination of Harm

The operator expects that Response Zone Three will meet the "significant and substantial" harm criteria due to the proximity of high consequence areas. However, a final determination is reserved pending completion of the design details required to perform the analysis. For the purposes of this preliminary document, Keystone has assumed the aforementioned criteria will be met.

11.4 Notification Procedures

The Regional EOC Manager (QI) is the key individual responsible for evaluating and activating the Oil Spill Response.

11.4.1 Prioritized Notification Checklist for Key Individuals

First Responder

- ☐ Notification of potential spill and dispatch received from OCC
- ☐ SPILL VERIFIED
- ☐ Notification of Emergency Services, if required

  Verify with OCC:
  - ☐ Pipeline shutdown and status
  - ☐ Pipeline segment isolation
- ☐ Regional EOC Manager (QI) notified

Regional EOC Manager (QI)

- ☐ Notification received from OCC
- ☐ Notification of spill details received from First Responder
- ☐ OIL SPILL RESPONSE PLAN ACTIVATED
- ☐ Emergency Site Manager (QI) notified
- ☐ Regional EOC activated
- ☐ Mobilize response resources requested by Emergency Site Manager (QI)
- ☐ Corporate EOC Manager contacted
- ☐ Agency contacts Initiated as per Section 2.3

Emergency Site Manager (QI)

- ☐ Notification received from Regional EOC Manager (QI)
- ☐ On site First Responder contacted to obtain briefing on spill
- ☐ On Site Command Post activated
- ☐ Regional EOC advised of resource requirements
- ☐ First Responder relieved

11.4.2 Notification Contacts

The contact list is currently incomplete but identifies the key contact positions required for activation of the Oil Spill Response Plan. Specific data fields will be completed when Keystone's personnel organization structure is finalized and State and Local requirements and contacts have been determined.

Keystone

Table 25: Response Zone Three Keystone Notification

Position Making Call	Keystone Contacts	Primary Telephone No.	Secondary Telephone No.
OCC	First Responder		
	Regional EOC Manager (QI)		
	- Primary		
	- Alternate		
	Corporate EOC		
Regional EOC Manager (QI)	Emergency Site Manager (QI)		
	- Primary		
	- Alternate		
	Corporate EOC Manager		

Agency

Table 26: Response Zone Three Agency Notification

Position Making Call	Agency Contact List	Telephone	Other Telephone/Fax
Regional EOC Manager (QI)	Federal		
	National Response Center	1-800-424-8802	
	State		
	Local		

Emergency Services

Table 27: Response Zone Three Emergency Services Notification

Position Making Call	Emergency Contact List	Telephone	Other Telephone/Fax
Emergency Site Manager (QI)	Emergency Services		
	Fire/Ambulance		
	Police/Sheriff		
	Hospital		

Information Reported to Agencies

Communication Report (Call) Record

Regional EOC Manager (QI)

The following agency mandatory information, ***as identified in bold italic***, will be provided initially with subsequent notifications to complete the required mandatory criteria or advise of any changes.

Name of Pipeline:_____

Time of Discharge:_____

Location of Discharge (MP):_____

(GPS):_____

Type of Oil:_____

Reason of Discharge:_____

Estimated Volume of Oil Spill:_____

Weather Condition on Scene: _____

Action taken/ Planned by Person on Scene: _____

Injuries: _____

Extent of Injuries: _____

Evacuation: _____

Public Consequence: _____

11.5 Spill Detection and Mitigation Procedures

Response Zone specific procedures will be identified and described following completion of the necessary design details.

11.6 Oil Spill Response Organizations and Contractors, Services and Resources

The contact lists below are currently incomplete and will be updated as Keystone identifies contract resources and contact information.

Table 28: Response Zone Three OSRO Contacts

OSRO/Contractor	Contractor Responsibility	Resource Capability for First 7 Days	Quantity of Equipment or Service Available
Name:			
24 Hour Contact No.:			
Address:			
Response Time:			

11.7 Oil Transportation and Reclamation Facilities and Services

The contact lists below are currently incomplete and will be updated as Keystone identifies contract resources and contact information.

Table 29: Response Zone Three Oil Transportation and Reclamation Facilities

Contractor	Service Provided	Capacity	Availability
Name:			
24 Hour Contact No.:			
Address:			

11.8 Type of Oil, Volume and Calculation Method for Worst Case Discharge Volume

Pending completion of the necessary engineering design details a worst case discharge calculation will be undertaken.

Keystone expects to transport crude oils in the range of 12 to 45° API.

11.9 Maps and Drawings

11.9.1 Location of Worst Case Discharge

Pending completion of engineering design details this information will be provided.

11.9.2 Location of Potentially affected Public Drinking Water Intakes

Pending completion of engineering design details this information will be provided.

11.9.3 Potentially affected environmentally sensitive areas

Pending completion of engineering design details this information will be provided.

11.9.4 Control Points and access descriptions

Pending completion of engineering design details this information will be provided.

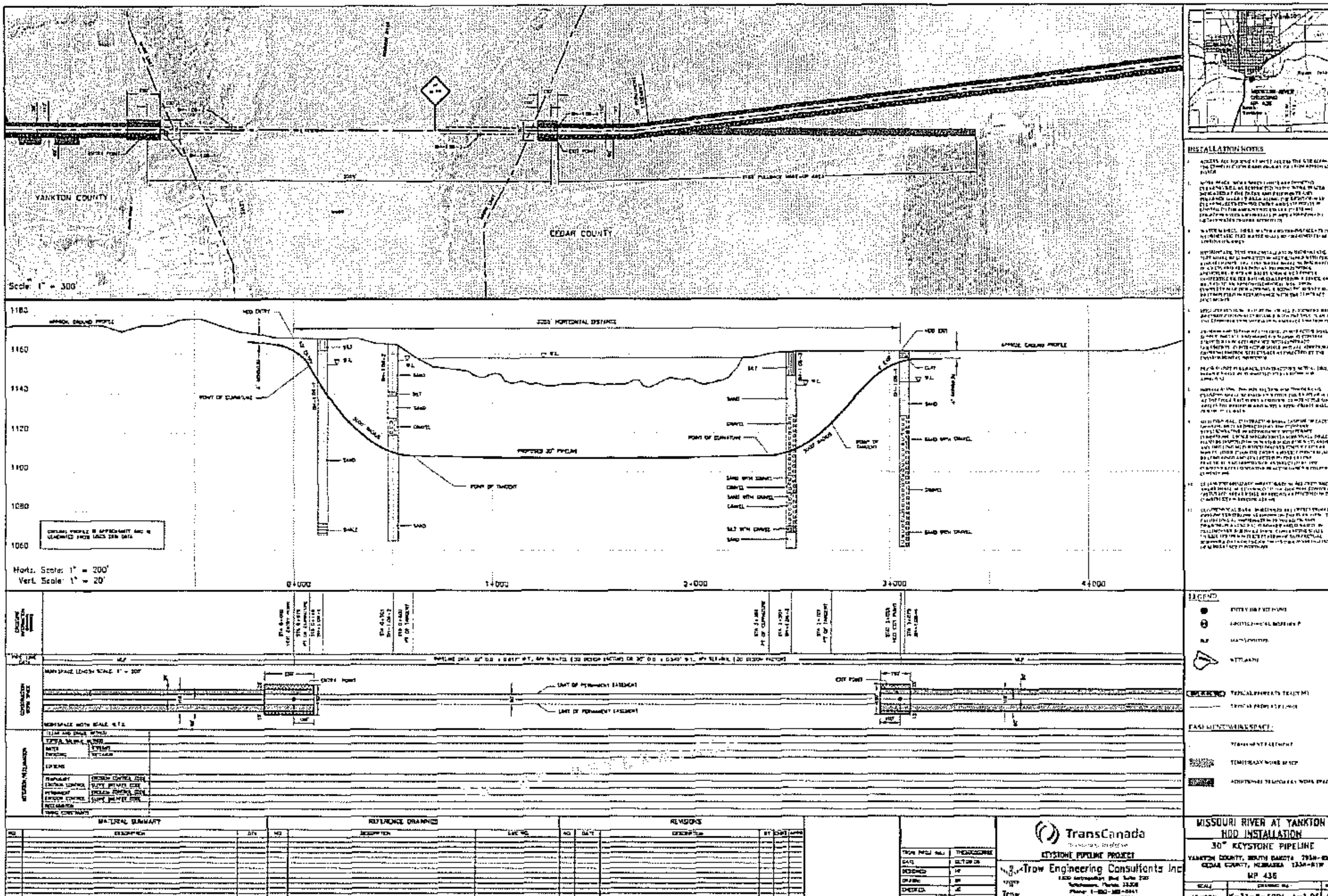
11.10 Piping Diagram and Plan Profile

Pending completion of engineering design details this information will be provided.

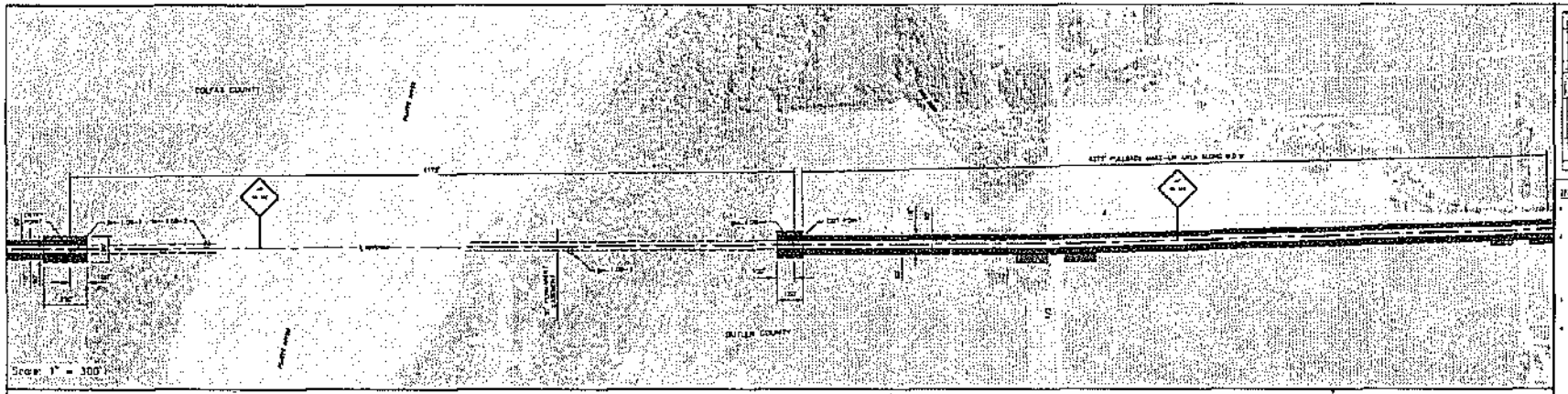
Appendix D

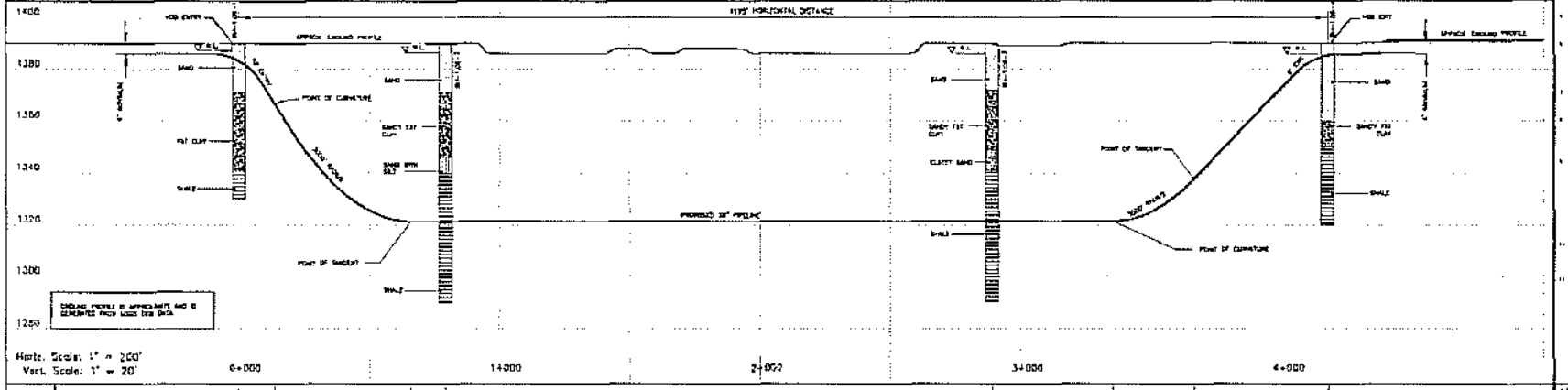
Site-Specific Water Body Crossing Plans

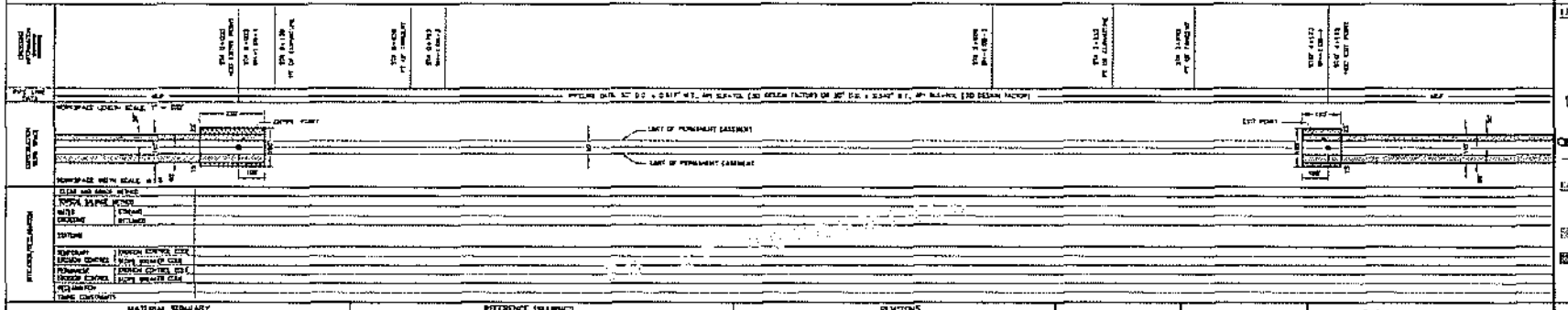
24 x 36 format; see the CD for file

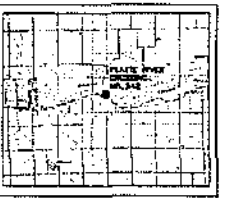


YANKTON COUNTY
CEDAR COUNTY
Scale: 1" = 300'
APPROX. GROUND PROFILE
HDD ENTRY
HDD EXIT
PROPOSED 30" PIPELINE
POINT OF CURVATURE
POINT OF TANGENT
SAND
GRAVEL
SILT
SHALE
SAND WITH GRAVEL
SILT WITH GRAVEL
1180
1160
1140
1120
1100
1080
1060
Horiz. Scale: 1" = 200'
Vert. Scale: 1" = 20'
0+000
1+000
2+000
3+000
4+000
ENTRY POINT
EXIT POINT
LIMIT OF PERMANENT EASEMENT
INSTALLATION NOTES
LEGEND
EASEMENT/WORKSPACE:
TEMPORARY WORK SPACE
MATERIAL SUMMARY
REFERENCE DRAWINGS
REVISIONS
TransCanada
KEYSTONE PIPELINE PROJECT
Trow Engineering Consultants Inc
MISSOURI RIVER AT YANKTON
HDD INSTALLATION
30" KEYSTONE PIPELINE
MP 436
K-31-P-6001-A-1.06









INSTALLATION NOTES:

1. NOTIFY ONE CALL SYSTEM AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.
2. WHERE TOPSOIL IS SEGREGATED DURING CLEARING, REMOVE ALL SEGREGATED TOPSOIL FROM THE WHOLE WIDTH OF THE TRENCH AND ADJACENT SPOIL STORAGE AREA. THE REMAINING TOPSOIL SHALL BE STRIPPED FROM THE TRENCH AND SPOIL STORAGE AREA AND STOCKPILED SEPARATELY FROM SUBSOIL.
3. WASTE DISPOSAL: DISPOSE OF ALL WASTE MATERIALS AT AN APPROVED SITE. DO NOT BURY WASTE MATERIALS ON THE RIGHT-OF-WAY OR IN ANY WATERBODY OR WETLAND.
4. DEWATERING: THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND AUTHORIZATIONS FOR DEWATERING ACTIVITIES. DISCHARGE WATER FROM DEWATERING ACTIVITIES IN A MANNER THAT DOES NOT CAUSE EXCESSIVE EROSION OR SEDIMENTATION. DISCHARGE WATER FROM DEWATERING ACTIVITIES IN UPLAND AREAS WHERE WATER WILL FILTER THROUGH VEGETATION BEFORE REACHING A WATERBODY OR WETLAND. DISCHARGE WATER FROM DEWATERING ACTIVITIES IN ACCORDANCE WITH THE CONDITIONS OF THE APPROPRIATE PERMITS.
5. SPECIAL PROVISIONS: WHERE SPECIAL PROVISIONS ARE REQUIRED BY PERMIT, THE CONTRACTOR SHALL BE RESPONSIBLE FOR IMPLEMENTING THE SPECIAL PROVISIONS IN ACCORDANCE WITH THE PERMIT REQUIREMENTS.
6. BLASTING AND EXPLOSIVES: CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND AUTHORIZATIONS FOR BLASTING ACTIVITIES. BLASTING ACTIVITIES SHALL BE CONDUCTED BY PERSONNEL QUALIFIED IN BLASTING PROCEDURES. BLASTING ACTIVITIES SHALL NOT BE CONDUCTED WITHIN 100 FEET OF ANY WATERBODY OR WETLAND. BLASTING ACTIVITIES SHALL BE CONDUCTED IN ACCORDANCE WITH THE CONDITIONS OF THE APPROPRIATE PERMITS.
7. PIPE STRINGING: PIPE SHALL BE STRUNG ALONG THE TRENCH IN A MANNER THAT MINIMIZES THE NUMBER OF ROAD AND STREAM CROSSINGS.
8. BACKFILL: BACKFILL THE TRENCH WITH THE EXCAVATED SPOIL MATERIAL IN A MANNER THAT RESTORES THE ORIGINAL CONTOURS AND DRAINAGE PATTERNS. BACKFILL SHALL BE COMPACTED TO PREVENT SETTLEMENT.
9. HYDROSTATIC TESTING: HYDROSTATIC TESTING SHALL BE CONDUCTED IN ACCORDANCE WITH APPLICABLE REGULATIONS AND PERMIT REQUIREMENTS. TEST WATER SHALL BE OBTAINED FROM AN APPROVED SOURCE AND DISPOSED OF IN A MANNER THAT DOES NOT CAUSE EXCESSIVE EROSION OR SEDIMENTATION.
10. RESTORATION: ALL DISTURBED AREAS SHALL BE RESTORED TO THEIR ORIGINAL CONDITION OR BETTER. RESTORATION SHALL INCLUDE REVEGETATION WITH APPROPRIATE SEED MIXES AND MULCHING.
11. POST-CONSTRUCTION MONITORING: THE CONTRACTOR SHALL MONITOR THE RESTORED AREAS FOR AT LEAST TWO GROWING SEASONS AFTER CONSTRUCTION TO ENSURE SUCCESSFUL REVEGETATION AND EROSION CONTROL. ANY AREAS THAT FAIL TO MEET RESTORATION STANDARDS SHALL BE REMEDIATED.

LEGEND

- ENTRY/EXIT POINT
- CENTERLINE REFERENCE
- MP MILEPOST/STATION
- WETLAND
- TEMPORARY WORKSPACE
- PERMANENT EASEMENT
- TEMPORARY WORK SPACE
- ADDITIONAL TEMPORARY WORK SPACE

EASEMENT/WORKSPACE

- PERMANENT EASEMENT
- TEMPORARY WORK SPACE
- ADDITIONAL TEMPORARY WORK SPACE

MATERIAL SUMMARY

NO.	DESCRIPTION	QTY.

REFERENCE DRAWINGS

NO.	DESCRIPTION	SPEC NO.

REVISIONS

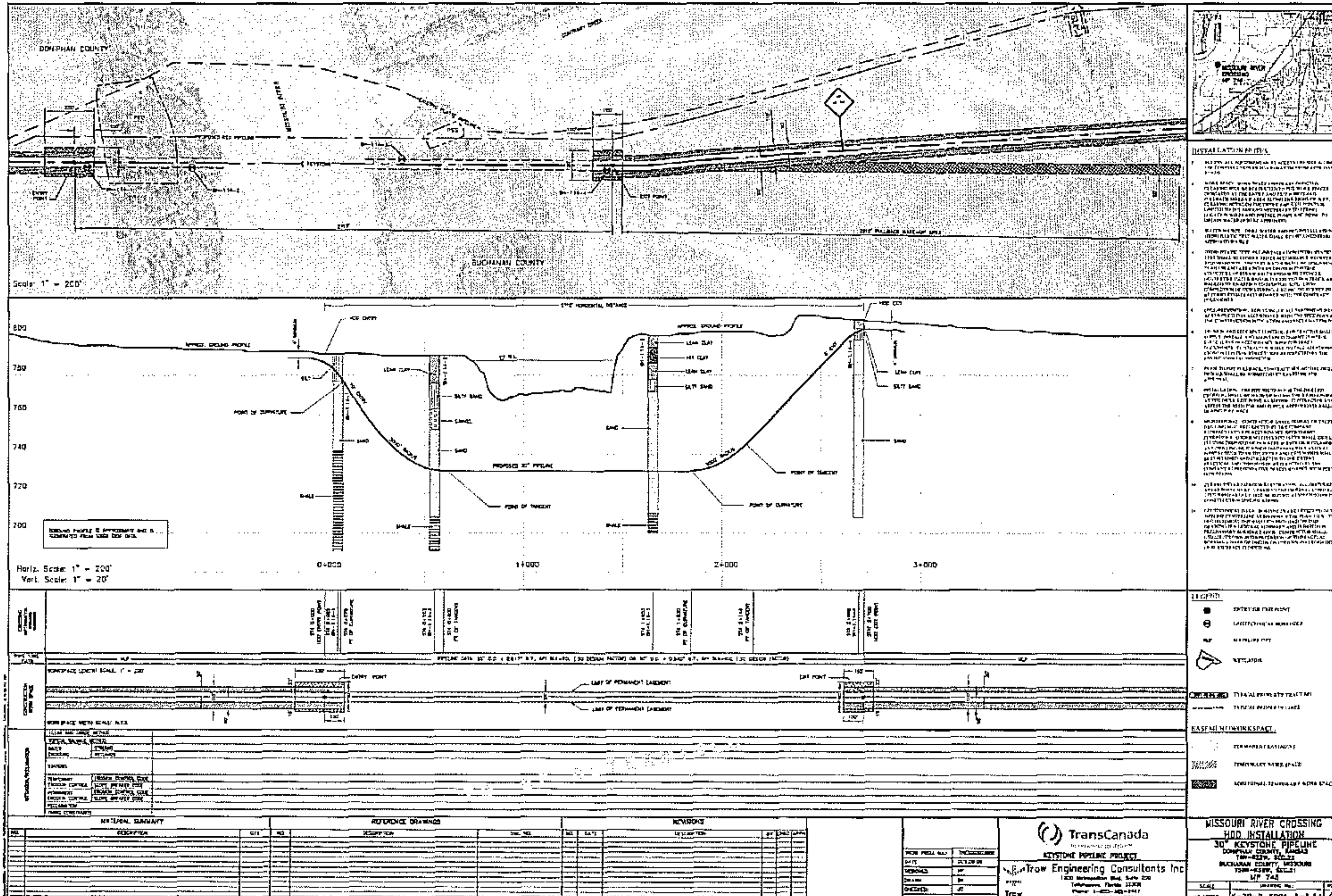
NO.	DATE	DESCRIPTION	BY	CHKD	APPD

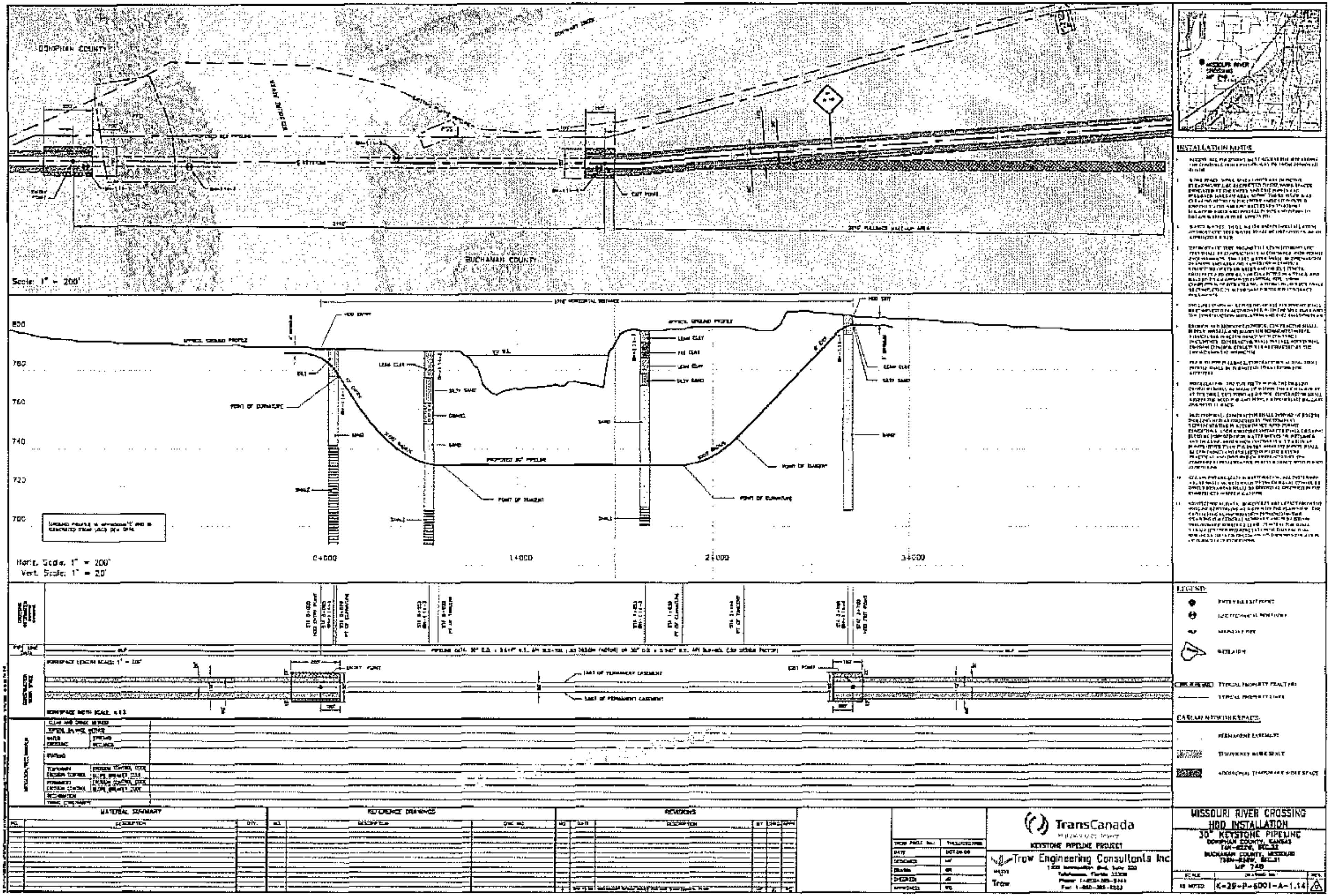
DRAWING NUMBER	K-SF-P-5001-A-1.08
DATE	DATE OF ISSUE
DESIGNED	MF
DRAWN	MC
CHECKED	JS
APPROVED	MC

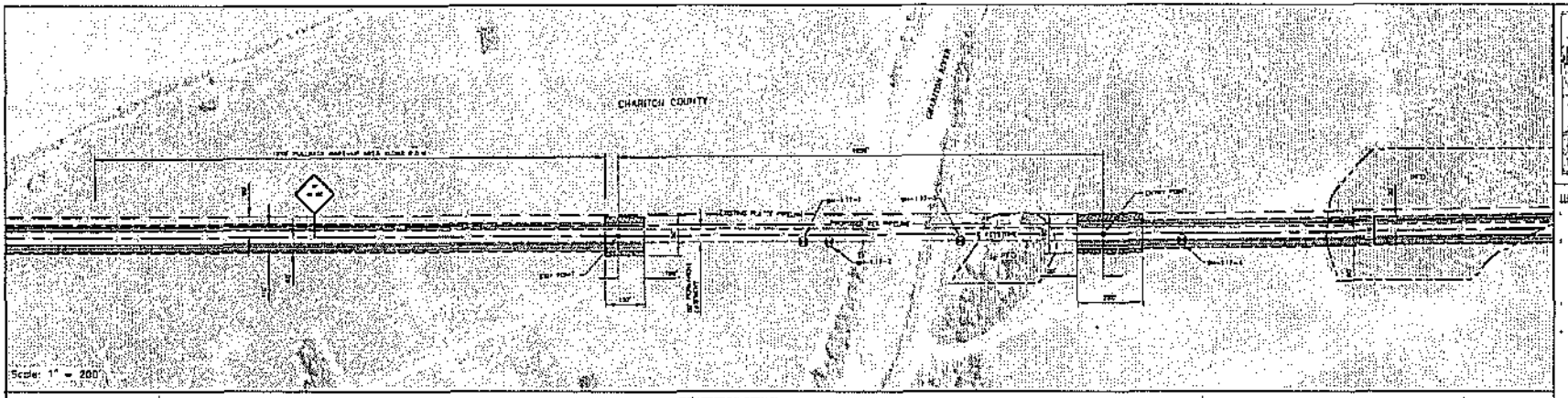
TransCanada
KEYSTONE PIPELINE PROJECT
Trow Engineering Consultants Inc
1300 Metropolitan Blvd Suite 204
Tallahassee, Florida 32308
Phone: 1-850-385-5441
Fax: 1-850-385-5513

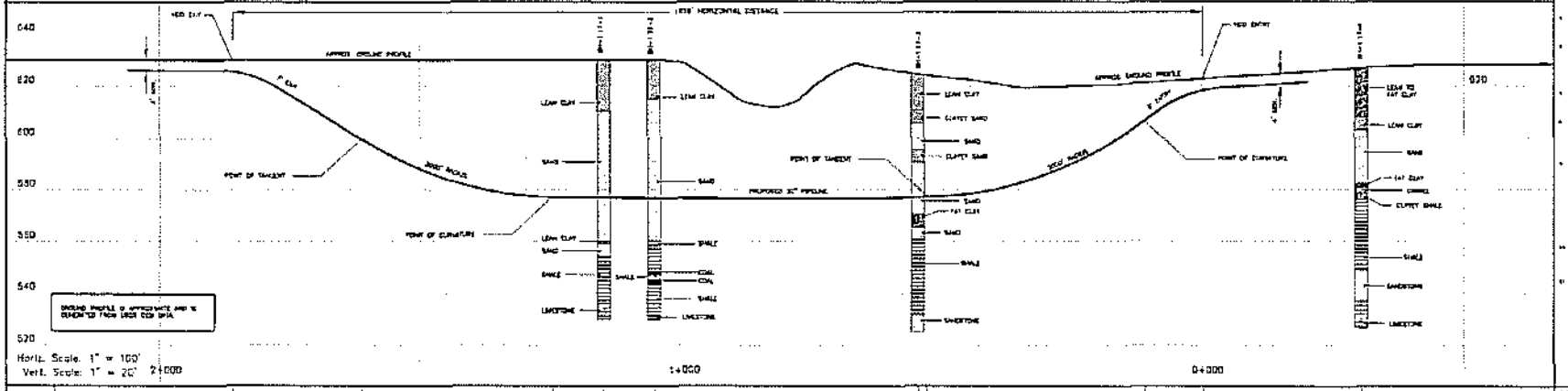
PLATTE RIVER
HDD INSTALLATION
30" KEYSTONE PIPELINE
COLFAX AND BUTLER COUNTIES, NEBRASKA
TRM-KOE SECTIONS 2 & 3
MP 542

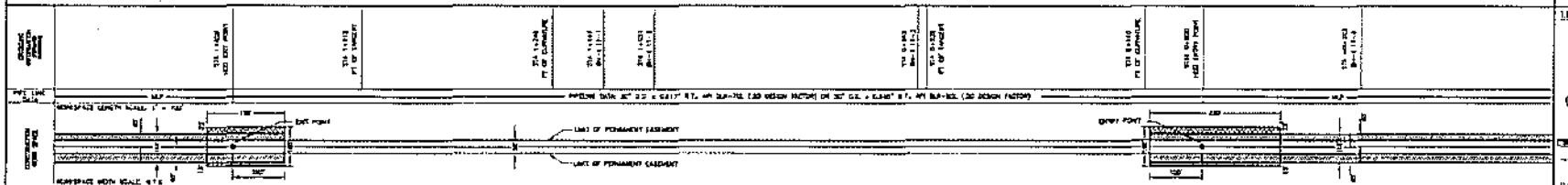
SCALE	DRAWING NO.	REV.
AS NOTED	K-SF-P-5001-A-1.08	0

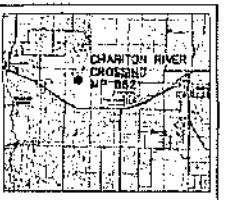

DONIPHAN COUNTY
MISSOURI RIVER
BUCHANAN COUNTY
Scale: 1" = 200'
ENTRY POINT
EXIT POINT
APPROX. GROUND PROFILE
HDD ENTRY
HDD EXIT
POINT OF CURVATURE
POINT OF TANGENT
PROPOSED 30" PIPELINE
LEAN CLAY
FAT CLAY
SILTY SAND
SAND
SHALE
800
780
760
740
720
700
0+000
1+000
2+000
3+000
Horiz. Scale: 1" = 200'
Vert. Scale: 1" = 20'
LIMIT OF PERMANENT EASEMENT
INSTALLATION NOTES
LEGEND
EASEMENT/WORKSPACE
MATERIAL SUMMARY
REFERENCE DRAWINGS
REVISIONS
TransCanada
KEYSTONE PIPELINE PROJECT
Trow Engineering Consultants Inc
MISSOURI RIVER CROSSING
HDD INSTALLATION
30" KEYSTONE PIPELINE
DONIPHAN COUNTY, KANSAS
BUCHANAN COUNTY, MISSOURI
MP 74
SCALE
AS NOTED
K-29-P-5001-A-5.14


DONIPHAN COUNTY
BUCHANAN COUNTY
Scale: 1" = 200'
INSTALLATION NOTES
APPROX. GROUND PROFILE
HDD ENTRY
HDD EXIT
PROPOSED 30" PIPELINE
POINT OF CURVATURE
POINT OF TANGENT
LEAN CLAY
FAT CLAY
SILTY SAND
SAND
GRAVEL
SHALE
800
780
760
740
720
700
0+000
1+000
2+000
3+000
Horiz. Scale: 1" = 200'
Vert. Scale: 1" = 20'
ENTRY POINT
EXIT POINT
LIMIT OF TEMPORARY EASEMENT
LIMIT OF PERMANENT EASEMENT
LEGEND:
TYPICAL PROPERTY TRACT
TYPICAL PROPERTY LINE
EASEMENT/WORKSPACE:
PERMANENT EASEMENT
TEMPORARY WORKSPACE
ADDITIONAL TEMPORARY WORKSPACE
MATERIAL SUMMARY
REFERENCE DRAWINGS
REVISIONS
DESCRIPTION
QTY.
DWG NO.
DATE
TransCanada
KEYSTONE PIPELINE PROJECT
Trow Engineering Consultants Inc
MISSOURI RIVER CROSSING
HDD INSTALLATION
30" KEYSTONE PIPELINE
DONIPHAN COUNTY, KANSAS
BUCHANAN COUNTY, MISSOURI
MP 240
K-29-P-6001-A-1.14









INSTALLATION NOTES:

LEGEND

EXIT/ENTRY POINT

TEMPORARY WORKSPACE

PERMANENT EASEMENT

MATERIAL SUMMARY

NO	DESCRIPTION	QTY.

REFERENCE DRAWINGS

NO	DESCRIPTION	DWG NO

REVISIONS

NO	DATE	DESCRIPTION	BY	CHKD	APPD

TransCanada

KEYSTONE PIPELINE PROJECT

Trow Engineering Consultants Inc

CHARITON RIVER CROSSING
HDD INSTALLATION

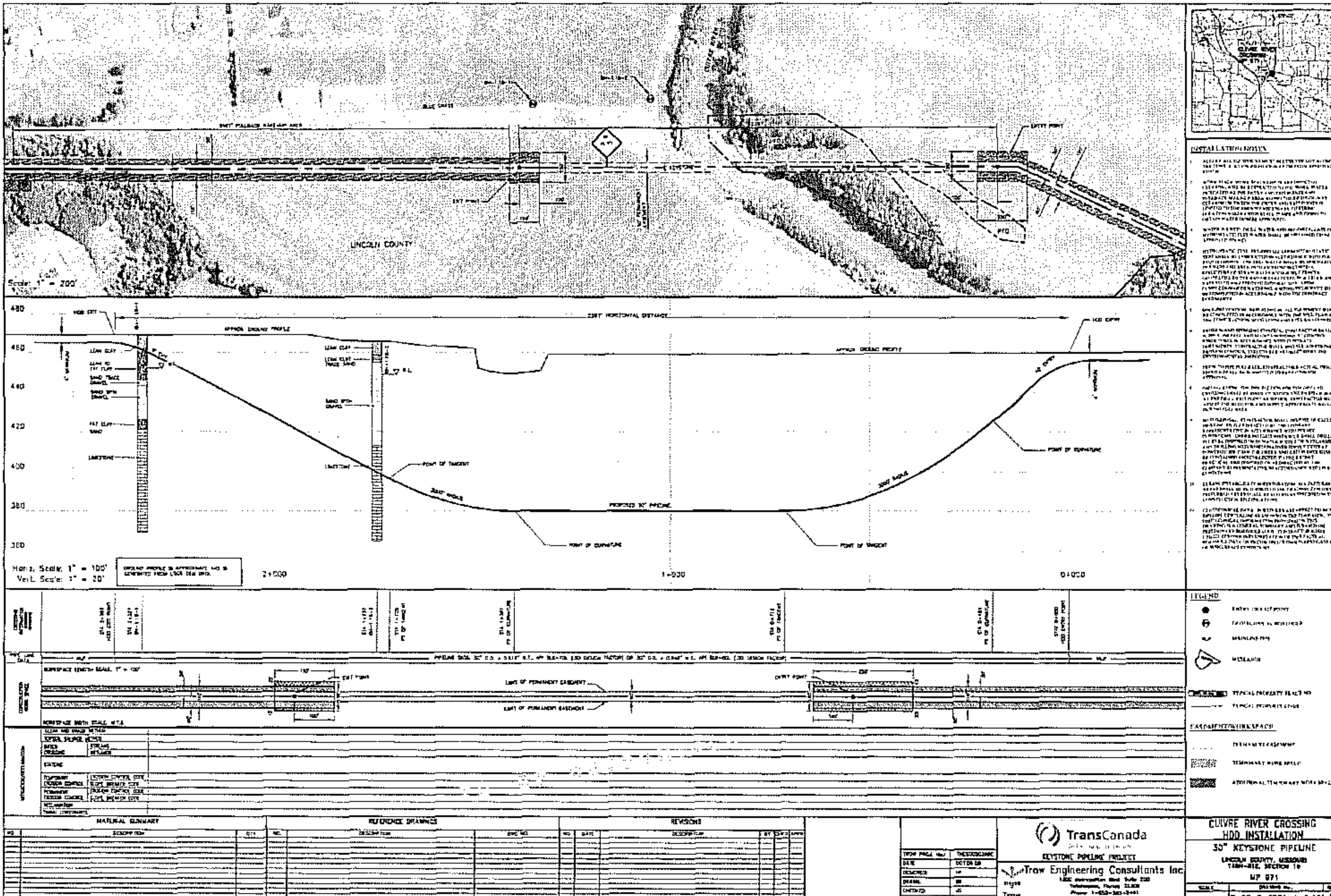
30" KEYSTONE PIPELINE

CHARITON COUNTY MISSOURI

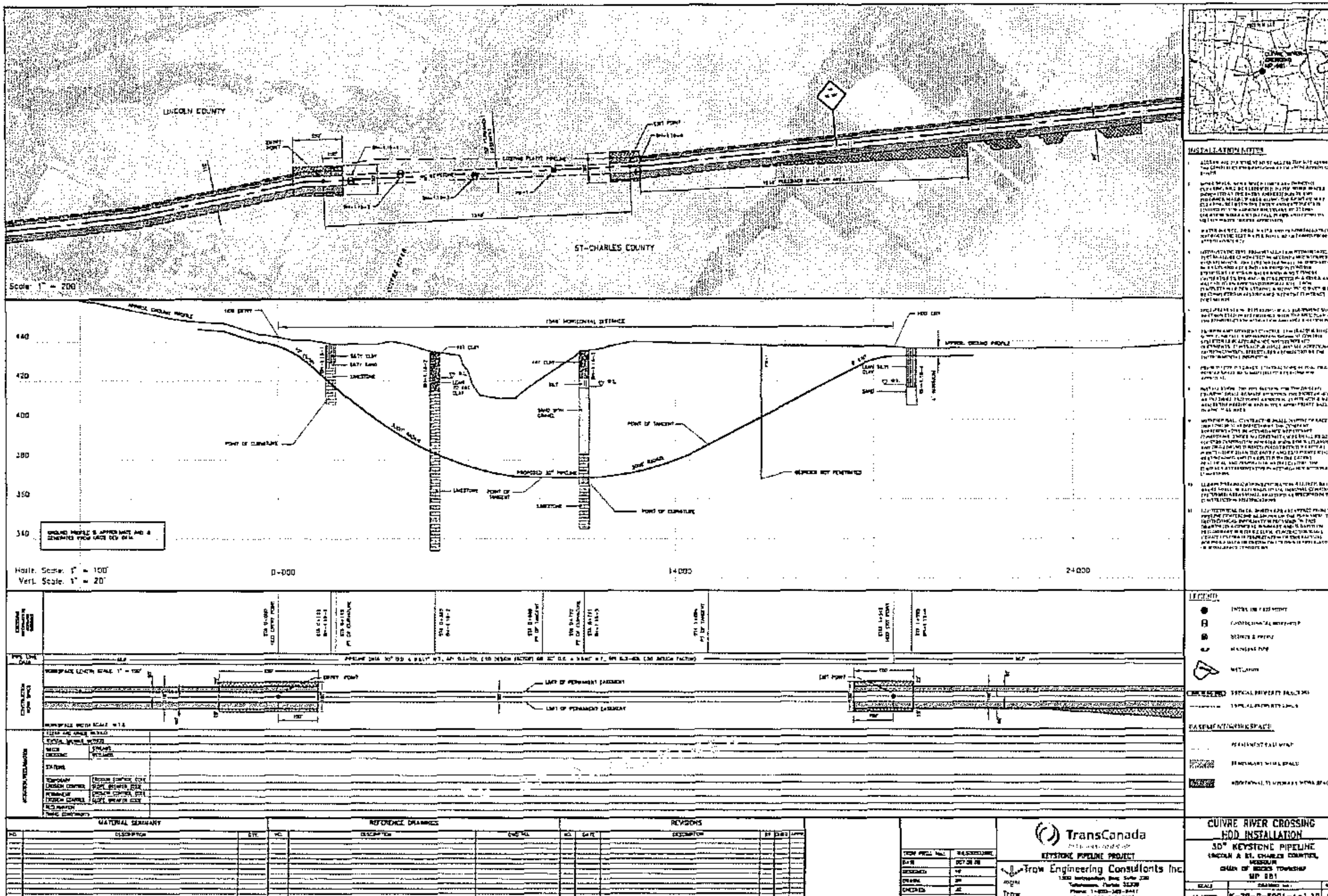
T53N-R18W, SECTION 1

MP 882

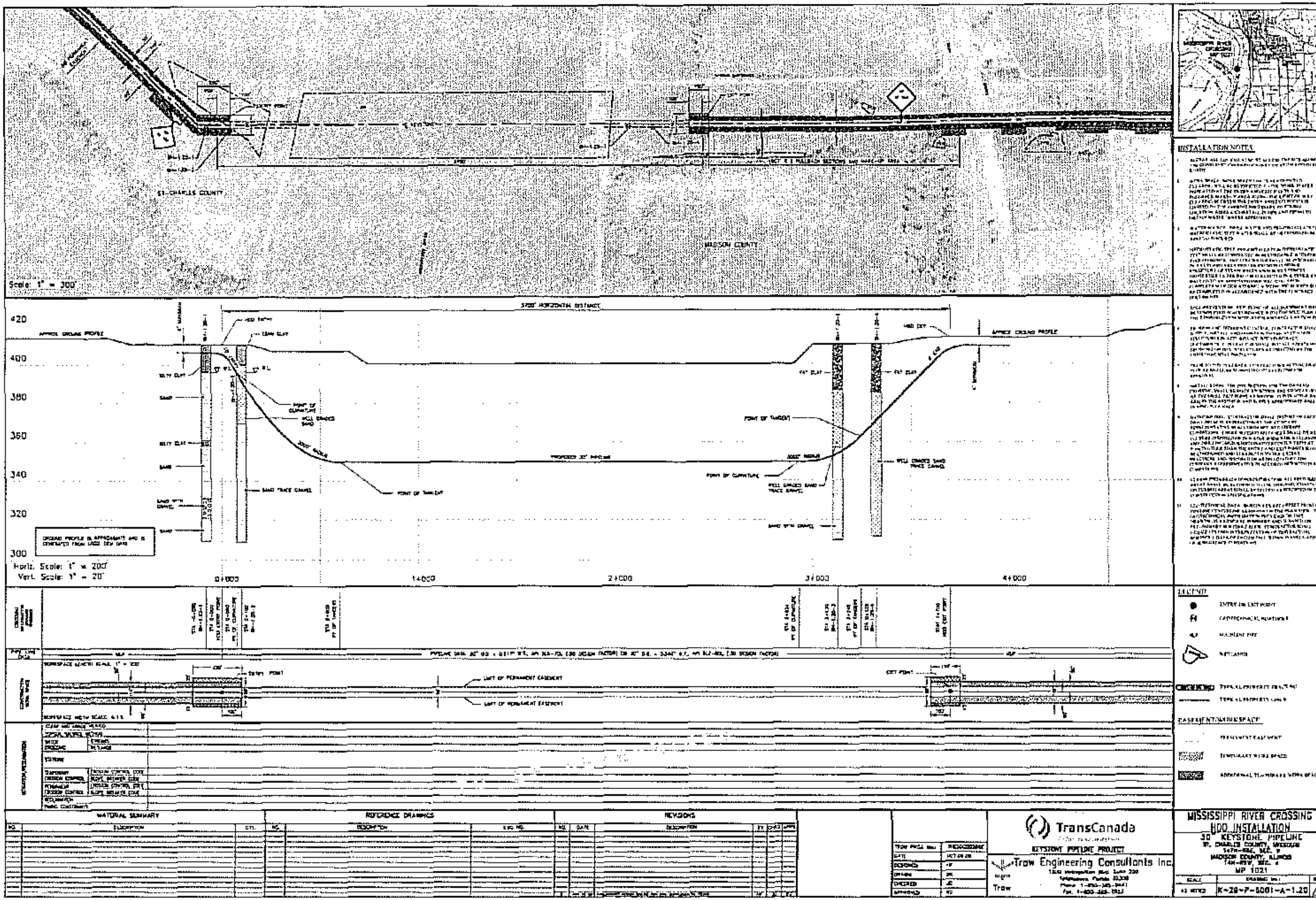
SCALE	DRAWING NO.	REV
AS NOTED	K-29-P-6001-A-1,17	0



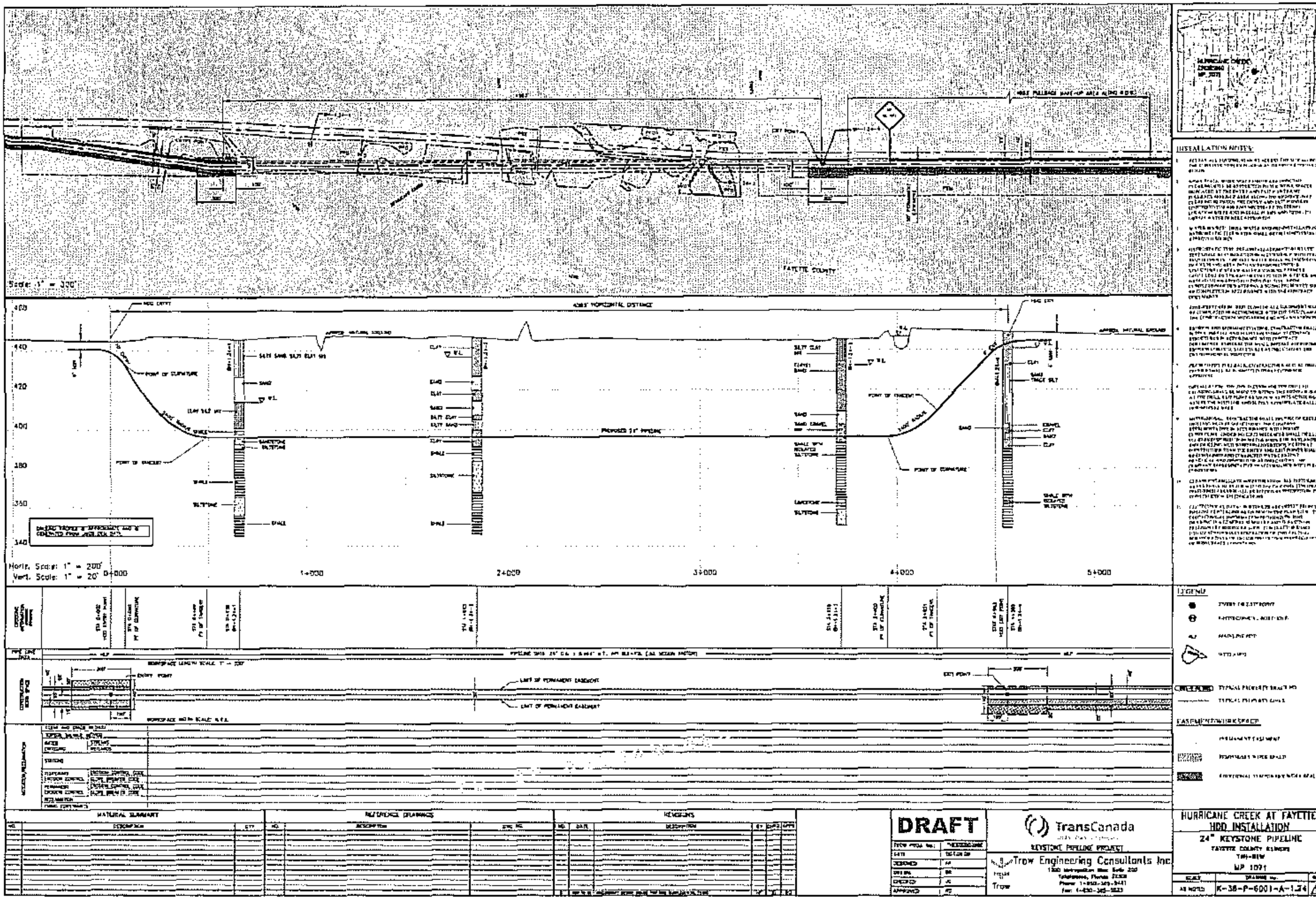
LINCOLN COUNTY
Scale: 1" = 200'
APPROX. GROUND PROFILE
POINT OF TANGENT
POINT OF CURVATURE
PROPOSED 30" PIPELINE
Horiz. Scale: 1" = 100'
Vert. Scale: 1" = 20'
2+000
1+000
0+000
INSTALLATION NOTES
LEGEND
EASEMENT/WORKSPACE
MATERIAL SUMMARY
REFERENCE DRAWINGS
REVISIONS
TransCanada
KEYSTONE PIPELINE PROJECT
Trow Engineering Consultants Inc
CUIVRE RIVER CROSSING
HDD INSTALLATION
30" KEYSTONE PIPELINE
LINCOLN COUNTY, MISSOURI
MP 071
K-29-P-6001-A-1.161



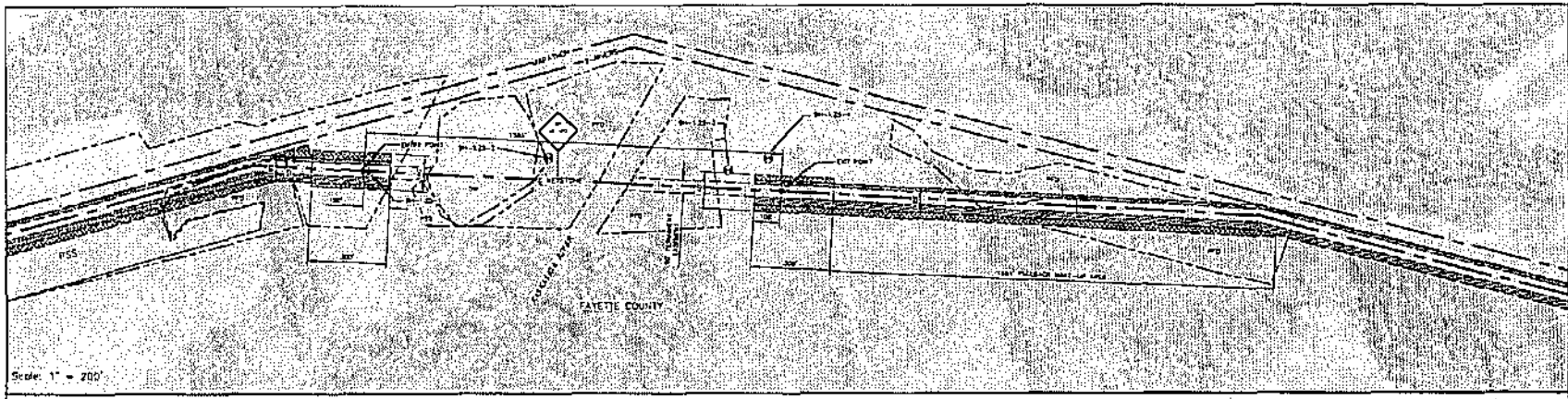
LINCOLN COUNTY
ST-CHARLES COUNTY
Scale: 1" = 200'
INSTALLATION NOTES
APPROX. GROUND PROFILE
PROPOSED 30" PIPELINE
POINT OF CURVATURE
POINT OF TANGENT
LIMESTONE
440
420
400
380
360
340
GROUND PROFILE IS APPROXIMATE AND IS GENERATED FROM USGS DEM DATA.
Horiz. Scale: 1" = 100'
Vert. Scale: 1" = 20'
0+000
1+000
2+000
LEGEND
EASEMENT/WORKSPACE
MATERIAL SUMMARY
REFERENCE DRAWINGS
REVISIONS
TransCanada
KEYSTONE PIPELINE PROJECT
Trow Engineering Consultants Inc.
CUIVRE RIVER CROSSING
HDD INSTALLATION
30" KEYSTONE PIPELINE
MP 881
K-29-P-6001-A-1.19

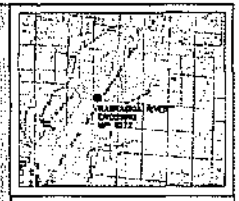


Scale: 1" = 300'
ST-CHARLES COUNTY
MADISON COUNTY
INSTALLATION NOTES
3700' HORIZONTAL DISTANCE
APPROX. GROUND PROFILE
PROPOSED 30" PIPELINE
POINT OF TANGENT
POINT OF CURVATURE
3000' RADIUS
SAND
SILTY CLAY
SAND WITH GRAVEL
WELL GRADED SAND TRACE GRAVEL
FAT CLAY
LEAN CLAY
HDD ENTRY
HDD EXIT
GROUND PROFILE IS APPROXIMATE AND IS GENERATED FROM USGS DEM DATA
420
400
380
360
340
320
300
Horiz. Scale: 1" = 200'
Vert. Scale: 1" = 20'
0+000
1+000
2+000
3+000
4+000
LIMIT OF PERMANENT EASEMENT
ENTRY POINT
EXIT POINT
LEGEND
ENTRY OR EXIT POINT
EASEMENT/WORKSPACE
PERMANENT EASEMENT
TEMPORARY WORKSPACE
ADDITIONAL TEMPORARY WORKSPACE
MATERIAL SUMMARY
REFERENCE DRAWINGS
REVISIONS
TransCanada
KEYSTONE PIPELINE PROJECT
Trow Engineering Consultants Inc.
Trow
MISSISSIPPI RIVER CROSSING
HDD INSTALLATION
30" KEYSTONE PIPELINE
ST. CHARLES COUNTY, MISSOURI
MADISON COUNTY, ILLINOIS
MP 1021
AS NOTED
K-29-P-0001-A-1.20

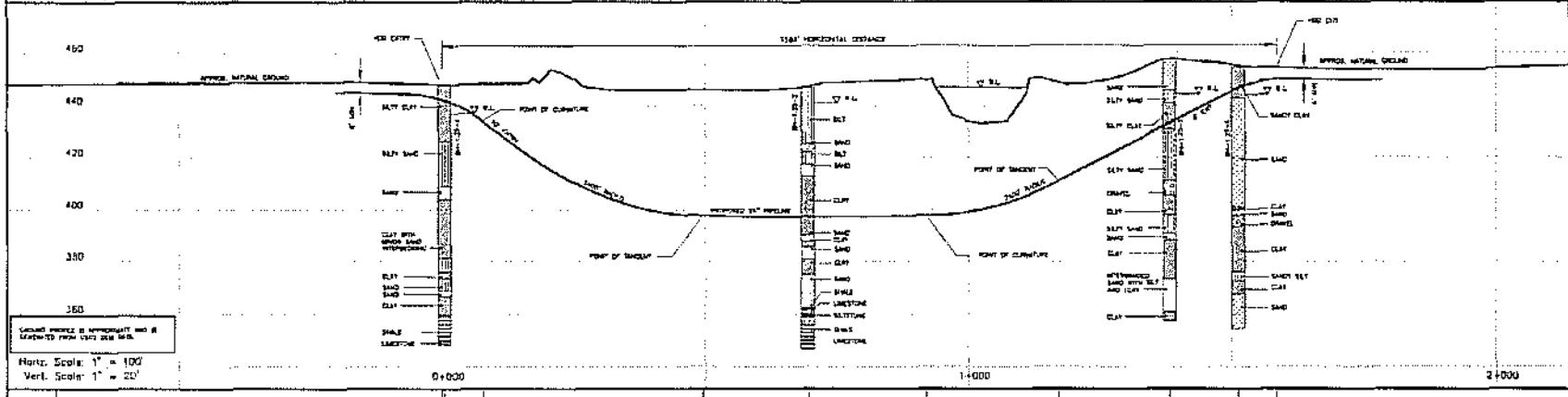


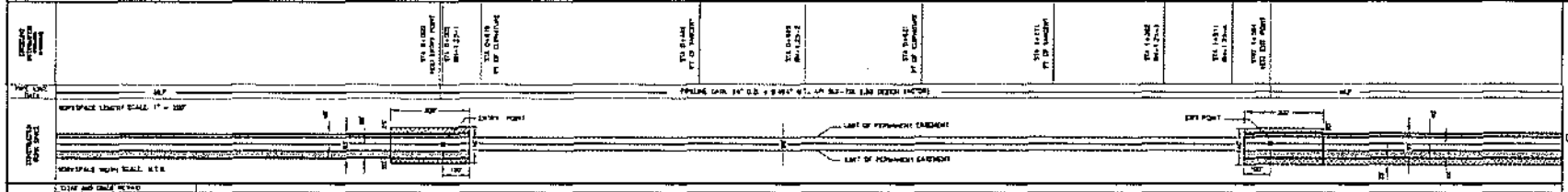
Scale: 1" = 300'
FAYETTE COUNTY
PROPOSED 24" PIPELINE
POINT OF CURVATURE
POINT OF TANGENCY
Horiz. Scale: 1" = 200'
Vert. Scale: 1" = 20'
0+000
1+000
2+000
3+000
4+000
5+000
INSTALLATION NOTES
LEGEND
EASEMENT/WORKSPACE
MATERIAL SUMMARY
REFERENCE DRAWINGS
REVISIONS
DRAFT
TransCanada
KEYSTONE PIPELINE PROJECT
Trow Engineering Consultants Inc.
HURRICANE CREEK AT FAYETTE
HDD INSTALLATION
24" KEYSTONE PIPELINE
MP 1071
AS NOTED
K-38-P-6001-A-1.24





INSTALLATION NOTES





LEGEND

EASEMENT/WORKSPACE

MATERIAL SUMMARY

NO.	DESCRIPTION	QTY

REFERENCE DRAWINGS

NO.	DESCRIPTION	DWG NO.

REVISIONS

NO.	DATE	DESCRIPTION	BY	CHK	APP'D

TransCanada
KEYSTONE PIPELINE PROJECT

Trow Engineering Consultants Inc
1500 Metropolitan Blvd Suite 200
Tallahassee, Florida 32308
Phone: 1-850-385-5441
Fax: 1-850-385-5443

KASKASKIA RIVER HDD INSTALLATION

24" KEYSTONE PIPELINE

FAYETTE COUNTY, ILLINOIS

T9N-R1E

WP 1072

SCALE	DRAWING NO.	REV
AS NOTED	K-17-P-6001-A-1.25	0

Appendix E

Pipeline Restrictive Layer Areas Crossings

KEYSTONE PIPELINE PROJECT

Pipeline Restrictive Layer Areas Crossings MP

Mainline CL based on November 17, 2006 Filing and the Cushing Extension CL based on Dec 15, 2006 Filing

REVISION 0

LINE	MP		LENGTH	SOIL NAME	RESTRICTIVE LAYER				COUNTY	STATE
	FROM	TO	[ft]		KIND	HARDNESS	DEPTH TO TOP - [in]	CONSTRUCTION		
14-ML	32.97	33.17	1095.4	Kloten	Bedrock (paralithic)	---	20 to 40	RIP	Walsh	North Dakota
14-ML	35.20	35.23	159.8	Kloten	Bedrock (paralithic)	---	9 to 20	RIP	Walsh	North Dakota
14-ML	35.26	35.29	154.8	Kloten	Bedrock (paralithic)	---	9 to 20	RIP	Walsh	North Dakota
14-ML	36.33	36.41	407.0	Kloten	Bedrock (paralithic)	---	20 to 40	RIP	Walsh	North Dakota
14-ML	36.51	36.59	393.7	Kloten	Bedrock (paralithic)	---	20 to 40	RIP	Walsh	North Dakota
14-ML	37.52	37.76	1264.2	Kloten	Bedrock (paralithic)	---	20 to 40	RIP	Walsh	North Dakota
14-ML	41.13	41.33	1031.7	Kloten	Bedrock (paralithic)	---	20 to 40	RIP	Walsh	North Dakota
14-ML	41.56	41.73	893.2	Kloten	Bedrock (paralithic)	---	9 to 20	RIP	Walsh	North Dakota
14-ML	41.73	42.11	2031.4	Kloten	Bedrock (paralithic)	---	20 to 40	RIP	Walsh	North Dakota
14-ML	42.11	42.16	263.9	Kloten	Bedrock (paralithic)	---	9 to 20	RIP	Walsh	North Dakota
14-ML	42.48	42.58	553.5	Kloten	Bedrock (paralithic)	---	20 to 40	RIP	Walsh	North Dakota
14-ML	46.28	46.34	310.4	Kloten	Bedrock (paralithic)	---	9 to 20	RIP	Walsh	North Dakota
14-ML	54.15	54.19	183.1	Kloten	Bedrock (paralithic)	---	9 to 20	RIP	Walsh	North Dakota
14-ML	54.32	54.44	661.1	Kloten	Bedrock (paralithic)	---	9 to 20	RIP	Walsh	North Dakota
14-ML	54.48	54.59	643.4	Kloten	Bedrock (paralithic)	---	9 to 20	RIP	Walsh	North Dakota
14-ML	63.00	63.08	431.4	Cavour	Natric	Noncemented	7 to 17	RIP	Nelson	North Dakota
14-ML	64.36	64.51	792.3	Cavour	Natric	Noncemented	7 to 17	RIP	Nelson	North Dakota
14-ML	66.98	67.03	264.8	Divide	Strongly contrasting textural stratification	---	20 to 40	RIP	Nelson	North Dakota
14-ML	76.56	76.59	183.4	Divide	Strongly contrasting textural stratification	---	20 to 40	RIP	Nelson	North Dakota
14-ML	77.88	77.91	159.3	Cavour	Natric	Noncemented	7 to 17	RIP	Nelson	North Dakota
14-ML	84.75	84.82	376.7	Divide	Strongly contrasting textural stratification	---	20 to 40	RIP	Nelson	North Dakota
14-ML	104.15	104.41	1401.2	Divide	Strongly contrasting textural stratification	---	20 to 40	RIP	Steele	North Dakota
14-ML	104.59	104.65	267.7	Divide	Strongly contrasting textural stratification	---	20 to 40	RIP	Steele	North Dakota
14-ML	104.66	104.70	304.7	Divide	Strongly contrasting textural stratification	---	20 to 40	RIP	Steele	North Dakota
14-ML	104.70	105.01	1641.3	Divide	Strongly contrasting textural stratification	---	20 to 40	RIP	Steele	North Dakota
14-ML	105.56	105.73	940.8	Divide	Strongly contrasting textural stratification	---	20 to 40	RIP	Steele	North Dakota
14-ML	105.88	106.07	990.9	Cavour	Natric	Noncemented	7 to 17	RIP	Steele	North Dakota
14-ML	106.27	106.30	182.4	Divide	Strongly contrasting textural stratification	---	20 to 40	RIP	Steele	North Dakota
14-ML	106.30	106.74	2303.6	Divide	Strongly contrasting textural stratification	---	20 to 40	RIP	Steele	North Dakota
14-ML	106.74	107.06	1685.7	Divide	Strongly contrasting textural stratification	---	20 to 40	RIP	Steele	North Dakota
14-ML	107.23	107.29	339.7	Divide	Strongly contrasting textural stratification	---	20 to 40	RIP	Steele	North Dakota
14-ML	109.50	109.61	561.1	Divide	Strongly contrasting textural stratification	---	20 to 40	RIP	Steele	North Dakota
14-ML	439.31	439.35	213.6	Redstoe	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Cedar	Nebraska
14-ML	439.70	439.72	85.2	Redstoe	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Cedar	Nebraska
14-ML	439.77	439.81	191.9	Redstoe	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Cedar	Nebraska
14-ML	439.81	439.83	134.9	Redstoe	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Cedar	Nebraska
14-ML	439.90	439.99	501.7	Redstoe	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Cedar	Nebraska
14-ML	441.22	441.26	211.7	Redstoe	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Cedar	Nebraska
14-ML	441.55	441.70	828.1	Redstoe	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Cedar	Nebraska
14-ML	441.75	441.87	468.1	Hord	Bedrock (paralithic)	---	40 to 60	RIP	Cedar	Nebraska
14-ML	441.87	441.95	427.8	Redstoe	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Cedar	Nebraska
14-ML	441.95	442.05	492.1	Redstoe	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Cedar	Nebraska
14-ML	442.05	442.11	317.8	Hord	Bedrock (paralithic)	---	40 to 60	RIP	Cedar	Nebraska
14-ML	442.11	442.17	338.7	Redstoe	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Cedar	Nebraska
14-ML	442.17	442.25	429.1	Hord	Bedrock (paralithic)	---	40 to 60	RIP	Cedar	Nebraska

LINE	MP		LENGTH [ft]	SOIL NAME	RESTRICTIVE LAYER				COUNTY	STATE
	FROM	TO			KIND	HARDNESS	DEPTH TO TOP - [in]	CONSTRUCTION		
14-ML	442.25	442.30	228.2	Redstoe	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Cedar	Nebraska
14-ML	442.30	442.34	211.8	Herd	Bedrock (paralithic)	---	40 to 60	RIP	Cedar	Nebraska
14-ML	442.34	442.41	367.3	Boyd	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Cedar	Nebraska
14-ML	446.21	446.27	334.5	Gavins	Bedrock (paralithic)	Moderately cemented	10 to 20	RIP	Cedar	Nebraska
14-ML	446.42	446.50	420.1	Gavins	Bedrock (paralithic)	Moderately cemented	10 to 20	RIP	Cedar	Nebraska
14-ML	446.50	446.55	267.5	Redstoe	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Cedar	Nebraska
14-ML	448.20	448.27	414.5	Redstoe	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Cedar	Nebraska
14-ML	448.47	448.56	476.0	Redstoe	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Cedar	Nebraska
14-ML	448.92	448.98	332.9	Redstoe	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Cedar	Nebraska
14-ML	635.36	635.39	194.3	Hedville	Bedrock (lithic)	Moderately cemented	4 to 20	BLAST	Jefferson	Nebraska
14-ML	635.47	635.56	482.1	Hedville	Bedrock (lithic)	Moderately cemented	4 to 20	BLAST	Jefferson	Nebraska
14-ML	635.56	635.56	4.0	Lancaster	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Jefferson	Nebraska
14-ML	635.59	635.65	322.8	Lancaster	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Jefferson	Nebraska
14-ML	635.77	635.88	605.3	Lancaster	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Jefferson	Nebraska
14-ML	635.88	635.95	352.4	Edalgo	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Jefferson	Nebraska
14-ML	635.95	636.07	661.5	Hedville	Bedrock (lithic)	Moderately cemented	4 to 20	BLAST	Jefferson	Nebraska
14-ML	636.07	636.13	292.7	Edalgo	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Jefferson	Nebraska
14-ML	636.13	636.13	24.2	Lancaster	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Jefferson	Nebraska
14-ML	636.13	636.22	441.1	Hedville	Bedrock (lithic)	Moderately cemented	4 to 20	BLAST	Jefferson	Nebraska
14-ML	636.22	636.33	587.1	Lancaster	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Jefferson	Nebraska
14-ML	636.33	636.43	527.7	Lancaster	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Jefferson	Nebraska
14-ML	637.49	637.56	389.1	Lancaster variant	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Jefferson	Nebraska
14-ML	637.70	638.01	1638.1	Lancaster	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Jefferson	Nebraska
14-ML	638.06	638.29	1237.4	Lancaster	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Jefferson	Nebraska
14-ML	638.29	638.34	268.7	Edalgo	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Jefferson	Nebraska
14-ML	638.62	638.62	39.1	Lancaster variant	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Jefferson	Nebraska
14-ML	638.96	639.01	285.0	Lancaster variant	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Jefferson	Nebraska
14-ML	639.18	639.24	285.8	Lancaster variant	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Jefferson	Nebraska
14-ML	639.27	639.34	391.2	Lancaster variant	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Jefferson	Nebraska
14-ML	639.39	639.45	342.4	Lancaster	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Jefferson	Nebraska
14-ML	639.67	639.78	596.2	Edalgo	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Jefferson	Nebraska
14-ML	658.22	658.33	559.2	Kipson	Bedrock (paralithic)	Moderately cemented	7 to 20	RIP	Marshall	Kansas
14-ML	658.46	658.50	212.2	Kipson	Bedrock (paralithic)	Moderately cemented	7 to 20	RIP	Marshall	Kansas
14-ML	659.19	659.29	495.6	Kipson	Bedrock (paralithic)	Moderately cemented	7 to 20	RIP	Marshall	Kansas
14-ML	659.40	659.43	165.2	Kipson	Bedrock (paralithic)	Moderately cemented	7 to 20	RIP	Marshall	Kansas
14-ML	659.60	659.69	455.0	Kipson	Bedrock (paralithic)	Moderately cemented	7 to 20	RIP	Marshall	Kansas
14-ML	662.14	662.16	100.6	Kipson	Bedrock (paralithic)	Moderately cemented	7 to 20	RIP	Marshall	Kansas
14-ML	685.37	685.40	195.0	Kipson	Bedrock (paralithic)	Weakly cemented	7 to ---	RIP	Nemaha	Kansas
15-ML	704.09	704.15	332.6	Padonia	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	704.37	704.38	13.1	Padonia	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	704.38	704.47	480.8	Kipson	Bedrock (paralithic)	Noncemented	7 to 20	RIP	Brown	Kansas
15-ML	704.51	704.62	584.7	Kipson	Bedrock (paralithic)	Noncemented	7 to 20	RIP	Brown	Kansas
15-ML	704.62	704.73	560.7	Padonia	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	704.82	704.88	338.0	Padonia	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	704.93	705.08	776.4	Padonia	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	705.08	705.10	96.4	Kipson	Bedrock (paralithic)	Noncemented	7 to 20	RIP	Brown	Kansas
15-ML	705.10	705.15	280.0	Padonia	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	705.15	705.27	615.8	Kipson	Bedrock (paralithic)	Noncemented	7 to 20	RIP	Brown	Kansas
15-ML	705.27	705.37	542.1	Padonia	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	705.46	705.47	47.7	Kipson	Bedrock (paralithic)	Noncemented	7 to 20	RIP	Brown	Kansas
15-ML	705.53	705.67	739.5	Kipson	Bedrock (paralithic)	Noncemented	7 to 20	RIP	Brown	Kansas
15-ML	707.51	707.58	344.0	Padonia	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	710.23	710.33	495.5	Padonia	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas

LINE	MP		LENGTH [ft]	SOIL NAME	RESTRICTIVE LAYER				COUNTY	STATE
	FROM	TO			KIND	HARDNESS	DEPTH TO TOP - [in]	CONSTRUCTION		
15-ML	710.65	710.81	879.4	Padonia	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	714.39	714.43	211.0	Padonia	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	715.28	715.35	333.0	Wamego	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	717.69	717.72	227.5	Padonia	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	717.78	717.84	318.7	Padonia	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	718.91	719.00	462.1	Wamego	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	720.47	720.54	364.1	Wamego	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	720.61	720.75	766.1	Wamego	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	720.78	721.01	1214.8	Wamego	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	724.02	724.12	496.1	Padonia	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	724.15	724.28	694.4	Padonia	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	724.50	724.62	640.5	Padonia	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	724.75	724.83	426.9	Padonia	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	725.29	725.36	382.1	Wamego	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	725.38	725.56	982.3	Wamego	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	725.84	725.95	600.9	Wamego	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	727.51	727.58	347.1	Wamego	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	727.73	727.95	1174.8	Wamego	Bedrock (paralithic)	Noncemented	20 to 40	RIP	Brown	Kansas
15-ML	728.48	728.51	128.9	Vinland	Bedrock (paralithic)	Weakly cemented	10 to 20	RIP	Doniphan	Kansas
15-ML	729.50	729.55	220.4	Vinland	Bedrock (paralithic)	Weakly cemented	10 to 20	RIP	Doniphan	Kansas
15-ML	729.64	729.78	749.8	Vinland	Bedrock (paralithic)	Weakly cemented	10 to 20	RIP	Doniphan	Kansas
15-ML	740.22	740.31	504.5	Vinland	Bedrock (paralithic)	Weakly cemented	10 to 20	RIP	Doniphan	Kansas
15-ML	740.41	740.46	220.5	Vinland	Bedrock (paralithic)	Weakly cemented	10 to 20	RIP	Doniphan	Kansas
15-ML	747.02	747.13	573.5	Rock outcrop	Bedrock (lithic)	---	---	BLAST	Doniphan	Kansas
15-ML	747.62	747.77	756.0	Rock outcrop	Bedrock (lithic)	---	---	BLAST	Doniphan	Kansas
15-ML	754.26	754.32	279.2	Gosport	Bedrock (paralithic)	---	32 to 32	RIP	Buchanan	Missouri
15-ML	754.78	754.81	140.5	Gosport	Bedrock (paralithic)	---	32 to 32	RIP	Buchanan	Missouri
15-ML	754.85	754.89	175.0	Gosport	Bedrock (paralithic)	---	32 to 32	RIP	Buchanan	Missouri
15-ML	754.94	755.09	801.8	Gosport	Bedrock (paralithic)	---	32 to 32	RIP	Buchanan	Missouri
15-ML	755.21	755.24	169.9	Gosport	Bedrock (paralithic)	---	32 to 32	RIP	Buchanan	Missouri
15-ML	755.46	755.51	268.5	Gosport	Bedrock (paralithic)	---	32 to 32	RIP	Buchanan	Missouri
15-ML	757.73	757.85	660.3	Gosport	Bedrock (paralithic)	Moderately cemented	27 to 40	RIP	Buchanan	Missouri
15-ML	757.97	758.15	950.4	Gosport	Bedrock (paralithic)	Moderately cemented	27 to 40	RIP	Buchanan	Missouri
15-ML	758.84	758.96	631.3	Gosport	Bedrock (paralithic)	Moderately cemented	27 to 40	RIP	Buchanan	Missouri
15-ML	763.61	763.68	360.2	Gosport	Bedrock (paralithic)	Moderately cemented	27 to 40	RIP	Buchanan	Missouri
15-ML	764.36	764.43	384.3	Gosport	Bedrock (paralithic)	Moderately cemented	27 to 40	RIP	Buchanan	Missouri
15-ML	764.53	764.54	69.5	Gosport	Bedrock (paralithic)	Moderately cemented	27 to 40	RIP	Buchanan	Missouri
15-ML	764.57	764.66	446.4	Gosport	Bedrock (paralithic)	Moderately cemented	27 to 40	RIP	Buchanan	Missouri
15-ML	764.69	764.79	539.3	Gosport	Bedrock (paralithic)	Moderately cemented	27 to 40	RIP	Buchanan	Missouri
15-ML	766.87	766.89	132.7	Gasconade	Bedrock (lithic)	Indurated	14 to 21	BLAST	Buchanan	Missouri
15-ML	798.16	798.21	196.4	Snead	Bedrock (paralithic)	---	15 to 36	RIP	Caldwell	Missouri
15-ML	798.55	798.56	166.3	Sampsel	Bedrock (paralithic)	Moderately cemented	40 to 80	RIP	Caldwell	Missouri
15-ML	798.05	798.64	314.2	Snead	Bedrock (paralithic)	Weakly cemented	31 to 33	RIP	Caldwell	Missouri
15-ML	798.80	798.89	454.6	Sampsel	Bedrock (paralithic)	Moderately cemented	40 to 80	RIP	Caldwell	Missouri
15-ML	799.42	799.44	140.3	Rock land	Bedrock (lithic)	---	0 to 60	BLAST	Caldwell	Missouri
15-ML	799.52	799.54	117.7	Rock land	Bedrock (lithic)	---	0 to 60	BLAST	Caldwell	Missouri
15-ML	801.24	801.27	114.2	Snead	Bedrock (paralithic)	Weakly cemented	31 to 33	RIP	Caldwell	Missouri
15-ML	801.51	801.55	237.3	Snead	Bedrock (paralithic)	Weakly cemented	31 to 33	RIP	Caldwell	Missouri
15-ML	801.59	801.59	5.6	Snead	Bedrock (paralithic)	Weakly cemented	31 to 33	RIP	Caldwell	Missouri
15-ML	801.59	801.67	394.2	Sampsel	Bedrock (paralithic)	Moderately cemented	40 to 80	RIP	Caldwell	Missouri
15-ML	807.30	807.32	125.6	Rock land	Bedrock (lithic)	---	0 to 60	BLAST	Caldwell	Missouri

LINE	MP		LENGTH	SOIL NAME	RESTRICTIVE LAYER				COUNTY	STATE
	FROM	TO	[ft]		KIND	HARDNESS	DEPTH TO TOP - [in]	CONSTRUCTION		
15-ML	807.66	807.70	224.5	Rock land	Bedrock (lithic)	---	0 to 60	BLAST	Caldwell	Missouri
15-ML	807.74	807.81	383.2	Rock land	Bedrock (lithic)	---	0 to 60	BLAST	Caldwell	Missouri
15-ML	807.87	807.94	382.3	Rock land	Bedrock (lithic)	---	0 to 60	BLAST	Caldwell	Missouri
15-ML	808.16	808.21	262.9	Rock land	Bedrock (lithic)	---	0 to 60	BLAST	Caldwell	Missouri
15-ML	808.24	808.26	94.2	Rock land	Bedrock (lithic)	---	0 to 60	BLAST	Caldwell	Missouri
15-ML	808.33	808.37	209.4	Rock land	Bedrock (lithic)	---	0 to 60	BLAST	Caldwell	Missouri
15-ML	808.68	808.72	209.7	Rock land	Bedrock (lithic)	---	0 to 60	BLAST	Caldwell	Missouri
15-ML	808.82	808.89	322.9	Rock land	Bedrock (lithic)	---	0 to 60	BLAST	Caldwell	Missouri
15-ML	808.96	809.10	744.0	Rock land	Bedrock (lithic)	---	0 to 60	BLAST	Caldwell	Missouri
15-ML	809.42	809.48	316.5	Sampsel	Bedrock (paralithic)	Moderately cemented	40 to 80	RIP	Caldwell	Missouri
15-ML	809.62	809.72	521.8	Rock land	Bedrock (lithic)	---	0 to 60	BLAST	Caldwell	Missouri
15-ML	809.72	809.92	1057.8	Sampsel	Bedrock (paralithic)	Moderately cemented	40 to 80	RIP	Caldwell	Missouri
15-ML	809.92	810.03	578.4	Rock land	Bedrock (lithic)	---	0 to 60	BLAST	Caldwell	Missouri
15-ML	810.12	810.16	248.0	Rock land	Bedrock (lithic)	---	0 to 60	BLAST	Caldwell	Missouri
15-ML	810.16	810.18	71.2	Snead	Bedrock (paralithic)	Weakly cemented	31 to 33	RIP	Caldwell	Missouri
15-ML	810.18	810.24	329.3	Rock land	Bedrock (lithic)	---	0 to 60	BLAST	Caldwell	Missouri
15-ML	810.29	810.42	676.5	Sampsel	Bedrock (paralithic)	Moderately cemented	63 to 67	RIP	Caldwell	Missouri
15-ML	810.43	810.51	422.6	Sampsel	Bedrock (paralithic)	Moderately cemented	63 to 67	RIP	Caldwell	Missouri
15-ML	810.60	810.72	628.0	Sampsel	Bedrock (paralithic)	Moderately cemented	63 to 67	RIP	Caldwell	Missouri
15-ML	812.72	812.77	253.5	Sampsel	Bedrock (paralithic)	Moderately cemented	63 to 67	RIP	Caldwell	Missouri
15-ML	812.77	812.85	497.9	Rock land	Bedrock (lithic)	---	0 to 60	BLAST	Caldwell	Missouri
15-ML	812.86	812.87	55.7	Snead	Bedrock (paralithic)	---	16 to 35	RIP	Caldwell	Missouri
15-ML	812.87	813.03	821.1	Sampsel	Bedrock (paralithic)	Moderately cemented	63 to 67	RIP	Caldwell	Missouri
15-ML	813.03	813.06	150.9	Snead	Bedrock (paralithic)	---	16 to 35	RIP	Caldwell	Missouri
15-ML	813.44	813.48	255.8	Snead	Bedrock (paralithic)	Weakly cemented	31 to 33	RIP	Caldwell	Missouri
15-ML	813.48	813.59	576.6	Rock land	Bedrock (lithic)	---	0 to 60	BLAST	Caldwell	Missouri
15-ML	813.73	813.74	37.1	Snead	Bedrock (paralithic)	Weakly cemented	31 to 33	RIP	Caldwell	Missouri
15-ML	813.74	813.87	700.7	Rock land	Bedrock (lithic)	---	0 to 60	BLAST	Caldwell	Missouri
15-ML	813.87	813.92	262.2	Snead	Bedrock (paralithic)	Weakly cemented	31 to 33	RIP	Caldwell	Missouri
15-ML	813.97	814.07	541.9	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Caldwell	Missouri
15-ML	814.07	814.10	181.5	Sampsel	Bedrock (paralithic)	Moderately cemented	63 to 67	RIP	Caldwell	Missouri
15-ML	814.15	814.19	225.8	Sampsel	Bedrock (paralithic)	Moderately cemented	63 to 67	RIP	Caldwell	Missouri
15-ML	814.24	814.29	262.3	Sampsel	Bedrock (paralithic)	Moderately cemented	63 to 67	RIP	Caldwell	Missouri
15-ML	814.29	814.32	170.4	Sampsel	Bedrock (paralithic)	Moderately cemented	40 to 80	RIP	Caldwell	Missouri
15-ML	814.32	814.38	296.8	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Caldwell	Missouri
15-ML	814.51	814.92	2145.2	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	815.43	815.64	607.3	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	815.63	815.67	233.4	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	815.78	815.83	269.8	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Carroll	Missouri
15-ML	815.87	815.93	287.1	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Carroll	Missouri
15-ML	816.01	816.15	766.2	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Carroll	Missouri
15-ML	816.16	816.17	39.4	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	816.21	816.23	102.0	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	816.28	816.43	787.3	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	816.49	816.52	160.9	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	816.56	816.72	845.9	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	816.75	816.81	339.0	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	820.50	820.58	413.6	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	820.74	821.31	3044.5	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	821.56	821.69	697.3	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Carroll	Missouri
15-ML	821.76	821.82	334.5	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Carroll	Missouri

LINE	MP		LENGTH	SOIL NAME	RESTRICTIVE LAYER				COUNTY	STATE
	FROM	TO	[ft]		KIND	HARDNESS	DEPTH TO TOP - [in]	CONSTRUCTION		
15-ML	821.91	822.05	589.4	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Carroll	Missouri
15-ML	822.10	822.21	591.3	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Carroll	Missouri
15-ML	822.73	822.94	1114.5	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Carroll	Missouri
15-ML	823.13	823.20	333.7	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Carroll	Missouri
15-ML	823.25	823.36	513.5	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Carroll	Missouri
15-ML	823.36	823.58	1027.1	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Carroll	Missouri
15-ML	823.90	823.91	49.7	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	823.95	823.95	13.6	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	824.22	824.38	844.1	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	824.45	824.51	290.5	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	824.84	824.93	469.6	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	824.69	824.87	984.0	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Carroll	Missouri
15-ML	825.36	825.54	909.4	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Carroll	Missouri
15-ML	825.94	826.04	527.8	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Carroll	Missouri
15-ML	826.05	826.09	211.3	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Carroll	Missouri
15-ML	826.25	826.40	728.2	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Carroll	Missouri
15-ML	829.91	829.99	413.8	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Carroll	Missouri
15-ML	830.03	830.12	504.0	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Carroll	Missouri
15-ML	830.17	830.28	599.3	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	830.31	830.34	136.3	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Carroll	Missouri
15-ML	830.37	830.43	337.8	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Carroll	Missouri
15-ML	832.04	832.08	173.6	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	832.78	832.87	477.5	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	834.22	834.24	77.7	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	834.28	834.41	676.4	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	837.14	837.20	297.9	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Carroll	Missouri
15-ML	837.52	837.69	422.9	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	837.68	837.69	36.8	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	838.25	838.26	94.5	Gosport	Bedrock (paralithic)	---	31 to 64	RIP	Carroll	Missouri
15-ML	843.16	843.25	460.1	Triplett	Abrupt textural change	Noncemented	---	RIP	Charlton	Missouri
15-ML	843.27	843.32	261.9	Triplett	Abrupt textural change	Noncemented	---	RIP	Charlton	Missouri
15-ML	844.57	844.61	223.5	Triplett	Abrupt textural change	Noncemented	---	RIP	Charlton	Missouri
15-ML	844.78	844.89	593.0	Triplett	Abrupt textural change	Noncemented	---	RIP	Charlton	Missouri
15-ML	844.98	845.09	585.3	Triplett	Abrupt textural change	Noncemented	---	RIP	Charlton	Missouri
15-ML	848.66	848.78	639.7	Newcomer	Bedrock (lithic)	Indurated	40 to 80	BLAST	Charlton	Missouri
15-ML	848.78	848.85	364.9	Newcomer	Bedrock (lithic)	Indurated	---	BLAST	Charlton	Missouri
15-ML	848.85	848.96	595.2	Newcomer	Bedrock (lithic)	Indurated	40 to 80	BLAST	Charlton	Missouri
15-ML	849.10	849.34	1300.9	Newcomer	Bedrock (lithic)	Indurated	40 to 80	BLAST	Charlton	Missouri
15-ML	849.39	849.73	1792.7	Newcomer	Bedrock (lithic)	Indurated	40 to 80	BLAST	Charlton	Missouri
15-ML	849.82	849.85	148.9	Newcomer	Bedrock (lithic)	Indurated	40 to 80	BLAST	Charlton	Missouri
15-ML	850.10	850.17	330.8	Newcomer	Bedrock (lithic)	Indurated	40 to 80	BLAST	Charlton	Missouri
15-ML	850.89	850.93	201.2	Newcomer	Bedrock (lithic)	Indurated	40 to 80	BLAST	Charlton	Missouri
15-ML	851.98	852.01	176.7	Newcomer	Bedrock (lithic)	Indurated	40 to 80	BLAST	Charlton	Missouri
15-ML	852.11	852.18	398.7	Newcomer	Bedrock (lithic)	Indurated	40 to 80	BLAST	Charlton	Missouri
15-ML	852.25	852.34	481.5	Newcomer	Bedrock (lithic)	Indurated	40 to 80	BLAST	Charlton	Missouri
15-ML	852.38	852.41	166.2	Newcomer	Bedrock (lithic)	Indurated	40 to 80	BLAST	Charlton	Missouri
15-ML	852.44	852.61	913.7	Newcomer	Bedrock (lithic)	Indurated	40 to 80	BLAST	Charlton	Missouri
15-ML	853.03	853.09	309.4	Newcomer	Bedrock (lithic)	Indurated	40 to 80	BLAST	Charlton	Missouri
15-ML	853.17	853.25	419.3	Newcomer	Bedrock (lithic)	Indurated	40 to 80	BLAST	Charlton	Missouri
15-ML	853.31	853.43	621.5	Newcomer	Bedrock (lithic)	Indurated	40 to 80	BLAST	Charlton	Missouri
15-ML	854.31	854.40	440.7	Newcomer	Bedrock (lithic)	Indurated	40 to 80	BLAST	Charlton	Missouri

LINE	MP		LENGTH	SOIL NAME	RESTRICTIVE LAYER				COUNTY	STATE
	FROM	TO	[ft]		KIND	HARDNESS	DEPTH TO TOP - [in]	CONSTRUCTION		
15-ML	854.46	854.55	475.6	Newcomer	Bedrock (lithic)	Indurated	40 to 80	BLAST	Charlton	Missouri
15-ML	854.57	854.62	250.5	Newcomer	Bedrock (lithic)	Indurated	40 to 80	BLAST	Charlton	Missouri
15-ML	854.70	854.76	336.4	Newcomer	Bedrock (lithic)	Indurated	40 to 80	BLAST	Charlton	Missouri
15-ML	854.84	854.90	298.2	Newcomer	Bedrock (lithic)	Indurated	40 to 80	BLAST	Charlton	Missouri
15-ML	856.82	857.00	968.3	Triplett	Abrupt textural change	Noncemented	---	RIP	Charlton	Missouri
15-ML	871.36	871.40	72.9	Newcomer	Bedrock (lithic)	Indurated	40 to 80	BLAST	Charlton	Missouri
15-ML	871.40	871.43	162.5	Newcomer	Bedrock (lithic)	Indurated	---	BLAST	Charlton	Missouri
15-ML	876.12	876.17	231.6	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Randolph	Missouri
15-ML	876.23	876.30	364.7	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Randolph	Missouri
15-ML	876.37	876.44	349.1	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Randolph	Missouri
15-ML	877.01	877.11	544.0	Reger	Bedrock (paralithic)	---	16 to 40	RIP	Randolph	Missouri
15-ML	877.18	877.41	1241.2	Reger	Bedrock (paralithic)	---	16 to 40	RIP	Randolph	Missouri
15-ML	877.55	877.59	216.8	Reger	Bedrock (paralithic)	---	16 to 40	RIP	Randolph	Missouri
15-ML	877.62	877.84	1171.6	Reger	Bedrock (paralithic)	---	16 to 40	RIP	Randolph	Missouri
15-ML	877.85	877.87	66.6	Reger	Bedrock (paralithic)	---	16 to 40	RIP	Randolph	Missouri
15-ML	879.52	879.68	826.8	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Randolph	Missouri
15-ML	880.16	880.40	1259.7	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Randolph	Missouri
15-ML	880.44	880.72	1507.0	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Randolph	Missouri
15-ML	881.25	881.45	1026.5	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Randolph	Missouri
15-ML	882.52	882.60	421.8	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Randolph	Missouri
15-ML	882.69	882.79	542.1	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Randolph	Missouri
15-ML	883.06	883.20	749.9	Gosport	Bedrock (paralithic)	---	20 to 40	RIP	Randolph	Missouri
15-ML	886.47	887.41	4974.5	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Randolph	Missouri
15-ML	887.85	888.05	1013.1	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Randolph	Missouri
15-ML	888.12	888.47	1869.3	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Randolph	Missouri
15-ML	889.16	889.74	3090.9	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Randolph	Missouri
15-ML	890.15	890.83	3581.0	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Randolph	Missouri
15-ML	898.63	899.18	2899.5	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Audrain	Missouri
15-ML	901.95	902.04	494.9	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Audrain	Missouri
15-ML	902.18	902.27	484.2	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Audrain	Missouri
15-ML	902.53	902.74	1112.2	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Audrain	Missouri
15-ML	904.50	904.59	493.5	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Audrain	Missouri
15-ML	904.67	904.95	1454.0	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Audrain	Missouri
15-ML	905.19	905.45	1363.3	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Audrain	Missouri
15-ML	905.85	907.04	1002.2	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Audrain	Missouri
15-ML	909.12	911.25	11211.2	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Audrain	Missouri
15-ML	911.90	912.11	1140.3	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Audrain	Missouri
15-ML	917.99	918.02	156.5	Marion	Abrupt textural change	Noncemented	5 to 18	RIP	Audrain	Missouri
15-ML	918.41	918.43	120.6	Winnegan	Bedrock (lithic)	Very strongly cemented	36 to 55	BLAST	Audrain	Missouri
15-ML	919.03	919.14	561.4	Winnegan	Bedrock (lithic)	Very strongly cemented	36 to 55	BLAST	Audrain	Missouri
15-ML	919.26	919.28	102.3	Marion	Abrupt textural change	Noncemented	5 to 18	RIP	Audrain	Missouri
15-ML	919.41	919.52	591.9	Winnegan	Bedrock (lithic)	Very strongly cemented	36 to 55	BLAST	Audrain	Missouri
15-ML	920.32	921.18	4549.4	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Audrain	Missouri
15-ML	924.01	924.07	324.4	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Audrain	Missouri
15-ML	924.31	924.42	583.6	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Audrain	Missouri
15-ML	925.52	925.70	933.9	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Audrain	Missouri
15-ML	926.46	926.53	368.3	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Audrain	Missouri
15-ML	927.43	927.66	1214.9	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Audrain	Missouri
15-ML	929.80	930.23	2239.6	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Audrain	Missouri
15-ML	931.82	932.13	1636.9	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Audrain	Missouri
15-ML	932.67	932.82	755.3	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Audrain	Missouri

