TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contact	Email Sent	Fax Sent	Meeting Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	Programmatic Agreement Signatory
Omaha Tribe of Nebraska	NE	8/3/06, 9/19/06, 1/17/07 2/1/07	10/5/06, 2/16/07		2/7/07, 2/15/07		√			
Osage Nation of Oklahoma	OK	8/3/06, 9/19/06, 2/1/07, 3/22/07	10/5/06, 2/15/07, 3/13/07, 5/23/07, 5/23/07	2/15/07, 5/23/07, 6/19/07	2/7/07, 2/1/5/07			√		TBD
Otoe-Missouri Tribe	OK	8/3/06, 9/19/06, 2/1/07	10/5/06, 2/16/07, 6/19/07	10/5/06, 2/15/07	2/7/07, 2/17/07		√			
Ottawa Tribe of Oklahoma	OK	3/22/20 07	5/22/07, 6/21/07(vm), 6/25/07, 6/28/07(vm)	5/23/20 07			√			
Pawnee Nation of Oklahoma	OK	8/3/06, 9/19/06, 2/1/07	10/6/06, 2/16/07 (vm), 5/23/07, 7/2/07(vm)	9/27/06, 2/7/07, 2/15/07, 3/28/07, 5/23/07, 6/19/07	2/7/07, 2/1/507			√		TBD
Peoria Indian Tribe of Oklahoma	OK	8/3/06, 9/19/06, 2/1/07	10/5/06, 2/16/07, 5/23/07(vm), 6/19/07(vm)	2/7/07, 2/15/07	2/7/07, 2/15/07		√			
Poarch Band of Creek Indians	AL	8/3/06, 9/19/06, 2/1/07	10/5/06, 2/16/07, 6/19/07(vm), 6/25/07(vm), 6/28/07	10/5/06, 2/15/07	2/7/07, 2/15/07		√			
Pokagon Band of Potawatomi Indians of Michigan	MI	9/19/06, 2/1/07	10/5/06, 6/21/07	10/6/06, 2/15/07, 6/25/07	2/15/07			√		TBD

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contact	Email Sent	Fax Sent	Meeting Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	Programmatic Agreement Signatory
Ponca Tribe of Indians of Oklahoma	OK	8/3/06, 9/19/06, 2/1/07, 2/7/07	2/16/07 (lm), 6/7/07(vm), 6/19/07, 6/21/07	6/25/07, 6/25/07	2/8/07, 2/1/07			√		TBD
Ponca Tribe of Nebraska	NE	3/22/2007	6/19/07, 7/3/07	6/19/2007			√			
Praire Island Band of Potawatomi Indians	KS	9/19/06, 2/1/07	5/23/07, 6/19/07				√			
Prairie Island Indian Community	MN	8/3/06, 9/19/06, 2/1/07	9/20/06(vm), 5/23/07(vm), 6/19/07, 6/19/07(vm)	6/20/2007	2/8/07		√			
Quapaw Tribe	OK	9/19/06, 2/1/07	2/16/07, 6/7/07(lm), 6/8/07, 6/8/07		2/8/07, 2/15/07		√			
Red Lake Band of Chippewa Indians of Minnesota	MN	8/3/06, 1/17/07, 2/1/07, 2/7/07	2/16/07, 6/19/07		2/16/2007		√			
Rosebud Sioux Tribe	SD	9/19/06, 2/1/07, 2/9/07	2/16/07	2/15/07	2/8/07, 2/15/07			√		TBD
Sac and Fox in Iowa	IA	8/3/06, 2/1/07, 2/9/07	2/1/06, 6/25/07(vm), 6/29/07(lm), 7/3/07	2/15/07, 2/16/07, 7/3/07, 7/3/07	2/8/07, 2/15/07		√			
Sac and Fox of the Missouri in Kansas and Nebraska	KS	8/3/06, 2/1/07, 2/9/07	2/16/07	2/16/07	2/9/07		√			
Sac and Fox Nation of Oklahoma	OK	8/3/06, 2/1/07, 2/9/07	2/16/07, 6/21/07	2/15/07, 2/16/07, 6/25/07	2/8/07, 2/15/07			√		TBD

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contact	Email Sent	Fax Sent	Meeting Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	Programmatic Agreement Signatory
Santee Sioux Tribe of Nebraska	NE	8/3/06, 1/17/07, 2/1/07, 2/9/07	2/16/07	2/15/07, 2/16/07, 3/1/07, 5/10/07	2/8/07, 2/15/07	5/30/2007		√		TBD
Shakopee Mdewankanton Sioux	MN	8/3/06, 2/1/07, 2/9/07	2/15/07, 6/25/07	2/15/07	2/8/07, 2/15/07		√	√		TBD
Shawnee Tribe	OK	2/1/07, 2/9/07	6/25/2007		2/9/07, 2/15/07		√			
Sisseton-Wahpeton Oyate Sioux	SD	8/3/06, 9/19/06, 1/17/07, 2/1/07, 2/9/07		3/28/07, 4/11/07, 5/10/07	2/9/07, 2/15/07	5/30/2007		√		TBD
Sisseton-Wahpeton Oyate Wahpekutz	SD					5/30/2007		√		TBD
Southern Ute Indian Tribe	CO	3/22/2007	6/29/07(vm)						√	
Spirit Lake Tribe	ND	9/19/06, 11/17/06, 1/17/07, 2/1/07, 2/9/07			2/9/07, 2/15/07	5/30/2007		√		TBD
Standing Rock Sioux Tribe	ND	9/19/06, 1/17/07, 2/1/07, 2/9/07	2/28/2007	3/2/07	2/9/07, 2/15/07	5/30/2007		√		TBD
Stockbridge-Munsee Tribe	WI	3/28/2007					√			
Three Affiliated Tribes	ND	3/22/2007	6/25/07(vm), 6/28/07(vm), 6/29/07	6/29/07				√		TBD

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contact	Email Sent	Fax Sent	Meeting Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	Programmatic Agreement Signatory
Tonkawa Tribe	OK	2/1/07, 2/9/07, 3/12/07	6/7/07(vm), 6/25/07(vm), 6/29/07(vm), 7/3/07	7/3/2007	2/8/07, 2/15/07			√		TBD
Trenton Indian Service Area	ND	3/22/2007	6/28/2007	6/28/07, 6/29/07, 6/29/07			√			
Turtle Mountain Band of Chipewa	ND	8/3/06, 9/19/06, 11/2/06, 1/17/07, 2/1/07	2/16/07, 6/25/07(vm), 6/28/07(vm), 6/29/07(vm), 7/3/07(vm)	2/15/07, 2/16/07	2/9/07, 2/15/07			√		TBD
United Keetoowah Band of Cherokee Indians	OK	8/3/06, 9/19/06, 2/1/07, 2/9/07		2/15/07	2/9/07, 2/15/07			√		TBD
Upper Sioux-Pezihutazizi	MN	8/3/06, 2/1/07, 2/9/07	2/16/07 (vm), 6/26/07(vm), 6/28/07,		2/8/07, 2/15/07		√	√		TBD
Ute Mountain Tribe	CO	3/22/2007	6/26/07(vm), 6/28/07(vm), 6/29/07(vm), 7/3/07(vm)						√	
White Earth Band of Minnesota Chippewa	MN	8/3/06, 1/17/07, 2/1/07, 2/9/07	2/16/07 (vm), 6/26/07(vm), 6/28/07, 6/29/07(vm)	2/15/07	2/8/07, 2/15/07				√	
Wichita and Affiliated Tribes	OK	9/19/06, 2/1/07, 2/9/07	6/28/2007		2/8/07		√			

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contact	Email Sent	Fax Sent	Meeting Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	Programmatic Agreement Signatory
Winnebago Tribe	NE	2/1/2007	2/16/07 (vm), 6/26/07(vm), 6/26/07, 6/28/07, 7/2/07	6/26/07, 6/26/07, 6/26/07, 6/28/07	2/9/07, 2/15/07		√			
Wyandotte Nation	OK	2/1/07, 2/9/07	2/16/07 (VM), 6/26/07	6/26/07, 6/26/07	2/8/07, 2/15/07		√			
Yankton Sioux	SD	8/3/06, 9/19/06, 2/1/07, 3/12/07		6/12/07, 6/29/07, 7/2/07		5/30/07		√		TBD

lm = Left message.

TBD = To be determined.

vm = Left voice mail.

In addition to tribal representatives, DOS has consulted with a number of federal agencies. This consultation has identified overlapping responsibilities for Section 106 on certain federally owned or managed lands in the Project area. COE and USFWS have reviewed the findings of cultural resources investigations on properties that they own or manage, in coordination with the DOS; these agencies will be signatories to a PA. DOS also has consulted with several state agencies, most notably the seven SHPO offices in the Project area. DOS has consulted with each SHPO in order to develop appropriate research and field survey methods that will adequately identify and evaluate cultural resources. DOS is also currently consulting with the SHPOs to gain concurrence on the overall project findings for NRHP eligibility and effects. Each SHPO has been actively consulted concerning filing of the various Unanticipated Discoveries Plans for each state, and DOS will actively consult with the SHPOs as the PA is drafted. A Section 106 Agency/Tribal Group (SATG) has been formed with SHPOs, local and federal consulting agencies; the group is led by DOS to work through the Section 106 process. The SATG has monthly conference calls or meetings to work on consultation issues and development of a PA.

Several teleconferences and on-site meetings were held in an effort to obtain comments from tribal officials. On May 30, 2007, a meeting was convened in North Dakota that was attended by officials representing DOS, USFWS, COE, ACHP, WAPA, DOE, SD SHPO, OK SHPO, and officials that represented eight Sioux tribes that included the Sisseton-Wahpeton Oyate, Yankton Sioux, SWO Wahpekutz, Santee Sioux Nation of Nebraska, Standing Rock Sioux, Spirit Lake Tribe, Fort Peck Tribes, and Mille Lacs Band of Ojibwe. At this meeting, the tribes made several requests that were taken into account by DOS. These requests included inviting any First Nation (Canadian) tribes with ancestral lands affected by the Project to consult, developing a TAC to address tribal cultural resources issues and discuss any programmatic agreements that may be prepared to address unsurveyed areas and inadvertent discoveries, requiring 100-percent archaeological surveys of the pipeline APE, and funding a TCP survey to be performed after completion of the archaeological survey to be performed by tribal cultural experts.