LINE	MP		LENGTH	SOIL NAME	RESTRICTIVE LAYER				COUNTY	STATE
	FROM	TO	[ft]		KIND	HARDNESS	DEPTH TO TOP - [in]	CONSTRUCTION		
15-ML	932.82	933.69	5624.2	Putnam	Abrupt textural change	Noncemented	10 to 20	RIP	Montgomery	Missouri
15-ML	934.30	934.41	553.1	Putnam	Abrupt textural change	Noncemented	---	RIP	Montgomery	Missouri
15-ML	935.98	936.45	2460.7	Putnam	Abrupt textural change	Noncemented	---	RIP	Montgomery	Missouri
15-ML	936.60	936.70	507.4	Putnam	Abrupt textural change	Noncemented	---	RIP	Montgomery	Missouri
15-ML	939.58	939.74	868.3	Auxvasse	Abrupt textural change	Noncemented	12 to ---	RIP	Montgomery	Missouri
15-ML	941.92	941.96	205.1	Auxvasse	Abrupt textural change	Noncemented	12 to ---	RIP	Montgomery	Missouri
15-ML	942.24	942.31	339.1	Halton	Dense material	Noncemented	27 to ---	RIP	Montgomery	Missouri
15-ML	942.69	942.81	629.5	Halton	Dense material	Noncemented	27 to ---	RIP	Montgomery	Missouri
15-ML	943.04	943.15	561.6	Halton	Dense material	Noncemented	27 to ---	RIP	Montgomery	Missouri
15-ML	948.51	948.54	199.6	Halton	Dense material	Noncemented	27 to ---	RIP	Montgomery	Missouri
15-ML	948.59	948.62	149.8	Gasconade	Bedrock (lithic)	Indurated	4 to ---	BLAST	Montgomery	Missouri
15-ML	949.25	949.30	256.7	Sampsel	Bedrock (paralithic)	Moderately cemented	63 to ---	RIP	Montgomery	Missouri
15-ML	949.40	949.44	227.0	Sampsel	Bedrock (paralithic)	Moderately cemented	63 to ---	RIP	Montgomery	Missouri
15-ML	950.40	950.54	767.2	Sampsel	Bedrock (paralithic)	Moderately cemented	63 to ---	RIP	Montgomery	Missouri
15-ML	950.54	950.57	156.2	Gasconade	Bedrock (lithic)	Indurated	4 to ---	BLAST	Montgomery	Missouri
15-ML	950.59	950.61	85.5	Gasconade	Bedrock (lithic)	Indurated	4 to ---	BLAST	Montgomery	Missouri
15-ML	950.61	950.85	1296.4	Sampsel	Bedrock (paralithic)	Moderately cemented	63 to ---	RIP	Montgomery	Missouri
15-ML	950.91	950.97	322.8	Gasconade	Bedrock (lithic)	Indurated	4 to ---	BLAST	Montgomery	Missouri
15-ML	950.97	951.00	154.1	Gasconade	Bedrock (lithic)	Indurated	4 to ---	BLAST	Montgomery	Missouri
15-ML	951.13	951.20	406.4	Auxvasse	Abrupt textural change	Noncemented	12 to ---	RIP	Montgomery	Missouri
15-ML	951.26	951.36	546.0	Gasconade	Bedrock (lithic)	Indurated	4 to ---	BLAST	Montgomery	Missouri
15-ML	951.36	951.39	134.5	Snead	Bedrock (paralithic)	Weakly cemented	31 to ---	RIP	Montgomery	Missouri
15-ML	951.50	951.52	144.2	Snead	Bedrock (paralithic)	Weakly cemented	31 to ---	RIP	Montgomery	Missouri
15-ML	951.52	951.55	114.4	Gasconade	Bedrock (lithic)	Indurated	4 to ---	BLAST	Montgomery	Missouri
15-ML	951.60	951.98	2012.2	Snead	Bedrock (paralithic)	Weakly cemented	31 to ---	RIP	Montgomery	Missouri
15-ML	952.02	952.03	63.8	Snead	Bedrock (paralithic)	Weakly cemented	31 to ---	RIP	Montgomery	Missouri
15-ML	952.29	952.51	1150.5	Snead	Bedrock (paralithic)	Weakly cemented	31 to ---	RIP	Montgomery	Missouri
15-ML	952.51	952.56	264.4	Gasconade	Bedrock (lithic)	Indurated	4 to ---	BLAST	Montgomery	Missouri
15-ML	952.61	952.64	153.7	Gasconade	Bedrock (lithic)	Indurated	4 to ---	BLAST	Montgomery	Missouri
15-ML	952.64	952.64	41.8	Snead	Bedrock (paralithic)	Weakly cemented	31 to ---	RIP	Montgomery	Missouri
15-ML	952.64	952.69	246.8	Gasconade	Bedrock (lithic)	Indurated	4 to ---	BLAST	Montgomery	Missouri
15-ML	952.69	952.79	539.7	Snead	Bedrock (paralithic)	Weakly cemented	31 to ---	RIP	Montgomery	Missouri
15-ML	952.79	952.89	530.3	Sampsel	Bedrock (paralithic)	Moderately cemented	63 to ---	RIP	Montgomery	Missouri
15-ML	953.20	953.23	194.1	Gasconade	Bedrock (lithic)	Indurated	4 to ---	BLAST	Montgomery	Missouri
15-ML	953.23	953.31	399.8	Gasconade	Bedrock (lithic)	Indurated	4 to ---	BLAST	Montgomery	Missouri
15-ML	953.38	953.42	215.3	Gasconade	Bedrock (lithic)	Indurated	4 to ---	BLAST	Montgomery	Missouri
15-ML	953.45	953.46	71.4	Gasconade	Bedrock (lithic)	Indurated	4 to ---	BLAST	Montgomery	Missouri
15-ML	953.50	953.52	118.3	Gasconade	Bedrock (lithic)	Indurated	4 to ---	BLAST	Montgomery	Missouri
15-ML	953.64	953.74	526.2	Gasconade	Bedrock (lithic)	Indurated	4 to ---	BLAST	Montgomery	Missouri
15-ML	953.77	953.82	246.9	Halton	Dense material	Noncemented	27 to ---	RIP	Montgomery	Missouri
15-ML	953.82	954.01	984.1	Halton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	954.02	954.04	121.1	Halton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	954.04	954.10	315.6	Halton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	954.20	954.29	454.6	Halton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	954.94	955.09	755.7	Halton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	955.21	955.27	315.6	Halton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	957.22	957.29	348.1	Gasconade	Bedrock (lithic)	Indurated	4 to 20	BLAST	Lincoln	Missouri
15-ML	959.95	960.09	722.6	Halton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	960.43	960.52	466.6	Halton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	961.63	961.69	336.8	Gasconade	Bedrock (lithic)	Indurated	4 to 20	BLAST	Lincoln	Missouri
15-ML	961.69	961.74	270.3	Bucklick	Bedrock (lithic)	Indurated	40 to 60	BLAST	Lincoln	Missouri

LINE	MP		LENGTH	SOIL NAME	RESTRICTIVE LAYER				COUNTY	STATE
	FROM	TO	[ft]		KIND	HARDNESS	DEPTH TO TOP - [in]	CONSTRUCTION		
15-ML	961.74	961.83	469.5	Gasconade	Bedrock (lithic)	Indurated	4 to 20	BLAST	Lincoln	Missouri
15-ML	962.23	962.26	170.9	Hatton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	962.30	962.38	389.1	Hatton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	962.71	962.77	294.1	Hatton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	963.04	963.08	205.1	Hatton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	963.23	963.25	114.2	Hatton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	963.51	963.63	593.3	Hatton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	963.83	963.99	871.0	Hatton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	964.29	964.34	266.3	Hatton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	964.46	964.50	204.3	Hatton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	964.75	964.83	443.1	Hatton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	965.07	965.15	423.0	Hatton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	965.30	965.35	264.0	Hatton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	965.41	965.45	177.6	Hatton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	965.69	965.84	781.3	Hatton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	966.20	966.25	240.2	Hatton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	966.38	966.55	902.9	Hatton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	966.58	966.65	396.4	Hatton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	966.85	966.89	198.1	Hatton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	966.91	967.00	427.0	Bucklick	Bedrock (lithic)	Indurated	40 to 60	BLAST	Lincoln	Missouri
15-ML	967.48	967.53	231.4	Bucklick	Bedrock (lithic)	Indurated	40 to 60	BLAST	Lincoln	Missouri
15-ML	967.70	967.74	208.0	Bucklick	Bedrock (lithic)	Indurated	40 to 60	BLAST	Lincoln	Missouri
15-ML	968.08	968.21	728.6	Bucklick	Bedrock (lithic)	Indurated	40 to 60	BLAST	Lincoln	Missouri
15-ML	968.39	968.69	1582.3	Bucklick	Bedrock (lithic)	Indurated	40 to 60	BLAST	Lincoln	Missouri
15-ML	969.02	969.05	165.8	Bucklick	Bedrock (lithic)	Indurated	40 to 60	BLAST	Lincoln	Missouri
15-ML	969.24	969.28	223.8	Bucklick	Bedrock (lithic)	Indurated	40 to 60	BLAST	Lincoln	Missouri
15-ML	969.34	969.38	237.8	Bucklick	Bedrock (lithic)	Indurated	40 to 60	BLAST	Lincoln	Missouri
15-ML	969.57	969.62	227.9	Bucklick	Bedrock (lithic)	Indurated	40 to 60	BLAST	Lincoln	Missouri
15-ML	969.83	969.94	598.8	Bucklick	Bedrock (lithic)	Indurated	40 to 60	BLAST	Lincoln	Missouri
15-ML	969.99	970.07	447.6	Bucklick	Bedrock (lithic)	Indurated	40 to 60	BLAST	Lincoln	Missouri
15-ML	971.95	972.11	850.8	Hatton	Dense material	Noncemented	27 to 38	RIP	Lincoln	Missouri
15-ML	976.37	976.40	150.0	Bucklick	Bedrock (lithic)	Indurated	40 to 60	BLAST	Lincoln	Missouri
15-ML	976.45	976.54	401.3	Bucklick	Bedrock (lithic)	Indurated	40 to 60	BLAST	Lincoln	Missouri
15-ML	976.82	976.86	213.7	Bucklick	Bedrock (lithic)	Indurated	40 to 60	BLAST	Lincoln	Missouri
15-ML	977.03	977.09	318.5	Bucklick	Bedrock (lithic)	Indurated	40 to 60	BLAST	Lincoln	Missouri
15-ML	977.19	977.22	138.2	Bucklick	Bedrock (lithic)	Indurated	40 to 60	BLAST	Lincoln	Missouri
15-ML	977.30	977.35	250.1	Bucklick	Bedrock (lithic)	Indurated	40 to 60	BLAST	Lincoln	Missouri
15-ML	977.70	977.75	292.5	Bucklick	Bedrock (lithic)	Indurated	40 to 60	BLAST	Lincoln	Missouri
15-ML	977.89	977.91	135.4	Bucklick	Bedrock (lithic)	Indurated	40 to 60	BLAST	Lincoln	Missouri
15-ML	978.97	979.01	174.2	Bucklick	Bedrock (lithic)	Indurated	40 to 60	BLAST	Lincoln	Missouri
16-ML	1045.47	1045.50	116.0	Gosport	Bedrock (parallithic)	---	20 to 40	RIP	Madison	Illinois
16-ML	1045.68	1045.70	105.8	Gosport	Bedrock (parallithic)	---	20 to 40	RIP	Madison	Illinois
16-ML	1045.90	1045.93	125.0	Gosport	Bedrock (parallithic)	---	20 to 40	RIP	Madison	Illinois
16-ML	1045.93	1045.96	134.1	Gosport	Bedrock (parallithic)	---	20 to 40	RIP	Madison	Illinois

TOTAL BEDROCK OCCURRENCE= 227851.4 feet OR 4.03% FROM ML TOTAL LENGTH

TOTAL BLASTING= 34312.3 feet OR 0.60% FROM ML TOTAL LENGTH

TOTAL RIPPING= 193539.1 feet OR 3.43% FROM ML TOTAL LENGTH

LINE	MP		LENGTH	SOIL NAME	RESTRICTIVE LAYER				COUNTY	STATE
	FROM	TO	[ft]		KIND	HARDNESS	DEPTH TO TOP - [in]	CONSTRUCTION		
14-CE	0.50	0.66	825.4	Hedville	Bedrock (lithic)	Moderately cemented	4 to 20	BLAST	Jefferson	Nebraska
14-CE	14.90	15.00	535.6	Sogn	Bedrock (lithic)	Indurated	4 to 20	BLAST	Washington	Kansas
14-CE	15.00	15.20	1085.4	Lancaster	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Washington	Kansas
14-CE	15.67	15.69	659.8	Lancaster	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Washington	Kansas
14-CE	15.82	15.87	278.8	Sogn	Bedrock (lithic)	Indurated	4 to 20	BLAST	Washington	Kansas
14-CE	15.87	15.99	656.2	Lancaster	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Washington	Kansas
14-CE	26.00	26.03	157.6	Lancaster	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Washington	Kansas
14-CE	39.77	39.85	432.0	Hedville	Bedrock (lithic)	Strongly cemented	4 to 20	BLAST	Clay	Kansas
14-CE	40.25	40.30	701.7	Hedville	Bedrock (lithic)	Strongly cemented	4 to 20	BLAST	Clay	Kansas
14-CE	41.04	41.26	1124.3	Hedville	Bedrock (lithic)	Strongly cemented	4 to 20	BLAST	Clay	Kansas
14-CE	41.38	41.72	1791.8	Hedville	Bedrock (lithic)	Strongly cemented	4 to 20	BLAST	Clay	Kansas
14-CE	41.99	42.33	1790.9	Hedville	Bedrock (lithic)	Strongly cemented	4 to 20	BLAST	Clay	Kansas
14-CE	44.12	44.20	426.3	Benfield	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Clay	Kansas
14-CE	44.21	44.28	376.5	Benfield	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Clay	Kansas
14-CE	45.20	45.24	203.2	Benfield	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Clay	Kansas
14-CE	45.36	45.45	460.2	Benfield	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Clay	Kansas
14-CE	45.63	45.67	719.9	Benfield	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Clay	Kansas
14-CE	53.38	53.59	1077.5	Kipson	Bedrock (paralithic)	---	7 to 20	RIP	Clay	Kansas
14-CE	54.39	54.46	365.9	Kipson	Bedrock (paralithic)	---	7 to 20	RIP	Clay	Kansas
14-CE	55.93	56.10	891.8	Kipson	Bedrock (paralithic)	---	7 to 20	RIP	Clay	Kansas
14-CE	56.27	56.39	613.1	Kipson	Bedrock (paralithic)	---	7 to 20	RIP	Clay	Kansas
14-CE	56.46	56.55	485.0	Kipson	Bedrock (paralithic)	---	7 to 20	RIP	Clay	Kansas
14-CE	56.64	56.71	381.2	Kipson	Bedrock (paralithic)	---	7 to 20	RIP	Clay	Kansas
14-CE	56.76	56.98	1127.6	Kipson	Bedrock (paralithic)	---	7 to 20	RIP	Clay	Kansas
14-CE	57.38	57.57	1031.8	Benfield	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Clay	Kansas
14-CE	56.39	56.49	525.5	Kipson	Bedrock (paralithic)	---	7 to 20	RIP	Clay	Kansas
14-CE	60.19	60.31	595.8	Kipson	Bedrock (paralithic)	---	7 to 20	RIP	Clay	Kansas
14-CE	60.68	60.71	179.2	Kipson	Bedrock (paralithic)	---	7 to 20	RIP	Clay	Kansas
14-CE	60.90	60.98	431.4	Kipson	Bedrock (paralithic)	---	7 to 20	RIP	Clay	Kansas
14-CE	87.71	87.80	444.5	Clime	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Dickinson	Kansas
14-CE	88.11	88.21	556.5	Clime	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Dickinson	Kansas
14-CE	80.38	80.49	550.7	Clime	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Dickinson	Kansas
14-CE	81.93	82.12	977.8	Clime	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Dickinson	Kansas
14-CE	91.34	91.43	478.2	Clime	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Dickinson	Kansas
14-CE	92.45	92.61	830.6	Clime	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Dickinson	Kansas
14-CE	96.33	96.40	371.9	Clime	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Dickinson	Kansas
14-CE	96.50	96.59	462.5	Clime	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Dickinson	Kansas
14-CE	96.73	96.76	131.0	Clime	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Dickinson	Kansas
14-CE	97.23	97.25	136.2	Clime	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Dickinson	Kansas
14-CE	96.07	96.13	328.3	Clime	Bedrock (paralithic)	Moderately cemented	20 to 40	RIP	Dickinson	Kansas
14-CE	101.88	102.12	1284.1	Clime	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Marion	Kansas
14-CE	104.90	104.93	22.7	Clime	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Marion	Kansas
14-CE	105.47	106.18	3747.4	Clime	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Marion	Kansas
14-CE	106.40	107.22	4304.0	Clime	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Marion	Kansas
14-CE	107.22	107.82	3184.4	Rosehill	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Marion	Kansas
14-CE	107.82	108.09	1417.7	Clime	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Marion	Kansas
14-CE	108.53	108.57	186.6	Rosehill	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Marion	Kansas
14-CE	108.71	110.07	7156.6	Clime	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Marion	Kansas
14-CE	111.60	111.77	880.2	Clime	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Marion	Kansas
14-CE	112.23	112.29	293.9	Clime	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Marion	Kansas
14-CE	112.48	112.65	919.7	Clime	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Marion	Kansas
14-CE	115.97	116.05	491.0	Clime	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Marion	Kansas
14-CE	116.16	116.25	436.6	Labette	Bedrock (lithic)	Indurated	20 to 40	BLAST	Marion	Kansas

LINE	MP		LENGTH [ft]	SOIL NAME	RESTRICTIVE LAYER				COUNTY	STATE
	FROM	TO			KIND	HARDNESS	DEPTH TO TOP - [in]	CONSTRUCTION		
14-CE	116.25	116.54	1556.1	Labette	Bedrock (lithic)	Indurated	20 to 40	BLAST	Marion	Kansas
14-CE	116.54	116.61	340.2	Clime	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Marion	Kansas
14-CE	119.26	119.60	1857.1	Clime	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Marion	Kansas
14-CE	119.90	120.00	524.5	Clime	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Marion	Kansas
14-CE	120.00	120.19	1000.8	Clime	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Marion	Kansas
14-CE	120.19	120.26	347.5	Clime	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Marion	Kansas
14-CE	120.26	120.49	1224.4	Clime	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Marion	Kansas
14-CE	251.15	251.20	240.2	Grainola	Bedrock (paralithic)	Very weakly cemented	20 to 40	RIP	Noble	Oklahoma
14-CE	251.20	251.26	303.0	Grainola	Bedrock (paralithic)	Very weakly cemented	20 to 40	RIP	Noble	Oklahoma
14-CE	251.26	251.28	112.2	Grainola	Bedrock (paralithic)	Very weakly cemented	20 to 40	RIP	Noble	Oklahoma
14-CE	251.28	251.30	135.3	Grainola	Bedrock (paralithic)	Very weakly cemented	20 to 40	RIP	Noble	Oklahoma
14-CE	251.30	251.36	278.0	Grainola	Bedrock (paralithic)	Very weakly cemented	20 to 40	RIP	Noble	Oklahoma
14-CE	264.62	264.63	94.4	Renfrow	Bedrock (paralithic)	Very weakly cemented	61 to 80	RIP	Noble	Oklahoma
14-CE	280.49	280.58	498.3	Zaneis	Bedrock (paralithic)	Weakly cemented	40 to 60	RIP	Payne	Oklahoma
14-CE	280.58	280.63	237.9	Coyle	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Payne	Oklahoma
14-CE	280.72	280.78	324.3	Coyle	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Payne	Oklahoma
14-CE	281.04	281.20	844.0	Stephenville	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Payne	Oklahoma
14-CE	287.73	287.78	260.6	Darnell	Bedrock (paralithic)	Weakly cemented	10 to 20	RIP	Payne	Oklahoma
14-CE	287.78	287.82	208.5	Grainola	Bedrock (paralithic)	Weakly cemented	20 to 40	RIP	Payne	Oklahoma

TOTAL BEDROCK OCCURRENCE= 59503.3 feet OR 3.85% FROM CE TOTAL LENGTH
TOTAL BLASTING= 9473.0 feet OR 0.61% FROM ML TOTAL LENGTH
TOTAL RIPPING= 50030.2 feet OR 3.24% FROM ML TOTAL LENGTH

(1) This table gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

(2) A "restrictive layer" is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness of the restrictive layer, both of which significantly affect the ease of excavation.

(3) "Depth to top" is the vertical distance from the soil surface to the upper boundary of the restrictive layer measured in inches.

(4) Data Source: Natural Resources Conservation Service (NRCS) http://soils.usda.gov/survey/geography/

(5) NOTE: Absence of an entry (- - -) indicates that the feature is not a concern or that data were not estimated.

Appendix F

Soil Associations along the Keystone Pipeline Project Route

Appendix F: Soil Associations Along the Proposed Keystone Pipeline Project

State	Approx. Start MP	Approx. End MP	Approx. Miles	MUID	Name	Highly Erodible %	Compaction Prone %	Low Revegetation Potential %	A-Horizon >12" Deep %	Prime Farmland %	Hydric %	Shallow (<60") Bedrock %
MAINLINE												
ND	0	1.3	1.3	ND012	GLYNDON-GILBY-GARDENA (ND012)	0	17	0	15	0	8	0
ND	1.3	4.1	2.8	ND004	HEGNE-FARGO-BEARDEN (ND004)	0	22	0	5	100	83	0
ND	4.1	6.3	2.2	ND021	HECLA-HAMAR-ULEN (ND021)	0	1	0	49	9	32	0
ND	6.3	7.4	1.2	ND027	BRANTFORD-VANG-WALSH (ND027)	2	2	98	33	0	2	0
ND	7.4	8.2	0.7	ND066	LA PRAIRIE-FAIRDALE-GARDENA (ND066)	1	0	12	19	0	5	0
ND	8.2	14	5.8	ND027	BRANTFORD-VANG-WALSH (ND027)	2	2	98	33	0	2	0
ND	14	32.5	18.5	ND061	KELVIN-WAUKON-OLGA (ND061)	30	0	59	8	67	0	7
ND	32.5	34.7	2.2	ND045	BARNES-SVEA-TONKA (ND045)	2	8	56	11	81	11	0
ND	34.7	35.4	0.7	ND038	EDGELEY-KLOTEN-SVEA (ND038)	27	5	67	3	56	5	60
ND	35.4	37.5	2.1	ND045	BARNES-SVEA-TONKA (ND045)	2	8	56	11	81	11	0
ND	37.5	38	0.5	ND038	EDGELEY-KLOTEN-SVEA (ND038)	27	4	66	3	56	5	60
ND	38	41.3	3.2	ND045	BARNES-SVEA-TONKA (ND045)	2	8	56	11	81	11	0
ND	41.3	43	1.8	ND038	EDGELEY-KLOTEN-SVEA (ND038)	27	5	67	3	56	5	60
ND	43	44.3	1.3	ND043	SVEA-BUSE-HAMERLY (ND043)	9	10	30	21	55	21	0
ND	44.3	46	1.7	ND051	SVEA-CRESBARD-HAMERLY (ND051)	0	5	8	6	58	8	0
ND	46	53.7	7.7	ND043	SVEA-BUSE-HAMERLY (ND043)	9	10	30	21	55	21	0
ND	53.7	55.4	1.7	ND025	BRANTFORD-RENSHAW-LANKIN (ND025)	8	8	31	34	35	17	0
ND	55.4	57.1	1.6	ND043	SVEA-BUSE-HAMERLY (ND043)	9	10	30	21	55	21	0
ND	57.1	57.6	0.5	ND040	HAMERLY-TONKA-SVEA (ND040)	0	23	19	30	73	30	0
ND	57.6	58	0.4	ND043	SVEA-BUSE-HAMERLY (ND043)	10	10	29	21	55	21	0
ND	58	58.7	0.7	ND040	HAMERLY-TONKA-SVEA (ND040)	0	23	18	30	73	30	0
ND	58.7	59.9	1.2	ND043	SVEA-BUSE-HAMERLY (ND043)	9	10	30	21	55	21	0
ND	59.9	61.6	1.8	ND053	CRESBARD-BARNES-CAVOUR (ND053)	1	7	33	7	46	7	0
ND	61.6	61.7	0	ND043	SVEA-BUSE-HAMERLY (ND043)	0	0	0	21	55	21	0
ND	61.7	66	4.4	ND053	CRESBARD-BARNES-CAVOUR (ND053)	1	7	33	7	46	7	0
ND	66	66.6	0.5	ND046	BARNES-SVEA-HAMERLY (ND046)	0	6	43	9	80	9	0
ND	66.6	69.2	2.6	ND037	BARNES-BUSE-PARNELL (ND037)	51	11	70	16	21	11	2
ND	69.2	73.6	4.5	ND046	BARNES-SVEA-HAMERLY (ND046)	0	6	43	9	80	9	0
ND	73.6	74.7	1.1	ND040	HAMERLY-TONKA-SVEA (ND040)	0	23	19	30	73	30	0
ND	74.7	78.7	4	ND043	SVEA-BUSE-HAMERLY (ND043)	9	10	30	21	55	21	0
ND	78.7	79.5	0.8	ND051	SVEA-CRESBARD-HAMERLY (ND051)	0	5	7	6	58	8	0
ND	79.5	83.8	4.3	ND043	SVEA-BUSE-HAMERLY (ND043)	9	10	30	21	55	21	0
ND	83.8	84.9	1.1	ND053	CRESBARD-BARNES-CAVOUR (ND053)	1	7	33	7	46	7	0
ND	84.9	87.1	2.2	ND043	SVEA-BUSE-HAMERLY (ND043)	9	10	30	21	55	21	0
ND	87.1	87.8	0.7	ND051	SVEA-CRESBARD-HAMERLY (ND051)	0	5	6	6	58	8	0
ND	87.8	90.4	2.6	ND043	SVEA-BUSE-HAMERLY (ND043)	9	10	30	21	55	21	0
ND	90.4	90.9	0.5	ND040	HAMERLY-TONKA-SVEA (ND040)	0	22	18	30	73	30	0
ND	90.9	104	13.1	ND043	SVEA-BUSE-HAMERLY (ND043)	9	10	30	21	55	21	0
ND	104	104.7	0.7	ND025	BRANTFORD-RENSHAW-LANKIN (ND025)	7	7	31	34	35	17	0
ND	104.7	107.4	2.7	ND051	SVEA-CRESBARD-HAMERLY (ND051)	0	5	8	6	58	8	0
ND	107.4	109.3	2	ND057	HEIMDAL-EMRICK-ESMOND (ND057)	20	5	37	13	54	10	0
ND	109.3	109.4	0	ND051	SVEA-CRESBARD-HAMERLY (ND051)	0	0	0	6	58	8	0
ND	109.4	110.5	1.2	ND043	SVEA-BUSE-HAMERLY (ND043)	9	10	30	21	55	21	0
ND	110.5	128.6	18	ND047	BARNES-BUSE-SVEA (ND047)	28	5	78	5	30	5	0
ND	128.6	129.6	1	ND046	BARNES-SVEA-HAMERLY (ND046)	0	6	43	9	80	9	0
ND	129.6	130	0.5	ND047	BARNES-BUSE-SVEA (ND047)	29	4	77	5	30	5	0
ND	130	132	2	ND046	BARNES-SVEA-HAMERLY (ND046)	0	6	43	9	80	9	0
ND	132	134.2	2.2	ND047	BARNES-BUSE-SVEA (ND047)	28	5	78	5	30	5	0
ND	134.2	134.8	0.7	ND026	RENSHAW-ARVILLA-DIVIDE (ND026)	2	5	30	16	31	16	0
ND	134.8	135.5	0.7	ND011	GARDENA-GLYNDON-BARNES (ND011)	4	22	19	33	0	13	2
ND	135.5	136.8	1.3	ND026	RENSHAW-ARVILLA-DIVIDE (ND026)	2	5	31	16	31	16	0
ND	136.8	137.4	0.6	ND011	GARDENA-GLYNDON-BARNES (ND011)	3	21	20	33	0	13	2

Appendix F: Soil Associations Along the Proposed Keystone Pipeline Project

State	Approx. Start MP	Approx. End MP	Approx. Miles	MUID	Name	Highly Erodible %	Compaction Prone %	Low Revegetation Potential %	A-Horizon >12" Deep %	Prime Farmland %	Hydric %	Shallow (<60") Bedrock %
ND	137.4	140.4	2.9	ND026	RENSHAW-ARVILLA-DIVIDE (ND026)	2	5	31	16	31	16	0
ND	140.4	141.9	1.5	ND046	BARNES-SVEA-HAMERLY (ND046)	0	6	43	9	80	9	0
ND	141.9	142.3	0.4	ND054	VALLERS-PARNELL-GLYNDON (ND054)	0	25	8	47	28	53	0
ND	142.3	144.6	2.3	ND046	BARNES-SVEA-HAMERLY (ND046)	0	6	43	9	80	9	0
ND	144.6	144.7	0.2	ND011	GARDENA-GLYNDON-BARNES (ND011)	5	19	19	33	0	13	2
ND	144.7	145.4	0.7	ND046	BARNES-SVEA-HAMERLY (ND046)	0	6	43	9	80	9	0
ND	145.4	148.9	3.5	ND011	GARDENA-GLYNDON-BARNES (ND011)	4	22	19	33	0	13	2
ND	148.9	149.4	0.5	ND046	BARNES-SVEA-HAMERLY (ND046)	0	6	43	9	80	9	0
ND	149.4	150	0.5	ND011	GARDENA-GLYNDON-BARNES (ND011)	4	22	19	33	0	13	2
ND	150	162.5	12.5	ND046	BARNES-SVEA-HAMERLY (ND046)	0	6	43	9	80	9	0
ND	162.5	164	1.5	ND047	BARNES-BUSE-SVEA (ND047)	28	5	78	5	30	5	0
ND	164	165.2	1.2	ND046	BARNES-SVEA-HAMERLY (ND046)	0	6	43	9	80	9	0
ND	165.2	166.3	1.2	ND039	LA PRAIRIE-BARNES-RENSHAW (ND039)	20	2	51	6	62	2	0
ND	166.3	167.4	1	ND046	BARNES-SVEA-HAMERLY (ND046)	0	6	43	9	80	9	0
ND	167.4	169.1	1.7	ND039	LA PRAIRIE-BARNES-RENSHAW (ND039)	20	2	51	6	62	2	0
ND	169.1	179.9	10.9	ND046	BARNES-SVEA-HAMERLY (ND046)	0	6	43	9	80	9	0
ND	179.9	180.2	0.3	ND026	RENSHAW-ARVILLA-DIVIDE (ND026)	3	6	32	16	31	16	0
ND	180.2	183.8	3.6	ND046	BARNES-SVEA-HAMERLY (ND046)	0	6	43	9	80	9	0
ND	183.8	184.1	0.3	ND026	RENSHAW-ARVILLA-DIVIDE (ND026)	4	4	32	16	31	16	0
ND	184.1	186.6	2.6	ND046	BARNES-SVEA-HAMERLY (ND046)	0	6	43	9	80	9	0
ND	186.6	188.5	2	ND040	HAMERLY-TONKA-SVEA (ND040)	0	23	19	30	73	30	0
ND	188.6	192.7	4.1	ND046	BARNES-SVEA-HAMERLY (ND046)	0	6	43	9	80	9	0
ND	192.7	199.5	6.8	ND026	RENSHAW-ARVILLA-DIVIDE (ND026)	2	5	31	16	31	16	0
ND	199.5	204.3	4.8	ND046	BARNES-SVEA-HAMERLY (ND046)	0	6	43	9	80	9	0
ND	204.3	216.8	12.5	ND021	HECLA-HAMAR-ULEN (ND021)	0	1	0	49	9	32	0
SD	216.8	217.5	0.7	SD142	HECLA-HAMAR-ULEN (SD142)	0	1	0	49	9	32	0
SD	217.5	222.6	5	SD141	SERDEN-HAMAR-MADDOCK (SD141)	38	0	0	40	0	35	0
SD	222.6	225.9	3.3	SD142	HECLA-HAMAR-ULEN (SD142)	0	1	0	49	9	32	0
SD	225.9	228.9	3	SD145	BEARDEN-GREAT BEND-OVERLY (SD145)	0	24	32	23	88	9	0
SD	228.9	231.4	2.4	SD144	GARDENA-ECKMAN-GLYNDON (SD144)	0	6	2	56	77	20	0
SD	231.4	243.4	12.1	SD145	BEARDEN-GREAT BEND-OVERLY (SD145)	0	24	32	23	88	9	0
SD	243.4	247	3.6	SD146	ABERDEEN-HARMONY-BEOTIA (SD146)	0	13	21	31	79	5	0
SD	247	258.4	11.4	SD126	BARNES-KRANZBURG-BROOKINGS (SD126)	0	9	67	33	83	9	0
SD	258.4	259.2	0.8	SD134	FORMAN-BUSE-SOUTHAM (SD134)	1	20	63	30	62	24	0
SD	259.2	261.7	2.4	SD128	FORDVILLE-RENSHAW-SOUTHAM (SD128)	23	16	70	15	31	17	0
SD	261.7	261.9	0.2	SD148	FORMAN-CAVOUR-PEEVER (SD148)	0	10	54	22	42	8	0
SD	261.9	270.5	8.7	SD128	FORDVILLE-RENSHAW-SOUTHAM (SD128)	23	16	70	15	31	17	0
SD	270.5	289.3	18.8	SD148	FORMAN-CAVOUR-PEEVER (SD148)	0	11	53	22	42	8	0
SD	289.3	289.7	0.4	SD135	FORMAN-AASTAD-BUSE (SD135)	34	17	12	39	58	18	0
SD	289.7	290.5	0.8	SD148	FORMAN-CAVOUR-PEEVER (SD148)	0	11	53	22	42	8	0
SD	290.5	299.6	9.1	SD136	PEEVER-FORMAN-TONKA (SD136)	12	16	19	20	63	19	0
SD	299.6	316.2	16.6	SD153	BEADLE-DUDLEY-BON (SD153)	2	9	71	10	2	9	0
SD	316.2	329.5	13.3	SD154	BEADLE-DUDLEY-BON (SD154)	2	1	48	19	2	1	0
SD	329.5	337	7.5	SD118	HOUDEK-DUDLEY-STICKNEY (SD118)	0	12	48	18	8	11	0
SD	337	337.7	0.7	SD083	BON-ETHAN-DAVIS (SD083)	23	12	60	53	48	2	0
SD	337.7	339.6	1.9	SD089	CLARNO-CROSSPLAIN-HOUDEK (SD089)	0	23	22	13	73	24	0
SD	339.6	342.3	2.7	SD118	HOUDEK-DUDLEY-STICKNEY (SD118)	0	12	48	18	8	11	0
SD	342.3	342.9	0.5	SD089	CLARNO-CROSSPLAIN-HOUDEK (SD089)	0	23	21	13	73	24	0
SD	342.9	344.3	1.4	SD083	BON-ETHAN-DAVIS (SD083)	24	12	60	53	48	2	0
SD	344.3	349.9	5.6	SD118	HOUDEK-DUDLEY-STICKNEY (SD118)	0	12	48	18	8	11	0
SD	349.9	350.1	0.2	SD241	CLARNO-PROSPER-TETONKA (SD241)	0	8	59	15	27	11	0
SD	350.1	350.6	0.5	SD118	HOUDEK-DUDLEY-STICKNEY (SD118)	0	11	48	18	8	11	0
SD	350.6	355.1	4.6	SD241	CLARNO-PROSPER-TETONKA (SD241)	0	9	50	15	27	11	0

Appendix F: Soil Associations Along the Proposed Keystone Pipeline Project

State	Approx. Start MP	Approx. End MP	Approx. Miles	MUID	Name	Highly Erodible %	Compaction Prone %	Low Revegetation Potential %	A-Horizon >12" Deep %	Prime Farmland %	Hydric %	Shallow (<60") Bedrock %
SD	355.1	360.7	5.6	SD116	HOUDEK-DUDLEY-STICKNEY (SD116)	0	12	48	18	8	11	0
SD	360.7	361.3	0.6	SD090	CLARNO-PROSPER-STICKNEY (SD090)	0	10	40	26	65	13	0
SD	361.3	362.8	1.5	SD083	BON-ETHAN-DAVIS (SD083)	24	12	60	53	48	2	0
SD	362.8	366.6	3.8	SD088	CLARNO-ETHAN-BONILLA (SD088)	4	10	69	19	66	12	0
SD	366.6	369.6	3	SD090	CLARNO-PROSPER-STICKNEY (SD090)	0	10	39	26	65	13	0
SD	369.6	370.4	0.8	SD087	CLARNO-BONILLA-TETONKA (SD087)	0	13	62	24	79	16	0
SD	370.4	371.2	0.9	SD090	CLARNO-PROSPER-STICKNEY (SD090)	0	11	39	26	65	13	0
SD	371.2	375.3	4.1	SD087	CLARNO-BONILLA-TETONKA (SD087)	0	13	62	24	79	16	0
SD	375.3	375.9	0.6	SD097	HAND-CLARNO-ETHAN (SD097)	0	16	71	11	63	21	0
SD	375.9	376.6	0.7	SD083	BON-ETHAN-DAVIS (SD083)	23	12	60	53	48	2	0
SD	376.6	376.9	0.3	SD097	HAND-CLARNO-ETHAN (SD097)	0	16	71	11	63	21	0
SD	376.9	378.7	1.9	SD083	BON-ETHAN-DAVIS (SD083)	24	12	60	53	48	2	0
SD	378.7	381.3	2.6	SD089	CLARNO-CROSSPLAIN-HOUDEK (SD089)	0	23	22	13	73	24	0
SD	381.3	382.1	0.8	SD095	CLAMO-ETHAN-LAMO (SD095)	26	42	42	24	16	6	0
SD	382.1	383.8	1.7	SD089	CLARNO-CROSSPLAIN-HOUDEK (SD089)	0	23	22	13	73	24	0
SD	383.8	384.5	0.7	SD095	CLAMO-ETHAN-LAMO (SD095)	27	42	42	24	16	6	0
SD	384.5	390.2	5.7	SD087	CLARNO-BONILLA-TETONKA (SD087)	0	13	62	24	79	16	0
SD	390.2	391.1	0.9	SD095	CLAMO-ETHAN-LAMO (SD095)	26	42	41	24	16	6	0
SD	391.1	394.2	3.1	SD090	CLARNO-PROSPER-STICKNEY (SD090)	0	10	39	26	65	13	0
SD	394.2	398.3	4.1	SD087	CLARNO-BONILLA-TETONKA (SD087)	0	13	62	24	79	16	0
SD	398.3	398.7	0.4	SD095	CLAMO-ETHAN-LAMO (SD095)	27	42	40	24	16	6	0
SD	398.7	406.5	7.8	SD090	CLARNO-PROSPER-STICKNEY (SD090)	0	10	39	26	65	13	0
SD	406.5	411.7	5.2	SD088	CLARNO-ETHAN-BONILLA (SD088)	4	10	69	19	66	12	0
SD	411.7	418.5	6.7	SD087	CLARNO-BONILLA-TETONKA (SD087)	0	13	62	24	79	16	0
SD	418.5	422.3	3.9	SD095	CLAMO-ETHAN-LAMO (SD095)	26	42	41	24	16	6	0
SD	422.3	423.2	0.9	SD087	CLARNO-BONILLA-TETONKA (SD087)	0	13	62	24	79	16	0
SD	423.2	424	0.8	SD095	CLAMO-ETHAN-LAMO (SD095)	25	42	41	24	16	6	0
SD	424	426	2	SD087	CLARNO-BONILLA-TETONKA (SD087)	0	13	62	24	79	16	0
SD	426	428.8	2.8	SD086	ETHAN-CLARNO-BETTS (SD086)	42	5	62	9	32	7	0
SD	428.8	430.7	1.9	SD087	CLARNO-BONILLA-TETONKA (SD087)	0	13	62	24	79	16	0
SD	430.7	431.5	0.8	SD095	CLAMO-ETHAN-LAMO (SD095)	26	42	41	24	16	6	0
SD	431.5	432.3	0.8	SD087	CLARNO-BONILLA-TETONKA (SD087)	0	12	62	24	79	16	0
SD	432.3	435.8	3.5	SD096	EGAN-WENTWORTH-ETHAN (SD096)	3	6	39	11	63	13	0
NE	435.8	438	2.2	NE112	SARPY-ONAWA-HAYNIE (NE112)	0	9	0	18	55	12	3
NE	438	438.4	0.3	NE003	AOWA-ALCESTER-KENNEBEC (NE003)	3	0	79	21	93	0	0
NE	438.4	440.8	2.5	NE029	CROFTON-ALCESTER-NORA (NE029)	83	0	82	0	10	0	0
NE	440.8	440.9	0.1	NE092	MOODY-THURMAN-CROFTON (NE092)	35	0	24	8	35	0	0
NE	440.9	442.6	1.7	NE029	CROFTON-ALCESTER-NORA (NE029)	83	0	82	0	10	0	0
NE	442.6	446.3	3.7	NE092	MOODY-THURMAN-CROFTON (NE092)	37	0	28	8	35	0	0
NE	446.3	447.6	1.3	NE094	NORA-CROFTON-MOODY (NE094)	39	0	53	0	35	0	0
NE	447.6	448.6	1	NE003	AOWA-ALCESTER-KENNEBEC (NE003)	2	0	79	21	93	0	0
NE	448.6	449.4	0.8	NE092	MOODY-THURMAN-CROFTON (NE092)	36	0	28	8	35	0	0
NE	449.4	450.6	1.2	NE117	SIMEON-MEADIN-BETTS (NE117)	94	0	74	5	6	0	11
NE	450.6	451.2	0.7	NE092	MOODY-THURMAN-CROFTON (NE092)	36	0	29	8	35	0	0
NE	451.2	451.7	0.5	NE003	AOWA-ALCESTER-KENNEBEC (NE003)	2	0	78	21	93	0	0
NE	451.7	453.4	1.7	NE094	NORA-CROFTON-MOODY (NE094)	39	0	53	0	35	0	0
NE	453.4	453.8	0.3	NE003	AOWA-ALCESTER-KENNEBEC (NE003)	3	0	79	21	93	0	0
NE	453.8	453.8	0	NE092	MOODY-THURMAN-CROFTON (NE092)	53	0	53	8	35	0	0
NE	453.8	456.3	2.5	NE094	NORA-CROFTON-MOODY (NE094)	39	0	53	0	35	0	0
NE	456.3	457.9	1.6	NE003	AOWA-ALCESTER-KENNEBEC (NE003)	2	0	79	21	93	0	0
NE	457.9	460.6	2.7	NE094	NORA-CROFTON-MOODY (NE094)	39	0	53	0	35	0	0
NE	460.6	461	0.4	NE003	AOWA-ALCESTER-KENNEBEC (NE003)	3	0	79	21	93	0	0
NE	461	466.7	5.7	NE094	NORA-CROFTON-MOODY (NE094)	39	0	53	0	35	0	0

Appendix F: Soil Associations Along the Proposed Keystone Pipeline Project

State	Approx. Start MP	Approx. End MP	Approx. Miles	MUID	Name	Highly Erodible %	Compaction Prone %	Low Revegetation Potential %	A-Horizon >12" Deep %	Prime Farmland %	Hydric %	Shallow (<60") Bedrock %
NE	466.7	467.3	0.6	NE072	KENNEBEC-WABASH-ZOOK (NE072)	3	39	2	88	69	43	0
NE	467.3	470	2.7	NE094	NORA-CROFTON-MOODY (NE094)	39	0	53	0	35	0	0
NE	470	470.7	0.7	NE072	KENNEBEC-WABASH-ZOOK (NE072)	3	39	1	88	69	43	0
NE	470.7	473.9	3.2	NE096	NORA-MOODY-JUDSON (NE096)	16	4	4	16	40	4	0
NE	473.9	474.3	0.3	NE072	KENNEBEC-WABASH-ZOOK (NE072)	3	39	3	88	69	43	0
NE	474.3	475.7	1.5	NE096	NORA-MOODY-JUDSON (NE096)	16	4	4	16	40	4	0
NE	475.7	477.5	1.8	NE072	KENNEBEC-WABASH-ZOOK (NE072)	3	39	2	88	69	43	0
NE	477.5	477.6	0.1	NE096	NORA-MOODY-JUDSON (NE096)	15	7	7	16	40	4	0
NE	477.6	478.3	0.6	NE072	KENNEBEC-WABASH-ZOOK (NE072)	3	39	2	88	69	43	0
NE	478.3	490.3	12	NE096	NORA-MOODY-JUDSON (NE096)	16	4	4	16	40	4	0
NE	490.3	492.4	2.1	NE094	NORA-CROFTON-MOODY (NE094)	39	0	53	0	35	0	0
NE	492.4	494.1	1.7	NE122	THURMAN-BOELUS-VALENTINE (NE122)	36	0	16	4	16	0	0
NE	494.1	499.5	5.5	NE094	NORA-CROFTON-MOODY (NE094)	39	0	53	0	35	0	0
NE	499.5	502.3	2.7	NE049	HOBBS-HORD-HALL (NE049)	0	0	98	44	92	0	0
NE	502.3	503.1	0.9	NE018	INAVALE-CASS-BARNEY (NE018)	12	0	3	40	42	10	0
NE	503.1	503.8	0.7	NE049	HOBBS-HORD-HALL (NE049)	0	0	98	44	92	0	0
NE	503.8	505.1	1.3	NE141	VALENTINE-THURMAN-DOGER (NE141)	95	0	0	5	0	0	0
NE	505.1	506.6	1.5	NE122	THURMAN-BOELUS-VALENTINE (NE122)	36	0	16	4	16	0	0
NE	506.6	516.3	9.7	NE094	NORA-CROFTON-MOODY (NE094)	39	0	53	0	35	0	0
NE	516.3	516.8	0.5	NE006	BELFORE-MOODY-FILLMORE (NE006)	6	6	0	72	95	5	0
NE	516.8	520.4	3.6	NE094	NORA-CROFTON-MOODY (NE094)	39	0	53	0	35	0	0
NE	520.4	521	0.6	NE006	BELFORE-MOODY-FILLMORE (NE006)	5	5	0	72	95	5	0
NE	521	521.1	0.1	NE094	NORA-CROFTON-MOODY (NE094)	44	0	55	0	35	0	0
NE	521.1	522.4	1.2	NE006	BELFORE-MOODY-FILLMORE (NE006)	5	5	0	72	95	5	0
NE	522.4	522.7	0.3	NE094	NORA-CROFTON-MOODY (NE094)	41	0	54	0	35	0	0
NE	522.7	523	0.3	NE006	BELFORE-MOODY-FILLMORE (NE006)	6	6	0	72	95	5	0
NE	523	523.4	0.4	NE094	NORA-CROFTON-MOODY (NE094)	39	0	52	0	35	0	0
NE	523.4	523.9	0.6	NE006	BELFORE-MOODY-FILLMORE (NE006)	5	5	0	72	95	5	0
NE	523.9	525.8	1.8	NE094	NORA-CROFTON-MOODY (NE094)	39	0	53	0	35	0	0
NE	525.8	529.3	3.6	NE006	BELFORE-MOODY-FILLMORE (NE006)	5	5	0	72	95	5	0
NE	529.3	531.3	2	NE094	NORA-CROFTON-MOODY (NE094)	39	0	53	0	35	0	0
NE	531.3	533	1.6	NE049	HOBBS-HORD-HALL (NE049)	0	0	98	44	92	0	0
NE	533	537	4.1	NE091	MOODY-FILLMORE-NORA (NE091)	10	10	0	12	62	10	0
NE	537	537.7	0.7	NE060	HORD-HALL-WOOD RIVER (NE060)	0	0	95	59	93	0	0
NE	537.7	538.9	1.1	NE038	GIBBON-LUTON-SALTINE (NE038)	6	42	3	91	63	27	0
NE	538.9	539.9	1	NE100	O'NEILL-BROCKSBURG-HORD (NE100)	4	0	65	39	58	0	0
NE	539.9	541.2	1.3	NE107	ALDA-PLATTE-LESHARA (NE107)	27	16	0	29	63	0	0
NE	541.2	542	0.8	NE018	INAVALE-CASS-BARNEY (NE018)	12	0	4	40	42	10	0
NE	542	542.2	0.1	NEW	WATER (NEW)	0	0	0	0	0	0	100
NE	542.2	542.7	0.5	NE018	INAVALE-CASS-BARNEY (NE018)	13	0	4	40	42	10	0
NE	542.7	543.1	0.4	NE107	ALDA-PLATTE-LESHARA (NE107)	27	16	0	29	63	0	0
NE	543.1	545.6	2.5	NE038	GIBBON-LUTON-SALTINE (NE038)	6	42	3	91	63	27	0
NE	545.6	547.1	1.5	NE058	HORD-HALL-HOBBS (NE058)	1	1	99	77	99	1	0
NE	547.1	548.5	1.5	NE023	COLY-ULY-HOBBS (NE023)	80	0	100	7	11	0	0
NE	548.5	548.7	0.2	NE051	HOLDER-FILLMORE-BUTLER (NE051)	5	5	88	7	93	5	0
NE	548.7	549.4	0.7	NE023	COLY-ULY-HOBBS (NE023)	79	0	101	7	11	0	0
NE	549.4	554.5	5.1	NE044	HASTINGS-FILLMORE-CRETE (NE044)	10	14	79	13	89	11	0
NE	554.5	555.3	0.7	NE049	HOBBS-HORD-HALL (NE049)	0	0	98	44	92	0	0
NE	555.3	557.5	2.3	NE044	HASTINGS-FILLMORE-CRETE (NE044)	10	14	79	13	89	11	0
NE	557.5	559.5	2	NE049	HOBBS-HORD-HALL (NE049)	0	0	98	44	92	0	0
NE	559.5	571.8	12.2	NE044	HASTINGS-FILLMORE-CRETE (NE044)	10	14	79	13	89	11	0
NE	571.8	572.4	0.6	NE045	HASTINGS-GEARY-CRETE (NE045)	30	2	53	0	65	2	0
NE	572.4	574.4	2	NE049	HOBBS-HORD-HALL (NE049)	0	0	98	44	92	0	0

Appendix F: Soil Associations Along the Proposed Keystone Pipeline Project

State	Approx. Start MP	Approx. End MP	Approx. Miles	MUID	Name	Highly Erodible %	Compaction Prone %	Low Revegetation Potential %	A-Horizon >12" Deep %	Prime Farmland %	Hydric %	Shallow (<60") Bedrock %
NE	574.4	575.2	0.8	NE045	HASTINGS-GEARY-CRETE (NE045)	30	2	53	0	65	2	0
NE	575.2	577.1	1.9	NE049	HOBBS-HORD-HALL (NE049)	0	0	98	44	92	0	0
NE	577.1	578.1	1	NE042	HASTINGS-CRETE-HOLDER (NE042)	12	5	87	5	88	3	0
NE	578.1	578.8	0.7	NE044	HASTINGS-FILLMORE-CRETE (NE044)	10	14	79	13	89	11	0
NE	578.8	579.3	0.5	NE042	HASTINGS-CRETE-HOLDER (NE042)	12	5	87	5	88	3	0
NE	579.3	580	0.6	NE044	HASTINGS-FILLMORE-CRETE (NE044)	10	14	78	13	89	11	0
NE	580	580.4	0.4	NE042	HASTINGS-CRETE-HOLDER (NE042)	12	5	87	5	88	3	0
NE	580.4	581.2	0.8	NE049	HOBBS-HORD-HALL (NE049)	0	0	98	44	92	0	0
NE	581.2	581.5	0.4	NE042	HASTINGS-CRETE-HOLDER (NE042)	13	5	87	5	88	3	0
NE	581.5	585.5	4	NE044	HASTINGS-FILLMORE-CRETE (NE044)	10	14	79	13	89	11	0
NE	585.5	586.5	0.9	NE042	HASTINGS-CRETE-HOLDER (NE042)	12	5	87	5	88	3	0
NE	586.5	588.5	2	NE044	HASTINGS-FILLMORE-CRETE (NE044)	10	14	79	13	89	11	0
NE	588.5	590	1.5	NE045	HASTINGS-GEARY-CRETE (NE045)	30	2	53	0	65	2	0
NE	590	591.9	1.9	NE049	HOBBS-HORD-HALL (NE049)	0	0	98	44	92	0	0
NE	591.9	592.3	0.4	NE045	HASTINGS-GEARY-CRETE (NE045)	31	3	54	0	65	2	0
NE	592.3	593.2	0.9	NE043	HASTINGS-CRETE-FILLMORE (NE043)	10	21	39	19	69	12	0
NE	593.2	594.7	1.6	NE027	CRETE-HASTINGS-BUTLER (NE027)	5	7	10	5	93	4	0
NE	594.7	595.1	0.4	NE045	HASTINGS-GEARY-CRETE (NE045)	30	3	52	0	65	2	0
NE	595.1	595.6	0.6	NE027	CRETE-HASTINGS-BUTLER (NE027)	5	7	11	5	93	4	0
NE	595.6	596.9	1.3	NE045	HASTINGS-GEARY-CRETE (NE045)	30	2	53	0	65	2	0
NE	596.9	597.6	0.6	NE049	HOBBS-HORD-HALL (NE049)	0	0	98	44	92	0	0
NE	597.6	598.2	0.7	NE045	HASTINGS-GEARY-CRETE (NE045)	29	1	53	0	65	2	0
NE	598.2	598.9	0.7	NE049	HOBBS-HORD-HALL (NE049)	0	0	99	44	92	0	0
NE	598.9	599.4	0.5	NE045	HASTINGS-GEARY-CRETE (NE045)	30	2	52	0	65	2	0
NE	599.4	600.6	1.2	NE027	CRETE-HASTINGS-BUTLER (NE027)	5	7	10	5	93	4	0
NE	600.6	603.2	2.6	NE045	HASTINGS-GEARY-CRETE (NE045)	30	2	53	0	65	2	0
NE	603.2	604.2	0.9	NE027	CRETE-HASTINGS-BUTLER (NE027)	5	8	10	5	93	4	0
NE	604.2	605.2	1	NE045	HASTINGS-GEARY-CRETE (NE045)	30	2	53	0	65	2	0
NE	605.2	605.5	0.3	NE049	HOBBS-HORD-HALL (NE049)	0	0	97	44	92	0	0
NE	605.5	605.6	0.1	NE045	HASTINGS-GEARY-CRETE (NE045)	33	0	50	0	65	2	0
NE	605.6	606	0.4	NE027	CRETE-HASTINGS-BUTLER (NE027)	4	7	9	5	93	4	0
NE	606	607.3	1.3	NE045	HASTINGS-GEARY-CRETE (NE045)	30	2	53	0	65	2	0
NE	607.3	607.4	0.1	NE027	CRETE-HASTINGS-BUTLER (NE027)	0	13	13	5	93	4	0
NE	607.4	607.8	0.5	NE045	HASTINGS-GEARY-CRETE (NE045)	30	2	54	0	65	2	0
NE	607.8	608.5	0.7	NE027	CRETE-HASTINGS-BUTLER (NE027)	6	7	10	5	93	4	0
NE	608.5	609.5	0.9	NE045	HASTINGS-GEARY-CRETE (NE045)	30	2	53	0	65	2	0
NE	609.5	610.3	0.8	NE027	CRETE-HASTINGS-BUTLER (NE027)	5	7	10	5	93	4	0
NE	610.3	612.1	1.8	NE045	HASTINGS-GEARY-CRETE (NE045)	30	2	53	0	65	2	0
NE	612.1	613.6	1.5	NE049	HOBBS-HORD-HALL (NE049)	0	0	98	44	92	0	0
NE	613.6	614.9	1.3	NE045	HASTINGS-GEARY-CRETE (NE045)	30	2	53	0	65	2	0
NE	614.9	621.4	6.5	NE027	CRETE-HASTINGS-BUTLER (NE027)	5	7	10	5	93	4	0
NE	621.4	622.4	1	NE049	HOBBS-HORD-HALL (NE049)	0	0	98	44	92	0	0
NE	622.4	624.9	2.5	NE093	MORRILL-BURCHARD-HASTINGS (NE093)	46	2	11	63	23	2	0
NE	624.9	628.4	3.5	NE027	CRETE-HASTINGS-BUTLER (NE027)	5	7	10	5	93	4	0
NE	628.4	635.2	6.8	NE026	CRETE-MAYBERRY-WYMORE (NE026)	6	0	9	12	76	0	0
NE	635.2	636	0.8	NE077	LANCASTER-HEDVILLE-EDALGO (NE077)	29	0	84	22	33	0	69
NE	636	636.6	0.6	NE026	CRETE-MAYBERRY-WYMORE (NE026)	5	0	9	12	76	0	0
NE	636.6	638.1	1.5	NE037	GEARY-JANSEN-MEADIN (NE037)	48	0	84	19	56	0	0
NE	638.1	638.6	0.6	NE026	CRETE-MAYBERRY-WYMORE (NE026)	5	0	9	12	76	0	0
NE	638.6	640.5	1.9	NE077	LANCASTER-HEDVILLE-EDALGO (NE077)	28	0	84	22	33	0	69
NE	640.5	649.6	9.2	NE026	CRETE-MAYBERRY-WYMORE (NE026)	6	0	9	12	76	0	0
KS	649.6	658.5	8.8	KS326	CRETE-MAYBERRY-WYMORE (KS326)	6	0	9	12	76	0	0
KS	658.5	659.4	0.9	KS371	EUDORA-MUIR-NODAWAY (KS371)	0	0	59	69	100	0	0

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State	Approx. Start MP	Approx. End MP	Approx. Miles	MUID	Name	Highly Erodible %	Compaction Prone %	Low Revegetation Potential %	A-Horizon >12" Deep %	Prime Farmland %	Hydric %	Shallow (<60") Bedrock %
KS	659.4	663.2	3.8	KS344	PAWNEE-WYMORE-KENNEBEC (KS344)	26	0	4	0	59	0	2
KS	663.2	670.1	6.9	KS310	WYMORE-MAYBERRY-PAWNEE (KS310)	30	0	0	11	58	0	0
KS	670.1	674.6	4.5	KS344	PAWNEE-WYMORE-KENNEBEC (KS344)	26	0	4	0	59	0	2
KS	674.6	679.5	4.9	KS311	PAWNEE-BURCHARD-WYMORE (KS311)	62	0	2	0	28	0	0
KS	679.5	679.8	0.3	KS344	PAWNEE-WYMORE-KENNEBEC (KS344)	26	0	4	0	59	0	2
KS	679.8	683.8	4	KS311	PAWNEE-BURCHARD-WYMORE (KS311)	62	0	2	0	28	0	0
KS	683.8	689.2	5.4	KS344	PAWNEE-WYMORE-KENNEBEC (KS344)	26	0	4	0	59	0	2
KS	689.2	690.1	0.9	KS376	KENNEBEC-WABASH-ZOOK (KS376)	3	39	2	88	59	43	0
KS	690.1	692	1.9	KS311	PAWNEE-BURCHARD-WYMORE (KS311)	62	0	2	0	28	0	0
KS	692	697.2	5.2	KS311	PAWNEE-BURCHARD-WYMORE (KS311)	62	0	2	0	28	0	0
KS	697.2	705.1	7.9	KS344	PAWNEE-WYMORE-KENNEBEC (KS344)	26	0	4	0	59	0	2
KS	705.1	705.3	0.2	KS311	PAWNEE-BURCHARD-WYMORE (KS311)	64	0	0	0	28	0	0
KS	705.3	706	0.7	KS194	WABASH-READING-KENNEBEC (KS194)	0	6	0	100	99	44	0
KS	706	706.5	0.4	KS344	PAWNEE-WYMORE-KENNEBEC (KS344)	27	0	5	0	59	0	2
KS	706.5	715.3	8.8	KS104	GRUNDY-PAWNEE-SHELBY (KS104)	0	64	0	27	50	0	0
KS	715.3	716.6	1.3	KS105	MARSHALL-MORRILL-SHARPSBURG (KS105)	5	2	77	90	29	1	4
KS	716.6	716.9	0.3	KS194	WABASH-READING-KENNEBEC (KS194)	0	7	0	100	99	44	0
KS	716.9	721.8	4.9	KS105	MARSHALL-MORRILL-SHARPSBURG (KS105)	5	2	77	90	29	1	4
KS	721.8	722.2	0.4	KS104	GRUNDY-PAWNEE-SHELBY (KS104)	0	64	0	27	50	0	0
KS	722.2	723.4	1.3	KS105	MARSHALL-MORRILL-SHARPSBURG (KS105)	5	2	77	90	29	1	4
KS	723.4	723.7	0.3	KS104	GRUNDY-PAWNEE-SHELBY (KS104)	0	64	0	27	50	0	0
KS	723.7	726	2.3	KS105	MARSHALL-MORRILL-SHARPSBURG (KS105)	5	2	77	90	29	1	4
KS	726	726.5	0.5	KS104	GRUNDY-PAWNEE-SHELBY (KS104)	0	64	0	27	50	0	0
KS	726.5	739	12.6	KS105	MARSHALL-MORRILL-SHARPSBURG (KS105)	5	2	77	90	29	1	4
KS	739	741.4	2.3	KS110	KNOX-MORRILL-ARMSTER (KS110)	61	1	32	74	31	1	14
KS	741.4	743	1.6	KS101	MONONA-MARSHALL-HAMBURG (KS101)	18	0	92	66	8	0	0
KS	743	747.9	4.9	KS110	KNOX-MORRILL-ARMSTER (KS110)	61	1	32	74	31	1	14
KS	747.9	748.3	0.4	KS192	HAYNIE-LETA-WALDRON (KS192)	0	9	0	38	99	12	0
KS	748.3	748.5	0.1	KSW	WATER (KSW)	0	0	0	0	0	0	100
MO	748.5	748.5	0.1	MOW	WATER (MOW)	0	0	0	0	0	0	100
MO	748.5	752.6	4.1	MO001	HAYNIE-LETA-WALDRON (MO001)	0	8	0	38	98	12	0
MO	752.6	754.4	1.8	MO008	KNOX-HIGGINSVILLE-SIBLEY (MO008)	35	24	40	73	26	0	4
MO	754.4	756.2	1.8	MO006	MARSHALL-EXIRA-SHELBY (MO006)	2	7	11	31	30	6	0
MO	756.2	761.2	5	MO008	KNOX-HIGGINSVILLE-SIBLEY (MO008)	35	24	40	73	26	0	4
MO	761.2	762.9	1.7	MO034	NODAWAY-COLO-ZOOK (MO034)	0	61	0	60	100	51	0
MO	762.9	766	3	MO006	MARSHALL-EXIRA-SHELBY (MO006)	2	7	11	31	30	6	0
MO	766	771.9	6	MO007	SHARPSBURG-SHELBY-COLO (MO007)	19	21	0	48	36	12	1
MO	771.9	772.4	0.5	MO013	GARA-ARMSTRONG-PERSHING (MO013)	48	25	0	28	16	6	2
MO	772.4	772.5	0.1	MO007	SHARPSBURG-SHELBY-COLO (MO007)	22	22	0	48	36	12	1
MO	772.5	774.3	1.8	MO013	GARA-ARMSTRONG-PERSHING (MO013)	47	24	0	28	16	6	2
MO	774.3	776	1.7	MO007	SHARPSBURG-SHELBY-COLO (MO007)	19	21	0	48	36	12	1
MO	776	780.3	4.3	MO012	GRUNDY-LAGONDA-LAMONI (MO012)	0	91	0	7	54	3	0
MO	780.3	782.3	2	MO013	GARA-ARMSTRONG-PERSHING (MO013)	47	24	0	28	16	6	2
MO	782.3	784.4	2.1	MO012	GRUNDY-LAGONDA-LAMONI (MO012)	0	91	0	7	54	3	0
MO	784.4	785.2	0.8	MO009	LAMONI-SHELBY-ADAIR (MO009)	10	51	0	5	6	5	0
MO	785.2	787.1	2	MO013	GARA-ARMSTRONG-PERSHING (MO013)	47	24	0	28	16	6	2
MO	787.1	787.4	0.2	MO009	LAMONI-SHELBY-ADAIR (MO009)	8	53	0	5	6	5	0
MO	787.4	787.9	0.5	MO012	GRUNDY-LAGONDA-LAMONI (MO012)	0	91	0	7	54	3	0
MO	787.9	788.4	0.5	MO013	GARA-ARMSTRONG-PERSHING (MO013)	47	24	0	28	16	6	2
MO	788.4	789.2	0.8	MO012	GRUNDY-LAGONDA-LAMONI (MO012)	0	91	0	7	54	3	0
MO	789.2	790	0.7	MO013	GARA-ARMSTRONG-PERSHING (MO013)	47	24	0	28	16	6	2
MO	790	790.8	0.8	MO012	GRUNDY-LAGONDA-LAMONI (MO012)	0	90	0	7	54	3	0
MO	790.8	791.4	0.6	MO014	ARMSTER-SNEAD-LADOGA (MO014)	52	23	0	43	7	2	31

Appendix F: Soil Associations Along the Proposed Keystone Pipeline Project

State	Approx. Start MP	Approx. End MP	Approx. Miles	MUID	Name	Highly Erodible %	Compaction Prone %	Low Revegetation Potential %	A-Horizon >12" Deep %	Prime Farmland %	Hydric %	Shallow (<60") Bedrock %
MO	791.4	792.3	0.9	MO012	GRUNDY-LAGONDA-LAMONI (MO012)	0	91	0	7	54	3	0
MO	792.3	792.7	0.4	MO014	ARMSTER-SNEAD-LADOGA (MO014)	51	23	0	43	7	2	31
MO	792.7	793.9	1.3	MO012	GRUNDY-LAGONDA-LAMONI (MO012)	0	91	0	7	54	3	0
MO	793.9	796.7	2.7	MO014	ARMSTER-SNEAD-LADOGA (MO014)	51	23	0	43	7	2	31
MO	796.7	798.3	1.6	MO012	GRUNDY-LAGONDA-LAMONI (MO012)	0	91	0	7	54	3	0
MO	798.3	800	1.7	MO014	ARMSTER-SNEAD-LADOGA (MO014)	51	23	0	43	7	2	31
MO	800	801.1	1.1	MO012	GRUNDY-LAGONDA-LAMONI (MO012)	0	91	0	7	54	3	0
MO	801.1	801.7	0.6	MO014	ARMSTER-SNEAD-LADOGA (MO014)	52	23	0	43	7	2	31
MO	801.7	807	5.3	MO012	GRUNDY-LAGONDA-LAMONI (MO012)	0	91	0	7	54	3	0
MO	807	810.8	3.8	MO014	ARMSTER-SNEAD-LADOGA (MO014)	51	23	0	43	7	2	31
MO	810.8	812	1.2	MO012	GRUNDY-LAGONDA-LAMONI (MO012)	0	91	0	7	54	3	0
MO	812	812.9	0.9	MO004	COLO-NODAWAY-ZOOK (MO004)	0	65	0	65	100	50	0
MO	812.9	813.8	0.9	MO014	ARMSTER-SNEAD-LADOGA (MO014)	51	23	0	43	7	2	31
MO	813.8	816.9	3.1	MO016	GREENTON-GOSPORT-SNEAD (MO016)	49	40	0	50	9	6	44
MO	816.9	820.1	3.2	MO012	GRUNDY-LAGONDA-LAMONI (MO012)	0	91	0	7	54	3	0
MO	820.1	826.9	6.8	MO016	GREENTON-GOSPORT-SNEAD (MO016)	49	40	0	50	9	6	44
MO	826.9	831.6	4.8	MO012	GRUNDY-LAGONDA-LAMONI (MO012)	0	91	0	7	54	3	0
MO	831.6	832.4	0.8	MO034	NODAWAY-COLO-ZOOK (MO034)	0	61	0	90	100	51	0
MO	832.4	840.5	8.2	MO012	GRUNDY-LAGONDA-LAMONI (MO012)	0	91	0	7	54	3	0
MO	840.5	846.7	6.2	MO020	CARLOW-DOCKERY-FATIMA (MO020)	0	25	0	65	98	77	2
MO	846.7	857.1	10.4	MO012	GRUNDY-LAGONDA-LAMONI (MO012)	0	91	0	7	54	3	0
MO	857.1	858.4	1.3	MO020	CARLOW-DOCKERY-FATIMA (MO020)	0	25	0	65	98	77	2
MO	858.4	860.7	2.4	MO012	GRUNDY-LAGONDA-LAMONI (MO012)	0	91	0	7	54	3	0
MO	860.7	865.5	4.8	MO020	CARLOW-DOCKERY-FATIMA (MO020)	0	25	0	65	98	77	2
MO	865.5	867.4	1.9	MO012	GRUNDY-LAGONDA-LAMONI (MO012)	0	91	0	7	54	3	0
MO	867.4	868.5	1.1	MO020	CARLOW-DOCKERY-FATIMA (MO020)	0	25	0	65	98	77	2
MO	868.5	869.1	0.6	MO018	LINDLEY-KESWICK-GOSS (MO018)	75	10	29	3	3	2	2
MO	869.1	871.1	2	MO012	GRUNDY-LAGONDA-LAMONI (MO012)	0	91	0	7	54	3	0
MO	871.1	871.2	0.1	MO018	LINDLEY-KESWICK-GOSS (MO018)	77	14	28	3	3	2	2
MO	871.2	872.7	1.5	MO020	CARLOW-DOCKERY-FATIMA (MO020)	0	25	0	65	98	77	2
MO	872.7	876.5	3.6	MO082	MACKSBURG-MARSHALL-GRUNDY (MO082)	1	70	22	67	61	13	15
MO	876.5	883.7	7.2	MO018	LINDLEY-KESWICK-GOSS (MO018)	75	11	29	3	3	2	2
MO	883.7	897.9	14.2	MO023	MEXICO-LEONARD-ARMSTRONG (MO023)	17	68	1	1	50	32	0
MO	897.9	899.6	1.7	MO022	MEXICO-PUTNAM-LEONARD (MO022)	0	98	0	0	98	48	0
MO	899.6	901.5	1.8	MO023	MEXICO-LEONARD-ARMSTRONG (MO023)	17	68	1	1	50	32	0
MO	901.5	907.8	6.3	MO022	MEXICO-PUTNAM-LEONARD (MO022)	0	98	0	0	98	48	0
MO	907.8	909.1	1.3	MO023	MEXICO-LEONARD-ARMSTRONG (MO023)	17	68	1	1	50	32	0
MO	909.1	911.6	2.5	MO022	MEXICO-PUTNAM-LEONARD (MO022)	0	98	0	0	98	48	0
MO	911.6	911.8	0.2	MO023	MEXICO-LEONARD-ARMSTRONG (MO023)	18	70	0	1	50	32	0
MO	911.8	912.3	0.5	MO022	MEXICO-PUTNAM-LEONARD (MO022)	0	98	0	0	98	48	0
MO	912.3	915.6	3.3	MO023	MEXICO-LEONARD-ARMSTRONG (MO023)	17	68	1	1	50	32	0
MO	915.6	918.2	2.6	MO018	LINDLEY-KESWICK-GOSS (MO018)	75	11	29	3	3	2	2
MO	918.2	919.1	0.9	MO029	FATIMA-ARBELA-VESSER (MO029)	0	51	0	53	99	67	1
MO	919.1	919.8	0.7	MO018	LINDLEY-KESWICK-GOSS (MO018)	75	11	30	3	3	2	2
MO	919.8	920.6	0.8	MO023	MEXICO-LEONARD-ARMSTRONG (MO023)	17	68	1	1	50	32	0
MO	920.6	921.6	1	MO022	MEXICO-PUTNAM-LEONARD (MO022)	0	98	0	0	98	48	0
MO	921.6	923.1	1.4	MO023	MEXICO-LEONARD-ARMSTRONG (MO023)	17	68	1	1	50	32	0
MO	923.1	925.7	2.6	MO022	MEXICO-PUTNAM-LEONARD (MO022)	0	98	0	0	98	48	0
MO	925.7	926.6	1	MO023	MEXICO-LEONARD-ARMSTRONG (MO023)	17	68	1	1	50	32	0
MO	926.6	928.4	1.7	MO022	MEXICO-PUTNAM-LEONARD (MO022)	0	98	0	0	98	48	0
MO	928.4	930.1	1.7	MO023	MEXICO-LEONARD-ARMSTRONG (MO023)	17	68	1	1	50	32	0
MO	930.1	934.4	4.3	MO022	MEXICO-PUTNAM-LEONARD (MO022)	0	98	0	0	98	48	0
MO	934.4	941.8	7.4	MO023	MEXICO-LEONARD-ARMSTRONG (MO023)	17	68	1	1	50	32	0

Appendix F: Soil Associations Along the Proposed Keystone Pipeline Project

State	Approx. Start MP	Approx. End MP	Approx. Miles	MUID	Name	Highly Erodible %	Compaction Prone %	Low Revegetation Potential %	A-Horizon >12" Deep %	Prime Farmland %	Hydric %	Shallow (<60") Bedrock %
MO	941.8	944	2.2	MO025	BARDLEY-GASCONADE-CEDARGAP (MO025)	71	10	17	4	12	1	56
MO	944	948.3	4.3	MO023	MEXICO-LEONARD-ARMSTRONG (MO023)	17	68	1	1	50	32	0
MO	948.3	949.3	1	MO025	BARDLEY-GASCONADE-CEDARGAP (MO025)	71	10	17	4	12	1	56
MO	949.3	950.7	1.5	MO023	MEXICO-LEONARD-ARMSTRONG (MO023)	17	68	1	1	50	32	0
MO	950.7	951.5	0.8	MO025	BARDLEY-GASCONADE-CEDARGAP (MO025)	71	10	17	4	12	1	56
MO	951.5	952.4	0.9	MO023	MEXICO-LEONARD-ARMSTRONG (MO023)	17	68	1	1	50	32	0
MO	952.4	965.3	12.9	MO025	BARDLEY-GASCONADE-CEDARGAP (MO025)	71	10	17	4	12	1	56
MO	965.3	970.9	5.6	MO023	MEXICO-LEONARD-ARMSTRONG (MO023)	17	68	1	1	50	32	0
MO	970.9	984.8	13.9	MO021	MENFRO-WINFIELD-WELLER (MO021)	21	0	41	58	18	0	1
MO	984.8	998.5	13.8	MO027	CARLOW-PORTAGE-CHEQUEST (MO027)	0	88	1	86	100	65	0
MO	998.5	1002.1	3.5	MO026	LOMAX-BLASE-BOOKER (MO026)	0	50	40	55	100	15	0
MO	1002.1	1021.1	19	MO065	HAYNIE-WALDRON-BLAKE (MO065)	0	32	2	21	94	18	0
MO	1021.1	1021.3	0.2	MOW	WATER (MOW)	0	0	0	0	0	0	100
IL	1021.3	1021.5	0.2	ILW	WATER (ILW)	0	0	0	0	0	0	100
IL	1021.5	1024.5	3	IL029	BEAUCOUP-LAWSON-DARWIN (IL029)	0	45	5	81	97	60	0
IL	1024.5	1027.6	3	IL068	WAKELAND-BIRDS-BELKNAP (IL068)	0	75	9	29	99	32	0
IL	1027.6	1027.7	0.1	IL034	ROZETTA-FAYETTE-HICKORY (IL034)	24	8	48	10	49	0	0
IL	1027.7	1028.1	0.4	IL034	ROZETTA-FAYETTE-HICKORY (IL034)	25	7	47	10	49	0	0
IL	1028.1	1030.2	2.1	IL068	WAKELAND-BIRDS-BELKNAP (IL068)	0	75	9	29	99	32	0
IL	1030.2	1033.6	3.4	IL034	ROZETTA-FAYETTE-HICKORY (IL034)	24	7	48	10	49	0	0
IL	1033.6	1034.9	1.3	IL002	TAMA-MUSCATINE-SABLE (IL002)	0	51	3	98	86	15	0
IL	1034.9	1035.2	0.3	IL034	ROZETTA-FAYETTE-HICKORY (IL034)	24	8	49	10	49	0	0
IL	1035.2	1036.6	1.4	IL036	ROZETTA-KEOMAH-HICKORY (IL036)	20	29	29	8	48	1	0
IL	1036.6	1037.3	0.7	IL068	WAKELAND-BIRDS-BELKNAP (IL068)	0	75	9	29	99	32	0
IL	1037.3	1039.5	2.2	IL034	ROZETTA-FAYETTE-HICKORY (IL034)	24	7	48	10	49	0	0
IL	1039.5	1040.6	1	IL004	HERRICK-VIRDEN-PIASA (IL004)	0	97	0	89	94	46	0
IL	1040.6	1041.7	1.1	IL036	ROZETTA-KEOMAH-HICKORY (IL036)	20	29	29	8	48	1	0
IL	1041.7	1042.3	0.6	IL005	COWDEN-OCONEE-DARMSTADT (IL005)	0	97	2	16	80	50	0
IL	1042.3	1043.4	1.1	IL036	ROZETTA-KEOMAH-HICKORY (IL036)	20	29	29	8	48	1	0
IL	1043.4	1045.3	1.8	IL004	HERRICK-VIRDEN-PIASA (IL004)	0	97	0	89	94	46	0
IL	1045.3	1046.7	1.4	IL036	ROZETTA-KEOMAH-HICKORY (IL036)	20	29	29	8	48	1	0
IL	1046.7	1049.2	2.6	IL004	HERRICK-VIRDEN-PIASA (IL004)	0	97	0	89	94	46	0
IL	1049.2	1049.5	0.3	IL005	COWDEN-OCONEE-DARMSTADT (IL005)	0	96	0	16	80	50	0
IL	1049.5	1050.7	1.2	IL034	ROZETTA-FAYETTE-HICKORY (IL034)	24	7	48	10	49	0	0
IL	1050.7	1052.2	1.5	IL005	COWDEN-OCONEE-DARMSTADT (IL005)	0	97	1	15	80	50	0
IL	1052.2	1054	1.8	IL037	HOSMER-STOY-HICKORY (IL037)	20	47	20	43	60	8	0
IL	1054	1055.7	1.7	IL068	WAKELAND-BIRDS-BELKNAP (IL068)	0	75	9	29	99	32	0
IL	1055.7	1056.8	1.1	IL037	HOSMER-STOY-HICKORY (IL037)	20	47	20	43	60	8	0
IL	1056.8	1058.6	1.8	IL005	COWDEN-OCONEE-DARMSTADT (IL005)	0	97	1	15	80	50	0
IL	1058.6	1062.2	3.6	IL038	BLUFORD-AVA-HICKORY (IL038)	17	62	13	12	55	10	0
IL	1062.2	1067.2	4.9	IL006	CISNE-HOYLETON-DARMSTADT (IL006)	0	100	0	3	82	62	0
IL	1067.2	1069.4	2.3	IL038	BLUFORD-AVA-HICKORY (IL038)	17	62	13	12	55	10	0
IL	1069.4	1070.1	0.7	IL068	WAKELAND-BIRDS-BELKNAP (IL068)	0	75	9	29	99	32	0
IL	1070.1	1070.1	0	IL068	WAKELAND-BIRDS-BELKNAP (IL068)	0	0	0	29	99	32	0
IL	1070.1	1072.3	2.2	IL068	WAKELAND-BIRDS-BELKNAP (IL068)	0	75	9	29	99	32	0
IL	1072.3	1073.2	0.8	IL038	BLUFORD-AVA-HICKORY (IL038)	17	62	13	12	55	10	0
IL	1073.2	1077.8	4.6	IL006	CISNE-HOYLETON-DARMSTADT (IL006)	0	100	0	3	82	62	0
IL	1077.8	1077.9	0.1	IL038	BLUFORD-AVA-HICKORY (IL038)	14	61	14	12	55	10	0

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CUSHING EXTENSION												
NE	0	2.2	2.2	NE037	GEARY-JANSEN-MEADIN (NE037)	48	0	84	19	56	0	0
NE	2.2	2.4	0.2	NE028	CRETE-MAYBERRY-WYMORE (NE028)	5	0	10	12	76	0	0
KS	2.4	3.7	1.3	KS328	CRETE-MAYBERRY-WYMORE (KS328)	6	0	9	12	76	0	0
KS	3.7	5.5	1.8	KS371	EUDORA-MUIR-NODAWAY (KS371)	0	0	69	69	100	0	0
KS	5.5	8.5	3	KS328	CRETE-MAYBERRY-WYMORE (KS328)	6	0	9	12	76	0	0
KS	8.5	15.2	6.7	KS371	EUDORA-MUIR-NODAWAY (KS371)	0	0	69	69	100	0	0
KS	15.2	16.3	1.1	KS302	LANCASTER-HEDVILLE-EDALGO (KS302)	28	0	84	22	27	0	69
KS	16.3	19.4	3.1	KS328	CRETE-MAYBERRY-WYMORE (KS328)	6	0	9	12	76	0	0
KS	19.4	21.1	1.8	KS301	CRETE-GEARY-LONGFORD (KS301)	4	0	26	4	72	0	5
KS	21.1	23.3	2.2	KS328	CRETE-MAYBERRY-WYMORE (KS328)	6	0	9	12	76	0	0
KS	23.3	33.5	10.2	KS307	CRETE-LANCASTER-EDALGO (KS307)	5	0	46	9	71	0	29
KS	33.5	36.5	3	KS373	KIPSON-CRETE-FAWNEE (KS373)	13	0	30	23	43	0	40
KS	36.5	39.8	3.3	KS301	CRETE-GEARY-LONGFORD (KS301)	4	0	26	4	72	0	5
KS	39.8	42.4	2.6	KS302	LANCASTER-HEDVILLE-EDALGO (KS302)	28	0	84	22	27	0	69
KS	42.4	49.8	7.4	KS301	CRETE-GEARY-LONGFORD (KS301)	4	0	26	4	72	0	5
KS	49.8	51.7	1.9	KS372	MUIR-EUDORA-SUTPHEN (KS372)	0	0	78	56	92	2	0
KS	51.7	55.1	3.4	KS301	CRETE-GEARY-LONGFORD (KS301)	4	0	26	4	72	0	5
KS	55.1	57.7	2.6	KS330	CLIME-SOGN-MARTIN (KS330)	67	0	5	7	20	0	80
KS	57.7	58.4	0.7	KS301	CRETE-GEARY-LONGFORD (KS301)	4	0	26	4	72	0	5
KS	58.4	61	2.6	KS330	CLIME-SOGN-MARTIN (KS330)	67	0	5	7	20	0	80
KS	61	67.8	6.8	KS301	CRETE-GEARY-LONGFORD (KS301)	4	0	26	4	72	0	5
KS	67.8	69.1	1.3	KS372	MUIR-EUDORA-SUTPHEN (KS372)	0	0	78	56	92	2	0
KS	69.1	70.3	1.2	KS301	CRETE-GEARY-LONGFORD (KS301)	4	0	26	4	72	0	5
KS	70.3	71.1	0.8	KS372	MUIR-EUDORA-SUTPHEN (KS372)	0	0	78	56	92	2	0
KS	71.1	72.7	1.6	KS338	IRWIN-KIPSON-CLIME (KS338)	18	0	7	51	63	0	37
KS	72.7	73.1	0.4	KS301	CRETE-GEARY-LONGFORD (KS301)	5	0	27	4	72	0	5
KS	73.1	73.9	0.8	KS338	IRWIN-KIPSON-CLIME (KS338)	18	0	8	51	63	0	37
KS	73.9	74.8	0.9	KS369	VALENTINE-WELLS-ORTELLO (KS369)	31	0	14	30	49	10	0
KS	74.8	76.8	2.1	KS372	MUIR-EUDORA-SUTPHEN (KS372)	0	0	78	56	92	2	0
KS	76.8	82.2	5.4	KS338	IRWIN-KIPSON-CLIME (KS338)	18	0	7	51	63	0	37
KS	82.2	84.8	2.6	KS351	IRWIN-CLIME-ROSEHILL (KS351)	6	0	8	56	66	0	37
KS	84.8	87.8	2.9	KS338	IRWIN-KIPSON-CLIME (KS338)	18	0	7	51	63	0	37
KS	87.8	89.9	2.1	KS351	IRWIN-CLIME-ROSEHILL (KS351)	6	0	8	56	66	0	37
KS	89.9	92.2	2.4	KS338	IRWIN-KIPSON-CLIME (KS338)	18	0	7	51	63	0	37
KS	92.2	101.6	9.3	KS351	IRWIN-CLIME-ROSEHILL (KS351)	6	0	8	56	66	0	37
KS	101.6	104.3	2.7	KS349	IRWIN-LADYSMITH-LABETTE (KS349)	2	30	4	47	78	0	20
KS	104.3	112.1	7.8	KS351	IRWIN-CLIME-ROSEHILL (KS351)	6	0	8	56	66	0	37
KS	112.1	115.3	3.1	KS354	WELLS-VERDIGRIS-IRWIN (KS354)	0	5	49	48	86	3	5
KS	115.3	116.3	1.1	KS351	IRWIN-CLIME-ROSEHILL (KS351)	6	0	8	56	66	0	37
KS	116.3	116.9	0.6	KS354	WELLS-VERDIGRIS-IRWIN (KS354)	0	5	48	48	86	3	5
KS	116.9	118.3	1.4	KS361	READING-IVAN-CHASE (KS361)	0	16	73	96	100	1	0
KS	118.3	118.8	0.5	KS351	IRWIN-CLIME-ROSEHILL (KS351)	6	0	8	56	66	0	37
KS	118.8	120.7	1.9	KS331	FLORENCE-LABETTE-TULLY (KS331)	17	0	5	19	29	0	66
KS	120.7	126.4	5.6	KS351	IRWIN-CLIME-ROSEHILL (KS351)	6	0	8	56	66	0	37
KS	126.4	128.1	1.7	KS331	FLORENCE-LABETTE-TULLY (KS331)	17	0	5	19	29	0	66
KS	128.1	128.5	0.4	KS354	WELLS-VERDIGRIS-IRWIN (KS354)	0	5	50	48	86	3	5
KS	128.5	131.9	3.4	KS350	TULLY-SOGN-CLIME (KS350)	10	0	3	19	33	0	55
KS	131.9	142.4	10.5	KS349	IRWIN-LADYSMITH-LABETTE (KS349)	2	30	4	47	78	0	20
KS	142.4	143.5	1.2	KS361	READING-IVAN-CHASE (KS361)	0	16	73	96	100	1	0
KS	143.5	144.9	1.4	KS349	IRWIN-LADYSMITH-LABETTE (KS349)	2	30	4	47	78	0	20
KS	144.9	145.6	0.7	KS361	READING-IVAN-CHASE (KS361)	0	16	74	96	100	1	0

Appendix F: Soil Associations Along the Proposed Keystone Pipeline Project

State	Approx. Start MP	Approx. End MP	Approx. Miles	MUID	Name	Highly Erodible %	Compaction Prone %	Low Revegetation Potential %	A-Horizon >12" Deep %	Prime Farmland %	Hydric %	Shallow (<60") Bedrock %
KS	145.6	149.5	3.9	KS349	IRWIN-LADYSMITH-LABETTE (KS349)	2	30	4	47	78	0	20
KS	149.5	150.3	0.7	KS232	DWIGHT-LABETTE-SOGN (KS232)	0	0	0	3	25	0	97
KS	150.3	151.2	0.9	KS349	IRWIN-LADYSMITH-LABETTE (KS349)	2	30	4	47	78	0	20
KS	151.2	151.7	0.5	KS361	READING-IVAN-CHASE (KS361)	0	17	73	96	100	1	0
KS	151.7	154.7	3.1	KS349	IRWIN-LADYSMITH-LABETTE (KS349)	2	30	4	47	78	0	20
KS	154.7	159.8	5	KS361	READING-IVAN-CHASE (KS361)	0	18	73	96	100	1	0
KS	159.8	160.7	1	KS349	IRWIN-LADYSMITH-LABETTE (KS349)	2	30	4	47	78	0	20
KS	160.7	161.8	1	KS361	READING-IVAN-CHASE (KS361)	0	18	73	96	100	1	0
KS	161.8	163.4	1.6	KS349	IRWIN-LADYSMITH-LABETTE (KS349)	2	30	4	47	78	0	20
KS	163.4	164.4	1	KS361	READING-IVAN-CHASE (KS361)	0	18	73	96	100	1	0
KS	164.4	167.9	3.5	KS349	IRWIN-LADYSMITH-LABETTE (KS349)	2	30	4	47	78	0	20
KS	167.9	166.6	0.6	KS361	READING-IVAN-CHASE (KS361)	0	19	73	96	100	1	0
KS	166.6	169.4	0.8	KS232	DWIGHT-LABETTE-SOGN (KS232)	0	0	0	3	25	0	97
KS	169.4	174.4	5	KS240	IRWIN-ROSEHILL-GOESSEL (KS240)	0	0	3	59	71	0	27
KS	174.4	174.6	0.2	KS237	NORGE-IRWIN-LADYSMITH (KS237)	0	18	36	86	74	0	14
KS	174.6	176.7	2.1	KS235	VERDIGRIS-BREWER-NORGE (KS235)	0	0	18	100	99	6	0
KS	176.7	178.6	1.9	KS240	IRWIN-ROSEHILL-GOESSEL (KS240)	0	0	3	59	71	0	27
KS	178.6	182.1	3.5	KS235	VERDIGRIS-BREWER-NORGE (KS235)	0	0	18	100	99	6	0
KS	182.1	184.4	2.3	KS240	IRWIN-ROSEHILL-GOESSEL (KS240)	0	0	3	59	71	0	27
KS	184.4	194.6	10.2	KS235	VERDIGRIS-BREWER-NORGE (KS235)	0	0	18	100	99	6	0
KS	194.6	204.8	10.2	KS242	VANOSS-BETHANY-TABLER (KS242)	0	0	74	32	100	0	0
KS	204.8	206.3	1.5	KS243	CANADIAN-DALE-LINCOLN (KS243)	0	0	33	85	85	0	0
KS	206.3	212.6	6.2	KS241	KIRKLAND-BETHANY-TABLER (KS241)	0	0	76	38	93	0	0
OK	212.6	233	20.8	OK093	KIRKLAND-BETHANY-TABLER (OK093)	0	0	76	38	93	0	0
OK	233	238.7	5.8	OK106	NORGE-VANOSS-VERDIGRIS (OK106)	2	0	85	63	81	0	2
OK	238.7	239.7	1	OK114	REINACH-ELANDCO-BREWER (OK114)	0	6	50	100	92	0	0
OK	239.7	240.3	0.6	OK080	GOODNIGHT-YAHOLA-GADDY (OK080)	16	0	0	0	43	0	0
OK	240.3	241.1	0.8	OK093	KIRKLAND-BETHANY-TABLER (OK093)	0	0	76	38	93	0	0
OK	241.1	242.5	1.4	OK114	REINACH-ELANDCO-BREWER (OK114)	0	6	50	100	92	0	0
OK	242.5	247.4	5	OK093	KIRKLAND-BETHANY-TABLER (OK093)	0	0	76	38	93	0	0
OK	247.4	247.9	0.6	OK106	NORGE-VANOSS-VERDIGRIS (OK106)	2	0	85	63	81	0	2
OK	247.9	249.5	1.6	OK112	PORT-PULASKI-ASHPORT (OK112)	0	5	49	63	82	0	0
OK	249.5	250.9	1.4	OK117	RENFROW-ZANEIS-GRAINOLA (OK117)	12	0	73	11	42	0	50
OK	250.9	252.2	1.3	OK116	RENFROW-KIRKLAND-GRAINOLA (OK116)	7	0	63	12	62	0	27
OK	252.2	253.8	1.6	OK117	RENFROW-ZANEIS-GRAINOLA (OK117)	12	0	73	11	42	0	50
OK	253.8	254.2	0.3	OKW	WATER (OKW)	0	0	0	0	0	0	100
OK	254.2	257	2.9	OK117	RENFROW-ZANEIS-GRAINOLA (OK117)	12	0	73	11	42	0	50
OK	257	257.4	0.4	OK116	RENFROW-KIRKLAND-GRAINOLA (OK116)	8	0	62	12	62	0	27
OK	257.4	260	2.7	OK106	NORGE-VANOSS-VERDIGRIS (OK106)	2	0	85	63	81	0	2
OK	260	261.6	1.6	OK112	PORT-PULASKI-ASHPORT (OK112)	0	5	49	63	82	0	0
OK	261.6	262.7	1.1	OK117	RENFROW-ZANEIS-GRAINOLA (OK117)	12	0	73	11	42	0	50
OK	262.7	263.7	1	OK116	RENFROW-KIRKLAND-GRAINOLA (OK116)	7	0	63	12	62	0	27
OK	263.7	264.9	1.3	OK112	PORT-PULASKI-ASHPORT (OK112)	0	5	49	63	82	0	0
OK	264.9	266.1	1.2	OK117	RENFROW-ZANEIS-GRAINOLA (OK117)	12	0	73	11	42	0	50
OK	266.1	267.3	1.2	OK116	RENFROW-KIRKLAND-GRAINOLA (OK116)	7	0	63	12	62	0	27
OK	267.3	268.9	1.6	OK117	RENFROW-ZANEIS-GRAINOLA (OK117)	12	0	73	11	42	0	50
OK	268.9	269.5	0.6	OK116	RENFROW-KIRKLAND-GRAINOLA (OK116)	7	0	63	12	62	0	27
OK	269.5	282.6	13.4	OK117	RENFROW-ZANEIS-GRAINOLA (OK117)	12	0	73	11	42	0	50
OK	282.6	284.5	1.9	OK146	KONAWA-EUFAULA-DOUGHERTY (OK146)	1	0	5	54	32	0	5
OK	284.5	285.6	1.1	OK079	GRACEMORE-GADDY-GOODNIGHT (OK079)	16	1	0	30	30	1	0
OK	285.6	291.1	5.6	OK119	SEMINOLE-CHICKASHA-GOWTON (OK119)	17	0	17	22	25	0	33
OK	291.1	292.2	1.2	OK131	AGRA-STEEDMAN-COYLE (OK131)	0	0	18	5	36	0	37

Appendix G

Public Water Supply Wells in the Vicinity of the Proposed Right-of-Way for the Keystone Pipeline Project

(Note: This appendix is Table 3.5-6, taken directly from the Environmental Report for the Keystone Pipeline Project [ENSR 2006a])

Table 3.5-6 Public Water Supplies (PWS) within 1 mile of the Proposed Keystone Centerline

State	County	Approximate Mile Post Marker (mi)	Distance From CL (mi)	Cardinal Direction from CL	PWS Name	Well ID
KEYSTONE MAINLINE						
North Dakota	Pembina	20.24	0.99	east	Cavalier	ND5000201
	Pembina	30.67	0.48	east	North Val	ND3401129
	Pembina	30.71	0.46	east	North Val	ND3401129
	Pembina	30.72	0.40	east	North Val	ND3401129
	Pembina	30.72	0.56	east	North Val	ND3401129
	Walsh	30.73	0.51	east	North Val	ND3401129
South Dakota	Marshall	235.8-236.2	< 0.04	west	Marshal County Source Water Area	unk
	Kingsbury	326.7	0	crosses CL	Zone B Aquifer Protection Area	none
Nebraska	Wayne	488.1	< 1.0	unk	Hoskins, Village of	NE3118101
	Colfax	518	< 1.0	unk	Leigh, Village of	NE3103705
	Seward	577.05	0	crosses CL	Seward Co. SID #2	NE3115904
	Seward	577.55	0	crosses CL	Seward, City of	NE3115905
	Seward	580.58	0	crosses CL	Glenhaven Village Subdivision	NE3110929
	Seward	584.20	0	crosses CL	Milford, City of	NE3115907
	Seward	585.86	0	crosses CL	Milford, City of	NE3115907
	Jefferson	618.88	0	crosses CL	Plymouth, Village of	NE3109503
	Jefferson	636.3	< 1.0	unk	Steele City, Village of	NE3109502
Kansas	Doniphan	736.7	< 1.0	north	Bendena	unk
Missouri	Chariton	859.01	0.96	south	Keytesville	14616
	Chariton	859.04	0.92	south	Keytesville	14615
	Chariton	862.55	0.06	south	Salisbury	14630
	Chariton	862.63	0.06	north	Salisbury	14629
	Chariton	862.86	0.38	north	Salisbury	14628
	Audrain	919.68	0.56	south	National Refractories & Mineral	12790
	Audrain	931.60	0.84	north	Community R-VI School	12791
	Lincoln	961.30	0.46	north	Lincoln Co. Egg Farm	13014
	Lincoln	961.34	0.50	north	Lincoln Co. Egg Farm	10124
	Lincoln	961.35	0.51	north	Lincoln Co. Egg Farm	10123

Table 3.5-6 Public Water Supplies (PWS) within 1 mile of the Proposed Keystone Centerline

State	County	Approximate Mile Post Marker (mi)	Distance From CL (mi)	Cardinal Direction from CL	PWS Name	Well ID
	Lincoln	970.57	0.73	north	Glenmeadows Subd.	16726
	Lincoln	972.79	0.89	north	Lincoln Co. PWSD #1	12706
	Lincoln	974.96	0.78	south	Moscow Mills	10131
	Lincoln	975.30	0.46	north	Lincoln Co. PWSD #1	16983
	Lincoln	976.75	0.91	south	Majestic Lakes	16955
	Lincoln	980.26	0.30	north	Autumn Hills MHP	12875
	Lincoln	980.26	0.29	north	Autumn Hills MHP	12874
	Lincoln	981.18	0.25	south	Joan's Chain of Events	11866
	St Charles	1001.40	0.55	south	Trinity Lutheran	13538
	St Charles	1014.42	0.62	south	West Alton Elem. School	10932
Illinois	Madison	1030	< 0.04	unk	County Highway 1 over Cahokia	26512
	Madison	1030	< 0.04	unk	County Highway 1 over Cahokia	26511
	Madison	1032	< 0.04	unk	IL 157 over Mooney Creek	27998
	Madison	1032	< 0.04	unk	IL 157 over Mooney Creek	27997
	Madison	1032	< 0.04	unk	IL 157 over Mooney Creek	27999
	Madison	1035	< 0.04	unk	N.Y.C. & St. L. RR. Overhead	27222
	Madison	1035	< 0.04	unk	N.Y.C. & St. L. RR. Overhead	27223
	Madison	1035	< 0.04	unk	N.Y.C. & St. L. RR. Overhead	27226
	Madison	1035	< 0.04	unk	N.Y.C. & St. L. RR. Overhead	27228
	Madison	1035	< 0.04	unk	N.Y.C. & St. L. RR. Overhead	27227
	Madison	1035	< 0.04	unk	N.Y.C. & St. L. RR. Overhead	27229
	Madison	1035	< 0.04	unk	N.Y.C. & St. L. RR. Overhead	27225
CUSHING EXTENSION						
Nebraska	Jefferson	N/A	N/A	N/A	NONE	NONE
Kansas	Washington	3.75	0.32	east	Hollenberg	unk
	Washington	20.80	0.20	west	Greenleaf Well #7	unk
	Washington	21.06	0.27	east	Greenleaf Well #8	unk
	Washington	21.67	0.70	east	Greenleaf	unk
	Washington	21.70	0.67	east	Standby Well #5	unk

Table 3.5-6 Public Water Supplies (PWS) within 1 mile of the Proposed Keystone Centerline

State	County	Approximate Mile Post Marker (mi)	Distance From CL (mi)	Cardinal Direction from CL	PWS Name	Well ID
	Washington	21.77	0.71	east	Greenleaf	unk
	Washington	21.78	0.71	east	Greenleaf	unk
	Washington	21.83	0.67	east	Standby Well #6	unk
	Dickinson	73.79	0.37	east	Chapman	unk
	Dickinson	73.80	0.40	east	Chapman	unk
	Dickinson	73.80	0.42	east	Chapman	unk
	Butler	146.13	0.37	west	Potwin	unk
	Butler	146.16	0.38	west	Potwin	unk
	Butler	146.16	0.38	west	Potwin	unk
	Butler	146.20	0.24	west	Potwin	unk
	Butler	146.36	0.02	east	Potwin	unk
	Butler	146.41	0.05	west	Potwin	unk
	Butler	155.27	0.27	west	Towanda	unk
	Butler	155.50	0.78	west	Towanda	unk
	Butler	155.63	0.65	west	Towanda	unk
	Butler	155.78	0.02	west	Towanda	unk
	Butler	155.78	0.02	west	Towanda	unk
	Butler	155.90	0.05	west	Towanda	unk
	Butler	155.90	0.05	west	Towanda	unk
	Cowley	194.81	0.04	west	Winifield	unk
	Cowley	207.25	1.00	east	Arkansas City, Well #4	unk
	Cowley	207.42	1.00	east	Arkansas City, Well #3	unk
	Cowley	207.51	1.00	east	Arkansas City, Well #2	unk
	Cowley	207.57	0.99	east	Arkansas City, Well #1	unk
	Cowley	207.58	0.98	east	Arkansas City, Well #9	unk
Oklahoma	Kay	240.04	0.25	east	Marland	OK2005204
	Kay	240.02	0.26	east	Marland	OK2005204
	Kay	240.00	0.28	east	Marland	OK2005204
	Payne	290.17	0.04	west	Linclon Co RW & Sewer Dist	OK2004105

Appendix H

Water Bodies within 10 Miles Downstream of Proposed Crossings for the Keystone Pipeline Project

(Note: This appendix is Table 3.5-1, taken directly from the Environmental Report for the Keystone Pipeline Project [ENSR 2006a])

Table 3.5-1 Waterbodies Within 10 Miles Downstream of Proposed Crossings

State	County	Stream Crossing Point	Approx. Milepost	Affected Downstream Reservoir/Fishery/Wildlife Area	Other Description
KEYSTONE MAINLINE					
North Dakota	Pembina	Smith Coulee Tribs	10.5, 10.9	Weiler Dam/Reservoir	Immediately downstream of tributary crossings, also downstream Jay V Wessels Wildlife Management Area (WMA)
	Pembina	Busee Coulee	13.2	Unnamed reservoir	Downstream of crossing
	Pembina	Tribs to Tounge River	16.2, 17, 17.4	Herzog Dam/ two reservoirs	Two reservoirs just downstream of crossing of tributaries into reservoir
	Pembina	Crossing of Tongue River	18.4	Renwick Dam at Icelandic State Park	Two additional small dams and state wildlife areas immediately downstream of river crossing
	Pembina	Crossing of Willow Creek	20.62	Unnamed reservoir	at 134th Ave.
	Walsh	Crossing of unnamed trib	34.8, 35.3	Charles C Cook State Game Management Area and wetlands	
	Walsh	South Branch Park River	41.5	Homme Lake	Homme Lake and Homme Lake Project
	Nelson	South Branch Forest River Tribs	56.9, 57.4, 58.1	Reservoir/Dam	Large reservoir downstream; Forest River Biology Area below reservoir
	Nelson	Pickart Lake	74.0	Pickart Lake	Within 2,000 feet of the centerline, however, no stream crossings connected to reservoir
	Barnes	Tribs to Sheyenne River	168.0	Lake Ashtabula	Valley City National Fish Hatchery downstream of lake
	Ransom	Trib to Lone Tree Lake	180.3	Lone Tree Lake	Pipeline crosses trib that leads into Lone Tree Lake and Englevale Slough WMA
	Sargent	Trib to Lake Taayer	183.4	Lake Taayer	Lake Taayer, wetlands area

Table 3.5-1 Waterbodies Within 10 Miles Downstream of Proposed Crossings

State	County	Stream Crossing Point	Approx. Milepost	Affected Downstream Reservoir/Fishery/Wildlife Area	Other Description
South Dakota	Marshall	Renzienhausen Slough	228.7	Renzienhausen Slough	Renzienhausen Game Production Area (GPA), wetlands
	Day	Trib	257.5, 257.7	Amsden Lake	Unclear if trib is upstream or downstream
	Clark	Logan Dam/Reservoir	294.0	Logan Dam/Reservoir	Pipeline crosses directly upstream of reservoir
	Clark	Tribs to Fordham Reservoir	299.0	Fordham Reservoir	Area also includes Fordham GPA/Water Access (WA)
	Beadle	Crossing of Pearl Creek	326.0	Reservoir/Dam	Reservoir and LeClaire Waterfowl Production Area (WPA) dowstream of crossing
	Kingsbury	Lake Iroquois	329.0	Lake Iroquois	Crosses very close to or through Lake Iroquois
	Miner	Tribs to Twin lakes	354.3	Twin Lakes, National Wildlife Production Area (NWPA)	Downstream is Twin Lakes, NWPA, and associated GPA
	Hanson	Trib to Lake Eli	372.7	Lake Eli	NWPA, fishing, and hunting area
Nebraska	Colfax	Crossing of Tribs from Lake McCallister	539.8	Whitetail State Wildlife Management Area (SWMA), 3612 Fishing Spot	Feeds into the Platte River
	Colfax	Platte River	541.0	Whitetail SWMA, 3612 Fishing Spot	
	Butler	Crossing of Deer Creek	544.5, 547.5	Whitetail SWMA, 3612 Fishing Spot	Downstream of river crossing, also feeds into the Platte River
	Seward	Crossing of Lone Tree Creek	577.9	Three small reservoirs	Immediately downstream of crossing
	Jefferson	Crossing through Tribs of Big Indian Creek	626.9, 627.2	Unnamed Reservoir	
	Jefferson	Tribs to Big Indian Creek	633.1	Reservoir	Reservoir southwest of Diller
Kansas	No waterbodies located within 10 miles downstream of proposed crossing.				