The TAC is currently slated to be convened in late July 2007 in an effort to address these and any other concerns and requests, and to facilitate development of a PA among signatory agencies and invited signatories or concurring parties. The consulting agencies currently consist of DOS, DOE, EPA, NRCS, COE, USFWS, RUS, FSA, ACHP, and SHPOs. Several THPOs and numerous tribes also have agreed to become consulting parties. Some of these consulting parties will be come signatories of the PA. Through this agreement, DOS will ensure that the Applicant identifies, evaluates, and treats cultural resources in a manner that is consistent with 36 CFR 800; addresses the process for establishing protocols for inadvertent discoveries and unsurveyed lands; and provides opportunities for consultation prior to the application of appropriate treatments to any cultural resources.

3.11.4 Unanticipated Discoveries Plans

Keystone, through its cultural resource contractor ARG, has submitted operational plans to the SHPOs and DOS for the Project that Keystone will implement in the event that unanticipated cultural materials or human remains are encountered during the construction phase of the Project. The filed REX plans also apply to the portion of the Keystone pipeline that is collocated with the REX pipeline. The plans were submitted on March 21, 2006, to the Nebraska and Kansas SHPOs and on April 5, 2006, to the Missouri SHPO as appendices to the filed REX cultural resources inventory reports (Myers et al. 2006a, Myers et al. 2006b, Schwegman et al. 2006a). In a letter to ARG dated March 29, 2006, the Nebraska SHPO accepted the plan as filed. The Kansas and Missouri SHPOs both requested minor revisions to the filed Unanticipated Discoveries Plans. ARG made the requested changes, and both SHPOs accepted the revised plans. The FERC also concurred with the plan in the EIS that was prepared for the REX pipeline under FERC Docket CP06-354-000.

Keystone, through its cultural resource contractors, has filed similar Unanticipated Discoveries Plans with DOS for those portions of the Keystone Mainline Project that are not associated with the REX pipeline and for the Cushing Extension. DOS requested minor changes to the plans filed for the North Dakota and South Dakota portions of the Project. Metcalf made the requested changes and re-filed the Plans with DOS and SHPOs. In a letter to DOS dated March 23, 2007, the South Dakota SHPO requested an additional change to the South Dakota Plan. Metcalf met with the South Dakota SHPO on June 15, 2007, to discuss the SHPO comments and has agreed to make the requested changes. DOS is in the process of consulting with the SHPOs to ensure that the plans fully meet the expectations of those offices. DOS also is discussing the Unanticipated Discoveries Plans with Native American Tribes that have requested copies. Any requests by the Tribes or SHPOs to change any submitted plan will be made available to Keystone and will be evaluated by DOS on a case-by-case basis.

3.11.5 Summary

Keystone has completed cultural resources surveys for the majority of the proposed Keystone Mainline Project and Cushing Extension in North Dakota, South Dakota, Nebraska, Kansas, Missouri, Illinois, and Oklahoma. However, additional cultural resources inventory and geomorphological testing remains outstanding for lands where owners refused survey permission and for Project access roads, additional temporary workspaces, pipeline reroutes, and appurtenant facilities. Consequently, the process of complying with Section 106 of the NHPA is not complete. The specific areas of compliance are discussed below.

3.11.5.1 North Dakota

Cultural resources surveys still need to be conducted for about 2.9 miles of the Keystone Mainline Project route in North Dakota. In addition, all reroutes, access roads, warehouse yards, pipe storage yards, compressor stations, and temporary workspaces outside of the pipeline survey corridor need to be inspected. Once these locations have been finalized and/or survey permission has been obtained, these areas should be inventoried and the results submitted to the North Dakota SHPO and DOS for review and approval prior to construction.

To date, 25 cultural resources have been identified in North Dakota. Eleven have been assessed by Metcalf as ineligible for listing in the NRHP. If DOS and the North Dakota SHPO concur with the final determinations of eligibility, these sites will not require analysis. Three sites have not been assessed for NRHP eligibility (32BA170, 32PB202, and 32NEx99), but Keystone has stated it will avoid adverse effects to these through pipeline route adjustments. Keystone needs to submit their avoidance plans for sites 32BA170 and 32PB202 before DOS, in consultation with the North Dakota SHPO, can make official determinations of effect. Keystone has filed avoidance plans for 11 historic railroad crossings (site numbers 32BA148, 32BA171, 32NE70, 32NE72, 32RM155, 32SA47, 32SA80, 32ST171, 32WA244, and 32WA246) by means of boring underneath the sites and utilizing established crossing points for vehicular traffic.

3.11.5.2 South Dakota

Cultural resources surveys still need to be conducted for about 2.0 miles of the Mainline Project pipeline route in South Dakota. In addition, all reroutes, access roads, warehouse yards, pipe storage yards, compressor stations, and any temporary workspaces outside of the pipeline survey corridor need to be inspected. Once these locations have been finalized and/or survey permission has been obtained, these

areas should be inventoried and the results submitted to the South Dakota SHPO and DOS for review and approval prior to construction.

To date, 17 cultural resources have been identified in South Dakota. Three have been assessed by Metcalf as ineligible for listing in the NRHP. If DOS and the South Dakota SHPO concur with the final determinations of eligibility, these sites will not require further work. Ten sites or structures have either not been assessed for NRHP eligibility (39HT133, 39HT134, 39CK50, 39DA70, DA-000-00951, KB-000-00462, and 39YK78) or have been assessed at a preliminary level as potential historic properties (Sites 39DA071, 39YK077, and 39YK79). The analysis of NRHP eligibility must be completed with DOS and SHPO approval prior to determining adverse effects. The Applicant has stated it will avoid adverse effects to these 10 locations through pipeline route adjustments and will submit the avoidance plans for eight of these sites (39CK50, 39HT133, 39HT134, DA-000-00951, KB-000-00462, 39YK77, 39YK78, and 39YK79) to DOS and the South Dakota SHPO, prior to making official determinations of effect. Keystone has filed avoidance plans for five historic railroad crossings (site numbers 39BE2072, 39DA2000, 39KB2003, 39ML2000, and 39YK2003) by means of boring underneath the sites and utilizing established crossing points for vehicular traffic.

3.11.5.3 Nebraska

Mainline Project

Cultural resources surveys still need to be conducted for about 5.5 miles of the Mainline Project route in Nebraska. In addition, all reroutes, access roads, warehouse yards, pipe storage yards, compressor stations, and any temporary workspace areas outside of the pipeline survey corridor need to be inspected. Once these locations have been finalized and/or survey permission has been obtained, these areas should be inventoried and the results submitted to the Nebraska SHPO and DOS for review and approval prior to construction.

To date, the Keystone and REX Projects have identified 29 cultural resources along the inventoried portions of the Mainline Project in Nebraska. Twenty-two have been assessed by ARG as being ineligible for listing in the NRHP. If DOS and the Nebraska SHPO concur with the final determinations of eligibility, these resources will not require further work. Additional information is required for one historic site that has not been assessed for NRHP eligibility (25CX7). Keystone needs to submit either their avoidance plans or results of NRHP evaluation research for this site before DOS, in consultation with the Nebraska SHPO, can make official determinations of eligibility and effect. Keystone has provided reroute information to avoid adverse effects to three Pre-contact sites (25SW53, 25SW54, and 25CD1) and one historic site (25SA79). No additional work is required at these four locations. However, Keystone needs to provide DOS its plan to prevent adverse impacts to the Pleasant Hill Cemetery.

Cushing Extension

Keystone has completed the cultural resource studies for all 2.4 miles of the Cushing Extension route in Nebraska. No cultural resources were identified. There is the potential for additional studies at reroutes, access roads, warehouse yards, pipe storage yards, compressor stations, and any temporary workspace areas outside of the pipeline survey corridor. If so, once these locations have been finalized and survey permission has been obtained, these project items should be inventoried and the results submitted to the Nebraska SHPO and DOS for review and approval prior to construction.

3.11.5.4 Kansas

Mainline Project

Keystone, through its submitted research from the REX Project, has completed the cultural resource studies for the Mainline Project in Kansas. All reroutes, access roads, warehouse yards, pipe storage yards, compressor stations, and any temporary workspaces outside of the pipeline survey corridor remain to be inspected. Once these locations have been finalized and/or survey permission has been obtained, these areas should be inventoried and the results submitted to the Kansas SHPO and DOS for review and approval prior to construction.

To date, the Keystone and REX projects have identified 25 cultural resources along the inventoried portions of the Mainline in Kansas. Twenty-one were initially assessed by ARG as not being eligible for listing in the NRHP. ARG also conducted NRHP evaluative testing at four sites that were designated potential historic properties (14MH160 (ARG-3), 14NH107 / 14NH112 (ARG-10), and 14NH110 (ARG-12) and has reported that all four sites do not meet the criteria for listing in the NRHP. If DOS and the Kansas SHPO concur with the final determinations of eligibility, these 25 sites will not require further work.

Cushing Extension

Cultural resources surveys still need to be conducted for about 19.8 miles of the Cushing Extension route in Kansas. In addition, all reroutes, access roads, warehouse yards, pipe storage yards, compressor stations, and any temporary workspace areas outside of the pipeline survey corridor need to be inspected. Once these locations have been finalized and/or survey permission has been obtained, these areas should be inventoried and the results submitted to the Kansas SHPO and DOS for review and approval prior to construction.