Table 3.5-1 Waterbodies Within 10 Miles Downstream of Proposed Crossings

State	County	Stream Crossing Point	Approx. Milepost	Affected Downstream Reservoir/Fishery/Wildlife Area	Other Description
Kansas Missouri	Buchanan	Tribs to New Mud Lake/Old Mud Lake	749.9	New Mud Lake/Old Mud Lake	May not be connected to reservoirs but located close to centerline
	Buchanan	Crossing Platte River	762.2	3112, 3120 Fishing Spot	
	Clinton	Crossing of Horse Fork, Little Platte River	778.6, 780.9	Smithville Reservoir, 2668 Fishing area	Large reservoir just south of Plattesburg
	Caldwell	Crossing of Brush Creek	801.2	2696 Fishing Spot	
	Chariton	Crossing of Grand River	840.6	2472 Fishing Spot	
	Chariton	Crossing Tribs of Palmer Creek	851.0, 851.8	Cut-Off Lake	Palmer Creek feeds into Cut-Off Lake then connects to Missouri River
	Montogomery	Crossing of Trib. to Middletown Lake	943.4	Middletown Lake	
	St. Charles	Tribs to Horseshoe and Mud Lake	985.2, 986.0	Horseshoe Lake and Mud Lake	Pipeline crosses through streams between the two waterbodies
	St. Charles	Crossing of Trib to Graus Lake	1002.6	Graus Lake	Pipeline crosses through streams that lead between the two areas
Illinois	Bond	Crosses Highland Silver Lake	1034.8	Highland Silver Lake	Very large reservoir
	Bond	Unnamed Reservoir	1046.2	Unnamed Reservoir	Southeast of Pocahontas
	Bond	Crosses Spring Branch	1059.0	Carlyle Lake and Carlyle Lake SWMA	Very large reservoir

Table 3.5-1 Waterbodies Within 10 Miles Downstream of Proposed Crossings

State	County	Stream Crossing Point	Approx. Milepost	Affected Downstream Reservoir/Fishery/Wildlife Area	Other Description
	Bond/Fayette	Carlyle Lake State Wildlife Management Area	1061.5-1064.5		Pipeline crosses through northern section and various streams and reservoirs
	Fayette/Marion	Tribs to Maggot Creek, North Fork	1066.0-1069.0	Carlyle Lake and Carlyle Lake SWMA	
CUSHING EXTENSION					
Kansas	Clay	W. Fancy Creek	36.5	Turtle Creek Wildlife Area, Turtle Creek Lake	More than 10 miles downstream, approximately 15 to 20, very large reservoir
	Clay	Lincoln Creek	44, 45.5, 46	Milford Wildlife Area, Milford Lake	Lincoln Creek feeds into the Republican River which leads directly downstream to the Milford Wildlife Area and Milford Lake
	Clay	Republican River	50	Milford Wildlife Area, Milford Lake	Pipeline crossed directly through the Milford Wildlife Area at this crossing. Feeds directly into Milford Wildlife Area and Milford Lake
	Clay	Cane Creek	54	Milford Wildlife Area, Milford Lake	Pipeline crossed directly through the Milford Wildlife Area at this crossing. Feeds directly into Milford Wildlife Area and Milford Lake
	Clay	Trib to Milford Lake	58	Milford Wildlife Area, Milford Lake	
	Clay	Quinnby Creek	61, 62	Milford Wildlife Area, Milford Lake, Milford Lake Project	
	Dickinson	Lyon Creek	98.5, 100, 101.5	Herington Reservoir	Immediately downstream
	Marion	Cottonwood River	117	Marion Lake Reservoir, Marion Lake State Wildlife Area	River crossing is downstream, but passes very closely to lake and WA
	Cowley	Arkansas River	206	Kaw WMA, Kaw Lake	
	Cowley	Spring Creek	210	Kaw WMA, Kaw Lake	Fishing area 3040 directly downstream
Oklahoma	Kay	Cholocco Creek	212, 213	Kaw WMA, Kaw Lake	
	Noble	Trib to Sooner Lake	254	Sooner Lake	

Appendix I

Levees and Water Control Structures in the Vicinity of the Keystone Pipeline Project

(Note: This appendix is Table 3.5-2, taken directly from the Environmental Report for the Keystone Pipeline Project [ENSR 2006a])

Table 3.5-2 Levees and Water Control Structures

State	County	Milepost	Type of Flood Protection Structure	Waterbody
KEYSTONE MAINLINE				
North Dakota	N/A	N/A	None	N/A
South Dakota	Marshall	225.5	Spoil bank/ditch	Crow Creek Ditch/Crow Creek
Nebraska	Cedar	436.6	Ditch	Kaiser Ditch
	Cedar	438.2	Ditch/canal	Antelope Creek
	Colfax	537.9	Ditch	Barnholdt Ditch
	Colfax	544.0	Canal	Deer Creek Canal
Kansas	Doniphan	743.3	Embankment/levee	Missouri River
Missouri	Buchanan	743.7	Embankment/levee	Missouri River
	Buchanan	752.7	Embankment/levee	
	Buchanan	752.8	Embankment/levee	
	Chariton	840.5	Levee at or nearby	Grand River area
	Chariton	856.9, 857.1, 857.2	(3) levees	Mussel Fork
	Chariton	857.5	Levee	
	Chariton	867.0	Embankment/levee	Middle Fork Little Chariton River
	Lincoln	971.1	Levee	Cuivre River
	St. Charles	985.4	Ditch	Horseshoe/Mud Lake
	St. Charles	985.7, 985.8	(2) levees	Horseshoe/Mud Lake
	St. Charles	986.0	Ditch	Horseshoe/Mud Lake
	St. Charles	986.4	Levee	Horseshoe/Mud Lake
	St. Charles	987.0	Levee	Fish Slough
	St. Charles	987.4, 987.5	(2) levees	Fish Slough
	St. Charles	987.7	Levee	None
	St. Charles	988.3	(2) levees	None
	St. Charles	988.7	Levee	None
	St. Charles	989.8-990.2	(3) levees	Dardenne Lake Area
	St. Charles	991.8	Levee	None

Table 3.5-2 Levees and Water Control Structures

State	County	Milepost	Type of Flood Protection Structure	Waterbody
	St. Charles	1008.9	Levee	Mississippi River Area
	St. Charles	1018.9	Levee	Mississippi River Area
	St. Charles	1021.0	Levee	Mississippi River Area
Illinois	Fayette	1069.8-1070.2	Levee	Carlyle WMA
	Fayette	1070.4	Levee	Carlyle WMA
	Fayette	1071.4	Levee	Carlyle WMA
CUSHING EXTENSION				
Nebraska	None	None	None	None
Kansas	None	None	None	None
Oklahoma	None	None	None	None

Appendix J

Major and Sensitive Water Body Crossings for the Keystone Pipeline Project

(Note: This appendix is Table F-1, taken directly from the Environmental Report for the Keystone Pipeline Project [ENSR 2006a])

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
KEYSTONE MAINLINE					
NORTH DAKOTA					
Cavalier	0.62	Unnamed	Intermittent Stream/River		
Cavalier	1.70	Unnamed	Intermittent Stream/River		
Cavalier	2.66	Unnamed	Intermittent Stream/River		
Cavalier		Unnamed	Intermittent Stream/River		
Cavalier	3.68	Unnamed	Intermittent Stream/River		
Pembina	7.09	Pembina River	Perennial Stream/River	Fish and Other Aquatic Biota, Recreation, Class 1A	Fully Supporting but Threatened
Pembina	10.49	Unnamed	Intermittent Stream/River		
Pembina	10.84	Unnamed	Intermittent Stream/River		
Pembina	11.73	Unnamed	Intermittent Stream/River		
Pembina	11.83	Unnamed	Intermittent Stream/River		
Pembina	11.92	Unnamed	Intermittent Stream/River		
Pembina	12.01	Unnamed	Intermittent Stream/River		
Pembina	13.13	Unnamed	Intermittent Stream/River		
Pembina	16.14	Unnamed	Intermittent Stream/River		
Pembina	16.50	Unnamed	Intermittent Stream/River		
Pembina	17.01	Unnamed	Intermittent Stream/River		
Pembina	17.41	Unnamed	Intermittent Stream/River		
Pembina	17.76	Unnamed	Intermittent Stream/River		
Pembina	18.38	Tongue River	Perennial Stream/River	Fish and Other Aquatic Biota, Class II	Fully Supporting but Threatened
Pembina	18.85	Tributary to Tongue River	Intermittent Stream/River	Fish and Other Aquatic Biota	

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Pembina	19.12	Unnamed	Intermittent Stream/River		
Pembina	20.05	Unnamed	Intermittent Stream/River		
Pembina	20.48	Unnamed	Intermittent Stream/River		
Pembina	20.62	Willow Creek	Intermittent Stream/River		
Pembina	21.54	Unnamed	Intermittent Stream/River		
Pembina	21.98	Unnamed	Intermittent Stream/River		
Pembina	22.27	Unnamed	Intermittent Stream/River		
Pembina	22.65	Unnamed	Intermittent Stream/River		
Pembina	22.81	Unnamed	Intermittent Stream/River		
Pembina	23.23	Unnamed	Intermittent Stream/River		
Pembina	23.73	Cart Creek	Intermittent Stream/River		
Pembina	24.74	Unnamed	Intermittent Stream/River		
Pembina	25.21	Unnamed	Intermittent Stream/River		
Pembina	26.02	Unnamed	Intermittent Stream/River		
Pembina	26.15	Unnamed	Intermittent Stream/River		
Pembina	26.77	Unnamed	Intermittent Stream/River		
Pembina	27.90	Unnamed	Intermittent Stream/River		
Pembina	29.44	North Branch Park River	Intermittent Stream/River	Fish and Other Aquatic Biota, Class III	Fully Supporting but Threatened
Pembina	31.05	Unnamed	Intermittent Stream/River		
Pembina	31.82	Unnamed	Intermittent Stream/River		
Walsh	32.98	Unnamed	Intermittent Stream/River		
Walsh	33.28	Unnamed	Intermittent Stream/River		
Walsh	33.34	Middle Branch Park River	Intermittent Stream/River	Fish and Other Aquatic Biota, Class III	Fully Supporting but Threatened
Walsh	34.26	Unnamed	Intermittent Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Walsh	34.76	Unnamed	Intermittent Stream/River		
Walsh	35.30	Unnamed	Intermittent Stream/River		
Walsh	36.28	Unnamed	Intermittent Stream/River		
Walsh	37.15	Unnamed	Intermittent Stream/River		
Walsh	37.39	Unnamed	Intermittent Stream/River		
Walsh	38.09	Unnamed	Intermittent Stream/River		
Walsh	38.68	Unnamed	Intermittent Stream/River		
Walsh	39.08	Unnamed	Intermittent Stream/River		
Walsh	39.53	Unnamed	Intermittent Stream/River		
Walsh	40.17	Unnamed	Intermittent Stream/River		
Walsh	41.56	South Branch Park River	Intermittent Stream/River	Fish and Other Aquatic Biota, Class II	Fully Supporting but Threatened
Walsh	42.25	Unnamed	Intermittent Stream/River		
Walsh	42.28	Unnamed	Intermittent Stream/River		
Walsh	42.33	Unnamed	Intermittent Stream/River		
Walsh	42.44	Unnamed	Intermittent Stream/River		
Walsh	42.91	Unnamed	Intermittent Stream/River		
Walsh	43.18	Unnamed	Intermittent Stream/River		
Walsh	43.67	Unnamed	Intermittent Stream/River		
Walsh	43.78	Unnamed	Intermittent Stream/River		
Walsh	43.96	Unnamed	Intermittent Stream/River		
Walsh	44.29	Unnamed	Intermittent Stream/River		
Walsh	44.71	Unnamed	Intermittent Stream/River		
Walsh	45.00	Unnamed	Intermittent Stream/River		
Walsh	45.26	Unnamed	Intermittent Stream/River		
Walsh	45.99	Unnamed	Intermittent Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Walsh	46.31	North Branch Forest River	Intermittent Stream/River	Fish and Other Aquatic Biota, Class III	Not Supporting
Walsh	46.81	Unnamed	Intermittent Stream/River		
Walsh	46.98	Unnamed	Intermittent Stream/River		
Walsh	47.20	Unnamed	Intermittent Stream/River		
Walsh	47.68	Unnamed	Intermittent Stream/River		
Walsh	47.82	Unnamed	Intermittent Stream/River		
Walsh	48.31	Unnamed	Intermittent Stream/River		
Walsh	48.53	Unnamed	Intermittent Stream/River		
Walsh	48.92	Unnamed	Intermittent Stream/River		
Walsh	49.34	Unnamed	Intermittent Stream/River		
Walsh	49.80	Unnamed	Intermittent Stream/River		
Walsh	50.07	Unnamed	Intermittent Stream/River		
Walsh	50.32	Unnamed	Intermittent Stream/River		
Walsh	50.99	Unnamed	Intermittent Stream/River		
Walsh	51.56	Unnamed	Intermittent Stream/River		
Walsh	51.88	Unnamed	Intermittent Stream/River		
Walsh	52.59	Unnamed	Intermittent Stream/River		
Walsh	53.17	Unnamed	Intermittent Stream/River		
Walsh	54.51	Middle Branch Forest River	Perennial Stream/River	Fish and Other Aquatic Biota	Not Supporting
Walsh	55.39	Unnamed	Intermittent Stream/River		
Nelson	56.91	South Branch Forest River	Intermittent Stream/River	Fish and Other Aquatic Biota	Not Supporting
Nelson	57.41	Unnamed	Intermittent Stream/River		
Nelson	58.16	Unnamed	Intermittent Stream/River		
Nelson	58.80	Unnamed	Intermittent Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Nelson	59.18	Unnamed	Intermittent Stream/River		
Nelson	59.42	Unnamed	Intermittent Stream/River		
Nelson	60.25	Unnamed	Intermittent Stream/River		
Nelson	60.45	Unnamed	Intermittent Stream/River		
Nelson	61.18	Unnamed	Intermittent Stream/River		
Nelson	62.53	Unnamed	Intermittent Stream/River		
Nelson	64.04	Unnamed	Intermittent Stream/River		
Nelson	64.64	Skunk Coulee	Intermittent Stream/River		
Nelson	66.97	North Branch Turtle River	Intermittent Stream/River	Class II (Turtle river)	Not Supporting
Nelson	71.54	Unnamed	Intermittent Lake/Pond		
Nelson	76.46	Goose River	Intermittent Stream/River	Fish and Other Aquatic Biota; Recreation, Class IA	Not Supporting; Fully Supporting but Threatenend
Nelson	84.35	Beaver Creek	Intermittent Stream/River		
Steele	94.82	Unnamed	Intermittent Lake/Pond		
Steele	100.23	Unnamed	Intermittent Lake/Pond		
Steele	103.47	Unnamed	Intermittent Stream/River		
Steele	105.90	Unnamed	Intermittent Stream/River		
Steele	107.93	Unnamed	Intermittent Stream/River		
Steele	108.33	Unnamed	Intermittent Stream/River		
Steele	109.53	Unnamed	Intermittent Stream/River		
Steele	~110.7	Unnamed	Intermittent Lake/Pond		
Steele	111.81	Unnamed	Intermittent Stream/River		
Steele	114.53	Unnamed	Intermittent Stream/River		
Steele		Unnamed	Intermittent Lake/Pond		
Steele		Unnamed	Intermittent Lake/Pond		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Barnes		Unnamed	Intermittent Lake/Pond		
Barnes	123.08	Unnamed	Intermittent Stream/River		
Barnes	125.04	Unnamed	Intermittent Stream/River		
Barnes	126.15	Unnamed	Intermittent Stream/River		
Barnes	130.41	Unnamed	Intermittent Stream/River		
Barnes	132.44	Unnamed	Intermittent Lake/Pond		
Barnes		Unnamed	Intermittent Lake/Pond		
Barnes	145.94	Unnamed	Intermittent Stream/River		
Barnes	148.88	Unnamed	Intermittent Stream/River		
Barnes	149.42	Unnamed	Intermittent Stream/River		
Barnes	149.74	Unnamed	Intermittent Stream/River		
Barnes	149.97	Unnamed	Intermittent Stream/River		
Barnes	151.13	Unnamed	Intermittent Stream/River		
Barnes	151.48	Unnamed	Intermittent Stream/River		
Barnes	156.47	Unnamed	Intermittent Lake/Pond		
Barnes	162.35	Unnamed	Intermittent Lake/Pond		
Ransom	166.90	Sheyenne River	Perennial Stream/River	Fish and Other Aquatic Biota; Recreation, Class IA	Fully Supporting but Threatened; Fully Supporting but Threatened/Not Supporting
Ransom	167.11	Tributary to Sheyenne River	Intermittent Stream/River	Fish and Other Aquatic Biota	
Ransom	170.09	Unnamed	Intermittent Stream/River		
Ransom	170.97	Unnamed	Intermittent Stream/River		
Ransom	171.51	Unnamed	Intermittent Stream/River		
Ransom	171.69	Unnamed	Intermittent Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Ransom	174.21	Unnamed	Intermittent Stream/River		
Ransom	178.68	Tributary to Lone Tree Lake	Intermittent Stream/River		
Sargent	189.17	Unnamed	Intermittent Stream/River		
Sargent	203.54	Unnamed	Intermittent Stream/River		
SOUTH DAKOTA					
Marshall	225.46	Crow Creek	Intermittent Stream/River		
Marshall	225.51	Unnamed	Canal/Ditch		
Marshall		Unnamed	Intermittent Lake/Pond		
Day	241.21	Antelope Creek	Intermittent Stream/River		
Day	241.84	Unnamed	Intermittent Stream/River		
Day	245.23	Unnamed	Intermittent Stream/River		
Day	246.52	Unnamed	Intermittent Stream/River		
Day	247.66	Unnamed	Intermittent Stream/River		
Day	247.66	Unnamed	Intermittent Stream/River		
Day	248.08	Unnamed	Intermittent Stream/River		
Day	248.76	Unnamed	Intermittent Stream/River		
Day	249.69	Unnamed	Intermittent Stream/River		
Day	250.73	Unnamed	Intermittent Stream/River		
Day	252.38	Unnamed	Intermittent Stream/River		
Day	253.12	Unnamed	Intermittent Stream/River		
Day	254.42	Unnamed	Intermittent Stream/River		
Day	255.66	Mud Creek	Perennial Stream/River		
Day	256.27	Unnamed	Intermittent Stream/River		
Day	257.04	Unnamed	Intermittent Stream/River		
Day	257.30	Unnamed	Intermittent Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Day	258.24	Unnamed	Intermittent Stream/River		
Day	261.49	Unnamed	Intermittent Stream/River		
Day	261.66	Unnamed	Intermittent Stream/River		
Day	262.65	Unnamed	Intermittent Stream/River		
Day	262.83	Foster Creek	Intermittent Stream/River		
Day	263.27	Unnamed	Intermittent Stream/River		
Day	264.35	Unnamed	Intermittent Stream/River		
Day	264.92	Unnamed	Intermittent Stream/River		
Day	265.20	Unnamed	Intermittent Stream/River		
Day	265.47	Unnamed	Intermittent Stream/River		
Day	265.74	Unnamed	Intermittent Stream/River		
Day	266.01	Unnamed	Intermittent Stream/River		
Day	266.45	Unnamed	Intermittent Stream/River		
Day	267.54	Unnamed	Intermittent Stream/River		
Day	267.96	Unnamed	Intermittent Stream/River		
Day	268.29	Unnamed	Intermittent Stream/River		
Day	268.60	Unnamed	Intermittent Stream/River		
Clark	269.16	Unnamed	Intermittent Stream/River		
Clark	270.59	Unnamed	Intermittent Stream/River		
Clark	270.76	Unnamed	Intermittent Stream/River		
Clark	273.02	Unnamed	Intermittent Stream/River		
Clark	273.55	Unnamed	Intermittent Stream/River		
Clark	274.04	Unnamed	Intermittent Stream/River		
Clark	274.51	Unnamed	Intermittent Stream/River		
Clark	275.72	Unnamed	Intermittent Stream/River		
Clark	276.83	Unnamed	Intermittent Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Clark	276.44	Unnamed	Intermittent Stream/River		
Clark	277.29	Unnamed	Intermittent Stream/River		
Clark	277.61	Unnamed	Intermittent Stream/River		
Clark	278.34	Unnamed	Intermittent Stream/River		
Clark	278.62	Unnamed	Intermittent Stream/River		
Clark	279.16	Unnamed	Intermittent Stream/River		
Clark	280.17	Unnamed	Intermittent Stream/River		
Clark	280.58	Unnamed	Intermittent Stream/River		
Clark	280.87	Unnamed	Intermittent Stream/River		
Clark	280.93	Unnamed	Intermittent Stream/River		
Clark	282.98	Unnamed	Intermittent Stream/River		
Clark	284.85	Unnamed	Intermittent Stream/River		
Clark	286.70	Unnamed	Intermittent Stream/River		
Clark	287.80	Unnamed	Intermittent Stream/River		
Clark	288.54	Unnamed	Intermittent Stream/River		
Clark	290.35	Logan Dam	Perennial Lake/Pond		
Clark	290.36	Unnamed	Artificial Path		
Clark	294.31	Foster Creek	Intermittent Stream/River		
Clark	295.31	Unnamed	Intermittent Stream/River		
Clark	300.32	Unnamed	Intermittent Stream/River		
Clark	300.48	Unnamed	Intermittent Stream/River		
Clark	301.74	Unnamed	Intermittent Stream/River		
Clark	302.43	Unnamed	Intermittent Stream/River		
Beadle	305.77	Unnamed	Intermittent Stream/River		
Beadle	307.37	Unnamed	Intermittent Stream/River		
Beadle	307.96	Unnamed	Intermittent Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Beadle	309.43	Shue Creek	Intermittent Stream/River	WW marginal fish life propagation waters, limited-contact recreation waters	
Beadle	310.06	Unnamed	Intermittent Stream/River		
Beadle	311.29	Unnamed	Intermittent Stream/River		
Beadle	311.86	Pearl Creek	Intermittent Stream/River	WW marginal fish life propagation waters, limited-contact recreation waters	
Beadle	312.37	Unnamed	Intermittent Stream/River		
Beadle	314.07	Middle Pearl Creek	Intermittent Stream/River		
Kingsbury	321.43	Unnamed	Intermittent Lake/Pond		
Kingsbury	322.37	South Fork Pearl Creek	Intermittent Stream/River		
Kingsbury	325.35	Unnamed	Intermittent Stream/River		
Kingsbury	331.29	Unnamed	Intermittent Stream/River		
Kingsbury	333.63	West Redstone Creek	Intermittent Stream/River		
Kingsbury		Trib to West Redstone Creek	Intermittent Stream/River		
Kingsbury	336.20	Unnamed	Intermittent Stream/River		
Miner	339.34	Redstone Creek	Intermittent Stream/River	WW marginal fish life propagation waters, limited-contact recreation waters (classification for segment in Sanborn county)	

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Miner	341.24	Unnamed	Intermittent Stream/River		
Miner	348.74	Unnamed	Intermittent Lake/Pond		
Miner	351.85	Unnamed	Intermittent Lake/Pond		
Miner	351.96	Unnamed	Intermittent Lake/Pond		
Miner	352.06	Unnamed	Intermittent Lake/Pond		
Miner	352.36	Unnamed	Intermittent Stream/River		
Miner	354.89	Unnamed	Intermittent Stream/River		
Miner	355.07	Unnamed	Intermittent Stream/River		
Miner	355.36	Unnamed	Intermittent Stream/River		
Miner	355.53	Unnamed	Intermittent Stream/River		
Miner	357.64	Unnamed	Intermittent Stream/River		
Miner	358.36	Rock Creek	Intermittent Stream/River	WW marginal fish life propagation waters, limited-contact recreation waters (classification for segment in Hanson county)	
Miner	358.50	Rock Creek	Intermittent Stream/River	WW marginal fish life propagation waters, limited-contact recreation waters (classification for segment in Hanson county)	
Miner		Unnamed	Intermittent Lake/Pond		
Miner	358.55	Rock Creek	Intermittent Stream/River	WW marginal fish life	

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				propagation waters, limited-contact recreation waters (classification for segment in Hanson county)	
Miner	359.60	Unnamed	Intermittent Stream/River		
Miner	359.70	Unnamed	Intermittent Stream/River		
Miner	359.79	Unnamed	Intermittent Stream/River		
Miner	359.90	Unnamed	Intermittent Stream/River		
Miner	360.90	Unnamed	Intermittent Stream/River		
Hanson	362.62	Unnamed	Intermittent Lake/Pond		
Hanson	363.61	Pierre Creek	Intermittent Stream/River		
Hanson		Unnamed	Intermittent Lake/Pond		
Hanson	368.86	Unnamed	Intermittent Stream/River		
Hanson	371.90	Wolf Creek	Intermittent Stream/River	WW marginal fish life propagation waters, limited-contact recreation waters	No Data
Hanson	373.80	Unnamed	Intermittent Stream/River		
Hanson	374.89	Unnamed	Intermittent Lake/Pond		
Hanson	375.86	Unnamed	Intermittent Stream/River		
McCook	360.24	Wolf Creek	Intermittent Stream/River	WW marginal fish life propagation waters, limited-contact recreation waters	No Data
McCook	361.73	Unnamed	Intermittent Lake/Pond		

. Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
McCook	382.77	Unnamed	Intermittent Stream/River		
McCook	387.23	Wolf Creek	Perennial Stream/River	WW marginal fish life propagation waters, limited-contact recreation waters	No Data
McCook		Unnamed	Intermittent Lake/Pond		
McCook	387.57	Unnamed	Intermittent Stream/River		
McCook	389.00	Unnamed	Intermittent Stream/River		
McCook	391.01	Unnamed	Intermittent Stream/River		
Hutchinson	392.26	Unnamed	Intermittent Stream/River		
Hutchinson	393.84	Unnamed	Intermittent Stream/River		
Hutchinson	394.91	Unnamed	Intermittent Stream/River		
Hutchinson	396.28	Unnamed	Intermittent Stream/River		
Hutchinson	397.26	Unnamed	Intermittent Stream/River		
Hutchinson	397.89	Unnamed	Intermittent Stream/River		
Hutchinson	398.28	Unnamed	Intermittent Stream/River		
Hutchinson	401.91	Unnamed	Intermittent Stream/River		
Hutchinson	402.36	Unnamed	Intermittent Stream/River		
Hutchinson	402.76	Unnamed	Intermittent Stream/River		
Hutchinson	403.40	Unnamed	Intermittent Stream/River		
Hutchinson	404.52	Unnamed	Intermittent Stream/River		
Hutchinson	405.14	Unnamed	Intermittent Stream/River		
Hutchinson	407.19	Unnamed	Intermittent Stream/River		
Hutchinson	407.54	Unnamed	Intermittent Stream/River		
Yankton	413.95	Unnamed	Intermittent Stream/River		
Yankton	417.96	James River	Perennial Stream/River	WW semiperm fish life propagation waters,	No Data

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Limited contact recreation waters	
Yankton	419.75	Unnamed	Intermittent Stream/River		
Yankton	420.78	Unnamed	Intermittent Stream/River		
Yankton	422.23	Unnamed	Intermittent Stream/River		
Yankton	424.15	Beaver Creek	Perennial Stream/River	WW marginal fish life propagation waters, limited-contact recreation waters	
Yankton	424.74	Unnamed	Intermittent Stream/River		
Yankton	427.05	Unnamed	Intermittent Stream/River		
Yankton	430.02	Unnamed	Intermittent Stream/River		
Yankton	431.92	Unnamed	Perennial Stream/River		
Yankton	431.92	Unnamed	Perennial Stream/River		
Yankton	431.92	Unnamed	Perennial Stream/River		
Yankton	432.04	Marne Creek	Artificial Path		
NEBRASKA					
Yankton/Cedar	432.05	Missouri River	Artificial Path	Primary Contact Recreation; Aquatif Life Use; Ag Water Supply; Industrial Water Supply	Inhibited; Inhibited; Supported; Supported
Cedar	433.03	Unnamed	Intermittent Stream/River		
Cedar	434.23	Antelope Creek	Perennial Stream/River	No Data	No Data
Cedar	435.46	Unnamed	Intermittent Stream/River		
Cedar	436.10	Unnamed	Intermittent Stream/River		
Cedar	436.57	Unnamed	Intermittent Stream/River		
Cedar	436.82	Unnamed	Intermittent Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Cedar	437.25	Unnamed	Intermittent Stream/River		
Cedar	438.08	Unnamed	Intermittent Stream/River		
Cedar	438.98	Unnamed	Intermittent Stream/River		
Cedar	439.44	Unnamed	Intermittent Stream/River		
Cedar	439.67	Unnamed	Intermittent Stream/River		
Cedar	441.04	Unnamed	Intermittent Stream/River		
Cedar	442.38	Unnamed	Intermittent Stream/River		
Cedar	443.57	Unnamed	Intermittent Stream/River		
Cedar	444.11	Bow Creek	Perennial Stream/River		
Cedar	445.13	Unnamed	Intermittent Stream/River		
Cedar	446.96	Unnamed	Intermittent Stream/River		
Cedar	447.28	Unnamed	Intermittent Stream/River		
Cedar	447.58	Norwegian Bow Creek	Perennial Stream/River	No Data	No Data
Cedar	448.35	Unnamed	Intermittent Stream/River		
Cedar	449.04	Unnamed	Intermittent Stream/River		
Cedar	449.84	Unnamed	Intermittent Stream/River		
Cedar	451.15	Unnamed	Intermittent Stream/River		
Cedar	452.79	Bow Creek	Perennial Stream/River	No Data	No Data
Cedar	453.32	Unnamed	Intermittent Stream/River		
Cedar	455.75	Unnamed	Intermittent Stream/River		
Cedar	456.66	Pearl Creek	Intermittent Stream/River		
Cedar	457.51	Unnamed	Intermittent Stream/River		
Cedar	457.83	Unnamed	Intermittent Stream/River		
Cedar	458.19	Unnamed	Intermittent Stream/River		
Cedar	458.59	Unnamed	Intermittent Stream/River		
Cedar	459.93	Unnamed	Intermittent Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Cedar	461.63	Unnamed	Intermittent Stream/River		
Cedar	462.14	Unnamed	Intermittent Stream/River		
Cedar	462.87	Unnamed	Intermittent Stream/River		
Cedar	463.46	Unnamed	Intermittent Stream/River		
Cedar	464.44	Unnamed	Intermittent Stream/River		
Cedar	465.32	Unnamed	Intermittent Stream/River		
Cedar	466.20	Middle Logan Creek	Perennial Stream/River	No Data	No Data
Wayne	469.96	Dog Creek	Intermittent Stream/River		
Wayne	472.30	Deer Creek	Intermittent Stream/River		
Wayne	473.04	Tributary to Deer Creek	Intermittent Stream/River		
Wayne	474.00	Tributary to Deer Creek	Intermittent Stream/River		
Wayne	476.06	Unnamed	Intermittent Stream/River		
Wayne	477.26	South Branch Deer Creek	Intermittent Stream/River		
Wayne	483.00	Spring Branch	Intermittent Stream/River		
Wayne	485.44	Unnamed	Intermittent Stream/River		
Wayne	486.42	Unnamed	Intermittent Stream/River		
Stanton	487.16	Unnamed	Intermittent Stream/River		
Stanton	489.72	Unnamed	Intermittent Stream/River		
Stanton	490.39	Unnamed	Intermittent Stream/River		
Stanton	491.09	Unnamed	Intermittent Stream/River		
Stanton	492.28	Unnamed	Intermittent Stream/River		
Stanton	493.14	Unnamed	Intermittent Stream/River		
Stanton	496.30	Pleasant Run	Intermittent Stream/River		
Stanton	496.65	Pleasant Run	Intermittent Stream/River		
Stanton		Tributary to Pleasant Run	Intermittent Stream/River		
Stanton	498.05	Unnamed	Perennial Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Stanton	498.07	Elkhorn River	Artificial Path	Primary Contact Recreation; Aquatic Life Use	Inhibited; Supported
Stanton	498.79	Unnamed	Intermittent Stream/River		
Stanton	500.30	Union Creek	Perennial Stream/River		
Stanton	501.32	Unnamed	Intermittent Stream/River		
Stanton	502.89	Unnamed	Intermittent Stream/River		
Stanton	503.36	Unnamed	Intermittent Stream/River		
Stanton	505.95	Unnamed	Intermittent Stream/River		
Stanton	507.48	Unnamed	Intermittent Stream/River		
Stanton	508.14	Unnamed	Intermittent Stream/River		
Stanton	513.55	Unnamed	Intermittent Stream/River		
Colfax	513.96	Tributary to West Fork Maple Creek	Intermittent Stream/River		
Colfax	514.75	Unnamed	Intermittent Stream/River		
Colfax	517.05	Unnamed	Intermittent Stream/River		
Colfax	519.67	Unnamed	Intermittent Stream/River		
Colfax	519.74	Unnamed	Intermittent Stream/River		
Colfax	527.24	Shell Creek	Perennial Stream/River	No Data	No Data
Colfax	533.08	Unnamed	Canal/Ditch		
Colfax	533.71	Unnamed	Intermittent Stream/River		
Colfax	534.76	Lost Creek	Perennial Stream/River	No Data	No Data
Colfax	535.37	Unnamed	Intermittent Stream/River		
Colfax	535.95	Unnamed	Intermittent Stream/River		
Colfax	536.22	Unnamed	Intermittent Stream/River		
Colfax	536.93	Unnamed	Perennial Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Colfax/Butler	536.98	Platte River	Artificial Path	Primary Contact Recreation; Aquatic Life Use; Agriculture Water Supply	Inhibited; Inhibited; Supported
Butler	537.04	Unnamed	Perennial Stream/River		
Butler	537.10	Unnamed	Perennial Stream/River		
Butler	537.22	Unnamed	Perennial Stream/River		
Butler	537.23	Unnamed	Artificial Path		
Butler	537.48	Unnamed	Perennial Stream/River		
Butler	539.40	Deer Creek	Intermittent Stream/River	No Data	No Data
Butler	542.17	Deer Creek	Intermittent Stream/River	No Data	No Data
Butler	542.35	Unnamed	Perennial Lake/Pond		
Butler	542.52	Deer Creek	Intermittent Stream/River	No Data	No Data
Butler	542.55	Deer Creek	Intermittent Stream/River	No Data	No Data
Butler	545.87	Unnamed	Intermittent Stream/River		
Butler	549.55	Unnamed	Intermittent Stream/River		
Butler	550.13	Unnamed	Intermittent Stream/River		
Butler	552.09	Unnamed	Intermittent Stream/River		
Butler	554.57	Unnamed	Intermittent Stream/River		
Butler	555.48	Unnamed	Intermittent Stream/River		
Butler	556.15	Unnamed	Intermittent Stream/River		
Butler	558.11	Unnamed	Intermittent Stream/River		
Butler	558.44	Unnamed	Intermittent Stream/River		
Seward	561.55	Unnamed	Intermittent Stream/River		
Seward	567.78	Tributary to Big Weedy Creek	Intermittent Stream/River		
Seward	568.58	Big Blue River	Perennial Stream/River	Aquatic Life Use;	Inhibited; Supported

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Agriculture Water Supply	
Seward	569.03	Unnamed	Intermittent Stream/River		
Seward	570.63	Coon Branch	Perennial Stream/River		
Seward	571.09	Unnamed	Intermittent Stream/River		
Seward	572.93	Tributary to Lone Tree Lake	Intermittent Stream/River		
Seward	574.23	Unnamed	Intermittent Stream/River		
Seward	575.61	Crooked Creek	Perennial Stream/River		
Seward		Unnamed	Perennial Lake/Pond		
Seward	578.68	Unnamed	Intermittent Stream/River		
Seward	580.74	Coon Creek	Intermittent Stream/River		
Seward	581.04	Unnamed	Intermittent Stream/River		
Seward	581.57	Unnamed	Intermittent Stream/River		
Seward	582.17	Unnamed	Intermittent Stream/River		
Seward	583.22	Unnamed	Intermittent Stream/River		
Seward	583.86	Unnamed	Intermittent Stream/River		
Seward	584.33	Unnamed	Intermittent Stream/River		
Seward	584.84	Unnamed	Intermittent Stream/River		
Seward	585.20	Unnamed	Intermittent Stream/River		
Saline	586.15	Unnamed	Intermittent Stream/River		
Saline	586.84	West Fork Big Blue River	Perennial Stream/River	Primary Contact Recreation; Aquatic Life Use; Ag Water Supply	Inhibited; Inhibited; Supported
Saline	587.62	Unnamed	Intermittent Stream/River		
Saline	590.60	Squaw Creek	Intermittent Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Saline	591.03	Unnamed	Intermittent Stream/River		
Saline	593.55	Unnamed	Intermittent Stream/River		
Saline	595.83	Turkey Creek	Perennial Stream/River	No Data	No Data
Saline	596.57	Coon Creek	Intermittent Stream/River		
Saline	598.06	Unnamed	Intermittent Stream/River		
Saline	598.08	Unnamed	Intermittent Stream/River		
Saline	598.21	Unnamed	Intermittent Stream/River		
Saline	598.58	Brush Creek	Intermittent Stream/River		
Saline	598.97	Unnamed	Intermittent Stream/River		
Saline	599.10	Unnamed	Intermittent Stream/River		
Saline	599.11	Unnamed	Intermittent Stream/River		
Saline	599.95	Unnamed	Intermittent Stream/River		
Saline	600.58	Dry Creek	Intermittent Stream/River		
Saline	600.88	Unnamed	Intermittent Stream/River		
Saline	601.62	Unnamed	Intermittent Stream/River		
Saline	603.14	Unnamed	Intermittent Stream/River		
Saline	604.50	Plummers Branch	Intermittent Stream/River		
Saline	604.61	Plummers Branch	Intermittent Stream/River		
Saline	604.63	Plummers Branch	Intermittent Stream/River		
Saline	604.70	Unnamed	Intermittent Stream/River		
Saline	605.85	Unnamed	Intermittent Stream/River		
Saline	607.94	Swan Creek	Perennial Stream/River	Aquatic Life Use; Agriculture Water Supply	Supported; Supported
Saline	609.69	Unnamed	Intermittent Stream/River		
Jefferson	611.20	Unnamed	Intermittent Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Jefferson	611.53	Unnamed	Intermittent Stream/River		
Jefferson	612.24	Unnamed	Intermittent Stream/River		
Jefferson	613.40	Unnamed	Intermittent Stream/River		
Jefferson	616.38	Unnamed	Intermittent Stream/River		
Jefferson	617.19	Cub Creek	Perennial Stream/River	No Data	No Data
Jefferson	618.13	Unnamed	Intermittent Stream/River		
Jefferson	619.15	Unnamed	Intermittent Stream/River		
Jefferson	622.15	Unnamed	Intermittent Stream/River		
Jefferson	623.98	Big Indian Creek	Intermittent Stream/River		
Jefferson	625.80	Unnamed	Intermittent Stream/River		
Jefferson	628.11	Unnamed	Intermittent Stream/River		
Jefferson	628.16	Unnamed	Intermittent Stream/River		
Jefferson	629.47	Unnamed	Intermittent Stream/River		
Jefferson	631.11	Unnamed	Intermittent Stream/River		
Jefferson	632.35	Unnamed	Intermittent Stream/River		
Jefferson	632.82	Unnamed	Intermittent Stream/River		
Jefferson	633.84	Unnamed	Intermittent Stream/River		
Jefferson	634.23	Unnamed	Intermittent Stream/River		
Jefferson	634.62	Unnamed	Intermittent Stream/River		
Jefferson	636.03	Unnamed	Intermittent Stream/River		
Jefferson	637.02	Unnamed	Intermittent Stream/River		
Jefferson	639.07	Horseshoe Creek	Intermittent Stream/River		
Jefferson	644.00	Unnamed	Intermittent Stream/River		
Jefferson	646.12	Little Indian Creek	Intermittent Stream/River	y	y

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
KANSAS					
Marshall	646.53	Meadow Creek	Intermittent Stream/River	No Data	No Data
Marshall	647.70	Unnamed	Perennial Stream/River		
Marshall	648.22	Indian Creek	Perennial Stream/River	No Data	No Data
Marshall	649.44	Unnamed	Perennial Stream/River		
Marshall	651.46	Deer Creek	Perennial Stream/River	General Purpose; Aquatic Life; Recreational Use (contact use not open to public)	No Data
Marshall	652.65	Unnamed	Intermittent Stream/River		
Marshall	653.72	Big Blue River	Perennial Stream/River	No Data	No Data
Marshall	654.01	North Elm Creek	Perennial Stream/River	General Purpose; Aquatic Life; Recreational Use (contact use not open to public)	No Data
Marshall	657.37	North Elm Creek	Perennial Stream/River	General Purpose; Aquatic Life; Recreational Use (contact use not open to public)	No Data
Marshall	661.67	North Elm Creek	Intermittent Stream/River	General Purpose; Aquatic Life; Recreational Use (contact use not open to public)	No Data

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Marshall	663.65	Unnamed	Intermittent Stream/River		
Marshall	665.30	Unnamed	Intermittent Stream/River		
Marshall	666.86	Robidoux Creek	Perennial Stream/River	General Purpose; Aquatic Life; Recreational Use (contact use not open to public)	No Data
Nemaha	676.27	Negro Creek	Intermittent Stream/River	No Data	No Data
Nemaha	679.61	North Fork Wildcat Creek	Perennial Stream/River	No Data	No Data
Nemaha	680.86	Wildcat Creek	Perennial Stream/River	General Purpose; Special Aquatic Life; Primary Contact Recreation Not Open To the Public; Domestic Water Supply; Food Procurement Use; Ground Water Recharge; Irrigation Use;	No Data
Nemaha	684.68	South Fork Big Nemaha River	Perennial Stream/River	General Purpose; Special Aquatic Life; Primary Contact Recreation Not Open To the Public; Domestic Water Supply; Food	No Data

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Procurement Use; Ground Water Recharge; Irrigation Use;	
Nemaha		Unnamed	Perennial Lake/Pond		
Nemaha	686.30	Harris Creek	Perennial Stream/River	General Purpose; Expected Aquatic life use water	No Data
Nemaha	687.95	Unnamed	Perennial Lake/Pond		
Nemaha	687.96	Unnamed	Artificial Path		
Nemaha	688.75	Unnamed	Intermittent Stream/River		
Nemaha	689.00	Unnamed	Intermittent Stream/River		
Nemaha	689.05	Harris Creek	Perennial Stream/River	General Purpose; Expected Aquatic life use	No Data
Nemaha	689.67	Harris Creek	Perennial Stream/River	General Purpose; Expected Aquatic life use	No Data
Nemaha	691.80	Unnamed	Intermittent Stream/River		
Nemaha	695.64	Craig Creek	Perennial Stream/River	No Data	No Data
Nemaha	696.24	Unnamed	Intermittent Stream/River		
Nemaha	697.47	Unnamed	Intermittent Stream/River	y	y
Nemaha	698.18	Unnamed	Intermittent Stream/River		
Nemaha	698.83	Unnamed	Intermittent Stream/River		
Brown	699.60	Unnamed	Intermittent Stream/River		
Brown	700.94	Delaware River	Perennial Stream/River	No Data	No Data
Brown	701.79	Unnamed	Perennial Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Brown	702.69	Unnamed	Perennial Stream/River		
Brown	704.38	Walnut Creek	Perennial Stream/River	General Purpose; Expected Aquatic life use	No Data
Brown	705.31	Walnut Creek	Perennial Stream/River	General Purpose; Expected Aquatic life use	No Data
Brown	705.86	Unnamed	Perennial Stream/River		
Brown	706.63	Unnamed	Intermittent Stream/River		
Brown	707.97	Wolf River	Intermittent Stream/River		
Brown	709.45	Unnamed	Intermittent Stream/River		
Brown	710.35	Unnamed	Intermittent Stream/River		
Brown	711.56	Unnamed	Intermittent Stream/River		
Brown	712.07	Unnamed	Intermittent Stream/River		
Brown	712.86	Unnamed	Intermittent Stream/River		
Brown	713.98	Unnamed	Intermittent Stream/River		
Brown	715.43	Middle Fork Wolf River	Perennial Stream/River	General Purpose; Expected aquatic life use; Domestic Water Supply; Food Procurement Use; Ground Water Recharge; Inudstrial Water Supply; Irrigation Use;	No Data
Brown	716.37	Unnamed	Intermittent Stream/River		
Brown	717.71	Buttermilk Creek	Perennial Stream/River	General Purpose;	No Data

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Expected Aquatic life use; Primary Contact Recreation is by Law or Written Permission of the Landowner	
Brown	718.27	Unnamed	Intermittent Stream/River		
Brown	719.08	Unnamed	Intermittent Stream/River		
Brown	720.12	South Fork Wolf River	Perennial Stream/River	General Purpose; Expected Aquatic Life Use; Domestic Water Supply Use; Food Procurement Use; Ground Water Recharge; Industrial Water Supply; Irrigation Use	No Data
Brown	721.04	Unnamed	Intermittent Stream/River		
Brown	721.42	Unnamed	Intermittent Stream/River		
Brown	722.72	Squaw Creek	Perennial Stream/River	General Purpose; Aquatic Life Use; Primary Contact Recreation is By Law or Written Permission of Landowner	No Data
Doniphan	723.52	Unnamed	Perennial Stream/River		
Doniphan	724.18	Unnamed	Intermittent Stream/River		
Doniphan	724.83	Halling Creek	Perennial Stream/River	General Purpose;	No Data

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Aquatic Life Use	
Doniphan	725.58	Unnamed	Intermittent Stream/River		
Doniphan	726.32	Unnamed	Intermittent Stream/River		
Doniphan	727.35	Unnamed	Perennial Stream/River		
Doniphan	729.97	Unnamed	Intermittent Stream/River		
Doniphan	731.15	Unnamed	Perennial Stream/River		
Doniphan	731.88	Unnamed	Perennial Stream/River		
Doniphan	732.50	Unnamed	Intermittent Stream/River		
Doniphan	733.03	Jordan Creek	Intermittent Stream/River	General Purpose; Aquatic Life Use	No Data
Doniphan	734.39	Unnamed	Intermittent Stream/River		
Doniphan	735.63	Rock Creek	Perennial Stream/River	General Purpose; Aquatic Life Use	No Data
Doniphan	738.28	Brush Creek	Perennial Stream/River	General Purpose; Aquatic Life Use	No Data
Doniphan	739.47	Unnamed	Intermittent Stream/River		
Doniphan	740.15	Unnamed	Perennial Stream/River		
Doniphan	740.38	Unnamed	Intermittent Stream/River		
Doniphan	741.31	Unnamed	Intermittent Stream/River		
Doniphan	742.18	Unnamed	Perennial Stream/River		
Doniphan	743.38	Unnamed	Perennial Stream/River		
Doniphan	743.38	Unnamed	Perennial Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
MISSOURI					
Doniphan, KS/Buchanan, MO	743.40	Missouri River	Artificial Path	Irrigation Use; Livestock and Wildlife g; Protection of Warm Water Aquatic Life and Human Health-Fish Consumption; Whole Body Contact Recreation; Secondary Contact Recreation; Drinking Water Supply; Industrial Process and Industrial Cooling Water	KS - State-listed fish species occurrence, MO - State-listed pallid sturgeon occurrence No Data
Buchanan	749.01	Contrary Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of Warm Water Aquatic Life and Human Health-Fish Consumption; Whole Body Contact Recreation	No Data
Buchanan	752.02	Pigeon Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of Warm Water Aquatic Life and Human Health-Fish Consumption; Whole Body Contact Recreation	No Data
Buchanan	752.98	Unnamed	Perennial Stream/River		
Buchanan	757.07	Platte River	Perennial Stream/River	Irrigation Use; Livestock and Wildlife Watering;	No Data

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Protection of Warm Water Aquatic Life and Human Health-Fish Consumption; Whole Body Contact Recreation; Secondary Contact Recreation; Drinking Water Supply	
Buchanan	758.56	Unnamed	Intermittent Stream/River		
Buchanan	761.56	Malden Creek	Perennial Stream/River	No Data	No Data
Buchanan	763.49	Wolfpen Creek	Perennial Stream/River	No Data	No Data
Clinton	764.08	Jenkins Branch	Intermittent Stream/River	No Data	No Data
Clinton	767.70	Castile Creek	Perennial Stream/River	Class C, Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation; Secondary Contact Recreation; Drinking Water Supply	
Clinton		Trib. Castile Creek	Perennial Stream/River		State spawning water in Castile Ck (3/15-6/15)
Clinton		Unnamed	Intermittent Lake/Pond		
Clinton	773.47	Trib. Castile Creek	Intermittent Stream/River	Class C, Livestock and Wildlife Watering; Protection of warm	

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				water aquatic life and human health-fish consumption; Whole Body Contact Recreation	
Clinton	775.67	Little Platte River	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health0fish consumption; Whole Body Contact Recreation; Secondary Contact Recreation Class C	State spawning water (3/15-6/15) No Data
Clinton	776.72	Unnamed	Perennial Stream/River		
Clinton	780.41	Shoal Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation; Secondary Contact Recreation	No Data
Clinton	781.13	Unnamed	Perennial Stream/River		
Clinton	783.00	Deer Creek	Intermittent Stream/River	No Data	No Data
Clinton	784.42	Plum Creek	Intermittent Stream/River	No Data	No Data
Caldwell	785.71	Goose Creek	Intermittent Stream/River	Class C, Livestock and	

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption	
Caldwell	789.21		Intermittent Stream/River		
Caldwell	790.26	Log Creek	Perennial Stream/River	No Data	No Data
Caldwell	791.08		Perennial Stream/River	Class C, Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation; Secondary Contact Recreation	
Caldwell	793.28	Long Creek	Perennial Stream/River		
Caldwell	794.32	Unnamed	Intermittent Stream/River		
Caldwell	796.02	Brush Creek	Intermittent Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption	No Data State spawning water (3/15-6/15)
Caldwell	796.51	Unnamed	Intermittent Stream/River		
Caldwell	799.32	Crabapple Creek	Intermittent Stream/River	Class C, Livestock and Wildlife Watering; Protection of warm	State spawning water (3/15-6/15)

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				water aquatic life and human health-fish consumption; Whole Body Contact Recreation	
Caldwell	802.20	Unnamed	Intermittent Stream/River		
Caldwell	802.64	Unnamed	Intermittent Stream/River		
Caldwell	803.15	Unnamed	Intermittent Stream/River		
Caldwell	803.62	Unnamed	Intermittent Stream/River		
Caldwell	804.34	Unnamed	Intermittent Stream/River		
Caldwell	804.91	Unnamed	Intermittent Stream/River		
Caldwell	807.10	South Mud Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation	No Data
Caldwell	807.52	Unnamed	Intermittent Stream/River		
Carroll	810.90	Turkey Creek	Intermittent Stream/River		
Carroll	811.21	Unnamed	Intermittent Stream/River		
Carroll	811.48	Unnamed	Intermittent Stream/River		
Carroll	812.84	Unnamed	Intermittent Stream/River		
Carroll	813.37	Unnamed	Intermittent Stream/River		
Carroll	813.73	Unnamed	Intermittent Stream/River		
Carroll	813.82	Unnamed	Intermittent Stream/River		
Carroll	815.49	Unnamed	Intermittent Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Carroll	816.61	Unnamed	Intermittent Stream/River		
Carroll	816.95	Unnamed	Intermittent Stream/River		
Carroll	817.74	Unnamed	Intermittent Stream/River		
Carroll	817.94	Unnamed	Intermittent Stream/River		
Carroll	820.14	Unnamed	Intermittent Stream/River		
Carroll	824.43	Unnamed	Perennial Stream/River		
Carroll	824.63	Unnamed	Intermittent Stream/River		
Carroll	826.55	Unnamed	Perennial Stream/River		
Carroll	826.89	Big Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation	
Carroll	827.31	Unnamed	Intermittent Stream/River		
Carroll	827.67	Unnamed	Intermittent Stream/River		
Carroll	828.87	Wolf Branch	Intermittent Stream/River		
Carroll	830.36	Unnamed	Intermittent Stream/River		
Carroll	832.05	Unnamed	Intermittent Stream/River		
Carroll	832.37	Unnamed	Intermittent Stream/River		
Carroll	834.68	Unnamed	Intermittent Stream/River		
Carroll	835.48	Unnamed	Perennial Stream/River		
Carroll	835.48	Unnamed	Perennial Stream/River		
Carroll	835.51	Grand River	Artificial Path	Irrigation Use; Livestock and Wildlife Watering; Protection of	No Data

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation; Secondary Contact Recreation; Drinking Water Supply	
Chariton	835.99	Unnamed	Intermittent Stream/River		
Chariton	837.70	Unnamed	Intermittent Stream/River		
Chariton	838.77	Unnamed	Intermittent Stream/River		
Chariton	840.81	Salt Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation	No Data
Chariton	841.80	Unnamed	Intermittent Stream/River		
Chariton	842.57	Unnamed	Intermittent Stream/River		
Chariton	843.21	Unnamed	Intermittent Stream/River		
Chariton	843.68	Unnamed	Intermittent Stream/River		
Chariton	844.09	Unnamed	Intermittent Stream/River		
Chariton	845.88	Unnamed	Intermittent Stream/River		
Chariton	846.54	Unnamed	Intermittent Stream/River		
Chariton	846.69	Lake Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life	No Data

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				and human health-fish consumption; Whole Body Contact Recreation	
Chariton	848.92	Unnamed	Intermittent Stream/River		
Chariton	849.15	Unnamed	Perennial Stream/River		
Chariton	849.51	Unnamed	Intermittent Stream/River		
Chariton	851.24	Unnamed	Intermittent Stream/River		
Chariton	852.41	Mussel Fork	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation	No Data
Chariton	852.76	Unnamed	Perennial Lake/Pond		
Chariton	853.07	Unnamed	Intermittent Stream/River		
Chariton	854.45	Unnamed	Intermittent Stream/River		
Chariton	855.68	Long Creek	Intermittent Stream/River		
Chariton	857.19	Unnamed	Intermittent Stream/River		
Chariton	857.27	Chariton River	Perennial Stream/River	Irrigation Use; Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact	No Data

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Recreation; Secondary Contact Recreation	
Chariton	857.94	Unnamed	Intermittent Stream/River		
Chariton	858.29	Unnamed	Intermittent Stream/River		
Randolph	859.86	Puzzle Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation	No Data
Randolph	862.86	Middle Fork Little Chariton River	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation	No Data
Randolph	863.23	Lake Branch	Intermittent Stream/River		
Randolph	863.52	Lake Branch	Intermittent Stream/River		
Randolph	863.97	Unnamed	Intermittent Stream/River		
Randolph	866.50	East Fork Little Chariton River	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact	No Data

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Recreation	
Randolph	867.10	Unnamed	Intermittent Stream/River		
Randolph	869.33	Unnamed	Intermittent Stream/River		
Randolph	869.81	Unnamed	Intermittent Stream/River		
Randolph	871.08	Unnamed	Intermittent Stream/River		
Randolph	871.42	Unnamed	Intermittent Stream/River		
Randolph	872.01	Unnamed	Intermittent Stream/River		
Randolph	874.54	Unnamed	Intermittent Stream/River		
Randolph	877.21	Unnamed	Intermittent Stream/River		
Randolph	878.01	Unnamed	Intermittent Stream/River		
Randolph	878.67	Unnamed	Intermittent Stream/River		
Randolph	880.37	Moniteau Creek	Intermittent Stream/River		
Randolph	884.85	Unnamed	Intermittent Stream/River		
Randolph	886.37	Hardin Creek	Intermittent Stream/River		
Randolph	887.00	Unnamed	Intermittent Stream/River		
Randolph	887.65	Unnamed	Intermittent Stream/River		
Randolph	889.02	Big Creek	Perennial Stream/River	No Data	No Data
Audrain	889.42	Unnamed	Intermittent Stream/River		
Audrain	890.23	Boat Branch	Intermittent Stream/River		
Audrain	892.12	Saling Creek	Perennial Stream/River	No Data	No Data
Audrain	892.55	Unnamed	Intermittent Stream/River		
Audrain	894.56	Unnamed	Intermittent Stream/River		
Audrain	894.78	Unnamed	Intermittent Stream/River		
Audrain	895.01	Unnamed	Intermittent Stream/River		
Audrain	895.81	Long Branch	Perennial Stream/River	Livestock and Wildlife Watering; Protection of	No Data

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation	
Audrain	896.69	Unnamed	Intermittent Stream/River		
Audrain	897.28	Unnamed	Intermittent Stream/River		
Audrain	898.09	Unnamed	Intermittent Stream/River		
Audrain	898.59	Unnamed	Intermittent Stream/River		
Audrain	898.95	Goodwater Creek	Perennial Stream/River	No Data	No Data
Audrain	900.03	Unnamed	Intermittent Stream/River		
Audrain	900.48	Unnamed	Perennial Lake/Pond		
Audrain	900.69	Unnamed	Intermittent Stream/River		
Audrain	902.42	Unnamed	Intermittent Stream/River		
Audrain	903.21	Youngs Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation	No Data
Audrain	909.95	Unnamed	Intermittent Stream/River		
Audrain	911.43	Skull Lick Creek	Perennial Stream/River	No Data	No Data
Audrain	912.56	Unnamed	Intermittent Stream/River		
Audrain	913.39	South Fork Salt River	Perennial Stream/River	No Data	No Data
Audrain	916.63	Unnamed	Intermittent Stream/River		
Audrain	917.26	Bean Branch	Perennial Stream/River	Livestock and Wildlife	No Data

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation	
Audrain	918.59	Unnamed	Intermittent Stream/River		
Audrain	919.41	Unnamed	Intermittent Stream/River		
Audrain	919.44	Unnamed	Intermittent Stream/River		
Audrain	919.68	Unnamed	Intermittent Stream/River		
Audrain	919.69	Unnamed	Intermittent Stream/River		
Audrain	919.93	Unnamed	Intermittent Stream/River		
Audrain	920.81	Unnamed	Intermittent Stream/River		
Audrain	921.03	Littleby Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation	No Data
Audrain	923.46	West Fork Cuivre River	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation	No Data

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Audrain	924.38	Unnamed	Intermittent Stream/River		
Audrain	925.71	Mams Slough	Intermittent Stream/River		
Audrain	926.56	Unnamed	Intermittent Stream/River		
Audrain	927.34	Johns Branch	Intermittent Stream/River		
Montgomery	929.47	Unnamed	Intermittent Stream/River		
Montgomery	932.32	Unnamed	Intermittent Stream/River		
Montgomery	933.21	Unnamed	Intermittent Stream/River		
Montgomery	933.36	Unnamed	Intermittent Stream/River		
Montgomery	933.40	Unnamed	Intermittent Stream/River		
Montgomery	934.10	Unnamed	Intermittent Stream/River		
Montgomery	934.66	Unnamed	Perennial Stream/River		
Montgomery	935.34	Unnamed	Intermittent Stream/River		
Montgomery	935.92	Unnamed	Intermittent Stream/River		
Montgomery	936.95	Crooked Creek	Intermittent Stream/River		
Montgomery	940.70	Unnamed	Intermittent Stream/River		
Montgomery	941.48	Unnamed	Intermittent Stream/River		
Montgomery	942.24	Long Branch	Intermittent Stream/River		
Montgomery	943.60	Unnamed	Perennial Stream/River		
Montgomery	945.48	Unnamed	Intermittent Stream/River		
Montgomery	945.93	Brush Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation	No Data
Montgomery	946.47	Unnamed	Intermittent Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Montgomery	947.51	Unnamed	Intermittent Stream/River		
Montgomery	948.20	Unnamed	Intermittent Stream/River		
Lincoln	950.31	Bear Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation; Class C	
Lincoln	950.50	Unnamed	Intermittent Stream/River		
Lincoln	951.85	Camp Creek	Perennial Stream/River	No Data	No Data
Lincoln	953.35	Unnamed	Intermittent Stream/River		
Lincoln	953.55	Unnamed	Intermittent Stream/River		
Lincoln	954.16	Unnamed	Intermittent Stream/River		
Lincoln	955.71	Unnamed	Intermittent Stream/River		
Lincoln	956.80	Turkey Creek	Intermittent Stream/River		
Lincoln	957.38	Unnamed	Intermittent Stream/River		
Lincoln	958.32	Unnamed	Intermittent Stream/River		
Lincoln	959.66	Cottonwood Branch	Intermittent Stream/River		
Lincoln	959.76	Unnamed	Intermittent Stream/River		
Lincoln	960.10	Unnamed	Intermittent Stream/River		
Lincoln	960.81	Unnamed	Intermittent Stream/River		
Lincoln	962.17	Unnamed	Intermittent Stream/River		
Lincoln	964.02	Spring Creek	Intermittent Stream/River		
Lincoln	964.49	Unnamed	Intermittent Stream/River		
Lincoln	967.38	Cuivre River	Perennial Stream/River	Livestock and Wildlife Watering; Protection of	No Data

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation; Secondary Contact Recreation	
Lincoln	968.11	Unnamed	Intermittent Stream/River		
Lincoln	968.97	Unnamed	Intermittent Stream/River		
Lincoln	969.50	Unnamed	Intermittent Stream/River		
Lincoln	969.92	Unnamed	Intermittent Stream/River		
Lincoln	970.42	Unnamed	Intermittent Stream/River		
Lincoln	971.79	Unnamed	Intermittent Stream/River		
Lincoln	972.28	Keelstone Branch	Intermittent Stream/River		
Lincoln	972.65	Unnamed	Intermittent Stream/River		
Lincoln	973.24	Groshong Branch	Intermittent Stream/River		
Lincoln	974.42	Campbell Branch	Intermittent Stream/River		
Lincoln	976.07	Unnamed	Intermittent Stream/River		
St. Charles	977.06	Cuivre River	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation; Secondary Contact Recreation	No Data
St. Charles	980.78	Unnamed	Intermittent Stream/River		
St. Charles	980.82	Unnamed	Perennial Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
St. Charles	981.40	Unnamed	Perennial Stream/River		
St. Charles	982.38	Unnamed	Intermittent Stream/River		
St. Charles	982.82	Unnamed	Swamp/Marsh		
St. Charles	984.71	Peruque Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation; Secondary Contact Recreation	No Data
St. Charles	985.85	Unnamed	Intermittent Stream/River		
St. Charles	986.90	Unnamed	Perennial Stream/River		
St. Charles	990.69	Unnamed	Intermittent Stream/River		
St. Charles	991.21	Dardenne Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation; Secondary Contact Recreation	No Data
St. Charles	993.40	Unnamed	Intermittent Stream/River		
St. Charles	993.89	Unnamed	Intermittent Stream/River		
St. Charles	995.37	Unnamed	Intermittent Stream/River		
St. Charles	995.51	Unnamed	Intermittent Stream/River		
St. Charles	996.45	Unnamed	Perennial Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
St. Charles	997.13	Unnamed	Intermittent Stream/River		
St. Charles	998.37	Unnamed	Perennial Stream/River		
St. Charles	998.76	Unnamed	Intermittent Stream/River		
St. Charles	1000.10	Unnamed	Intermittent Stream/River		
St. Charles	1016.64	Unnamed	Perennial Stream/River		
St. Charles	1016.64	Unnamed	Perennial Stream/River		
St. Charles	1016.64	Unnamed	Perennial Stream/River		
St. Charles	1016.82	Mississippi River	Artificial Path	Irrigation; Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation; Secondary Contact Recreation; Drainking Water Supply; Industrialprocess water and cooling water	No Data
ILLINOIS					
Madison	1016.82	Mississippi River	Artificial Path	Aquatic Life; Fish Consumption; Public Water Supply; Primary Contact; Secondary Contact; Aesthetic Quality	Fully Supporting; Not Supporting; Fully Supporting; Not Supporting; Not Assessed; Not Assessed

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Madison	1019.35	Unnamed	Intermittent Stream/River		
Madison	1019.45	Unnamed	Perennial Lake/Pond		
Madison	1021.72	Indian Creek	Perennial Stream/River	Aquatic Life; Fish Consumption; Primary Contact; Secondary Contact; Aesthetic Quality	Not Supporting; Fully Supporting; Not Assessed; Not Assessed; Not Assessed
Madison	1022.69	Cahokia Canal	Perennial Stream/River	Aquatic Life; Fish Consumption; Primary Contact; Secondary Contact; Aesthetic Quality	Fully Supporting; Fully Supporting; Not Supporting; Not Assessed; Not Assessed
Madison	1023.91	Unnamed	Intermittent Stream/River		
Madison	1024.75	Unnamed	Intermittent Stream/River		
Madison	1025.37	Unnamed	Intermittent Stream/River		
Madison	1026.79	Mooney Creek	Perennial Stream/River	Aquatic Life; Fish Consumption; Primary Contact; Secondary Contact; Aesthetic Quality	Not Assessed
Madison	1027.41	Unnamed	Intermittent Stream/River		
Madison	1028.51	Unnamed	Intermittent Stream/River		
Madison	1030.16	Unnamed	Intermittent Stream/River		
Madison	1032.24	Unnamed	Intermittent Stream/River		
Madison	1032.49	Silver Creek	Perennial Stream/River	Aquatic Life; Fish Consumption; Secondary Contact;	Not Supporting/Fully Supporting; Fully Supporting; Not Assessed;

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Aesthetic Quality	Not Assessed
Madison	1033.29	Unnamed	Intermittent Stream/River		
Madison	1034.13	Unnamed	Intermittent Stream/River		
Madison	1036.44	Sugar Fork	Perennial Stream/River	Aquatic Life; Fish Consumption; Primary Contact; Secondary Contact; Aesthetic Quality	Not Assessed
Madison	1038.18	Sand Creek	Perennial Stream/River	Aquatic Life; Fish Consumption; Primary Contact; Secondary Contact; Aesthetic Quality	Not Assesed
Madison	1041.51	Unnamed	Perennial Lake/Pond		
Madison	1041.54	East Fork Silver Creek	Artificial Path		
Madison	1043.56	Unnamed	Intermittent Stream/River		
Madison	1044.48	Sugar Creek	Intermittent Stream/River	Aquatic Life; Fish Consumption; Primary Contact; Secondary Contact; Aesthetic Quality	Not Assessed
Bond	1046.39	Unnamed	Intermittent Stream/River		
Bond	1048.91	Unnamed	Intermittent Stream/River		
Bond	1050.00	Unnamed	Intermittent Stream/River		
Bond	1050.78	Shoal Creek	Perennial Stream/River	Aquatic Life; Fish Consumption; Public and Food Processing	Not Supporting/Fully Supporting; Fully Supporting/Not Assessed;

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Water Supplies; Primary Contact; Secondary Contact; Aesthetic Quality	Not Supporting; Not Supporting/Not Assessed; Not Assessed
Bond	1051.54	Unnamed	Intermittent Stream/River		
Bond	1052.36	Unnamed	Intermittent Stream/River		
Bond	1053.40	Unnamed	Intermittent Stream/River		
Bond	1054.17	Unnamed	Intermittent Stream/River		
Bond	1054.89	Beaver Creek	Perennial Stream/River		
Bond	1057.07	Little Beaver Creek	Perennial Stream/River	Aquatic Life; Fish Consumption; Primary Contact; Secondary Contact; Aesthetic Quality	Not Assessed
Bond	1058.80	Unnamed	Intermittent Stream/River		
Bond	1059.40	Flat Branch	Intermittent Stream/River		
Bond	1059.61	Flat Branch	Intermittent Stream/River		
Bond	1059.65	Flat Branch	Intermittent Stream/River		
Bond	1061.42	Unnamed	Intermittent Stream/River		
Bond	1062.59	Unnamed	Intermittent Stream/River		
Bond	1062.92	Unnamed	Intermittent Stream/River		
Bond	1063.79	Unnamed	Intermittent Stream/River		
Fayette	1064.97	Unnamed	Inundation Area		
Fayette	1065.06	Unnamed	Inundation Area		
Fayette	1065.77	Hurricane Creek	Perennial Stream/River		
Fayette	1067.57	Unnamed	Perennial Lake/Pond		
Fayette	1067.59	Kaskaskia River	Artificial Path	Aquatic Life; Fish	Not Supporting/Not

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Consumption; Public Food and Processing Water Supplies; Primary Contact; Secondary Contact; Aesthetic Quality	Assessed; Fully Supporting; Not Supporting; Not Supporting/Fully Supporting/Not Assessed; Not Assessed
Fayette	1067.61	Unnamed	Inundation Area		
Fayette	1069.76	Unnamed	Intermittent Stream/River		
Marion	1073.18	Unnamed	Intermittent Stream/River		
CUSHING EXTENSION					
NEBRASKA					
Jefferson	0.65	Fayette	Intermittent Stream/River		
Jefferson	1.78	Fayette	Intermittent Stream/River		
Jefferson	1.90	Fayette	Intermittent Stream/River		
Jefferson	1.92	Fayette	Intermittent Stream/River		
Jefferson	1.95	Fayette	Intermittent Stream/River		
KANSAS					
Washington	4.19	Little Blue River	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Primary Contact Recreation Not Open to Public, Secondary Contact Recreation Not Open To Public, Domestic Water Supply, Food Procurement Use, Groundwater	Supporting

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Recharge, Industrial Water Supply, Irrigation, Livestock Watering	
Washington	6.87	Unnamed	Perennial Stream/River		
Washington	9.11	Unnamed	Connector		
Washington	9.78	Mill Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Secondary Contact Recreation Not Open to Public, Food Procurement Use	Supporting
Washington	12.12	Mill Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Secondary Contact Recreation Not Open to Public, Food Procurement Use	Supporting
Washington	13.45	Mill Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Secondary Contact Recreation Not Open to Public, Food Procurement Use	Supporting
Washington	13.80	Mill Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Secondary Contact Recreation Not Open	Supporting

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				to Public, Food Procurement Use	
Washington	13.92	Mill Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Secondary Contact Recreation Not Open to Public, Food Procurement Use	Supporting
Washington	14.02	Mill Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Secondary Contact Recreation Not Open to Public, Food Procurement Use	Supporting
Washington	14.18	Mill Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Secondary Contact Recreation Not Open to Public, Food Procurement Use	Supporting
Washington	22.69	Coon Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Primary Contact Recreation Not Open to Public, Food Procurement	Supporting
Washington	23.91	Unnamed	Perennial Stream/River		
Washington	26.20	Unnamed	Connector		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Washington	28.76	Unnamed	Intermittent Stream/River		
Washington	29.70	Unnamed	Intermittent Stream/River		
Washington	31.34	Unnamed	Intermittent Stream/River		
Washington	32.15	Unnamed	Intermittent Stream/River		
Clay	33.27	Unnamed	Intermittent Stream/River		
Clay	34.73	Carter Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Secondary Contact Recreation Not Open to Public	Supporting
Clay	34.81	Carter Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Secondary Contact Recreation Not Open to Public	Supporting
Clay	34.85	Carter Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Secondary Contact Recreation Not Open to Public	Supporting
Clay	34.89	Carter Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Secondary Contact Recreation Not Open to Public	Supporting
Clay	34.96	Carter Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use,	Supporting

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Secondary Contact Recreation Not Open to Public	
Clay	36.30	West Fancy Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life use, Primary Contact Recreation Not Open to Public, Food Procurement	Supporting
Clay	37.76	Unnamed	Intermittent Stream/River		
Clay	37.76	Unnamed	Intermittent Stream/River		
Clay	37.81	Unnamed	Intermittent Stream/River		
Clay	37.90	Unnamed	Intermittent Stream/River		
Clay	39.57	Unnamed	Intermittent Stream/River		
Clay	40.77	Unnamed	Intermittent Stream/River		
Clay	43.82	Unnamed	Intermittent Stream/River		
Clay	43.84	Unnamed	Intermittent Stream/River		
Clay	43.87	Lincoln Creek	Intermittent Stream/River	General Purpose Waters, Expected Aquatic Life Use, Secondary Contact Recreation Not Open to Public	Supporting
Clay	45.46	Unnamed	Intermittent Stream/River		
Clay	50.04	Unnamed	Not Controlled Inundation Area		
Clay	51.11	Unnamed	Perennial Stream/River		
Clay	51.14	Republican River	Artificial Path Artificial Path	General Purpose Waters, Special	Supporting

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Aquatic Life Use, Primary Contact Recreation Not Open to Public, Domestic Water Supply, Food Procurement Use, Groundwater Recharge, Industrial Water Supply, Irrigation, Livestock Watering	
Clay	51.18	Unnamed	Not Controlled Inundation Area		
Clay	52.49	Unnamed	Intermittent Stream/River		
Clay	53.84	Unnamed	Not Controlled Inundation Area		
Clay	53.90	Unnamed	Perennial Stream/River		
Clay	54.86	Unnamed	Intermittent Stream/River		
Clay	55.38	Unnamed	Intermittent Stream/River		
Clay	57.74	Unnamed	Intermittent Stream/River		
Clay	58.00	Unnamed	Intermittent Stream/River		
Clay	59.24	Unnamed	Intermittent Stream/River		
Clay	59.99	Unnamed	Intermittent Stream/River		
Clay	60.74	Unnamed	Intermittent Stream/River		
Clay	61.93	Unnamed	Intermittent Stream/River		
Clay	62.55	Unnamed	Intermittent Stream/River		
Dickinson	63.76	Unnamed	Intermittent Stream/River		
Dickinson	64.49	Unnamed	Intermittent Stream/River		
Dickinson	68.68	Chapman Creek	Perennial Stream/River	General Purpose	Supporting

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Waters, Expected Aquatic Life Use, Primary Contact Recreation Not Open to Public, Domestic Water Supply, Food Procurement Use, Groundwater Recharge, Industrial Water Supply, Irrigation, Livestock Watering	
Dickinson	69.36	Unnamed	Intermittent Stream/River		
Dickinson	70.16	Unnamed	Perennial Stream/River		
Dickinson	70.57	Unnamed	Intermittent Stream/River		
Dickinson	71.13	Unnamed	Intermittent Stream/River		
Dickinson	71.83	Unnamed	Perennial Stream/River		
Dickinson	71.93	Unnamed	Intermittent Stream/River		
Dickinson	76.01	Unnamed	Intermittent Lake/Pond		
Dickinson	76.45	Unnamed	Perennial Stream/River		
Dickinson	76.48	Smoky Hill River	Artificial Path	General Purpose Waters, Expected Aquatic Life Use, Primary Contact Recreation Not Open to Public, Domestic Water Supply, Food Procurement Use, Groundwater Recharge, Industrial Water Supply,	Supporting

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Irrigation, Livestock Watering	
Dickinson	78.21	Unnamed	Intermittent Stream/River		
Dickinson	78.53	Unnamed	Intermittent Stream/River		
Dickinson	79.39	Unnamed	Intermittent Stream/River		
Dickinson	79.95	Unnamed	Intermittent Stream/River		
Dickinson	80.05	Unnamed	Intermittent Stream/River		
Dickinson	81.35	Unnamed	Intermittent Stream/River		
Dickinson	83.49	Unnamed	Intermittent Stream/River		
Dickinson	85.01	Unnamed	Perennial Stream/River		
Dickinson	86.13	Unnamed	Intermittent Stream/River		
Dickinson	86.98	Carry Creek	Perennial Stream/River	General Purpose Waters, Special Aquatic Life Use, Food Procurement	Supporting
Dickinson	87.60	Unnamed	Intermittent Stream/River		
Dickinson	88.99	Unnamed	Intermittent Stream/River		
Dickinson	89.62	Unnamed	Intermittent Stream/River		
Dickinson	90.13	Unnamed	Intermittent Stream/River		
Dickinson	90.89	Unnamed	Intermittent Stream/River		
Dickinson	91.49	Unnamed	Intermittent Stream/River		
Dickinson	91.89	West Branch Lyon Creek	Perennial Stream/River	General Purpose Waters, Special Aquatic Life Use, Food Procurement	Supporting
Dickinson	95.08	Unnamed	Intermittent Stream/River		
Dickinson	95.69	Unnamed	Intermittent Stream/River		
Dickinson	96.17	Unnamed	Perennial Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Dickinson	97.01	Unnamed	Perennial Stream/River		
Dickinson	98.62	Unnamed	Perennial Stream/River		
Marion	99.83	Unnamed	Perennial Stream/River		
Marion	101.25	Unnamed	Intermittent Stream/River		
Marion	101.49	Unnamed	Intermittent Stream/River		
Marion	103.08	Unnamed	Intermittent Stream/River		
Marion	105.00	Unnamed	Intermittent Stream/River		
Marion	105.04	Unnamed	Intermittent Stream/River		
Marion	105.11	Unnamed	Intermittent Stream/River		
Marion	106.19	Unnamed	Intermittent Stream/River		
Marion	108.52	Unnamed	Intermittent Stream/River		
Marion	109.22	Unnamed	Intermittent Stream/River		
Marion	111.43	Unnamed	Intermittent Stream/River		
Marion	111.47	Unnamed	Intermittent Stream/River		
Marion	111.76	Unnamed	Intermittent Stream/River		
Marion	112.54	Unnamed	Intermittent Stream/River		
Marion	113.97	Mud Creek	Perennial Stream/River	General Purpose Waters, Special Aquatic Life Use, Domestic Water Supply, Food Procurement	Supporting
Marion	116.76	Unnamed	Intermittent Stream/River		
Marion	116.97	Cottonwood River	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Primary Contact Recreation Not Open to Public, Domestic	Supporting

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Water Supply, Food Procurement, Groundwater Recharge, Industrial water Supply, Irrigation, Livestock Watering	
Marion	117.56	Unnamed	Intermittent Stream/River		
Marion	117.57	Unnamed	Intermittent Stream/River		
Marion	117.59	Unnamed	Intermittent Stream/River		
Marion	118.76	Spring Branch	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use	Supporting
Marion	119.17	Unnamed	Intermittent Stream/River		
Marion	119.31	Unnamed	Intermittent Stream/River		
Marion	119.54	Unnamed	Intermittent Stream/River		
Marion	120.42	Unnamed	Intermittent Stream/River		
Marion	122.43	Unnamed	Intermittent Stream/River		
Marion	123.21	Catlin Creek	Perennial Stream/River	General Purpose Waters, Special Aquatic Life Use, Food Procurement	Supporting
Marion	124.06	Unnamed	Intermittent Stream/River		
Marion	124.10	Unnamed	Intermittent Stream/River		
Marion	128.05	Unnamed	Intermittent Stream/River		
Marion	128.05	Doyle Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Domestic Water Supply, Food	Supporting

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Procurement, Groundwater Recharge, Industrial water Supply, Irrigation, Livestock Watering	
Marion	128.09	Doyle Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Domestic Water Supply, Food Procurement, Groundwater Recharge, Industrial water Supply, Irrigation, Livestock Watering	Supporting
Marion	128.16	Doyle Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Domestic Water Supply, Food Procurement, Groundwater Recharge, Industrial water Supply, Irrigation, Livestock Watering	Supporting
Marion	128.78	Unnamed	Intermittent Stream/River		
Marion	128.85	Unnamed	Intermittent Stream/River		
Marion	129.03	Unnamed	Intermittent Stream/River		
Marion	129.30	Unnamed	Intermittent Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Marion	132.87	Unnamed	Intermittent Stream/River		
Marion	133.23	Unnamed	Intermittent Stream/River		
Marion	134.25	Unnamed	Intermittent Stream/River		
Butler	136.00	Unnamed	Perennial Stream/River		
Butler	136.14	Unnamed	Intermittent Stream/River		
Butler	136.57	Unnamed	Intermittent Stream/River		
Butler	137.18	Unnamed	Intermittent Stream/River		
Butler	139.16	Unnamed	Intermittent Stream/River		
Butler	139.93	Unnamed	Perennial Stream/River		
Butler	139.99	Unnamed	Perennial Stream/River		
Butler	140.03	Unnamed	Perennial Stream/River		
Butler	142.34	East Branch Whitewater River	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Domestic Water Supply, Food Procurement, Groundwater Recharge, Industrial water Supply, Irrigation, Livestock Watering	Supporting
Butler	144.75	Diamond Creek	Perennial Stream/River	No Data	No Data
Butler	145.36	Brush Creek	Intermittent Stream/River	No Data	No Data
Butler	146.23	Unnamed	Intermittent Stream/River		
Butler	148.58	Fourmile Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Food Procurement	Supporting

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Butler	150.17	Unnamed	Intermittent Stream/River		
Butler	150.68	Rock Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use	Supporting
Butler	151.39	Unnamed	Intermittent Stream/River		
Butler	152.19	Unnamed	Intermittent Stream/River		
Butler	153.08	Unnamed	Intermittent Stream/River		
Butler	154.73	Spring Branch	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use	Supporting
Butler	155.81	Unnamed	Intermittent Stream/River		
Butler	158.03	Whitewater River	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Domestic Water Supply, Food Procurement, Groundwater Recharge, Industrial water Supply, Irrigation, Livestock Watering	Supporting
Butler	158.86	Badger Creek	Intermittent Stream/River	General Purpose Waters, Expected Aquatic Life Use, Domestic Water Supply	Supporting
Butler	159.72	Unnamed	Intermittent Stream/River		
Butler	160.32	Unnamed	Intermittent Stream/River		
Butler	160.37	Unnamed	Intermittent Stream/River		
Butler	160.39	Unnamed	Intermittent Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Butler	163.84	Dry Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use	Supporting
Butler	165.20	Unnamed	Intermittent Stream/River		
Butler	167.39	Unnamed	Intermittent Stream/River		
Butler	167.78	Fourmile Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Primary Contact Recreation Not Open To Public, Domestic Water Supply, Food Procurement, Groundwater Recharge, Industrial water Supply, Irrigation, Livestock Watering	Supporting
Butler	169.31	Unnamed	Intermittent Stream/River		
Butler	170.65	Unnamed	Intermittent Stream/River		
Butler	172.22	Unnamed	Intermittent Stream/River		
Butler	174.59	Eightmile Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Domestic Water Supply, Food Procurement, Groundwater Recharge, Industrial water Supply, Irrigation, Livestock Watering	Supporting

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Butler	175.51	Unnamed	Intermittent Stream/River		
Butler	175.97	Unnamed	Intermittent Stream/River		
Butler	176.64	Unnamed	Intermittent Stream/River		
Butler	177.39	Unnamed	Intermittent Stream/River		
Butler	177.84	Unnamed	Intermittent Stream/River		
Cowley	178.59	Unnamed	Intermittent Stream/River		
Cowley	180.66	Polecat Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use, Food Procurement	Supporting
Cowley	182.07	Unnamed	Intermittent Stream/River		
Cowley	182.79	Unnamed	Intermittent Stream/River		
Cowley	185.10	Stewart Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use	Supporting
Cowley	185.20	Stewart Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use	Supporting
Cowley	185.30	Stewart Creek	Perennial Stream/River	General Purpose Waters, Expected Aquatic Life Use	Supporting
Cowley	186.71	Unnamed	Intermittent Stream/River		
Cowley	187.87	Unnamed	Intermittent Stream/River		
Cowley	188.01	Crooked Creek	Intermittent Stream/River	General Purpose Waters, Expected Aquatic Life Use	Supporting
Cowley	188.17	Unnamed	Intermittent Stream/River		
Cowley	189.94	Unnamed	Intermittent Stream/River		
Cowley	190.96	Unnamed	Intermittent Stream/River		

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Cowley	191.31	Unnamed	Intermittent Stream/River		
Cowley	194.88	Unnamed	Intermittent Stream/River		
Cowley	195.87	Unnamed	Intermittent Stream/River		
Cowley	196.21	Unnamed	Intermittent Stream/River		
Cowley	197.99	Unnamed	Intermittent Stream/River		
Cowley	199.68	Unnamed	Intermittent Stream/River		
Cowley	201.08	Spring Creek	Intermittent Stream/River	General Purpose Waters, Expected Aquatic Life Use	Supporting
Cowley	201.46	Unnamed	Intermittent Stream/River		
Cowley	205.01	Unnamed	Intermittent Stream/River		
Cowley	206.04	Unnamed	Perennial Stream/River		
Cowley	206.04	Unnamed	Perennial Stream/River		
Cowley	206.06	Arkansas River	Artificial Path	General Purpose Waters, Special Aquatic Life Use, Primary Contact Recreation by Law or Written Permission, Domestic Water Supply, Food Procurement, Groundwater Recharge, Industrial water Supply, Irrigation, Livestock Watering	Supporting
Cowley	207.50	Unnamed	Intermittent Stream/River		
Cowley	209.47	Unnamed	Intermittent Stream/River		
OKLAHOMA					

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Kay	212.23	Chilocco Creek	Intermittent Stream/River		
Kay	213.01	Unnamed	Intermittent Stream/River		
Kay	216.14	Bois d'Arc Creek	Intermittent Stream/River	Agriculture; WW Aquatic Community; Hydropower; Primary Contact Recreation; Public and Private Water Supply; Fish Consumption; Aesthetics	Fully Supporting; Insufficient Information; Insufficient Information; Not Supporting; Fully Supporting; Not Assessed; Fully Supporting
Kay	216.31	Bois d'Arc Creek	Perennial Stream/River	Agriculture; WW Aquatic Community; Hydropower; Primary Contact Recreation; Public and Private Water Supply; Fish Consumption; Aesthetics	Fully Supporting; Insufficient Information; Insufficient Information; Not Supporting; Fully Supporting; Not Assessed; Fully Supporting
Kay	216.50	Bois d'Arc Creek	Perennial Stream/River	Agriculture; WW Aquatic Community; Hydropower; Primary Contact Recreation; Public and Private Water Supply; Fish Consumption; Aesthetics	Fully Supporting; Insufficient Information; Insufficient Information; Not Supporting; Fully Supporting; Not Assessed; Fully Supporting
Kay	216.84	Bois d'Arc Creek	Perennial Stream/River	Agriculture; WW Aquatic	Fully Supporting; Insufficient Information;

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Community; Hydropower; Primary Contact Recreation; Public and Private Water Supply; Fish Consumption; Aesthetics	Insufficient Information; Not Supporting; Fully Supporting; Not Assessed; Fully Supporting
Kay	219.15		Intermittent Stream/River	Agriculture; WW Aquatic Community; Hydropower; Primary Contact Recreation; Public and Private Water Supply; Fish Consumption; Aesthetics	Fully Supporting; Insufficient Information; Insufficient Information; Not Supporting; Fully Supporting; Not Assessed; Fully Supporting
Kay	222.31	Bois d'Arc Creek	Perennial Stream/River	Agriculture; WW Aquatic Community; Hydropower; Primary Contact Recreation; Public and Private Water Supply; Fish Consumption; Aesthetics	Fully Supporting; Insufficient Information; Insufficient Information; Not Supporting; Fully Supporting; Not Assessed; Fully Supporting
Kay	222.73	Bois d'Arc Creek	Perennial Stream/River	Agriculture; WW Aquatic Community; Hydropower; Primary Contact	Fully Supporting; Insufficient Information; Insufficient Information; Not Supporting;

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Recreation; Public and Private Water Supply; Fish Consumption; Aesthetics	Fully Supporting; Not Assessed; Fully Supporting
Kay	225.85	Bois d'Arc Creek	Perennial Stream/River	Agriculture; WW Aquatic Community; Hydropower; Primary Contact Recreation; Public and Private Water Supply; Fish Consumption; Aesthetics	Fully Supporting; Insufficient Information; Insufficient Information; Not Supporting; Fully Supporting; Not Assessed; Fully Supporting
Kay	230.46	Bois d'Arc Creek	Perennial Stream/River	Agriculture; WW Aquatic Community; Hydropower; Primary Contact Recreation; Public and Private Water Supply; Fish Consumption; Aesthetics	Fully Supporting; Insufficient Information; Insufficient Information; Not Supporting; Fully Supporting; Not Assessed; Fully Supporting
Kay	232.23	Unnamed	Intermittent Stream/River		
Kay	233.83	Bois d'Arc Creek	Perennial Stream/River	Agriculture; WW Aquatic Community; Hydropower; Primary Contact Recreation; Public and Private	Fully Supporting; Insufficient Information; Insufficient Information; Not Supporting; Fully Supporting;

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Water Supply; Fish Consumption; Aesthetics	Not Assessed; Fully Supporting
Kay	234.61	Bois d'Arc Creek	Perennial Stream/River	Agriculture; WW Aquatic Community; Hydropower; Primary Contact Recreation; Public and Private Water Supply; Fish Consumption; Aesthetics	Fully Supporting; Insufficient Information; Insufficient Information; Not Supporting; Fully Supporting; Not Assessed; Fully Supporting
Kay	236.44	Bois d'Arc Creek	Perennial Stream/River	Agriculture; WW Aquatic Community; Hydropower; Primary Contact Recreation; Public and Private Water Supply; Fish Consumption; Aesthetics	Fully Supporting; Insufficient Information; Insufficient Information; Not Supporting; Fully Supporting; Not Assessed; Fully Supporting
Kay	238.10	Cowskin Creek	Intermittent Stream/River	No Data	No Data
Kay	238.58	Unnamed	Perennial Stream/River		
Kay	238.61	Salt Fork Arkansas River	Artificial Path	Aesthetics; Agriculture; WW Aquatic Community; Industrial and Municipal Process and Cooling Water; Primary Contact Recreation;	Insufficient Data; Fully Supporting/Not Assesed; Not Supporting, Fully Supporting; Not Supporting; Not Assessed; Not Assessed

Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
				Public and Private water supply; Fish Consumption	
Noble	240.48	Deadman Creek	Intermittent Stream/River		
Noble	248.24	Red Rock Creek	Perennial Stream/River		
Noble	249.67	Long Branch	Intermittent Stream/River		
Noble	249.72	Long Branch	Intermittent Stream/River		
Noble	252.39	Unnamed	Intermittent Stream/River		
Noble	254.02	Unnamed	Intermittent Stream/River		
Noble	254.42	Greasy Creek	Intermittent Stream/River		
Noble	257.47	Unnamed	Intermittent Stream/River		
Noble	258.44	Unnamed	Intermittent Stream/River		
Noble	259.94	Black Bear Creek	Perennial Stream/River		
Noble	261.20	Unnamed	Intermittent Stream/River		
Noble	262.23	Unnamed	Intermittent Stream/River		
Noble	263.85	Long Branch	Intermittent Stream/River		
Payne	266.29	Unnamed	Intermittent Stream/River		
Payne	266.63	Unnamed	Intermittent Stream/River		
Payne	268.85	East Brush Creek	Intermittent Stream/River		
Payne	270.77	Little Stillwater Creek	Intermittent Stream/River		
Payne	270.93	Unnamed	Intermittent Stream/River		
Payne	272.67	Unnamed	Intermittent Stream/River		
Payne	274.03	Unnamed	Intermittent Stream/River		
Payne	275.42	Unnamed	Intermittent Stream/River		
Payne	277.61	Unnamed	Intermittent Stream/River		
Payne	278.62	Unnamed	Intermittent Stream/River		
Payne	279.34	Unnamed	Intermittent Stream/River		

Table F-1 Major and Sensitive Waterbodies

State / County	Approx. MP	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification	Supports Use Designation
Payne	282.80	Long Branch	Intermittent Stream/River		
Payne	284.31	Unnamed	Perennial Stream/River		
Payne	284.34	Cimarron River	Artificial Path		
Payne	286.11	Unnamed	Intermittent Stream/River		
Payne	287.23	Cabin Creek	Intermittent Stream/River		
Payne	288.50	Cabin Creek	Intermittent Stream/River		
Payne	288.66	Cabin Creek	Intermittent Stream/River		
Payne	288.66	Cabin Creek	Intermittent Stream/River		
Payne	288.67	Cabin Creek	Intermittent Stream/River		
Payne	288.83	Cabin Creek	Intermittent Stream/River		
Payne	288.86	Unnamed	Perennial Lake/Pond		

Data from previous 20 years of USGS gaging data: 1982 to 2002 (USGS 2002).