To date, the Keystone and REX projects have identified 38 cultural resources along the inventoried portions of the Cushing Extension in Kansas. Thirty-one have been assessed by ARG as not being eligible for listing in the NRHP. If DOS and the Kansas SHPO concur with the final determinations of eligibility, these will not require further work. Additional information is required for five sites that ARG have designated potential historic properties (14WH318, KS-KEY-CX-609, KS-KEY-CX-614, KS-KEY-CX-615, and KS-KEY-CX-616). Keystone needs to submit the results of NRHP evaluation research for these sites before DOS, in consultation with the Kansas SHPO, can make official determinations of eligibility and effect. Keystone also needs to provide DOS its plans to prevent adverse impacts to the burials at the Brethren in Christ Cemetery and at site KS-KEY-CX-609.

3.11.5.5 Missouri

Cultural resources surveys still need to be conducted for about 18.5 miles of the Mainline Project route in Missouri. In addition, all reroutes, access roads, warehouse yards, pipe storage yards, compressor stations, and any temporary workspace areas outside of the pipeline survey corridor need to be inspected. Once these locations have been finalized and/or survey permission has been obtained, these areas should be inventoried and the results submitted to the Missouri SHPO and DOS for review and approval prior to construction.

To date, the Keystone and REX projects have identified 82 cultural resources along the inventoried portions of the Mainline in Missouri. Fifty-six were initially assessed by ARG as not being eligible for listing in the NRHP, and another six were identified as lying outside of the Project APE. ARG also

conducted NRHP evaluative testing at 14 sites that were designated as potential historic properties (23AU137, 23CH343, 23CH344, 23CH1345, 23LN298, 23LN299, 23LN300, 23LN301, 23LN303, 23LN307, 23LN308, 23MT420, 23SC1055, and 23SC1056) and has reported that all 14 sites do not meet any of the evaluation criteria for listing in the NRHP. If DOS and the Missouri SHPO concur with the final determinations of eligibility, these 76 sites will not require further work.

ARG conducted NRHP evaluative testing at two additional sites (23CH348 and 23CI088) and has assessed them both as meeting the eligibility requirements for listing in the NRHP under Criterion D (ability to provide significant data to history or prehistory). Keystone has submitted a plan to avoid adverse effects to site 23CH348 through a pipeline route adjustment but needs to file a similar avoidance or mitigation plan for site 23CI088 so that DOS, in consultation with the Missouri SHPO, can make an official determination of eligibility and effect. Keystone also needs to provide DOS its plan to prevent adverse impacts to the Barnett Cemetery at Site 23AU139.

3.11.5.6 Illinois

Cultural resources surveys still need to be conducted for about 6.6 miles of the Keystone Mainline Project route in Illinois. In addition, all reroutes, access roads, warehouse yards, pipe storage yards, compressor stations, and any temporary workspace areas outside of the pipeline survey corridor need to be inspected. Once these locations have been finalized and/or survey permission has been obtained, these areas should be inventoried and the results submitted to the Illinois SHPO and DOS for review and approval prior to construction.

To date, Keystone has identified 41 cultural resources along the inventoried portions of the pipeline in Illinois. Twenty-six were initially assessed by ARG as not being eligible for listing in the NRHP, and another three were identified as lying outside of the Project APE. ARG also conducted NRHP evaluative testing at seven sites that were designated as potential historic properties (11MS2018, JM-02, JM-09, JM-17, JM-18, JM-19, and JM-20) and has reported that all seven sites do not meet the criteria for NRHP listing. If DOS and the Illinois SHPO concur with the final determinations of eligibility, these 36 sites will not require further work.

ARG conducted NRHP evaluative testing at one additional site (JM-03) and has assessed it as meeting the eligibility requirements for listing in the NRHP under Criterion D (ability to provide significant data to prehistory). Keystone has submitted a plan to avoid adverse effects to this site by boring underneath and the intent to use HDD under one other site that ARG assessed as a potential historic property (site 11FY020). Keystone needs to provide DOS its plan to prevent adverse impacts to the historic farmstead at site JM-14 and the results of subsurface testing at site 11MS0178 (that could not be surveyed due to a landowner refusal) and at site ARG-02 (that was requested by COE at the Carlyle Lake WMA).

3.11.5.7 Oklahoma (Cushing Extension)

Cultural resources surveys still need to be conducted for about 15.9 miles of the Cushing Extension route in Oklahoma. In addition, all reroutes, access roads, warehouse yards, pipe storage yards, compressor stations, and any temporary workspace areas outside of the pipeline survey corridor need to be inspected. Once these locations have been finalized and/or survey permission has been obtained, these areas should be inventoried and the results submitted to the Oklahoma SHPO and DOS for review and approval prior to construction.

To date, Keystone has identified 10 cultural resources along the inventoried portions of the Mainline Project in Oklahoma. Eight have been assessed by ARG as not being eligible for listing in the NRHP. If DOS and SHPO concur with the final determinations of eligibility then these sites will not require further work. Additional information is required for one historic farmstead site (OK-KEY-CX-105) and one Pre-contact artifact scatter site (OK-KEY-CX-601) that ARG have designated as potential historic properties. Keystone needs to submit the results of NRHP evaluation research for these sites before DOS, in consultation with the Oklahoma SHPO, can make official determinations of eligibility and effect.

When Keystone has completed the surveys listed above, DOS—in consultation with the relevant SHPO, the tribes and other consulting parties, will make a final determination whether construction of the Project would affect any cultural resources listed, or eligible for listing, in the NRHP. If any historic property would be adversely effected, Keystone must propose mitigation measures that would be evaluated and agreed on by DOS, the relevant SHPO, THPO, and other consulting parties. As referenced in Section 3.11.3, a PA is currently being developed by DOS with help from the consulting agencies and tribes to reach an agreement on how, when, and by whom the remaining surveys, determinations of NRHP eligibility, project effects, and mitigation measures will be completed.

3.11.5.8 Connected Action

In modifying or constructing transmission line substations to support the Keystone Project, Western would implement the following mitigation measures for Cultural Resources:

- Before construction, Western would perform a Class III (100 percent of surface) cultural survey on all areas to be disturbed. These surveys would be coordinated with the appropriate land owner or land management agency. A product of the survey would be a Cultural Resources Report recording findings and suggesting mitigation measures. These findings would be reviewed with the State Historic Preservation Offices and other appropriate agencies, and specific mitigation measures necessary for each site or resource would be determined.
- Western would avoid cultural resource sites eligible for or included on the National Register of Historic Places.
- Construction activities would be monitored or sites flagged to prevent inadvertent destruction of any cultural resource for which the agreed mitigation was avoidance.
- Western would provide cultural education to all project personnel regarding Culturally Sensitive Areas prior to and during the construction phase.
- Should any cultural resources that were not discovered during the Class III Survey be encountered during construction, ground disturbance activities at that location would be suspended until the provisions of the National Historic Preservation Act and enabling legislation have been carried out.
- Construction crews would be monitored to the extent possible to prevent vandalism or unauthorized removal or disturbance of cultural artifacts or materials from sites where the agreed mitigation was avoidance.

3.11.6 References

Aberle, G. 2007a. Phase II Archaeological Investigations at Sites 23CI88, 23CH343, 23CH348, 23CH1345, 23CH344 and 23AU137 within the Rockies Express Pipeline Project Corridor, Clinton, Chariton, and Audrain Counties, Missouri. American Resources Group, Ltd. (Cultural Resources Management Report Nos. 1550.)

Aberle, G. 2007b. Draft Report Addendum No. 1: Phase II Archaeological Investigations at Sites 23CI88, 23CH343, 23CH348, 23CH1345, 23CH344 and 23AU137 within the Rockies Express Pipeline Project Corridor, Clinton, Chariton, and Audrain Counties, Missouri. American Resources Group, Ltd. (Cultural Resources Management Report No. 1550.)

Anderson, J. and G. Aberle. 2007. Final Report Addendum No. 5: A Phase I Cultural Resources Survey of the Nebraska Segment of the Proposed Rockies Express Pipeline Project (REX) Corridor, Perkins, Lincoln, Dawson, Gosper, Phelps, Kearney, Franklin, Webster, Nuckolls, Thayer, Jefferson, and Gage Counties, Nebraska. American Resources Group, Ltd. (Cultural Resources Management Report No. 1477.)

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3.12 AIR QUALITY AND NOISE

3.12.1 Air Quality

As described in Section 2.0, the Keystone Project consists of installation of pipeline and construction of pump stations and associated facilities. The proposed pump stations would be electrically driven, with electricity to be provided from existing local electric utilities. Backup power at each pump station would be provided by an uninterruptible power supply (UPS). A 5-kW gasoline-powered standby generator set would provide extended backup to each UPS-for essential services. A small (200-gallon) gasoline storage tank would be located with each backup generator. No other stationary sources of air pollutants are proposed.

3.12.1.1 Environmental Setting

Regional climate and meteorological conditions can influence the transport and dispersion of air pollutants that affect air quality. The existing climate and ambient air quality in the Keystone Project area are described below.

Regional Climate

The proposed Keystone Project would be constructed in portions of North Dakota, South Dakota, Nebraska, Kansas, Missouri, Illinois, and Oklahoma. These areas are located within the humid continental climate, which is noted for its variable weather patterns and large temperature ranges that can exceed 82 °F. The project area lies in the boundary between many different air masses, principally polar and tropical. Polar-type air masses collide with tropical-type air masses, causing uplift of the less dense and moister tropical air and resulting in precipitation. Representative climate data for Grand Forks, North Dakota; Lincoln, Nebraska; Salisbury, Missouri; and Tulsa, Oklahoma are presented in Table 3.12.1-1.