Appendix K

Impaired Water Bodies in the Vicinity of the Keystone Pipeline Project

(Note: This appendix is Table 3.5-3, taken directly from the Environmental Report for the Keystone Pipeline Project [ENSR 2006a])

Table 3.5-3 Impaired Waterbodies

State	Waterbody Name	Designated Use	Use Support/ Attainment	Impairment	TMDL Priority
KEYSTONE MAINLINE					
NORTH DAKOTA[1]	Pembina River	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Sedimentation / Siltation	2
		Recreation	Fully Supporting but Threatened	Total Fecal Coliform	2
	Tongue River	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Sedimentation / Siltation	1B
	North Branch, Middle Branch, South Branch Park River	Fish and Other Aquatic Biota (Designation for Park River)	Fully Supporting but Threatened	Sedimentation / Siltation, Total Dissolved Solids (TDS) and Organic Enrichment	2
	North Branch, Middle Branch, South Branch, Forest River	Fish and Other Aquatic Biota (Designation for Forest River)	Not Supporting	Biological Indicators, Sedimentation / Siltation, TDS	2
	North Branch Turtle River	Fish and Other Aquatic Biota (Designation for Turtle River)	Not Supporting	Cadmium, Sedimentation / Siltation, Selenium, TDS	2
	Goose River	Fish and Other Aquatic Biota	Not Supporting	Sedimentation / Siltation	2
		Recreation	Fully Supporting but Threatened	Total Fecal Coliform	
	Sheyenne River	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Sedimentation / Siltation	2
		Recreation	Fully Supporting but Threatened / Not Supporting	Total Fecal Coliform	
SOUTH DAKOTA[2]	No Data For Streams Crossed				
NEBRASKA[3]	Missouri River	Primary Contact Recreation	Inhibited	Fecal Coliform	5
		Aquatic Life Use	Inhibited	Dieldrin, polychlorinated biphenyls (PCBs)	
		Agriculture Water Supply	Supported		
		Industrial Water Supply	Supported		
	Antelope Creek	N/A	N/A	N/A	3
	West Bow Creek	N/A	N/A	N/A	3
	Norwegian Bow Creek	N/A	N/A	N/A	3
	Bow Creek	N/A	N/A	N/A	3
	Middle Logan Creek	N/A	N/A	N/A	3

Table 3.5-3 Impaired Waterbodies

State	Waterbody Name	Designated Use	Use Support/ Attainment	Impairment	TMDL Priority
	Elkhorn River	Primary Contact Recreation	Inhibited	Fecal Coliform	5
		Aquatic Life Use	Supported		
	Shell Creek	N/A	N/A	N/A	3
	Lost Creek	N/A	N/A	N/A	3
	Platte River	Primary Contact Recreation	Inhibited	Fecal Coliform	5
		Aquatic Life Use	Inhibited	PCBs	
		Agriculture Water Supply	Supported		
	Deer Creek	N/A	N/A	N/A	3
	Little Blue River	N/A	N/A	N/A	3
	Big Blue River	Aquatic Life Use	Inhibited	DO	5
		Agriculture Water Supply	Supported		
	Lincoln Creek	Aquatic Life Use	Inhibited	Selenium	5
		Agriculture Water Supply	Supported		
	Crooked Creek	N/A	N/A	N/A	3
	West Fork Big Blue River	Primary Contact Recreation	Inhibited	E. Coli, Fecal coliform	5
		Aquatic Life Use	Inhibited	Selenium, Dieldrin	
		Agriculture Water Supply	Supported		
	Turkey Creek	N/A	N/A	N/A	3
	Swan Creek	Aquatic Life Use	Supported		2
		Agriculture Water Supply	Supported		
	Cub Creek	N/A	N/A	N/A	3
KANSAS[4]	Meadow Creek	N/A			
	Indian Creek	N/A		Biological Impairment	1
	Deer Creek	GP, AL-E, CR-b		Atrazine, Berillium, Copper, pH	2 & 3
	Big Blue River	N/A		Atrazine, Berillium, Copper, pH	2 & 3

Table 3.5-3 Impaired Waterbodies

State	Waterbody Name	Designated Use	Use Support/ Attainment	Impairment	TMDL Priority
	North Elm Creek	GP, AL-E, CR-b		Atrazine, Berillium, Copper, pH	1
	Robidoux Creek	GP, AL-E, CR-B			
	Negro Creek	GP, AL-E, CR-b			
	North Fork Wildcat Creek	N/A			
	Wildcat Creek	GP, AL-S, CR-C, DS, FP, GR, IW, IR, LW or GP, E		Biological Impairment	1
	South Fork Big Nemaha River	GP, AL-S, CR-C, DS, FP, GR, IW, IR, LW		Biological Impairment	1
	Harris Creek	GP, AL-E		Biological Impairment	1
	Craig Creek	N/A			
	Delaware River	N/A		Beryllium, Biological Impairment	1
	Walnut Creek	GP, AL-E		Atrazine	1
	Middle Fork Wolf River	GP, AL-E, DS, FP, GR, IW, IR, LW		Atrazine, Biological Impairment	2
	Buttermilk Creek	GP, AL-E, CR-b		Atrazine, Copper	2
	South Fork Wolf River	GP, AL-E, DS, FP, GR, IW, IR, LW		Atrazine, Biological Impairment	2
	Squaw Creek	GP, AL-E, CR-b			
	Halling Creek	GP, AL-E		Atrazine, Biological Impairment	2
	Jordan Creek	GP, AL-E		Copper	3
	Rock Creek	GP, AL-E		Copper	3
	Brush Creek	GP, AL-E			
	Missouri River	GP, AL-S, CR-B, DS, FP, GR, IW, IR, LW			

Table 3.5-3 Impaired Waterbodies

State	Waterbody Name	Designated Use	Use Support/ Attainment	Impairment	TMDL Priority
MISSOURI[5]	Missouri River	IRR, LWW, AQL, WBC-B, SCR, DWS, IND	N/A	Chlorodane, PCBs	M
	Contrary Creek	LWW, AQL, WBC-B	N/A	N/A	N/A
	Platte River	IRR, LWW, AQL, WBC-B, SCR, DWS	N/A	N/A	N/A
	Malden Creek	N/A	N/A	N/A	N/A
	Wolfpen Creek	N/A	N/A	N/A	N/A
	Jenkins Branch	N/A	N/A	N/A	N/A
	Horse Fork Creek	LWW, AQL, WBC-B	N/A	N/A	N/A
	Little Platte River	LWW, AQL, WBC-B, SCR	N/A	N/A	N/A
	Shoal Creek	LWW, AQL, WBC-B, SCR		Fecal Coliform	M
	Little Shoal Creek	N/A	N/A	N/A	N/A
	Deer Creek	N/A	N/A	N/A	N/A
	Plum Creek	N/A	N/A	N/A	N/A
	Log Creek	LWW, AQL, WBC-B, SCR	N/A	N/A	N/A
	Brush Creek	N/A	N/A	BOD, VSS	H
	Crabapple Creek	LWW, AQL, WBC-B	N/A	N/A	N/A
	Mud Creek	LWW, AQL, WBC-B	N/A	N/A	N/A
	Willow Creek	LWW, AQL, WBC-B	N/A	N/A	N/A
	Big Creek	LWW, AQL, WBC-B	N/A	Metals, Sediment	H/M
	Grand River	IRR, LWW, AQL, WBC-A, SCR, DWS	N/A	N/A	N/A
	Potter Slough	N/A	N/A	N/A	N/A
	Salt Creek	LWW, AQL, WBC-B	N/A	N/A	N/A
	Brush Creek	LWW, AQL, WBC-B	N/A	BOD, VSS	H
	Lake Creek	LWW, AQL, WBC-B		Sediment	M

Table 3.5-3 . Impaired Waterbodies

State	Waterbody Name	Designated Use	Use Support/ Attainment	Impairment	TMDL Priority
	Palmer Creek	LWW, AQL, WBC-B	N/A	N/A	N/A
	Mussel Fork Creek	LWW, AQL, WBC-B	N/A	Sediment	M
	Chariton River	IRR, LWW, AQL, WBC-A, SCR	N/A	N/A	N/A
	Puzzle Creek	LWW, AQL, WBC-B	N/A	N/A	N/A
	Middle Fork Little Chariton River	LWW, AQL, WBC-B (classifications for Little Chariton River)	N/A	N/A	N/A
	East Fork Little Chariton River	LWW, AQL, WBC-B (classifications for Little Chariton River)	N/A	N/A	N/A
	Big Creek	N/A	N/A	Metals, Sediment	H/M
	Saling Creek	N/A	N/A	N/A	N/A
	Long Branch Creek	LWW, AQL, WBC-B	N/A	Unknown	M
	Goodwater Creek	N/A	N/A	N/A	N/A
	Youngs Creek	LWW, AQL, WBC-B	N/A	N/A	N/A
	Skull Lick Creek	N/A	N/A	N/A	N/A
	South Fork Salt River	N/A	N/A	N/A	N/A
	Bean Creek	LWW, AQL, WBC-B	N/A	N/A	N/A
	Littleby Creek	LWW, AQL, WBC-B	N/A	N/A	N/A
	West Fork Cuivre River	LWW, AQL, WBC-B	N/A	N/A	N/A
	Coon Creek	LWW, AQL, WBC-B	N/A	N/A	N/A
	Long Branch Creek	N/A	N/A	N/A	N/A
	Elkhorn Creek	LWW, AQL, WBC-B	N/A	BOD, VSS	H
	Brush Creek	LWW, AQL, WBC-B	N/A	BOD, VSS	H
	Bear Creek	LWW, AQL, WBC-B	N/A	Unknown	M
	Camp East Creek	N/A	N/A	N/A	N/A

Table 3.5-3 Impaired Waterbodies

State	Waterbody Name	Designated Use	Use Support/ Attainment	Impairment	TMDL Priority
	Cuivre River	LWW, AQL, WBC-B/A, SCR	N/A	N/A	N/A
	Whites Branch Creek	N/A	N/A	N/A	N/A
	Peruque Creek	LWW, AQL, WBC-B/A, SCR		NVSS	M
	Boiseau Creek	LWW, AQL, WBC-B	N/A	N/A	N/A
	Dardenne Creek	LWW, AQL, WBC-B/A, SCR		Unknown	M
	Trinity Channel	N/A	N/A	N/A	N/A
	Grand Lake	N/A	N/A	N/A	N/A
	Mississippi River	IRR, LWW, AQL, WBC-B, SCR, DWS, IND		Chlordane, PCBs	M
ILLINOIS[6]	Mississippi River				
	Indian Creek	Aquatic Life	Not Supporting	Habitat Assessment	(Category) 4C
		Fish Consumption	Fully Supporting		
		Primary Contact	Not Assessed		
		Secondary Contact			
		Aesthetic Quality			
	Cahokia Creek	Aquatic Life	Fully Supporting		2 & 5
		Fish Consumption			
		Primary Contact	Not Supporting	Fecal Coliform	
		Secondary Contact	Not Assessed		
		Aesthetic Quality			
	Burrough's Branch (N. loop)	Aquatic Life	Not Assessed	N/A	3
		Fish Consumption			
		Primary Contact			
		Secondary Contact			
		Aesthetic Quality			

Table 3.5-3 Impaired Waterbodies

State	Waterbody Name	Designated Use	Use Support/ Attainment	Impairment	TMDL Priority
	Mooney Creek (S. loop)	Aquatic Life	Not Assessed	N/A	3
		Fish Consumption			
		Primary Contact			
		Secondary Contact			
		Aesthetic Quality			
	Sugar Creek	Aquatic Life	Not Assessed	N/A	3
		Fish Consumption			
		Primary Contact			
		Secondary Contact			
		Aesthetic Quality			
	Silver Creek	Aquatic Life	Not Supporting/Fully Supporting	Dissolved Oxygen, Sedimentation/Siltation, TSS, pH, Total Nitrogen, TPH	2 & 5
		Fish Consumption	Fully Supporting		
		Secondary Contact	Not Assessed		
		Aesthetic Quality			
	Sugar Fork	Aquatic Life	Not Assessed	N/A	3
		Fish Consumption			
		Primary Contact			
		Secondary Contact			
		Aesthetic Quality			
	Sand Creek	Aquatic Life	Not Assessed	N/A	3
		Fish Consumption			
		Primary Contact			
		Secondary Contact			
		Aesthetic Quality			

Table 3.5-3 Impaired Waterbodies

State	Waterbody Name	Designated Use	Use Support/ Attainment	Impairment	TMDL Priority
	Highland Silver Lake	Aquatic Life	Not Supporting	Dissolved Oxygen, Sedimentation/Siltation, TSS, TPH, Aldrin	5
		Fish Consumption	Not Supporting	Chlordane	
		Public Food and Processing Water Supplies	Not Supporting	Manganese	
		Primary Contact	Not Assessed		
		Secondary Contact			
		Aesthetic Quality	Not Supporting	Aquatic Algae	
	Shoal Creek	Aquatic Life	Not Supporting/Fully Supporting	Dissolved Oxygen, Sedimentation/Siltation, TSS, TPH, Unknown Impairment	2 & 5
		Fish Consumption	Fully Supporting/Not Assessed		
		Public and Food Processing Water Supplies	Not Supporting	Manganese	
		Primary Contact	Not Supporting/Not Assessed	Fecal Coliform	
		Secondary Contact	Not Assessed		
		Aesthetic Quality			
	Little Beaver Creek	Aquatic Life	Not Assessed	N/A	3
		Fish Consumption			
		Primary Contact			
		Secondary Contact			
		Aesthetic Quality			
	Kaskaskia River	Aquatic Life	Not Supporting/Not Assessed	Dissolved Oxygen, Silver, pH, TSS, TPH, Unknown Impairment	2 & 5
		Fish Consumption	Fully Supporting		

Table 3.5-3 Impaired Waterbodies

State	Waterbody Name	Designated Use	Use Support/ Attainment	Impairment	TMDL Priority
		Public Food and Processing Water Supplies	Not Supporting	Manganese	
		Primary Contact	Not Supporting/Fully Supporting/Not Assessed	Fecal Coliform	
		Secondary Contact	Fully Supporting/ Not Assessed		
		Aesthetic Quality	Not Assessed		
	Bear Creek	Aquatic Life	Not Assessed	N/A	3
		Fish Consumption			
		Primary Contact			
		Secondary Contact			
		Aesthetic Quality			
CUSHING EXTENSION					
KANSAS	Little Blue River	GP, AL-E, CR-C, CR-b, DS, FP, GR, IW, IR, LW	Supporting	Copper, Biology	2
	Mill Creek	GP, AL-E, CR-b, FP	Supporting	Atrazine	3
	Coon Creek	GP, AL-E, CR-C, FP	Supporting	No Data	No Data
	Carter Creek	GP, AL-E, CR-b	Supporting	No Data	No Data
	West Fancy Creek	GP, AL-E, CR-b, FP	Supporting	No Data	No Data
	Lincoln Creek	GP, AL-E, CR-b	Supporting	Biology	2
	Republican River	GP, AL-S, CR-C, DS, FP, GR, IW, IR, LW	Supporting	Biology	2
	Chapman Creek	GP, AL-E, CR-C, DS, FP, GR, IW, IR, LW	Supporting	Fecal Coliform; Sulfate	1
	Smoky Hill River	GP, AL-E, CR-C, DS, FP, GR, IW, IR, LW	Supporting	Chloride; Fecal Coliform; Sulfate; Biology	1
	Carry Creek	GP, AL-S, FP	Supporting	Sulfates	1
	West Branch Lyon Creek	GP, AL-S, FP	Supporting	Fecal Coliform	1
	Mud Creek	GP, AL-S, DS, FP	Supporting	Chloride; Fecal Coliform; Sulfate	1

Table 3.5-3 Impaired Waterbodies

State	Waterbody Name	Designated Use	Use Support/ Attainment	Impairment	TMDL Priority
	Cottonwood River	GP, AL-E, CR-C, DS, FP, GR, IW, IR, LW	Supporting	Zinc	3
	Spring Branch	GP, AL-E	Supporting	No Data	No Data
	Catlin Creek	GP, AL-S, FP	Supporting	No Data	No Data
	Doyle Creek	GP, AL-E, DS, FP, GR, IW, IR, LW	Supporting	No Data	No Data
	East Branch Whitewater River	GP, AL-E, DS, FP, GR, IW, IR, LW	Supporting	Atrazine	2
	Diamond Creek	No Data	Supporting	No Data	No Data
	Brush Creek	No Data	Supporting	No Data	No Data
	Fourmile Creek	GP, AL-E, FP	Supporting	Atrazine	2
	Rock Creek	GP, AL-E	Supporting	Atrazine	2
	Spring Branch	GP, AL-E	Supporting	No Data	No Data
	Whitewater River	GP, AL-E, DS, FP, GR, IW, IR, LW	Supporting	Atrazine	2
	Badger Creek	GP, AL-E, DS	Supporting	Atrazine	2
	Dry Creek	GP, AL-E	Supporting	Atrazine	2
	Fourmile Creek	GP, AL-E, CR-C, DS, FP, GR, IW, IR, LW	Supporting	Atrazine	2
	Eightmile Creek	GP, AL-E, DS, FP, GR, IW, IR, LW	Supporting	No Data	No Data
	Polecat Creek	GP, AL-E, FP	Supporting	No Data	No Data
	Stewart Creek	GP, AL-E	Supporting	No Data	No Data
	Crooked Creek	GP, AL-E	Supporting	No Data	No Data
	Spring Creek	GP, AL-E	Supporting	Chloride; pH; Fecal Coliform; Sulfate	1; 2; 2; 4
	Arkansas River	GP, AL-S, CR-B, DS, FP, GR, IW, IR, LW	Supporting	pH; Chloride	2;1

Table 3.5-3 Impaired Waterbodies

State	Waterbody Name	Designated Use	Use Support/ Attainment	Impairment	TMDL Priority
OKLAHOMA	Chilocco Creek	No Data	No Data	No Data	No Data
	Bois d'Arc Creek	Agriculture; WW Aquatic Community; Hydropower; Primary Contact Recreation; Public and Private Water Supply; Fish Consumption; Aesthetics	Fully Supporting; Insufficient Information; Insufficient Information; Not Supporting; Fully Supporting; Not Assessed; Fully Supporting	Sulfates, Pathogens, Turbidity	High
	Cowskin Creek	No Data	No Data	No Data	No Data
	Salt Fork Arkansas River	Aesthetics; Agriculture; WW Aquatic Community; Industrial and Municipal Process and Cooling Water; Primary Contact Recreation; Public and Private water supply; Fish Consumption	Insufficient Data; Fully Supporting/Not Assessed; Not Supporting, Fully Supporting; Not Supporting; Not Assessed; Not Assessed	Pathogens, Turbidity	High
	Deadman Creek	Aesthetics; Agriculture; Warm Water Aquatic Community; Industrial and Municipal Process Cooling Water; Primary Contact Recreation; Fish Consumption	Insufficient Data; Insufficient Data; Insufficient Data; Insufficient Data; Not Assessed; Not Assessed	No Data	No Data
	Red Rock Creek	Aesthetics; Agriculture; Warm Water Aquatic Community; Industrial and Municipal Process Cooling Water; Primary Contact Recreation; Fish Consumption	Fully Supporting; Fully Supporting; Not Supporting; Fully Supporting; Not Supporting; Not Assessed	Turbidity	High
	Long Branch	Aesthetics; Agriculture; Warm Water Aquatic Community; Industrial and Municipal Process Cooling Water; Primary Contact Recreation; Fish Consumption	Not Assessed	No Data	No Data
	Greasy Creek	No Data	No Data	No Data	No Data
	Black Bear Creek	Aesthetics; Agriculture; Warm Water Aquatic Community; Industrial and Municipal Process Cooling Water; Primary Contact Recreation; Fish Consumption	Fully Supporting; Fully Supporting; Fully Supporting/Not Supporting; Fully Supporting; Not Supporting; Insufficient Data; Insufficient Data	Unknown Toxicity, Lead, Pathogens, Turbidity	High
	East Brush Creek	Aesthetics; Agriculture; Warm Water Aquatic Community; Industrial and Municipal Process Cooling Water; Primary Contact Recreation; Fish Consumption	Not Assessed	No Data	No Data

Table 3.5-3 Impaired Waterbodies

State	Waterbody Name	Designated Use	Use Support/ Attainment	Impairment	TMDL Priority
	Little Stillwater Creek	No Data	No Data	Nitrates	High
	Cimarron River	Aesthetics; Agriculture; Emergency Water Supply; Warm Water Aquatic Community; Industrial and Municipal Process Colling Water; Primary Contact Recreation; Fish Consumption	Fully Supporting; Fully Supporting; Fully Supporting; Insufficient Information; Fully Supporting; Not Assessed; Not Assessed	Sulfates, Pathogens, Turbidity	High
	Cabin Creek	Aesthetics; Agriculture; Warm Water Aquatic Community; Industrial and Municipal Process Colling Water; Primary Contact Recreation; Fish Consumption	Not Assessed	No Data	No Data

[1]Source: NDDH 2004.

1A = TMDLs are scheduled for completion in the next two years.

1B = TMDL activities (e.g., monitoring or modeling) are scheduled to begin in the next two years.

2 = scheduled for TMDL development in the next 10 years.

3 = Impaired for fish consumption due to methyl mercury (low priority for state due to complexities related to fate and transport of methyl mercury and due to interstate and international nature of atmospheric mercury sources.

[2]Source: SDDENR 2004.

[3]Source: Nebraska Department of Environmental Quality (NEDEQ) 2004.

Category 2 = Some of the designated uses are met but there is insufficient information to determine if all uses are being met; Category 3 = Insufficient data to determine if any beneficial uses are being met; Category 5 = One or more beneficial uses are determined to be impaired by one or more pollutants and all of the TMDLs have not been developed. Category 5 waters constitute the Section 303(d) list subject to EPA approval/disapproval.

[4]Source: KDHE 2004.

AL-E = expected aquatic life use.
AL-S = special aquatic life use.
CR-B = primary contact recreation segment is by law or written permission of the landowner open to and accessible to the public.
CR-b = secondary contact recreational segment is not open to and accessible by the public under Kansas law.
CR-C = primary contact recreation segment is not open to and accessible by the public under Kansas law.
DS = domestic water supply use.
FP = food procurement use.
GP = general purpose waters.
GR = groundwater recharge.
IR = irrigation use.
IW = industrial water supply use.
LW = livestock watering use.

Priority Levels – unknown.

[5]Source: MODNR 2004.

AQL = protection of warmwater aquatic life and human health-fish consumption.
BOD = biological oxygen demand (mg/l).
DWS = drinking water supply.
IND = industrial water supply.
IRR = irrigation water supply.
LWW = livestock and wildlife watering.
SCR = secondary contact recreation.
THP = total petroleum hydrocarbons (mg/l).
VSS = volatile (organic) suspended solids (mg/l).
WBC-A = whole body contact recreation open to public with whole body contact recreational use(s).
WBC-B = whole body contact recreation waters not contained within Category A.

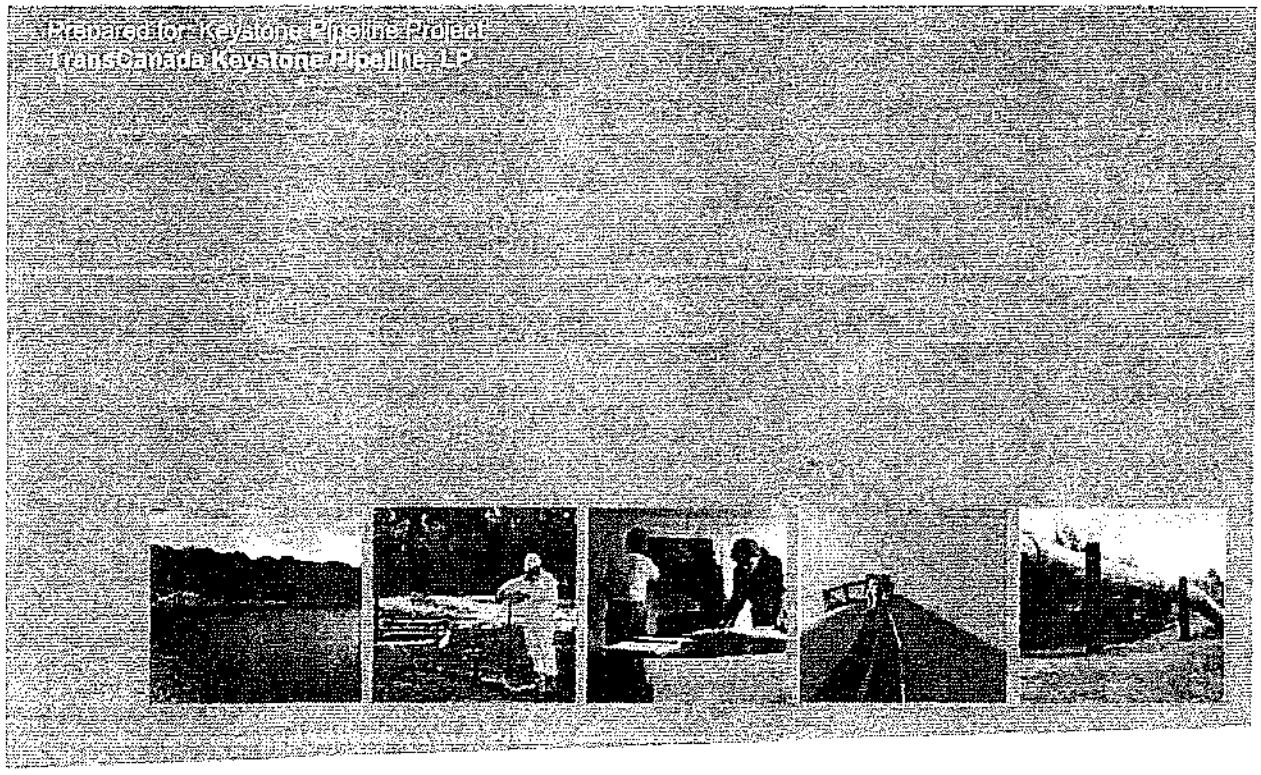
Priority M – Medium.

Priority H – High.

[6]Source: ILEPA 2006.

Appendix L

Risk Assessment and Environmental Consequence Analysis



Pipeline Risk Assessment and Environmental Consequence Analysis

ENSR Corporation
June 2006
Document No.: 10623-004

ENSR | AECOM

Prepared for: Keystone Pipeline Project
TransCanada Keystone Pipeline, LP

Pipeline Risk Assessment and Environmental Consequence Analysis

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ENSR Corporation
June 2006
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1.0 Project Overview

TransCanada Keystone Pipeline, LP (Keystone) proposes to construct and operate a crude oil pipeline and related facilities from Hardisty, Alberta, Canada, to Patoka, Illinois, in the United States (U.S.). The project, known as the Keystone Pipeline Project or Keystone, initially will have the capacity to deliver 435,000 barrels per day (bpd) of crude oil from an oil supply hub near Hardisty to existing terminals in Salisbury, Missouri, and Wood River and Patoka, Illinois. If market conditions warrant expansion in the future, additional pumping capacity could be added to increase the average throughput to 591,000 bpd. Based on shipper interest, Keystone also is considering the construction of two pipeline extensions to take crude oil from terminals in Fort Saskatchewan, Alberta, and deliver to Cushing, Oklahoma.

In total, the Keystone Pipeline Project will consist of approximately 1,833 miles of pipeline, including about 760 miles in Canada and 1,073 miles within the U.S. (**Figure 1-1**). These distances will increase if either or both of two potential pipeline extensions to Fort Saskatchewan, Alberta, or Cushing, Oklahoma, are constructed as discussed below.

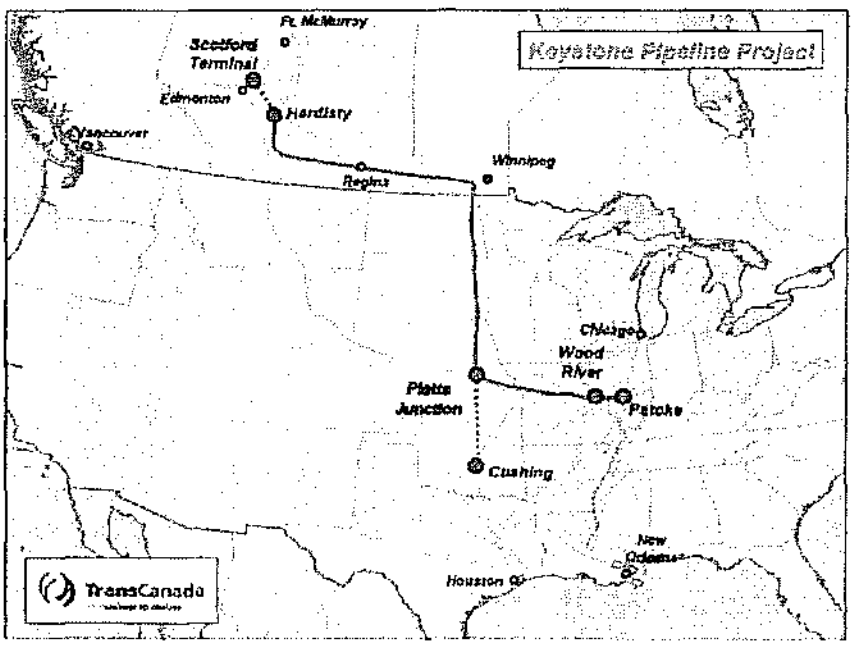

Figure 1-1 Overview Map of the Keystone Pipeline Project (Potential expansions represented by the dotted line)

In the U.S., Keystone will construct and operate a new 1,073-mile pipeline (Keystone Mainline) that will transport crude oil from the Canadian border to existing terminals in the Midwest. The proposed pipeline will consist of 1,018 miles of 30-inch pipe between the Canadian border and Wood River, Illinois and a 55-mile segment of 24-inch pipeline between Wood River and Patoka, Illinois. Depending on the results of an additional binding Open Season to be held later in 2006, Keystone also may construct a 291-mile 30-inch pipeline extension to Cushing, Oklahoma (Cushing Extension). Thus, there will be 1,365 total miles of new pipeline in the U.S. if the Cushing Extension is constructed. Unless specified, the remainder of this Supplemental Filing describes and evaluates the U.S. portion of the Keystone Pipeline Project, including both the Keystone Mainline and Cushing Extension, and the additional facilities required to increase capacity to 591,000 bpd.

The Keystone Pipeline Project will require the issuance of a Presidential Permit by the U.S. Department of State to cross the U.S./Canadian border. Issuance of the Presidential Permit is considered a federal action and is subject to environmental review pursuant to the National Environmental Policy Act (NEPA) (42 United States Code § 4321 et seq.). Keystone filed a Presidential Permit Application and Environmental Report (ER) on April 19, 2006. The ER was intended to provide the Department of State and other involved agencies with adequate information to commence review of the Keystone Pipeline Project under NEPA. The ER includes an objective disclosure of beneficial and adverse environmental impacts resulting from the Keystone Pipeline Project, as well as a set of reasonable alternatives. Keystone has stated that it will supplement the environmental information provided in the ER with the results of its field studies and pipeline risk assessment as they are completed.

2.0 Introduction

This portion of the supplemental filing represents Keystone's initial evaluation of the risk of a pipeline disruption and its potential environmental consequences. This section focuses on the potential for spills during operations and the subsequent potential effects on sensitive resources and humans associated with major spills. Additional effects on public health and safety that could occur during project construction are discussed under other resource sections (e.g., air quality, water resources, transportation, land use, and aesthetics) within the Keystone Pipeline Project's ER, which was submitted to the Department of State on April 19, 2006.

General information on pipeline safety and historical spills as documented in the U.S. Department of Transportation (USDOT) incident database were previously presented in Section 3.12 of the ER. Section 3.12 of the ER also summarized the location and extent of natural hazards and sensitive natural and human resources near the Keystone Pipeline Project.

This report builds upon the baseline information presented in the ER. The report presents the results of a pipeline oil spill frequency and spill analysis based on Keystone's current project-specific design and operations criteria and applies the resulting risk probabilities to an environmental consequence analysis that incorporates project-specific environmental data. Specifically, this report evaluates the risk of crude oil spills during pipeline operations, including contribution of natural hazards to spill risk, and the subsequent potential effects on humans and other sensitive resources, called high consequence areas (HCAs), that include populated areas, drinking water areas, and/or ecologically sensitive areas.

As Keystone collects additional information to support the risk assessment through ongoing design work and environmental field surveys, this risk assessment and its supporting reference documents will continue to evolve. The risk assessment process is an iterative procedure in which information is continually updated and refined in an effort to improve the specificity of the assessment. Keystone anticipates submitting an updated consequence analysis in November 2006 that incorporates the additional design and environmental data into the assessment.

3.0 Spill Frequency-Volume Study

A project-specific oil spill frequency and volume study for the Keystone Pipeline Project was conducted by DNV Consulting and is provided in **Appendix A**. DNV Consulting assessed the U.S. portion of the Keystone Pipeline in terms of frequency and volume of potential spills to quantify the likelihood of realistic maximum spill volumes. The study estimated the frequency and volume of releases for each defined pipeline segment for three postulated hole sizes and six distinct and independent failure causes, and developed a frequency-volume curve for the pipeline as a whole.

The study is a quantitative assessment of spill potential for the entire pipeline system and of individual segments of the pipeline. The Keystone Pipeline system was partitioned into 1,317 segments based on similar design, operational, terrain, and other potential risk parameters, each with a virtually consistent risk profile. Spill frequency was estimated for each segment along with potential spill volumes, based on small holes (<0.1-inch diameter), medium holes (1-inch diameter), and large holes (>10-inch diameter).

Two throughput scenarios were evaluated, a 435,000 bpd and a 591,000 bpd throughput case (nominal and maximum throughput). For the assessment, a leak detection capability of 1.5 percent in 138 minutes and a 15 percent leak detected within 18 minutes was assumed. Because Keystone is currently engineering the pipeline system, a detailed hydraulic profile and leak detection systems are not currently available. As the engineering and design progresses, the information will be integrated into the study and revised spill frequency and spill volumes will be estimated.

3.1 Spill Frequency

Spill frequencies were estimated from historical data and modified by project-specific factors to estimate spill frequencies for the Keystone Pipeline system. Based on the available information, the study produced an overall frequency for spills or leaks greater than 50 barrels of 0.14 spills per year for a throughput of 435,000 bpd over the entire pipeline system, equivalent to one spill every 7 years. **Table 3-1** shows the number of spills that might occur along the Keystone Pipeline system during the next 10 years.

Table 3-1 Spill Occurrence Interval Associated with the Proposed Keystone Project over 10 Years

	Spills[1]
Keystone Mainline (1,073 miles)	1.1
Cushing Extension (291 miles)	0.3
Total Keystone Project (1,365 miles)	1.4

[1]Calculated based on project-specific analysis of spill probabilities for 435,000 bpd (**Appendix A**).

While future events cannot be known with absolute certainty, spill frequencies can be used to estimate the number of events that might occur. Actual frequency may differ from the predicted values of this analysis. Notably, with the implementation of USDOT's Integrity Management Rule, the number of spills is expected to decline from historical levels observed on other pipelines. Incident frequencies have been steadily decreasing and are five times lower in recent years compared with thirty years ago (EGIG 2005).

3.2 Spill Volume

Estimated spill volumes were based on leak rate and time to isolate for throughputs of 435,000 and 591,000 bpd along the Keystone Pipeline system. The study currently assumes complete drain down within the affected segment, recognizing that actual spill volumes are expected to be significantly less. Actual incident data from the *Hazardous Liquid Pipeline Risk Assessment* (California State Fire Marshal 1993) indicate that spill volumes are significantly less than the potential drain down volume. For example, in 50 percent of the cases, the actual spill volume represented less than 0.75 percent of the maximum potential drain down volume. In 75 percent of the cases, the actual spill volume represented less than 4.6 percent of the maximum drain down volume. Procedures to reduce spill volume, such as depressurization and drain down, may significantly reduce the predicted spill volumes estimated for the Keystone Pipeline, bringing the spill volume distribution more in line with USDOT historical data. Spill volume estimates, revised to account for drain down and depressurization, will be included in Keystone's November 2006 Supplemental filing.

Of the postulated 1.4 spills along the Keystone Pipeline system during a 10-year period, the study's findings suggest that approximately 0.2 would be 50 barrels or less; 0.8 would consist of between 50 and 1,000 barrels; 0.3 would consist of between 1,000 and 10,000 barrels; and 0.2 would contain more than 10,000 barrels[1] (**Appendix A**). The spill volume frequency distribution likely underestimates the proportion of spill volumes under 50 barrels due to reliance upon the greater than 50 barrel reporting criteria within the USDOT incident database. The current analysis tends to overemphasize larger spills and underreport the small spills, making the assessment conservative.

Based on probabilities generated from the study, the estimated occurrence intervals for a spill of 50 barrels or less occurring anywhere along the entire pipeline system is once every 65 years, a spill between 50 and 1,000 barrels might occur once in 12 years; a spill of 1,000 and 10,000 barrels might occur once in 39 years; and a spill containing more than 10,000 barrels might occur once in 50 years. Applying these statistics to a 1-mile section, the chances of a large spill (greater than 10,000 barrels) would be less than once every 67,000 years. The results of the study are incorporated into the environmental consequence analysis presented in Section 4.0 below.

3.3 Contribution of Natural Hazards to Spill Potential

As part of its National Pipeline Mapping System (NPMS) program, the USDOT has compiled data from a variety of sources to identify areas of high geologic hazard potential for pipelines (USDOT-NPMS 2005). The Integrity Management Rule (2002) states that segments of pipeline with a high geologic risk and the potential to impact HCAs must implement protective measures. HCAs are specific locales and areas where a release could have the most significant adverse consequences. Examples of protective measures may include: enhanced damage prevention programs, reduced inspection intervals, corrosion control program improvements, leak detection system enhancements, installation of Emergency Flow Restricting Devices (EFRDs), and emergency preparedness improvements. **Table 3-2** provides a summary of the geologic hazards and pipeline miles identified with HCAs.

[1] Total does not sum to 1.4 spills due to rounding.

Table 3-2 Summary of Geological Hazard HCAs Identified Along the Keystone Pipeline Project

	Potential Geological Hazards (miles of pipeline)		
	Earthquake	Flood	Landslide
Keystone Mainline			
North Dakota	0.0	3.0	0.0
South Dakota	0.0	21.9	7.7
Nebraska	0.0	21.9	13.1
Kansas	0.0	10.9	0.0
Missouri	0.0	99.5	30.1
Illinois	0.0	12.8	6.9
Keystone Mainline subtotal	*0.0*	*170.1*	*57.8*
Cushing Extension			
Nebraska	0.0	2.5	2.5
Kansas	0.0	107.2	7.0
Oklahoma	0.0	27.8	0.0
Cushing Extension Subtotal	*0.0*	*137.4*	*9.5*
Project Total	**0.0**	**307.5**	**67.3**

Seismicity and Faults. Seismic damage to buried pipelines is due to the combination of seismic wave propagation and permanent ground displacement. Strong ground shaking also can cause water-saturated soils to become liquified (liquifaction). Earthquakes tend to cause more damage to segmented pipelines than to continuous pipelines that have joints consisting of full penetration welded steel. The Keystone Pipeline will be a continuous pipeline. Buckling and pinhole leaks (typically at previously weakened areas of corrosion) are the most common types of pipeline damage caused by seismic events.

Nationwide, earthquakes (and other natural hazards) are responsible for less than 3 percent of all pipeline incidents each year. Moreover, O'Rourke and Palmer (1996) studied earthquake performance data for steel transmission and distribution pipelines over a 61-year period. Their review of the data found that post-1945 electric arc-welded transmission pipelines in good repair have performed very well in earthquakes.

Keystone will construct all new facilities to current Uniform Building Code standards. Additional engineering measures to account for seismic activity are not expected to be required due to relatively low seismic activity in the region crossed by the Keystone Pipeline Project.

Federal regulations (49 CFR 195) require Keystone to conduct an internal inspection if an earthquake, landslide, or soil liquefaction is suspected of having caused abnormal movement of the pipeline. Consequently, damage to the pipeline would be detected quickly and spills would be averted or minimized. The likelihood of earthquake damage to the Keystone Pipeline is low, as the entire Keystone Pipeline Project falls outside of the USDOT-defined high earthquake hazard areas.

Landslides. Three segments of the Keystone Pipeline Project cross areas identified by the NPMS as having high landslide potential (**Table 3-2**). These areas are located at 1) the Missouri River crossing near Yankton, South Dakota; 2) the Nebraska-Kansas border at Silver Hills; and 3) the Missouri and Mississippi River crossings. These areas will be field verified and evaluated for recent landslide activity and determination of whether HCAs could be impacted. Overall, landslides are considered a low hazard to the Keystone Pipeline system.

Subsidence. Subsidence of the ground surface can result in damage due to loss of support and the transfer of stresses in the ground to structures and facilities. Subsidence can be caused by several factors, but the cause of subsidence considered here is the dissolution of subsurface strata. Limestone, dolomite, gypsum or other susceptible rock is susceptible to water solution. The dissolution may cause surface effects such as sinkholes or depressions of the ground surface, caves, sinking streams, springs and seeps, and valleys with closed drainage (Kastning and Kastning 1999). The surface effects of dissolution are referred to as karst terrain.

Several areas of potential karst hazards were identified along the proposed route based on the map produced by Davies et al. (1984). In South Dakota and Nebraska, Upper Cretaceous Niobrara Formation and equivalents are identified as strata that could be involved in the formation of karst. Areas in northeast Kansas and Missouri are underlain by limestones in Pennsylvanian and Permian-age strata. The solution features are characterized as irregularly spaced (1,000 feet or more) small fissures (less than 1,000 feet long and 50 feet deep) with 50 feet or more overburden. Overall, subsidence is a low hazard to the Keystone Pipeline System.

Flooding. Scattered portions of the Keystone Pipeline Project cross areas that are ranked as high flood hazard areas by the NPMS (**Table 3-2**). These areas are more prevalent along the southern portion of the route and are generally collocated with major river systems, such as the Missouri, Platte, Kansas, Arkansas, and Mississippi Rivers. These areas will be field verified and cross-checked with Federal Emergency Management Agency flood maps. If the area is highly susceptible to flooding, then the portion of pipeline within the affected area will be cross-referenced for presence of HCAs and, if present, protective measures will be taken, as per 49 CFR Part 195. Additionally, if aboveground facilities are located within potential floodplains, Keystone will evaluate the potential for relocating these facilities and/or measures to reduce damage to aboveground facilities should flooding occur.

4.0 Consequences of a Spill

4.1 Human Consequences

The risk associated with the Keystone Pipeline system can be compared with the general risk to the population encountered in everyday life. Proposed actions that result in negligible additional risk are generally acceptable. The National Center for Health Statistics (CDC 2003) age-adjusted average annual death rate in the U.S. is approximately 830 per 100,000. The USDOT reports the historical average risk to the general population per year associated with hazardous liquids transmission pipelines, such as Keystone, is 1 in 27,708,096 (USDOT 2002). Therefore, the predicted risk of fatality to the public from incidents associated with the Keystone Pipeline over and above the normal U.S. death rate is negligible (<1 percent).

4.2 Environmental Consequences

The environmental risk posed by a crude oil pipeline is a function of 1) the probability of an accidental release, 2) the probability of a release reaching an environmental receptor (e.g., waterbody, fish), 3) the concentration of the contamination once it reaches the receptor, and 4) the hazard posed by that concentration of crude oil to the receptor. Based on spill probabilities and estimated spill volumes, this environmental assessment determines the probability of exposure to environmental receptors and the probable impacts based on a range of potential concentrations.

4.2.1 Environmental Fate of Crude Oil Spills

4.2.1.1 Crude Oil Composition

The composition of crude oil varies widely, depending on the source and processing. Crude oils are complex mixtures of hundreds of organic (and a few inorganic) compounds. These compounds differ in their solubility, toxicity, persistence, and other properties that profoundly affect their impact on the environment. The effects of a specific crude oil cannot be thoroughly understood without taking its composition into account.

Crude oil transported by the Keystone Pipeline Project is derived from the Alberta oil sands region. The oil extracted from the sands is called bitumen, a black and thick oil. In order for the bitumen to be transported by pipeline, an upgrading technology is applied to convert the bitumen to synthetic crude oil. The precise composition of synthetic crude will vary by shipper and is considered proprietary information.

The primary classes of compounds found in crude oil are alkanes (hydrocarbon chains), cycloalkanes (hydrocarbons containing saturated carbon rings), and aromatics (hydrocarbons with unsaturated carbon rings). Most crude oils are more than 95 percent carbon and hydrogen, with small amounts of sulfur, nitrogen, oxygen, and traces of other elements. Crude oils contain lightweight straight-chained alkanes (e.g., hexane, heptane), cycloalkanes (e.g., cyclyohexane), aromatics (e.g., benzene, toluene), cycloalkanes, and heavy aromatic hydrocarbons (e.g., polycyclic aromatic hydrocarbons [PAHs], asphaltines). Straight-chained alkanes are more easily degraded in the environment than branched alkanes. Cycloalkanes are extremely resistant to biodegradation. Aromatics (i.e., benzene, toluene, ethylbenzene, xylenes [BTEX compounds]) pose the most potential for environmental concern. Because of their lower molecular weight they are more soluble in water than alkanes and cycloalkanes.

4.2.1.2 Environmental Fate and Transport

Accidental releases of crude oil can occur during transport by pipeline. Once released into the environment, the crude oil will pool in low-lying areas. Some lighter volatile constituents of the crude oil will evaporate into air, while other constituents will bind or leach into soils, or dissolve into water. Hydrocarbons that volatilize into

the atmosphere are broken down by sunlight into smaller compounds. This process, referred to as photodegradation, occurs rapidly in air and the rate of photodegradation increases as molecular weight increases. If released onto soil, a portion of the crude oil will penetrate the soil as a result of the effects of gravity and capillary action. The rate of penetration will depend on the nature of the soil. Since crude oil is more viscous than water, crude oils penetrate soils less quickly. When released into water, a portion of the crude oil will tend to float to the surface where it can evaporate, other fractions will dissolve, and some material may descend to the bottom as sedimentation.

Spreading of crude oil increases with wind and current speed and increasing temperature. Most crude oils spread across surface waters at a rate of 100 to 300 meters per hour. Surface ice will greatly reduce the spreading rate of oil across a waterbody. Spreading reduces the bulk quantity of crude oil present in the vicinity of the spill but increases the spatial area within which adverse effects may occur. Thus crude oil in flowing, as opposed to contained, waterbodies will be less concentrated in any given location, but may cause impacts, albeit reduced in intensity, over a much larger area. Spreading and thinning of spilled crude oil also increases the surface area of the slick, thus enhancing surface dependent fate processes such as evaporation, degradation, and dissolution.

Dispersion of crude oil increases with increasing surface turbulence. The dispersion of crude oil into water may serve to increase the surface area of crude oil susceptible to dissolution and degradation processes and thereby limit the potential for physical impacts.

Evaporation will be the primary mechanism of loss for low molecular weight constituents and light oil products. As lighter components evaporate, remaining crude oil becomes denser and more viscous. Evaporation thus tends to reduce crude oil toxicity but enhances crude oil persistence. Bulk evaporation of Alberta crude oil accounted for an almost 50 percent reduction in volume over a 12-day period (Shiu et al. 1988). Evaporation increases with increased spreading of a slick, increased temperature, and increased wind and wave action.

Dissolution of crude oil in water is not a significant process controlling the crude oil's fate in the environment, since most components of oils are relatively insoluble (Neff and Anderson 1981). Moreover, overall solubility of crude oils tend to be less than their constituents since solubility is limited to the partitioning between oil and water interface and individual compounds are often more soluble in oil than in water, thus they tend to remain in the oil. Nevertheless, dissolution is one of the primary processes affecting the toxic effects of a spill, especially in confined waterbodies. Dissolution increases with decreasing molecular weight, increasing temperature, decreasing salinity, and increasing concentrations of dissolved organic matter. Greater photodegradation also tends to enhance the solubility of crude oil in water.

Heavy molecular weight hydrocarbons will bind to suspended particulates, and this process can be significant in highly turbid or eutrophic waters. Organic particles (e.g., biogenic material) tend to be more effective at sorbing 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. Sedimented oil tends to be highly persistent and can cause shoreline impacts.

Photodegradation of crude oil increases with greater solar intensity. It can be a significant factor controlling the disappearance of a slick, especially of lighter oil constituents; but it will be less important during cloudy days and winter months. Photodegraded crude oil constituents tend to be more soluble and more toxic than parent compounds. Extensive photodegradation, like dissolution, may thus increase the biological impacts of a spill event.

In the immediate aftermath of a crude oil spill, natural biodegradation of crude oil will not tend to be a significant process controlling the fate of spilled crude oil in waterbodies previously unexposed to oil. Microbial populations must become established before biodegradation can proceed at any appreciable rate. Also, prior to weathering (i.e., evaporation and dissolution of light-end constituents), oils may be toxic to the very

organisms responsible for biodegradation and high molecular weight constituents tend to be resistant to biodegradation. Biodegradation is nutrient and oxygen demanding and may be precluded in nutrient-poor aquatic systems. It also may deplete oxygen reserves in closed waterbodies, causing adverse secondary effects to aquatic organisms.

With time, however, microorganisms capable of consuming crude oil generally increase in number and the biodegradation process naturally remediates the previously contaminated soil. The biodegradation process is enhanced as the surface area of spilled oil increases (e.g., by dispersion or spreading). Biodegradation has been shown to be an effective method of remediating soils and sediments contaminated by crude oil.

Overall, the environmental fate of released crude oil is controlled by many confounding factors and persistence is difficult to predict with great accuracy. Major factors affecting the environmental fate include spill volume, type of crude oil, dispersal rate of the crude oil, terrain, receiving media, and weather. Once released, the physical environment largely dictates the environmental persistence of the spilled material. Along the Keystone Pipeline route, the primary habitats of concern include low gradient streams, rivers, and small intermittent ponds. Wetlands also are frequently located along the proposed pipeline route. Estimates of the length of time materials could persist at potentially acute concentrations vary depending on the size of spill and environmental conditions. In warm summer months, the acutely toxic volatile component of crude oil will evaporate quickly, and a relatively small release into a high gradient stream would be expected to rapidly dissipate. In contrast, crude oil released into a small stream in winter could become trapped under pockets of ice and, thus persist longer.

4.2.2 Environmental Impacts

An evaluation of the potential impacts resulting from the accidental release of crude oil into the environment is discussed by environmental resource below.

4.2.2.1 Soils

Soils could be impacted because pipelines are buried and soil absorption of spilled crude oil would occur. In contrast with crude oil releases to surface waters where the oil would disperse downstream, subsurface releases to soil tend to disperse more slowly and are generally located within a contiguous and discrete area. Effects to soils can be quite slow to develop, allowing time for emergency response and cleanup actions to mitigate effects to potential receptors.

Depending on a number of factors (including size and rate of release, topography of the release site, vegetative cover, soil moisture, bulk density and soil porosity), a portion of the released materials would enter the surrounding soil and disperse both vertically and horizontally in the soil. High rates of release from the buried pipeline would result in a greater likelihood that released materials would reach the ground surface, while low rates of release would be more likely to primarily remain within the less compacted pipe trench backfill with a smaller portion dispersing within surrounding, consolidated subsurface materials. The sandy soils found throughout most of the pipeline route would likely facilitate horizontal and vertical dispersion. If present, soil moisture and moisture from precipitation would increase the dispersion and migration of crude oil.

Crude oil released to the soil's surface could potentially produce localized effects on plant populations (see Vegetation, Section 3.2.3 below). Within areas of active agriculture, the release of crude oil could result in the contamination of soils. Keystone would be responsible for cleanup of contaminated soils. Once remedial cleanup levels were achieved in the soils, no adverse or long-term impacts to agricultural lands would be expected.

Both on the surface and in the subsurface, rapid attenuation of light, volatile constituents (due to volatilization) would quickly reduce the total volume of product, while heavier constituents would be more persistent. Except in cases of high rate and high total volume releases, and environmental settings characterized by steep

topography or karst terrain, soil impacts would be confined to a relatively small, contiguous, and easily defined area. This would facilitate cleanup and remediation. Within a relatively short time, lateral migration would generally stabilize and downward vertical migration could begin to occur.

If a spill were to occur, the majority of the crude oil would likely reside in the less consolidated soil (lower soil bulk density) within the pipeline trench. The vast majority of the pipeline is located in relatively flat terrain. In these flat locations, the oil would disperse horizontally within the pipeline trench with a smaller portion of the spilled oil moving into the surrounding, more consolidated soil. If the spill were to occur on a steep slope, crude oil would likely pool primarily within the trench behind the trench breakers. If sufficient volume existed, the crude oil would breach the soil's surface as it extended over the top of the trench breaker. Once on the soil's surface, the release would be more apparent to leak surveillance patrols. Soil types and the presence of clay lenses, layers of bedrock, or karst terrain would significantly influence the dispersal pattern of spilled materials.

Crude oil released to the environment would tend to have greater dispersion in sandy and badland soils than in more consolidated soils. If a release were to occur in sandy soils or badland areas, it is likely that the spatial extent of the contamination would be greater than in areas containing more organic soils. Consequently, the amount of soil that would need to be cleaned up would be less than or equal to the maximum amount. Crude oil released into sandy or badland soils would likely become visible to aerial surveillance due to product on the soils surface or discoloration of vegetation.

The removal and disposal of contaminated soil likely represents the remedial action that would cause the greatest amount of surface disturbance. Based on a spill volume of 2,000 barrels (over 80 percent of spills are smaller than this volume), the maximum amount of soil that would need to be removed was calculated. Soil cleanup levels for benzene in soil from petroleum releases vary by state (Nebraska: 3.63 parts per million [ppm]; Illinois: 1.6 ppm; South Dakota: 17 ppm; Kansas 9.8 ppm). The volume of soil remediation is based upon two different calculations to aid in identifying worst-case (2,001,277 cubic yards) and best-case (2,059 cubic yards) volume estimates. The worst-case estimate assumes a 2,000-barrel release, an estimated concentration of benzene in the oil, and a uniform distribution of oil to achieve the most stringent state recommended soil cleanup level (RCL) for benzene (1.6 ppm). The approach assumes that all the oil is evenly spread to a mass of oil such that the resulting oil benzene concentration is 1.6 milligrams per kilograms. Because the RCL is used as a target, the resulting volume of soil is actually the volume of soil at which no removal action would be needed. The best case estimate assumes the same 2000 barrel release but calculates the volume of soil that could fill with the volume of the release based on an estimated 30 percent soil porosity and a 10 percent soil moisture content and would likely be the minimum volume of soil to be removed. The actual remediation soil volume would likely be closer to the best-case estimate although higher than this estimate.

These estimates are gross estimations. Release dynamics such as leak rate, leak duration, and effects of isolation controls would result in different surface spreading and infiltration rates, which in turn, affect the final volume of affected soil to be remediated.

4.2.2.2 Water Resources

While normal operations would not adversely affect water resources, abnormal operations could result in released crude oil entering water resources. As part of project planning and in recognition of the environmental sensitivity of waterbodies, the Keystone Pipeline routing process attempted to minimize the waterbodies crossed. Furthermore, valves have been strategically located along the Keystone Pipeline to help reduce the amount of crude oil that could potentially spill into waterbodies, if such an event were to occur. The location of valves, spill containment measures, and the Keystone Emergency Response Plan would mitigate adverse effects to both surface and groundwater.

Flowing Surface Waters

To evaluate the likelihood of adverse effects to surface water resources, measurement endpoints were developed to correspond with the most sensitive resource potentially affected (surface water that provides drinking water and supports aquatic life) and to address the primary regulatory thresholds that trigger emergency response and remediation. These measurement endpoints (toxicity thresholds and drinking water standards) were compared to the maximum possible concentration of benzene. Benzene values were selected for comparison because they were the most likely to show adverse impacts to aquatic biota and drinking water.

These measurement endpoints were compared to estimated concentrations of crude oil in the surface water. Rather than evaluate the risk to each waterbody crossed by the Keystone Pipeline, this risk assessment evaluated streams categories, broadly classified by magnitude of streamflow and stream width. **Table 4-1** summarizes the stream categories used for the assessment and identifies several representative streams within these categories.

Table 4-1 Stream Categories

	Streamflow (cubic feet per second; cfs)	Stream Width (feet)	Representative Streams
Low Flow Stream	10 – 100	<50	Shell Creek, Mill Creek
Lower Moderate Flow Stream	100 – 1,000	50 – 500	Pembina Creek, James River, Sheyenne River, Cuivre River
Upper Moderate Flow Stream	1,000 – 10,000	500 – 1,000	Platte River, Charlton River, Missouri River
High Flow Stream	>10,000	1,000 – 2,500	Mississippi River

Although the concentration of crude oil constituents in an actual spill would vary both temporally and spatially and localized toxicity could occur from virtually any size of crude oil spill, for this analysis it was conservatively assumed that the entire volume of the spill was released directly into a waterbody and that complete, instantaneous mixing occurred. These assumptions are highly conservative and, thus, overestimate potential toxic effects. These estimated benzene concentrations within the surface waterbodies were then compared with acute and chronic toxicity thresholds for human health drinking water thresholds and for aquatic biota.

The promulgated drinking water standards for humans vary by several orders of magnitude for crude oil constituents. For human health protection, the national Maximum Contaminant Level (MCL) is an enforceable standard established by the U.S. Environmental Protection Agency (USEPA) and is designed to protect long-term human health. Of the various crude oil constituents, benzene has the lowest national MCL at 0.005 ppm[2] and, therefore, it was used to evaluate impacts on drinking water supplies, whether from surface or groundwaters.

An evaluation of water quality was conducted to assess potential risk to drinking water supplies. The estimated concentrations of benzene within representative streamflows are summarized in **Tables 4-2** and **4-3**. A 1-hour release period for the entire spill volume was assumed in order to maximize the product concentration in water. Results suggest that most spills that enter a waterbody could result in exceedence of the national MCL for benzene. These findings indicate that rapid notification of managers of municipal water intakes downstream

[2] All affected states along the Keystone Pipeline route use the national MCL value of 0.005 ppm.

of a spill would be essential so that any drinking water intakes could be closed to bypass river water containing crude oil.

To evaluate the potential for drinking water impacts to occur in any specific waterbody, the occurrence interval for a spill at the river crossing was calculated based on probabilities generated from the USDOT database. To be conservative, a 500-foot buffer on either side of the river was added to the crossing widths identified in **Table 4-1**.

Results indicate that the chance of a spill occurring at any specific waterbody is very low. Depending on throughput, occurrence intervals ranged from about 16,000 years for a large waterbody to over 450,000 years for a small waterbody. If any release did occur, it is likely that the total release volume of a spill likely would be 50 barrels or less based on historical spill volumes, or less than 1,000 barrels based on the spill volume study (**Appendix A**).

In summary, while a release of crude oil into any given waterbody would likely cause an exceedance of drinking water standards, the frequency of such an event would be low. Nevertheless, streams and rivers with downstream drinking water intakes represent the sensitive environmental resources and could be temporarily impacted by a crude oil release.

Wetlands/Prairie Potholes/Playa Lakes

Although planning and routing efforts attempted to reduce the overall number of wetlands (including prairie potholes and playa lake environments) and static waterbodies environment crossed by the Keystone Pipeline, wetlands and waterbodies with persistently saturated soils commonly occur along and adjacent to the Keystone Pipeline route. The effects of crude oil released into a wetland environment will depend not only upon the quantity of oil released, but also on the physical conditions of the wetland at the time of the release. Wetlands include a wide range of environmental conditions. Wetlands can consist of many acres of standing water dissected with ponds and channels, or they may simply be areas of saturated soil with no open water. A single wetland can even vary between these two extremes as seasonal precipitation varies. Wetland surfaces are generally low gradient with very slow unidirectional flow or no discernable flow. The presence of vegetation or narrow spits of dry land protruding into wetlands also may isolate parts of the wetland. Given these conditions, spilled materials may remain in restricted areas for longer periods than in river environments.

Crude oil released from a subsurface pipe within a wetland could reach the soil surface. If the water table reaches the surface, the release would manifest as floating crude oil. The general lack of surface flow within a wetland would restrict crude oil movement. Where surface water is present within a wetland, the spill would spread laterally across the water's surface and be readily visible during routine right-of-way (ROW) surveillance. The depth of soil impacts likely would be minimal, due to shallow (or emergent) groundwater conditions. Conversely, groundwater impacts within the wetland are likely to be confined to the near-surface, enhancing the potential for biodegradation. If humans or other important resource exposures were to occur in proximity to the wetland, then regulatory drivers would mandate the scope of remedial actions, timeframe for remediation activities, and cleanup levels. However, response and remediation efforts in a wetland have the potential for appreciable adverse effects from construction/cleanup equipment. If no active remediation activities were undertaken, natural biodegradation and attenuation would ultimately allow a return to baseline conditions in both soil and groundwater. This would likely require a timeframe on the order of tens of years.

The evaluation of spill effects on fish and aquatic invertebrates also is applicable to wetland environments and plants. Based on a review of toxicity literature for wetland plant groups (i.e., algae, annual macrophytes, and perennial macrophytes), crude oil is toxic to aquatic plants but at higher concentrations than observed for fish and invertebrates. Therefore, assumptions and calculations based on aquatic life standards are conservative (i.e., more likely to show an adverse effect than if the limited amount of wetland toxicity data were used). Therefore, spill concentrations that are less than toxic effect levels for fish and invertebrates also would be protective for wetland plant species.

Table 4-2 Estimated Benzene Concentrations from Crude Oil Release Compared with Human Drinking Water for Streams Crossed by the Proposed Action

Throughput – 435,000 bpd	Benzene MCL (ppm)	Stream Flow Rate (cfs)	Product Released					
			Small spill: 50 barrels		Moderate spill: 1,000 barrels		Large spill: 10,000 barrels	
			Concentration (ppm)	Occurrence Interval (years)	Concentration (ppm)	Occurrence Interval (years)	Concentration (ppm)	Occurrence Interval (years)
Low Flow Stream	0.005	10	11	457,042	220	63,562	2,201	342,782
Lower Moderate Flow Stream	0.005	100	1.1	319,930	22	44,494	220	239,947
Upper Moderate Flow Stream	0.005	1,000	0.11	239,947	2.2	33,370	22	179,690
High Flow Stream	0.005	10,000	0.01	137,113	0.2	19,069	2.2	102,835

Notes:

-Predicted rates apply for each stream crossing.

-Estimated concentration is based on release of benzene into water over a 24-hour period with uniform mixing conditions.

-Concentrations are based on a 0.15 percent by weight benzene content of the crude oil.

-Benzene concentrations compared to benzene's MCL of 0.005 ppm.

-Shading indicates concentrations that could exceed the MCL.

-Occurrence intervals are based on a predicted incident frequency of 0.14 spills/year for 435,000 bpd along the entire Keystone Pipeline (Appendix A) and estimated stream widths. Widths of higher flow streams are greater than widths of lower flow streams, with more distance where an incident might occur. This results in a greater predicted frequency for high flow streams and a corresponding lower occurrence interval.

Table 4-3 Estimated Benzene Concentrations from Crude Oil Release Compared with Human Drinking Water Standard for Streams Crossed by the Proposed Action

Throughput – 591,000 bpd	Benzene MCL (ppm)	Stream Flow Rate (cfs)	Product Released					
			Small spill: 50 barrels		Moderate spill: 1,000 barrels		Large spill: 10,000 barrels	
			Concentration (ppm)	Occurrence Interval (years)	Concentration (ppm)	Occurrence Interval (years)	Concentration (ppm)	Occurrence Interval (years)
Low Flow Stream	0.005	10	11	281,692	220	52,783	2,201	217,030
Lower Moderate Flow Stream	0.005	100	1.1	197,149	22	36,948	220	151,921
Upper Moderate Flow Stream	0.005	1,000	0.11	147,862	2.2	27,711	22	113,941
High Flow Stream	0.005	10,000	0.01	84,493	0.2	15,835	2.2	65,109

Notes:

-Predicted rates apply for each stream crossing.

-Estimated concentration is based on release of benzene into water over a 24-hour period with uniform mixing conditions.

-Concentrations are based on a 0.15 percent by weight benzene content of the crude oil.

-Benzene concentrations compared to benzene's MCL of 0.005 ppm.

-Shading indicates concentrations that could exceed the MCL.

-Occurrence intervals are based on a predicted incident frequency of 0.19 spills/year for 591,000 bpd along the entire Keystone Pipeline (**Appendix A**) and estimated stream widths. Widths of higher flow streams are greater than widths of lower flow streams, with more distance where an incident might occur. This results in a greater predicted frequency for high flow streams and a corresponding lower occurrence interval.

Results indicate that the chance of a spill occurring at any specific wetland is very low. Based on National Wetlands Inventory mapping, wetlands comprise 46.4 miles of the entire Keystone Pipeline system (Table 3.5-8 of the Keystone Environmental Report). Of the estimated 1.4 spills postulated to occur during a 10-year period within the entire pipeline system, about 0.05 spills would be expected to occur within wetland areas (equivalent to one spill every 200 years). If any release did occur, it is likely that the total release volume of a spill likely would be 50 barrels or less based on historical spill volumes, or less than 1,000 barrels based on the spill volume study (**Appendix A**).

The predicted effects of a spill reaching standing water (e.g., reservoirs, prairie potholes) would depend largely upon the volume of crude oil entering the waterbody and the volume of water within the waterbody. **Table 4-4** summarizes the amount of water necessary to dilute spill volumes below aquatic toxicity and drinking water thresholds. While this preliminary approach does not account for fate and transport mechanisms, mixing zones, environmental factors, and emergency response capabilities, it does provide an initial benchmark for identifying areas of potential concern. An evaluation of standing water resources that could be impacted by a crude oil spill will be evaluated more completely in Keystone's November 2006 supplemental filing.

Table 4-4 Amount of Water Required to Dilute Crude Oil Spills Below Threshold Values

Barrels of Crude Oil	Volume of Water Required to Dilute Crude Oil Below Threshold (acre-feet)[1]		
	Acute Toxicity Threshold (7.4 milligrams per liter [mg/L])	Chronic Toxicity Threshold (1.4 mg/L)	Drinking Water MCL (0.005 mg/L)
50	4.6	25	6,890
150	14	74	20,669
1,000	93	492	137,790
10,000	931	4,921	1,377,904

[1]Thresholds based on aquatic toxicity and drinking water thresholds established for benzene. For the Keystone crude oil, the benzene content is estimated to be 0.15 percent by weight.

In summary, while a release of crude oil into wetland and static waterbodies has the potential to cause temporary environmental impacts, the frequency of such an event would be low. Nevertheless, wetlands and static waterbodies represent the sensitive environmental resources and further evaluation of potential impacts is warranted.

Groundwater

Multiple groundwater aquifers underlie the proposed Keystone Pipeline system. Vulnerability of these aquifers is a function of the depth to groundwater and the permeability of the overlying soils. While routine operation of the Keystone Pipeline would not affect groundwater, there is the possibility that a release could migrate through the overlying surface materials and enter a groundwater system.

In general, the potential for groundwater contamination following a spill would be more probable in locations where a release into or on the surface of soils has occurred:

- Where a relatively shallow water table is present (as opposed to locations where a deeper, confined aquifer system is present); and
- Where relatively porous soil conditions are present throughout the unsaturated zone.

Depending on soil properties, the depth to groundwater, and the amount of crude oil in the unsaturated zone, groundwater contamination can result from the migration of dissolved constituents and free crude oil. Movement in the dissolved phase typically extends for greater distances than movement of pure crude oil in the subsurface. Crude oil is less dense than water and initially would tend to form a floating pool after reaching the groundwater surface. This pool would tend to migrate laterally in the direction of groundwater flow, and the oil flow velocity would be a function of the soil properties and groundwater flow rate. Those compounds in the crude oil that are soluble in water will form a larger, dissolved "plume." This plume also would tend to migrate laterally in the direction of groundwater flow. The flow velocity of dissolved constituents also would be a function of the groundwater flow rate and would tend to migrate at a faster rate than free crude oil itself.

The extent to which potential groundwater receptors may be contaminated by a release of crude oil depends upon the rate of contaminant transport in the subsurface. The rate of contaminant movement depends, in turn, on the rate of groundwater movement and the attenuation mechanisms that act to retard contaminant movement relative to groundwater movement. In shallow aquifer systems where impacts from released crude oil are most likely, the rate of groundwater movement depends upon the hydraulic gradient, aquifer permeability and porosity, and the geometry of the aquifer system. Groundwater flow rates typically move less than 1 foot per year, though there can be much more rapid movement in individual locations (Wilson 1986). Individual constituents tend to move faster than the groundwater itself; however, contamination often takes years to disperse one mile from the point of origin (Wilson 1986).

If exposure to humans or other important resources would be possible from a release into groundwater, then regulatory drivers would mandate the scope of remedial actions, timeframe for remediation activities, and cleanup levels. However, response and remediation efforts have the potential for appreciable adverse effects from construction/cleanup equipment. If no active remediation activities were undertaken, natural biodegradation and attenuation would ultimately allow a return to baseline conditions in both soil and groundwater. Depending on the amount of crude oil reaching the groundwater and natural attenuation rates, this would likely require a timeframe up to the range of tens of years.

Attenuation mechanisms that retard the movement of contaminants include dispersion, sorption, volatilization, abiotic chemical degradation, and biological degradation. The extent to which any of these mechanisms would retard contaminant movement at a given location depends upon site-specific conditions. In general, crude oil in groundwater tends to biodegrade as described for soil releases. Even in the case of large released volumes and floating free crude oil, dispersive forces become balanced with biodegradation and attenuation mechanisms, establishing degradation equilibrium. The typical result is a relatively limited zone of impact, typically 200 meters or less downgradient (USGS 1998). Over time, these natural degradation mechanisms, along with other natural attenuation mechanisms, including dispersion, result in the removal and/or destruction of crude oil materials; both in groundwater, and in overlying impacted soils. Observed degradation rates indicate this process would typically occur in timeframes measured in tens of years, depending on the concentration of crude oil in the groundwater.

4.2.2.3 Vegetation

Terrestrial plants are much less sensitive to crude oil than aquatic species. The lowest toxicity threshold for terrestrial plants found in the USEPA ECOTOX database (USEPA 2001) was 18.2 ppm for benzene, higher than the 7.4 ppm threshold for aquatic species and the 0.005 ppm threshold for human drinking water. Similarly, available data from the USEPA database indicate that earthworms also are less sensitive than aquatic species (toxicity threshold was greater than 1,000 ppm). If concentrations were sufficiently high, crude oil in the root zone could harm individual plants and organisms.

Release of crude oil could result in the contamination of soils (see Soils, Section 3.2.1 above). Keystone would be responsible for cleanup of contaminated soils. Once remedial cleanup levels were achieved in the soils, no adverse or long-term impacts to vegetation would be expected.

4.2.2.4 Wildlife and Aquatic Resources

Spilled crude oil can affect organisms directly and indirectly. Direct effects include physical processes, such as oiling of feathers and fur, and toxicological effects, which can cause sickness or death. Indirect effects are less conspicuous and include habitat impacts, nutrient cycling disruptions, and alterations in ecosystem relationships. The magnitude of effects varies with multiple factors, the most significant of which include the amount of material released, the size of the spill dispersal area, the type of crude oil spilled, the species assemblage present, climate, and the spill response tactics employed.

The toxicity of crude oil is dependent upon its composition and that of its water-soluble fraction (WSF), especially of its aromatic content. The WSF of crude oil is dominated by one- and two-ringed aromatics (e.g., benzene and naphthalene) along with some short-chained alkanes. Long-chained alkanes (e.g., decane) and aromatic compounds with many rings (e.g., PAHs) tend to be less soluble in water. As an example, **Table 4-5** summarizes the toxicity of various crude oil hydrocarbons to the zooplankton, *Daphnia magna*. The relative toxicity of decane is much lower than for benzene or ethylbenzene because of the comparatively low solubility of decane. Most investigators have concluded that the acute toxicity of crude oil is related to the concentrations of relatively lightweight aromatic constituents (BETX and naphthalenes), particularly benzene.

Because of competing effects of solubility and toxicity, the higher the concentration of these aromatics in a particular crude oil, the more toxic it will be. Studies have shown that lighter, more volatile compounds (e.g., benzene) are more acutely toxic than heavier, more viscous compounds. While lightweight aromatics tend to be water soluble and relatively toxic, they also are highly volatile. Thus, most or all of the lightweight hydrocarbons accidentally released into the environment evaporate, and the environmental persistence of crude oil tends to be low.

High molecular weight aromatic compounds, including PAHs, are not very water-soluble and have a high affinity for organic material. Consequently, these compounds, if present, have limited bioavailability, which render them substantially less toxic than more water-soluble compounds (Neff 1979). Additionally, these compounds generally do not accumulate to any great extent because these compounds are rapidly metabolized (Lawrence and Weber 1984; West et al.1984). There are some indications, however, that prolonged exposure to elevated concentrations of these compounds may result in a higher incidence of growth abnormalities and hyperplastic diseases (Couch and Harshbarger 1985).

The sensitivity of organisms to crude oil is extremely varied. **Table 4-6** summarizes acute toxicity data for a broad range of species based on USEPA's AQUIRE database (USEPA 2000). Acute toxicity refers to the death or complete immobility of an organism within a short period of exposure. The LC_{50} is the concentration of a compound necessary to cause 50 percent mortality in laboratory test organisms. For aquatic biota, most acute LC_{50}s for monoaromatics range between 10 and 100 ppm. LC_{50}s for the polyaromatic naphthalene were generally between 1 and 10 ppm, while LC_{50} values for anthracene were generally less than 1 ppm. Fish are among the most sensitive aquatic biota, while aquatic invertebrates generally have intermediate sensitivities, and algae and bacteria tend to be the least sensitive. Nevertheless, even when major fish kills have occurred as a result of oil spills, population recovery has been observed, and long-term changes in fish abundance have not been reported. Benthic (bottom-dwelling) aquatic invertebrates tend to be more sensitive than algae, but are equally or less sensitive than fish. Planktonic (floating) species tend to be more sensitive than most benthic insects, crustaceans, and molluscs.

Fewer data are available to evaluate the toxicity of crude oil hydrocarbons on terrestrial organisms. **Table 4-7** summarizes toxicity data from the EPA's ECOTOX database (2001) for earthworms and terrestrial plants. Comparison of LC_{50} values for benzene suggests that aquatic species are more sensitive to crude oil than terrestrial organisms. Insufficient information was available to evaluate other constituents of concern.

Significantly, some constituents in crude oil may have greater environmental persistence than lightweight compounds (e.g., benzene), but their limited bioavailability renders them substantially less toxic than other

more soluble compounds. For example, aromatics with four or more rings are not acutely toxic at their limits of solubility (Muller 1987).

Table 4-5 Acute Toxicity of Crude Oil Hydrocarbons to *Daphnia magna*

Compound	48-hr LC_{50} (ppm)	Optimum Solubility (ppm)	Relative Toxicity
Hexane	3.9	9.5	2.4
Octane	0.37	0.66	1.8
Decane	0.026	0.052	1.9
Cyclohexane	3.8	55	14.5
methyl cyclohexane	1.5	14	9.3
Benzene	9.2	1,800	195.6
Toluene	11.5	515	44.8
Ethylbenzene	2.1	152	72.4
p-xylene	8.5	185	21.8
m-xylene	9.6	162	16.9
o-xylene	3.2	175	54.7
1,2,4-trimethylbenzene	3.6	57	15.8
1,3,5-trimethylbenzene	6	97	16.2
Cumene	0.6	50	83.3
1,2,4,5-tetramethylbenzene	0.47	3.5	7.4
1-methylnaphthalene	1.4	28	20.0
2-methylnaphthalene	1.8	32	17.8
Biphenyl	3.1	21	6.8
Phenanthrene	1.2	6.6	5.5
Anthracene	3	5.9	2.0
9-methylanthracene	0.44	0.88	2.0
Pyrene	1.8	2.8	1.6

Note: The LC_{50} is the concentration of a compound necessary to cause 50 percent mortality in laboratory test organisms within a predetermined time period (e.g., 48 hours) (USEPA 2000).

Relative toxicity = optimum solubility/LC_{50}.

Table 4-6 Acute Toxicity of Aromatic Hydrocarbons to Freshwater Organisms

Species	Toxicity Values (ppm)				
	Benzene	Toluene	Xylene	Naphthalene	Anthracene
Carp (*Cyprinus carpio*)	40.4	—	780	—	—
Channel catfish (*Ictalurus*)	—[1]	240	—	—	—
Clarias catfish (*Clarias* sp.)	425	26	—	—	—
Coho salmon (*Oncorhyncus kisutch*)	100	—	—	2.6	—
Fathead minnow (*Pimephales*)	—	36	25	4.9	25
Goldfish (*Carassius auratus*)	34.4	23	24	—	—
Guppy (*Poecilia reticulate*)	56.8	41	—	—	—
Largemouth bass (*Micropterus*)	—	—	—	0.59	—
Medaka (*Oryzias* sp.)	82.3	54	—	—	—
Mosquitofish (*Gambusia affinis*)	—	1,200	—	150	—
Rainbow trout (*Oncorhyncus mykis*)	7.4	8.9	8.2	3.4	—
Zebrafish (*Therapon larbua*)	—	25	20	—	—
Rotifer (*Brachionus calyciflorus*)	>1,000	110	250	—	—
Midge (*Chironomus attenuatus*)	—	—	—	15	—
Midge (*Chironomus tentans*)	—	—	—	2.8	—
Zooplankton (*Daphnia magna*)	30	41	—	6.3	0.43
Zooplankton (*Daphnia pulex*)	111	—	—	9.2	—
Zooplanton (*Diaptomus forbesi*)	—	450	100	68	—
Amphipod (*Gammarus lacustris*)	—	—	0.35	—	—
Amphipod (*Gammarus minus*)	—	—	—	3.9	—
Snail (*Physa gyrina*)	—	—	—	5.0	—
Insect (*Somatochloa cingulata*)	—	—	—	1.0	—
Chlorella vulgaris	—	230	—	25	—
Microcystis aeruginosa	—	—	—	0.85	—
Nitzschia palea	—	—	—	2.8	—
Scenedesmus subspicatus	—	130	—	—	—
Selenastrum capricornutum	70	25	72	7.5	—

[1] — indicates no value was available in the database.

Note: Data summarize conventional acute toxicity endpoints from USEPA's ECOTOX database. When several results were available for a given species, the geometric mean of the reported LC_{50} values was calculated.

Table 4-7 Comparison of Benzene Toxicity Concentrations for Various Organisms

	Benzene
Aquatic species	7.4 ppm
Terrestrial plant	18.2 ppm
Earthworm	>1,000 ppm

Table 4-8 summarizes chronic toxicity (most frequently measured as reduced reproduction, growth, or weight) of benzene to freshwater biota. Benzene was selected as the most conservative measure of chronic toxicity due to its combined water solubility and chronic toxicity value. Chronic toxicity from other oil constituents may occur, however, if sufficient quantities of crude oil are continually released into the water to maintain elevated concentrations.

Table 4-8 Chronic Toxicity of Benzene to Freshwater Biota

Taxa	Test species	Chronic Value (ppm)
Fish	Fathead minnow (*Pimephales promelas*)	17.2 *
	Guppy (*Poecilia reticulata*)	63
	Coho salmon (*Oncorhynchus kitsutch*)	1.4
Amphibian	Leopard frog (*Rana pipens*)	3.7
Invertebrate	Zooplankton (*Daphnia* spp.)	>98
Algae	Green algae (*Selenastrum capricornutum*)	41 4.8 *

Note: Test endpoint was mortality unless denoted with an asterisk (*). The test endpoint for these studies was growth.

Wildlife Impacts

Wildlife, especially birds and shoreline mammals, are typically among the most visibly affected organisms in any crude oil spill. Effects of crude oil can be differentiated into physical (mechanical) and toxicological (chemical) effects. Physical effects result from the actual coating of animals with crude oil, causing reductions in thermal insulative capacity and buoyancy of plumage (feathers) and pelage (fur).

Crude oil released to the environment may cause adverse biological effects on birds and mammals via inhalation or ingestion exposure. Ingestion of crude oil may occur when animals consume oil-contaminated food, drink oil-contaminated water, or orally consume crude oil during preening and grooming behaviors.

Potential adverse effects could result from direct acute exposure. Acute toxic effects include drying of the skin, irritation of mucous membranes, diarrhea, narcotic effects, and possible death. While releases of crude oil may have an immediate and direct effect on wildlife populations, the potential for physical and toxicological effects attenuates with time as the volume of material diminishes, leaving behind more persistent, less volatile, and less water-soluble compounds. Although many of these remaining compounds are toxic and potentially

carcinogenic, they do not readily disperse in the environment and their bioavailability is low, and therefore, the potential for impacts is low.

Unlike aquatic organisms that frequently cannot avoid spills in their habitats, the behavioral responses of terrestrial wildlife may help reduce potential adverse effects. Many birds and mammals are mobile and generally will avoid oil-impacted areas and contaminated food (Sharp 1990; Stubblefield et al. 1995). In a few cases, such as cave-dwelling species, organisms that are obligate users of contaminated habitat may be exposed. However, most terrestrial species have alternative, unimpacted habitat available, as will often be the case with localized spills (in contrast to large-scale oil spills in marine systems), therefore, mortality of these species would be limited (Stubblefield et al. 1995).

Indirect environmental effects of spills can include reduction of suitable habitat or food supply. Primary producers (e.g., algae and plants) may experience an initial decrease in primary productivity due to physical effects and acute toxicity of the spill. However, these effects tend to be short-lived and a decreased food supply is not considered to be a major chronic stressor to herbivorous organisms after a spill. If mortality occurs to local invertebrate and wildlife populations, the ability of the population to recover will depend upon the size of the impact area and the ability of surrounding populations to repopulate the area.

Aquatic Toxicity

In aquatic environments, toxicity is a function of the concentration of a compound necessary to cause toxic effects combined with the compound's water solubility. For example, a compound may be highly toxic, but if it were not very soluble in water then its toxicity to aquatic biota would be relatively low. The toxicity of crude oil is dependent of the toxicity of its constituents. Among these, benzene is generally considered the most toxic constituent due to the low concentrations at which toxic effects are observed and its high water solubility. Other compounds in crude oil are considered much less toxic. For this assessment, the benzene content within the crude oil hypothetically entering the waterbody was assumed to be completely dissolved in the water. This assumption overestimates the actual amount of benzene that likely would become solubilized in the water. Concentrations of benzene were compared to benzene toxicity thresholds to assess whether toxic effects might be anticipated.

For aquatic biota, the acute and chronic toxicity thresholds for benzene are 7.4 ppm and 1.4 ppm, respectively, based on standardized trout toxicity tests (USEPA 2000). These toxicity threshold values are considered protective of acute and chronic effects to other aquatic biota, since other major constituents of crude oil are less toxic. Although trout are not found in many of the habitats crossed by the project, trout studies were selected because trout are among the most sensitive aquatic species and reliable acute and chronic trout toxicity data are available.

Tables 4-9 to 4-12 summarize the predicted acute and chronic toxicity to aquatic resources, based on the amount of crude oil released and the streamflow. Broadly, acute toxicity could potentially occur if substantial amounts of crude oil were to enter most rivers and streams, as demonstrated by the Moderate and Large Spill Scenarios. If such an event were to occur within a small stream, toxicity could potentially kill or injure aquatic species in the immediate vicinity and downstream of the rupture. Under these two scenarios, chronic toxicity also could potentially occur in small and moderate sized streams and rivers. However, emergency response, containment, and cleanup efforts would help reduce the concentrations and minimize the potential for chronic toxicity. In comparison, relatively small spills (less than 50 barrels) into moderate and large rivers would not pose a major toxicological threat. In small to moderate sized streams and rivers, some toxicity might occur in localized areas, such as backwaters where concentrations would likely be higher than in the mainstream of the river.

The likelihood of a release into any particular waterbody is low, with an occurrence interval of once every 16,000 to 500,000 years. If any release did occur, it is likely that the total release volume of a spill likely would

be 50 barrels or less based on historical spill volumes, or less than 1,000 barrels based on the spill volume study (**Appendix A**).

In summary, while a release of crude oil into any given waterbody might cause immediate localized toxicity to aquatic biota, particularly in smaller streams and rivers, the frequency of such an event would be low. Nevertheless, streams and rivers with aquatic biota represent the sensitive environmental resources that could be temporarily impacted by a crude oil release.

4.3 Risk to Populated and High Consequence Areas (HCAs)

Consequences of inadvertent releases from pipelines can vary greatly, depending on where the release occurs. Pipeline safety regulations use the concept of HCAs to identify specific locales and areas where a release could have the most significant adverse consequences. HCAs include populated areas, drinking water, and unusually sensitive ecologically resource areas (USAs) that could be environmentally damaged from a hazardous liquid pipeline release (**Table 4-13**). HCAs are subject to higher levels of inspection, per 49 CFR Part 195. These data are compiled from a variety of data sources, including federal and state agencies (e.g., state drinking water agencies and the Environmental Protection Agency). These USDOT-designated HCAs are continually refined and updated. The USDOT acknowledges that spills within a sensitive area might not actually impact the sensitive resource and encourages operators to conduct detailed analysis, as needed. TransCanada will conduct a thorough analysis of potential impacts to HCAs as part of its compliance with federal regulations.

Assuming that 1.4 spills occurred along the Keystone Pipeline system in a 10-year period, it is estimated that approximately 0.18 of these spills would occur in HCAs (**Table 4-13**). Although the number of predicted spills in HCAs is relatively small, the potential impacts of these individual spills are expected to be greater than in other areas due to the environmental sensitivity within these areas. **Table 4-14** also shows the number of spills and their predicted sizes.

4.3.1 Populated Areas

Highly populated HCAs occur along 4.0 miles of the Keystone Pipeline system. These highly populated areas have been identified as HCAs by the USDOT based on U.S. Census data (**Table 4-14**). More than 99 percent of these miles are near St. Louis, Illinois. Because of the recent population growth in some areas, Keystone also will review other populated areas, including those around Troy (Missouri), Edwardsville (Missouri) and the St. Louis area (Missouri and Illinois), to determine if these areas qualify as HCAs.

Table 4-9 Comparison of Estimated Crude Oil Concentrations Following a Spill to the Acute Toxicity Thresholds for Aquatic Life (7.4 ppm) for Streams Crossed by the Proposed Action

Throughput – 435,000 bpd	Stream Flow Rate (cfs)	Acute Toxicity Threshold (ppm)	Product Released					
			Small spill: 50 barrels		Moderate spill: 1,000 barrels		Large spill: 10,000 barrels	
			Concentration (ppm)	Occurrence Interval (years)	Concentration (ppm)	Occurrence Interval (years)	Concentration (ppm)	Occurrence Interval (years)
Low Flow Stream	10	7.4	**11**	**457,042**	**220**	**63,562**	**2,201**	**342,782**
Lower Moderate Flow Stream	100	7.4	1.1	319,930	**22**	**44,494**	**220**	**239,947**
Upper Moderate Flow Stream	1,000	7.4	0.11	239,947	2.2	33,370	**22**	**179,690**
High Flow Stream	10,000	7.4	2.2	102,835	0.2	19,069	0.01	137,113

Notes:

-Predicted rates apply for each stream crossing.

-Estimated proportion of benzene in the crude oil is 0.15 percent, and is assumed to be entirely water solubilized in the event of a spill. The resulting concentration was calculated by multiplying 0.15 percent of the total amount of crude oil released divided by 96 hours of stream flow volume. The model assumes uniform mixing conditions.

-Benzene concentrations are compared against the acute toxicity threshold for benzene.

-Shading indicates concentrations that could potentially cause acute toxicity to aquatic species. The darkest shading represents high probability of acute toxicity (>10 times the toxicity threshold); lighter shading represents moderate probability of acute toxicity (1 to 10 times the toxicity threshold); and unshaded areas represent low probability of acute toxicity (<toxicity threshold).

-Occurrence intervals are based on a predicted incident frequency of 0.14 spills/year along the entire Keystone Pipeline (**Appendix A**) and estimated stream widths. Widths of higher flow streams are greater than widths of lower flow streams, with more distance where an incident might occur. This results in a greater predicted frequency for high flow streams and a corresponding lower occurrence interval.

Table 4-10 Comparison of Estimated Crude Oil Concentrations Following a Spill to the Acute Toxicity Thresholds for Aquatic Life for Streams Crossed by the Proposed Action

Throughput – 591,000 bpd	Stream Flow Rate (cfs)	Acute Toxicity Threshold (ppm)	Product Released					
			Small spill: 50 barrels		Moderate spill: 1,000 barrels		Large spill: 10,000 barrels	
			Concentration (ppm)	Occurrence Interval (years)	Concentration (ppm)	Occurrence Interval (years)	Concentration (ppm)	Occurrence Interval (years)
Low Flow Stream	10	7.4	**11**	**281,692**	**220**	**52,783**	**2,201**	**217,030**
Lower Moderate Flow Stream	100	7.4	1.1	197,149	**22**	**36,948**	**220**	**151,921**
Upper Moderate Flow Stream	1,000	7.4	0.11	147,862	2.2	27,711	**22**	**113,941**
High Flow Stream	10,000	7.4	0.01	84,493	0.2	15,835	2.2	65,109

Notes:

-Predicted rates apply for each stream crossing.

-Estimated proportion of benzene in the crude oil is 0.15 percent, and is assumed to be entirely water solubilized in the event of a spill. The resulting concentration was calculated by multiplying 0.15 percent of the total amount of crude oil released divided by 96 hours of stream flow volume. The model assumes uniform mixing conditions.

-Shading indicates concentrations that could potentially cause acute toxicity to aquatic species. The darkest shading represents high probability of acute toxicity (>10 times the toxicity threshold); lighter shading represents moderate probability of acute toxicity (1 to 10 times the toxicity threshold); and unshaded areas represent low probability of acute toxicity (<toxicity threshold).

-Occurrence intervals are based on a predicted incident frequency of 0.19 spills/year along the entire Keystone Pipeline (Appendix A) and estimated stream widths. Widths of higher flow streams are greater than widths of lower flow streams, with more distance where an incident might occur. This results in a greater predicted frequency for high flow streams and a corresponding lower occurrence interval.

Table 4-11 Estimated Crude Oil Concentrations Compared to the Chronic Toxicity Threshold for Aquatic Life for Streams Crossed by the Proposed Action

Throughput – 435,000 bpd	Stream Flow Rate (cfs)	Chronic Toxicity Threshold (ppm)	Product Released					
			Small spill: 50 barrels		Moderate spill: 1,000 barrels		Large spill: 10,000 barrels	
			Concentration (ppm)	Occurrence Interval (years)	Concentration (ppm)	Occurrence Interval (years)	Concentration (ppm)	Occurrence Interval (years)
Low Flow Stream	10	1.4	0.07	457,042	1.3	63,562	13	342,782
Lower Moderate Flow Stream	100	1.4	0.007	319,930	0.1	44,494	1.3	239,947
Upper Moderate Flow Stream	1,000	1.4	0.001	239,947	0.01	33,370	0.1	179,690
High Flow Stream	10,000	1.4	0.0001	137,113	0.001	19,069	0.01	102,835

-Predicted rates apply for each stream crossing.

-Estimated proportion of benzene in the crude oil is 0.15 percent, and is assumed to be entirely water solubilized in the event of a spill. The resulting concentration was calculated by multiplying 0.15 percent of the total amount of crude oil released divided by 7 days of stream flow volume. The model assumes uniform mixing conditions.

-The chronic toxicity value for benzene is based on a 7-day toxicity value of 1.4 ppm for trout.

-Exposure concentrations were estimated over a 7-day period since the chronic toxicity value was based on a 7-day exposure.

-Shading indicates concentrations that could potentially cause chronic toxicity to aquatic species. The darkest shading represents high probability of chronic toxicity (>10 times the toxicity threshold); lighter shading represents moderate probability of chronic toxicity (1 to 10 times the toxicity threshold); and unshaded areas represent low probability of chronic toxicity (<toxicity threshold).

-Occurrence intervals are based on a predicted incident frequency of 0.14 spills/year along the entire Keystone Pipeline (Appendix A) and estimated stream widths. Widths of higher flow streams are greater than widths of lower flow streams, with more distance where an incident might occur. This results in a greater predicted frequency for high flow streams and a corresponding lower occurrence interval.

Table 4-12 Estimated Crude Oil Concentrations Compared to the Chronic Toxicity Threshold for Aquatic Life for Streams Crossed by the Proposed Action

Throughput – 591,000 bpd	Stream Flow Rate (cfs)	Chronic Toxicity Threshold (ppm)	Product Released					
			Small spill: 50 barrels		Moderate spill: 1,000 barrels		Large spill: 10,000 barrels	
			Concentration (ppm)	Occurrence Interval (years)	Concentration (ppm)	Occurrence Interval (years)	Concentration (ppm)	Occurrence Interval (years)
Low Flow Stream	10	1.4	0.07	281,692	1.3	52,783	13	217,030
Lower Moderate Flow Stream	100	1.4	0.007	197,149	0.1	36,948	1.3	151,921
Upper Moderate Flow Stream	1,000	1.4	0.001	147,862	0.01	27,711	0.1	113,941
High Flow Stream	10,000	1.4	0.0001	84,493	0.001	15,835	0.01	65,109

-Predicted rates apply for each stream crossing.

-Estimated proportion of benzene in the crude oil is 0.15 percent, and is assumed to be entirely water solubilized in the event of a spill. The resulting concentration was calculated by multiplying 0.15 percent of the total amount of crude oil released divided by 7 days of stream flow volume. The model assumes uniform mixing conditions.

-The chronic toxicity value for benzene is based on a 7-day toxicity value of 1.4 ppm for trout.

-Exposure concentrations were estimated over a 7-day period since the chronic toxicity value was based on a 7-day exposure.

-Shading indicates concentrations that could potentially cause chronic toxicity to aquatic species. The darkest shading represents high probability of chronic toxicity (>10 times the toxicity threshold); lighter shading represents moderate probability of chronic toxicity (1 to 10 times the toxicity threshold); and unshaded areas represent low probability of chronic toxicity (<toxicity threshold).

-Occurrence intervals are based on a predicted incident frequency of 0.19 spills/year along the entire Keystone Pipeline (**Appendix A**) and estimated stream widths. Widths of higher flow streams are greater than widths of lower flow streams, with more distance where an incident might occur. This results in a greater predicted frequency for high flow streams and a corresponding lower occurrence interval.

Table 4-13 Mileage Summary of USDOT-Defined HCAs Identified Along the Keystone Pipeline Project

	Miles of Pipeline				Number of Spills in 10 years *(occurrence interval)*			
	Highly Populated Areas	Drinking Water	Ecologically Sensitive Area	Total in HCAs[1]	Highly Populated Areas	Drinking Water	Ecologically Sensitive Area	Total HCAs
North Dakota	0.0	7.0	2.0	9.0	NA	0.007 (1,300 yrs)	0.002 (4,700 yrs)	0.01
South Dakota	0.0	7.8	22.5	26.9	NA	0.008 (1,200 yrs)	0.024 (420 yrs)	0.03
Nebraska	0.0	7.9	9.3	12.6	NA	0.008 (1,200 yrs)	0.009 (1,000 yrs)	0.01
Kansas	0.0	8.4	18.3	26.7	NA	0.008 (1,100 yrs)	0.019 (510 yrs)	0.03
Missouri	0.1	16.7	59.0	69.6	NA	0.018 (560 yrs)	0.063 (160 yrs)	0.07
Illinois	3.9	16.8	7.3	25.2	0.004 (2,500 yrs)	0.018 (560 yrs)	0.007 (1,300 yrs)	0.03
Keystone Mainline subtotal	*4.0*	*64.6*	*118.4*	*169.9*	*0.004 (2,500 yrs)*	*0.069 (145 yrs)*	*0.13 (79 yrs)*	*0.18*
Nebraska	0.0	0.0	0.0	0.0	NA	0.0	0.0	0.00
Kansas	0.0	45.3	47.7	59.7	NA	0.048 (210 yrs)	0.051 (200 yrs)	0.06
Oklahoma	0.0	18.3	7.7	11.4	NA	0.019 (510 yrs)	0.008 (1,200 yrs)	0.01
Cushing Extension Subtotal	*0.0*	*63.6*	*55.4*	*71.1*	*NA*	*0.068 (150 yrs)*	*0.060 (170 yrs)*	*0.07*
Project Total	**4.0**	**128.2**	**173.8**	**0.0**	**0.004 (2,500 yrs)**	**0.14 (73 yrs)**	**0.19 (54 yrs)**	**0.00**

[1] Numbers do not add up because some miles overlap in the different types of HCAs.

Note: NA indicates no highly populated area within the segment.

Table 4-14 Release and Spill Volume Occurrence Interval Associated with the Keystone Pipeline Project

	Miles of Pipe[1]	Number of Spills in 10 years (occurrence interval)				
		Total Number	<50 barrels (bbls)	50 to 1,000 bbls	1,000 to >10,000 bbls	>10,000 bbls
KEYSTONE MAINLINE						
Populated Areas	3.9	0.004 (2,500 years)	0.0004 (23,000 years)	0.002 (4,000 years)	0.0007 (14,000 years)	0.0006 (18,000 years)
Drinking Water Areas	64.6	0.069 (140 years)	0.007 (1,300 years)	0.04 (250 years)	0.01 (820 years)	0.01 (1,000 years)
Ecologically Sensitive Areas	118.4	0.13 (77 years)	0.014 (710 years)	0.075 (130 years)	0.023 (430 years)	0.018 (560 years)
CUSHING EXTENSION						
Populated Areas[2]	0.0	0.0	0.0	0.0	0.0	0.0
Drinking Water Areas	63.6	0.068 (150 years)	0.007 (1,400 years)	0.039 (260 years)	0.012 (830 years)	0.010 (1,000 years)
Ecologically Sensitive Areas	55.4	0.060 (170 years)	0.006 (1,700 years)	0.035 (290 years)	0.011 (910 years)	0.008 (1,250 years)

[1]The amount of pipe located within HCAs was quantified by geographical information system (GIS) and was based on the intersection of a 1,000-foot-wide corridor (centered on the pipeline route) and USDOT-defined HCAs.

4.3.2 Drinking Water

Surface water USAs identified for their potential as a drinking water resource have a 5-mile buffer placed around their intake location. The groundwater USAs have buffers that vary in size. These buffers are designated by the state's source water protection program or their wellhead protection program and the buffer sizes vary from state to state.

Isolated segments of the Keystone Pipeline Project cross areas that are considered HCAs by the USDOT due to potential risks to sensitive drinking water resources (**Table 4-13**). These areas are scattered throughout both the Keystone Mainline and Cushing Extension Pipeline routes. Keystone will conduct a more thorough evaluation to identify HCAs associated with sensitive drinking water resources. HCA will be subject to higher levels of inspection, as per 49 CFR Part 195. Keystone will evaluate the location of valves as a measure to reduce potential risk to highly sensitive drinking water resources.

4.3.3 Ecologically Sensitive Areas

Portions of the Keystone Pipeline Project cross areas that are considered HCAs by the USDOT due to potential risks to ecologically sensitive resources (**Table 4-13**). These areas are generally associated with major river systems (e.g., Missouri, Platte, and Mississippi Rivers) and the Flint Hills

in central Kansas. As with other HCAs, these locations will be subject to higher levels of inspection, as per 49 CFR Part 195, in order to reduce the probability of pipeline incident.

4.3.4 Distribution of Risk Among HCAs

In this initial assessment, it has been presumed that risk is distributed evenly across the pipeline route. However, risk of a spill tends to concentrate in some areas more than others due to differences in hydraulic gradients, numbers of roads, and other factors (**Appendix A**). Spill frequency and volume was calculated for 1,314 individual segments and two throughput cases.

When the throughput is 435,000 bpd, 25 percent of the overall spill risk predicted for the pipeline is contained within 82 segments (representing 13 percent of the pipeline system length). Within these 82 segments, there are 0.1 mile located within highly populated areas, 0.0 mile within ecologically sensitive areas, and 11.6 miles located within drinking water HCAs.

Similarly, the top 59 segments (representing 9 percent of the pipeline system length) account for 25 percent of the overall spill risk predicted for the pipeline when the throughput is 591,000 bpd. Within these 59 segments, there are 0.0 miles located within highly populated areas, 0.0 mile within ecologically sensitive areas, and 4.3 miles located within drinking water HCAs.

To protect these sensitive resources, HCAs would be subject to a higher level of inspection per USDOT regulations. Federal regulations require periodic assessment of the pipe condition and correction of identified anomalies within HCAs. In compliance with federal regulations, Keystone will develop management and analysis processes that integrate available integrity-related data and information and assess the risks associated with segments that can affect HCAs. Furthermore, Keystone will implement additional risk control measures if needed to protect HCAs. Examples of these additional measures may include: enhanced damage prevention programs, reduced inspection intervals, corrosion control program improvements, leak detection system enhancements, installation of EFRDs, and emergency preparedness improvements.

5.0 Keystone's Pipeline Safety Program

Pipelines are one of the safest forms of crude oil transportation. The Keystone Pipeline system will be designed, constructed and maintained in a manner that meets or exceeds industry standards. All pipelines will be built within an approved ROW and highly visible signs will be installed at all road, railway, and water crossings indicating that a pipeline is located in the area to prevent damage or impact to the pipeline. Keystone will manage a crossing and encroachment approval system for all other operators. Keystone will 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.

Historically, the most significant risk associated with operating a crude oil pipeline is the potential for third-party excavation damage. Keystone will mitigate this risk by implementing a comprehensive Integrated Public Awareness program focused on education and awareness. The cornerstone of the program encourages use of the state One-Call system before people begin excavating. Keystone's operating staff also will complete regular visual inspections of the ROW and monitor activity in the area.

Keystone will have a preventative maintenance, inspection and repair program that ensures the integrity of all its pipeline. Keystone's annual Pipeline Maintenance Program will be designed to maintain the safe operation of the pipeline system. The system will include routine visual inspections of the ROW, regular inline inspections, and collection of predictive data, underpinned by a company wide goal to ensure facilities are reliable and in service. Data collected in each year of the program will fed back into the decision making process for the development of the following year's program, which aids in facilitating a safe pipeline system. The pipeline system will be monitored 24 hours a day, 365 days a year.

In compliance with applicable regulations governing the operation of pipelines, periodic in-line inspections will be conducted to collect information on the status of pipe for the entire length of the system. In-line inspection represents the state-of-the-art methodology 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., scratch in the pipe from third-party excavation damage) can be identified and proactively repaired. Additional types of information collected along the pipeline will include cathodic protection readings, geotechnical investigations, aerial patrol reports and routine investigative digs. In addition, line patrol, leak detection systems, supervisory control and data acquisition (SCADA), fusion bond epoxy coating and construction techniques with associated quality control will be implemented.

Keystone will carry out routine visual inspections and other operating activities with an awareness of pipeline and facility safety, and the prevention of unauthorized trespass or access.

Keystone will have an Emergency Response Program in place to manage a variety of events. Human health and the environment are of the utmost importance to the Keystone in these types of situations. Risk assessment is an iterative process. As additional engineering and design information and refinements become available, Keystone will update its risk assessment and submit the updated assessment in an expected November 2006 filling with the Department of State.

In summary, the analysis shows that the frequency of incidents is low and the environmental consequences would likely be nominal. In addition, compliance with regulations, use of state-of-the-art inspection methodology and adherence to safety procedures will help to ensure environmentally sound and safe operation of the pipeline.

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7.0 Glossary

Accidental Release

An accidental release is an unplanned occurrence that results in a release of oil or natural gas from the pipeline.

Acute exposure

Exposure to a chemical or situation for a short period of time.

Acute toxicity

The ability of a substance to cause severe biological harm or death soon after a single exposure or dose.

Adverse effect

Any effect that causes harm to the normal functioning of plants or animals due to exposure to a substance (i.e., a chemical contaminant).

Algae

Chiefly aquatic, eucaryotic one-celled or multicellular plants without true stems, roots and leaves that are typically autotrophic, photosynthetic, and contain chlorophyll. They are food for fish and small aquatic animals.

Aquifer

An underground layer of water-bearing permeable rock, or unconsolidated materials (gravel, sand, silt or clay) from which groundwater can be usefully extracted using a water well.

Barrel

A barrel is a standard measure of a volume of oil and is equal to 42 gallons.

Benthic Invertebrates

Those animals without backbones that live on or in the sediments of a lake, pond, river, etc.

Bioavailability

How easily a plant or animal can take up a particular contaminant from the environment.

Biodegradation

Biodegradation is the breakdown of organic contaminants by microbial organisms into smaller compounds. The microbial organisms transform the contaminants through metabolic or enzymatic processes. Biodegradation processes vary greatly, but frequently the final product of the degradation is carbon dioxide or methane.

Blue Barrel (bbl)

In the late 1800's Standard Oil began manufacturing 42 gallon barrels painted blue for the express purpose of transporting petroleum. This blue barrel became the standard in industry. Hence, the abbreviation bbl for 1 barrel of oil.

BPD

Abbreviation for barrels per day

Cathodic Protection System

A technique to provide corrosion protection to a metal surface by making the surface of the metal object the cathode of an electrochemical cell. In the pipeline industry that is done using impressed current. Impressed current Cathodic Protection (ICCP) systems use an anode connected to a DC power source (a cathodic protection rectifier).

Chronic toxicity

The capacity of a substance to cause long-term poisonous health effects in humans, animals, fish, and other organisms. Biological tests that use sublethal effects such as abnormal development, growth, and reproduction, rather than solely lethality, as endpoints.

Contaminant

Any physical, chemical, biological, or radiological substance found in air, water, soil or biological matter that has a harmful effect on plants or animals; harmful or hazardous matter introduced into the environment.

Ecosystem

The sum of all the living plants and animals, their interactions, and the physical components in a particular area.

Emergency Flow Restricting Device (EFRD)

An emergency flow-restricting device is a device used to restrict or limit the amount of oil or gas that can release out of a leak or break in a pipeline. Check valves and remote control valves are types of EFRDs.

Exposure

How a biological system (i.e., ecosystem), plant, or animal comes in contact with a chemical.

Event

An event is a significant occurrence or happening. As applicable to pipeline safety, an event could be an accident, abnormal condition, incident, equipment failure, human failure, or release.

Facility

Any structure, underground or above used to transmit a product.

Failure Frequency

Failure frequency is the rate at which failures are observed or are predicted to occur, expressed as events per given timeframe.

Failure Probability

Failure probability is the probability that a structure, device, equipment, system, etc. will fail on demand or will fail in a given time interval, expressed as a value from 0 to 1

Failure Rate

Failure rate is the rate at which failures occur. It is the number of failure events that occur divided by the total elapsed operating time during which those events occur or by the total number of demands, as applicable.

Geographical Information System (GIS)

A computer data system for creating and managing spatial data and associated attributes.

Habitat

The place where a population of plants or animals and its surroundings are located, including both living and non-living components.

High Consequence Area (HCA)

A high consequence area is a location that is specially defined in pipeline safety regulations as an area where pipeline releases could have greater consequences to health and safety or the environment. For oil pipelines, HCAs include high population areas, other population areas, commercially navigable waterways and areas unusually sensitive to environmental damage. Regulations require a pipeline operator to take specific steps to ensure the integrity of a pipeline for which a release could affect an HCA and, thereby, the protection of the HCA.

High Population Area (HPA)

A high population area is an urbanized area, as defined and delineated by the U.S. Census Bureau, which contains 50,000 or more people and has a population density of at least 1,000 people per square mile. High population areas are considered HCAs.

Incident

As used in pipeline safety regulations, an incident is an event occurring on a pipeline for which the operator must make a report to the Office of Pipeline Safety. There are specific reporting criteria that define an incident that include the volume of the material released, monetary property damage, injuries, and fatalities (Reference 49 CFR 191.3, 49CFR 195.50).

Integrity Management Program

An integrity management program is a documented set of policies, processes, and procedures that are implemented to ensure the integrity of a pipeline. An oil pipeline operator's Integrity Management Program must comply with the federal regulations (i.e., the Integrity Management Rule, 49 CFR 195).

Integrity Management Rule

The Integrity Management Rule specifies regulations to assess, evaluate, repair, and validate the integrity of gas transmission lines that, in the event of a leak or failure, could affect HCAs.

Invertebrates

Animals without backbones: e.g., insects, spiders, crayfish, worms, snails, mussels, clams, etc.

LC_{50}

A concentration expected to be lethal to 50 percent of a group of test organisms.

Leak

A leak is a small opening, crack, or hole in a pipeline allowing a release of oil or gas.

Likelihood

Likelihood refers to the probability that something possible may occur. The likelihood may be expressed as a frequency (e.g., events per year), a probability of occurrence during a time interval (e.g., annual probability), or a conditional probability (e.g., probability of occurrence, given that a precursor event has occurred).

Maximum Contaminant Level (MCL)

The maximum level of a contaminant allowed in drinking water by federal or state law. Based on health effects and currently available treatment methods.

National Pipeline Mapping System (NPMS)

The National Pipeline Mapping System is a GIS database that contains the locations and selected attributes of natural gas transmission lines, hazardous liquid trunklines, and liquefied natural gas (LNG) facilities operating in onshore and offshore territories of the United States.

One-Call System

A one-call system is a system that allows excavators (individuals, professional contractors, and governmental organizations) to make one telephone call to underground facility operators to provide notification of their intent to dig. The facility operators or, in some cases, the one-call center can then locate the facilities before the excavation begins so that extra care can be taken to avoid damaging the facilities. All 50 states within the U.S. are covered by one-call systems. Most states have laws requiring the use of the one-call system at least 48 hours before beginning an excavation.

Operator

An operator is a person who engages in the transportation of gas (Reference 49 CFR 192.3) or a person who owns or operates pipeline facilities (Reference 49 CFR 195.2).

Polycyclic Aromatic Hydrocarbons (PAHs)

Group of organic chemicals.

Pipeline

Used broadly, pipeline includes all parts of those physical facilities through which gas, hazardous liquid, or carbon dioxide moves in transportation. Pipeline includes but is not limited to: line pipe, valves and other appurtenances attached to the pipe, pumping/compressor units and associated fabricated units, metering, regulating, and delivery stations, and holders and fabricated assemblies located therein, and breakout tanks.

Playa Lake

A rain-filled small, round depression in the surface of the ground.

Prairie Pothole

Water-holding depressions of glacial origin in the prairies of northern United States and southern Canada. Water is supplied by rainfall, basin runoff and seepage inflow of groundwater.

Receptor

The species, population, community, habitat, etc. that may be exposed to contaminants.

Risk

Risk is a measure of both the likelihood that an adverse event could occur and the magnitude of the expected consequences should it occur.

Sediment

The material of the bottom of a body of water (i.e., pond, river, stream, etc.).

Stressor

Any factor that may harm plants or animals; includes chemical (e.g. metals or organic compounds), physical (e.g. extreme temperatures, fire, storms, flooding, and construction/development) and biological (e.g. disease, parasites, depredation, and competition).

Supervisory Control and Data Acquisition System (SCADA)

A SCADA is a pipeline control system designed to gather information such as pipeline pressures and flow rates from remote locations and regularly transmit this information to a central control facility where the data can be monitored and analyzed.

Throughput

Amount of oil through a pipeline during a specified time.

Toxicity Testing

A type of test that studies the harmful effects of chemicals on particular plants or animals.

Toxicity Threshold

Numerical values that represent concentrations of contaminants in abiotic media (sediments, water, soil) or tissues of plants and animals above which those contaminants are expected to cause harm.

Unusually Sensitive Areas (USAs)

A USA is a drinking water or ecological resource area that is unusually sensitive to environmental damage from a hazardous liquid pipeline release, as defined in 49CFR 195.6.

Zooplankton

Small, usually microscopic animals (such as protozoans) found in lakes and reservoirs.

Appendix M

Specific Practices of the Pertinent Natural Resources Conservation Service Field Office Technical Guides

(Note: This appendix is Table 1, taken directly from Data Response #2, submitted by TransCanada Keystone Pipeline, L.P. to the Department of State in the Application for Presidential Permit on April 4, 2007.)

Soils: Item 2

Data Request:

List by state and county the specific practices of the pertinent NRCS Field Office Technical Guide (Section IV) that would be followed during construction, operation, and maintenance of the proposed pipeline.

Response:

Keystone is reviewing the NRCS Field Office Technical Guides (Section IV) for relevant conservation and reclamation practices, and will conform to district guidelines as they apply to the project.

Based on information compilation from Technical Guides, Keystone will develop a comprehensive conservation and reclamation document for the construction, operation and maintenance of the proposed pipeline. Table 1 includes the requirements identified to date.

Table 1: Specific Practices of the pertinent NRCS Field Office Technical Guide

State	Document Title	Summary
North Dakota	NRCS ND Conservation Practice Standard and Specifications Critical Planting (342)	General guidelines for planting vegetation on critical areas. Includes information on seeding rates and quality, seedbed preparation, and soil amendments and stabilization. NRCS recommends using the critical area planting practice for reclamation.
North Dakota	NRCS ND Conservation Practice Standard and Specifications Mulching (484)	Standards and specifications for mulching after seeding has occurred. Covers criteria, purposes, guidance, operation and maintenance for mulching.
North Dakota	NRCS ND Conservation Practice Standard Range Planting (550)	Outlines general guidelines used for range (native) plantings. Used by NRCS to define overall intent of the practice.
North Dakota	NRCS ND Conservation Practice Standard Pasture and Hay Planting (512)	Outlines general guidelines for forage plantings. Used by NRCS to define overall intent of the practice.
North Dakota	NRCS ND Conservation Practice Standard Riparian Herbaceous Cover (390)	Outlines general guidelines for the protection of habitats for aquatic, semi-aquatic and terrestrial species through streambank and shoreline stabilization and water quality management techniques.

Soils: Item 2

Table 1: Specific Practices of the pertinent NRCS Field Office Technical Guide

State	Document Title	Summary
North Dakota	NRCS ND Conservation Practice Standard Salinity and Sodic Soil Management (610)	Outlines general guidelines for the management of land, water, and plants to control and minimize accumulations of salts and/or sodium on the soil surface. This technical guide may aid in the development of strategies to maximize post-construction ROW revegetation success in areas with high sodic and/or saline concentrations.
North Dakota	NRCS Conservation Practice Standard Stream Crossing (578)	General guidelines for constructing and improving stream crossings to improve water quality, reduce streambank and streambed erosion and provide access across the stream. Provides criteria for various types, considerations, operation and maintenance.
North Dakota	NRCS Conservation Practice Standard Wetland Restoration (657)	Provides general guidelines to rehabilitate wetlands to a close approximation of the original natural condition prior to disturbance through restoring hydric soils, hydrology and native vegetation.
North Dakota	NRCS Conservation Practice Standard Channel Bank Restoration (322)	General guidelines to establish and maintain vegetation on channel banks other such similar areas. Purpose of vegetation is to stabilize streambanks, reduce erosion and sedimentation and enhance environmental quality.
South Dakota	NRCS SD Conservation Practice Standard and Specifications Critical Planting (342)	General guidelines for planting vegetation on critical areas. Includes information on seeding rates and quality, seedbed preparation, and soil amendments and stabilization. NRCS recommends using the critical area planting practice for reclamation.
South Dakota	NRCS SD Conservation Practice Standard and Specifications Mulching (484)	Standards and specifications for mulching after seeding has occurred. Covers criteria, purposes, guidance, operation and maintenance for mulching.
South Dakota	NRCS SD Conservation Practice Standard Range Planting (550)	Outlines general guidelines used for range (native) plantings. Used by NRCS to define overall intent of the practice.
South Dakota	NRCS SD Conservation Practice Standard Pasture and Hay Planting (512)	Outlines general guidelines for forage plantings. Used by NRCS to define overall intent of the practice.
South Dakota	NRCS SD Conservation Practice Standard Riparian Herbaceous Cover (390)	Outlines general guidelines for the protection of habitats for aquatic, semi-aquatic and terrestrial species through streambank and shoreline stabilization and water quality management techniques.
South Dakota	NRCS ND Conservation Practice Standard Salinity and Sodic Soil Management (610)	Outlines general guidelines for the management of land, water, and plants to control and minimize accumulations of salts and/or sodium on the soil surface. This technical guide may aid in the development of strategies to maximize post-construction ROW revegetation success in areas with high sodic and/or saline concentrations.

Soils: Item 2

Table 1: Specific Practices of the pertinent NRCS Field Office Technical Guide

State	Document Title	Summary
South Dakota	NRCS Conservation Practice Standard Stream Crossing (578)	General guidelines for constructing and improving stream crossings to improve water quality, reduce streambank and streambed erosion and provide access across the stream. Provides criteria for various types, considerations, operation and maintenance.
South Dakota	NRCS Conservation Practice Standard Wetland Restoration (657)	Provides general guidelines to rehabilitate wetlands to a close approximation of the original natural condition prior to disturbance through restoring hydric soils, hydrology and native vegetation.
South Dakota	NRCS Conservation Practice Standard Channel Bank Restoration (322)	General guidelines to establish and maintain vegetation on channel banks other such similar areas. Purpose of vegetation is to stabilize streambanks, reduce erosion and sedimentation and enhance environmental quality.
Nebraska	NRCS NE Conservation Practice Standard and Specifications Critical Planting (NE 342)	General guidelines for planting vegetation on critical areas. Includes information on seeding rates and quality, seedbed preparation, and soil amendments and stabilization. NRCS recommends using the critical area planting practice for reclamation.
Nebraska	NRCS NE Critical Planting Design Procedure (NE 342DP)	Provides specific requirements for stabilizing critical areas in Nebraska. It outlines various revegetation aspects such as seedbank preparation, site shaping, seeding methods, dates, rates, mixtures, weed control, mulching, and site maintenance.
Nebraska	NRCS NE Conservation Practice Standard Range Planting (NE 550)	Outlines general guidelines used for range (native) plantings. Used by NRCS to define overall intent of the practice.
Nebraska	NRCS NE Range Planting Specification (NE 550S)	Provides specific requirements for seed mixtures, seeding methods, rates, dates, depths, etc. by NE vegetation zones and site types. Goal of this document was to provide specifications for revegetation with respect to restoring communities to their historic climax form and function. Map included with vegetation zones.
Nebraska	University of Nebraska Guide for Weed Management in Nebraska	Guide for weed management developed by the University of Nebraska and used by the NRCS for technical guidance.
Nebraska	Pure Live Seed Calculations	Seeding rate information for several plant species in NE. Provides an overview of how NRCS calculates seed mixtures and seeding requirements in NE.
Nebraska	Nebraska Noxious Weed List	List of state regulated noxious weeds that need to be controlled in the pipeline corridor
Nebraska	Seeding Recommendations	Seeding recommendations to restore plant communities similar to historic climax for the counties in the project area.
Nebraska	NRCS NE Conservation Practice Standard Riparian Herbaceous Cover (390)	Outlines general guidelines for the protection of habitats for aquatic, semi-aquatic and terrestrial species through streambank and shoreline stabilization and water quality management techniques.

Soils: Item 2

Table 1: Specific Practices of the pertinent NRCS Field Office Technical Guide

State	Document Title	Summary
Nebraska	NRCS ND Conservation Practice Standard Salinity and Sodic Soil Management (610)	Outlines general guidelines for the management of land, water, and plants to control and minimize accumulations of salts and/or sodium on the soil surface. This technical guide may aid in the development of strategies to maximize post-construction ROW revegetation success in areas with high sodic and/or saline concentrations.
Nebraska	NRCS Conservation Practice Standard Wetland Restoration (657)	Provides general guidelines to rehabilitate wetlands to a close approximation of the original natural condition prior to disturbance through restoring hydric soils, hydrology and native vegetation.
Nebraska	NRCS Conservation Practice Standard Channel Bank Restoration (322)	General guidelines to establish and maintain vegetation on channel banks other such similar areas. Purpose of vegetation is to stabilize streambanks, reduce erosion and sedimentation and enhance environmental quality.
Kansas	List of Noxious Weeds present in the four impacted counties	List of 4 weeds most prevalent in disturbed areas in the four impacted counties. Contact county weed supervisor for specific control methods.
Kansas	NRCS KS Conservation Practice Standard and Specifications Critical Planting (342)	Contains seed, fertilizer and seedbed preparation information. Noted, that in four impacted counties, both cool and warm season grass species are present.
Kansas	List of CRP lands	Needed: List of Conservation Reserve Program (CRP) lands present in the pipeline corridor.
Kansas	List of EQIP lands	Needed: List of Environmental Quality Incentives Program (EQIP) lands present in the pipeline corridor.
Kansas	List of WHIP lands	Needed: List of Wildlife Habitat Incentives Program (WHIP) lands present in the pipeline corridor.
Kansas	NRCS NE Conservation Practice Standard Riparian Herbaceous Cover (390)	Outlines general guidelines for the protection of habitats for aquatic, semi-aquatic and terrestrial species through streambank and shoreline stabilization and water quality management techniques.
Kansas	NRCS ND Conservation Practice Standard Salinity and Sodic Soil Management (610)	Outlines general guidelines for the management of land, water, and plants to control and minimize accumulations of salts and/or sodium on the soil surface. This technical guide may aid in the development of strategies to maximize post-construction ROW revegetation success in areas with high sodic and/or saline concentrations.
Kansas	NRCS Conservation Practice Standard Stream Crossing (578)	General guidelines for constructing and improving stream crossings to improve water quality, reduce streambank and streambed erosion and provide access across the stream. Provides criteria for various types, considerations, operation and maintenance.
Kansas	NRCS Conservation Practice Standard Wetland Restoration (657)	Provides general guidelines to rehabilitate wetlands to a close approximation of the original natural condition prior to disturbance through restoring hydric soils, hydrology and native vegetation.

Soils: Item 2

Table 1: Specific Practices of the pertinent NRCS Field Office Technical Guide

State	Document Title	Summary
Kansas	NRCS Conservation Practice Standard Channel Bank Restoration (322)	General guidelines to establish and maintain vegetation on channel banks other such similar areas. Purpose of vegetation is to stabilize streambanks, reduce erosion and sedimentation and enhance environmental quality.
Illinois	NRCS IL Conservation Practice Standard and Specifications Critical Planting (342)	General guidelines for planting vegetation on critical areas. Includes information on seeding rates and quality, seedbed preparation, and soil amendments and stabilization. NRCS recommends using the critical area planting practice for reclamation.
Illinois	NRCS IL Conservation Practice Standard and Specifications Mulching (484)	Standards and specifications for mulching after seeding has occurred. Covers criteria, purposes, guidance, operation and maintenance for mulching.
Illinois	NRCS IL Conservation Practice Standard Pasture and Hay Planting (512)	Outlines general guidelines for forage plantings. Used by NRCS to define overall intent of the practice.
Illinois	NRCS NE Conservation Practice Standard Riparian Herbaceous Cover (390)	Outlines general guidelines for the protection of habitats for aquatic, semi-aquatic and terrestrial species through streambank and shoreline stabilization and water quality management techniques.
Illinois	NRCS ND Conservation Practice Standard Salinity and Sodic Soil Management (610)	Outlines general guidelines for the management of land, water, and plants to control and minimize accumulations of salts and/or sodium on the soil surface. This technical guide may aid in the development of strategies to maximize post-construction ROW revegetation success in areas with high sodic and/or saline concentrations.
Illinois	NRCS Conservation Practice Standard Stream Crossing (578)	General guidelines for constructing and improving stream crossings to improve water quality, reduce streambank and streambed erosion and provide access across the stream. Provides criteria for various types, considerations, operation and maintenance.
Illinois	NRCS Conservation Practice Standard Wetland Restoration (657)	Provides general guidelines to rehabilitate wetlands to a close approximation of the original natural condition prior to disturbance through restoring hydric soils, hydrology and native vegetation.
Missouri	Missouri Noxious Weed List	List of state regulated noxious weeds that need to be controlled in the pipeline corridor
Missouri	Missouri Reclamation Guidance	Covers types of vegetation expected to be encountered in Missouri; the vegetation types that need to reseeded, required seed mixes for various vegetation types; steps for reseeding an area; mulching; operation and maintenance requirements.
Missouri	NRCS MO Conservation Practice Standard and Specifications Critical Planting (342)	General guidelines for planting vegetation on critical areas. Includes information on seeding rates and quality, seedbed preparation, and soil amendments and stabilization. NRCS recommends using the critical area planting practice for reclamation.

Soils: Item 2

Table 1: Specific Practices of the pertinent NRCS Field Office Technical Guide

State	Document Title	Summary
Missouri	NRCS MO Conservation Practice Standard and Specifications Mulching (484)	Standards and specifications for mulching after seeding has occurred. Covers criteria, purposes, guidance, operation and maintenance for mulching.
Missouri	NRCS Conservation Practice Standard Stream Crossing (578)	General guidelines for constructing and improving stream crossings to improve water quality, reduce streambank and streambed erosion and provide access across the stream. Provides criteria for various types, considerations, operation and maintenance.
Missouri	NRCS Conservation Practice Standard Wetland Restoration (657)	Provides general guidelines to rehabilitate wetlands to a close approximation of the original natural condition prior to disturbance through restoring hydric soils, hydrology and native vegetation.
Oklahoma	Noxious Weed Species List and Probable Occurrence Information	Provided in response letter from NRCS Oklahoma office. Lists the species on the Oklahoma Noxious Weed List and the species present in impacted counties that are on Oklahoma noxious weed list.
Oklahoma	NRCS OK Conservation Practice Standard and Specifications Critical Planting (342)	Standards and Specifications for planting vegetation on critical areas. Includes information on seeding rates and quality, seedbed preparation, and soil amendments and stabilization.
Oklahoma	NRCS OK Conservation Practice Standard and Specifications Mulching (484)	Standards and specifications for mulching (applying plant residue or other suitable materials to the soil surface) after seeding has occurred. Covers criteria for mulching, purposes of mulching, guidance and operation and maintenance. Included are a table detailing mulch materials, rates and uses and a table listing mulch anchoring methods and materials.
Oklahoma	NRCS OK Conservation Practice Standard Range Planting (550)	Outlines general guidelines used for range (native) plantings. Used by NRCS to define overall intent of the practice.
Oklahoma	NRCS OK Conservation Practice Standard Pasture and Hay Planting (512)	Outlines general guidelines for forage plantings. Used by NRCS to define overall intent of the practice.

Definitions:

Critical areas: Areas that have or are expected to have high erosion rates, and on sites that have physical, chemical or biological conditions that prevent the establishment of vegetation with normal practices.

Mulching: Applying plant residues, by-products, or other suitable materials produced off-site and applied to the land surface.

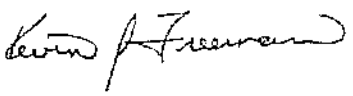
Appendix N

Conflict of Interest Statements

OCI Representation Statement

Name of Person or Organization: ENTRIX, Inc.

I hereby certify (or as a representative of my organization, I hereby certify) that, to the best of my knowledge and belief, no facts exist relevant to any past, present or currently planned interest or activity (financial, contractual, personal, organizational or otherwise) that relate to the proposed work; and bear on whether I have (or the organization has) a possible conflict of interest with respect to (1) being able to render impartial, technically sound, and objective assistance or advice; or (2) being given an unfair competitive advantage.

Signature:  Date: August 3, 2006

Name: Kevin Freeman

Organization: ENTRIX, Inc.

Title: Senior Vice President

ATTACHMENT "B1"
OCI REPRESENTATION STATEMENT

Name of Person or Organization: Osprey Environmental Consulting

I hereby certify (or as a representative of my organization, I hereby certify) that, to the best of my knowledge and belief, no facts exist relevant to any past, present or currently planned interest or activity (financial, contractual, personal, organizational or otherwise) that relate to the proposed work; and bear on whether I have (or the organization has) a possible conflict of interest with respect to (1) being able to render impartial, technically sound, and objective assistance or advice; or (2) being given an unfair competitive advantage[1]

Signature: Peter M Hendricks Date: July 30, 2006

Name: Peter M Hendricks

Organization: Osprey Environmental Consulting

Title: President

[1] An unfair competitive advantage does not include the normal flow of benefits from the performance of the contract.

ATTACHMENT "B1"
OCI REPRESENTATION STATEMENT

Name of Person or Organization: R. Christopher Goodwin & Associates, Inc.

I hereby certify (or as a representative of my organization, I hereby certify) that, to the best of my knowledge and belief, no facts exist relevant to any past, present or currently planned interest or activity (financial, contractual, personal, organizational or otherwise) that relate to the proposed work; and bear on whether I have (or the organization has) a possible conflict of interest with respect to (1) being able to render impartial, technically sound, and objective assistance or advice; or (2) being given an unfair competitive advantage[1]

Signature: _____ Date: July 31, 2006

Name: Robert W. Noel, Jr.

Organization: R. Christopher Goodwin & Associates, Inc.

Title: Senior Vice President and Chief Financial Officer

[1] An unfair competitive advantage does not include the normal flow of benefits from the performance of the contract.

ENTRIX
ENVIRONMENTAL CONSULTANTS

OCI Questionnaire

Name of Person or Organization: ENTRIX, Inc.

1. Will you (or your organization) be involved in the performance of any portion of the proposed work under this solicitation?

☐ No.

☒ Yes. The portion of the proposed work; the proposed hours and dollar value; and the type of involvement are fully disclosed on the attached pages.

2. What is (are) the major type(s) of business conducted by you (or your organization)? Please reply on the attached pages.

3. Do you (or your organization) have any affiliates?

☐ No.

☒ Yes. The name and a description of the major type(s) of businesses that each affiliate conducts are disclosed on the attached pages.

4. Will any of the following be involved in performing the proposed work: (a) any entities owned or represented by you (or your organization); (b) your organization's Chief Executive or any of its directors; or (c) any affiliates?

☒ No.

☐ Yes. A full disclosure and discussion is given in the attached pages.

5. Are you (or your organization) an energy concern?

☒ No.

☐ Yes. A full disclosure and discussion is given in the attached pages.

6. Do you (or your organization) have a direct or indirect relationship (financial, organizational, contractual or otherwise) with any business entity that could be affected in any way by the proposed work under this solicitation?

Your Name or Organization: **ENTRIX, Inc.**

☒ No.

☐ Yes. List the business entity (ies) showing the nature of your relationship and how it would be affected by the proposed work.

7. What percentage of your total income for the current and preceding fiscal years resulted from arrangements with any of the entities identified in Question 6 above?

0% For the current fiscal year - from / / to / / .

0% For the preceding fiscal year - from / / to / / .

8. Do you (or your organization) currently have or have you had during the last 6 years any arrangements (for example, contracts and cooperative agreements) awarded, administered, or funded wholly or partly by the Commission or any other Federal agency which relate to the proposed Statement of Work?

☒ No.
☐ Yes. A full disclosure and discussion is given in the attached pages.

9. Do you (or your organization) have or have you ever had any contracts, agreements, special clauses, or other arrangements which prohibit you (or your organization) from proposing work to be performed in this solicitation or any portion thereof.

☒ No.

☐ Yes. A full disclosure and discussion is given in the attached pages.

10. Do you (or your organization) have any involvement with or interest (direct or indirect) in technologies, which are or may be subjects of the contract, or which maybe substitutable for such technologies?

☒ No.

☐ Yes. A full disclosure and discussion is given in the attached pages.

11. Could you (or your organization) in either your private or Federal Government business pursuits use information acquired in the performance of the proposed work; such as:

A. Data generated under the contract?

B. Information concerning Commission plans and programs?

C. Confidential and proprietary data of others?

☒ No.

☐ Yes. A full disclosure and discussion is given in the attached pages.

12. Under the proposed work, will you (or your organization) evaluate or inspect your own services or products, or the services or products of any other entity that has a relationship (such as client, organizational, financial, or other) with you (or your organization)? This could include evaluating or inspecting a competitor's goods and services.

☒ No.

☐ Yes. A full disclosure and discussion is given in the attached pages.

13. To avoid what you perceive as a possible organizational conflict of interest, do you (or your organization) propose to: exclude portions of the proposed work; employ special clauses; or take other measures?

☒ No.

ENTRIX
ENVIRONMENTAL CONSULTANTS

☐ Yes. A full discussion is given in the attached pages. No possibility of an organizational conflict of interest is perceived. This answer is briefly justified on the attached pages.

I hereby certify that I have authority to represent my organization, if applicable, and that -- to the best of my knowledge and belief -- the facts and representations presented on the three pages of this questionnaire and on the 1 page of the attachment to it are accurate and complete.

Signature: Kevin Freeman Date: August 3, 2006
Name: Kevin Freeman Organization: ENTRIX, Inc.
Title: Senior Vice President and Manager, Pacific Northwest Region

OCI Questionnaire – Additional Information

ENTRIX, Inc. –

1. The services to be provided are to assist the DOS in preparation of an Environmental Impact Statement for the Keystone Project. The cost estimate has been provided to Keystone Energy Gas Transmission.
2. ENTRIX, Inc. is an Environmental Consulting firm.
3. ENTRIX affiliates are:
   - ENTRIX Bolivia Limited – Environmental Consulting
   - ENTRIX Americas SA – Environmental Consulting
   - ENTRIX Canada Limited – Environmental Consulting
   - EMS Works – Environmental Management Software

ATTACHMENT "C"
OCI QUESTIONNAIRE

Name of Person or Organization: Osprey Environmental Consulting

1. Will you (or your organization) be involved in the performance of any portion of the proposed work?

   (X) No.
   ( ) Yes. The portion of the proposed work; the proposed hours and dollar value; and the type of involvement are fully disclosed on the attached pages.

2. What is (are) the major type(s) of business conducted by you (or your organization)? Please reply on the attached pages.

3. Do you (or your organization) have any affiliates?[1]

   (X) No.
   ( ) Yes. The name and a description of the major type(s) of business that each affiliate conducts is disclosed on the attached pages.

4. Will any of the following be involved in performing the proposed work: (a) any entities owned or represented by you (or your organization); (b) your organization's Chief Executive or any of its directors; or (c) any affiliates?[1]

   (X) No.
   ( ) Yes. A full disclosure and discussion is given in the attached pages.

5. Are you (or your organization) an energy concern?[1]

   (X) No.
   ( ) Yes. A full disclosure and discussion is given on the attached pages.

6. Do you (or your organization) have a direct or indirect relationship (financial, organizational, contractual or otherwise) with any business entity that could be affected in any way by the proposed work?

   (X) No.
   ( ) Yes. List the business entity(ies) showing the nature of your relationship and how it would be affected by the proposed work.

---

[1] See Definitions in Attachment 3.

7. What percentage of your total income for the current and preceding fiscal years resulted from arrangements with any of the entities identified in Question 6 above? Not Applicable

0 % For the current fiscal year -- from _____ to _____
0 % For the preceding fiscal year -- from _____ to _____

8. Do you (or your organization) currently have or have you had during the last 6 years any arrangements (for example, contracts and cooperative agreements) awarded, administered, or funded -- wholly or partly -- by the Commission or any other Federal agency which relate to the proposed Statement of Work?

X No.
( ) Yes. A full disclosure and discussion is given on the attached pages.

9. Do you (or your organization) have or have you ever had any contracts, agreements, special clauses, or other arrangements which prohibit you (or your organization) from proposing work to be performed in this solicitation or any portion thereof?

X No.
( ) Yes. A full disclosure and discussion is given on the attached pages.

10. Do you (or your organization) have any involvement with or interest (direct or indirect) in technologies which are or may be subjects of the contract, or which may be substitutable for such technologies?

X No.
( ) Yes. A full disclosure and discussion is given on the attached pages

11. Could you (or your organization) in either your private or Federal Government business pursuits use information acquired in the performance of the proposed work: such as:

(a) Data generated under the contract?
(b) Information concerning Commission plans and programs?
(c) Confidential and proprietary data of others?

X No
( ) Yes. A full disclosure and discussion is given on the attached pages

12. Under the proposed work, will you (or your organization) evaluate or inspect your own services or products, or the services or products of any other entity that has a relationship (such as client, organizational, financial, or other) with you (or your organization)? This could include evaluating or inspecting a competitor's goods and services.

X No.
( ) Yes. A full disclosure and discussion is given on the attached pages

13. To avoid what you perceive as a possible organizational conflict of interest, do you (or your organization) propose to: exclude portions of the proposed work; employ special clauses; or take other measures?

(X) No.
( ) Yes. A full discussion is given on the attached pages.
( ) No possibility of an organizational conflict of interest is perceived. This answer is briefly justified on the attached pages.

I hereby certify that I have authority to represent my organization, if applicable, and that – to the best of my knowledge and belief -- the facts and representations presented on the three pages of this questionnaire and on the 0 pages of the attachment to it are accurate and complete.

Signature: Peter M. Hendricks Date: July 30, 2006

Name: Peter M. Hendricks

Organization: Osprey Environmental Consulting, Inc.

Title: President

ATTACHMENT "C"
OCI QUESTIONNAIRE

Name of Person or Organization: R. Christopher Goodwin & Associates, Inc.

1. Will you (or your organization) be involved in the performance of any portion of the proposed work?

   (X) No.
   ( ) Yes. The portion of the proposed work; the proposed hours and dollar value; and the type of involvement are fully disclosed on the attached pages.

2. What is (are) the major type(s) of business conducted by you (or your organization)? Please reply on the attached pages.

3. Do you (or your organization) have any affiliates?[1]
   (X) No.
   ( ) Yes. The name and a description of the major type(s) of business that each affiliate conducts is disclosed on the attached pages.

4. Will any of the following be involved in performing the proposed work: (a) any entities owned or represented by you (or your organization); (b) your organization's Chief Executive or any of its directors; or (c) any affiliates?[1]

   (X) No.
   ( ) Yes. A full disclosure and discussion is given in the attached pages.

5. Are you (or your organization) an energy concern?[1]

   (X) No.
   ( ) Yes. A full disclosure and discussion is given on the attached pages.

6. Do you (or your organization) have a direct or indirect relationship (financial, organizational, contractual or otherwise) with any business entity that could be affected in any way by the proposed work?
   (X) No.
   ( ) Yes. List the business entity(ies) showing the nature of your relationship and how it would be affected by the proposed work.

---

[1] See Definitions in Attachment 3.

7. What percentage of your total income for the current and preceding fiscal years resulted from arrangements with any of the entities identified in Question 6 above?

N/A __% For the current fiscal year -- from _____ to _____.
N/A __% For the preceding fiscal year -- from _____to _____.

8. Do you (or your organization) currently have or have you had during the last 6 years any arrangements (for example, contracts and cooperative agreements) awarded, administered, or funded -- wholly or partly -- by the Commission or any other Federal agency which relate to the proposed Statement of Work?

(X) No.
( ) Yes. A full disclosure and discussion is given on the attached pages.

9. Do you (or your organization) have or have you ever had any contracts, agreements, special clauses, or other arrangements which prohibit you (or your organization) from proposing work to be performed in this solicitation or any portion thereof?

(X) No.
( ) Yes. A full disclosure and discussion is given on the attached pages.

10. Do you (or your organization) have any involvement with or interest (direct or indirect) in technologies which are or may be subjects of the contract, or which may be substitutable for such technologies?

(X) No.
( ) Yes. A full disclosure and discussion is given on the attached pages.

11. Could you (or your organization) in either your private or Federal Government business pursuits use information acquired in the performance of the proposed work; such as:
(a) Data generated under the contract?
(b) Information concerning Commission plans and programs?
(c) Confidential and proprietary data of others?

(X) No.
( ) Yes. A full disclosure and discussion is given on the attached pages.

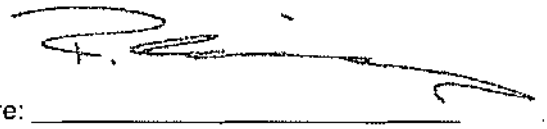
12. Under the proposed work, will you (or your organization) evaluate or inspect your own services or products, or the services or products of any other entity that has a relationship (such as client, organizational, financial, or other) with you (or your organization)? This could include evaluating or inspecting a competitor's goods and services.

( ) No.
(X) Yes. A full disclosure and discussion is given on the attached pages.

13. To avoid what you perceive as a possible organizational conflict of interest, do you (or your organization) propose to: exclude portions of the proposed work; employ special clauses; or take other measures?

( ) No.
( ) Yes. A full discussion is given on the attached pages.
(X) No possibility of an organizational conflict of interest is perceived. This answer is briefly justified on the attached pages.

I hereby certify that I have authority to represent my organization, if applicable, and that -- to the best of my knowledge and belief -- the facts and representations presented on the three pages of this questionnaire and on the 1 page of the attachment to it are accurate and complete.



Signature: _____ Date: August 1, 2006

Name: Robert J. Lackowicz (RPA)

Organization: R. Christopher Goodwin & Associates, Inc.

Title: Senior Project Manager

APPENDIX TO ATTACHMENT "C"
OCI QUESTIONNAIRE

2. R. Christopher Goodwin & Associates, Inc. conducts cultural resource investigations, including terrestrial and nautical archeology, history, remote sensing and architectural (HABS/HAER) studies.

12. The proposed work requires the review and evaluation of one (or more) firm's cultural resource investigation results. R. Christopher Goodwin & Associates, Inc. currently, or has in the past 10 years, conducted cultural resource investigations for pipeline projects within North Dakota, South Dakota, Kansas and Illinois.

13. No possibility of an organizational conflict of interest is perceived. While R. Christopher Goodwin & Associates, Inc. has a Kansas office that conducts work in the general area of the proposed work, the project review will be headed by a registered professional archeologist (RPA) from the company's New Orleans office, which does not conduct work in the area. The review also will fully abide by the Register of Professional Archaeologists codes of conduct and ethics.

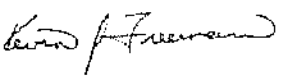
ENTRIX
ENVIRONMENTAL CONSULTANTS

Attachment 2
Contractor CII Non-Disclosure Agreement

Name of Person or Organization: ENTRIX, Inc.

On behalf of ENTRIX, Inc., I certify that ENTRIX, Inc. will abide by the following terms with respect to critical infrastructure information (CII) that the company has access to because of its work for the Department of State.

- Only authorized company employees with a need for the information will be given access to CII. ENTRIX, Inc. will maintain a list of each employee who is given access to CII, including a listing of each project for which the employee has been given CII.
- ENTRIX, Inc. will not provide CII to or discuss CII with anyone outside the company, except that CII may be discussed with the DOS and other agencies as directed by the DOS, the project's owner, operator, or applicant.
- Any copies made of CII will be marked as CII and treated as CII.
- CII will be used only in performance of ENTRIX, Inc. work for the Department of State. When ENTRIX has completed work on the project, all CII will be returned to the Department of State.
- I acknowledge that a violation of this agreement may result in negative consequences and could alter ENTRIX's ability to contract with the Department of State in the future.

By: 

Title: Senior Vice President

Representing: ENTRIX, Inc.

Date: August 3, 2006

ATTACHMENT "E"
CONTRACTOR CII NON-DISCLOSURE AGREEMENT

On behalf of [*contractor name*], I certify that [*contractor name*] will abide by the following terms with respect to critical infrastructure information (CII) that the company has access to because of its work for the Department of State.

- Only authorized company employees with a need for the information will be given access to CII [contractor name] will maintain a list of each employee who is given access to CII, including a listing of each project for which the employee has been given CII.

- [*Contractor name*] will not provide CII to or discuss CII with anyone outside the company, except that CII may be discussed with the DOS and other agencies as directed by the DOS, the project's owner, operator, or applicant.

- Any copies made of CII will be marked as CII and treated as CII.

- CII will be used only in performance of [*contractor name*]'s work for the Department of State. When [*contractor name]* has completed work on the project, all CII will be returned to the Department of State.

- I acknowledge that a violation of this agreement may result in negative consequences and could alter [*contractor name*]'s ability to contract with the Department of State in the future.

By: Peter M. Hendricks

Title: President

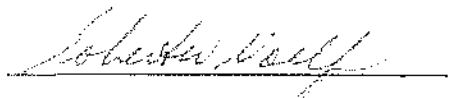
Representing: Osprey Environmental Consulting, Inc.

Date: July 30, 2008

ATTACHMENT "E"
CONTRACTOR CII NON-DISCLOSURE AGREEMENT

On behalf of R. Christopher Goodwin & Associates, Inc., I certify that R. Christopher Goodwin & Associates, Inc. will abide by the following terms with respect to critical infrastructure information (CII) that the company has access to because of its work for the Department of State.

- Only authorized company employees with a need for the information will be given access to CII. R. Christopher Goodwin & Associates, Inc. will maintain a list of each employee who is given access to CII, including a listing of each project for which the employee has been given CII.
- R. Christopher Goodwin & Associates, Inc. will not provide CII to or discuss CII with anyone outside the company, except that CII may be discussed with the DOS and other agencies as directed by the DOS, the project's owner, operator, or applicant.
- Any copies made of CII will be marked as CII and treated as CII.
- CII will be used only in performance of R. Christopher Goodwin & Associates, Inc.'s work for the Department of State. When R. Christopher Goodwin & Associates, Inc. has completed work on the project, all CII will be returned to the Department of State.
- I acknowledge that a violation of this agreement may result in negative consequences and could alter R. Christopher Goodwin & Associates, Inc.'s ability to contract with the Department of State in the future.

Signature: 

Name: Robert W. Noel, Jr.

Title: Senior Vice President and Chief Financial Officer

Representing: R. Christopher Goodwin & Associates, Inc.

Date: July 31, 2006

Appendix O

List of Preparers

LIST OF PREPARERS

ENTRIX, Inc.

Ayala, Chelsea- Air Quality

B.A. Environmental Studies, Minor, Geology, California State University, Sacramento, 1992

Ban, Suzanne – Project Management

M.S., Biological Oceanography, Florida Institute of Technology, 1985
B.S. (with honor), Biology, Pennsylvania State University, 1982

Barrick, Robert- Risk Assessment, Reliability and Safety

MBA, Business-Government Interaction/Project Management, University of Washington, 1983
B.S. (cum laude), Chemistry, University of Washington, 1975
B.S. (honors, Phi Beta Kappa), Oceanography, University of Washington, 1975

Brady, Caitlin – Ecology

Master of Applied Science in Coastal Management, University of Sydney, 2007
Bachelor of Science in Applied Economics, Cornell University, 2000 (Minor, Agronomy)

Brena, Jeannette – Air Quality

M.S., Environmental Engineering, Washington State University, 1997
B.S., Civil/Environmental Engineering, Seattle University, 1996

Bunn, Jeremy – Geology, Geologic Hazards, Route Alternatives

M.S., Geological Sciences, University of Washington, 2003
B.S., Conservation & Resource Studies, UC Berkeley, 1989

Colonell, Joseph – Engineering, Project Description, Alternatives

Applied Mathematics, Stanford University, 1966
M.S., Civil Engineering & Applied Mathematics, Washington State University, 1962
B.S., 1958 Civil Engineering, University of Colorado, 1958
Fulbright Scholar – Coast Engineering, Delft Technical University, Netherlands, 1960-61

Demuth, Kimberly – Cultural Resources

M.S., Historic Preservation of Architecture, University of Oregon, Eugene, 1982
B.A., Fine Arts and Design, University of California, Santa Cruz, 1977

Dilts, Erik – Project Management

M.S., Forest Resources (Fisheries), University of Georgia, 1999
B.S., Biology, Oglethorpe University, 1995

Fleece, William – Biology

M.S., Environmental Studies, University of Oregon, Eugene: 2000
Post-baccalaureate, Environmental Studies, University of Oregon, Eugene, 1996-1997
B.S., Political Science, Ball State University, Muncie, 1990

Freeman. Kevin Project Management, Geology

M.S., Geology, Michigan State University: 1974
B.S., Geology, Michigan State University: 1971
R.G., R.E.G., Oregon
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B.S., Geography, Oregon State University, Corvallis, 1994

Haley, John – Information Technology and Web development

M.S., Management, Computing, and Systems, Houston Baptist University, 1997
Graduate Studies, Geology, Rice University, 1986–1988
Graduate Studies, Geology, University of Florida, 1983-1986
B.S., Geology, University of Florida, 1983
B.S., Economics, University of Oregon, 1975
Undergraduate Studies, United States Air Force Academy, 1972-1974

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M.A., Archaeology, University of Washington, 2005
B.A., Anthropology, Whitman College, 2000

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M.S., Geography, emphasis on Environmental GIS and Remote Sensing, University of Illinois, Champaign, IL, 2002
B.A., Geography, Valparaiso University, Valparaiso, IN, 2000

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Kyte, Michael – Biology, Oil Spill Risk

M.S., Zoology, University of Maine, 1974
B.S., Zoology, University of Washington, 1969

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B.S., Marine Biology, U.C. Santa Cruz, 2004
Certificate, Tropical Marine Ecology, ITME, 2004

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B.A., Geography-Emphasis: Environmental Studies, University of California at Santa Barbara, 2000

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M.A., American History, Washington State University, Pullman, 1996
B.A., History, Lewis and Clark College, Portland, OR, 1989

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M.S., Remote Sensing & Geographic Information Sc. & Technology, University of Wisconsin-Madison, 2001
M.S., Applied Geology, Indian Institute of Technology, Bombay, India, 1996
B.S., Geology, University of Bombay, Bombay, India, 1994

Nagy, Michael -Project Description & Alternatives

B.S., Natural Resources, Ball State University, Indiana, 1977
Graduate Studies in Natural Resources, Michigan State University, 1978

Nelson, Stephen – Graphics

Undergraduate Studies for B.S., Marketing California State University, East Bay, 2009.

Noel, Lynn – Wetlands, Biology

M.S., Natural Resources–Fisheries, Humboldt State University, 1988
B.S., Biology, University of Illinois, 1980

Parton, Michael- Biology, Oil Spill Risk and Impacts

B.S., Biology, (minors in Land Use Planning and Chemistry) Southern Oregon State College, 1982

Paul, Duane –Socioeconomic and Land Use

Ph.D., Agricultural Economics, University of California (Davis), 1976
M.S., Agricultural Economics, University of California (Davis), 1969
B.S., Agricultural Management, California State University, 1968

Pavich, Steve –Socioeconomics

M.S., Agricultural and Resource Economics, Oregon State University, 1999
B.A., Economics, University of California, Davis, 1994

Peters, Brenda- Socioeconomic and Land Use

M.P.A., Public Administration, California State University at San Francisco, 1985
B.A., Environmental Studies and Sociology, University of California, Santa Barbara, 1980

Peterson, David-Socioeconomic and Land Use

M.A., Urban & Regional Planning, University of Michigan , Ann Arbor, 2005
B.A., Sociology / Anthropology and Religion, Swarthmore College, 2000

Prosser, Billie Administration & Project Coordination

Undergraduate Studies for B.A., Communication and English, Hunter College, New York, in progress
A.A., St. Petersburg Junior College, St. Petersburg, FL, 1991.

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Ph.D. Urban Affairs and Public Policy. University of Delaware, 2001-2006
M.A. in Urban Affairs and Public Policy, specialization in Historic Preservation University of Delaware, Newark, DE, 1994-1996
B.A., Historic Preservation, Cum Laude Mary Washington College, Fredericksburg, VA., 1990-1994

Reub, Greg – Biology, Oil Spill Risk and Impacts

M.A., Ecology and Systematic Biology, San Francisco State University, 1990
B.S., Wildlife and Fisheries Science, Minor Chemistry, South Dakota State University, 1977

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Ph.D. Zoology, University of Washington, 1971
M.S. Zoology, University of Washington, 1967
B.Sc. (Honours) Biology, I University of Victoria, 1965

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Graduate Studies, Urban Design & Planning, University of California, Los Angeles, 1973
B.A., Architecture, California State Polytechnical University, San Luis Obispo, 1971

Shatt, Ryan – Hydrology and Hydrogeology

B.S. Geosciences, Pennsylvania State University, 1997

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M.S., Fisheries Biology, Oregon State University, 1974
B.A., Biology, Lafayette College, 1967

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Ph.D., Economics, University of Delaware, Newark, DE. 2001
M.S., Marine Biology and Biochemistry, College of Marine Studies, Lewes, DE., 1996
B.S., Biology, Rochester Institute of Technology, Rochester, NY., 1993

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B.A., Communication Design, California State University, 1990

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B.S., Chemical Engineering, University of California, Davis, 1978
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Appendix P

Distribution List

MEMBERS OF CONGRESS

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Representative Sam Graves, MO
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Representative Adrian Smith, NE
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Senator E. Benjamin Nelson, NE
Representative Jeff Fortenberry, NE
Representative Frank D. Lucas, OK
Senator James M. Inhofe, OK
Senator Tom Coburn, OK
Senator John Thune, SD
Representative Stephanie Herseth Sandlin, SD

GOVERNMENT AGENCIES

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Bureau Of Indian Affairs
- Bob Ecosee, SD
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- Darin Larson, SD
- Larry Haikey, OK
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- Robert Cupina
- Richard Hoffman

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Skip Ricketts	

Missouri Dept Of Transportation

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North Dakota Game & Fish Department, ND; Michael Mckenna
North Dakota Public Service Commission, ND; Pat Fahn
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Terry Steinacher, Archeologist, ND	

US Army Corps Of Engineers

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Richard Fristik	Mark Plank, Utilities Program
Dennis Rankin, Utilities Programs	

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US Department Of Health And Human Services, NE; Jack Daniel,

US Department Of Homeland Security, Anacostia Naval Annex, DC; David Reese

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- Ivan Huntoon, MO
- Larry T. White, DC
- Theodore L. Wilke, DC
- John Jacobi, TX
- Jeff Wiese, DC
- Karen Butler, OPS, MO

US Environmental Protection Agency, DC;

- Robert Hargrove
- Virginia Laszewski, Region 5, IL
- Richard Clark,
- Rhonda Smith, Region 6, TX
- Ken Westlake, Region 5, IL
- Joe Cothern, Region 7, NEPA Team, KS
- Steve Pratt, Region 8, CO

US Fish And Wildlife Service

- Connie Young-Dubovsky, Region 6, NEPA Coordinator, CO
- Jerry Brabander, OK
- Joyce Collins, IL
- Mark D. Howell, MO
- Michael J. Levalley, Supervisor, KS
- Peter Gober, SD
- Charles Scott, Ecological Services, MO
- Hayley Dikeman, OK
- John Cochner, NE
- Marjorie Nelson, VA
- Michael J. Horton, VA
- Michael Olson, Missouri River Coordinator, ND
- Rick Hansen, MO

Web Water Development Association, SD; Curt Hohn, General Manager

Western Area Power Administration, CO;

- Dave Swanson, CO
- Dirk Shulund, MT

LANDOWNERS AND LOCAL BUSINESSES

Alberta, Canada

Platte Pipeline Company, Calgary, Alberta

Alabama

Keith Allan Bowers Management Trust, Gardendale, AL

Mary Elizabeth Bowers Management Trust, Gardendale, AL

Arizona

Basch Company, Sun City West, AZ

California

Newark Company, Los Angeles, CA

Colorado

Rock Family Investments, CO

Toburn LLC, CO

Illinois

Allied Waste Systems, Inc, Roxana, IL

Ammann Farms Inc, Pocahontas, IL

Amoco Pipeline Company, Warrenville, IL

City Of Edwardsville, Edwardsville, IL

City Of Highland, Highland, IL

Frank Heinzmann Company, Patoka, IL

Keller Excavating LLC, Glen Carbon, IL

Knebel Circle K Farms Inc, Pocahontas, IL

M And E Farms, Inc, Alton, IL

Madison County Mass Transit District, Granite City, IL

Mueller Estates Inc, Edwardsville, IL

LANDOWNERS AND LOCAL BUSINESSES (CONTINUED)

Phelps Construction Inc, Edwardsville, IL
Rapp Ag Land, Inc, Highland, IL
River Bluffs Girl Scout Council, Glen Carbon, IL
Ron Schmidt Farms Inc, Edwardsville, IL
Roxana Landfill Inc, Edwardsville, IL
Schewe Farms LLC, Smithboro, IL
Schreiber Farm, LLC, Edwardsville, IL
The Bank Of Edwardsville, Edwardsville, IL
Tri Vision Partnership, Dorsey, IL
USA, Vandalia, IL
Vonder Haar Agriprises, Greenville, IL
Wanda Cemetery Association, East Alton, IL

Kansas

Albertson Farms Inc, Robinson, KS
A T & S F Railroad, KS
Ben Aberle & Sons Inc, Sabetha, KS
Bob Bergkamp Construction Co, KS
Cemetery Brethern #11, KS
Diedrich Farms, KS
Ferrier Grandchildren LLC, KS
Galichia Ranch Properties LLC, KS
Glenwood Farms, KS
Graber Backhoe Inc, KS
G&O Inc, Hiawatha, KS
Henry Creek Farms Inc, KS
J B Ranch-Augusta LLC, KS
Jodebal, Inc, Wichita, KS
J-Six Farms Inc, Seneca, KS
Kansas Highway Commission, KS
Koch Supply & Trading LP, KS
Kiehnhoff Farms Inc, Wathena, KS
L & V Deines Farms, KS
Laham Family Partnership, KS
Larmar Inc, Robinson, KS
Lefert Farms, KS
Lyons Creek Watershed Joint Dist #41, KS
MDM Farms LLC, KS
Meier Dairy Of Palmer Inc, KS
M & K Farms, Marysville, KS
M And E Farms Inc, Manhattan, KS
Max E. Oltjen Land & Cattle Co Inc, Hiawatha, KS
MBM Partnership, Overland Park, KS
Montrica Farm Trust, Sabetha, KS
Moore Family Farms, Marysville, KS
Myers Farms Inc, Denton, KS
Potwin Land & Cattle Co, KS
Rahe Family Farms, KS
Ralston Farms Inc, KS
Riedy Farms, Inc, KS
Roberts Farms Inc, Denton, KS
Rottinghaus Holstein Farm. Inc A Kansas Corporation, Seneca, KS
Scholfield Farm, KS
Scully Partners LP, Marion, KS
Seeliger Farms, KS
St. John's Cathedral Church, KS
Steinbach Enterprises LP, KS
Stewart Family Farms LLC, KS
T.F.B. Farms Inc A Kansas Corporation, Hanover, KS
Terra Vista Land KLK LLC, Overland Park, KS
Tollefson Farms Inc, Hiawatha, KS
Trees Oil Company, KS
Triple T Livestock LLC, KS
Usd #433, KS
Zelta At Kellogg LLC, KS
Zschoche Farms Inc, KS

Mississippi

Galazin Family LLC, Flushing, MI

LANDOWNERS AND LOCAL BUSINESSES (CONTINUED)

Minnesota

Burlington Northern Railroad Properties Inc, St Paul, MN

Cass Prairie Farms LLP, St Paul, MN

Petersen Family LMTD Partnership & MTL. Farms LLP, Coon Rapids, MN

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American Pipeline Rental Inc, Troy, MO

Aulbur Inc, Laddonia, MO

BBW Farms LLC, Mexico, MO

Becker Brothers Farms, LLC, Mexico, MO

Beckett Realty Company, Cameron, MO

Bern Goeke And Sons Inc, St Charles, MO

Blackwell Partnership, Blue Springs, MO

Bosworth Farms LP, St Joseph, MO

Brits Sport Storage Inc, St Louis, MO

C & B Enterprises Inc, St Peters, MO

Cannon Hall Properties Inc, Troy, MO

Cemetery, West Alton, MO

Central Electric Power Cooperative, Inc, Jefferson City, MO

Central Illinois Public Service Company, St. Louis, MO

City Of St Joseph, St Joseph, MO

CLC Investments Inc, Troy, MO

Conservation Commission Of State Of Missouri, Jefferson City, MO

County Of Lincoln, Troy, MO

County Of St Charles & State Of Missouri, St Charles, MO

Cramer Farms Inc, Cowgill, MO

Cuivre Farms Inc, St Louis, MO

Dardenne Realty Co, St. Charles, MO

Doc-Cab LLC, St Charles, MO

Double C Farms Inc, Turney, MO

Dunkmann Farms, Inc, St. Charles, MO

Eggering Brothers Farm Inc, Old Monroe, MO

Emar Farms Inc., St Louis, MO

Emerald View Turf Farms, O Fallon, MO

F & G Farms Inc, St Charles, MO

Farley Point Farms, Inc, West Alton, MO

Firma Farm Company LLC, Laduc, MO

Flying B LLC, St Louis, MO

Flying L Farms Inc, New Melle, MO

Four D Ranch, Plattsburg, MO

Freeman Farms Inc, Plattsburg, MO

Grotjan H & J Farms Inc, Keytesville, MO

Heckman Farms LLC, Parkville, MO

Heisel Bob Farms Inc, Brunswick, MO

Hilltop Grain Company, Polo, MO

Horseshoe Lake Hunting And Fishing Club, O' Fallon, MO

J & C Farms Inc, Salisbury, MO

J Bishop Farm LLC, Mexico, MO

Jimko Farms Inc., Salisbury, MO

K Davis Farms LP, Gamma, MO

KWK Management LP, Bridgeton, MO

Lindenwood Female College, St Charles, MO

Machens Family LLC, Portage Des Sioux, MO

Mallard Farms Associates, St Louis, Mo

Marquitz Motors, Troy, MO

Marshland Realty Co, Town And Country, MO

Mc Neall Farms Inc., Keytesville, MO

Metropolitan Park & Recreation District, St Louis, MO

Middleton Lake Recreation Assn, Middleton, MO

Missouri Department Of Natural Resources, Jefferson City, MO

Moscow Mills Athletic Associate, Moscow Mills, MO

LANDOWNERS AND LOCAL BUSINESSES (CONTINUED)

Missouri (continued)

Muckerman Tree Farm LLC, Bellflower, Mo

Myer Agricultural Enterprises Inc, St Charles, Mo

Naylor Community Center, Centralia, MO

Nelson Properties Inc, St Joseph, MO

Oldenburg Investment Partnership, LP, St Charles, Mo

Oltjen W.C. Inc, St Joseph, MO

Over And Under Land Co LLC, St Louis, MO

Pavelka, Faye Family Partnership, St Louis, MO

Peruque Creek Farms Co, St Louis, MO

PFA Associates LP, St. Charles, MO

Porters Last Chance LLC, O Fallon, MO

R & H Farms Inc, Agency, MO

Rajac Properties LLC, Chillicothe, MO

Richards Farms Inc, Keytesville, MO

Rose Acre Farms, Inc., Hawk Point, MO

Saale Farms Inc, O Fallon, Mo

Schneider Farms Of Gower Inc, Gower, Mo

Schutte Farms Inc, Benton City, Mo

Scott W & Company A Mo Corp, St Joseph, Mo

Shelton Family Partnership LP, Foristell, Mo

Shoal Creek Farms LLC, Columbia, MO

Sitting Ducks LLC, St Louis, MO

Sprouse Farms Inc, Braymer, MO

St. Louis Piscatorial Club, Fenton, MO

Ten Hi Farms Inc, Wentzville, MO

The Nature Conservancy, St Louis, MO

Thomson B H & J Farms Inc, Salisbury, MO

Triple L Farms Ltd, Mexico, MO

Troy Development Company Inc, Troy, MO

Union Electric Co, St Louis, MO

United Hog Systems Inc, Marshall, MO

United States Of America, West Alton, MO

USA West Alton, MO

VRM Family LP, St Charles, MO

Wilson Grain & Livestock Farms Ltd, Thompson, MO

Yellowstone Farms LLC, Mexico, MO

Army Corps Of Engineers, MO

Montana

Pine Farms LLC, Mt

New Brunswick

Austin Company, Milford, NB

North Dakota

Bell Core Inc, Oriska, ND

Fallcrest Farms Inc, Crete, ND

Furst Stoltz, Llp, Fargo, ND

Future Vision Partnership, Kathryn, ND

Hodek Brothers, Lankin, ND

Methodist Episcopal Church Of Concrete, Cavalier, ND

Michel Family Farm Partnership, Minot, ND

Nesvig Family Farms LLP, La Moure, ND

Noeske Farms, Valley City, ND

Ransom County Soil Conservation, Lisbon, ND

Schwab Brothers Partnership, Englevale, ND

Sigurdson Farms, Edinburg, ND

Sondeland Brothers, Edinburg, ND

State Of North Dakota, Bottineau, ND

Tri-County Water, Petersburg, ND

UOA Partnership, Lakota, ND

Walsh County Water Res Dist, Grafton, ND

LANDOWNERS AND LOCAL BUSINESSES (CONTINUED)

Nebraska

Boeckner Farms Inc, Fairbury, NE
Bohac Farm Inc, Leigh, NE
Briggs Cattle Company, Seward, NE
Buckshot Farms, Lincoln, NE

Cast Farms Inc, Milford, NE
Crucible Farms Inc, Bellwood, NE
D. And R. Farms Inc, Dwight, NE
Dale Electronics Inc, Columbus, NE
Dickenson Sarpy LP, Milford, NE
Ellusa Enterprises Inc, Omaha, NE

FDH LLC, Malcolm, NE
Fred-Kluck Land Co, Richland, NE

Glen A Kluck Co, Richland, NE
Grain Belt LLC, Laurel, NE

Grass Valley Farms Inc, David City, NE
Hertz Farm Management, Omaha, NE
Hill & Valley Farms Inc, Columbus, NE
Hiller Farms LLP, Bellwood, NE
Hogwild Farms Inc, Humboldt, NE
Hueskes Inc, Dewitt, NE
Hunters Hill Trio, David City, NE
Jonesy-B Limited Partnership, Omaha, NE
Katy-Pat Farms Inc, Leigh, NE
Kruse Brothers Partnership, Seward, NE
Larkin Enterprises, LLC, Omaha, NE
Logan Valley Implement Inc, WayNE, NE
Marsh Farms, A NE Partnership, Hartington, NE
Mary Ann Kruse Life Use, Seward, NE
McMaster Enterprises Inc, Lincoln, NE
McMullin Farms Inc, Leigh, NE
Meinberg Farms Inc, Seward, NE
Mjm Families Real Estate Ltd Partnership, Richland, NE
Mts Farms, Inc., Bellwood, NE
Mullenhoff Farms Inc, Leigh, NE
Nordhues Farms Partnership, Randolph, NE
O'Neal Family Farms, LLC, Clarkson, NE
Pearson Farms Inc, Plymouth, NE
Rambour Realty, Columbus, NE
Raymond Siffring Company, Rising City, NE
R & B Langenberg, NE
Schlichting Family Partnership, Randolph, NE
State National Bank And Trust Company, Wayne, NE
Sunnyhill Farms Inc, Columbus, NE
T F Farms Inc, Fordyce, NE
T. T. D., Seward, NE
Tomek Recreational Property Trust, Bellevue, Ne
Weber & Sons Co, Saline, NE
Youth Development Memorial Foundation, David City, NE

Ohio

Marathon Ashland Petroleum Company, Findlay, OH

Oklahoma

Conoco Phillips F/K/A/ Tosco Corporation, Bartlesville, OK
Williams Communications, Tulsa, OK
Abh Inc., OK
Brorsen Blue Stems, OK
City Of Cushing, OK
Commissioner Of The Land Office, OK
Conoco Phillips F/K/A/ Tosco Corporation, OK
Edge Resources Trust, OK
Evans Cushing Inc, OK
Grand River Dam Authority, OK
J B Ranch-Butler LLC OK
Kahle Corporation, Inc, OK
OKlahoma Gas & Electric, OK
OKlahoma Turnpike Authority, OK
Old Blue Ranch, OK
Phillips Pipeline Company, OK
Rissmann Elizabeth & Company Inc, OK
Rothgeb Farms, Inc, OK

Spi Services LLC, OK
State School Fund Land, OK
Teppco Crude Oil LLC, OK
Vap Farms, OK
Vince Myers Welding & Construction Inc, OK

LANDOWNERS AND LOCAL BUSINESSES (CONTINUED)

Pennsylvania

Conrail, Philadelphia, PA

South Dakota

Albrecht Bros., Desmet, SD
Arens & Weverstad Partnership, Yankton, SD
Cimpl's Inc, Yankton, SD
City Of Yankton, Yankton, SD
Clark Hutterian Brethren, Raymond, SD
D.A.D. Farms Inc, Emery, SD
Daveens Limited Inc, Emery, SD
Docter Feedlot, Inc., Amherst, SD
Fordham Hutterian Brethren Inc, Carpenter, SD
Game, Fish & Parks / Habitat Section, State Of SD, Pierre, SD
Hansmeier & Son Inc, Bristol, SD
Heine Farms Etal, Yankton, SD
Hohm Farms, Yale, SD
Johnson Farms, Bristol, SD
L & J Enterprises, Bristol, SD
Munkvold Land & Cattle Inc Company, Menno, SD
Nelson Family Partnership, Yankton, SD
Newport Hutterian Brethren Inc, Claremont, SD
Noethlich Brothers, Doland, SD
Norjo Inc, Desmet, SD
R & L Farms Inc, Conde, SD
Rix Farms, Groton, SD
Ryken Family Limited Partnership, Yankton, SD
Schmieding Farms, L.L.C., Sioux Falls, SD
Schultz Farms, Inc, Freeman, SD
Schuring Farms Inc, Andover, SD
Sturdevant's East River Holding Company Llc, Sioux Falls, SD
Sunset Hutterian Brethren Inc., Britton, SD
Vietor Brothers, Amherst, SD
Vigdal Farm Inc, Britton, SD
Walter Family Limited Partnership, Conde, SD
Wolf Creek Hutterian Breth Inc, Olivet, SD
Zion Lutheran Church, Bridgewater, SD

Texas

BNSF Railway Company, Fort Worth, TX
Burlington Northern & Santa Fe Railway Company, Ft Worth, TX
Burlington Northern Railroad, Ft Worth, TX
Gsx Corp Of Illinois, Ft Worth, TX
Beal Ranch, TX
Federal National Mgt Association, TX
Oz Land Ltd Partnership, TX
Shell Pipeline Corporation, TX

Virginia

Norfolk & Western Railroad, Roanoke, VA

Washington

Longview Fibre Paper And Packaging Inc, Longview, WA
MTL Farms, LLP, Renton, WA

Wyoming

Platte Pipeline Company, Cody, WY

No State Available

Heim Brother Farm Inc ,
R K & K Dairy ,

PRIVATE LANDOWNERS

Alabama

Keith Bowers, AL
Dawn Keenan, AL
Phyllis Peterson, AL

Arkansas

Beverly And Douglas Davidson, AR
Kristi Downing, AR

Arizona

Viva Bolton, AZ
Carolyn Campbell, AZ
White Family, AZ
Pamela And Robert Affholder, AZ
Bob Brown, AZ
Theodore Freeman, AZ
Larry Gatliff, AZ
Donald Hooey, AZ
Paul Kloster, AZ
Arlene Kremer, AZ
Vicki Lenihan, AZ
Alene Midstokke, AZ
Ernest Midstokke, AZ
Pamela Midstokke Poley, AZ
Dawn Mulligan, AZ
Alice Paulson, AZ
Edwin Wieber, AZ

California

James Rock, CA
Kristy Weaver Neura, CA
Kim And Maurine Andersen, CA
Carol Anderson, CA
Betty Anderson, CA
Carlson Family, CA
Marcia Desautel, CA
Dale Geraldson, CA
Phyllis Grame, CA
Halla Family, CA

California (cont.)

Dennis Hillard, CA
Ronald Hillard, CA
Marjorie F. Howe, CA
Gerald Johnson, CA
Beverly Kelley, CA
William Kennealley, CA
Douglas Kinsinger, CA
Laurie Kinsinger, CA
Ferdinand & Marjorie Kloster, CA
Mable Long, CA
Donald Martin, CA
Martha Martin, CA
Brenda Meyer, CA
Richard Meyer, Ca
William And Richard Movius, CA
Lynn Paulson, CA
Sherry Pollman, CA
Larry And Regina Romine, CA
Leora Sandelin, CA
Robert Sandelin, CA
Pauline Schiappa, CA
Jean Seymour, CA
Erland Stenberg, CA
Mary Stenberg, CA
Clinton Stevenson, CA
Craig Stewart, CA
Marie Stewart, CA
Marian Swendseid, CA
Jack Von Bloeker, CA

Colorado

Hall Family, CO
Thelma Hinnen, CO
Paul Otto, CO
Judith Bauman, CO
Donald And Donice Bylander, CO

Colorado (cont.)

Cheryl And Stefan Carlson, CO
Nina And Rodney Christ, CO
Donald Kludt, CO
Delores Lowe, CO
Raymond Lowe, CO
Robert Mount, CO
Virginia Mount, CO
Olthoff Family Trust, CO
Kendall Peeks, CO
Michael Reber, CO
Doug Simon, CO
Jerry Simon, CO
Julie Simon, CO
Lora Sinkey, CO
Kim Spaulding, CO
Mary Tyser, CO
Richard Tyser, CO
Janet Wergin, CO
Alburn Wiebelhaus, CO
Vivian Wiebelhaus, CO
Zulauf Family, CO

District Of Columbia

Landon Fulmer, DC
Riley Scott, DC
Robert Jeske, DC

Florida

Catharine Boys, FL
John Bures, FL
David K.Ehrlin, FL
Laveda And Raymond Ferren, FL
Frances Frazer, FL
Marion Johnson, FL
Ruth Juttemeyer, FL
Alice Leathem, FL
Jerry Neff, FL

PRIVATE LANDOWNERS (CONTINUED)

Florida (cont.)

Norma Ochs, FL
Carrie Ruhn, FL
Shirley Williams, FL

Georgia

Joel Bass, GA
Andrews Family, GA
Carol Lohr, GA
Darwin Puls, GA
Deanna Puls, GA

Iowa

Robert Irwin, IA
Jacob And Shirley Anderson, IA
Donna Buyert, IA
Tweila Freeman, IA
Alma Huber, IA
Robert Kelly, IA
Teresa Mccune, IA
Clarine Mehlhaff, IA
Karen Murray, IA
Robert Peters, IA
Cleo Rinehart, IA
Greg Rinehart, IA
Rinehart Trust, IA
Frances June Wehrman, IA

Idaho

Morley Nelson, ID
Timothy Wagner, ID

Illinois

Brent And Denise Augustin, IL
T Ballance, IL
Charles Barth, IL
Richard Bast, IL
Randy (Il) Beck, IL
Russell Becker, IL
Mark Belcher, IL

Illinois (cont.)

Gretchen And Robert Bernardi, IL
Marian Beyer, IL
Marita Biggerstaff, IL
Keith Biver, IL
Carol And Donald Block, IL
Harold (Dean) And Judith Boren, IL
Marilyn And Kent Bosen, IL
Leo And Joe Brass, IL
Leslie Britt, IL
Steve Britt, IL
John And Tonya Brocco, IL
Connie Brown, IL
Lamoine AND Lola Brown, IL
Brown Family Partnership, IL
Eva And Gary Brumfield, IL
James Bucher, IL
Michael And Stacy Cain, IL
Carol Carlburg, IL
Margaret And Terry Carter, IL
Woody Family, IL
Sandra Chinn, IL
Lucie Cizek, IL
Louise Connell, IL
Mary Cowie, IL
Martin And Rita Degenhardt, IL
Robert Delaney, IL
Joe Doll, IL
Doll Family LP, IL
James And Louise Downen, IL
Marilyn Drew, IL
Drummond Family, IL
Carrie And David Jr Dunn, IL
Sandra East, IL
Curt Eversgerd, Il
Chris And Keith Federer, Il

Illinois (cont.)

Robert And Ruth Feyerbend, IL
Della And Gene File, IL
Jerry And Terry File, IL
Kacie And Marie Firkus, IL
Michael And Susan Firsching, IL
Jennifer Follwell, IL
Arlene And Worley Frye, IL
Scott And Tina Gaines, IL
Leonard Gall, IL
Barbara And Lester Gieseking, IL
Edward Giliham, IL
George & Jeannine Gobberdiel, IL
Beverly Gorman, IL
Linda And Mark Grinter, IL
Norman Gross, IL
David Grotefendt, IL
Lonis Gruen, IL
Homer Gurtler, IL
Louis Haegele, IL
Haegele Family Land Trust, IL
Edward And Judy Hagler, IL
Linda And Randall Hamel, IL
Larry Hanke, IL
Rita Hardy, IL
Debra And Harry Hediger, IL
Mary Heilig, IL
Flossie And John, Jr Helmkamp, IL
Betty And Elmer Hemminghaus, IL
Gary And Sheila Hemminghaus, IL
Dale And Eugene Henderson, IL
Gerard And Janice Hess, IL
Mary Hess, IL
Brian And Kimberly Hilmes, IL
Ethel And Harold Hitz, IL
Constance Hofer, IL
Houston Family, IL

PRIVATE LANDOWNERS (CONTINUED)

Illinois (cont.)

Lucille Huffman, IL
Harvey Jakel, IL
George Jaynes, IL
Jeffrey And Kimberly Jenne, IL
Larry And Lisa Johnson, IL
Linda And Michael Johnson, IL
Ruth Jordan, IL
Lynn And Richard Kampwerth, IL
Agnes And Roland Keller, IL
Kenneth And Leona Kersch, IL
Chris King, IL
Dwanna Kirkwood, IL
Ina Klette, IL
Kenneth Klette, IL
Gary Kneipmann, IL
James Kolda, IL
Gary Kreutzberg, IL
Dennis Kusterman, IL
Jeanne Kusterman, IL
OrvILle Kusterman, IL
Larry Lagant, IL
Linda Lagant, IL
Jennie Lee, IL
Joseph Leidner, IL
Valerie Leidner, IL
Michael Leonard, IL
Verla Leonard, IL
Lj Grigsby Trust, IL
Catherine Losch, IL
Charles Losch, IL
Herman Louer, IL
Margaret Louer, IL
Ann Maassen, IL
Angela Maedge, IL
Wayne Maedge, IL
Evelyn Mansholt, IL
James And Lauren Marshall, IL
Darrell Marti, IL
Wayne Marti, IL
Loraine Mc Casland, IL
Lynnette And Ronald Menold, IL
Carol Mestemacher, IL
Mark Mestemacher, IL
Meyer Family, IL
Bill Mills, IL
Margaret And William Mills, IL
Carl And Margaret Modine, IL
Alan And Douglas Moore, IL
William Moore, IL
Lucy Morgan, IL
Rita Morr, IL
Thomas Morr, IL
Tammy Mount, IL
Wayne Mount, IL
John Mudge, IL
Dave Mueller, IL
Dennis Nagel, IL
Dale Nagel, IL
Ruth Nagel, IL
Donald Neumann, IL
Edward Niemeier, IL
Robert Norris, IL
Virginia Norris, IL
Lori Nungesser, IL
Randall Nungesser, IL
Mabel Oates, IL
Thomas Oates, IL
WILliam Oelze, IL
Patricia Ogle, IL
Cheryl Orr, IL
Beth Orrell, IL
Edward Orrell, IL
Becky Overmark, IL
Geraline Pape, IL
David Payne, IL
Patricia Payne, IL
Mark Payne, IL
Julie Payne, IL
Mack Payne, IL
George Pierson, IL
Lexie Pierson, IL
John Pinegar, IL
Steve Plocher, IL
Joe Pourchot, IL
Marla Pourchot, IL
Larry Prott, IL
Donald Rapp, IL
Janet Rapp, IL
Henry Reymond, IL
Cheryl Reymond, IL
Roger Reymond, IL
Gladys Riepshoff, IL
Glenn Sr Riepshoff, IL
Verna Roberts, IL
Dwight Jr Rogier, IL
Vincent Saale, IL
Albertine Saale, IL
Vinca Saale, IL
Debbie And Scott Sadkowski, IL
James Schaufelberger, IL
K. Schaufelberger, IL
Terry Scheibal, IL
Mark Schewe, IL
Mark Schewe, IL
Rodger Schmidt, IL
Scott Schmitt, IL
Delmar Schoenleber, IL
Marcella Schoenleber, IL
Merle Schrumpf, IL
Robert Schulte, IL
Sandra Schulte, IL
Harold Schwartz, IL
Richard Schwartz, IL
Harold Schwehr, IL
Mary Schwehr, IL
Scott Secor, IL
Gene Shriver, IL
Tod Siebert, IL
Larry Skinner, IL
George Slifka, IL
Marcia Slifka, IL
Eldon And Helen Smith, IL
George Sotiroff, IL
Mattie Sotiroff, IL
Chris Sotiroff, IL
Michael St. John, IL
Pamela St. John, IL
Deborah Stagner, IL

PRIVATE LANDOWNERS (CONTINUED)

Illinois (cont.)

Dennis Stagner, IL
Alan & Aloysius Stahlschmidt, IL
Walter Steiner, IL
John Stobbs, IL
Douglas Strasser, IL
Jacqueline Strasser, IL
Barbara Stumpf, IL
Joanne Suess, IL
Michael Suess, IL
Larry Suess, IL
Suess Family, IL
Walter Suessen, IL
Betty And Dean Sullens, IL
John Tate, IL
Sharon Tate, IL
Ronald Tishhauser, IL
Kevin Todd, IL
Candace Todd Kindle, IL
Ernest Tosovsky, IL
Tim Tosovsky, IL
Mary Trampe, IL
Vernon Trampe, IL
Bernice And Kenneth Tune, IL
Connie And Neal Turley, IL
Arthur Unterbrink, IL
Sandra Unterbrink, IL
Uram Family, IL
Chuck Ursprung, IL
Marian Verharst, IL
Donald Voigt, IL
Melba Voigt, IL
David Voigt, IL
Kenneth Voigt, IL
Margy Voigt, IL
Ralph Jr Von Bokel, IL
Allen Vonder Haar, IL
Jo Vonder Haar, IL
Marlin Wagner, IL
Patricia Wagner, IL
Suzanne Walker, IL
William Walker, IL

Illinois (cont.)

Nick Walker, IL
William Walker, IL
Brant Weidner, IL
Marie Weis, IL
Gary Weis, IL
Delores Weiss, IL
Richard Weiss, IL
Weiss Family, IL
Robert Wessel, IL
Paul And Rhonda Wiegand, IL
Brandi Wilson, IL
Michael Wilson, IL
Bob Winet, IL
Jennifer And Robert Wukovich, IL
Daniel Zitta, IL

Indiana

Jul Mall, IN
Grayce Lechtenberg, IN
Victor Lechtenberg, IN
Jul C. Mall, IN
John Parker, IN
Barbara Reber, IN
Donald Reber, IN

Kansas

Aitchison Family, KS
Alexander Family, KS
Alquist Family, KS
Amidon Family, KS
Avery Family, KS
Bahruth Family, KS
Bannon Family, KS
Barnett Family, KS
Barrett Family, KS
Bazil Family, KS
Bear Family, KS
Bennett Family, KS
Benson Family, KS
Berrie Family, KS
Beswick Family, KS
Betzen Family, KS
Biehler Family, KS

Kansas (cont.)

Black Family, Ks
Blush Family, Ks
Bonewell Family, KS
Bott Family, KS
Braddy Family, KS
Brewer Family, KS
Brookings Family, KS
Brown Family, KS
Broyles Family, KS
Bryant Family, KS
Caldwell Family, KS
Carl Family, KS
Chamberlin Family, KS
Chaput Family, KS
Chase Family, KS
Chinn Family, KS
Claassen Family, KS
Clemence Family, KS
Cole Family, KS
Conway Family, KS
Corbin Family, KS
Coufal Family, KS
Cox Family, KS
Craig Family, KS
Craun Family, KS
Crisler Family, KS
Cronin Family, KS
Cummins Family, KS
Cunningham Family, KS
Dennett Family, KS
Diederich Family, KS
Diehl Family, KS
Dunlap Family, KS
Eastman Family, KS
Eenhuis Family, KS
Ensz Family, KS
Eskeldson Family, KS
Estes Family, KS
Evans Family, KS
Floyd Family, KS
Forsyth Family, KS

PRIVATE LANDOWNERS (CONTINUED)

Kansas (cont.)

Foster Family, KS
Frommack Family, KS
Geis Family, KS
Gelmers Family, KS
Gerardy Family, KS
Gfeller Family, KS
Godfrey Family, KS
Graff Family, KS
Gray Family, KS
Griest Family, KS
Gruber Family, KS
Guthrie Family, KS
Hanschu Family, KS
Harder Family, KS
Harviston Family, KS
Haunschild Family, KS
Heigele Family, KS
Helmer Family, KS
Hennerberg Family, KS
Herrell Family, KS
Hett Family, KS
Hiebert Family, KS
Hoffman Family, KS
Hogan Family, KS
Hostetler Family, KS
Howard Family, KS
Hunt Family, KS
Husted Family, KS
Jacobson Family, KS
Jefferis Family, KS
Jimeson Family, KS
Johnson Family, KS
Joseph Family, KS
Jueneman Family, KS
Karber Family, KS
Keil Family, KS
Kloppenberg Family, KS
Knaak Family, KS
Knickerbocker Family, KS
Knitter Family, KS
Koch Family, KS

Kansas (cont.)

Konarik Family, KS
Kontz Family, KS
Koontz Family, KS
Korte Family, KS
Kraisinger Family, KS
Krehbiel Family, KS
Kroupa Family, KS
Kruse Family, KS
Lang Family, KS
Larkin Family, KS
Larson Family, KS
L'ecuyer Family, KS
Leppke Family, KS
Lexow Family, KS
Locke Family, KS
Lohmeyer Family, KS
Long Family, KS
Lovell Family, KS
Lyons Family, KS
Mackay Family, KS
March Family, KS
Markley Family, KS
Marnane Family, KS
Martin Family, KS
Mattix Family, KS
Mauzey Family, KS
May Family, KS
Mcculloch Family, KS
Mcewen Family, KS
Mcgrath Family, KS
Mcmahan Family, KS
Mettling Family, KS
Miller Family, KS
Mundy Family, KS
Myers Family, KS
Neuwirth Family, KS
Nichols Family, KS
Nixon Family, KS
Nutsch Family, KS
Obenland Family, KS
Ohlde Family, KS

Kansas (cont.)