Ambient Air Quality

Ambient air quality is regulated by federal, state, and local agencies. EPA has established national ambient air quality standards (NAAQS) for seven criteria pollutants: sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter (PM_{10} particulates and $PM_{2.5}$ particulates), carbon monoxide (CO), ozone (O_3), and lead (Pb). The NAAQS were developed to protect human health (primary standards) and human welfare (secondary standards). State air quality standards cannot be less stringent than the NAAQS. South Dakota, Nebraska, Kansas, Missouri, Illinois, and Oklahoma have adopted ambient air quality standards that are the same as the NAAQS for all seven criteria pollutants, whereas North Dakota has more stringent standards for SO_2 (i.e., 0.023 ppm annual average, 0.099 ppm 24-hour average, and 0.273 ppm 1-hour average). Table 3.12.1-2 lists the NAAQS for the seven criteria pollutants.

TABLE 3.12.1-1
Representative Climate Data in the Vicinity of the Keystone Pipeline

Location/ Measurement (Average)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Annual
Grand Forks, North Dakota													
Maximum temperature (°F)	13.5	20.4	32.6	51.8	67.5	76.2	81.2	80.2	69.0	55.3	34.7	19.8	50.2
Minimum temperature (°F)	-5.5	1.1	14.6	30.7	42.1	52.2	56.6	54.3	44.5	33.3	18.0	2.5	28.7
Total precipitation (inches)	0.69	0.50	0.80	1.18	2.31	3.17	3.09	2.69	1.97	1.37	0.87	0.62	19.27
Total snowfall (inches)	10.0	5.2	7.1	2.8	0.2	0	0	0	0	1.0	6.8	7.9	41.1
Snow depth (inches)	7	7	4	0	0	0	0	0	0	0	1	4	2
Lincoln, Nebraska													
Maximum temperature (°F)	33.4	40.0	50.5	63.7	73.8	84.5	89.2	86.6	78.7	66.4	49.5	37.3	62.8
Minimum temperature (°F)	11.9	17.9	27.2	38.8	50.1	60.7	66.0	63.6	53.1	40.3	27.4	16.4	39.4
Total precipitation (inches)	0.72	0.86	2.04	2.87	4.25	3.75	3.42	3.36	2.92	1.88	1.56	0.76	28.39
Total snowfall (inches)	6.5	5.4	4.9	1.5	0	0	0	0	0	0.6	2.7	5.3	26.8
Snow depth (inches)	2	2	0	0	0	0	0	0	0	0	0	1	0
Salisbury, Missouri													
Maximum temperature (°F)	36.4	42.6	53.2	65.9	75.7	84.0	88.6	87.3	80.1	69.0	53.5	41.1	64.8
Minimum temperature (°F)	17.4	22.5	31.2	42.9	53.0	62.0	66.3	63.8	55.5	44.4	33.0	22.8	42.9
Total precipitation (inches)	1.63	1.68	2.75	3.57	4.92	4.84	4.29	3.84	4.22	3.31	2.50	1.95	39.51
Total snowfall (inches)	6.4	4.5	3.2	0.4	0	0	0	0	0	0	1.1	4.6	20.2
Snow depth (inches)	2	1	0	0	0	0	0	0	0	0	0	0	0
Tulsa, Oklahoma													
Maximum temperature (°F)	46.5	52.9	62.4	72.1	79.6	88.0	93.8	93.2	84.1	74.0	60.0	49.6	71.4
Minimum temperature (°F)	26.3	31.1	40.3	49.5	59.0	67.9	73.1	71.2	62.9	51.1	39.3	29.8	50.1
Total precipitation (inches)	1.60	1.95	3.57	3.95	6.11	4.72	2.96	2.85	4.76	4.05	3.47	2.43	42.42
Total snowfall (inches)	3.0	2.1	1.4	0	0	0	0	0	0	0	0.6	2.0	9.1
Snow depth (inches)	NA [a]	NA [a]	NA [a]	0	NA [a]	0	0	0	0	0	NA [a]	NA [a]	NA [a]

Notes:

°F = degrees Fahrenheit.

All measurements in the table are averages.

[a] Data for snow depths are not available.

Source: ENSR 2006a.

TABLE 3.12.1-2
National Ambient Air Quality Standards

Pollutant	Time Frame	Primary	Secondary
Particulate matter less than 10 microns in diameter	Annual[a]	Revoked	Revoked
	24-hour[b]	150 $\mu g/m^3$	150 $\mu g/m^3$
Particulate matter less than 2.5 microns in diameter	Annual[c]	15 $\mu g/m^3$	15 $\mu g/m^3$
	24-hour[d]	35 $\mu g/m^3$	NA
Sulfur dioxide	Annual	0.030 ppm (80 $\mu g/m^3$)	NA
	24-hour[b]	0.14 ppm (365 $\mu g/m^3$)	NA
	3-hour[b]	NA	0.5 ppm (1,300 $\mu g/m^3$)
Carbon monoxide	8-hour[b]	9 ppm (10,000 $\mu g/m^3$)	NA
	1-hour[b]	35 ppm (40,000 $\mu g/m^3$)	NA
Nitrogen dioxide	Annual	0.053 ppm (100 $\mu g/m^3$)	0.053 ppm (100 $\mu g/m^3$)
Ozone	8-hour[e]	0.08 ppm (157 $\mu g/m^3$)	0.08 ppm (157 $\mu g/m^3$)
	1-hour[f]	0.12 ppm (235 $\mu g/m^3$)	0.12 ppm (235 $\mu g/m^3$)
Lead	Quarterly	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$

Notes:

μg = Microgram(s).
m^3 = Cubic meter(s).
NA = Not applicable.
ppm = Part(s) per million.