Ohlson Family, KS
Ohm Family, KS
Olson Family, KS
Orr Family, KS
Overton Family, KS
Owen Family, KS
Pankratz Family, KS
Pannbacker Family, KS
Pappan Family, KS
ParKS Family, KS
Parsley Family, KS
Pellegrini Family, KS
Penner Family, KS
Peters Family, KS
Pettit Family, KS
PinKSton Family, KS
Poore Family, KS
Powell Family, KS
Preheim Family, KS
Ralston Family, KS
Ramsey Family, KS
Randle Family, KS
Ray Family, KS
Reed Family, KS
Regier Family, KS
Reich Family, KS
Reiter Family, KS
Richmond Family, KS
Richter Family, KS
Riddle Family, KS
Rock Family, KS
Roth Family, KS
Rupp Family, KS
Salava Family, KS
Schauf Family, KS
Schellenger Family, KS
Schlesener Family, KS
Schmale Family, KS
Schmidt Family, KS
Schoonover Family, KS
Seifert Family, KS

PRIVATE LANDOWNERS (CONTINUED)

Kansas (cont.)

Seitz Family, KS
Seiwert Family, KS
Shahzada Family, KS
Sharp Family, KS
Shaver Family, KS
Shelley Family, KS
Shurtz Family, KS
Simon Family, KS
Siviseth Family, KS
Slingsby Family, KS
Sly Family, KS
Smith Family, KS
Snodgrass Family, KS
Spencer Family, KS
Stalder Family, KS
Stamm Family, KS
Stein Family, KS
Storey Family, KS
Stroda Family, KS
Stucky Family, KS
Sump Family, KS
Svitak Family, KS
Tajchman Family, KS
Taylor Family, KS
Thiessen Family, KS
Thurlow Family, KS
Tilton Family, KS
Tolles Family, KS
Tucker Family, KS
Tyler Family, KS
Underwood Family, KS
Urban Family, KS
Varner Family, KS
Vetter Family, KS
Vinduska Family, KS
Visser Family, KS
Voegele Family, KS
Vogel Family, KS
Walker Family, KS
Walsh Family, KS

Kansas (cont.)

Walter Family, KS
Warns Family, KS
Waterman Family, KS
Weber Family, KS
Wedel Family, KS
White Family, KS
Whiteman Family, KS
Wiebe Family, KS
Wieters Family, KS
Wilder Family, KS
Wilson Family, KS
Winegar Family, KS
Winter Family, KS
Wood Family, KS
Woolley Family, KS
Wurtz Family, KS
Yarrow Family, KS
Yenni Family, KS
Lars Aarstad, KS
James Aberle, KS
Raymond Adam, KS
James And Tammy Adams, KS
Phil Albers, KS
Gladys And Herbert Albers, KS
Luther And Wilma Albertson, KS
Robert Alexander, KS
Marie Anderson, KS
Joel And Rebecca Bacon, KS
Alan Bahr, KS
Freda Bahr, KS
Ronald Bahr, KS
Rys Baker, KS
Harold And Sharon Bannon, KS
Marion Barrow, KS
Jerilean Bartels, KS
Ivan And Sharon Bartels, KS
George And Joyce Bauer, KS
Mike Beam, KS
John Bergman, KS
Debra And John Bergman, KS

Kansas (cont.)

Theodore Bergman, KS
Jeannie And Leo Berry, KS
Richard E. Black, KS
Jerry And Nancy Bottiger, KS
Lois And Samuel Bowen, KS
Darrel And Ruby Boyd, KS
Karen Bramlage, KS
Ann Brown, KS
David And Karen Brown, KS
Caroline And Charles Bruna, KS
Lynn Bruna, KS
Greg Bryant, KS
Annette And Roland Burton, KS
Robert Ahlerich, KS
Delores Albrecht, KS
Gary Alleven, KS
C J Andes, KS
Jeffrey Artz, KS
Herbert Austin, KS
Raymond Ayers, KS
Nadine Baer, KS
Gene Beard, KS
Mark Bechtel, KS
Becky Beichter, KS
Mike Beltz, KS
Juanita Berg, KS
Bill Bergmeier, KS
Leland Bernhardt, KS
Margie Berrie, KS
Elizabeth Berry (Hoskins), KS
Laverne Bina, KS
Edward Blue, KS
Dolores Brabec, KS
Jeffrey Brabec, KS
Russell Brehm, KS
Tena Brenneis, KS
Patsy Brill, KS
Phyllis Britt, KS
Eldred Brockmeier, KS
Johnnie Brookings, KS

PRIVATE LANDOWNERS (CONTINUED)

Kansas (cont.)

Ruby Brower, KS
Kent Brunner, KS
Ken Bryant, KS
Patricia Bunck, KS
Rene Charbonneau, KS
Travis Charbonneau, KS
Helen Claassen, KS
Virginia Claassen, KS
Mabel Collinson, KS
Linda Consolver, KS
James Corbin, KS
Mac Corbin, KS
Mary Covalt, KS
Nancy Cowan, KS
Lydia Cox, KS
Charles Craig, KS
James Day, KS
James Dean, KS
Earl Deines, KS
Mervin Deines, KS
Bernard Diederich, KS
Don Diederich, KS
James Diederich, KS
Lyle Diehl, KS
Dean Dodson, KS
Viola Dodson, KS
Mary Duffy, KS
Bart Duncan, KS
Michael Durkin, KS
Michael Fager, KS
Mary Farney, KS
Sharon Finley, KS
Ralph Fischer, KS
Dennis Fisk, KS
Orpha Fox, KS
David Frantz, KS
Maxine Friederich, KS
Dennis Friedli, KS
James Fritz, KS
Donna Fruechting, KS
Marvin Fuller, KS

Kansas (cont.)

Roberta Galbraith, KS
Richard Gawith, KS
Jacqueline Geist, KS
Gelter Living Trust, KS
Gerald Jr. Geringer, KS
Dough Gerleve, KS
Charlotte Gilbert, KS
Anna Gilliam, KS
Michael Gilliam, KS
Sharon Gordon, KS
Darrel Gottlob, KS
Max Griffin, KS
Glenda Gulick, KS
Eugene Jr Hagan, KS
Burma Hanschu, KS
Ronnie Hanschu, KS
Glenda Harder, KS
Lloyd Harvey, KS
Gary Hatesohl, KS
Janet Hatesohl, KS
Glen Heimerich, KS
Willard Hett, KS
Susan Higgins, KS
Charles Hilt, KS
Areata Hofmann, KS
Marcella Holbrook, KS
Helen Holston, KS
Terry Hoover, KS
Rene Hromek, KS
Russell Hummel, KS
Kenneth Hutchinson, KS
Allen JacKSon, KS
Dean JacKSon, KS
Steve Johnson, KS
Mark Johnston, KS
Ronald Johnston, KS
Mary Jones, KS
Stanley Jones, KS
Oscar Kasenberg, KS
Beverly Keller, KS
Dennis Kelley, KS

Kansas (cont.)

Mark Kennedy, KS
Shirley Kern, KS
Terry Ketterman, KS
Wauneta Ketterman, KS
Judyth Kill, KS
Donna Klein, KS
Raymond Knoll, KS
Keith Koehn, KS
Ralph Lanzrath, KS
Jarrod Lawrence, KS
Jeanette Lawrence, KS
Joanita Lawrence, KS
Terry Lawrence, KS
Diana Lee, KS
Yvonne Lee, KS
Justin Lefert, KS
Mike Litke, KS
Scott Litke, KS
Richard Lloyds Inc, KS
Donald Loe, KS
Jerry Lovett, KS
Raymond Luthi, KS
Carl Mar, KS
Ning Mar, KS
Nina March, KS
Phillip Martin, KS
Carol Matas, KS
Craig Mate, KS
Marion Mathews, KS
Robert Mayfield, KS
Jim Mcclung, KS
Craig Mcclure, KS
Jake Mcclure, KS
Karen Mccoy, KS
Spencer Mcfarland, KS
Pat Mcgatlin, KS
Marvin Mclaughlin, KS
Jim Mercer, KS
Greg Mettling, KS
Donald Meysing, KS
Emily Miller, KS

PRIVATE LANDOWNERS (CONTINUED)

Kansas (cont.)

Joe Miller, KS
Regina Miller, KS
Clayton Moore, KS
Robert Moore, KS
Morgan Family, Irr Trust, KS
Richard Morris, KS
Ricky Morriss, KS
Clyde Morton, KS
Don Morton, KS
Lydia Morton, KS
Michael Morton, KS
Gerald Mullett, KS
Joe Neises, KS
John Neises, KS
Gregory Nelson, KS
William Newell, KS
Justin Nilik, KS
Marlin Oestman, KS
Robert Ohm, KS
Dorothy Osburn, KS
Gary Osman, KS
Gary Padgett, KS
C M Pannbacker, KS
Parker Family Trust, KS
Rick Pauly, KS
Wilma Pearson, KS
Phyllis Perry, KS
Charles Pilkington, KS
John Posey, KS
Myrtle Posey, KS
Randall Preheim, KS
Mauricia Prosser, KS
Carla Purdy, KS
Catherine Rademacher, KS
James Redington, KS
Joseph Redington, KS
Owen Redington, KS
Mary Reich, KS
Brenda Reimer, KS
Leonard Richardson, KS
Robbie Riedy, KS

Kansas (cont.)

Steven Riedy, KS
Eugene Riffel, KS
Jeff Riffel, KS
Ronnie Roberts, KS
Loren Rock, KS
Greg Roles, KS
Donald Rosenow, KS
Daniel Rudolph, KS
Victoria Rudolph, KS
Gregory Samuels, KS
Dan Schalk, KS
Allen Schanbacher, KS
William Schaulis, KS
Paul Jr Schellhorn, KS
Iva Schlatter, KS
Lester Schlesener, KS
Gary Schmutz, KS
Brian Schwartz, KS
William Scully, KS
Facia Self, KS
Greg Shepard, KS
Stuart Shepard, KS
Benjamin Siebold, KS
Ed Silhan, KS
Betty Sills, KS
Thomas Slick, KS
Doris Sly, KS
Joseph Smith, KS
Rodney Smith, KS
Smith Family Loving Trust, KS
Bob Sommers, KS
Terry Steiner, KS
Norman Stewart, KS
Gary Stroda, KS
Kenny Stroda, KS
Curtis Stroud, KS
Lavern Stucky, KS
Don Suderman, KS
Colleen Suffron, KS
E Svitak, KS
George Svitak, KS

Kansas (cont.)

Betty Taylor, KS
Blair Tharp, KS
Dalene Tharp, KS
Diana Thiessen, KS
Joe Thomas, KS
Randall Thurlow, KS
Keith Tyler, KS
Gailen Tyrell, KS
Eleanor Urbanek, KS
Don Van Zee, KS
Leon Vanvessum, KS
John Vinduska, KS
Chris Visser, KS
Mardell Voelker, KS
Thelma Vogelman, KS
Michael Voit, KS
Crystal Voth, KS
Laurie Wade, KS
Virginia Wagner, KS
Hadley Wait, KS
Leslie Waldeck, KS
Christine Walker, KS
Patricia Waters, KS
Mary Watson, KS
William Watson, KS
Loren Watts, KS
Martha Watts, KS
John Weber, KS
Ray Wentworth, KS
Kathleen Westphal, KS
Steve Whitehair, KS
Chester Wichman, KS
Jack Williams, KS
Margaret Wilson, KS
Rodney Wilson, KS
Dean Winters, KS
Erna Yeagley, KS
Lenore Yost, KS
Dennis Zumbrunn, KS
Darlene And Wilbur Campbell, KS
Bryan Cannon, KS

PRIVATE LANDOWNERS (CONTINUED)

Kansas (cont.)

David And Tammy Claeys, KS
Larry And Reva Creamer, KS
Gordon Crome, KS
Bill And Rosae Crow, KS
Elizabeth Daniels, KS
Terry Daniels, KS
Patricia Denton, KS
Louis Decin, KS
Marilee And Virgil Deters, KS
Gerald Detweiler, KS
Rita Detweiler, KS
Mary Diebolt, KS
Donald And Marlene Dodd, KS
Dennis Doebele, KS
Lyle And Lois Drehl, KS
Susan Duell, KS
Floyd And Mary Duffy, KS
Leo And Marie Eagan, KS
Elsie Earhart, KS
Denise Eenhuis, KS
Clarence And Lillian Engelken, KS
Gale Epple, KS
Clyde And Karla Epple, KS
Eldon R. Ten Eyck, KS
Rosalia Fangman, KS
Virginia Farrar, KS
Robert Fee, KS
Wayne Finger, KS
Ralph And Penny Fischer, KS
Bernard W. Frommack, KS
Rebecca Frontiera, KS
Susan Gartrell, KS
Michael Gee, KS
Robert Georgeson, KS
Amaryllis Gerber, KS
Esther Gibson, KS
Gibson Family Trust, KS

Kansas (cont.)

Jerry And Shirley Gifford, KS
Francis And Kent Gockel, KS
Kevin And Vickie Goodman, KS
Evelyn Gore, KS
Tim Grable, KS
Janis And Wayne Grable, KS
Grable Family, KS
Marlene Greene, KS
David Gress, KS
Norbert Gress, KS
Cherie And Christopher Grimm, KS
Harry And Michael Gudenkauf, KS
Marda Gudenkauf, KS
Richard Hagedorn, KS
Jim Hall, KS
Deeanna And Robert Halling, KS
Kelly E. Hanranhan, KS
Loretta And Harold Harter, KS
Diane And Larry Hasenkamp, KS
Melvin Haug, KS
Mary And Russel Haverkamp, KS
Marlene & Timothy Haverkamp, KS
John Haverkamp, KS
George Haverkamp, KS
Arlene And Lillis Haverkamp, KS
Edward Hawkins, KS
Bruce Heiman, KS
Jim Heiman, KS
Gilbert And Janice Heiman, KS
Virgil Heinen, KS
Harold Heinen, KS
Emma Heiniger, KS
Eugenia Heinricken Schwart, KS
Glenn And Linda Hennigan, KS
Ilene Henning, KS
Glenn Henningan, KS
Lynn Hermesch, KS
Clifford Hett, KS

Kansas (cont.)

Willard Hett, KS
Amaryllis Holloway, KS
Lynn Holthaus, KS
Arlyn And Joan Holthaus, KS
Kevin Holthaus, KS
Helen And James Hopkins, KS
Carol Hughes, KS
Francis And Stephanie Hulsing, KS
Neal Jacobsen, KS
Delmar And Janice Jaden, KS
Gladys And Harold Jahnke, KS
Dirk Jamvold, KS
Howard Jensen, KS
Ronald Johnson, KS
Craig And Douglas Johnson, KS
Steven Jones, KS
Earl Jones, KS
Damon And Judith Jones, KS
Al Jones, KS
Gerald Joyce, KS
Gary Kabriel, KS
Dave Katz, KS
Keim Family, KS
Norman Kenworthy, KS
Ray Kessler, KS
John Kiehnhoff, KS
Mark Kiehnhoff, KS
Friedrich Klaus, KS
Barbara And Clifford Klein, KS
Rick Klein, KS
Marvin Kleppe, KS
Bernard Klover, KS
John Knudson, KS
Carol Koch, KS
Kenneth Koch, KS
Fred Kopp, KS
John Koppes, KS
Nick Kosar, KS

PRIVATE LANDOWNERS (CONTINUED)

Kansas (cont.)	Kansas (cont.)	Kansas (cont.)
Sue Kosar, KS	Terry Montgomery, KS	Twila Rector, KS
John And Madeline Kramer, KS	Lucian Iii And Ruth Moore, KS	David Rector, KS
Elaine Kramer, KS	Caroline Mulhern, KS	Steven Rector, KS
Keith Kramer, KS	Lawrence Mulhern, KS	Amy Rengstorf, KS
Janice Krogman, KS	Patt Murphy, KS	Todd Rengstorf, KS
Diane Krogmann, KS	John Myers, KS	Carol Renyer, KS
Joshua Krogmann, KS	Kathleen Myers, KS	Greg Renyer, KS
Willis Kuhnert, KS	Lewis Myers, KS	Barbara Ricklefs, KS
Sharon Lackey, KS	Larry Nelson, KS	Bonnie Ricklefs, KS
Eula Larmore, KS	Nancy Nelson, KS	Ronald Ricklefs, KS
Laverentz Estate Trust, KS	Charles Nimtz, KS	Ringen W E & D E Family Trust, KS
Yvonne Lee, KS	Joan Nimtz, KS	Anita Rockey, KS
Tyler Lienemann, KS	Larry Nolte, KS	Dwight Rockey, KS
Gail Lierz, KS	Ruby Nolte, KS	Douglas Rodvelt, KS
Lynn Lierz, KS	Don Nye, KS	Alvin Roggenkamp, KS
Douglas Linkugel, KS	Kent Obermeyer, KS	Donald Roggenkamp, KS
Joyce Loe, KS	Loallen Obermeyer, KS	Ruth Rohmeyer, KS
Carroll Loyd, KS	Betty & Lawrence Olberding, KS	Larry Rohrer, KS
Evelyn Loyd, KS	Olberding Family, KS	Theresa Rohrer, KS
Shawn Loyd, KS	Jack Oldridge, KS	Allen Rokey, KS
John And Mavis Lucas, KS	Leola Oldridge, KS	Glenda Rokey, KS
Patricia Lukert, KS	Robert Oltjen, KS	Delinda Rosenberger, KS
Rick Lukert, KS	Shaun O'neil, KS	Randall Rosenberger, KS
Henry Macke, KS	Kevin O'neil, KS	June Rottinghaus, KS
Mary Macke, KS	Arlene Payne, KS	Walter Rottinghaus, KS
Linda Madzey, KS	Gerald Payne, KS	John Rottinghaus, KS
Bob Mayfields, KS	Merle Pech, KS	Mary Rottinghaus, KS
Donald And Elizabeth Meng, KS	Kim Petr, KS	David And Jan Rottinghaus, KS
John Meyburnn, KS	Richard Petr, KS	Daniel Rottinghaus, KS
Dwight Meyer, KS	Diane And Dow Pierce, KS	Thomas Rottinghaus, KS
Allen Meyer, KS	Jesse Pierce, KS	Eileen Rottinghaus, KS
Alice Meyer, KS	Michelle Pierce, KS	Leonard Rottinghaus, KS
Kenneth Meyer, KS	Richard Sr Piper, KS	James Ruddy, KS
John Meyer, KS	John Pollard, KS	Mary Ruddy, KS
Donald And Marcelline Meyer, KS	Mary Pollard, KS	Victoria Rudolph, KS
James Meyer, KS	Glenn Potts, KS	Kathryn Rueger, KS
Julie Meyer, KS	Marjorie Potts, KS	John Rueger, KS
Todd Miller, KS	Jeanette Prebyl, KS	Linda Rueger, KS
Leo Mohrman, KS	John Prebyl, KS	Elsie Ruhnke, KS

PRIVATE LANDOWNERS (CONTINUED)

Kansas (cont.)

Wayne Rush, KS
Danny Rush, KS
Alice Sauer, KS
Leroy Sauer, KS
James Sauer, KS
Douglas Schaefer, KS
Tamara Schaefer, KS
Charlet Schaible, KS
John Jr Schilling, KS
Vera Schilling, KS
Larry Schlesener, KS
Nola Schmidt, KS
Dorothy Schmitt, KS
Michael Schmitt, KS
Kenneth Schmitz, KS
Larry Schmitz, KS
Gilbert Schmitz, KS
Scott Schotte, KS
Kevin Schotte, KS
Kathleen Schraad, KS
John Schraade, KS
Marion Schuetz, KS
Schumann Family Trust, KS
Scoby Family, KS
Michael Scott, KS
Scott Family, KS
William Sechler, KS
Howard Sechler, KS
Wanda Sedlacek, KS
Ella Sedlacek Talbot, KS
Ken Shrivers, KS
Douglas Sibold, KS
Duane And Bonnie Slingsby, KS
Ron Smith, KS
Justin Smith, KS
Shanna Smith, KS
James Spellimeier, KS
Melba Spoo, KS

Kansas (cont.)

Robert Stallbaumer, KS
Sandra Stallbaumer, KS
Charles Staudenmaier, KS
Paul Staudenmaier, KS
Rebecca Steele, KS
Darrel Stoller, KS
Gloria Stoller, KS
Thomas Strahm, KS
Trent Strahm, KS
Dean Sudbeck, KS
Julie Sudbeck, KS
Betty Sudbeck, KS
Richard Sudbeck, KS
Helen Sumner, KS
Bernard&Tamara Sunnenberg, KS
Gerald Sylvester, KS
Sylvester Family, KS
Merton Talbot, KS
Leroy And Sharon Tangeman, KS
The Wm H Myers Trust, KS
Eldon Thomsen, KS
Delmer Toaden, KS
Ryan Toaden, KS
Matt Tollefson, KS
Lester Trentman, KS
Brett Trentman, KS
Patrick Urban, KS
Robert Van Epps, KS
Charlene Versch, KS
Loren And Norman Volle, KS
Martin Volle, KS
Ray Vonderschmidt, KS
Tracy Vonderschmidt, KS
Galen Walters, KS
Vickie Walters, KS
Riley Walters, KS
Wassenberg Family, KS
Donald Werner, KS

Kansas (cont.)

Stephanie Werner, KS
Dortha And Leslie Wikle, KS
Dale And Karla Williams, KS
Rodney Wilson, KS
Kenneth Wood, KS
Janet Woolsoncroft, KS
Jim And Kathy Yarrow, KS
Donald And Patsy Yaussi, KS
Ira L. Penner, KS

Kentucky

Gruber Family, KY

Louisiana

Lee-Roy Madison, LA

Maryland

Bateson Family, MD

Massachusetts

Ed Hoeckelmann, MA

Maine

Lucille Huber, ME
Patricio Mujica, ME
Veronica Mujica, ME

Minnesota

Duane Brodersen, MN
Anna Mae Broton, MN
Lars Conway, MN
Nicholas Delaney, MN
Paul Eberth, MN
Dorothy And Norman Evers, MN
Brent And Gail Fox, MN
Sharon Frank, MN
Virginia Froemke, MN
Charles & Kathleen Hentzen, MN
David Highness, MN
Alice And Maryann Hjelmstad, MN
Hott Family, MN
Alma And Donald Huber, MN
Marlene Johnson, MN
Frances Lingen, MN

PRIVATE LANDOWNERS (CONTINUED)

Minnesota (cont.)

Cecilia Lysne, MN
Michael Mueller, MN
Joan Odney, MN
Phyllis Petersen, MN
Norbert Rusch, MN
Tom Sandhei, MN
Lloyd Schmidt, MN
Paul Sticha, MN
Gladys Stromberg, MN
Sheryl Sutliff, MN
Linda Thomson, MN
Dan Urness, MN
Julie Urness, MN
James Venaas, MN
Frances Voss, MN
Janene Wandersee, MN
Nathan Wandersee, MN
Thomas Williams, MN
Douglas Wulf, MN
Joyce Wulf, MN

Missouri

John Abbott, MO
Linda (S) Adams, MO
Lois Adcock, MO
Dennis And Karen Ahal, MO
Michael And Phyllis Aley, MO
Beulah And Taylor Alkire, MO
Barbara And Charles Allard, MO
Kizziah Allen, MO
Brian Allen-Modnr, MO
Joan/John Andrzejewski, MO
Robert Angel, MO
Arthur H. Burkemper Trust, MO
Dennis Asbury, MO
Sammie Asbury, MO
Richard Aulbur, MO
James Babcock, MO
Debra And Douglas Bachtel, MO
James And June Bachtel, MO
Joan And Mark Backowski, MO
Catherine And Terry Bagby, MO
Jane And Kenneth Baker, MO
Richard Baldwin, MO
Melany Ballard, MO
John Bamberger, MO
Guy Barber, MO

Missouri (cont.)

Glenda Barnes, MO
Carol And Wayne Barnett, MO
Clarence Jr And Lorraine Barringer, MO
Sara Baskett, MO
Debbie And Ted Bauer, MO
Jesse And Terri Bauer, MO
Edwin And Harriet Bauer, MO
David Baugh, MO
Mark Baugh, MO
John And Margaret Beamon, MO
Erma Beasley, MO
Michael Beasley, MO
Eileen Beck, MO
Richard And Rita Beckman, MO
Jane Beetem, MO
Jeff And Vickie Bell, MO
Gregory And Karen Bell, MO
Roy Benne, MO
Brenda And Curtis Bennett, MO
Margo And Robert Benoit, MO
Floyd And Pamela Benson, MO
Charles And Martha Bentley, MO
Louise Bequette, MO
Diane And Mark Berkowitz, MO
Mark Bertels, MO
Stan And Edith Beumer, MO
Francis And Terry Biron, MO
Karen Blake, MO
Amanda And Edwin Blasé, MO
Mary And William Blaue, MO
William Blaue, MO
Adam And Nancy Blaue, MO
Eunice Blunk, MO
Glen F. Blunk, MO
Mary Forsythe & Bob Roberts, MO
Keith Bodenhausen, MO
Linda/Vance Bodenhausen, MO
Mary Bodenhausen, MO
Henry/Viola Boeckelman, MO
Jerry Boeger, MO
Boerding, MO
Sam Boerding, MO
Jim Boerding, MO
Boerding Family, MO
Cathy And Lane Bond, MO
Cathy And Wayne Bondy, MO
Alfred Jr Bondy, MO

Missouri (cont.)

Robert Bonney Sr., MO
Phyllis Bontz, MO
Theodore Borgmeyer, MO
Katie And Levi Borntrager, MO
Lydia And Moses Borntrager, MO
M Bryan Boschert, MO
Margaret And Meredith Boschert, MO
Monica Boschert, MO
Kenton & Victoria Boschert, MO
David Boschert, MO
Ray Boschert, MO
Mathilda Boschert, MO
James And Sally Bouril, MO
Craig And Rodd Boyer, MO
Jennifer Boyston, MO
June And Aubrey Bradley Jr, MO
Ronnie And Stella Brandow, MO
William Brandow, MO
Tony Brass, MO
George Braungardt, MO
Beverly And Victor Brewer, MO
Cheryl And George, Jr Bright, MO
Bonita And Todd Bristow, MO
Bettie And Samuel Britts, MO
Lorene Brokaw, MO
Michael Brooke, MO
William Brooke, MO
Carol And Charles Brown, MO
Adam And Herb Brown, MO
Juanita Brown, MO
Barbara And David Brown, MO
Brown Family Rev.Living Trust, MO
Garrison And Hazel Bruce, MO
Gary Bruce, MO
Ralph Bruce, MO
William Brunscher, MO
James Brunscher, MO
Brunstein Family, MO
Mary/Thomas Buckman, MO
Marshall Buder, MO
Ann And John Buehler, MO
Richard Buenemann, MO
Dorothy/James Burkemper, MO
Melvin Burkemper, MO
Christian/Virginia Burkemper, MO
Delbert/Patsy Burkemper, MO
Ernest Burkemper, MO

PRIVATE LANDOWNERS (CONTINUED)

Missouri (cont.)

Joyce Burnett, MO
Margret Burns, MO
Janice And Stuart Burnside, MO
Adolphus Busch, MO
Dixie And Leland Byrns, MO
Cathy And Harold Cannon, MO
Carol And Terry Carder, MO
Deborah And John Carey, MO
Karen Cargill, MO
Robert & Vernadeane Carroll, MO
Signa Carter, MO
Elizabeth And Marc Carter, MO
Donald Castillon, MO
Amanda And Rebecca Cato, MO
Chambers Family, MO
Alice And Ray Chastain, MO
Betty And Robert Chowning, MO
Esther&Franklin Christner Jr, MO
John Christopher, MO
Landfill Div.,City Of St Joseph, MO
Jerry Clem, MO
Blake Clevenger, MO
Carol And Rodney Clevenger, MO
Bobby And Jill Clevenger, MO
Rodney L. Clevenger, MO
Clevenger Family, MO
Herb Cochran, MO
Dixie And Michael Cochran, MO
Elisie Cockrell, MO
Helen Coe, MO
Helga And James Collier, MO
Gayel And Shirley Colliver, MO
Cook Family, MO
Dusti And Jamie Cooke, MO
Jason And Wendy Cooley, MO
Mary Cowie, MO
Jamie Cox, MO
Leland Cox, MO
Mike Craven, MO
Mary Creason, MO
Elaine And James Creech, MO
Betty Creech, MO
Floyd Cronen, MO
Jimmy And Vivian Crose, MO

Missouri (cont.)

Virginia Crouse, MO
Carol Crouser, MO
Debra And Mark Crow, MO
Luetta Crowley, MO
Luetta M. Crowly, MO
Jerry And Neta Crutchfield, MO
James Culwell Jr, MO
Darrell Curless, MO
Barbara And James Curp, MO
Billy And Delores Dameron, MO
Jill Daugherty, MO
John Daugherty, MO
Marie Daughtery, MO
Lorena & Robert Davenport, MO
Nancy Davenport, MO
Donald Davidson, MO
Dennis And Rita Davidson, MO
Bradley Davidson, MO
Harley Davidson, MO
Dennis Davidson, MO
David L. Davies, MO
Davies Family, MO
Chad Davis, MO
Brian Davis, MO
Rebecca Day, MO
Goldie Decker, MO
Lucy And William Deimeke, MO
Clarence And Janis Deimeke, MO
Standley Deloroese, MO
Amber And Todd Deornellis, MO
Jean And Millard Deshon, MO
Cathy And Edmond Deuser, MO
Brenda And Lynn Dickherber, MO
David And Thomas Doak, MO
Joseph Jr. Doll, MO
Wendy Donahue, MO
Harold And Roberta Dooley, MO
Ralph Dooley, MO
Marilyn And Terry Doss, MO
James & Darlene Dougherty, MO
Donald Ii Dowell, MO
Thomas Downs, MO
Rachel Doyle, MO
Robert Dreier, MO

Missouri (cont.)

Angela Drew, MO
Joseph And Sheila Driver, MO
Mary And William Dubbert, MO
Norbert Dubbert, MO
Harold And Mildred Dubbert, MO
Emily And Paul Dudley, MO
John Jr Duncan, MO
Jeanne Dunkmann, MO
Darrell Dunkmann, MO
Sue Durrett, MO
Josphine And Oliver Dwiggins, MO
Donald And Mary Dyer, MO
Mary And Thomas Dyer, MO
William And Catherine Dyer, MO
Jean Dyer, MO
Donald Eads, MO
Brian Easley, MO
Anna And William Eaton, MO
William Eddins Jr, MO
Beverly And James Edwards, MO
Mary Edwards, MO
Eva And Harold Eiken, MO
Mary Ell, MO
John And Victoria Elliott, MO
Barbara And Robert Elliott, MO
Carol And Howard, Jr. Elmore, MO
Michael And Tammy Elms, MO
Rodney Elms, MO
Darla Hall Emmendorfer, MO
Susie Emmerich, MO
Denise And Randy Evans, MO
M Kay And Richard Evans, MO
Donald And Teresa Evans, MO
Mary And David Sr. Evans, MO
Barbara And William Fairchild, MO
David And Michael Farley, MO
Fay Family, MO
Charles And Nellie Fecht, MO
Fred And Mary Fennewald, MO
Cynthia Fennewald, MO
Fennewald Family, MO
David And Mary Fickess, MO
Lorene And Paul Fickess, MO
Bob Fiese, MO

PRIVATE LANDOWNERS (CONTINUED)

Missouri (cont.)	Missouri (cont.)	Missouri (cont.)
Carl And Laverne Fisher, MO	Wayne Grable, MO	Samuel Hartman, MO
Carl Fisher, MO	Lynn And William Green, MO	Charles And Paula Hartmann, MO
Leda Fletcher, MO	Catina Green, MO	Carolyn And Donald Hatfield, MO
Gerald Fletcher, MO	Velma And Walter Green, MO	Lucille Hatton, MO
Floyd Belot Trust, MO	Patricia And Ralph Grier, MO	Lucille H. Hatton, MO
Jerry Flynn, MO	Hazel Griffin, MO	Cynthia And Kim Haverstick, MO
Selma Flynn, MO	Ida And Robert Griffin, MO	Bill Hayes, MO
Alice Flynn, MO	Thomas Jr Griffin, MO	Alida And Raymond Hayes, MO
Michael Flynn, MO	Frances Grotjan, MO	Carla And Glenn Hayes, MO
Catherine Forsyth, MO	Deborah And Joseph Gully, MO	Hayes Family Land Trust, MO
Keith Forsyth, MO	Marlene Haarmann, MO	Marlene Heislen, MO
Mary Forsythe, MO	John Hagemier, MO	Lorraine Heitmann, MO
Joyce And Robert Frakes, MO	Michael Hagen, MO	Mary And Michael Held, MO
Julie And Timothy Frazier, MO	John Haines, MO	Helmich Marital Trust, MO
Charles Freie, MO	Michael And Wanda Hale, MO	Charlotte Henderson, MO
Dennis And Patsy Freise, MO	Geraldine Hales, MO	Mary And Orville Hendricker, MO
Edward And Maryann Freise, MO	Russell And Shirley Hall, MO	Alberta And Kenneth Henebry, MO
Dean And Shirley Friedli, MO	Darren And Kathy Hall, MO	Donald And June Henebry, MO
Sylvia Friesz, MO	Nancy Hall, MO	Marvin Henke, MO
Gerald And Judith Friesz, MO	Everett And Janice Hall, MO	Jean And Wilfred Henke, MO
Donald Friesz, MO	Robert Halsey, MO	Dennis And Lebrinda Henke, MO
Dan Froneyberger, MO	Lucinda And Richard Ham, MO	Mary And Ralph Henke, MO
Jerry Fuemmeler, MO	Marcella & Thomas Handsome, MO	Fred And Patricia Henke, MO
Robert Gaateke, MO	Rhonda And Ronald Haney, MO	Larry Henke, MO
John Gall, MO	Carolyn And George Hanke, MO	Charles Henke, MO
Jean And Virgil Gentry, MO	Vincent Hanke, MO	Joni And Timothy Henry, MO
Robert Gerardy, MO	Shirley Har, MO	Mary And Gary Henry, MO
Chris Gieseker, MO	Michael/Wendy Hardman, MO	Bob Henry, MO
Lawrence Gieseker, MO	Carl And Dorothy Harke, MO	Gary Henry, MO
Cathy /Timothy Gieseker, MO	Betty Harke, MO	Jack And Shirley Hickerson, MO
Charles And Linda Gilman, MO	Eugene/Patricia Harmon, MO	Maxwell And Paula Hicks, MO
Andrew/Clara Gingerich, MO	Dwight And Leo Harper, MO	James Hicks, MO
Chrissie And Fannie Gingerich, MO	Evelyn Harper, MO	Karen/Matt Higginbothom, MO
Donald And Sandra Goeke, MO	Dwight Harper, MO	Justin Hill, MO
Dennis Goeke, MO	Victor Harrell, MO	Jason And Sherry Hill, MO
Dorothy Golden, MO	John Jr. And Sheri Harter, MO	Charles & Margaret Hinchey, MO

PRIVATE LANDOWNERS (CONTINUED)

Missouri (cont.)	Missouri (cont.)	Missouri (cont.)
Willard Hoagland, MO	Barbara And Delano Jones, MO	Charles Kline, MO
Dean And Steve Hobbs, MO	Michael Jones, MO	Sara Kline, MO
Dean Hobbs, MO	Christina And John Jones, MO	Ann Kline, MO
Frances (Buck) Hoeckelmann, MO	Adrian And Alfred Jones, MO	Dennis Kline, MO
Dennis Hoelting, MO	Karla And Russell Jones, MO	Linda Kluner, MO
Judith And Paul Hoer, MO	Rogers Jones, MO	Julie Knocke, MO
Carl Hoerman, MO	Bryce Jones, MO	Kevin Knocke, MO
Leila Holaday, MO	Alfredjones, MO	Dorothy Knox, MO
Daniel Hollaway, MO	Mehrdad Jou, MO	Mary Knox, MO
George And Vickie Holmes, MO	Charles/Joann Jungermann, MO	Orvie Knox, MO
Jack Holt, MO	Charles And Joan Kahler, MO	Helen Knutter, MO
Samuel And Stanley Hoover, MO	Kaiser Family, MO	Jody Knutter, MO
Paul Horner, MO	Leonard Kaplan, MO	Robin Knutter, MO
Sue Hughes, MO	Leola/Wallace Keeteman, MO	Harold Koch, MO
Constance & Kenneth Hulett, MO	Michael Keeven, MO	Pauline Koch, MO
Adelaide Huncker, MO	Kehoe Family, MO	W. Koch, MO
Ronald Hundley, MO	Micheael And Donna Kelley, MO	Diana Koshinski, MO
Edward Hunker, MO	Jay And Ronda Kelly, MO	Herbert Koshinski, MO
Brian And Vickie Hunt, MO	Kelly Family, MO	Robert Kottman, MO
Kenneth Hutchinson, MO	Anitasue/RayMOnd Kern, MO	Sandra Kottman, MO
Hildred Hutchinson, MO	Billie And Kenneth Kerpash, MO	Mary Ann Krauss, MO
Marvin Hutchinson, MO	Michael Kersey, MO	Dorothy Kretzer, MO
Fred And Linda Hyde, MO	Bernard And Dorothy Kertz, MO	Ronald Kretzer, MO
Phillip And Sandra Iman, MO	Clifton Kieffer, MO	John Kretzer, MO
Donna And Kenneth Inglis, MO	Wilma Kieffer, MO	Marsha Kretzer, MO
Betty And Donald Sr Ireland, MO	Susan Kilpatrick, MO	Joseph Kroner, MO
Donald And Betty Ireland, MO	Delores King, MO	Rose Kroner, MO
Betty Isgrig, MO	Max King, MO	Henry Kruessel, MO
Claude And Judy Jacobs, MO	Vernon King, MO	Gerald Kruse, MO
Nancy James, MO	Dorothy King, MO	Wilma Kruse, MO
Brenda And James Janecek, MO	Gary King, MO	Berniece And Ernest Kunkel, MO
Dorothy And Robert Janitch, MO	John Kirchhoff, MO	Bernice Lang, MO
Jarman Family, MO	Pauline Kirchhoff, MO	Frederick Lang, MO
Jeannie Jenkins, MO	Katherine Kirschner, MO	Dixon Leamer, MO
John And Linda Johnson, MO	George Kirschner, MO	Malissa Lee, MO
Nadine And Rick Johnson, MO	Phillip Kirschner, MO	Duane And Sandra Lee, MO
Leonard Johnson, MO	Earl Jr Kirschner, MO	Connie Leeson, MO
Johnson Family, MO	Charles Kleinsorge, MO	Robert Leeson, MO
Sidney Johnson Jr, MO	Lois And Mary Kline, MO	Huge Lehnen, MO

PRIVATE LANDOWNERS (CONTINUED)

Missouri (cont.)

Dennis And Judith Lehnen, MO
Loretta Lemkemann, MO
Nicholas Lemkemann, MO
Leighton Lester, MO
Helen Lester, MO
Randy Lester, MO
Vickie Lewis, MO
Mark Lewis, MO
Pamela Lewis, MO
John And Rose Leykamp, MO
Julie Libich, MO
William Libich, MO
Brad Libich, MO
Glenda Jane Liday, MO
Carol Lienemann, MO
David Lierheimer, MO
E Lierheimer, MO
Edna Lierheimer, MO
Kenneth Lierheimer, MO
Daniel Lierheimer, MO
Charles Lindsey, MO
Claron Lingo, MO
Mary Lingo, MO
Gerald Link, MO
Martha Link, MO
Deborah Link Gorman, MO
Evelyn Linneman, MO
Roger Linneman, MO
Littleton Family, MO
Patricia Livingston, MO
Larry Livingston, MO
Molly Livingston, MO
Charlotte Lock, MO
Emma Logsdon, MO
John Logsdon, MO
Clay Long, MO
Teresa Long, MO
Ricky Loubey, MO

Missouri (cont.)

Tammy Loubey, MO
Stevelove, MO
Tracy Loveland, MO
Elizabeth Lowry, MO
Charles Lucas, MO
Francis Lyon, MO
Gwendonline Lyon, MO
Mary Maasdam, MO
Robert Maasdam, MO
Gary Machens, MO
Aloysius Machens, MO
Joan/Raymond Machens, MO
Dewayne Machens, MO
Tricia Machens, MO
Margaret/Thomas Machens, MO
Evelyn Mackey, MO
Orma Mackey, Jr, MO
Ron Maddison, MO
Brian Maenner, MO
Jennifer Maenner, MO
Dorothy Mallory, MO
Howard Mallory, MO
Norman Mallory, MO
Alvin Malott, MO
Emily Mangano, MO
Gino Mangano, MO
Robert Manion, MO
Larry Mann, MO
Sandra Mann, MO
Anne Manns, MO
Robert Manns, MO
Joleen Manson, MO
Joseph Manson, MO
Ann Manson, MO
Billy Dale Marcell, MO
Glenna Marceli, MO
Joyce And Kenneth Marcum, MO
William Marple, MO

Missouri (cont.)

Mary Marple, MO
Kimyla Martin, MO
Michael Martin, MO
Donna Martin, MO
Harvey Martin, MO
James Martin, MO
Joan Martin, MO
Dennis Martin, MO
Earl Martin, MO
Frank Martinek, MO
Jeaniemaskill, MO
Helmi Mason, MO
Norbert Mason, MO
Franz Mayer, MO
Curtis/Gwendolyn Mayes, MO
Terry Mc Clatchey, MO
David Mc Knight, MO
Alpha Mc Queen, MO
Larry Mc Queen, MO
James McAfee, MO
Mary McBee, MO
Jay McBee, MO
Stephen McBee, MO
Robert McBee, MO
John McCoy, MO
Wanda McCoy, MO
William McCumber, MO
Kenneth/Stacey McCune, MO
Linda And Ronald McElwee, MO
McGrath Living Trust, MO
Tim McHugh, MO
Charles McKeown, MO
Mary McKeown, MO
Bonnie McKeown, MO
Roger McPheeters, MO
Daniel McReynolds, MO
David McReynolds, MO
Mark McReynolds, MO

PRIVATE LANDOWNERS (CONTINUED)

Missouri (cont.)

Michelle McReynolds, MO
Nellie Jo Mcwilliams Miller, MO
Mary Mead, MO
Carol Meierotto, MO
Dennis Meierotto, MO
Ryan Mellon, MO
Sarah Mellon, MO
George Melson, MO
Mary Melson, MO
Michael Meoli, MO
Sharon Meoli, MO
Alfred Meyer, MO
Carole Meyer, MO
Scott Meyer, MO
Robert Meyer, MO
Ruth Meyer, MO
Francis Meyer, MO
Walter Meyer, MO
Clarence Meyer, MO
Laura Meyer, MO
Alen Michalik, MO
Carol Michalik, MO
Leona Midyett, MO
James Miljavac, MO
Ervin And Lydia Miller, MO
Levi And Sara Miller, MO
Eli And Susie Miller, MO
Levi And Lizzie Miller, MO
Emma And Noah Miller, MO
Levi Miller, MO
Millie Miller, MO
Nellie Miller, MO
Martha Minner, MO
Stanley Mintert, MO
Michael And Stanley Mintert, MO
Dorothy Mintert, MO
Joseph Mintert, MO
Bernard Mintert, MO
Mary Mintert, MO
Charles Mintert, Mo

Missouri (cont.)

Michelle And Robert Mittler, Mo
Albert And Diana Monteil, MO
Carolyn And John Mooney, MO
Dearl And Linda MOore, MO
Maurice Moore, MO
Charles Jr./Lurlye Moore, MO
Charles And Susan Moore , MO
Gwenda Moose, MO
Dale Sr Morris, MO
Joan MOrris, MO
James Morris, MO
James Mott, MO
Lester Mount, MO
Roger Mudd, MO
Dale Mudd, MO
Lorenz Mueller Iii, MO
Arthur Muensterman, MO
Pamela Muensterman, MO
Pat Mujica, MO
John Myers, MO
Rochelle Myers, MO
Melvin Jr Neustadt, MO
Violet Neustadt, MO
Patsy Newton, MO
James Niederschulte, MO
Ellen Niemeyer, MO
William Niemeyer, MO
Arnold Nixon, MO
Laura And Wesley Norton, MO
Benjamin Nothstine, MO
Charla Nothstine, MO
Dan O'connor, MO
Grace Odell, MO
Olin Oden, MO
Shirlie Ogle, MO
O'neal Family, MO
Henry Orf, MO
Susanne Orf, MO
Katherine Owings, Mo

Missouri (cont.)

Tom Ossmann, MO
Ostrander Family, MO
Mickey Owen, Mo
Douglas Owsley, MO
Ralph Parker, MO
Edwin Parker, MO
Patricia Parket, MO
Larry Parrish, MO
Mary Parrish, MO
Paula Patient, MO
Barry Patton, MO
Anita Patton, MO
Faye Pavelka, MO
James Payne, MO
Kendra Payne Mcgill, MO
Camille Peasel, MO
Daniel Peasel, MO
Peasel Family, MO
Cliff Perry, MO
Robert Peters, MO
Robert Peters, MO
Helen And Larry Peters, MO
Eli Petersheim, MO
Mary Petersheim, MO
Kristine Pettet, MO
Janice Pettet, MO
Allen Piles, MO
Jason Piper, MO
Gerald Pittman, MO
Mike Pitts, MO
Helen Pitts, MO
John Pitts, MO
Michael Platte, MO
Duane And Penny Plotner, MO
Eunice Poggemeiek, MO
Jeanne And Michael Pollard, MO
Barbara (S) Porter, MO
Marcella Post, MO
Virgil Post, MO
Fredrick Potter, MO

PRIVATE LANDOWNERS (CONTINUED)

Missouri (cont.)	Missouri (cont.)	Missouri (cont.)
City of Salisbury Potts Mem.Pk, MO	Marian Richardson, MO	Van Sr. Samuels, MO
Nellie Powell, MO	Eric Ridenhour, MO	Howard Sanders, MO
John Prinster, MO	Lisa Ridenhour, MO	Clemens Sauter Iii, MO
Bonnie Prinster, MO	Ollie Riggs, MO	Patricia Sauter, MO
Phillip Prinster, MO	Bob Roberts, MO	Mary Sauter, MO
Clarance Prinster, MO	Alan Rock, MO	Vernon Sauter, MO
Prinster Family Trust, MO	James And Janet Rock, MO	Patricia Scavada, MO
Doyle Proctor, MO	Myrna Rodgers, MO	Janice Schafer, MO
Lela Proctor, MO	Barbara Roe, MO	Richard Schafer, MO
Bobbie Propes, MO	Richard Roe, MO	Mike Schaper, MO
Cynthia Propes, MO	Linda Rogers, MO	Elenore Schewe, MO
David Propes, MO	William Rogers, MO	Carolyn & Clem Schlueter Jr, MO
Lillian Propes, MO	Earl Rogers, MO	Schmitz Family, MO
Joe Prouhet, MO	David And Debbie Roling, MO	Janet Schroeder, MO
Wilma Punzo, MO	Carolyn Romine, MO	Linda And Roger Schroeder, MO
Anthony Punzo, MO	John Romine, MO	James Schuette, MO
Steven Punzo, MO	Richard Rooney, MO	Tina Schuette, MO
Doris Quick, MO	Walter Rooney, MO	Debra Schuette, MO
Teddy Quick, MO	Naomi Rose, MO	Gerald Schuette, MO
Donna Quinlan, MO	Douglas Rose, MO	Betty Schulze, MO
James Quinlan, MO	Kala Rose, MO	James Schulze, MO
Marlene Quinn, MO	Sammie Rose, MO	John Schumacher, MO
Dr George Quinn, MO	Fred Jr Rosenbohm, MO	Marilou Schumacher, MO
John Quinn, MO	Rosenbohm Family, MO	George Schupback, MO
Brenda Rahn, MO	Donald Ross, MO	Jewell & Dorothy Schuster, MO
Curtis Randel, MO	Edna/Marvin Rothermich, MO	Steve Schuster, MO
Richard Reddell, MO	Cal Rowan, MO	Theresa Schuster, MO
David Reddick, MO	Mark Ruether, MO	Ellen Schutte, MO
Mikeal Reichardt, MO	Traci Ruether, MO	Gary Schutte, MO
Matthew Reichert, MO	Karen Runions, MO	Robert Schutte, MO
Shaun Reid, MO	Larry Runions, MO	Lindell Sconce, MO
Kathy Reische, MO	Donna Ruoff, MO	Mary Sconce, MO
Mitchell Reische, MO	David Ruoff, MO	Ron Sconce, MO
Jack Reische, MO	Richard Ryan, MO	Donald Scott, MO
Jane Reynolds, MO	Sandra Ryan, MO	Mildred Scott, MO
W Iv Richards, MO	John Ryan, MO	Catherine Seeburgen Trust, MO
Cecilia Richards, MO	Eugene Ryan, MO	Kathy Seevers, MO
Charles Richardson, MO	Zeta Ryan, MO	Stephen Seevers, MO
Paul Richardson, MO	Norman Saale, MO	Floyd Seidel, MO
Judy Richardson, MO	Marcine Sample, MO	Marilyn Seidel, MO
Keith Richardson, MO	Michael Sample, MO	Felicia Semchee, MO

PRIVATE LANDOWNERS (CONTINUED)

Missouri (cont.)

Thomas Semchee, MO
Carolyn Shaffer, MO
Stanley Shaffer, MO
Ruth Sharp, MO
Scott Sharp, MO
Jace Shea, MO
Jesse Shea, MO
Eugenia Shellabarger, MO
Gene Shellabarger, MO
Douglas Shelton, MO
Donald Shelton, MO
Joy Shelton, MO
Genevieve Sherman, MO
William Sherman, MO
James Shine, MO
Diane Shine, MO
Anna Shire, MO
Philip Shire, MO
Betty Shoemaker, MO
Ben Simmons, MO
Evralean Simmons, MO
Loyd Simpson, MO
Patricia Simpson, MO
Jeffrey Sims, MO
John Sims, MO
Karen Sims, MO
Carl Sloan, MO
Mary Sloan, MO
Helen Sloan, MO
Evelyn Smith, MO
William Smith Jr, MO
Carol And Gerald Smith, MO
Geoffrey Smith, MO
Carl Sneed, MO
Jane Sneed, MO
Jason Snodgrass, MO
Paul Soriano, MO
Willis Speiser, MO
Kathleen Splean, MO
Glennon Sprehe, MO
Sherrie Sprehe, MO
Bob Sprouse, MO

Missouri (cont.)

Paula Sprouse, MO
Edward Spurling, MO
Linda Spurling, MO
George Stallo, MO
Nayna Stallo, MO
George Stamper, MO
Jay Standley, MO
Judith Starvon, MO
Thomas Starvon, MO
James Staub, MO
Nadine Staub, MO
Doris Steiman, MO
Edward Steiman, MO
Mark Steiman, MO
Steinhoff Family, MO
Steinmann Family, MO
Darlene Stephens, MO
Barbara Stephens, MO
Warren Stephens, MO
Donald Stevens, MO
Robert Stewart, MO
Barbara Still, MO
Darrell Still, MO
Mary Stipe, MO
Rosemary Stipe, MO
Stockmor Living Rev.Trust, MO
Jeremy Stone, MO
Lynn Stone, MO
James Stone, MO
Joyce Stone, MO
Beverly Straight, MO
Robert Straight, MO
Gary Stuchlik, MO
Chris Stuckenschnieder, MO
William Sturm, MO
Nancy Sutton, MO
Vivian Swanson, MO
Wayne Swanson, MO
Helen Swartz, MO
Robert Sweany, MO
Daniel Swiney, MO
Lynn Switzer, MO

Missouri (cont.)

Stanley Switzer, MO
Junita Sykes, MO
Mitchell Sykes, MO
Donald Sypkens, MO
Sherri Tarwater, MO
Brent Taylor, MO
Deborah Tayon, MO
Harry Tayon, MO
MOllie Teel, MO
Tony Teel, MO
Jerry Templeton, MO
Kent Templeton, MO
Terri Templeton, MO
Edward Thiel, MO
Carol Thompson, MO
Chad Thompson, MO
Mary Thompson, MO
Bobby Thornhill, MO
Marvalee Toebben, MO
Edward Townsend, MO
Bruce Trammell, MO
Linda Trammell, MO
Anna Trauernicht, MO
James/Rosalie Tregnago, MO
Albert Troyer, MO
Daniel Troyer, MO
Edna Troyer, MO
David Trussel, MO
Bobbie Trussell, MO
Juanita Trussell, MO
Miloney Tunnage, MO
Phillip Tunnage, MO
Anne/Thomas Turnbaugh, MO
Elsie Turnbull, MO
Harold Turnbull, MO
Ivette Turner, MO
Michael Turner, MO
Charles Tutt, MO
Kathy Tutt, MO
Edward Twellman, MO
Joseph Twellman, MO
Elizabeth Twitty, MO

PRIVATE LANDOWNERS (CONTINUED)

Missouri (cont.)

Frank Twitty, MO
Ricky Tyler, MO
Edwin Tyler, MO
Gail Tyler, MO
Candace Tyson, MO
Brenda Underwood, MO
Carol Underwood, MO
Deborah Unternaehrer, MO
Robert Unternaehrer, MO
Mary Vance, MO
Rodney Vance, MO
Philip Vandel, MO
Traci Vandel, MO
Sammy Vaughn, MO
Betty Vaughn, MO
Cleo Vaughn, MO
Norma Vaughn, MO
Ernest And Ritavaughn, MO
Berniece Vitt, MO
James Voss, MO
Tammie Voss, MO
Marleen Waechter, MO
Roy Waechter, MO
Darlene Waggoner, MO
Jeffrey Wagner, MO
Joyce Wagner, MO
Bryce Jr Wagner, MO
Kathy Wagner, MO
Jennifer Walljasper, MO
Melissa Walton, MO
John Watson, MO
Marilyn Watts, MO
Darlene Weakley, MO
Larry Webb, MO
Lee Webb, MO
Catherine Weber, MO
Clemance Weber, MO
Marlyn Weber, MO
Thomas Weber, MO
Beth Weber, MO
John Weber, MO
Leroy Weimer, MO

Missouri (cont.)

Wilma Weimer, MO
Ann Weimer, MO
Randall Weimer, MO
Atheleen Welch, MO
Leila Wemhoff, MO
Vincent Wemhoff, MO
Don And Donna Wemhoff, MO
Merl Wemhoff, MO
Don Wemhoff, MO
Katherine Wenger Owing, MO
James Werner, MO
Samuel Werner, MO
Linda West, MO
Thomas West III, MO
Gracewest, MO
Elaine Westerveld, MO
John Westerveld, MO
Darrell Westhoff, MO
Vicki Westhoff, MO
Helen Westhoff, MO
Harold & Patricia Westhoff, MO
Helen Wheeler, MO
Roger Whetsell, MO
Allen White, MO
Dorothy White, MO
David Whitehead, MO
Billy Whitworth, MO
Jarrotte Whyte, MO
Kelley Whyte, MO
Donna Widmer, MO
Leona Wienhaus, MO
Henery Wienhaus, MO
Marilyn Wienhaus, MO
Karen/Raymond Wilbers, MO
Robert Wilcox, MO
Sandra Wilcox, MO
Margaret Wilcox, MO
Robert Wilcox, MO
Carolyn And Clifford Wilke, MO
Paul Wilke, MO
Wilke Family, MO

Missouri (cont.)

Claude And Hope Wilkinson, MO
Fred & Geneva Willbrand Jr, MO
Laura And Roy Williams, MO
Diane Williams, MO
Michael Williams, MO
Robert Williams, MO
Susan Williams, MO
Angela Williams, MO
Matthew Williams, MO
Arthur Williams, MO
Susan Williams, MO
Rodney Willingham, MO
Annette And James Wilson, MO
Nelson Wilson, MO
Jon Wilson, MO
Derek And Jennifer Wilson, MO
Grace Winberry, MO
Dick And Shirley Windmiller, MO
Ruby Wing, MO
Joseph Wing Jr, MO
Galen Winger, MO
Virginia Winger, MO
Harold/Winnie, MO
Shawn Witkowski, MO
Carol Witte, MO
Donald Witte Sr., MO
Candance Wolfe, MO
John Wolfe, MO
Ruth Woodland, MO
Dorothy Wortmann, MO
John Wortmann, MO
Wright Family, MO
Nancy Wyss, MO
Fannie And Samuel Yoder, MO
James And Debra Young, MO
Barbara/Roosevelt Young Jr, MO
Helen Zeikle, MO
RayMOnd Zeikle, MO
Charles Zeller, MO
Millie Zeller, MO
Sherry Zeller, MO

PRIVATE LANDOWNERS (CONTINUED)

Missouri (cont.)

Nanette Zeysing, MO
Robert Zeysing, MO
E K Zinna, MO
Jane Zinna, MO
Robin Zuroweste, MO
Frederick Zykan, MO
Karen Zykan, MO
Jack Down, MO
John Everly, MO
Haas Family, MO
Leatherman Family, MO
Ringgenberg Family, MO
Thompson Family, MO
Wilson Family, MO
Jason Hill, MO
Ruth King, MO

Montana

Marlis Dodds, MT
Bonnie And Elver Hehn, MT
Charles Johns, MT
Jeanne Smeins, MT
Ronald Smeins, MT

North Carolina

Houser Family, NC

North Dakota

Joe Zahadkha, ND
June Aabye, ND
C. Aafedt, ND
Allen Aarseth, ND
Joann AND Peter Almen, ND
Lenhart Almen, ND
Jacob Andersen, ND
Gary Delaine Anderson, ND
Lee Anderson, ND
Gladys Anderson, ND
Carl Anderson, ND
John Anderson, ND
Beverly Anton, ND
Raymond Banderet, ND
Emil /Mable Banderet, ND
Laurie / Robert Banderet , ND

North Dakota (cont.)

Terri A. Barta, ND
Eleanor Becker, ND
Larry Behm, ND
Charles And Hilda Belanus, ND
James/Teresa Belanus, ND
Therese Benoit Charrier, ND
Darlene Benzel, ND
Clinton/Wayne Bernhoft, ND
Isabella Bertram AND Family, ND
Edward Bessa, ND
Janice B.Bhop, ND
Dennis Bina, ND
Kevin AND Janice Bishop, ND
Gloria Bock, ND
Delores/Larry Bohnenkamp, ND
Kevinbonham, ND
Lars Borgen, ND
Deborah AND James Bosse, ND
Jason Bosse, ND
Ryan Braaten, ND
Timothy Brakke, ND
Timothy A.Brakke, ND
Barbara & Wayne Brandvold, ND
Tricia Breckheim, ND
Perry Brintnell, ND
Dennis Brodina, ND
Anna/ John Broton, ND
Ardell Bruckner, ND
Deborah / John Bruns, ND
Mark Bucher, ND
Lynette Bunn, ND
Jeffrey Bunn, ND
Kathy / Perry Burchill, ND
Burchill Family, ND
Francis Bures, ND
Donna Burton, ND
Shirley Buttke, ND
Christopher /Julie Byron, ND
Mayo Byron, ND
Dwight /Elaine Byron, ND
Eugene AND John Capp, ND

North Dakota (cont.)

Brian Capp, ND
John Capp, ND
Roger/Rosanna Carignan, ND
RaNDy Carignan, ND
Kevin Carlson, ND
Luke Carlson, ND
Dana / Larry Carlson, ND
Dennis Carlson, ND
Jason Carlson, ND
Brandon Cavett, ND
Jolene/Roland Christenson, ND
Floyd AND Patricia Clark, ND
Myron Clauson, ND
Ken Clauson, ND
Myrtis Clauson, ND
Clarice/ William Coit, ND
Marlene AND Royce Dahl, ND
David Dahl, ND
Chuck Damschen, ND
Richard Davis, ND
Dan Delhoyde, ND
Lori Dick, ND
Gaylen / Janna Dick, ND
Dale Dick, ND
Dorothy Ackley Family Trust, ND
Raymond Dunnigan, ND
Rita Dunnigan, ND
Donald Dvorak, ND
Don Dvorak, ND
June /Omer Ellingson, ND
Dee / Terry Ellingson, ND
Ruth Emery, ND
Randy Engquist, ND
Espelien Family, ND
Johnson Farms Family Prtnship, ND
Gapp Family, ND
Longtin Family, ND
Dean / Marvel Fiala, ND
Lindsey Fingarson, ND
John Finstad, ND
Fischer Family, ND

PRIVATE LANDOWNERS (CONTINUED)

Missouri (cont.)

Bernice Flanagan, ND
Darren Fougner, ND
Donald Fougner, ND
Gary Fougner, ND
Bradley Frovarp, ND
Al Fugal, ND
Laverne V Gaarder, ND
Lawrence Gapp, ND
Arthur Gapp, ND
Evelyn GartlaND, ND
Gene Gehrke, ND
Leslie Geir, ND
Jeanette / Ronald Gemmill, ND
Gordon AND Wilma Gemmill, ND
Jeff Gilbertson, ND
Verdell Gilbertson, ND
Donald / Mayvis Gilbertson, ND
Rodney Gilderhus, ND
Norma Gire, ND
Dale AND Peggy Good, ND
Kay Gorder, ND
Brady Paulgrant, ND
Ron Greenmeyer, ND
Ardyce Gregerson, ND
Evelyn / Harlan Grove, ND
Evelyn L.Grove, ND
Tim Haakenson, ND
Myron Hammer, ND
Donna Hannon, ND
Dennishansel, ND
Olga Hanson, ND
Lynelle / Timothy Hanson, ND
Brian Hardy, ND
Penelope Hardy, ND
Hardy Family, ND
Douglas Harris, ND
Jay Harris, ND
Arma Haseleu, ND
Darwin Haugaard, ND
Duane Hayen, ND
Barbara / John Hayen, ND

North Dakota (cont.)

Richard Heck, ND
Carlton / Linda Heck, ND
Scott Heck, ND
Tom Heimbach, ND
Margaret & Randy Hemminger, ND
Aaron Henderson, ND
James Henderson, ND
Paul Henderson, ND
Brian Henderson, ND
Marjorie Herr, ND
Duane Heuchert, ND
James Hillerson, ND
Hillesland Family, ND
Kevin Hodny, ND
Kevinhodny, ND
Russell Hoge, ND
Lynn Holcomb, ND
Eve Holland, ND
Chris Holm, ND
Walter Holm, ND
Holm Family, ND
LiNDa Holmgren, ND
Wallace Horejsi, ND
Larryhoverson, ND
Newton Huffman, ND
Gregory/Sharon Huffman, ND
Bryce Huseby, ND
Brycehuseby, ND
Gary/ Mary Ihry, ND
Neal Ihry, ND
Trevor Jacobsen, ND
Jacobsen Family, ND
Carol Jacobsen, ND
Claudia /James Jacobsen, ND
Darrell / Debbie Jallo, ND
Carol / Harold Jallo, ND
Anton / Kenneth Johansen, ND
John Johnson, ND
Darlene / John Johnson, ND
Mark Johnson, ND

North Dakota (cont.)

Warren Johnson, ND
Valerie / David Johnson, ND
Teresa Johnson, ND
Warren K. Johnson, ND
Junell Jonasson, ND
Den Jorgensen, ND
Marlene Jorgenson, ND
Jerome / Susan Kappenman, ND
Francis S. Karnik, ND
Scott Karnik, ND
Kermit Kaufman, ND
Carla Kelly, ND
Kelly Family, ND
Terry Kempel, ND
Michael Kenyon, ND
Larry / Shirley Kenyon, ND
Ryan Kenyon, ND
Tom K JellaND, ND
Francis K JellaND, ND
Orville K JellaND, ND
Ramona Klein, ND
Cindy Klein, ND
Ramona Klein, ND
Myron Kloster, ND
Todd Knudson, ND
Keith Knudson, ND
Peggy / RaNDall Koch, ND
Josephine/Theodore Koch, ND
Merle Kratochvil, ND
Marie / Linette Kratochvil, ND
Dane / Mary Kreidelcamp, ND
R Krueger, ND
R.C. Krueger, ND
Gregory Kueber, ND
John AND Patsy Kueber, ND
Kelly Kueber, ND
Johnkueber, ND
Jack Lambercht, ND
Jack Lambert, ND
Tom Langemo, ND
Kelly Langle, ND

PRIVATE LANDOWNERS (CONTINUED)

North Dakota (cont.)

Robert Larson, ND
Phyllis Larson, ND
Galen Larson, ND
Larson Family, ND
Jarry Lautt, ND
Lisa Lautt, ND
Craig Law, ND
Wilfred AND Almira Law, ND
James Law Family, ND
John Lawson, ND
Julius Lee, ND
Paul Lee, ND
Debra Letkeman, ND
Alfred LiNDell, ND
Mary LiNDell, ND
Jeanette LiNDsay, ND
Warren LiNDvold, ND
Clint Linstad, ND
Ann Linstad, ND
Merlin Linstad, ND
Duane Lippert, ND
Larry Locken, ND
Phillip Longtin, ND
Corliss Longtin, ND
Roderick Longtin, ND
Gary Lynnes, ND
Eldon Maasjo, ND
Ruth Maasjo, ND
David Maasjo, ND
SaNDra Maasjo, ND
Bonnie AND James Magill, ND
RhoNDa Marshall, ND
Robert Marshall, ND
Paul Mathews, ND
Eugene Mc Mangle, ND
Jean Mc Mangle, ND
Peggy Mcculough, ND
Dave Mcglynn, ND
Eric Meberg, ND
RaNDy Meece, ND
Roger Meece, ND
Robert Meece, ND

North Dakota (cont.)

Charlene Meehl, ND
Chad Melville, ND
Paul Metcalf, ND
Jim Metelmann, ND
Stanley Metelmann, ND
Rodney AND SaNDra Meyer, ND
Jason Meyer, ND
Jerod Meyer, ND
John Mickkelson, ND
Peder Mikkelson, ND
John Mikkelson, ND
Donald Miller, ND
Homer Moffett, ND
Rita Moffett, ND
Hovey Molstad, ND
John Molstad, ND
Pamela AND Thomas Moore, ND
Jay Morgan, ND
Davemunkeby, ND
Munkeby Family, ND
Myrtle Nelson, ND
RaNDy Nelson, ND
Gary Nelson, ND
Sherry Nelson, ND
Constance Nelson-Skoog, ND
Karven Nepstad, ND
Lana Nicholas, ND
Harvey Nicoli, ND
Louis Nicoli, ND
Janet Nicoli, ND
Jerome Noeske, ND
Darrell Nottestad, ND
Ellen Nottestad, ND
Curt Novak, ND
Mark Novak, ND
Janice AND Rodney Nygard, ND
Kim Olson, ND
Tracy Olson, ND
Kenneth Olson, ND
Annalee Olson, ND
Howard Olson, ND
Kenneth Olson, ND

North Dakota (cont.)

Tracy Olson, ND
Kenneth Olson, ND
Annalee Olson, ND
Howard Olson, ND
Kenneth Olson, ND
Lauri Olson, ND
Troy Olson, ND
Cheryl Olson, ND
Harold Olson, ND
William Olson, ND
Robert Olson, ND
Ruth Olson, ND
Colleen Olson, ND
Russel Olson, ND
SimuNDson Orville, ND
Perry Ostmo, ND
Overby Living Trust, ND
George Overn, ND
Karen Overn, ND
LiNDa Palmer, ND
Norma Paulson, ND
Ralph Paulson, ND
Beverly Paulson, ND
Scott Pedersen, ND
Mark Pedersen, ND
Bruce Pedersen, ND
Delaine Peoples, ND
Paul Peoples, ND
Mark Peterson, ND
James P Peterson, ND
Dorothy Peterson, ND
Joel Peterson, ND
Michael Peterson, ND
Warren Peterson, ND
James Peterson, ND
Annella Pfeifer, ND
Loren Pfeifer, ND
Scott Pfeifer, ND
Michael Pithey, ND
Janet Pokrzwinski, ND
Clayton Pokrzywinski, ND
Matt Powers, ND

PRIVATE LANDOWNERS (CONTINUED)

North Dakota (cont.)

F.W.Praska, ND
Earl Priebe, ND
Marline Priebe, ND
Evelyn Pross, ND
Brent Ptacek, ND
RaNDy Ptacek, ND
Donald Quam, ND
Julia Quam, ND
Bruce Ranum, ND
Gladys Ratzlaff, ND
Gary Rodine, ND
Kevin Rodine, ND
Phil Roney, ND
Delores Ronning, ND
Hilmer Ronning, Jr, ND
Esther Rufsvold, ND
Don Rust, ND
Leo Rust, ND
Lee Ruzicka, ND
Allenruzicka, ND
John AND Tammy Sadek, ND
Mclaughlin Samuelson, ND
Opal Samuelson, ND
Jerry SaNDbeck, ND
James SaNDen, ND
RaNDy Schaley, ND
RaNDyschantz, ND
Lynel Schleicher, ND
Michael Schmidt, ND
Erwin Schmidt, ND
Judith Schmidt, ND
Janice Schmidt, ND
Darrell Schroeder, ND
Fred Schroeder, ND
Mary Kayschuh, ND
Carl Schulz, ND
Kenneth Schulz, ND
Norma Schulz, ND
David Schwab, ND
Lori Schwab, ND
Jolene Schwab, ND

North Dakota (cont.)

Michael Schwab, ND
Roger Schwan, ND
Calmer Sebby, ND
Erena Seboe, ND
Jessi Seelye, ND
Ronald Setness, ND
Bruce Shanenko, ND
Greg Shanenko, ND
Jeremy Shanenko, ND
Howard Shelton, ND
LiNDa Shelton, ND
James T. Shirek, ND
Coryshuh, ND
Cecil Sigurdson, ND
Skonseng Family, ND
Delores Smith, ND
Karen AND Tomothy Smith, ND
James Smykowski, ND
Thomas SnortlaND, ND
John Soeby, ND
Mary Soergel, ND
Lillian Solberg, ND
Inez Solseng, ND
Lee/Patricia Sommerland, ND
Tyler Sorby, ND
Paul Speicher, ND
Earl Speicher, ND
Carol Stalheim, ND
Edward Stalheim, ND
Richard Starke, ND
Rosemary Starkson-Conati, ND
Clarence Steffen, ND
Mary Steffen, ND
Todd Stein, ND
Stevens Andrew Family Trust, ND
Stevens Family, ND
Edward Stremick, ND
Marlene Stremick, ND
Myrna Stremick, ND
John SuNDquist, ND
John P.SuNDquist, ND

North Dakota (cont.)

Harold SuNDvor, ND
Helen SuNDvor, ND
Larry Svenningsen, ND
Deborah Svenningsen, ND
Rodd Svenningsen, ND
Howard Svenningsen, ND
Mark Svenningsen, ND
Shirley Svenningsen, ND
Gordon/Ranee Svenningsen, ND
Jody Svenningsen, ND
Arvid Swendseid, ND
Ardis/ Wayne Swendseid, ND
Loren Swenson, ND
Swenson Family, ND
Allen Tennison, ND
Carol Thibeault, ND
Anthony Thilmony, ND
Lloyd Thilmony, ND
Margaret Thilmony, ND
Phyllis Thompson, ND
Ann Thompson, ND
Allan Sr Thompson, ND
Rick Thompson, ND
Charles Thoreson, ND
Debbie Thoreson, ND
Jamie Thorfinnson, ND
David Tingley, ND
Carrie AND Jeff TreNDa, ND
Arlyce TreNDa, ND
Gary Triebold, ND
Barbara Triebold, ND
Herbert Triebold, ND
Arlynn Troftgruben, ND
Charles Troftgruben, ND
Sharon Troftgruben, ND
Scott - Brian Udby, ND
Leo Urlaub, ND
Mary Urlaub, ND
Richard Urness, ND
Loretta VaNDal, ND
Barry Vculek, ND

PRIVATE LANDOWNERS (CONTINUED)

North Dakota (cont.)

Brian Vculek, ND
Bernard/Marlene Vculek, ND
Pearl Vig, ND
Dean Vig, ND
Ben Vig, ND
Emery Visto, ND
Erwin Visto, ND
Bruce Voelker, ND
Debby Vorachek, ND
Urness Vorachek, ND
Mildred Wangen, ND
Cathern Wangen, ND
Jerrywaswick, ND
Todd Whitman, ND
Robert Wiek, ND
Wayne Wiek, ND
Janet AND Stephen Wieser, ND
Janetwieser, ND
Lana/Lenore WiNDinglaND, ND
Marcus Windingland, ND
Steve Winter, ND
Kimberly/Shawn Wittenberg, ND
Jean/Robert Wittenberg, ND
Ralph Wittenberg, ND
Albert Wittenberg, ND
Anton Wixo, ND
Lynn C.Wolff, ND
Leonardwolfgam, ND
Wesleywolfgram, ND
Vaughn Zacharias, ND
Bruce Zacharias, ND
Julie Zellmer, ND
Marla Zidon, ND

Nebraska

Wilma Banahan, NE
Dale Beran, NE
Beran Family, NE
Cumro Family, NE
Graff Family, NE
Hennerberg Family, NE
Koehler Family, NE
Lohmeyer Family, NE
Saathoff Family, NE
Wilson Family, NE
Rhonda Frase, NE
Ervin HenNErberg, NE
Paul Kirby, NE
Ardan Leonard, NE
Donald Pingel, NE
Dean Roelfs, NE
Ron Sasse, NE
Robert Abraham, NE
Doris Achtemeier, NE
Fred Achtemeier, NE
Harlan And Lorna Adam, NE
Gary Aksamit, NE
Russell Albers, NE
Charles Albers, NE
JaNEt Albers, NE
Donald And Marcia Albers, NE
Charles And JaNEtalbers, NE
Floyd/Joyce Albrecht, NE
Angie And Larry Anderson, NE
Marilyn Antons, NE
Arlan Arens, NE
Jeffrey Arens, NE
Marcel Arens, NE
Dennis And Mary Arens, NE
Charlotte Arens, NE
Gerald And JaNEt Arens, NE
Kevin Arens, NE
Alice Augustin, NE
Barbara Bach, NE
Dale And Lucille Bach, NE
Hilda And Marvin Bakenhus, NE
Eldean And Norma Banahan, NE
Eldean Banahan, NE
Arthur And Mureen Bangert, NE
Ardith I Barber, NE
Charles Barber, NE

Nebraska(cont.)

Dorothy And George Barlean, NE
Steven Barlean, NE
Barbara And Tom Barlean, NE
Sam Barlean, NE
Bradleybarrows, NE
Barta Family Ltd Partnrshp, NE
Robert And Wilma Bartels, NE
Eugene/Celestine BartuNEk, NE
Agatha And Earl Baumert, NE
Clinton And DianNE Becker, NE
Dale And Denise Becker, NE
Roger Beckmann, NE
Alvin And Esther Beckmann, NE
Dean And Lana Bell, NE
Darren And Lisa Beller, NE
Bender Family, NE
Shirley And Vernon Beran, NE
Dorothy & Wallace Berchtold, NE
Harold Bergmeier, NE
Harold Bergquist, NE
Bermel Family, NE
Irene/Steve Blankenbaker, NE
Florence/Gilbert Bluhm, NE
Dale Bohac, NE
Bohac Familygrantor Trust Of 2006, NE
Rachel/Robert Bohlken, NE
William Boller, NE
CaroliNE/George Bouc Jr, NE
Carol Bowen, NE
Douglas And Gail Brand, NE
Robert Brandl, NE
Leon Bruhn, NE
Lavern Bugbee, NE
JeaNEtte Bures, NE
Burdette Burkey, NE
Jerry And Susan Burkey, NE
Lori Burton, NE
Donald And Eileen Busboom, NE
Mark And Mona Buschelman, NE

PRIVATE LANDOWNERS (CONTINUED)

Nebraska (cont.)

Tom Jr And Bernice Cantrell, NE
Linda Carlson, NE
Clay/Janice Carskadon Jr, NE
David Cast, NE
Linda Catlin, NE
Lynton Cattau, NE
John Cerny, NE
Darlene/Frankie Charipar, NE
Matthew/Melinda Christensen, NE
John Cisler, NE
Dawid Cisler, NE
Larry And Reta Clark, NE
Ken Codr, NE
Joy Colwell, NE
John And Maureen Coufal, NE
Roger Cutshall, NE
D W & I L Cerveny,2003 Family Trust, NE
James Dallegge, NE
Gordon And Verna Dennis, NE
Jan And Timothy Dewaard, NE
Sandy And Stacy Dieckman, NE
Peter And Ruth Diedrichsen, NE
Carolyn Dietrich, NE
Scott Dietrich, NE
Marjorie Dobesh, NE
Arthur Dobesh, NE
Jarett/Kathleen Doernemann, NE
Kimberly And Rodney Doffin, NE
Robert And Tina Dowling, NE
Bill Dubs, NE
Marcella And Vernon Duis, NE
Lynette/Wayne Duis, NE
Roy East, NE
Jeffrey And Brian Ebberson, NE
Fran And Michael Ebel, NE
Joann Ebel, NE
KenNEth Ebel, NE
Kim Eberspacher, NE

Nebraska (cont.)

Carroll&Margret Berspacher, NE
Eberspacher Family, NE
Margareteberspacker, NE
Kevin Ebke, NE
Robert Ehlers, NE
Leland/Robert Ehrishman, NE
Mark Eiles, NE
Janet/Kenneth Eisenmann, NE
Janet Eisenmann, NE
Chad Eisenmenger, NE
Gayleen And Marvin Ernesti, NE
Shirley Fictum, NE
Cindy And Samuel Fischer, NE
DianNE And Lyle Fittje, NE
John Fleming, NE
Darwin And Gary Franzen, NE
Maynard / Norma Freeouf, NE
Lillian Freese, NE
Leon And Mark Freese, NE
Alida Freese, NE
Robert Freiberg, NE
Richard Frew, NE
Jim Frew, NE
Richard Frew, NE
Curt Friesen, NE
Paul Galter, NE
Norman Gerkensmeyer, NE
NadiNE Glanzer Anderson, NE
Lois And Lowell Glock, NE
DianNE And Reginald Gnirk, NE
Gary Godbersen, NE
James /Thomas Goetz, NE
Barbara Golding, NE
Marleen Gordon, NE
Marvin Grindvold, NE
Alan Gronemeyer, NE
Alan Grotelueschen, NE
Mark Grotelueschen, NE
Eugene/Maxe Grotelueschen, NE

Nebraska (cont.)

Ann And Eldon Gruntorad, NE
Ann Gruntorad, NE
Detta And Walter Gubbels, NE
Randy Gubbels, NE
Ivan And Shirley Gubbels, NE
Donna Gubbels, NE
Gaylord And Netta Gubbels, NE
Richard And Rita Gubbels, NE
Marla Gubbels, NE
Gubbels Family Partnership, NE
Russell Gubbles, NE
John Gubbles, NE
Ed Guirk, NE
Mary Haberman, NE
Dean And Delores Hahn, NE
Allen Hains, NE
John Hajek, NE
August And Elaine Hake, NE
Ken Hamm, NE
Matt Hansen, NE
Deborah / Robbie Harmeier, NE
Dennis Hartman, NE
Deryl Hayek, NE
Esther Heckman, NE
Dona And Jim Heeren, NE
Nancy / Robert Heidemann, NE
Lee Heidemann, NE
EugeNE Heitz, NE
Margaret Hejny, NE
William Helgoth, NE
De Ann Heller, NE
Charles/Wm Hendrickson Rev. Trust, NE
Dennis/Jeanette Hennerberg, NE
Elizabeth/Ervin HenNErberg, NE
NEal Hentzen, NE
Delores Hernandez, NE
Mark Hesser, NE
David Hicks, NE
Robert And Susan Hilger, NE

PRIVATE LANDOWNERS (CONTINUED)

Nebraska (cont.)

Lillian And Lawrence Hillen, NE
Dorothy Hillen, NE
Clara And Gerald Hillmann, NE
Frances /Gerry Hochstein, NE
Bernice/Marilyn Hockman, NE
Gary/Kathrin Hoebelheinrich, NE
Hoebelheinrich Family, NE
Laverne And Sharon Hoeft, NE
Bonnie Hoesing, NE
Gloria Hoesing, NE
Alan Hoesing, NE
Gloria Hoesing, NE
Jack Hoffman, NE
Joe Hoffman, NE
Debra Hoggatt, NE
Merle And Mary Ann Holle, NE
John Holmbeck, NE
Allen Hormandl Sr, NE
Evelyn Hormandl, NE
Dale Hottovy, NE
Lumir Houser, NE
David Houser, NE
Mavis Houser, NE
Viola Hovis, NE
Marjorie Howe, NE
Ronald Hruska, NE
Rita And Timothy Hughes, NE
Jackie Hughes, NE
Karen Huls, NE
Nancy Hunt, NE
Richard Huss, NE
E. And W. Inselman, NE
Myron Inselman, NE
Edwin IrviNE, NE
ChristiNE Janda, NE
Mary And Terry Janke, NE
Byron And Patricia Janke, NE
Doug Jiskra, NE
Jannabelle Jochens, NE
Carolyn Johnson, NE
Allen And Letha Jones, NE
Robert Jones, NE

Nebraska (cont.)

Peggy/Richard Junck, NE
JaNEt Jura, NE
Sally /William JuraNEk, NE
Kayleen Kaiser, NE
Kelly Kaiser, NE
Diane Kapels, NE
Brad Karl, NE
Lonnie Karl, NE
Jimmy Karl, NE
Donald Kasik, NE
Mary And Robert Kasik, NE
Heather And Joseph Kasik, NE
Larry Kaspar, NE
Bernard And Arlene Kastl, NE
James And Joann Kaup, NE
CharmaiNE And Kerry Kearl, NE
Jacob And DarleNE Keiter, NE
Antony Keiter, NE
KenNEth Keiter, NE
James KenNEdy, NE
Walter KenNEdy Jr, NE
Larry Kessler, NE
Donald / Lois Kilchenmann, NE
Carole Kirby, NE
Dennis Kirby, NE
EugeNE Kisling, NE
JoanNE Kisling, NE
Mary Klecan, NE
Wilhelm Klein, NE
Klein Family Trust, NE
Clara Kleinschmit, NE
Kevin & Deb Kleinschmit, NE
Ralph Kleinschmit, NE
John Klosterman, NE
Julie Klosterman, NE
Gaylen Kluck, NE
Joanell And Ronald Klug, NE
Joan Klug, NE
Thomas Klug, NE
James Kmoch, NE
Thomas Kmoch, NE
Sharon Koepke, NE

Nebraska (cont.)

Irene Koepke, NE
Lester Koepke, NE
Sharon Koepke, NE
ShayleNE Kolbo, NE
Doris Koll, NE
Kenneth Koll, NE
Kenneth And Doriskoll, NE
Kelly Konken, NE
Delphin And Shirley Korinek, NE
Colleen Korte, NE
David Korte, NE
Donald Korth, NE
GeNEvieve Korth, NE
Leonard Korth, NE
Margaret Korth, NE
Timothy Korth, NE
Lawrence Korth, NE
Korth Family, NE
Korth Family Lp, NE
Joann And Ronald Kostal, NE
Jeffrey Kotas, NE
Rose Kouba, NE
Lisakrasser, NE
Arthur/Bernice Kreikemeier, NE
Gary Kreikemeier, NE
Lyle Krska, NE
BerdiNE Kruse, NE
Milton Kruse, NE
Jon Kruse, NE
Mary Ann Kruse, NE
Steven Kruse, NE
Thomas Kruse, NE
BerdiNE Kruse, NE
Joan Kruse Rogers, NE
Roger Kucera, NE
Terry Kudera, NE
Dorothy Kuhn, NE
Harold Kuhn, NE
Lloyd Lamb, NE
Rosalyn Lamb, NE
Ron Lammers, NE
Lammers Family, NE

PRIVATE LANDOWNERS (CONTINUED)

Nebraska (cont.)

John Langenberg, NE
Lola Langenberg, NE
Norris Langenberg, NE
Roger Langenberg, NE
William Langenberg, NE
Stanley Langenberg, NE
Jessie Langworthy, NE
Elise Lauer, NE
Ron Lauer, NE
Dwayne LieNEmann, NE
Herman Linkugel, NE
Wilma Linkugel, NE
Alice Liska, NE
Ladislav Liska, NE
Mary Livingston, NE
Debra And Mark Loecker, NE
Alan Loftis, NE
Frances Loftis, NE
Marcella Longnecker, NE
Gurney Lorenz, NE
Mary Lorenz, NE
Cindy Lottman, NE
John Louden, NE
KatheriNE Louden, NE
Sherry Luebbe, NE
Brent Luebbe, NE
Norman Luebbe, NE
Bruce Luebbe, NE
Anna B. Luebbe, NE
Linda Luedtke, NE
Louis Maas, NE
James Makovicka, NE
Jerome Makovicka, NE
Norma Maliha, NE
John Mangels, NE
Emma Mann, NE
Kevin Marotz, NE
Clarence Marschman, NE
Mary Marschman, NE
Marsh Family, NE
Caroline Martin, NE
John Martin, NE

Nebraska (cont.)

Lynn Martin, NE
D.Marxhausen, NE
Emil And Margaret Mastny, NE
Adeline Matulka Family, NE
Mike Mauch, NE
Winona Mcilnay, NE
Randymcmullin, NE
Gary Meinberg, NE
John Jr Meyer, NE
Betty Meyer, NE
Don Milander, NE
Wilma Milander, NE
Marilyn Millard, NE
Paul Millard, NE
Scott Millard, NE
Virginia Miller, NE
Doris MoNEypenny, NE
KenNEth MoNEypenny, NE
Margaret Montag, NE
Allen And DiaNE Moravec, NE
Mary Moravec, NE
Richard Moravec, NE
James Morbach, NE
Charles Morris, NE
Michael Moser, NE
Nancy Moser, NE
Alan Motycka, NE
Edward Motycka, NE
Weta Motycka, NE
Delmar Motycka, NE
Joan Mueller, NE
Merle Mueller, NE
Jerome Mueller, NE
Janice Mueller, NE
Allan And Janice Mueller, NE
Eloyde Mueller, NE
Maurice Mueller, NE
Lois Mueller, NE
Judith Muhle, NE
Leonard Muhle, NE
Gordon Muhle, NE
Jacqueline Muhle, NE

Nebraska (cont.)

Darin Nernd, NE
Tom Nerud, NE
Donald Nerud, NE
Mary Nerud, NE
Danny Nerud, NE
Joan Nerud, NE
Eileen Nerud, NE
Thomas Newman, NE
Elaine Nielsen, NE
Merlyn Nielsen, NE
Debra Niemann, NE
Susan Niemann, NE
David Niemeier, NE
Rosemary Niemeier, NE
Joseph /Rosalee Nordhues, NE
Joenordhues, NE
Rosaleenordhues, NE
Dean Novak, NE
Susan Novak, NE
Darrell Novak, NE
Nathan Oehlrich, NE
Arthur Olson, NE
Mary Olson, NE
John O'NEal, NE
Dale And Jean OnNEn, NE
Elmer And Ester Opfer, NE
Norma Orth, NE
Robert Orth, NE
Francis Osantowski, NE
ErNEst Osantowski, NE
Marie Ostry, NE
Doris Ourecky, NE
Lloyd Ourecky, NE
Lori Owens, NE
Randall Owens, NE
Frank And Nina Papik, NE
Allen Papik, NE
Twila Papik, NE
Sandra Passyka, NE
Neal Pavlish, NE
Alma Peckman, NE
Carl Peckman, NE

PRIVATE LANDOWNERS (CONTINUED)

Nebraska (cont.)

Jule Peters , NE
DiaNE Petersen, NE
RodNEy Petersen, NE
C Pieper, NE
Pamela Pieper, NE
Bertha And Donald Pingel, NE
Galen Pinkelman, NE
Kevin Pinkelman, NE
Alan Platt, NE
Fern Platt, NE
Bert Platt, NE
Loren Pogreba, NE
Brandon Pohlman, NE
Lonnie Pohlman, NE
Stephen Poots, NE
Marcus Potts, NE
Michael Pracheil, NE
Dean Pretzer, NE
Julie Prochaska, NE
Ronald Prochaska, NE
Marilyn Prochaska, NE
Dennis Puls, NE
Ramona Puls, NE
JaNEt Raville, NE
DwayNE Rech, NE
Sheri Rech, NE
Thomas L.Reents, NE
Dorothy Rees, NE
John Rees, NE
Tim Rees, NE
Mary Reetz, NE
Wayne Reetz, NE
Nicholas Reisinger, NE
Rebecca Reisinger, NE
Carolyn And Eugene Rejda, NE
Lori Rempel, NE
Roger Rempel, NE
Suzanne Remter, NE
Deborah Richter, NE
Donald Richters, NE
Patricia Rickard, NE
Verlin Rickard, NE

Nebraska (cont.)

KenNEth Ripa, NE
William Ripa, NE
Lloyd Rippe, NE
James Roberts, NE
Brenda Roberts, NE
Paul Roberts, NE
Bradley Roberts, NE
Lois Roberts, NE
Raymond Roberts, NE
Dale Rocker, NE
Sandra Rocker, NE
Dean Roelfs, NE
KenNEth Roth, NE
Vada Roth, NE
Milton Roth, NE
Wilma Roth, NE
Eleanor Roth, NE
Russell Roth, NE
Brenda Roth Family, NE
Gerald Rupprecht, NE
Norman Rupprecht, NE
MarleNE Rutledge, NE
JaNE Rutt, NE
Helen Saathoff, NE
Becky Saathoff, NE
Randall Saathoff, NE
Galen Sabata, NE
Tom Same, NE
Barbara Sampson, NE
Sam Sampson, NE
Jeannine Sanders, NE
Martha Sasse, NE
Darrell And Sondra Sasse, NE
Leroy And Mary Sasse, NE
Sasse Family, NE
Donald Schaecher, NE
Alice Schaefer, NE
Roger Schaefer, NE
Doris Scheer, NE
Thomas Scheer, NE
Dallas Schellenberg, NE
Marcella Schellenberg, NE

Nebraska (cont.)

Leona Schindler, NE
Mary Ann Schlichting, NE
Robert Schmid, NE
Viola Schmid, NE
James Schmid, NE
Madonna Schmidt, NE
Darold Schmidt, NE
Lillian Schmidt, NE
Nancy Schmidt, NE
Russell Schmidt, NE
Marjorie Schmidt, NE
Robert Schmidt, NE
Schmidt Family, NE
Debra Schramm, NE
Gary Schramm, NE
Shelley Schreiber, NE
Arthur Schreiber, Iii, NE
Lindaschrock, NE
Shirley /Dornelius Schroeder, NE
Beverly Schroeder, NE
William Schroeder, NE
Dennis Schroeder, NE
Donovan Schulte, NE
Chrles J. Schulte, NE
Marvin Schultis, NE
WayNE Schultz, NE
Brian Schulz, NE
Lyndsy Schulz, NE
Beth Schulz, NE
Mary Schwab, NE
William Schwab, Sr, NE
Randy Schwang, NE
Nancy Schwanke, NE
Schweitzer Family, NE
Carol Sell, NE
NEal Sell, NE
Timothy Sell, NE
Evelyn Shalander, NE
Donald Shutts, NE
Mary Shutts, NE
Susan Siefken, NE
Delores Slepicka, NE

PRIVATE LANDOWNERS (CONTINUED)

Nebraska (cont.)

Lambert Slepicka, NE
Dennis Sloup, NE
Sloup Family, NE
David Smisek, NE
Gail Smisek, NE
FaunNEll Smith, NE
Karen Smith, NE
Roy Smith, NE
Lois Sohl, NE
Norbert Sohl, NE
Russsouchek, NE
Keith Spanyers, NE
James Stara, NE
Betty And KenNEth Stara, NE
Dan Stauffer, NE
Elainstecker, NE
JeaNEtte Stehlik, NE
Leonard Stehlik, NE
Helen Stehlik, NE
Lloyd /Margaret Stevenson, NE
Thomas Stibal, NE
Holly Stoltenberg, NE
Debra Strate, NE
Merwyn Strate, NE
Lori Strouf, NE
Lynn Strouf, NE
Richard Struebing, NE
Vera Struebing, NE
Allison Struebing Trust, NE
Daniel Sudbeck, NE
Lisa Sudbeck, NE
Rogersudbeck, NE
Sudbeck Family, NE
Bessie Svajgr, NE
Ed Svajgr, NE
Eldon Taake, NE
Judy Taake, NE
Jean Tachovsky, NE
Lester Tachovsky, NE
Joan F.Tanderud, NE
Joan Tanderup, NE
Wayne Tanderup, NE

Nebraska (cont.)

Allen Tennison, NE
George Jr Thelen, NE
John Thelen, NE
Danielthoena, NE
Marcus ThoeNE, NE
Phyllis ThoeNE, NE
Arlyce ThoeNE, NE
Jerome ThoeNE, NE
Paul ThoeNE, NE
Tammy ThoeNE, NE
Donna Thomas, NE
Harold Thorell, NE
Vera Thorell, NE
Daniel Timms, NE
Russell Tooker, NE
Phyllis Tooker, NE
Kyletowle, NE
Roger Trudell, NE
Douglas Tunink, NE
Roger Tunink, NE
AdeliNE Turek, NE
Evelyn Tyser, NE
Leonard Tyser, NE
Cindy Urban, NE
Dean Urban, NE
Barbara Vales, NE
John Vales, NE
Linda Vandenberg, NE
Chris Vandenberg, NE
Leroy Vanicek, NE
Milo Vanis, NE
John And Mildred Vaught, NE
Pamela Vavrina, NE
Reynold Vering, NE
Ann Vobril, NE
Alfred Voelker, NE
Ella Voelker, NE
Melvon Vollbrecht, NE
Allan Vyhnalek, NE
Melinda Vyhnalek, NE
Scott Vyhnalek, NE
Steven Vyhnalek, NE

Nebraska (cont.)

Fredrick Wachal, NE
Colleen And Richard Wachal, NE
Gary Wachal, NE
Jeffrey Wachal, NE
Anthony Walz, NE
Bette Walz, NE
CurtiswaNEk, NE
Phil Weber, NE
Phil F.Weber, NE
Ronald Weers, NE
Mark Weers, NE
Rachelle Weers, NE
Lyle Wegele, NE
Sherrill Wegele, NE
Cynthia Weichel, NE
Lonnie Weichel, NE
Frank Weiher, NE
Linda Weiher, NE
Alvin Wellman, NE
Elizabeth Wellman, NE
Randy Wendt, NE
Tamara Wendt, NE
Joyce Wendt, NE
Lavern Wendt, NE
Mildred Wendt, NE
Wendt Family, NE
JaNE Wenz, NE
William Wenz, NE
Weyer Family, NE
Vicki Wilke, NE
Lisa Wilke, NE
Bill Willers, NE
Miriam Willers, NE
Penny Williams, NE
Brian Wolesensky, NE
Daniel Wolfe, NE
Patricia Wood, NE
Mary Wright, NE
KristiNE Wright, NE
Richard Wright, NE
David Wurdeman, NE
Lawrence/Larian Wurm, NE

PRIVATE LANDOWNERS (CONTINUED)

Nebraska (cont.)

Lloyd Young, NE
Catherine/Ronald Zarybnicky, NE
Richard/Tammy Zarybnicky, NE
Eleanor Zarybnicky, NE
John / Patricia Zarybnicky, NE
Lawrence And Mary Zavadil, NE
Zavadil Family, NE
Larry Zimmer, NE
Carol Zimmer, NE
GeraldiNE Zimmer, NE
Larry Zimmer, NE
Zimmerman Family, NE
Jon Zulauf, NE
Cheryl Zulauf, NE

New Jersey

Richard Stewart, NJ
Janice Tomlinson, NJ
Thomas Tomlinson, NJ

New Mexico

Arlys And James Frybarger, NM
Lavelle Ashley, NM

Nevada

Donald Docter, NV
Timothy Mortensen, NV
James Jimmerson, NV
Margaret Thomason, NV

New York

Allen Retzlaff, NY

Ohio

Jean Burger, OH

Oklahoma

Lois Ablin, OK
Arthur Anderson, OK
Matt Ball, OK
John And Karen Bode, OK
Ginger K.Glidewell, OK
Janell Harman, OK
Leo And Norma Hunt, OK
Duane Kleppe, OK
Loleta Kleppe, OK
Marla Knecht, OK

Nebraska (cont.)

Martin Knecht, OK
Carolyn Lodhia, OK
Sue Mcwhorter, OK
Renee Prince, OK
Joseph Robertson, OK
Sidney Spore, OK
Ken Staley, OK
Warren E.Taylor, OK
Alta Adams, OK
Cheryl Bandy, OK
Jerry Bean, OK
Beulah Behrens, OK
Sandra Blakley, OK
Lillie Bowman, OK
Jerry Boyer, OK
Robert Boyer, OK
Diane Browning, OK
Bobby Bruner, OK
Patricia Burritt, OK
Sam Case, OK
Barbara Cavett, OK
Rick Chester, OK
Bobby Clary, OK
Berniece CoOK, OK
Betty Dennet, OK
Nitaya Driskel, OK
Mary Eaton, OK
W. D. Eggers, OK
Mary Ellis, OK
Emmett Ellis, OK
Harvey Ely, OK
Jean Evans, OK
Adams Family, OK
Ailey Family, OK
Alderson Family, OK
Alexander Family, OK
Anderson Family, OK
Atkinson Family, OK
Blankinship Family, OK
Boyer Family, OK
Buntt Family, OK

Nebraska (cont.)

Christy Family, OK
Cline Family, OK
CoOK Family, OK
Cullers Family, OK
Dean Family, OK
Diehm Family, OK
Dilley Family, OK
Dormire Family, OK
Ethridge Family, OK
Fanning Family, OK
Fisher Family, OK
Fitch Family, OK
Frank Family, OK
French Family, OK
Garvie Family, OK
Gooch Family, OK
Goondo Family, OK
Grassman Family, OK
Greer Family, OK
Griffith Family, OK
Harman Family, OK
Harper Family, OK
Harting Family, OK
Hensley Family, OK
Hillier Family, OK
Horinek Family, OK
Irwin Family, OK
Jueschke Family, OK
Kelle Family, OK
Liston Family, OK
Lovell Family, OK
Marino Family, OK
Martin Family, OK
Matheson Family, OK
Mattox Family, OK
Mccroskey Family, OK
Mckinnis Family, OK
Mcpeak Family, OK
Mertz Family, OK
Mitchell Family, OK
Olbert Family, OK

PRIVATE LANDOWNERS (CONTINUED)

Oklahoma (cont.)

Orr Family, OK
Otto Family, OK
Payne Family, OK
Puls Family, OK
Reinhardt Family, OK
Roberson Family, OK
Roby Family, OK
Rocbertson Family, OK
Roe Family, OK
Rogers Family, OK
Rosiere Family, OK
Ross Family, OK
Schwanke Family, OK
Scott Family, OK
Sebor Family, OK
Sewell Family, OK
Sexton Family, OK
Sharp Family, OK
Sheik Family, OK
Shick Family, OK
Shock Family, OK
Short Family, OK
Simon Family, OK
Simons Family, OK
Spore Family, OK
Steichen Family, OK
Stiles Family, OK
Stout Family, OK
Talbert Family, OK
Thompson Family, OK
Tubbs Family, OK
Vap Family, OK
Vassar Family, OK
Vickery Family, OK
Voegele Family, OK
Warner Family, OK
Wilkerson Family, OK
Williams Family, OK
Wilson Family, OK
Yaunt Family, OK
John Flournoy, OK
Bill Foote, OK

Oklahoma (cont.)

Carl Frank, OK
Jd Frank, OK
Loyal Frank, OK
Michael Frank, OK
Roland Frank, OK
Donald Fultz, OK
Gregg Glass, OK
Delbert Grassman, OK
William Greenshields, OK
Jack Harney, OK
Sam Harris, OK
Michael Hart, OK
Scott Harting, OK
Rocky Henderson, OK
David Hesser, OK
Ival Hesser, OK
Jocille Hoffman, OK
Sharon Holman, OK
Edith Hunt, OK
Rose Jones, OK
Alberta Kahle, OK
Jack Kelly, OK
Robert Kendrick, OK
David Kerr, OK
Kenneth Klinger, OK
Barry Lane, OK
Jack Lane, OK
John Leven, OK
H A Linn, OK
John Linn, OK
Patty Luter, OK
Carolyn Mann, OK
Danube Mc Farlin, OK
David Mcclure, OK
Robert Mcclure, OK
Robert Mcclure Jr, OK
Danube Mcfarlin, OK
Brian Mcneil, OK
Jeffrey Meyer, OK
Dorothy Meyers, OK
Lavera Middlebusher, OK
Dennis Mittasch, OK

Oklahoma (cont.)

Patricia Monsees, OK
Dorothy Moomey, OK
Pam Morris, OK
Pamela Nicholson, OK
Cathy Oden, OK
Harlan Overman, OK
Karen Overman, OK
Darrel Patton, OK
Byron Phipps, OK
Lola Pogue, OK
Nikki Puls, OK
Mickey Ratliff, OK
Michael Ritter, OK
William Roof, OK
Jess Ross, OK
Ada Rossander, OK
Mellige Rudkin, OK
Emma Sanders, OK
Gottfried Schmaltz, OK
Bruce Scott, OK
Scott Sewell, OK
John Shiflet, OK
Fern Smith, OK
Karla Smith, OK
Edgar Snyder, OK
Robert Snyder, OK
Claude Stafford, OK
Janice Stiles, OK
James Stone, OK
Richard Sullins, OK
Wayland Swinford, OK
Warren Taylor, OK
Jack Terry, OK
Victor Testerman, OK
Ronnie Thomason, OK
Taylor Utahna, OK
Bobby Ventris, OK
Charles Ventris, OK
Jeff Vitale, OK
Henry Voise, OK
Beth Walton, OK
Sue Walton, OK

PRIVATE LANDOWNERS (CONTINUED)

Oklahoma (cont.)
Oreta Warford, OK
Bob Warner, OK
Mildred Wheatley, OK
Doug Will, OK
Randy Will, OK
Lois Williams, OK
M H Williams, OK
Mark Wilson, OK

Oregon
Baird Family, OR
Susan Baker, OR
Lance And Lyle Dirksen, OR
Lundeen Family LP, OR
Norma Ruble, OR
Gerald Swendseid, OR
Blanche Westberg, OR
Orrin Westberg, OR

Rhode Island
Alan And Jane Humphrey, RI

South Carolina
Mustard Family, SC
Roselyn Runge, SC

South Dakota
Edna Wagner, SD
Jon Albrecht, SD
Raymond Anderson, SD
Allan And Janice Anderson, SD
Roger Anderson, SD
Kevin Anderson, SD
Blair And Lynette Arne, SD
Annabeth And Donald Arne, SD
Donald Arne, SD
Alan Aughenbaugh, SD
Richard Aughenbaugh, SD
John And Marlys Baird, SD
Lorna Baldwin, SD
Wilmer Banger, SD
Candie And Randall Beck, SD
Terry Beers, SD
Dennis Beers, SD
Joan And Leonard Berg, SD

South Dakota (cont.)
Eugene Berg, SD
Vivian Bethke, SD
Gene Bethke, SD
Charles And Holly Beving, SD
Lucille Blakely, SD
Gregory Bonn, SD
David Bornitz, SD
Donald And Mary Bowers, SD
Lucille Bowling, SD
Peter Bremmon, SD
Dorothy And Donald Brown, SD
Daniel And Debra Brown, SD
Bud Brucknec, SD
Jim Brutty, SD
Donald Brutty, SD
Lyle Buchanan, SD
Dale And Russel Buising, SD
Wilmer Bunger, SD
Michael Burger, SD
Bernetta &Richard Burghardt, SD
J J Burke, SD
James Bush, SD
William Calmus, SD
Stanley Capp, SD
Janice And Robert Carlson, SD
C Carson, SD
Lucille Carson, SD
Joyce Cheeseman, SD
Chronister Family, SD
Timothy Clarke, SD
Marlin Clendening, SD
Ricky Cole, SD
Kevin Congdon, SD
Debra And James Coughlin, SD
David Cwach, SD
Randy Dawson, SD
Dale And Jean Deboer, SD
Melea Dejean, SD
Lynne And Steve Dejong, SD
James And Jodi Dinan, SD
Mary Doorn, SD
Mary E. Doorn, SD

South Dakota (cont.)
Bertram Drake, SD
Dorothy And George Dylla, SD
Miles Dyran, SD
Linda Easton, SD
Robert Ehlers, SD
Leanne Eich, SD
Diana And Lawrence Eich, SD
Orville Ellwein, SD
Bruce Emery, SD
Kent Erickson, SD
Margaret /Elmer Erickson, SD
Elmererickson, SD
Hugh Evans, SD
Cynthia And Dean Farley, SD
Robert Farrar, SD
Cherrlyn And Darrell Fast, SD
Wayne Fast, SD
Arlene And Dalin Fast, SD
Myrna And Robert Fast, SD
Robert Fast, SD
Fast Family, SD
Steve Fejtar, SD
James And Ramon Feller, SD
Donald Fisher, SD
James Fitzgerald, SD
Donald Fluth, SD
Delmar Foiles, SD
Hazel Foiles, SD
Delmar And Hazelfoiles, SD
Robert Foley, SD
Donald Foley, SD
Wayne Foote, SD
Doug Fosheim, SD
Terry Frick, SD
Frick Family LP, SD
Christopher Gederos, SD
Norma Glanzer, SD
Chad And Keith Glanzer, SD
Elaine And Jerauld Glanzer, SD
Chauntel & Timothy Glanzer, SD
Claude Glanzer, SD
Jeffrey Glanzer, SD

PRIVATE LANDOWNERS (CONTINUED)

South Dakota (cont.)

Fawn And Tim Glanzer, SD
Emauel And Mary Glanzer, SD
Glanzer Family, SD
Dennis Gosmire, SD
Deetta And Edward Goss, SD
Wilmer L.Gran, SD
Todd Grandpre, SD
Sheri Gross, SD
Terry And Tonda Gross, SD
Kyle Gross, SD
Mark Gross, SD
Joyce Gross, SD
Alan And Amy Grupe, SD
Roger Grupe, SD
Duane S.Gustafson, SD
Troy Hamilton, SD
Glenn And Donald Handke, SD
Clarence And Ida Hannon, SD
Thomas Hanson, SD
Gordon And Johnny Hanson, SD
James And Marian Hanson, SD
Marlyss And Milton Hanssen, SD
Jim Hanssen, SD
Jay Harmelink, SD
Larry Harry, SD
Francis And Alma Hass, SD
Robert Hastings, SD
Hastings Family, SD
Willis Hauger, SD
Michael Hausvik, SD
Mary Hayenga, SD
William Haywood, SD
Patricia And William Hearnen, SD
Larry And Marlene Hearnen, SD
Galen Heckenlaible, SD
Daryl / Janet Heckenlaible, SD
Reuben Heckenlaible, SD
Loarine Heckenlaible, SD
Ella And Elsie Hein, SD
Dave Heinrichs, SD
Debra Heitzman, SD

South Dakota (cont.)

Calvin And Glorius Heitzman, SD
Wayne Helkenn, SD
Lavonne Helmer, SD
Lee W.Henld, SD
Janice Herman, SD
Reuben Hermann, SD
John And Jolene Hermoe, SD
Jolene And Laron Herr, SD
Idella And Walter Herrboldt, SD
Richard Herrboldt, SD
Celesta And Martin Herrboldt, SD
Lee Herrboldt, SD
Idella Herrboldt, SD
David And Jill Hiebert, SD
Lorrene And Norman Hiebert, SD
Norman Hiebert, SD
Dave Hindricks, SD
Gary Hofer, SD
Leroy Hofer, SD
Kathryn And Mark Hofer, SD
Priscilla Hofer, SD
Alvin And Mary Hofer, SD
Robert Hofer, SD
Glendon And Jayne Hofer, SD
Darrell Hofer, SD
Carlos Hofer, SD
Delwin And Pamela Hofer, SD
Derick Hofer, SD
John Hofer, SD
Janice Hofer, SD
Willard And Sarah Hofer, SD
Mary Hofer, SD
Orville Hofer, SD
Joe Hofer, SD
Delsin/Pamhofer, SD
Jerauld And Shirley Hoffman, SD
Kevin Hollen, SD
Gayle And Steven Horter, SD
Greg Hough, SD
David Huber, SD
Herbert Huber, SD

South Dakota (cont.)

Steve Huber, SD
Thomas Huber, SD
Roger Hurlbert, SD
Harold Hurlbert, SD
Sherray And Russel Hurlbert, SD
Carol And Ralph Hurlbert, SD
Ralph Hyrlbert, SD
Janette Imsland, SD
Jean Janssen, SD
Ronald Jarrett, SD
James Jenkins, SD
Greg Johnson, SD
Carl Johnson, SD
Carl Wayne Johnson, SD
Maxine / Thomas Johnston, SD
Janann And Lonnie Jones, SD
Boyd And Cherlye Jones, SD
Deanjones, SD
William Kadoun, SD
Gerald Kaufmann, SD
Gregory /Machelle Keating, SD
Dona / Vincent Kennealley, SD
J.V.Kennealley, SD
Sherrie Kersting, SD
Darian Kilker, SD
Phyllis Kirschenman, SD
Ronald Kirschenman, SD
Betty Kirschenman, SD
Leroy Kirschenman, SD
Darwin Kirschenman, SD
Delores Klimisch, SD
James Klimisch, SD
Roger Klimisch, SD
Jim Klimisct, SD
Jean/Kenneth Klinkhammer, SD
Dewayne / Lavina Klunder, SD
Brian Knittel, SD
Phyllis Knittel, SD
Arlo Koerner, SD
Marilyn Korkow, SD
Jerry Korkow, SD

PRIVATE LANDOWNERS (CONTINUED)

South Dakota (cont.)

Kathryn Kothe, SD
Laverne Kothe, SD
Aleta Kraft, SD
James Kroll, SD
Richard Kunkel, SD
La Mee Family Trust, SD
Steven Labay, SD
William Lamee, SD
David Lamee, SD
Erna Lamee, SD
Thomas Landreth, SD
Lucas Landreth, SD
Thomas Landreth, SD
Elaine Lane, SD
Harry Lane, SD
James Lane, SD
Jana Lane, SD
George Leitheiser, SD
Janette / Roger Leitheiser, SD
Doug Leschison, SD
Larry Lewis, SD
Lee Lewis, SD
Glenn Lingen, SD
James List, SD
Sharon List, SD
Ryan Loecker, SD
Alan Lohr, SD
Lorraine Tusha Trust, SD
Glen Lubbers, SD
Delores Luze, SD
Madsen Family, SD
Dorn Malpert, SD
Doug Marquardt, SD
Jason Marquardt, SD
Lucille And Ralph Marquardt, SD
Lyn May, SD
Floyd Mcelroy, SD
Michael Mcmenamy, SD
Bruce Merkel, SD
Pamela Merkel, SD
Dennis Michael, SD
Paul Michels, SD

South Dakota (cont.)

Denene Miles, SD
Donald Miles Jr, SD
Edward Miller, SD
Clark Moeckly, SD
Kent Moeckly, SD
Wayne Moore, SD
Denis Moschell, SD
Virginia Moschell, SD
Albert Mueller, SD
John Mueller, SD
Edward And Helen Munkvold, SD
Marsha Murphy, SD
Patrick Murphy, SD
Evelyn Nelson, SD
Evelyn Nelson, SD
Marlene Nelson, SD
Michael Nelson, SD
J. Neu, SD
Harlin Neuharth, SD
Dale Neuharth, SD
Alice Neuharth, SD
Steve Nielson, SD
Luther Nielson, SD
Norbert N. Muller Trust, SD
Karen North, SD
Rumie Nusz, SD
Gerald Nusz, SD
Gary Nutter, SD
D.W.Ochachek, SD
Daniel Olinger, SD
Timothy Olson, SD
James Olson, SD
Neil Olson, SD
David Olson, SD
Olson Family, SD
Mary Opsahl, SD
Belinda Panek, SD
Norman Papendick, SD
Robert Patrick, SD
Marina Payne, SD
Darwin Peckham, SD
Marsha Peckham, SD

South Dakota (cont.)

Jennifer/ Jonathan Penner, SD
Abe /Clarabel Penner, SD
John Pennes, SD
David Pigors, SD
Jerry Poeschl, SD
Todd Pollman, SD
Carma Popp, SD
Chad Popp, SD
Eugene Prunty, SD
Lavina Pullman, SD
David Putman, SD
Weona And Dale Quist, SD
Jerald Raap, SD
Sherry Rabenburg, SD
Randy Reis, SD
Carrie Reis, SD
Anne Reisch, SD
Leerettig, SD
Paul Roby, SD
Gary Roby, SD
Kathleen Roby, SD
Robert Roby, SD
Roster Family, SD
Charles Rostyne, SD
Travis Rostyne, SD
Lora Lea And Verlyn Rye, SD
Clara Rye, SD
Larry Ryken, SD
Brian And Joyce Sanderson, SD
Ronald (Dcd) Sanderson, SD
Richard Sanderson, SD
Lynn Sanderson, SD
Ronald Schaeffer, SD
Cheryl Schaefle, SD
Eugene Schlagel, SD
Wayne Schlagel, SD
Mona Schlagel, SD
Karla Schlapkohl, SD
Lonny Schlim, SD
Eileen Schmidt, SD
Charlene Schmit, SD
Richard Schmit, SD

PRIVATE LANDOWNERS (CONTINUED)

South Dakota (cont.)

Edward Schmit, SD
Janet Schmit, SD
Judith Schmuck, SD
Kenneth Schmuck, SD
Viona Schnabel, SD
Michael Schock, SD
Schoenfelder Family, SD
Mike Schook, SD
Janette Schramm, SD
Mark Schramm, SD
Rodney Schramm, SD
Terrence Schramm, SD
Jeannette Schramm, SD
Dorothy Schrooten, SD
Vicki And Michael Schultz, SD
Loren Schultz, SD
Stewart Schultz, SD
Amos Schultz, SD
Geraldine Schultz, SD
Stanley Schulz, SD
Randall Schuring, SD
Carl Schwab, SD
Dorothy Schwab, SD
Lillian Schwab, SD
Arthur Sees, SD
Rosemary Sees, SD
James Sees, SD
Michael Sibson, SD
Susan Sibson, SD
Leo Sibson, SD
Mike And Suesibson, SD
Richard Sievert, SD
Dean Stabnow, SD
Betty And Sam Stahl, SD
Jacob Stahl, SD
Marvin Stahl, SD
Eli Stahl, SD
Debra Stahl, SD
Melvin Stahl, SD
Thomas Stahl, SD
Mary Stahl, SD
Jacob M.Stahl, SD

South Dakota (cont.)

Oren Stahl, SD
Sarah Stahl, SD
Joanne Steichen, SD
Kenneth Steichen, SD
Arthur Stip, SD
Milo Stip, SD
Allison Tank, SD
Renold Tank, SD
Allen Terveen, SD
Opal Terveen, SD
Ronnie Thompson, SD
Gene Tisher, SD
Bill Tisher, SD
Donald Tisher, SD
Danny Tople, SD
Dean Townsend, SD
Russell Townsend, SD
Doris /Norman Townsend, SD
Hollis And Karen Treeby, SD
Henrietta Truh, SD
Ava Tucker, SD
Donald Tucker, SD
Scott Tuschen, SD
Craig Tuschen, SD
Michele Tuschen, SD
Chritsa Tusha, SD
Justin Tusha, SD
Lorraine Tusha, SD
Marlin Tusha, SD
Donald Ulrich, SD
Marvalee Ulrich, SD
Darwin Unruh, SD
Unruh Family Trust, SD
Karavan Bockern, SD
Phyllis Vermeulen, SD
Anita Voss, SD
Richard Voss, SD
Jeff Voss, SD
Jon Voss, SD
Wade Family, SD
Luella Wagner, SD
Adelia Wagner, SD

South Dakota (cont.)

Carroll Wagner, SD
Galen Waldner, SD
Kim Waldner, SD
Bennie Waldner, SD
Julie Waldner, SD
Waldner Family, SD
Vera Walls, SD
William Walter, SD
Joe Walter, SD
Timothy Walter, SD
Linda And Ray Walter, SD
Amy Walter, SD
Alton Walz, SD
Cheryl Walz, SD
Gary Walz, SD
Gregory Ward, SD
Mike Weaver, SD
Floyd Weeldreyer, SD
Leona Weeldreyer, SD
Jesse West, SD
Sandy Wheeldryer, SD
Jo Ann And Larry Whirledge, SD
Marvin Whites, SD
Margery Whites, SD
Ronald Whites, SD
Jerry Wicks, SD
Delton Wiebe, SD
Robert And Stacey Wingen, SD
Evelyn Witham, SD
Charles Wollman, SD
Mary E.Wollman, SD
Lyle Wollmann, SD
Raymond Wormke, SD
Conrad And Erich Wutsch, SD
Elta J Zens, SD
Elta Zens, SD
Gary Zuehlke, SD

PRIVATE LANDOWNERS (CONTINUED)

Tennessee

Carole Gray, TN
Neilsanderson, TN
Sharleine Hall, TN
Ordean Oen, TN
Kenneth Uehling, TN
James Wilson, TN

Texas

Jeppesen Family, TX
Jones Family, TX
Vaughn Family, TX
Larry Hart, TX
Kurt Lindahl, TX
W G Mouser, TX
Neil Skach, TX
Adele Bakken, TX
Billy And Rebecca Bednar, TX
Swana & T. Brooks Wittgow, TX
Corbit Family, TX
Ronald Forman, TX
Hugo Herzberg, TX
Lisa Hinckley, TX
John Lorinc, TX
Patricia Lorinc, TX
Joseph Nash, TX
Brenda Oenbring, TX
Patrick Oenbring, TX

Virginia

Charles Gurtler, VA
Ralph Dannettell, VA
William Gellerman Jr, VA

Washington

Winney Family, WA
Geri Johnston, WA
Harold Schwortz, WA
Catherine Slankas, WA
Irvin Chemelir, WA
Rose Ann Daniel, WA
Leal Dorsey, WA
Douglas Eidsvig, WA
Sarah Eidsvig Jarheim, WA
Maureen Hamilton, WA

Washington (cont.)

Coni And Gary Hehn, WA
Barbara Kurtz, WA
Florence Lee, WA
Kathleen Loyet, Wa
Dale Myer, Wa
Papendick Living Trust, Wa
Pierson Rev. Living Trust, Wa
Olaf Skrogstad, Wa

Wisconsin

Mayer Family, WI
Miltmore Family, WI
Laura Machart, WI
Barbara Anderson, Wi
Margaret Bettendorf, WI
Bernice Brown, WI
William Decesare, WI
Glenn And Janice Gehring, WI
Glenn/Michelle Hofer Liv. Tr, Wi
Joanne Johnson, WI
Lovina And Mahlon Miller, WI
Lois Novicki Muhle, WI

Wyoming

Dwight Ostenson, WY

No State Available

Glennda Marsh-Letts,
Rutledge Childrens Trust,
Alice Dietrich,
Andrew Klug,
Barry Eberspacher,
Betty Griess,
Bryan Dietrich,
Bryce Grotelueschen,
Carmelita Depauw,
Cory Smisek,
Dan Kouma,
Daniel Arens,
Dave Clark,
Denise Keay,
Dennis Bowers,
Dennis Kostal,
Diane Thomas,

No State Available (cont.)

Donald Kostal,
Douglas Gruntorad,
Edward Osantowski,
Ellen Meyer,
Gary Miller,
George Rambour,
Glen Hillen,
Glennda Marsh-Letts,
Greg Roth,
Hilda Franzen,
James Nerud,
Jane Schnittker,
Janelle Marsh,
Jason Heithold,
Jeanice Vinduska,
Jeff Olson,
John Carmichael,
John Dietrich,
Kathleen Rees,
Larry Landreth,
Larry Muhle,
Lawrence Kasik,
Len Korza,
Leo Osantowski,
Linda Motycka,
Lynette Klug,
Margaret Reibold,
Mary Bridgman,
Mike Heimes,
Mike Koch,
Mike Settje,
Robert Schindler,
Robin Schweitzer,
Sarah Vyhnalek,
Scott Muhle,
Sharon Matejka,
Terri Logan,
Terry Hockbart,
Tony Vanis,
Vickie Palky,
Virginia Langenberg,

LIBRARIES

ILLINOIS

Case-Halstead Library, Carlyle, IL
Evans Public Library, Vandalia, IL
Greenville Public Library, Greenville, IL
Latzer Memorial Public Library, Highland, IL
Patoka Public Library, Patoka, IL
Wood River Public Library, Wood River, IL

KANSAS

Arkansas City Library, Arkansas City, KS
Clifton City Library, Clifton, KS
Derby Public Library, Derby, KS
Douglass Public Library, Douglass , KS
Hope Community Library, Hope, KS
Library District 1, Troy, KS
Marion City Library, Marion, KS
Marysville Public Library, Marysville, KS
Morrill Free Public Library, Hiawatha, KS
Oxford Public Library, Oxford, KS
Potwin Public Library, Potwin, KS
Seneca Free Library, Seneca, KS
Wakefield Public Library, Wakefield, KS
Washington Library, Washington, KS

MISSOURI

Carrollton Public Library, Carrollton, MO
Centralia Public Library, Centralia, MO
Dulany Memorial Library, Salisbury, MO
Hamilton Public Library, Hamilton, MO
Howard County Library, Fayette, MO
Library & Museum, Lathrop, MO
Little Dixie Regional Library, Moberly, MO
Livingston County Library, Chillicothe, MO
Mexico Audrain County Library, Mexico, MO
Powell Memorial Library, Troy, MO
Scenic Reg Library, Warrenton, MO
St Joseph Public Library, St. Joseph, MO
St Louis County Library, Florissant, MO
St. Charles City-County Library, Saint Peters, MO
Wellsville Public Library, Wellsville, MO

NORTH DAKOTA

Cavalier City Library, Cavalier, ND
Cavalier County Library, Langdon, ND
Enderlin Municipal Library, Enderlin, ND
Forman Public Library, Forman, ND
Grand Forks Library, Grand Forks, ND
Griggs County Library, Cooperstown, ND
Lakota City Library, Lakota, ND
Lamoure Public Library, Lamoure, ND
Mayville Library, Mayville, ND
Oakes Public Library, Oakes, ND
Park River Public Library, Park River, ND
Valley City Public Library, Valley City, ND
Walhalla Public Library, Walhalla, ND

NEBRASKA

Beatrice Public Library, Beatrice, NE
City of Wausa Library, Wausa, NE
Columbus Public Library, Columbus, NE
Fairbury Public Library, Fairbury, NE
Hartington Public Library, Hartington, NE
Hruska Memorial Library, David City, NE
Leigh Public Library, Leigh, NE
Liberty Gilbert City of Friend Library, Friend, NE
Pierce Carnegie Library, Pierce, NE
Randolph Public Library, Randolph, NE
Seward Public Library, Seward, NE
Stanton Public Library, Stanton, NE
Wayne Public Library, Wayne, NE

OKLAHOMA

Bristow Public Library, Bristow, OK
Cushing Public Library, Cushing, OK
Fairfax Public Library, Fairfax, OK
Pawnee Public Library, Pawnee, OK
Perry Carnegie Library, Perry, OK
Ponca City Library, Ponca City, OK

LIBRARIES (CONTINUED)

SOUTH DAKOTA

Alexander Mitchell Library, Aberdeen, SD
Alexandria Public Library, Alexandria, SD
Britton Public Library, Britton, SD
City of Yankton Library, Yankton, SD
De Smet Library, De Smet, SD
Emil M. Larson Public Library, Clark, SD
Freeman Public Library, Freeman, SD
Hanson/McCook Regional Library, Spencer, SD
Howard Public Library, Howard, SD
Huron Public Library, Huron, SD

MEDIA

ILLINOIS

Daily Herald, Arlington Heights, IL
Greenville Advocate, Greenville, IL
Highland Park News, Waukegan, IL
Leader-Union, Vandalia, IL
Marion Daily Republican, Marion, IL
The Record, Edwardsville, IL
WQAD-TV, Moline, IL

KANSAS

Courier Tribune, Seneca, KS
Derby Reporter, Wichita, KS
Derby Weekly Informer, Derby, KS
Eastern Cowley County Advocate, Burden, KS
KNDY, Marysville, KS
Marysville Advocate, Marysville, KS
The Traveler, Arkansas City, KS
Washington County News, Washington, KS

MISSOURI

Brunswick Brunswicker, Brunswick, MO
Caldwell County News, Hamilton, MO
Cameron Citizen-Observer, Cameron, MO
Carrollton Democrat, Carrollton, MO
Chillicothe Constitution-Tribune, Chillicothe, MO
Elsberry Democrat, Elsberry, MO
Fayette Newspapers, Fayette, MO
Glasgow Missourian, Glasgow, MO
KCHI, Chillicothe, MO
KFNS AM, St Louis, MO

MISSOURI (cont.)

KMFC, Centralia, MO
KMOX 1120, St. Louis, MO
KMRN-KKWK Regional Radio, Cameron, MO
KQ2, St. Joseph, MO
KSDK-TV, St. Louis, MO
KTRS, St. Louis, MO
KWRT-AM, Boonville, MO
KWWR, Mexico, MO
Lathrop Publishing/Rural Reporter, Lathrop, MO
Lincoln County Journal, Troy, MO
Mexico Ledger, Mexico, MO
Moberly Monitor-Index, Moberly, MO
Norborne Democrat-Leader, Norborne, MO
Salisbury Press-Spectator, Salisbury, MO
South County Times, St. Louis, MO
St. Charles Journal, St. Peters, MO
St. Charles Watchman Advocate, St. Charles, MO
St. Joseph News-Press, St. Joseph, MO

NORTH DAKOTA

American Ag Network, Fargo, ND
Cavalier Chronicle, Cavalier, ND
Cavalier County Republican, Langdon, ND
Enderlin Independent, Enderlin, ND
Grand Forks Herald, Grand Forks, ND
Grand Forks Herald Online, Grand Forks, ND
Griggs County Courier, Cooperstown, ND
KBMW-AM, Wahpeton, ND

MEDIA (CONTINUED)

North Dakota (cont.)

KCNN-AM, GRAND FORKS, ND
KDDR-AM, OAKES, ND
KEGK-FM, FARGO, ND
KFGO-AM, FARGO, ND
KFNW-AM, FARGO, ND
KJKJ-FM, GRAND FORKS, ND
KNDK 1080 AM, LANGDON, ND
KOVC-AM, VALLEY CITY, ND
KQLX FM 106.1 RADIO, LISBON, ND
KVLY-TV, FARGO, ND
KVRR-TV, FARGO, ND
KXPO-AM, GRAFTON, ND
Larimore Leader, Fargo, ND
Litchville Bulletin, Litchville, ND
Milnor Teller, Milnor, ND
Morning News, Fargo, ND
Northwood Gleaner, Northwood, ND
Oakes Times, Oakes, ND
Pembina New Era, Pembina, ND
Ransom County Gazette, Lisbon, ND
Richland County News-Monitor, Hankinson, ND
Steele County Press, Finley, ND
The Daily News, Wahpeton, ND
The Forum, Fargo, ND
The Forum Online, Fargo, ND
Tri-County Sun, Fordville, ND
Valley City Times-Record, Valley City, ND
Valley News & Views, Drayton, ND
Walhalla Mountaineer, Walhalla, ND
Walsh County Press, Park River, ND
Walsh County Record, Grafton, ND
WDAY-AM, FARGO, ND
WDAY-TV, FARGO, ND
WDAZ-TV, GRAND FORKS, ND
West Fargo Pioneer, West Fargo, ND

NATIVE AMERICAN GROUPS

Colorado

Clement Frost, Chairman, Southern Ute Indian Tribe, Co
Manuel Heart, Acting Chairman, Ute Mountain Tribe, Co
Carl Knight, Land Manager, Ute Mountain Tribe, Co

Kansas

Iowa Tribe Of Kansas And Nebraska, Ks

Michigan

D.K. Sprague, Chair, Gun Lake Potawatomi, Mi
Ed Pigeon, Gun Lake Potawatomi, Mi
Kenneth Meshigaud, Chair, Hannahville Indian Community Of Michigan, Mi
Earl Meshigaud, Cultural Director, Hannahville Indian Community Of Michigan, Mi
Laura Spurr, Chair, Huron Potawatomi Nation, Mi
David Jones, Environmental Director, Huron Potawatomi Nation, Mi
Mike Zimmerman, Acting Chairman, Pokagon Band Of Potawatomi Indians Of Michigan, Mi

Michigan (cont.)

Mark Parrish, THPO, Pokagon Band Of Potawatomi Indians Of Michigan, MI

Montana

Earl Old Person, Chairman, Blackfeet Tribe, MT
John Murray, THPO, Blackfeet Tribe, MT
John Houle, Chairman, Chippewa-Cree Business Committee, MT
Elvin Windyboy, CPO, Chippewa-Cree Indians, MT
John Morales, Jr., Chairman, Fort Peck Tribes, MT
Curley Youpee, THPO, Fort Peck Tribes, MT
Julia Doney, President, Gros Ventre and Assiniboine Tribe of Ft. Belknap, MT
John Allen, Councilman, Gros Ventre and Assiniboine Tribe of Ft. Belknap, MT
Drew Shanni Spang, President, Northern Cheyenne Tribal Council, MT
Conrad Fisher, THPO, Northern Cheyenne Tribe, MT

NATIVE AMERICAN GROUPS (CONTINUED)

Minnesota

Sheldon Peters Wolfchold, Lower Sioux Indian Community, MN

Pam Halverson, THPO, Lower Sioux Indian Community, MN

Melanie Benjamin, Mille Lacs Band of Ojibwe, MN

Natalie Weyans, THPO, Mille Lacs Band of Ojibwe, MN

Stanley R. Crooks, Chairman , Shakopee Mdewakanton Sioux, MN

Leonard Wabafha, Shakopee Mdewakanton Sioux, MN

Erma Vizenor, Chairwoman, White Earth Band of Minnesota Chippewa, MN

Tom McCauley, THPO, White Earth Band of Minnesota Chippewa, MN

North Dakota

Myra Pearson, Chairperson, Spirit Lake Tribe, ND

Ken Graywater, Sr., Spirit Lake Tribe, ND

Allen McKay, Spirit Lake Tribe, ND

Ron His Horse is Thunder, Chairman, Standing Rock Sioux Tribe, ND

Tim Mentz, THPO, Standing Rock Sioux Tribe, ND

Marcus Wells, Jr., Chairman, Three Affiliated Tribes, ND

Elgin Crow's Breast, THPO, Three Affiliated Tribes, ND

Ken W. Davis, Chairman, Turtle Mountain Band of Chippewa , ND

Brady Paul Grant, THPO, Turtle Mountain Band of Chippewa , ND

Nebraska

Roger Trudell, Chairman, Santee Sioux Tribe of Nebraska, NE

Wyatt Thomas, Santee Sioux Tribe of Nebraska, NE

Robert Campbell, Santee Sioux Tribe of Nebraska, NE

OKLAHOMA

Kenneth Blanchard, Governor, Absentee-Shawnee Tribe of Indians of OK, OK

Oklahoma (cont.)

Karen Kaniatobe, THPO, Absentee-Shawnee Tribe of Indians of OK, OK

Chad Smith, Chief, Cherokee Nation, OK

Dr. Richard Allen, THPO, Cherokee Nation, OK

Darryl Flyingman, Governor, Cheyenne-Arapaho Tribe of Oklahoma, OK

Gordon Yellowman, NAGPRA, Cheyenne-Arapaho Tribe of Oklahoma, OK

Bill Anoatubby, Governor, Chickasaw Nation of Oklahoma, OK

Eddie Postoak, Chickasaw Nation of Oklahoma, OK

Gingy Nail, THPO, Chickasaw Nation of Oklahoma, OK

John Barrett, Chairman, Citizen Potawatomi Nation, OK

Jon Boursaw , Citizen Potawatomi Nation, OK

Jeremy Finch, Citizen Potawatomi Nation, OK

Bruce Gonzales, President, Delaware Nation, OK

Tamara Francis, Delaware Nation, OK

Jeff Houser, Chairman, Fort Sill Apache Business Committee, OK

Leland Michael Darrow, Fort Sill Apache Business Committee, OK

Bryan Jones, Fort Sill Apache Business Committee, OK

E. Bernadette Huber, Chair, Iowa Tribe of Oklahoma, OK

Joyce Miller, THPO, Iowa Tribe of Oklahoma, OK

Tony Salazar, Chairman, Kickapoo Tribe of Oklahoma, OK

Kent Collier, NAGPRA, Kickapoo Tribe of Oklahoma, OK

Tribal Chairman, Miami Tribe of Oklahoma, OK

Julie Olds, Miami Tribe of Oklahoma, OK

A.D. Ellis, Chief, Muscogee Creek Nation, OK

Joyce A. Bear, THPO, Muscogee Creek Nation, OK

NATIVE AMERICAN GROUPS (CONTINUED)

Oklahoma (cont.)

Jim Gray, Chief, Osage Nation of Oklahoma , OK

David Conrad, Osage Nation of Oklahoma , OK

Dr. Andrea Hunter, Osage Nation of Oklahoma , OK

Ron Rice, President, Pawnee Nation of Oklahoma, OK

Daniel Jones, Chairman, Ponca Tribe of Indians of Oklahoma, OK

Kay Rhoads, Chief, Sac & Fox Nation of Oklahoma, OK

Sandra Massey, THPO, Sac & Fox Nation of Oklahoma, OK

Anthony Street, Chairman, Tonkawa Tribe, OK

Josh Waffle, Tonkawa Tribe, OK

Dallas Proctor, Chief, United Keetoowah Band of Cherokee Indians, OK

Stephen "Archie" Mouse, THPO, United Keetoowah Band of Cherokee Indians, OK

South Dakota

Joseph Brings Plenty, Chairman, Cheyenne River Sioux, SD

Albert LeBeau, THPO, Cheyenne River Sioux Tribe, SD

Josh Weston, President, Flandreau Santee Sioux Tribal Council, SD

Sam Allen, THPO, Flandreau Santee Sioux Tribe, SD

Michael Jandreau, Lower Bruhle Sioux Tribe, SD

Scott Jones, Lower Bruhle Sioux Tribe, SD

John Yellow Bird Steele, President, Oglala Sioux Tribe, SD

Edgar Bear Runner, THPO, Oglala Sioux Tribe, SD

Rodney Bordeaux, President, Rosebud Sioux Tribe, SD

Russell Eagle Bear, THPO, Rosebud Sioux Tribe, SD

Jim Whitted, THPO, Sisseton-Wahpeton Sioux , SD

Winfield Rondell, Jr., Sisseton-Wahpeton Oyate Sioux , SD

Michael Selvage Chair, Sisseton-Wahpeton Oyate Sioux , SD

South Dakota (cont.)

Winfield Rondell, Jr., Sisseton-Wahpeton Oyate Sioux , SD

Michael Selvage Chair, Sisseton-Wahpeton Oyate Sioux , SD

Norman Perko, Sisseton-Wahpeton Oyate Sioux , SD

Charlotte Almanza, Sisseton-Wahpeton Oyate Sioux , SD

Vine T. Marks, Sr., Sisseton-Wahpeton Oyate Sioux , SD

Dianne Desrosiers, Sisseton-Wahpeton Oyate Sioux , SD

Dennis Gill, Sr., Sisseton-Wahpeton Oyate Wahpekutz , SD

Darrell Drapeau, Councilman, Yankton Sioux, SD

Texas

Juan Garza, Kickapoo Traditional Tribe of Texas, TX

Mary Jane Salgado, Kickapoo Traditional Tribe of Texas, TX

Utah

Maxine Natchees, Chairperson, Northern Ute Tribe , UT

Betsy Chapoose, Northern Ute Tribe , UT

Wisconsin

Harold Frank, Chairperson, Forest County Potawatomi Community of Wisconsin Potawatomi Indians, WI

Mike Alloway, Sr., Forest County Potawatomi Community of Wisconsin Potawatomi Indians, WI

George Lewis, President, Ho-Chunk Nation of Wisconsin, WI

William Quackenbush, THPO, Ho-Chunk Nation of Wisconsin, WI

Larry Garvin, NAGPRA, Ho-Chunk Nation of Wisconsin, WI

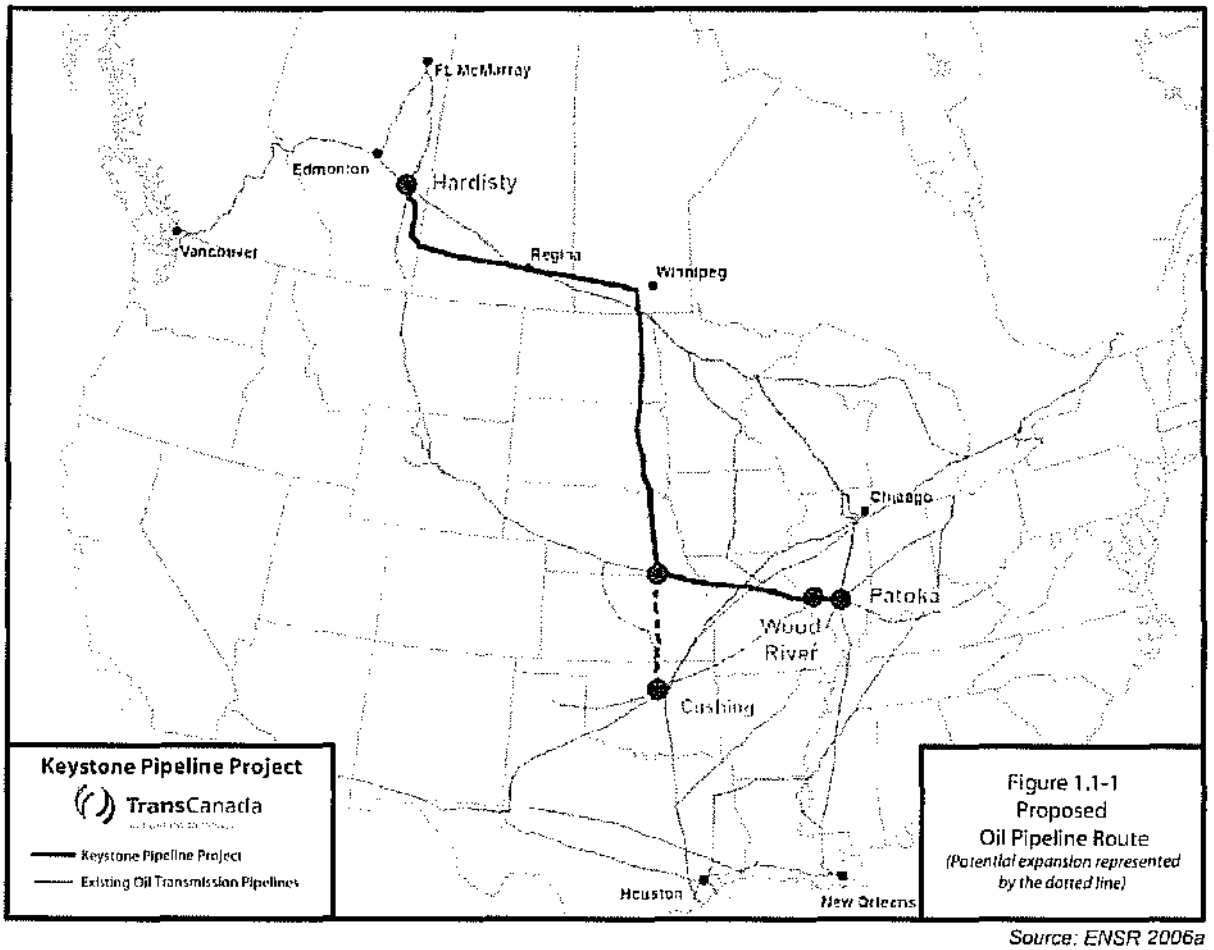
Wyoming

Ivan D. Posey, Chairman, Eastern Shoshone Tribe, WY

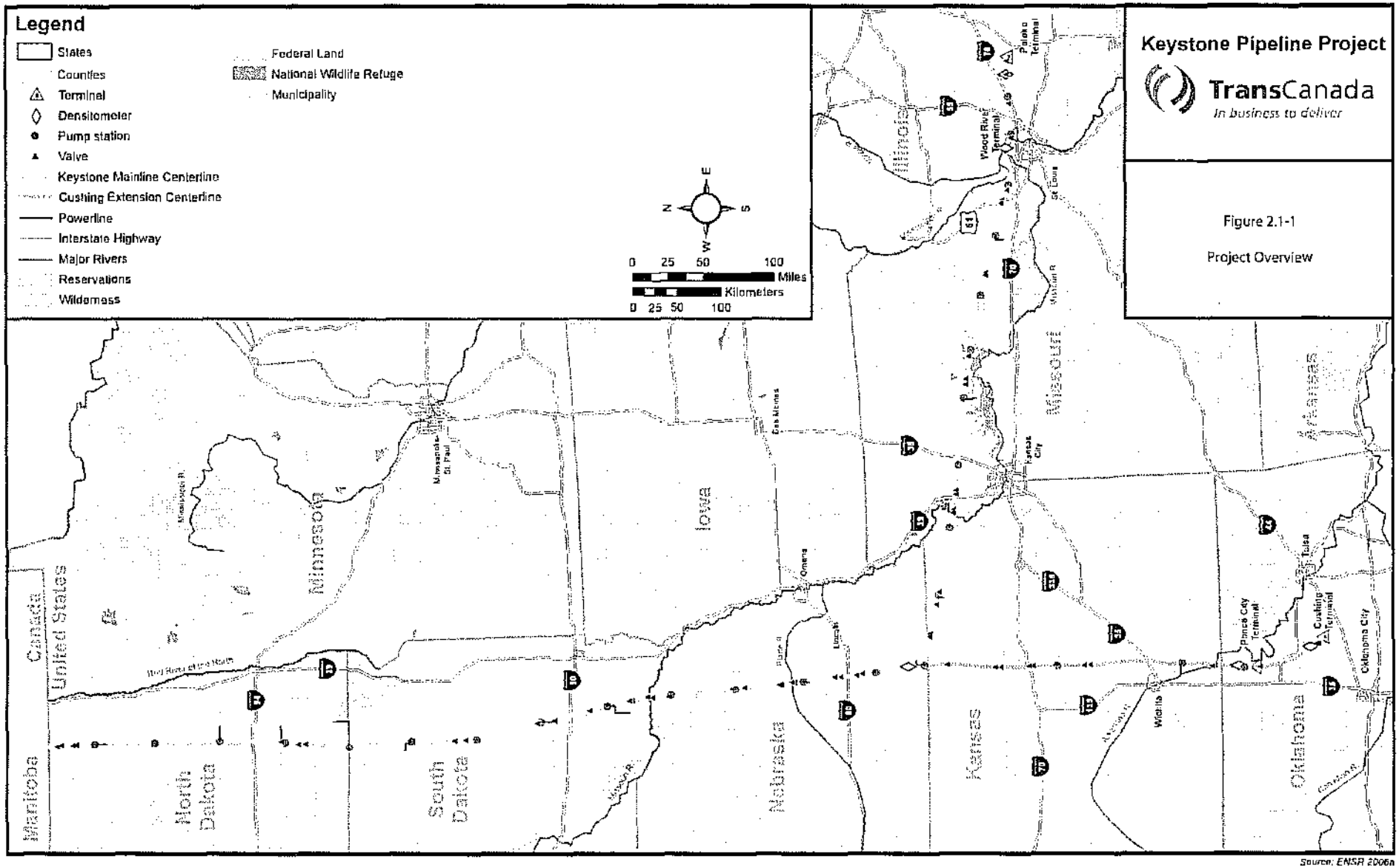
Tribal Historic Preservation Officer, Eastern Shoshone Tribe, WY

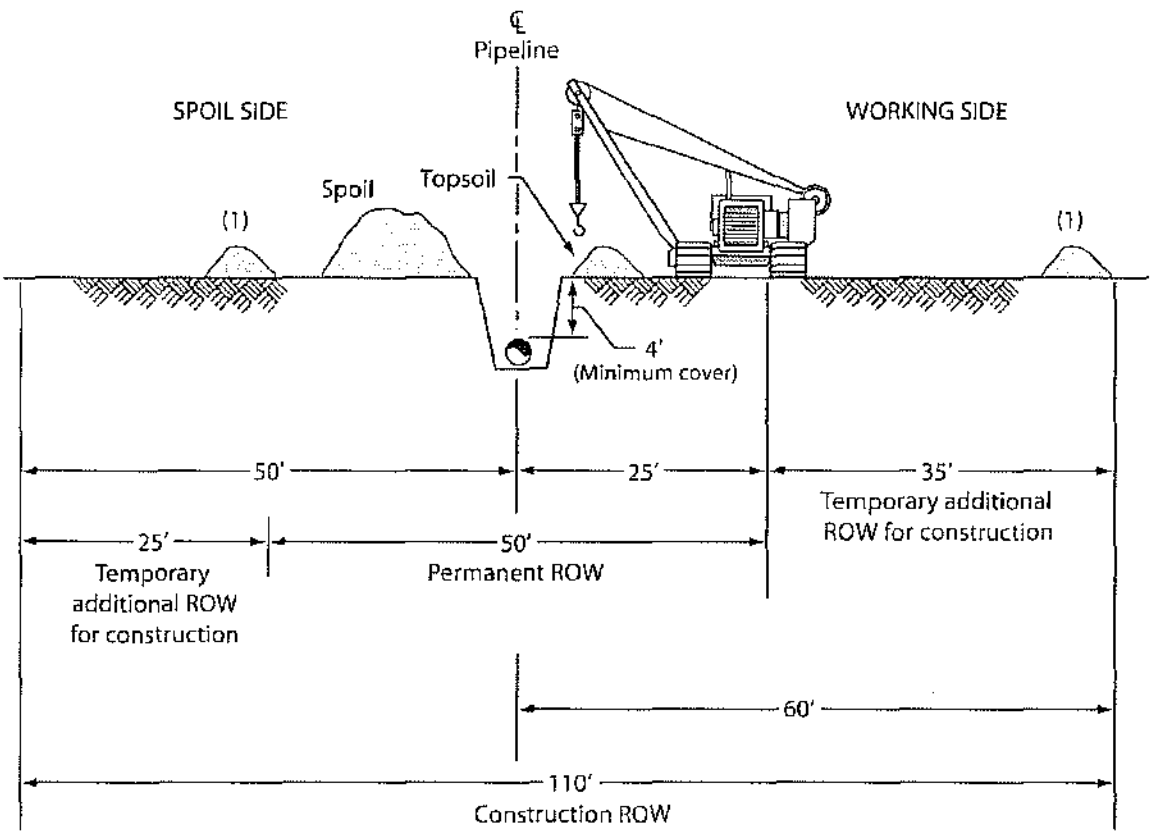
Richard Brannan, Chairman, Northern Arapaho Tribe, WY

Jo Ann White, THPO, Northern Arapaho Tribe, WY



Source: ENSR 2006a


Legend
States
Counties
Terminal
Densitometer
Pump station
Valve
Keystone Mainline Centerline
Cushing Extension Centerline
Powerline
Interstate Highway
Major Rivers
Reservations
Wilderness
Federal Land
National Wildlife Refuge
Municipality
N
E
S
W
0 25 50 100
Miles
Kilometers
0 25 50 100
Keystone Pipeline Project
TransCanada
In business to deliver
Figure 2.1-1
Project Overview
Canada
United States
Manitoba
North Dakota
South Dakota
Minnesota
Iowa
Nebraska
Kansas
Missouri
Oklahoma
Arkansas
Illinois
Source: ENSR 2006a

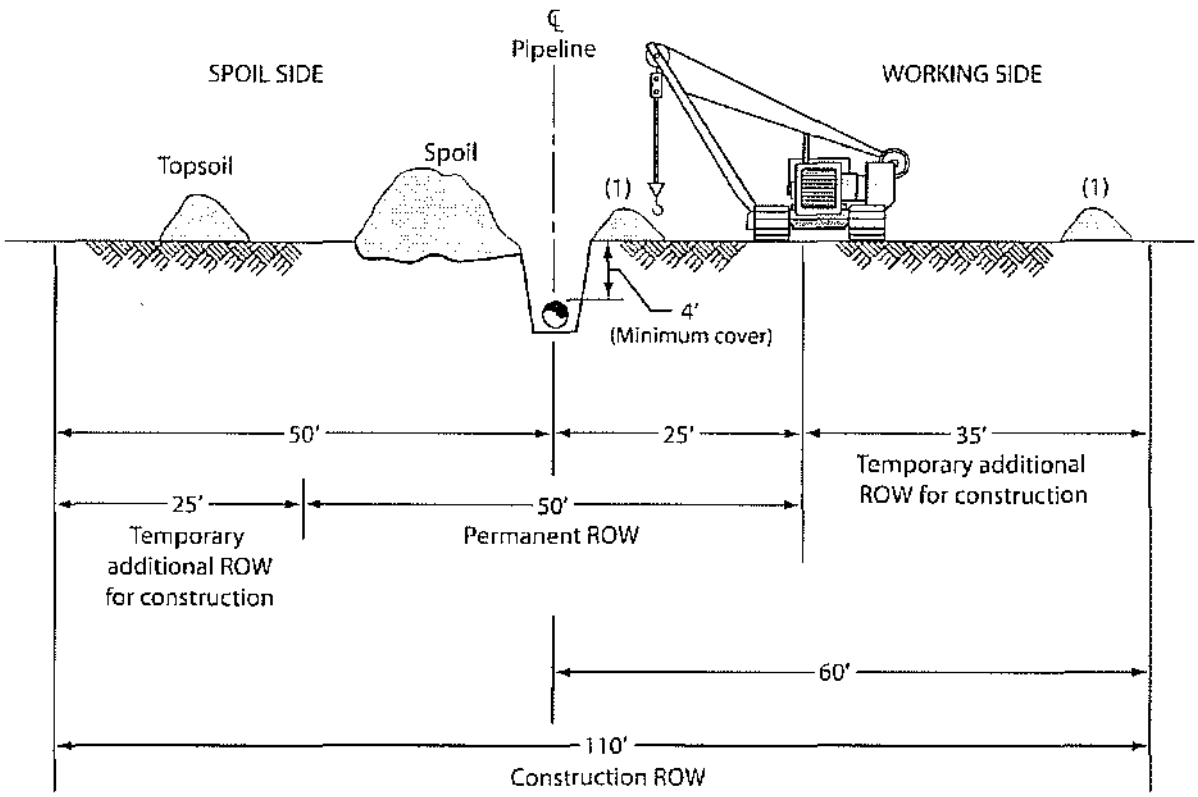


(1) Alternate topsoil placement locations

KEYSTONE PIPELINE PROJECT

Figure 2.1-2
Typical 110-Foot-Wide Construction Right-of-Way
(30- or 36-inch Pipeline)
with Topsoil Removal Only
over Trench Line

Source: ENSR 2006a

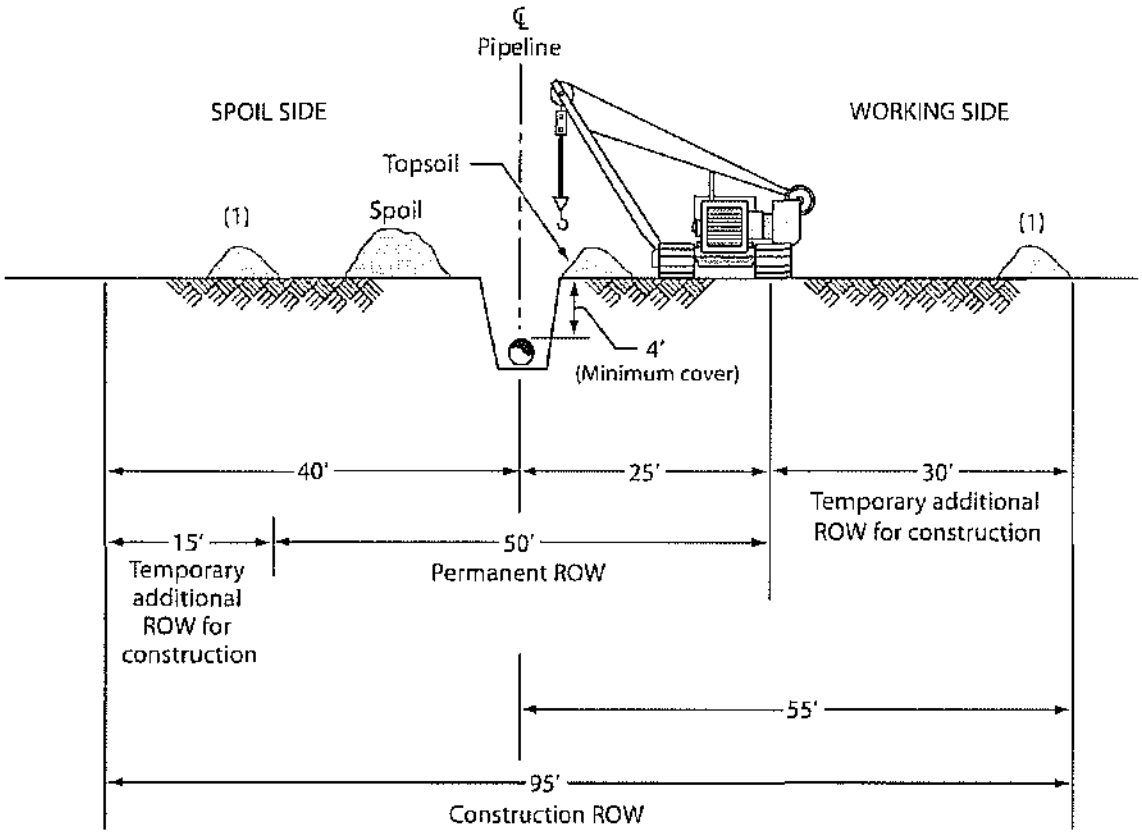


(1) Alternate topsoil placment locations

KEYSTONE PIPELINE PROJECT

Figure 2.1-3
Typical 110-Foot-Wide Construction Right-of-Way (30- or 36-inch Pipeline) with Topsoil Removal over Trench Line and Spoil Side

Source: ENSR 2006a

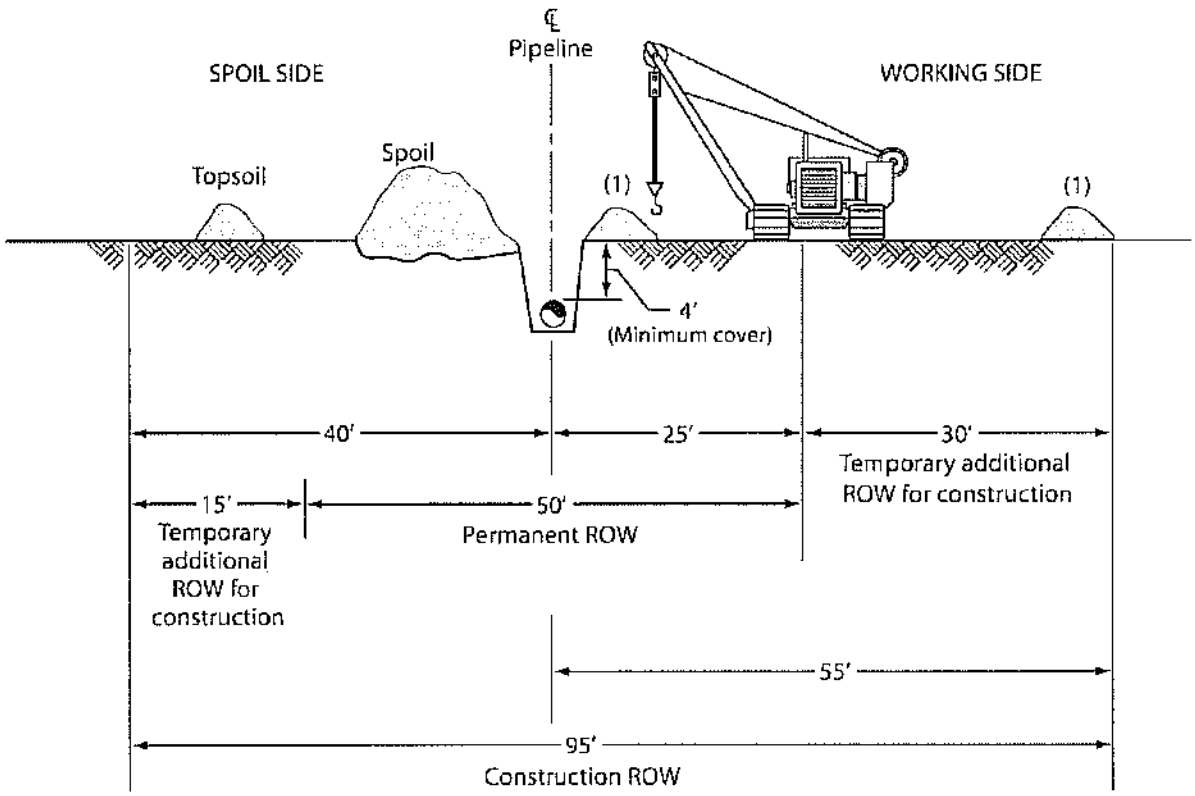


(1) Alternate topsoil placement locations

KEYSTONE PIPELINE PROJECT

Figure 2.1-4
Typical 95-Foot-Wide Construction Right-of-Way (24-inch Pipeline) with Topsoil Removal Only over Trench Line

Source: ENSR 2006a

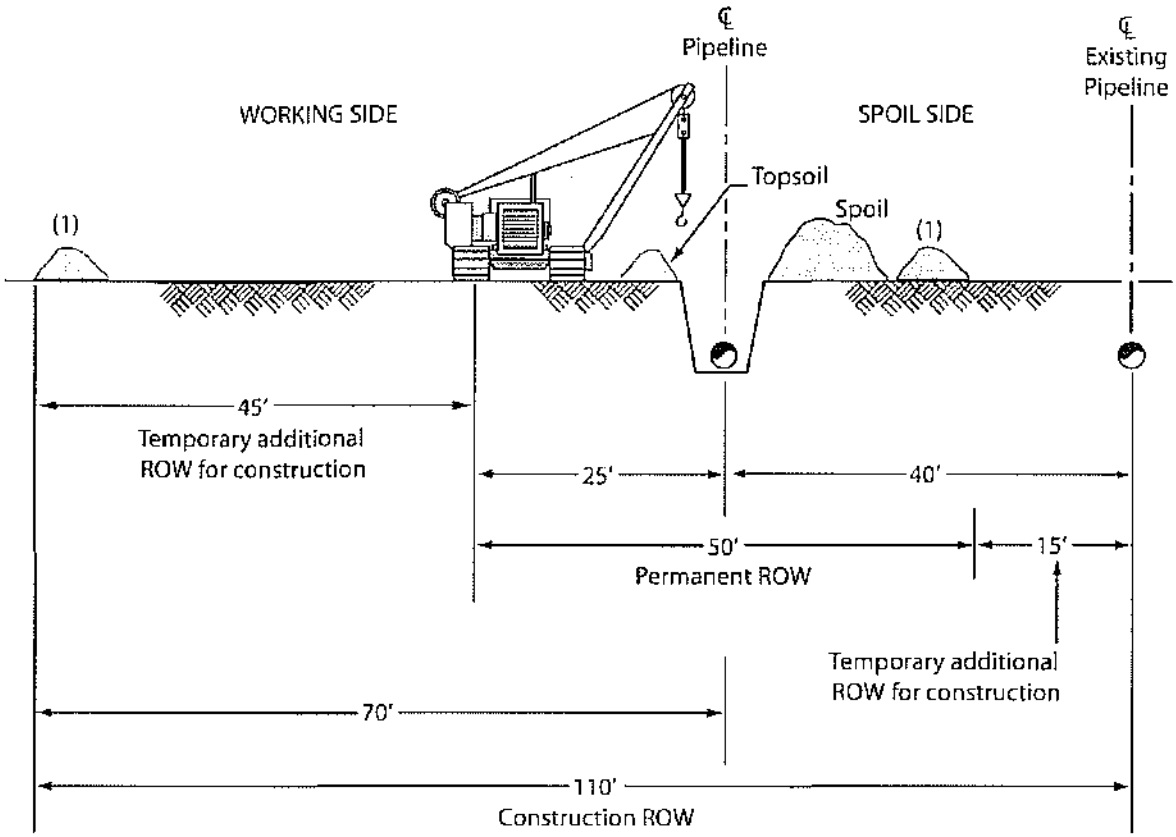


(1) Alternate topsoil placement locations

KEYSTONE PIPELINE PROJECT

Figure 2.1-5
Typical 95-Foot-Wide Construction Right-of-Way (24-inch Pipeline) with Topsoil Removal over Trench Line and Spoil Side

Source: ENSR 2006a

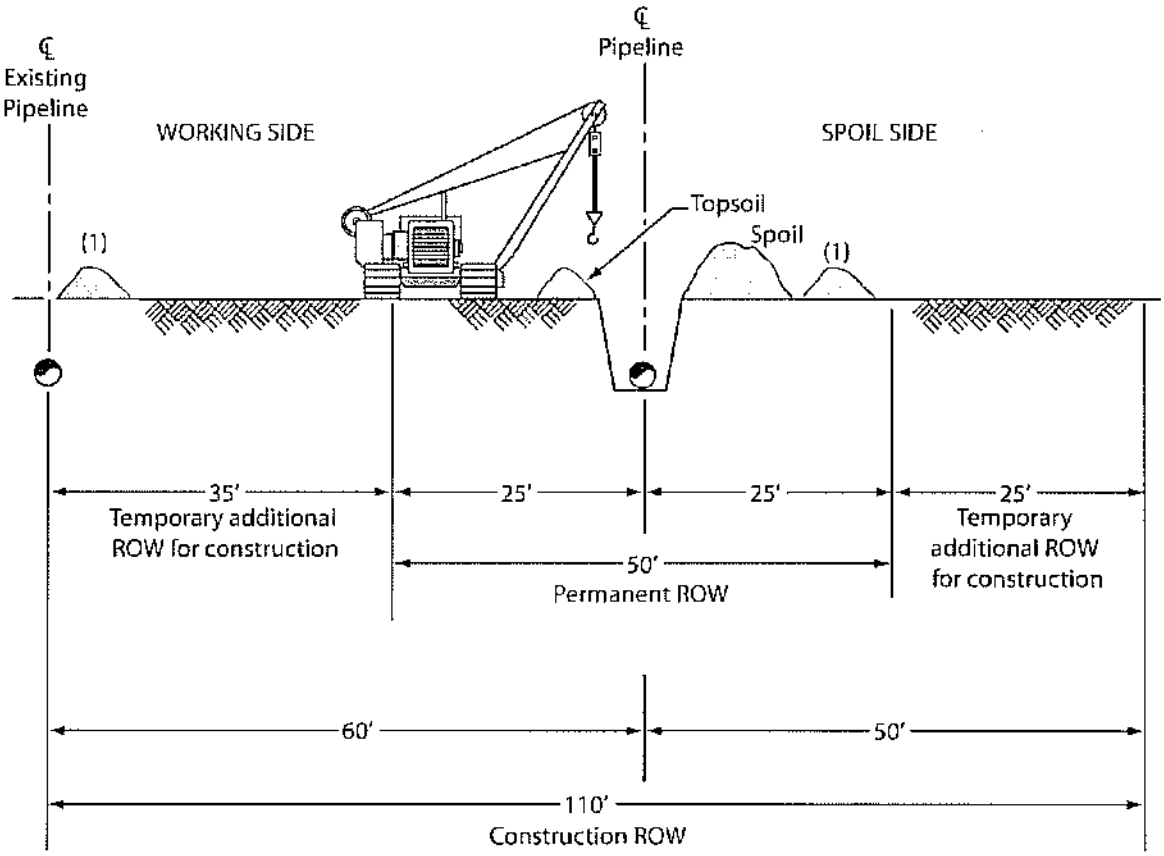


(1) Alternate topsoil placement locations

KEYSTONE PIPELINE PROJECT

Figure 2.1-6
Typical 110-Foot-Wide Construction Right-of-Way
(30- or 36-inch Pipeline)
- Spoil Side Adjacent and Parallel to Existing Pipeline

Source: ENSR 2006a

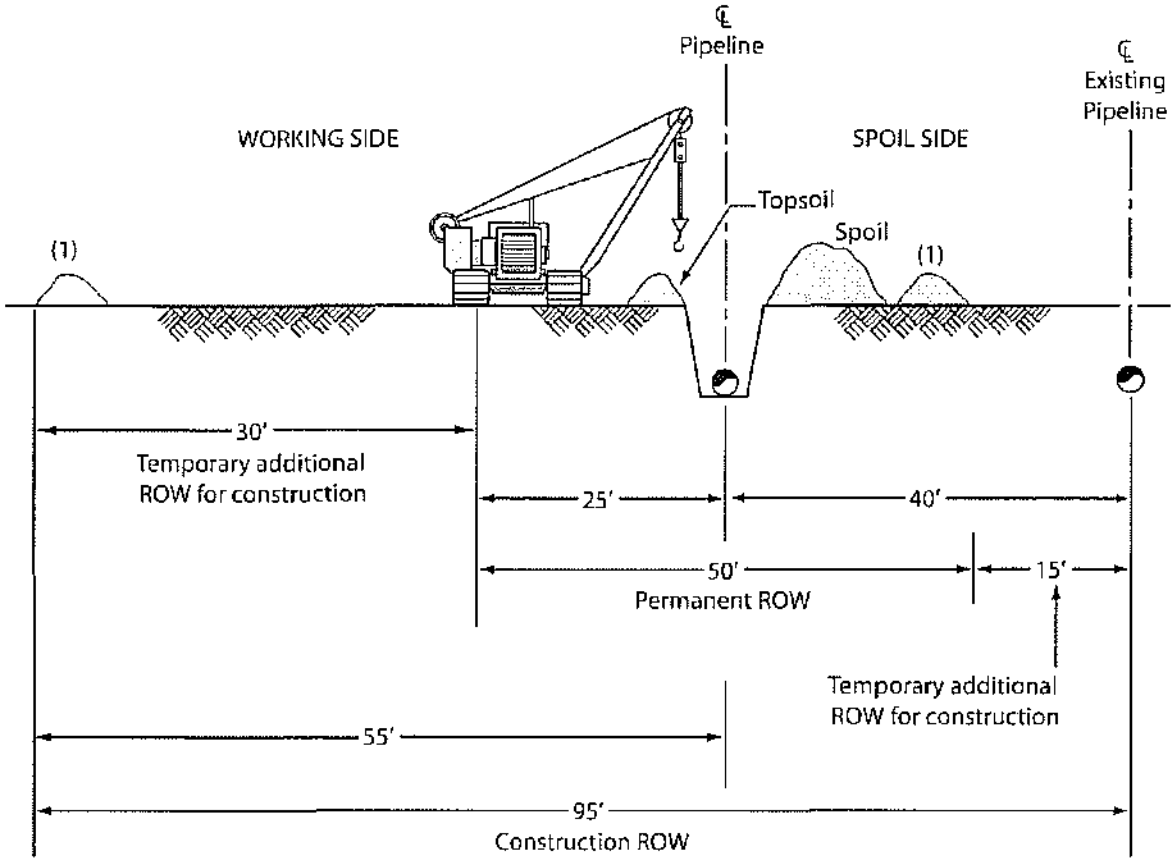


(1) Alternate topsoil placement locations

KEYSTONE PIPELINE PROJECT

Figure 2.1-7
Typical 110-Foot-Wide Construction Right-of-Way
(30- or 36-inch Pipeline)
- Working Side Adjacent and Parallel to Existing Pipeline

Source: ENSR 2006a

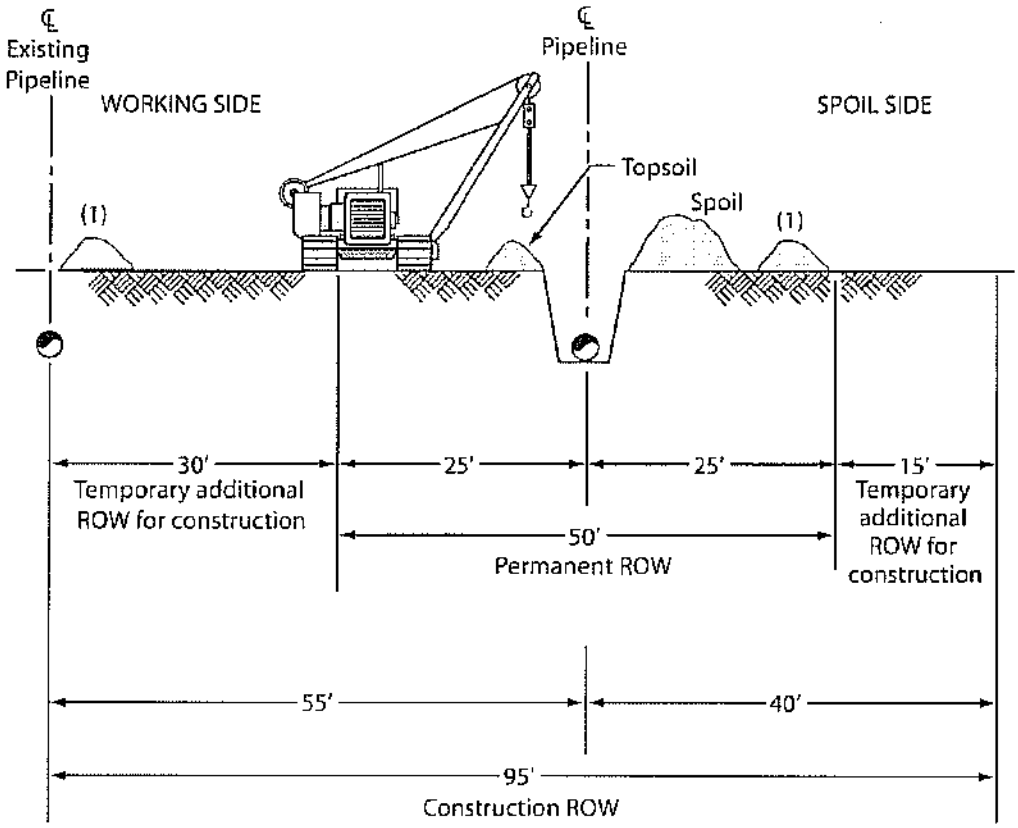


(1) Alternate topsoil placement locations

KEYSTONE PIPELINE PROJECT

Figure 2.1-8
Typical 95-Foot-Wide Construction Right-of-Way (24-inch Pipeline) - Spoil Side Adjacent and Parallel to Existing Pipeline

Source: ENSR 2006a

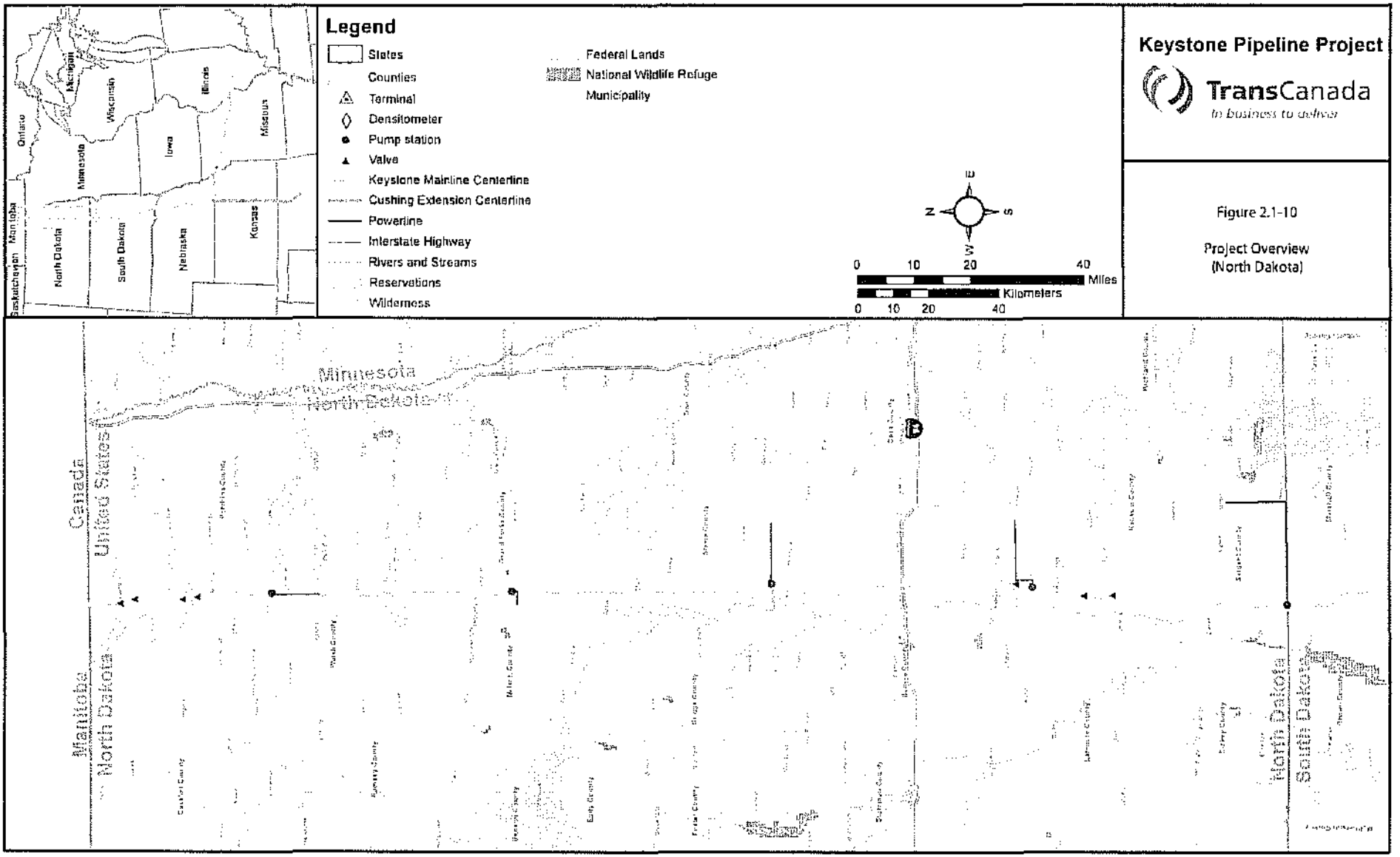


(1) Alternate topsoil placement locations

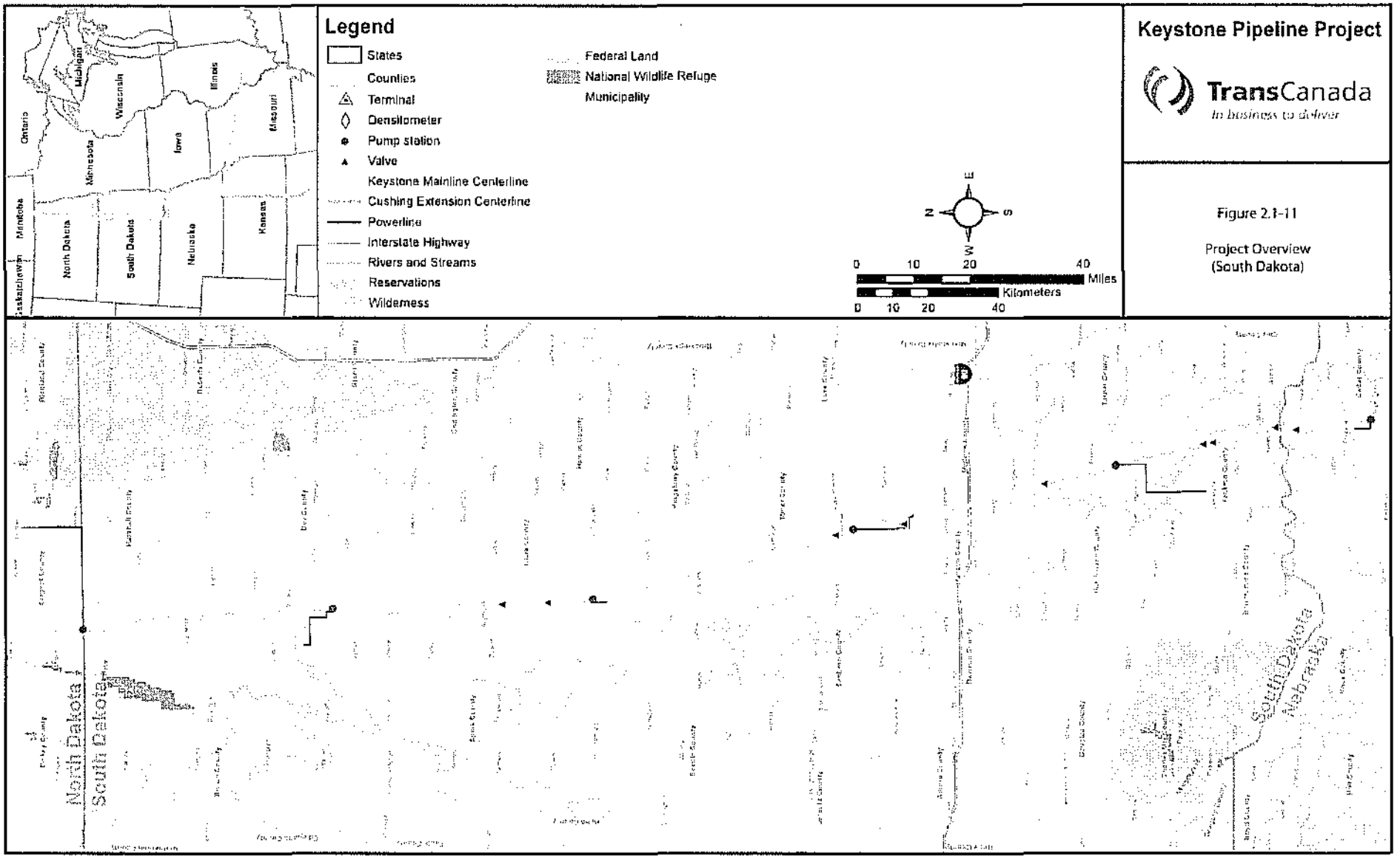
KEYSTONE PIPELINE PROJECT

Figure 2.1-9
Typical 95-Foot-Wide Construction Right-of-Way (24-inch Pipeline) - Working Side Adjacent and Parallel to Existing Pipeline

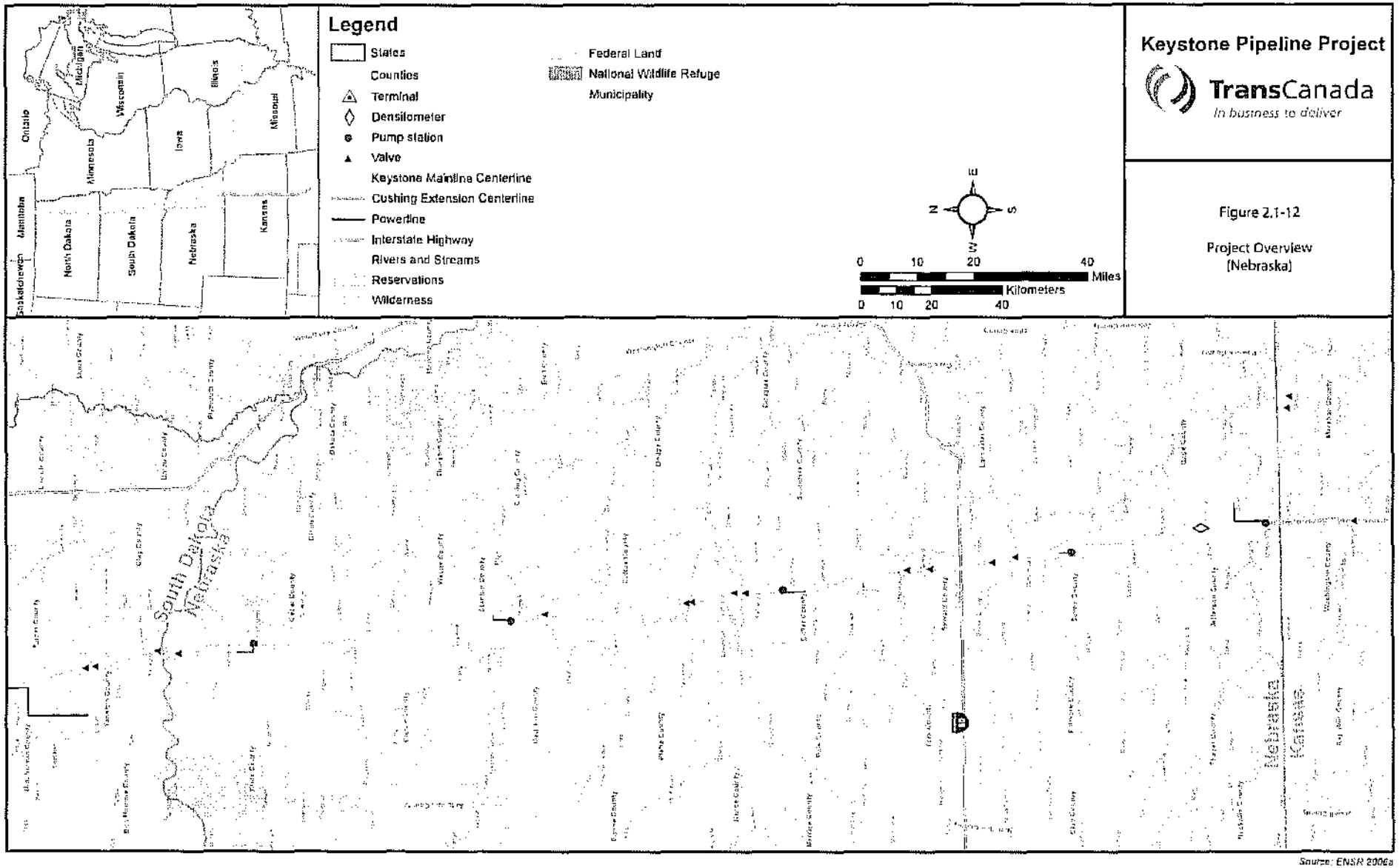
Source: ENSR 2006a

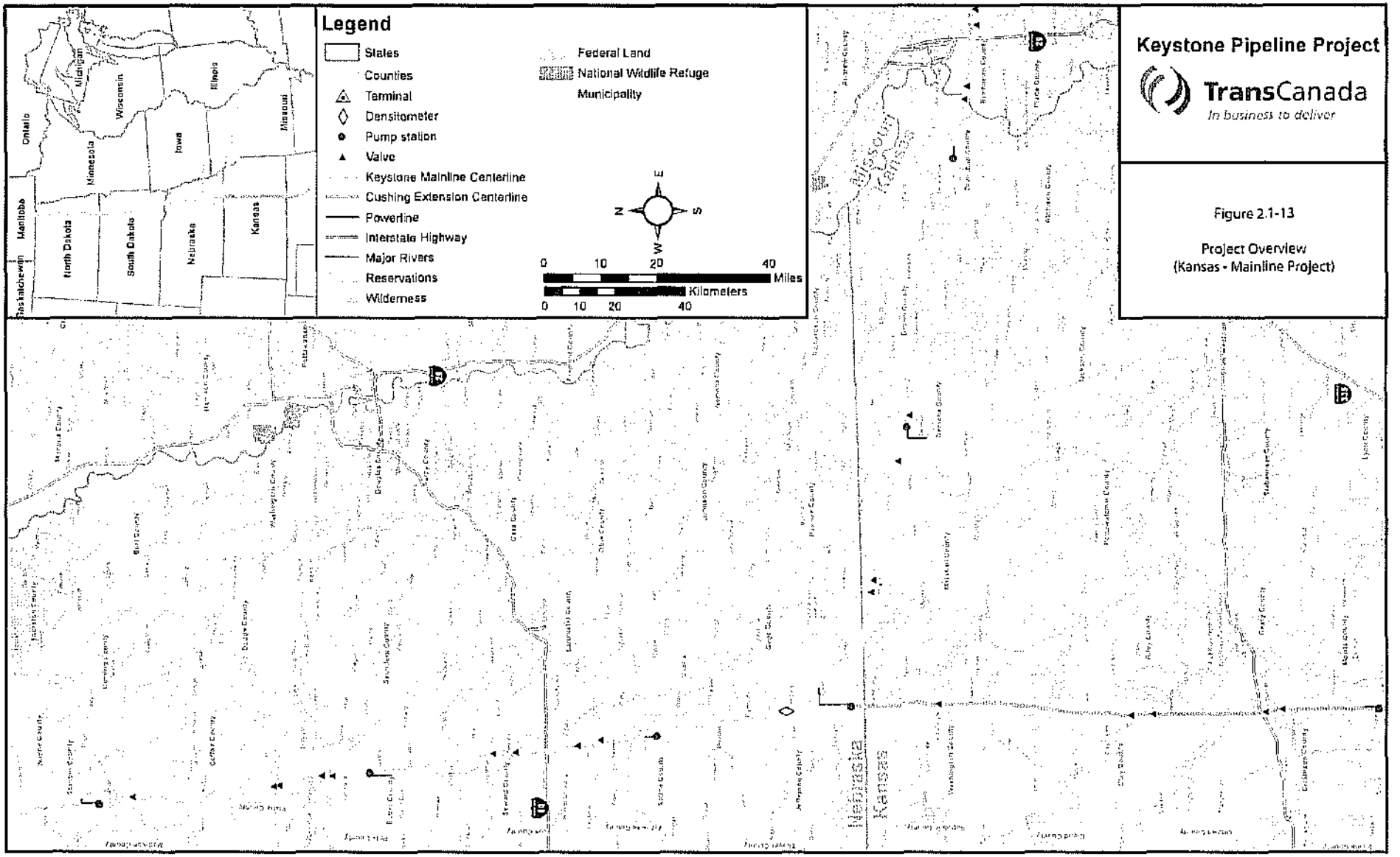


Source: ENSR 2006a

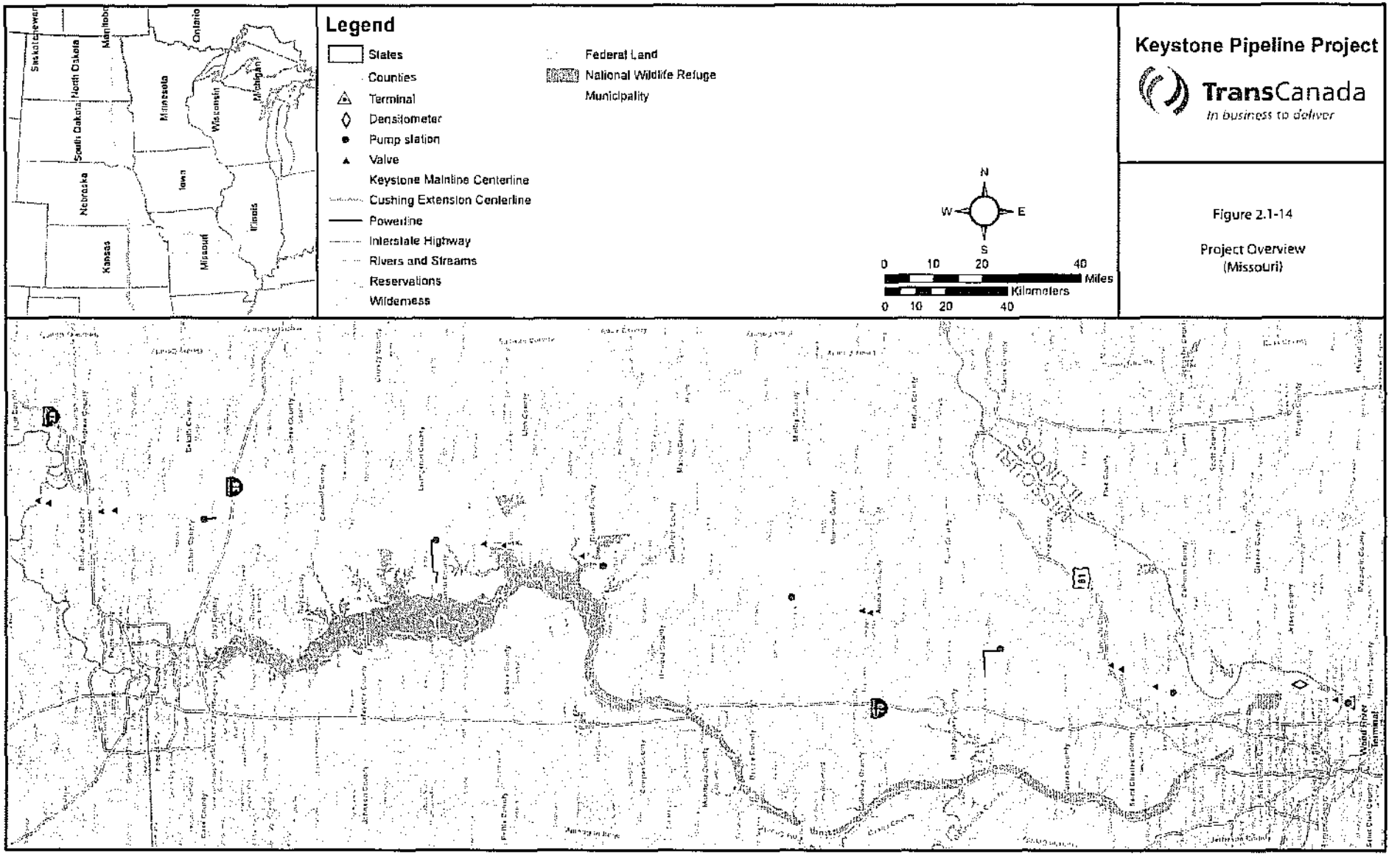


Source: ENSR 2008a


Legend
States
Counties
Terminal
Densilometer
Pump station
Valve
Keystone Mainline Centerline
Cushing Extension Centerline
Powerline
Interstate Highway
Rivers and Streams
Reservations
Wilderness
Federal Land
National Wildlife Refuge
Municipality
0 10 20 40 Miles
0 10 20 40 Kilometers
Keystone Pipeline Project
TransCanada
In business to deliver
Figure 2.1-12
Project Overview
(Nebraska)
South Dakota
Nebraska
Source: ENSR 2006a



Source: ENSR 2008a



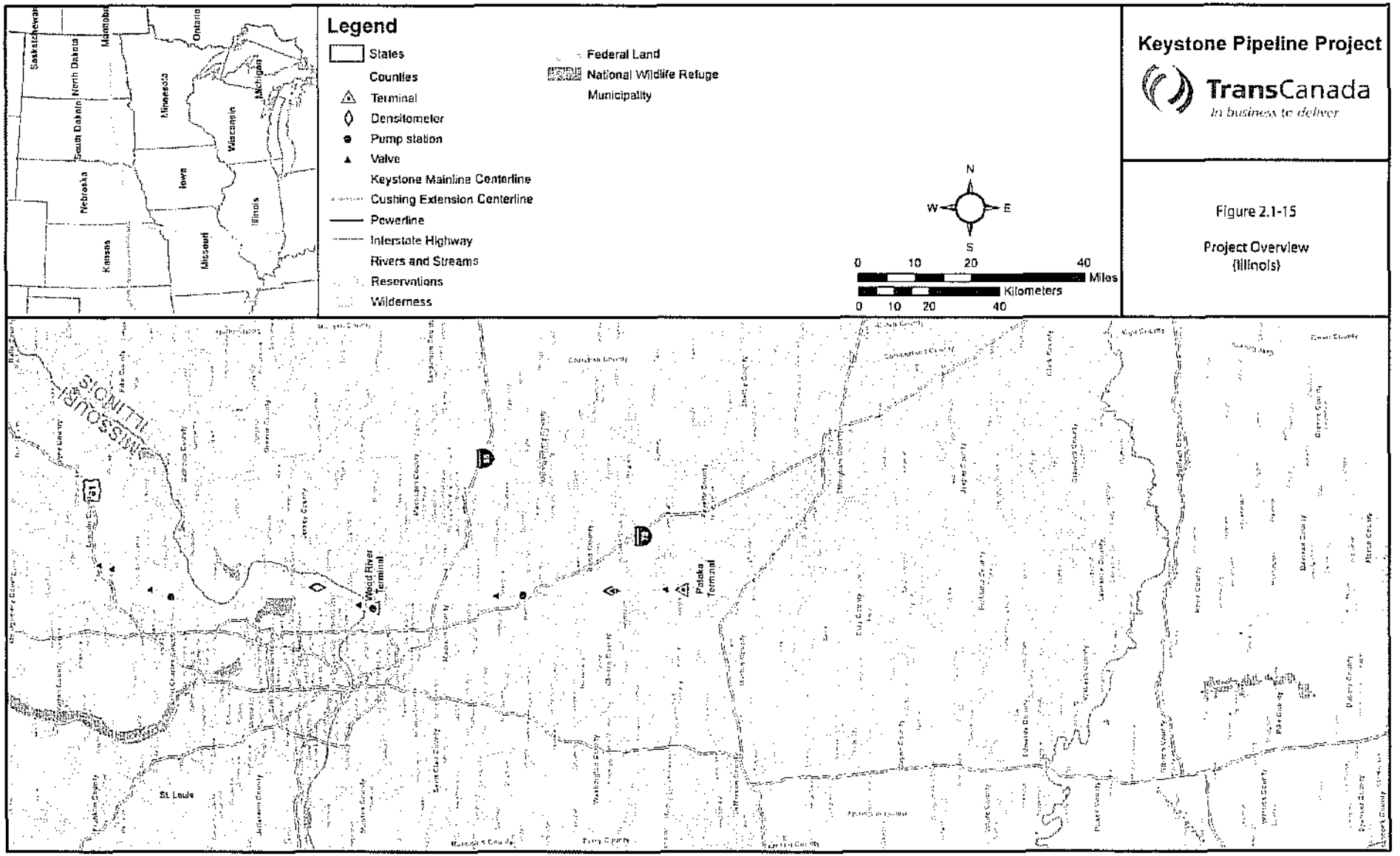
Keystone Pipeline Project

TransCanada
In business to deliver

Figure 2.1-14

Project Overview
(Missouri)

Source: ENSR 2008a


Legend
States
Counties
Terminal
Densitometer
Pump station
Valve
Keystone Mainline Centerline
Cushing Extension Centerline
Powerline
Interstate Highway
Rivers and Streams
Reservations
Wilderness
Federal Land
National Wildlife Refuge
Municipality
N
W
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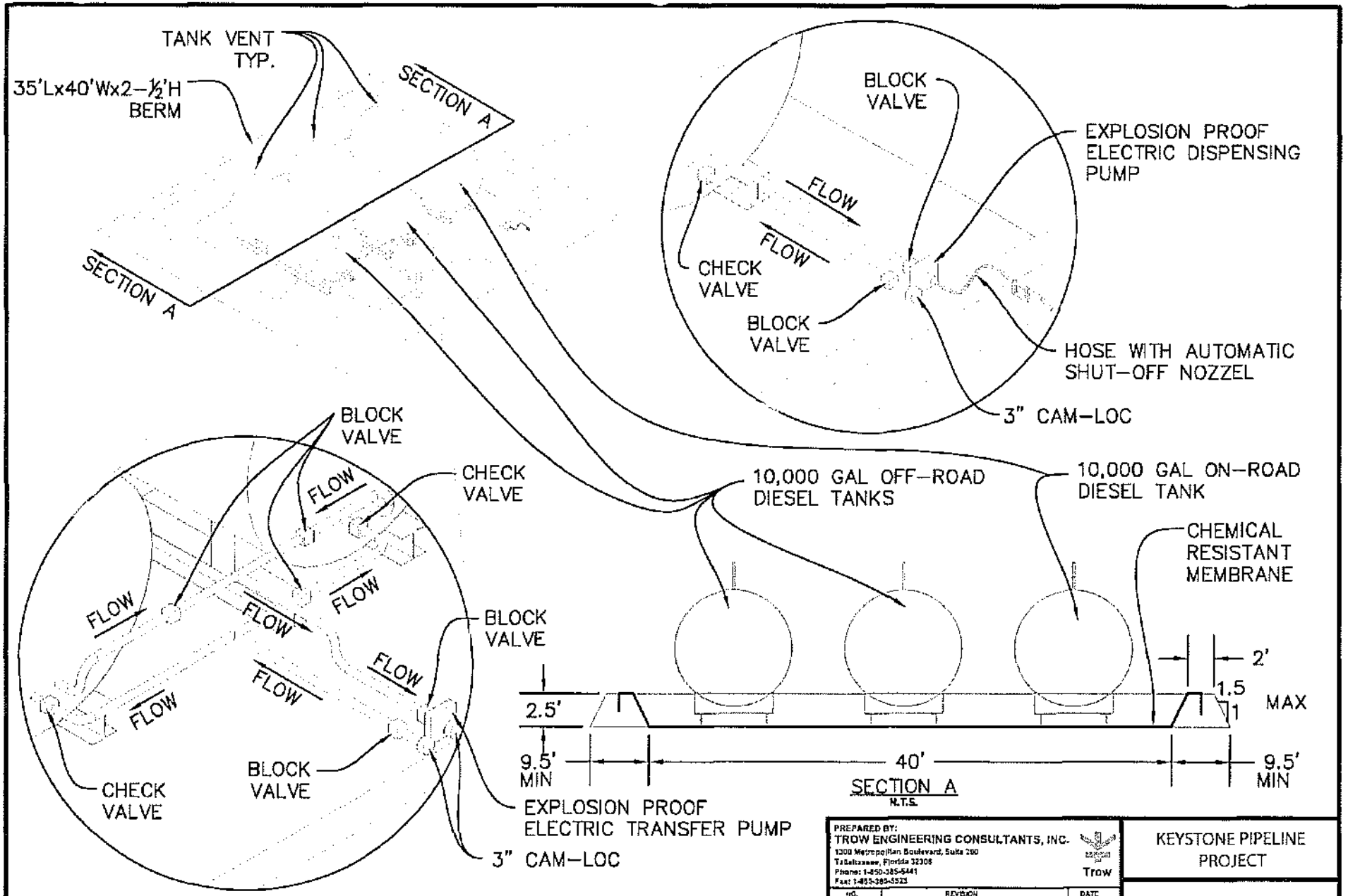
S
0 10 20 40 Miles
0 10 20 40 Kilometers
Keystone Pipeline Project
TransCanada
In business to deliver
Figure 2.1-15
Project Overview
(Illinois)
Wood River Terminal
Patoka Terminal
St Louis
Source: ENSR 2006a



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

PREPARED BY:
TROW ENGINEERING CONSULTANTS, INC.
1300 Metropolitan Boulevard, Suite 200
Tallahassee, Florida 32308
Phone: 1-850-385-5441
Fax: 1-850-385-5523
Trow

NO.	REVISION	DATE
0	ISSUED FOR DEPARTMENT OF STATE PERMIT	MAR.16.2006

DRAWING NUMBER	DRAWN BY	CHECKED BY
K-00-P-7000-809	ABH	

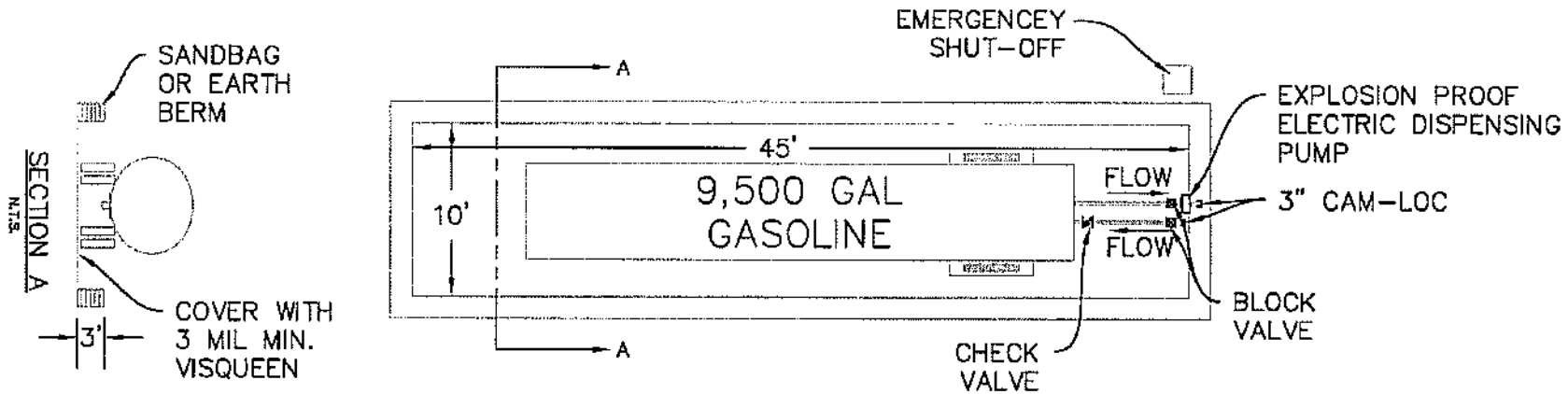
APPROVED BY

LAST PLOT DATE: Wed, 28 Mar 2007 – 3:51 pm

KEYSTONE PIPELINE PROJECT

Figure 2.1-16
Typical Diesel Transfer Station

Source: TransCanada 2007c



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

PREPARED BY:
TROW ENGINEERING CONSULTANTS, INC.
1300 Metropolitan Boulevard, Suite 200
Tallahassee, Florida 32308
Phone: 1-850-385-5441
Fax: 1-850-385-5523
Trow

NO.	REVISION	DATE
0	ISSUED FOR DEPARTMENT OF STATE FILING	MAR.30.2008

DRAWING NUMBER	DRAWN BY	CHECKED BY
K-00-P-7000-810	ASH	

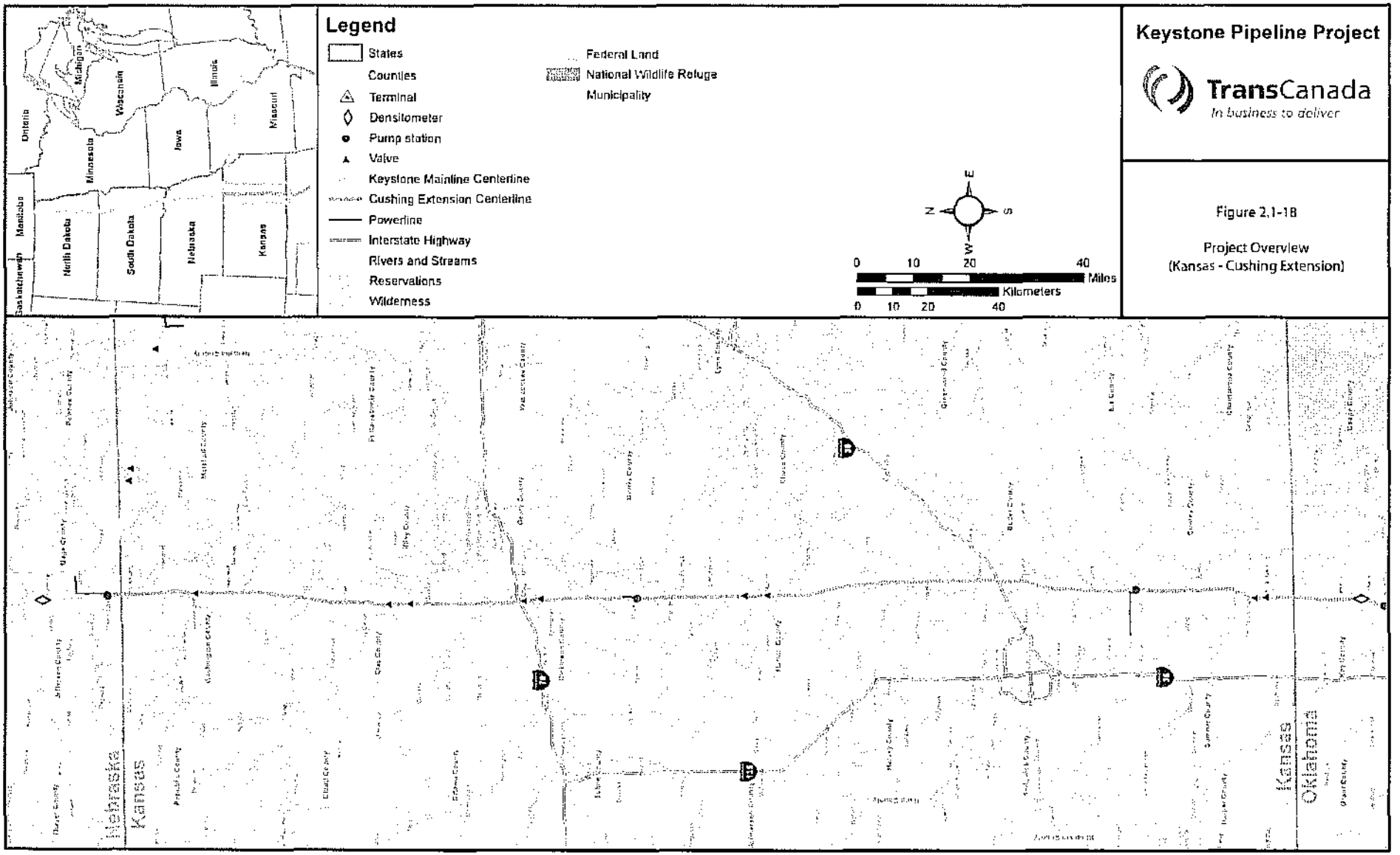
KEYSTONE PIPELINE PROJECT

Figure 2.1-17
Typical Gasoline Transfer Station

APPROVED BY:

LAST PLOT DATE: Wed, 28 Mar 2007 – 1:07 pm

Source: TransCanada 2007c



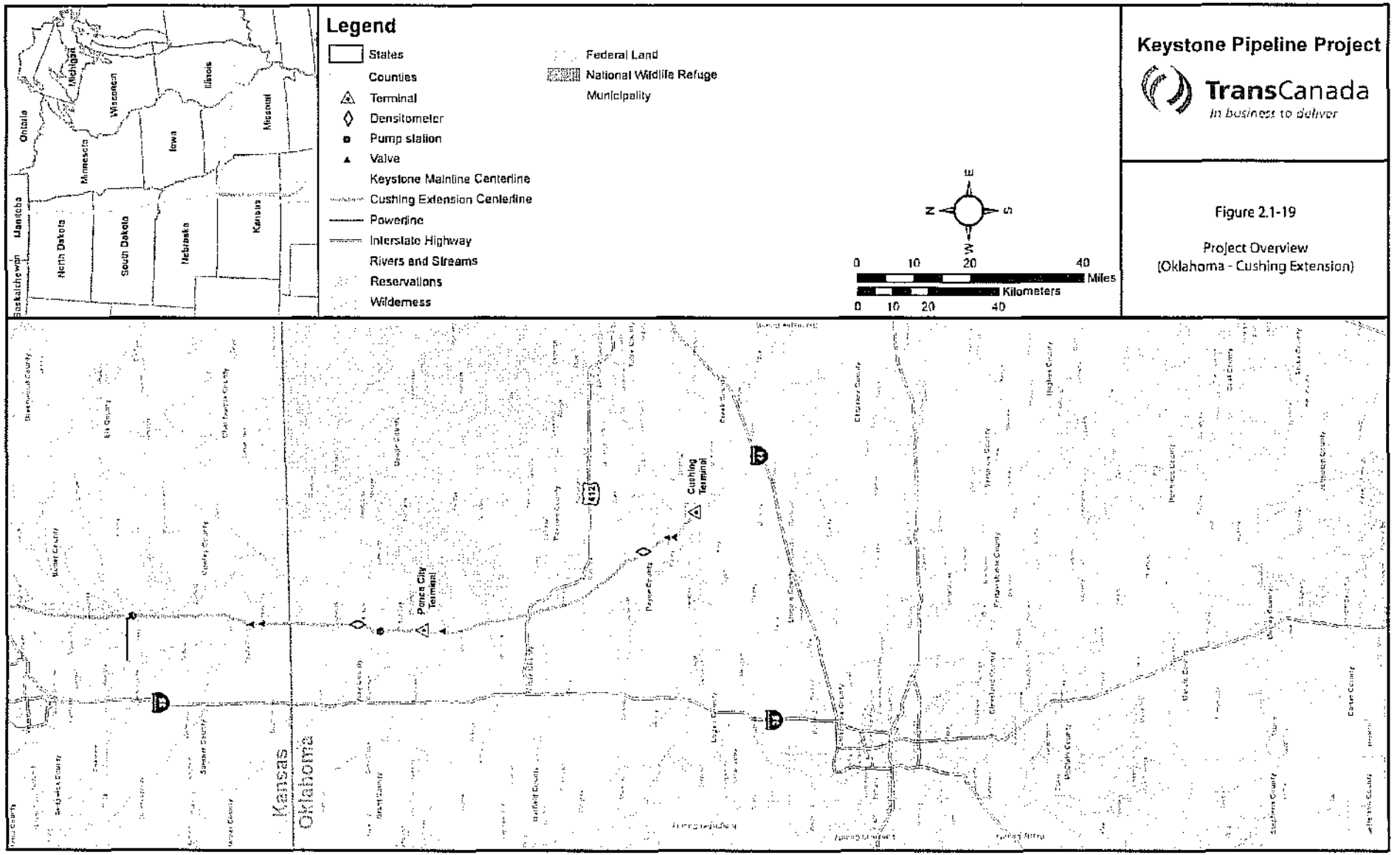
Keystone Pipeline Project

TransCanada
In business to deliver

Figure 2.1-18

Project Overview
(Kansas - Cushing Extension)

Source: ENSR 2008a



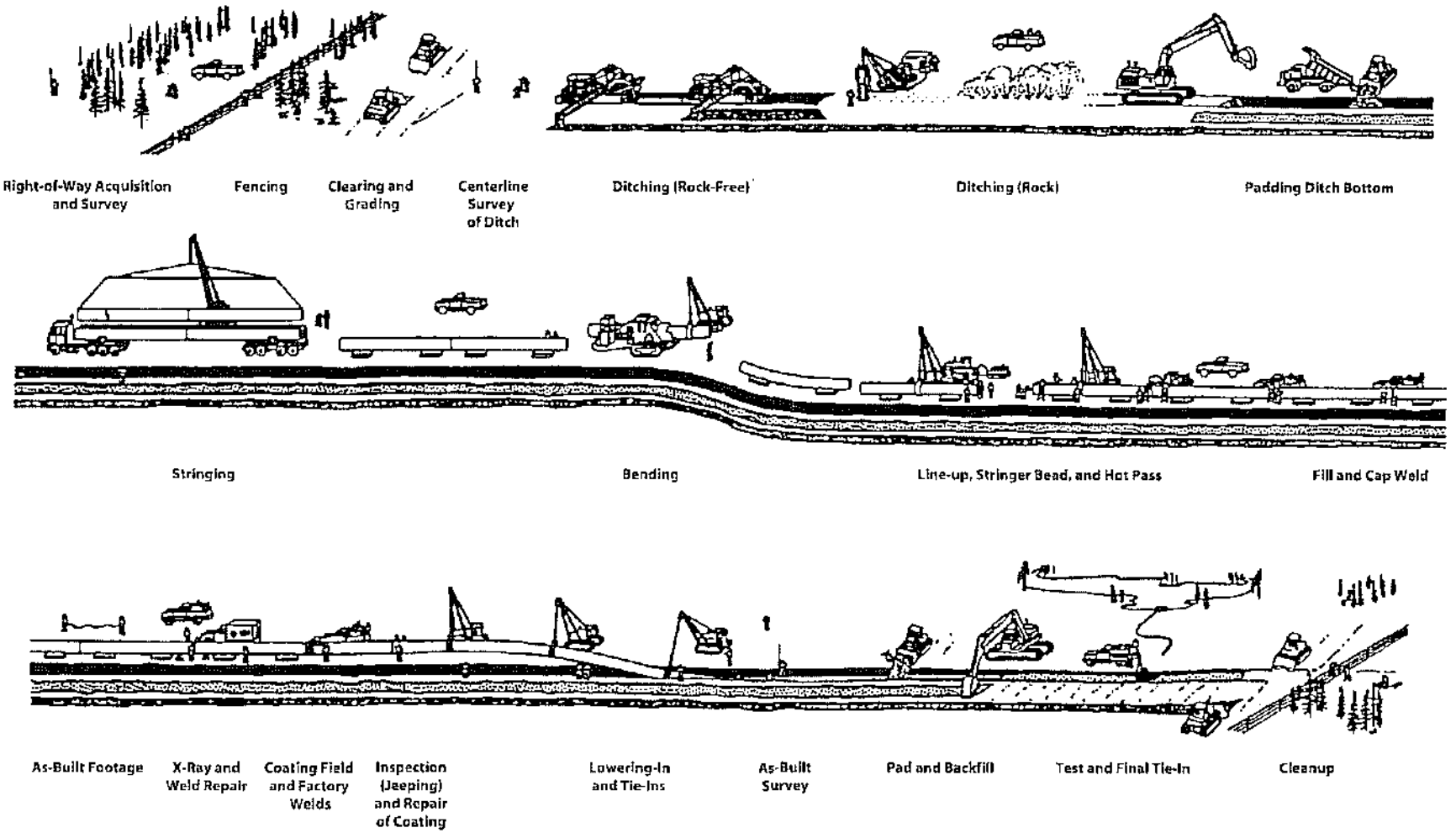
Keystone Pipeline Project

TransCanada
In business to deliver

Figure 2.1-19

Project Overview
(Oklahoma - Cushing Extension)

Source: ENSR 2006a



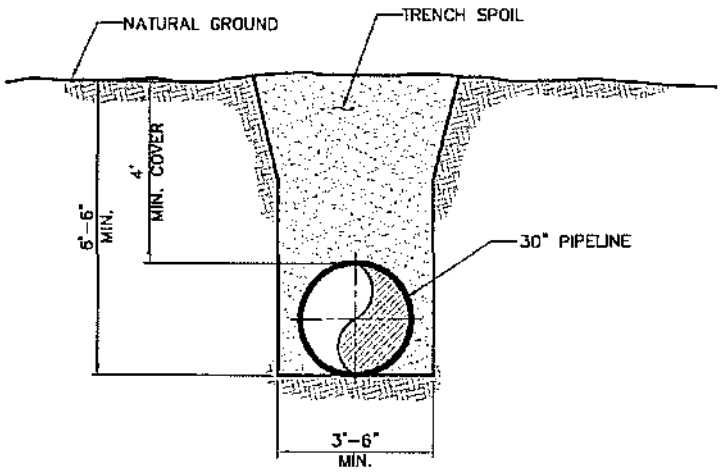
Not to Scale

KEYSTONE PIPELINE PROJECT

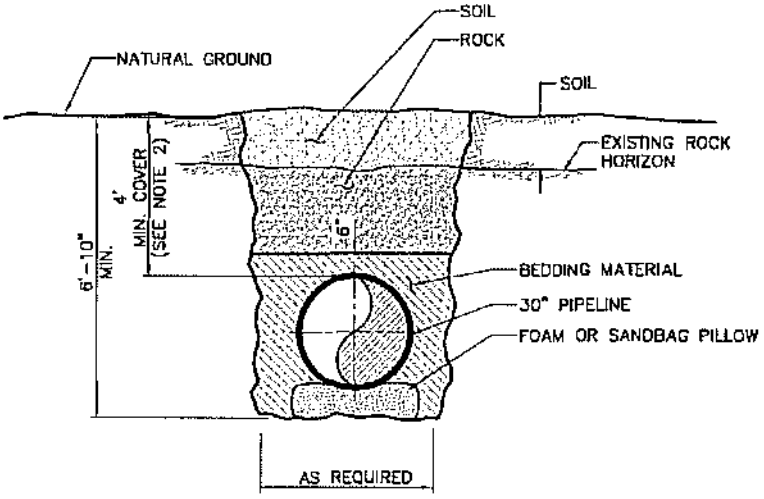
Figure 2.2-1

Typical Pipeline Construction Sequence

Source: ENSR 2006a



TRENCH IN SOILS
SCALE: 1/4" = 1'



TRENCH IN ROCK
SCALE: 1/4" = 1'

NOTES:

1. ADDITIONAL DEPTH OF COVER REQUIRED AT WATER BODY, DRY STREAM, ROAD AND RAILROAD CROSSING
2. DEPTH OF COVER MAY BE REDUCED TO 3' IN CONSOLIDATED ROCK.
3. CONFIGURATIONS ARE TYPICAL AND SUBJECT TO MODIFICATION DURING CONSTRUCTION TO SUIT ACTUAL SITE CONDITIONS.

PREPARED BY:
TROW ENGINEERING CONSULTANTS, INC.
1300 Metropolitan Boulevard, Suite 200
Tallahassee, Florida 32308
Phone: 1-850-385-6441
Fax: 1-850-385-5523
Trow

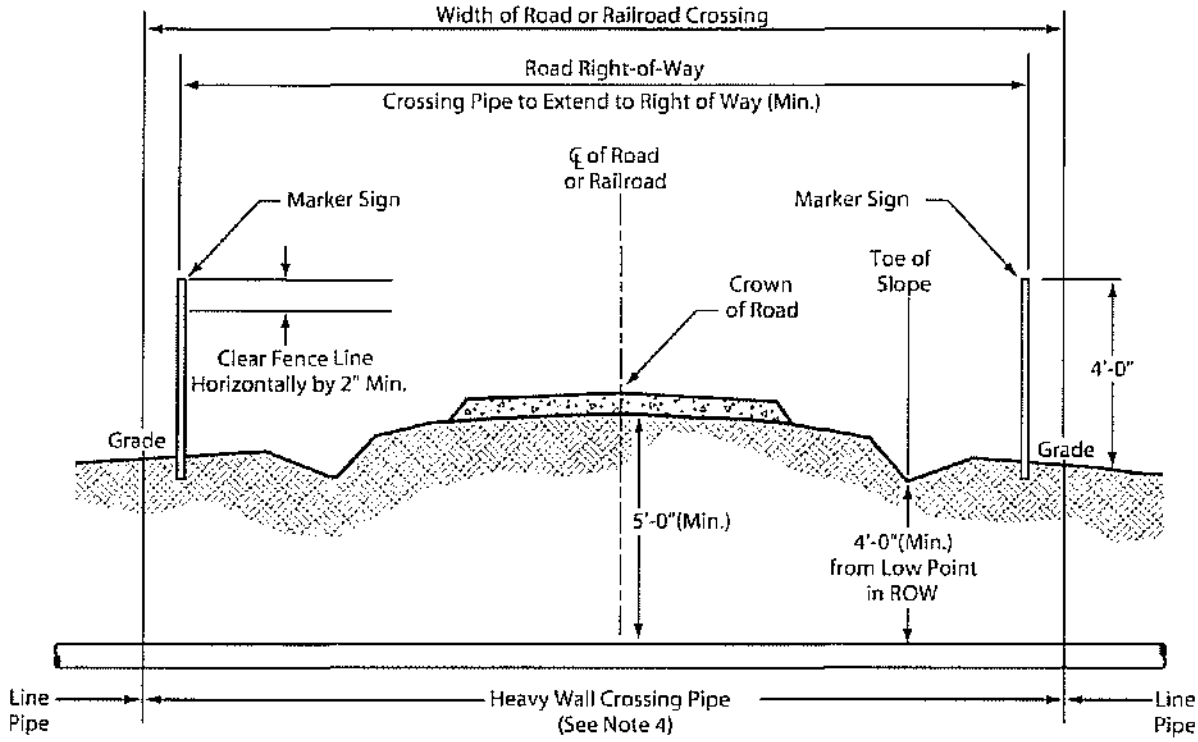
NO.	REVISION	DATE
1	ADDED NOTE 3	01.19.2007
0	ISSUED FOR REVIEW	01.10.2007

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY	LAST PLOT DATE:
K-00-P-7000-400	ALS	BS	BS	Fri, 19 Jan 2007 - 2:04pm

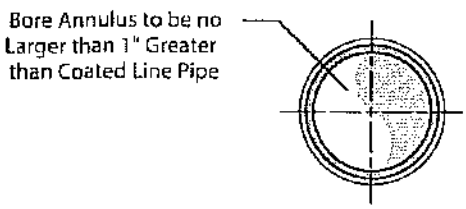
KEYSTONE PIPELINE PROJECT

Figure 2.2-2
Typical Pipeline Trench Profile

Source: TransCanada 2007c



TYPICAL UNCASED ROAD CROSSING - BORED



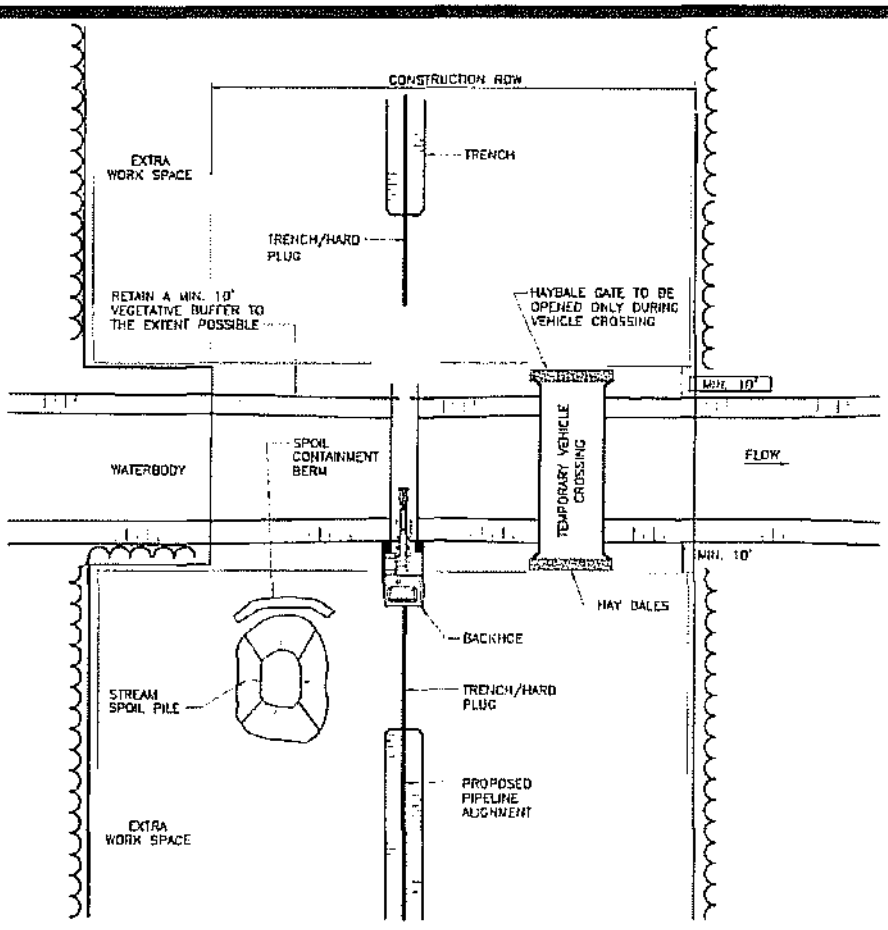
Notes:

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

KEYSTONE PIPELINE PROJECT

Figure 2.2-3
Typical Uncased
Road or Railroad
Crossing - Bored

Source: ENSR 2006a



PLAN VIEW

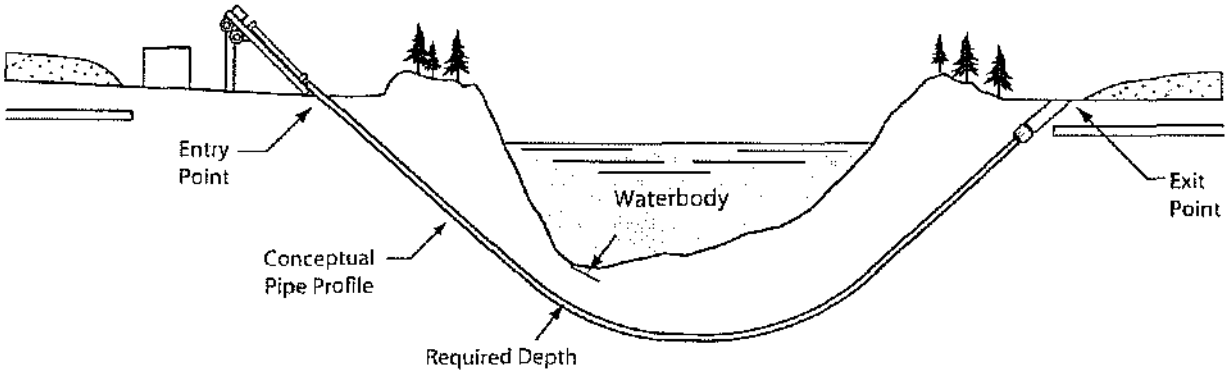
CONSTRUCTION PROCEDURES:

1. RIGHT-OF-WAY BOUNDARIES AND WORK SPACE LIMITS SHALL BE CLEARLY DELINEATED. STAGING FOR MAKEUP SHALL BE LOCATED A MINIMUM OF 10 FEET FROM WATERBODY.
2. CLEARING LIMITS WILL BE CLEARLY DELINEATED AND A 10 FOOT VEGETATIVE BUFFER STRIP BETWEEN DISTURBED AREA AND THE WATERBODY SHALL BE MAINTAINED TO THE EXTENT POSSIBLE. ALL CLEARING SHALL BE MINIMIZED TO THE EXTENT POSSIBLE AND TO ONLY THAT NECESSARY FOR CONSTRUCTION. WOODY VEGETATION SHALL BE CUT AT GROUND LEVEL AND THE STUMPS/ROOTS LEFT IN PLACE TO THE EXTENT POSSIBLE.
3. TOPSOIL SHALL BE STRIPPED FROM THE DITCH LINE IN ALL WETLANDS RIPARIAN.
4. CONTRACTOR SHALL INSTALL SIGNS APPROXIMATELY 100 FEET MINIMUM FROM EACH WATERBODY AND WETLAND TO IDENTIFY THE HAZARDOUS MATERIALS EXCLUSION AREA.
5. EROSION AND SEDIMENT CONTROL
   A. CONTRACTOR SHALL SUPPLY, INSTALL AND MAINTAIN SEDIMENT CONTROL STRUCTURES, AS DEPICTED OR ALONG DOWN GRADIENT SIDES OF WORK AREAS AND STAGING AREAS SUCH THAT NO HEAVILY SILT LADEN WATER ENTERS WATERBODY OR WETLAND.
   B. NO HEAVILY SILT LADEN WATER SHALL BE DISCHARGED DIRECTLY OR INDIRECTLY INTO THE WATERBODY. ALL EROSION AND SEDIMENT CONTROL STRUCTURE LOCATIONS AS DEPICTED ARE APPROXIMATE AND MAY BE ADJUSTED AS DIRECTED BY THE COMPANY INSPECTOR TO SUIT ACTUAL SITE CONDITIONS. SILT FENCE OR STRAW BALE INSTALLATIONS SHALL INCLUDE REMOVABLE SECTIONS TO FACILITATE ACCESS DURING CONSTRUCTION.
   C. SEDIMENT LADEN WATER FROM TRENCH DEWATERING SHALL BE DISCHARGED TO A WELL VEGETATED UPLAND AREA, INTO A STRAW BALE DEWATERING STRUCTURE OR GEOTEXTILE FILTER BAG. SEDIMENT CONTROL STRUCTURES MUST BE IN PLACE AT ALL TIMES ACROSS THE DISTURBED CONSTRUCTION RIGHT OF WAY EXCEPT DURING EXCAVATION/INSTALLATION OF THE CROSSING PIPE.
   D. SOFT DITCH PLUGS MUST REMAIN IN PLACE AT CONVENIENT LOCATIONS TO SEPARATE MAINLINE DITCH FROM THE WATERBODY CROSSING UNTIL THE WATER CROSSING IS INSTALLED AND BACKFILLED.
   E. TRENCH BREAKERS ARE TO BE INSTALLED AT THE SAME SPACING AND IMMEDIATELY UPSLOPE OF PERMANENT SLOPE BREAKERS, OR AS DIRECTED BY THE COMPANY.
6. CONTRACTOR SHALL MAINTAIN HARD PLUGS IN THE DITCH AT THE WATERBODY UNTIL JUST PRIOR TO PIPE INSTALLATION. CONTRACTOR SHALL EXCAVATE TRENCH AND INSTALL PIPE AS EXPEDIENTLY AS PRACTICAL TO REDUCE THE DURATION OF WORK ACTIVITIES IN THE WATERBODY BED.
7. CONTRACTOR SHALL PLACE TRENCH SPOIL ONLY IN CERTIFICATED WORK SPACE AND A MINIMUM OF 10 FEET FROM THE WATERBODY BANKS TO PREVENT ENTRY OF SPOIL INTO THE WATERBODY. SPOIL SHALL BE CONTAINED AS NECESSARY USING EITHER A STRAW BALE BARRIER OR AN EARTH/ROCK BERM.
8. CONTRACTOR SHALL RESTORE THE WATERBODY AND BANKS TO APPROXIMATE PRECONSTRUCTION CONTOURS, UNLESS OTHERWISE APPROVED BY THE COMPANY. CONTRACTOR SHALL INSTALL PERMANENT EROSION AND SEDIMENT CONTROL STRUCTURES AS INDICATED. ANY MATERIALS PLACED IN THE WATERBODY TO FACILITATE CONSTRUCTION SHALL BE REMOVED DURING RESTORATION. BANKS SHALL BE STABILIZED AND TEMPORARY SEDIMENT BARRIERS INSTALLED AS SOON AS POSSIBLE AFTER CROSSING, BUT WITHIN 24 HOURS OF COMPLETING THE CROSSING. MAINTAIN A SILT FENCE OR STRAW BALE BARRIER ALONG THE WATERBODY AND WETLAND BOUNDARIES UNTIL VEGETATION IS ESTABLISHED IN ADJACENT DISTURBED AREAS.
9. VEHICLE CROSSING CAN BE CONSTRUCTED USING EITHER A FLUME CROSSING OR A TEMPORARY BRIDGE. VEHICLE CROSSING ONLY REQUIRED IF STREAM SUPPORTS A STATE DESIGNATED FISHERY.

KEYSTONE PIPELINE PROJECT

Figure 2.2-4
Typical Water Body Crossing
Open-Cut Trench

Source: ENSR 2006a



PROFILE

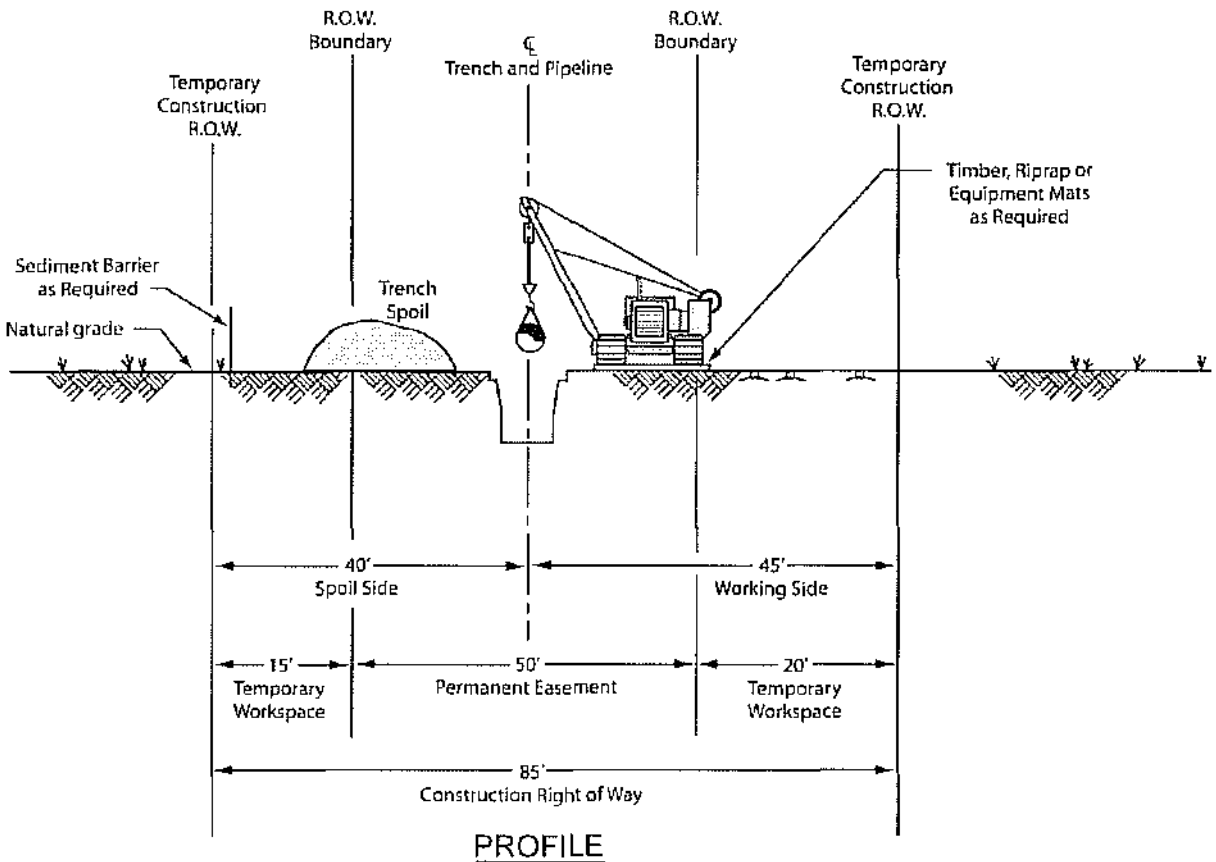
Notes:

1. Set up drilling equipment a minimum of 100 feet from the edge of the watercourse. Limit clearing between drill entry and exit point to brush clearing of a 10-foot wide strip as necessary to monitor drilling activities and obtain water for hydrostatic testing and drilling mud.
2. Ensure that only bentonite-based drilling mud is used.
3. Install suitable drilling mud tanks or sumps to prevent contamination of watercourse.
4. Install berms downslope from the drill entry and anticipated exit points to contain any release of drilling mud.
5. Dispose of drilling mud in accordance with the appropriate regulatory authority requirements.

KEYSTONE PIPELINE PROJECT

Figure 2.2-5
Typical Water Body Crossing
Horizontal Directional Drill

Source: ENSR 2006a



PROFILE

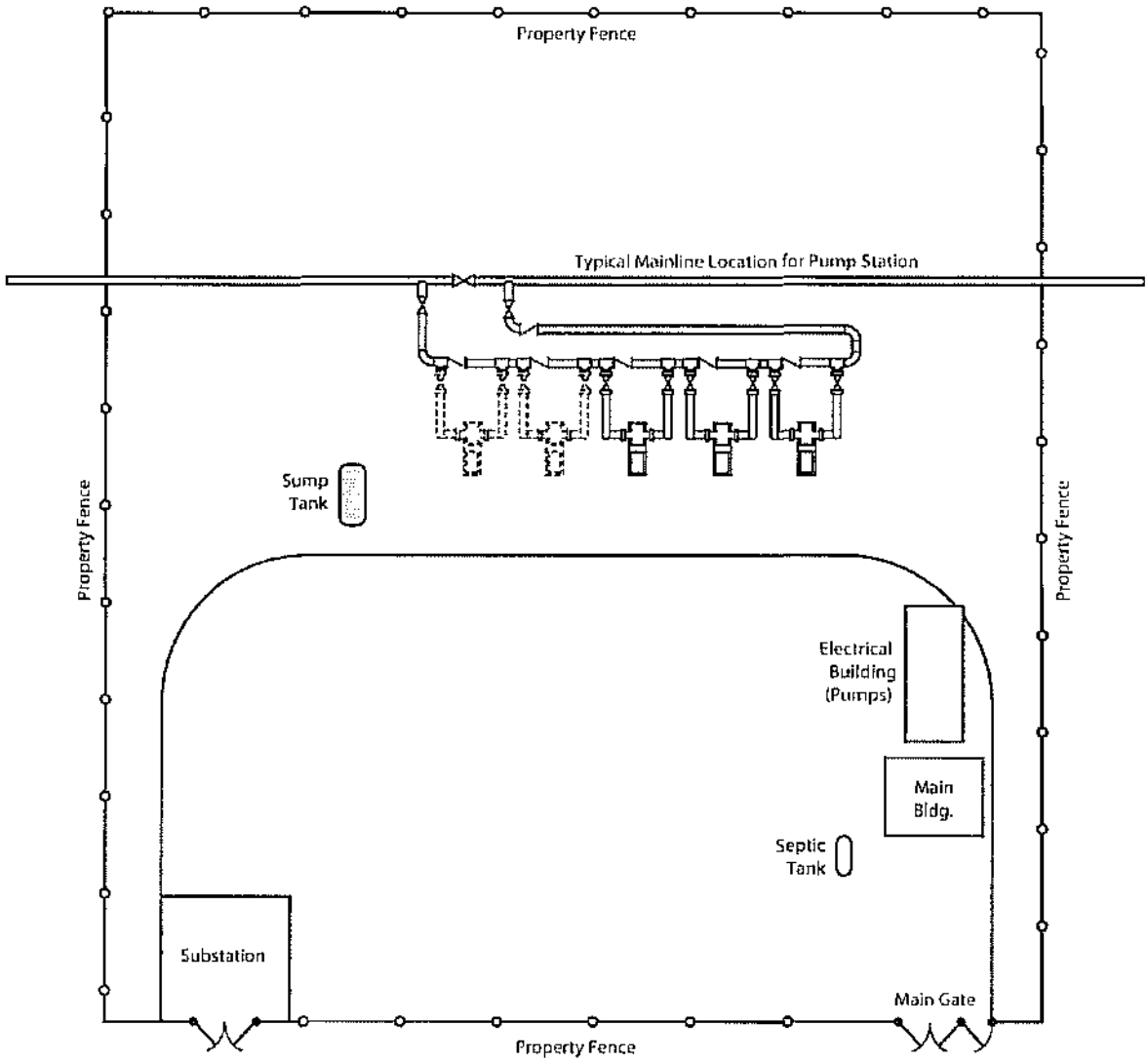
Notes:

1. Flag wetland boundaries prior to clearing.
2. No refueling of mobile equipment is allowed within 100 feet of wetland. Place "No Fueling" sign posts 100 feet back from wetland boundary. Refuel stationary equipment as per Keystone's spill prevention procedures.
3. Install temporary slope breaker upslope within 100 feet of wetland boundary if directed by Keystone.
4. Install timber mats/riprap through entire wetland area. Equipment necessary for right-of-way clearing may make one (1) pass through the wetland before mats are installed.
5. Avoid adjacent wetlands. Install sediment barriers (straw bales and/or silt fence) at downslope edge of right-of-way and along wetland edge as required.
6. Restrict root grubbing to only that area over the ditchline and ditch spoil areas and remove from wetland for disposal.
7. Topsoil stripping shall not be required in saturated soil conditions
8. Leave hard plugs at edge of wetland until just prior to trenching.
9. Pipe section may be fabricated within the wetland and adjacent to alignment, or in staging area outside the wetland and walked in.
10. Trench through wetland.
11. Lower-in pipe, install trench plugs at wetland edges as required and backfill immediately.
12. Remove timber mats or prefabricated mats from wetland upon completion.
13. Restore grade to near pre-construction topography, replace topsoil, and install permanent erosion control.

KEYSTONE PIPELINE PROJECT

Figure 2.2-6
Typical Standard
Wetland Crossing

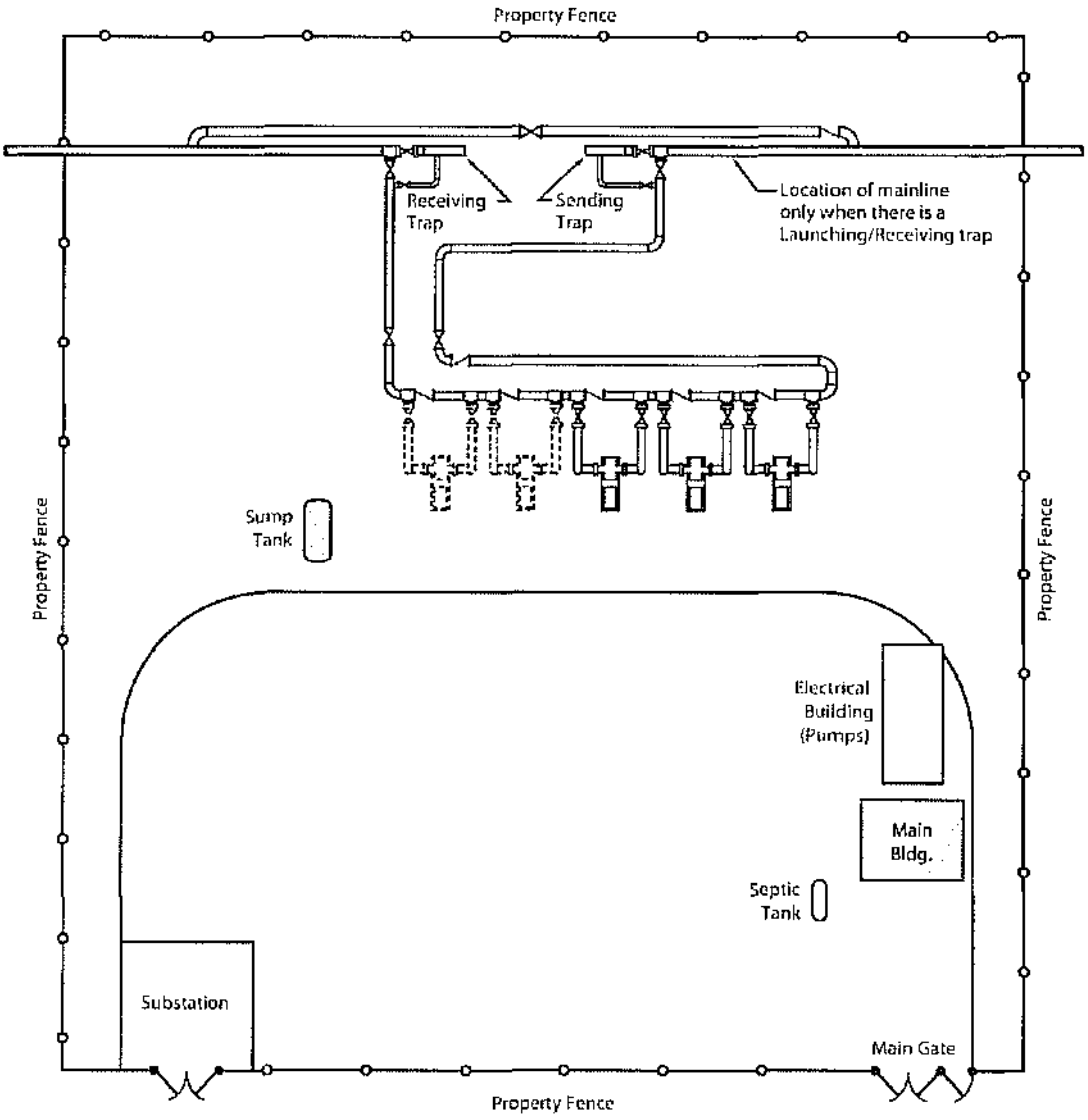
Source: ENSR 2006a



KEYSTONE PIPELINE PROJECT

Figure 2.2-7
Typical Pump Station without Pigging Facilities

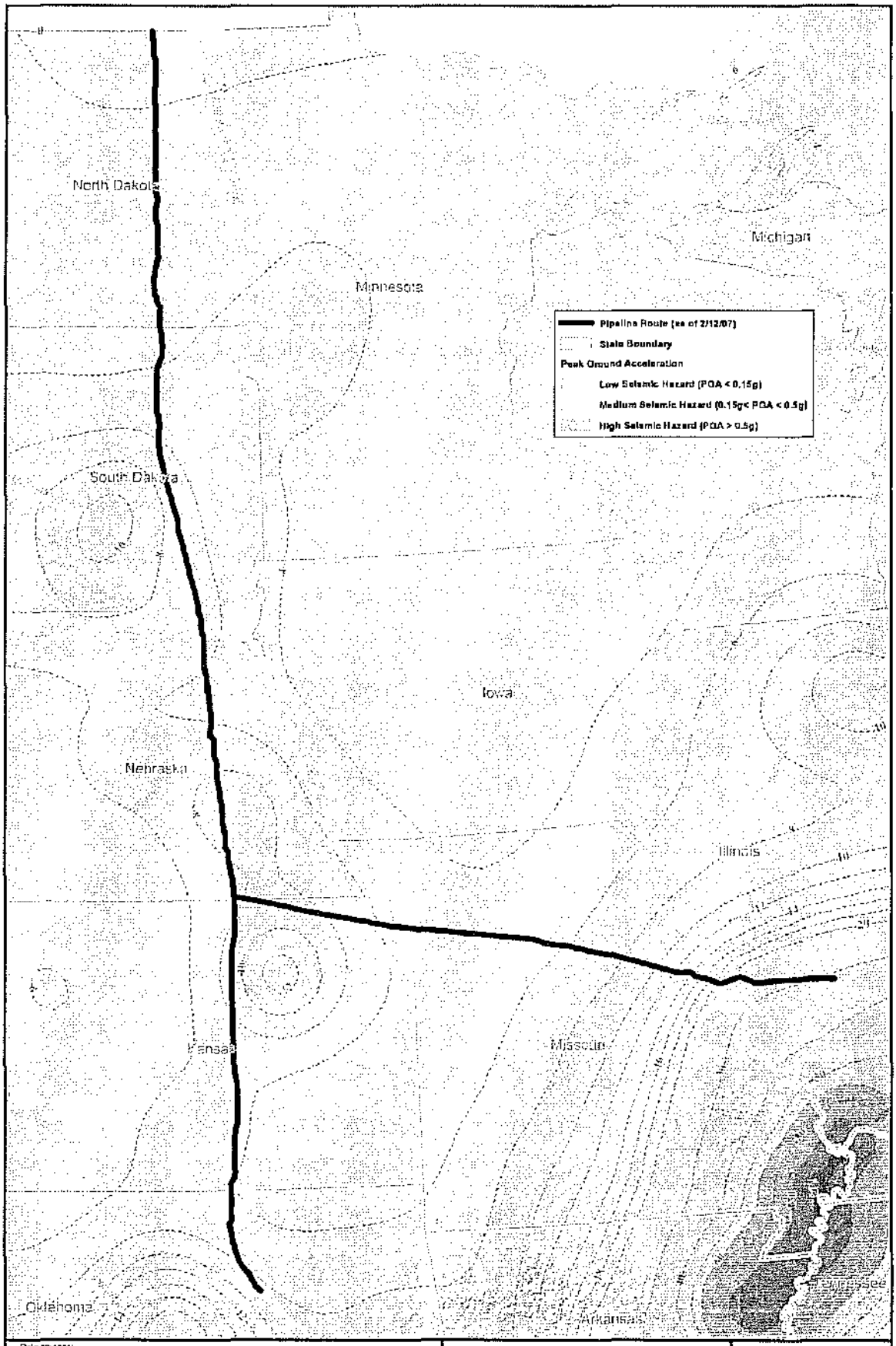
Source: ENSR 2006a



KEYSTONE PIPELINE PROJECT

Figure 2.2-8
Typical Pump Station with Pigging Facilities

Source: ENSR 2006a


North Dakota
Minnesota
Michigan
South Dakota
Iowa
Nebraska
Illinois
Missouri
Kansas
Oklahoma
Arkansas
Tennessee
Pipeline Route (as of 2/12/07)
State Boundary
Peak Ground Acceleration
Low Seismic Hazard (PGA < 0.15g)
Medium Seismic Hazard (0.15g< PGA < 0.5g)
High Seismic Hazard (PGA > 0.5g)
Data sources:
1) USGS. 2002. National Seismic Hazard Map. Earthquake Hazards Program website. http://earthquake.usgs.gov/research/hazmaps/products_data/48_StatesMinus.zip
2) American Lifelines Alliance. 2005. Guideline for Assessing the Performance of Oil and Natural Gas Pipeline Systems in Natural Hazard and Human Threat Events. www.americanlifelinesalliance.org/pdf/PipeguideFinalPosted061705.pdf
0
100 Miles
Keystone Pipeline Project
TransCanada
In business to deliver
Figure 3.1.4-1
Seismic Hazard Map

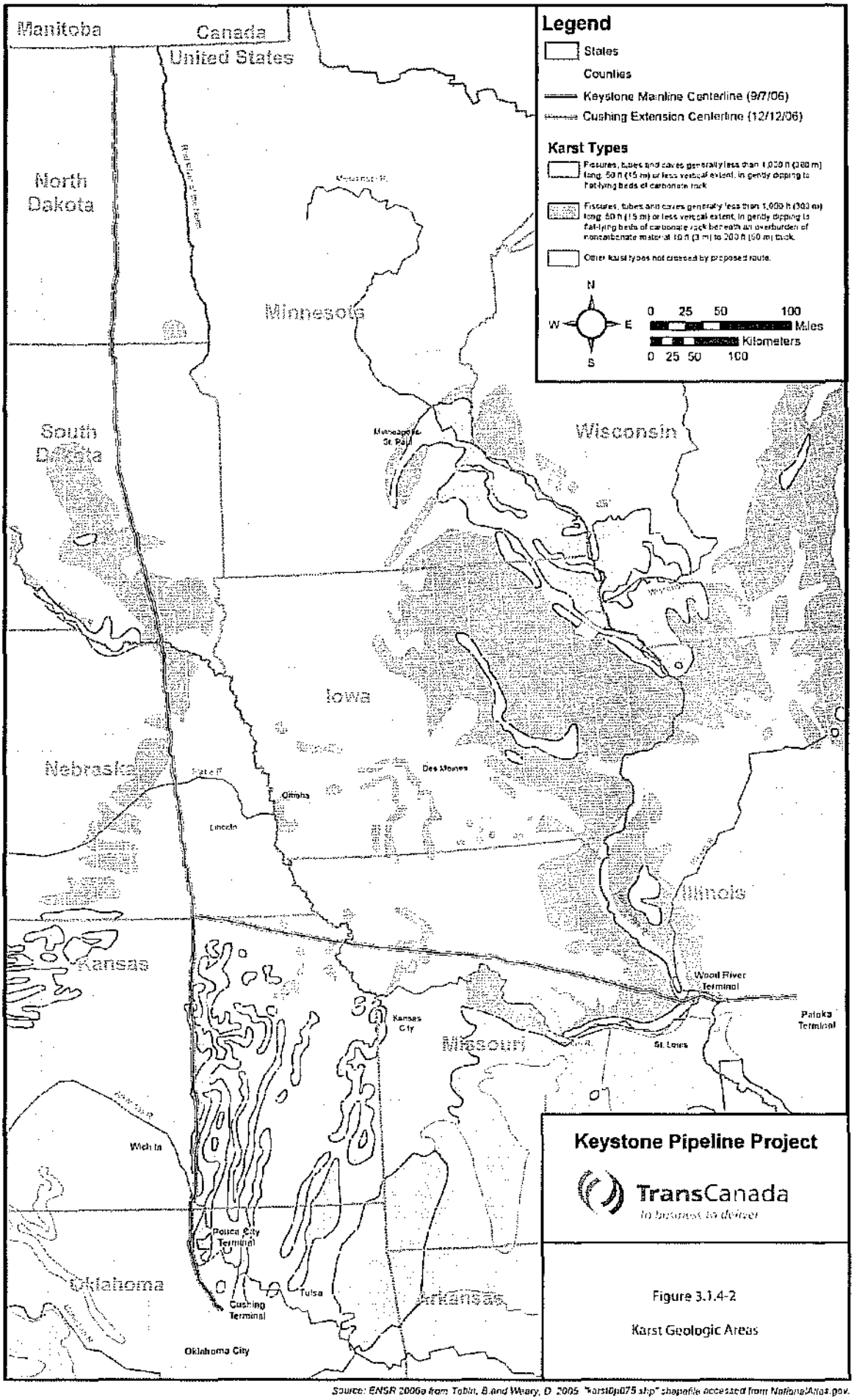
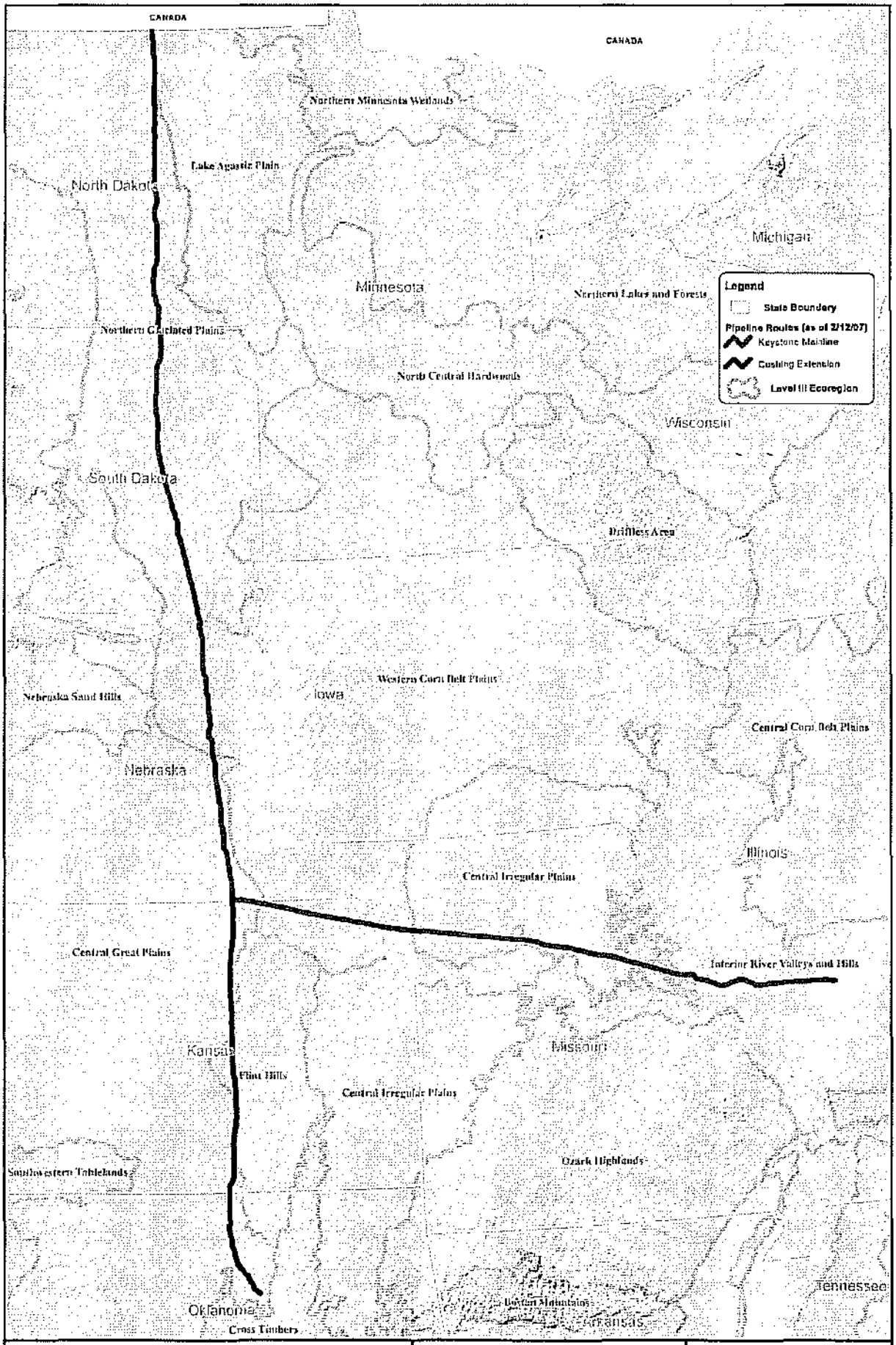


Figure 3.1.4-2

Karst Geologic Areas

Source: ENSR 2006a from Tobin, B.and Weary, D. 2005. "karst0p075.shp" shapefile accessed from NationalAtlas.gov.


CANADA
CANADA
Northern Minnesota Wetlands
Lake Agassiz Plain
North Dakota
Michigan
Minnesota
Northern Lakes and Forests
Legend
State Boundary
Pipeline Routes (as of 2/12/07)
Keystone Mainline
Cushing Extension
Level III Ecoregion
Northern Glaciated Plains
North Central Hardwoods
Wisconsin
South Dakota
Driftless Area
Western Corn Belt Plains
Nebraska Sand Hills
Iowa
Central Corn Belt Plains
Nebraska
Illinois
Central Irregular Plains
Central Great Plains
Interior River Valleys and Hills
Kansas
Missouri
Flint Hills
Central Irregular Plains
Ozark Highlands
Southwestern Tablelands
Tennessee
Ouachita Mountains
Oklahoma
Arkansas
Cross Timbers
Data sources
U.S. Environmental Protection Agency (EPA). 2006. Level III Ecoregions of the Continental United States. National Health and Environmental Effects Research Laboratory. [Available online at http://www.epa.gov/wed/pages/ecoregions/level_iii.htm] Accessed 16 February 2007.
0
100 Miles
N
W
E
S
Keystone Pipeline Project
TransCanada
Figure 3.5-1
EPA Level III Ecoregions
Crossed by the Keystone
Project

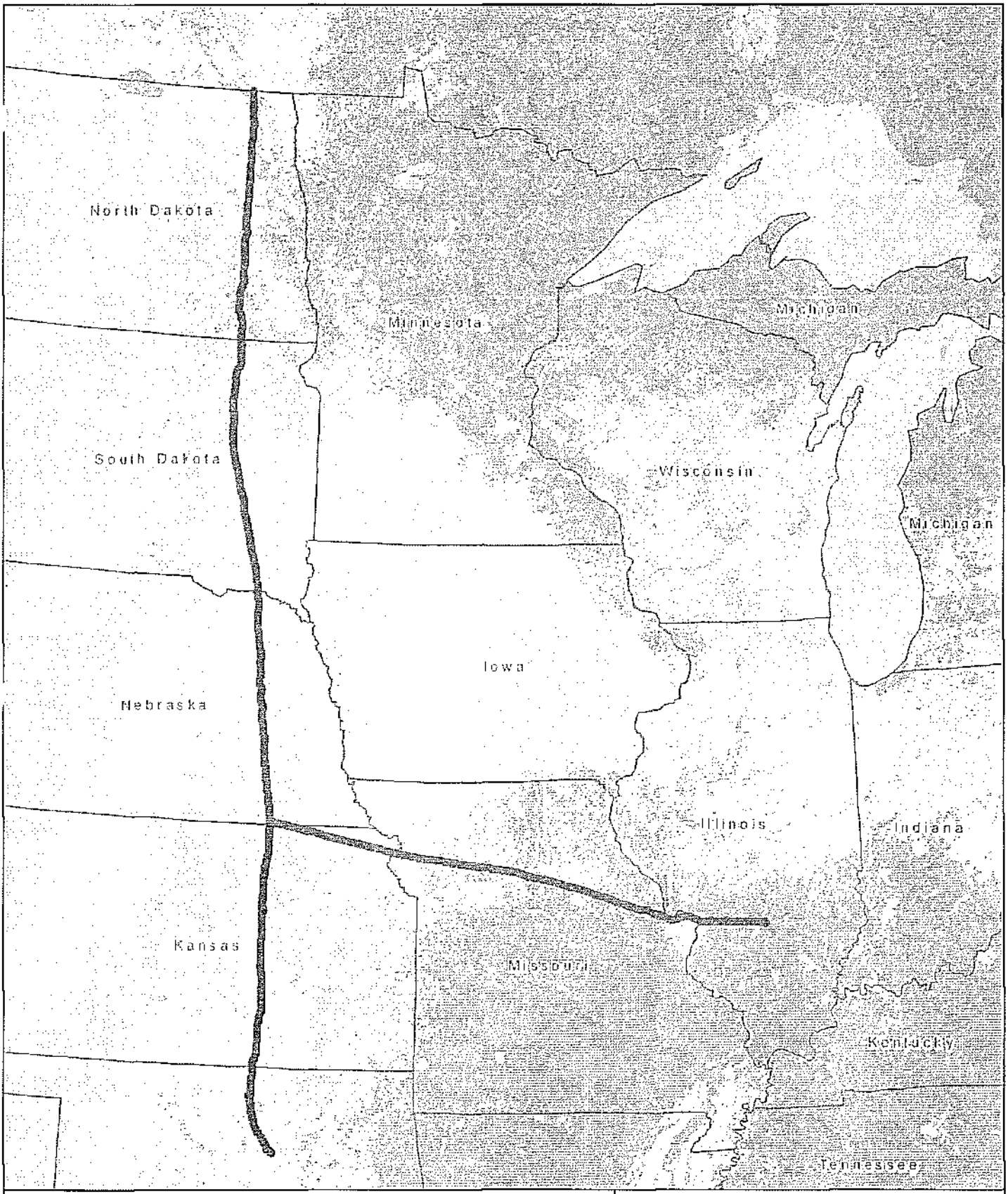
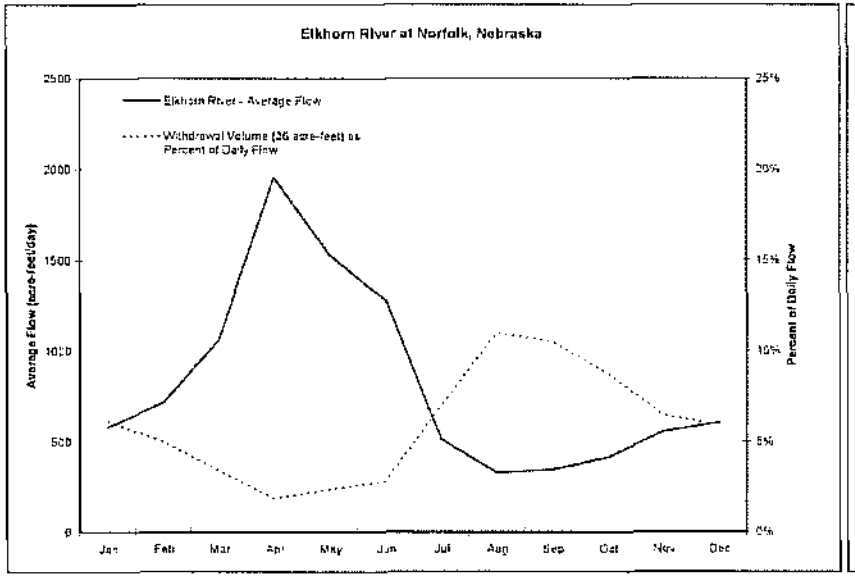
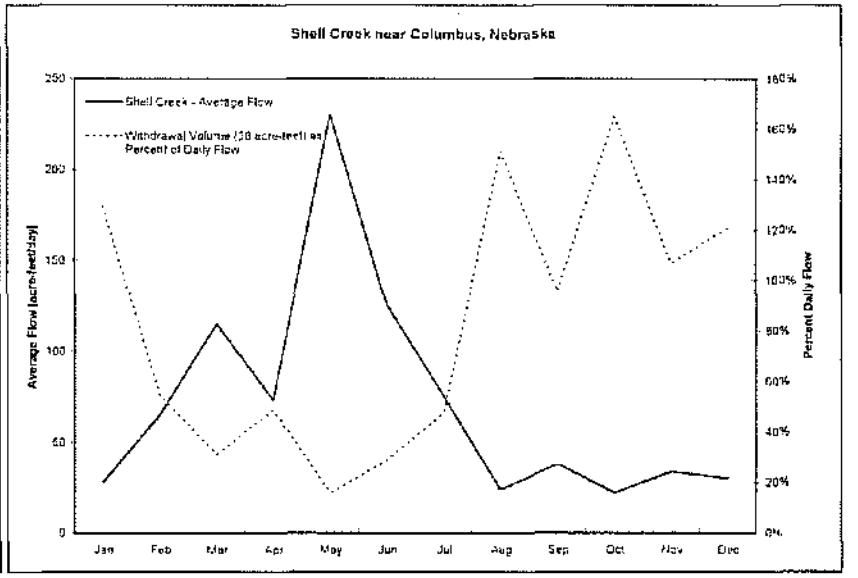


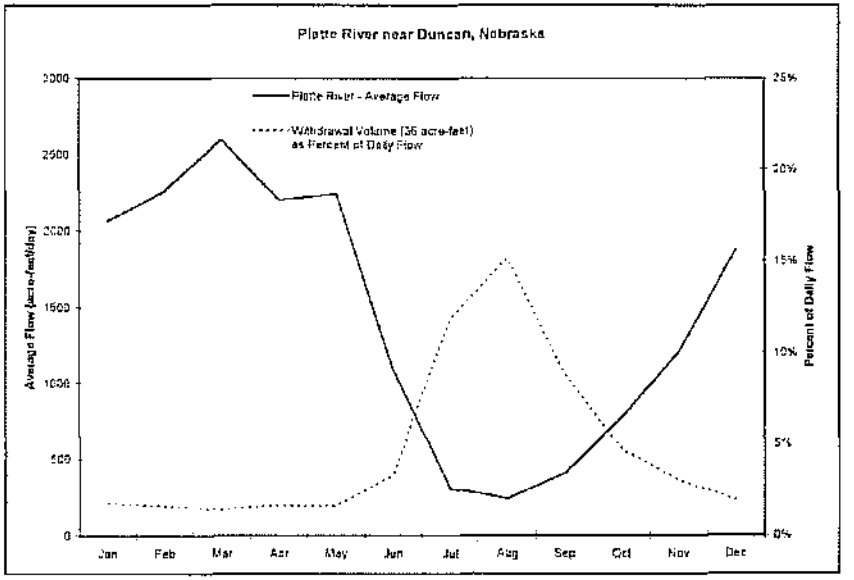
Figure 3.5.2-1

Grassland and Forest Cover within States Crossed by the Keystone Project

Source: Transcanada 2007c and National Center for Earth Resources Observation and Science, US Geological Survey, 1-kilometer resolution



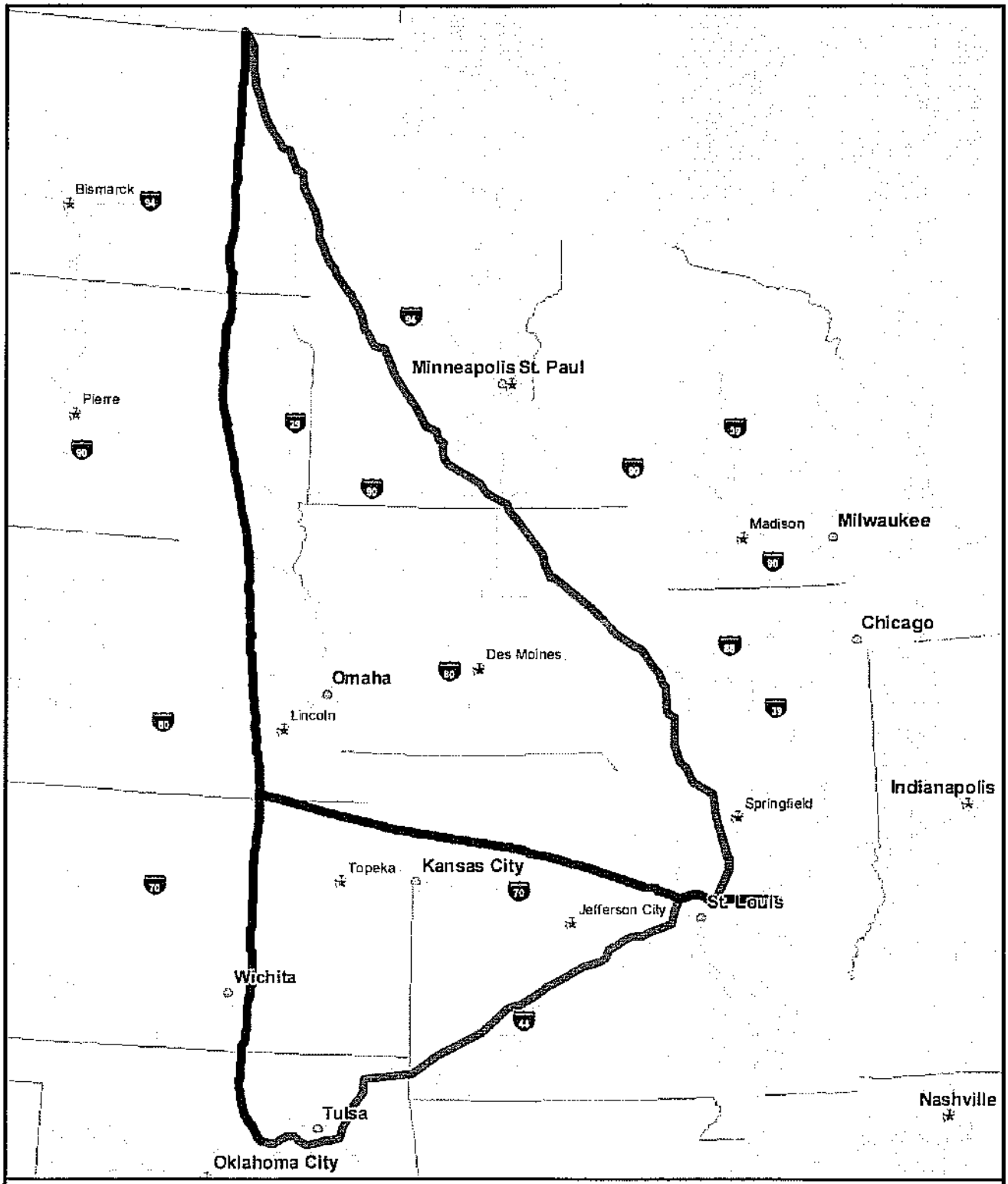




KEYSTONE PIPELINE PROJECT

Figure 3.8.1-1
Average Flow and
Test Water Withdrawal Volume
as a Percent of Daily Flow
at Three Locations near the Proposed Route

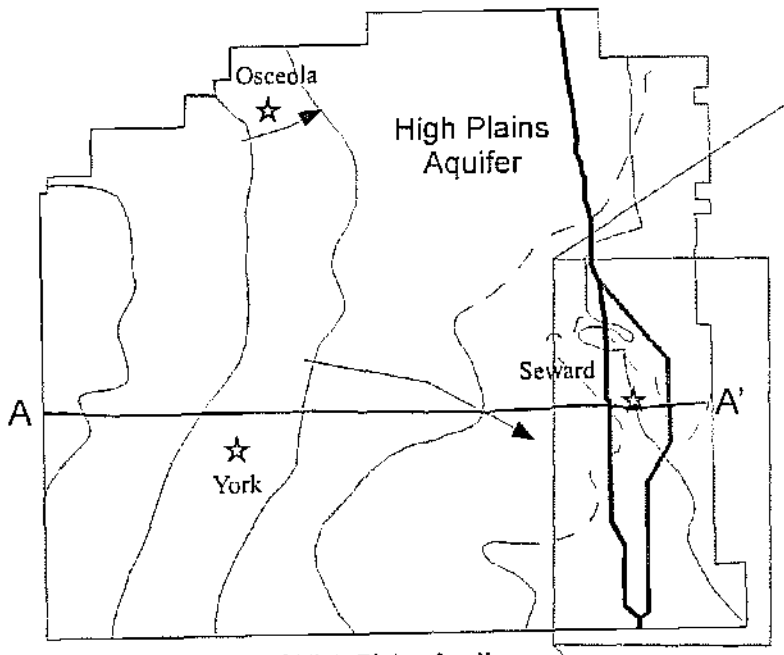
Source: ENSR 2006a



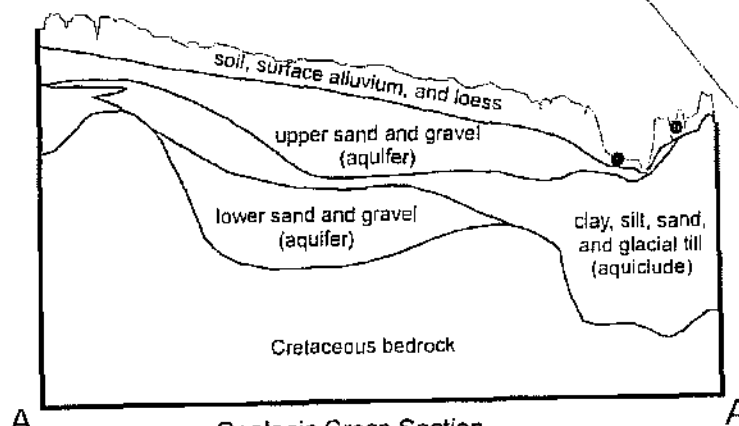
KEYSTONE PIPELINE PROJECT

Figure 4.3-2
Keystone Pipeline
Proposed and Alternative Routes

Source: ENSR 2006a



Extent of High Plains Aquifer
(Groundwater Contours, Spring 1996)



Geologic Cross Section

High Plains Aquifer Extent after Verstraeten *et al.* (1998), Figure 5.
Groundwater Contours and Flow Direction after Verstraeten *et al.* (1998), Figure 6.

Geologic Cross Section after Verstraeten *et al.* (1998), Figure 4.

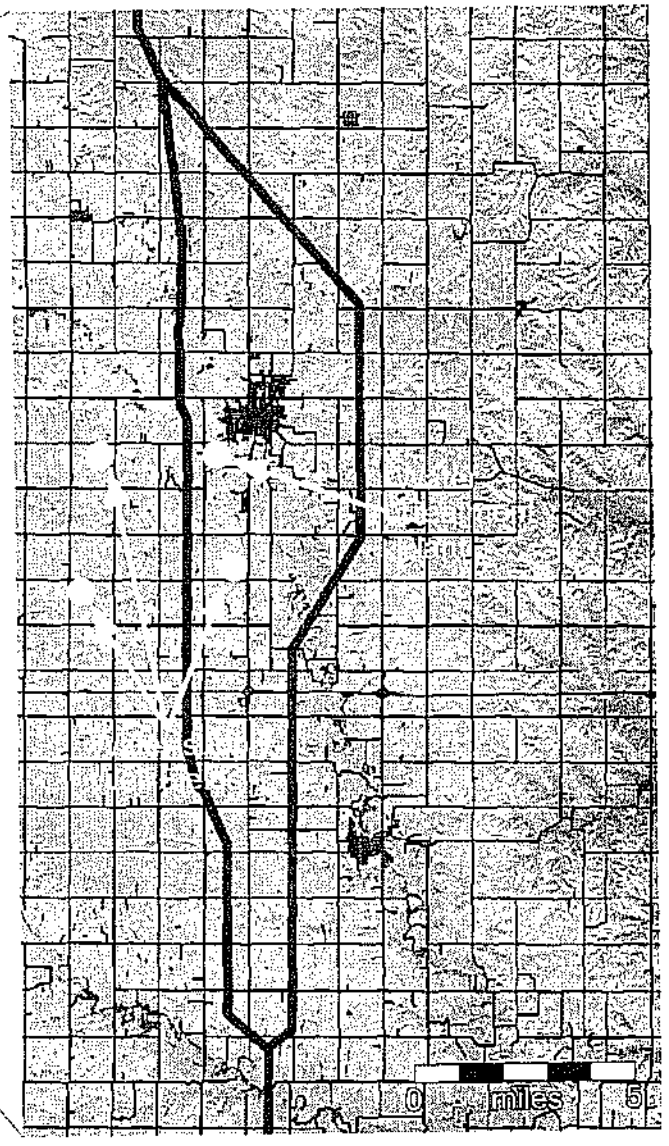
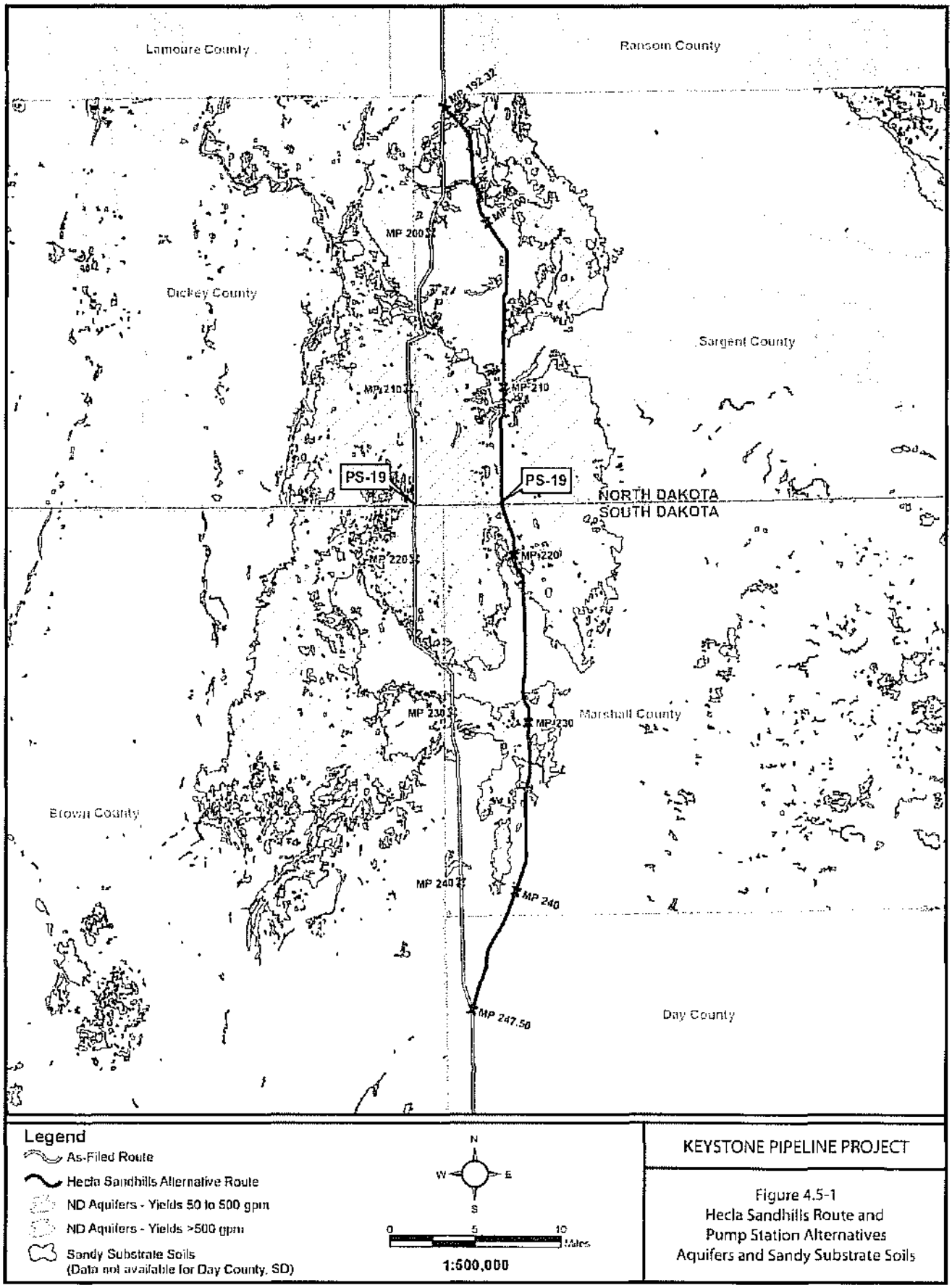


Figure 4.4-1: Keystone Pipeline
Proposed and Seward Alternate Routes

Original Keystone Route

Seward Alternative Route

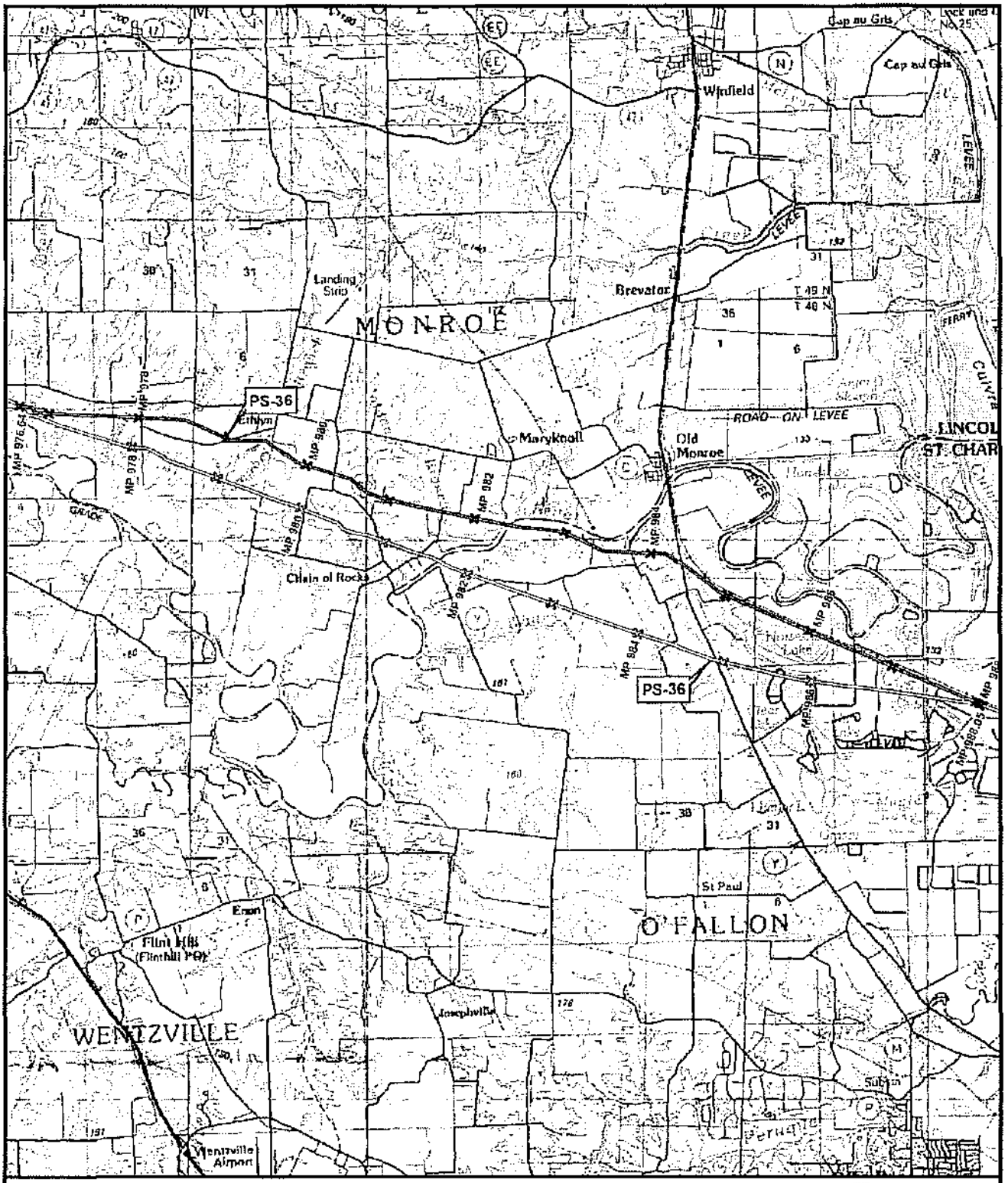
N
W
E
S



KEYSTONE PIPELINE PROJECT

Figure 4.5-1
Hecla Sandhills Route and
Pump Station Alternatives
Aquifers and Sandy Substrate Soils

Source: ENSR 2006a



Legend

As-Filed Route

Chain of Rocks Alternative Route

N

W E

S

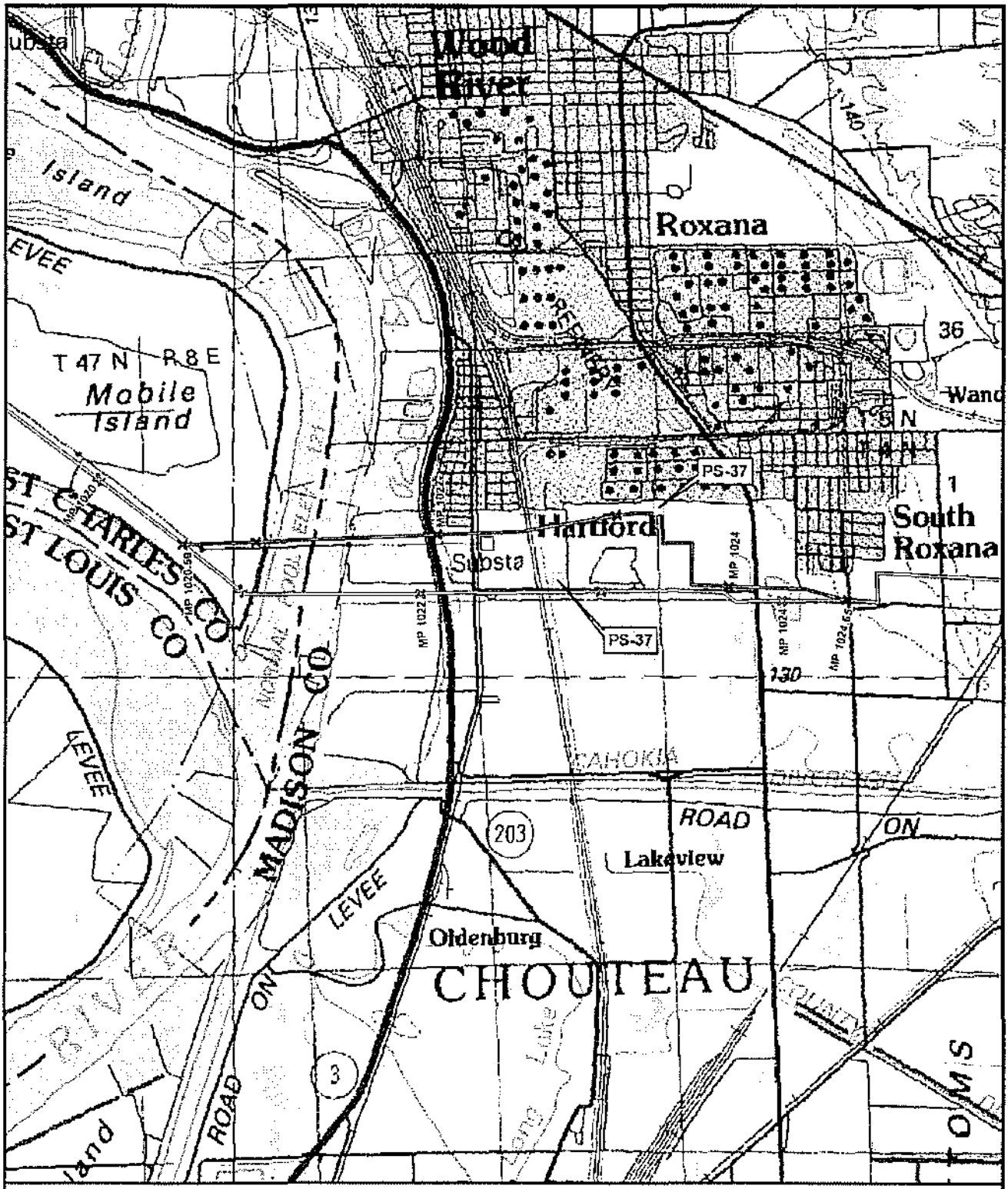
0 1 2 Miles

1:100,000

KEYSTONE PIPELINE PROJECT

Figure 4.5-2
Chain of Rocks Route and Pump Station Alternatives

Source: ENSR 2006a



Legend

As-Filed Route

Wood River Alternative Route

N

W E

S

0 0.5 1 Miles

1:50,000

KEYSTONE PIPELINE PROJECT

Figure 4.5-3
Wood River Route and
Pump Station Alternatives

Source: ENSR 2006a