[a] Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, the United States Environmental Protection Agency revoked the annual PM_{10} standard in 2006 (effective December 17, 2006).

[b] Not to be exceeded more than once per year.

[c] To attain this standard, the 3-year average of the weighted annual mean particulate matter less than 2.5 microns in diameter concentrations from single- or multiple community-oriented monitors must not exceed 15.0 $\mu g/m^3$.

[d] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 $\mu g/m^3$ (effective December 17, 2006).

[e] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations, measured at each monitor within an area over each year, must not exceed 0.08 ppm.

[f] The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤ 1. As of June 15, 2005, EPA revoked the 1-hour ozone standard in all areas, except the fourteen 8-hour ozone nonattainment Early Action Compact Areas.

EPA has characterized all areas of the United States as attainment, unclassifiable, maintenance, or nonattainment. Areas where the ambient air concentration of a pollutant is less than the NAAQS are designated as attainment; areas where no ambient air quality data are available are designated as unclassifiable. Unclassifiable areas are treated as attainment areas for the purposes of permitting stationary sources. Areas are designated as nonattainment when a pollutant's ambient air concentration is greater than the NAAQS. If an area was designated as nonattainment and has since demonstrated compliance with the NAAQS, it is considered a maintenance area. While maintenance areas are treated as attainment areas for the purposes of permitting stationary sources, states may have specific provisions to ensure that the area will continue to comply with the NAAQS.

The Keystone Project would pass through nonattainment areas in Illinois and Missouri. Madison County, Illinois and St. Charles, Missouri are both designated as nonattainment for the 8-hour ozone and $PM_{2.5}$ federal standards. Ozone is not emitted directly into the air but rather develops as inversion-layer ozone formed through photochemical reactions between atmospheric oxygen, oxides of nitrogen (NO_x), and volatile organic compounds (VOCs) in the presence of sunlight (ultraviolet light). The major sources of NO_x and VOC precursor emissions include motor vehicles, industrial facilities, electric utilities, gasoline storage facilities, chemical solvents, and biogenic sources. $PM_{2.5}$ sources include direct emission from a wide variety of source types, including both mobile and stationary combustion sources. $PM_{2.5}$ also results

from atmospheric particle formation from the reaction of gaseous air pollutants, including SO_2 and ammonia (NH_3). Because of this nonattainment designation, the Keystone Project would be subject to a General Conformity determination, as described further in Sections 3.12.1.2 and 3.12.1.3.

A network of ambient air quality monitoring stations has been established by EPA and state and local agencies to measure and track the background concentrations of criteria pollutants across the United States, and to assist in designation of nonattainment areas. To characterize the background air quality in the regions surrounding the proposed Keystone Project area, data from air quality monitoring stations were obtained. A summary of the available regional background air quality concentrations is presented in Table 3.12.1-3.

3.12.1.2 Regulatory Requirements

The Clean Air Act (CAA) and its implementing regulations (42 USC 7401 et seq., as amended in 1977 and 1990) are the basic federal statutes and regulations governing air pollution in the United States. The following federal requirements have been reviewed for applicability to the proposed Keystone Project:

- New Source Review (NSR) / Prevention of Significant Deterioration (PSD),
- Air Quality Control Regions (AQCRs),
- New Source Performance Standards (NSPS),
- National Emission Standards for Hazardous Air Pollutants (NESHAPs) / Maximum Achievable Control Technology (MACT),
- Chemical Accident Prevention Provisions,
- Title V Operating Permits, and
- General Conformity Rule.

New Source Review/Prevention of Significant Deterioration

The NSR permitting program was established as part of the 1977 Clean Air Act Amendments (CAAA). New Source Review is a preconstruction permitting program that ensures that air quality is not significantly degraded from the addition of new or modified major emissions sources.[1] In poor air quality areas, NSR ensures that new emissions do not inhibit progress toward cleaner air. In addition, the NSR program ensures that any large new or modified industrial source will be as clean as possible, and that the best available pollution control is utilized. The NSR permit establishes what construction is allowed, how the emission source is operated, and which emission limits must be met.

If construction or modification of a major stationary source located in an attainment area would result in emissions greater than the significance thresholds, the project must be reviewed in accordance with PSD regulations. Construction or modification of a major or, in some jurisdictions, non-major stationary source in a nonattainment or PSD maintenance (Section 175A) area requires that the project be reviewed in accordance with nonattainment NSR regulations.

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[1] A major stationary pollutant source in a nonattainment area has the potential to emit more than 100 tons per year (tpy) of any criteria pollutant. In PSD areas, the threshold level may be either 100 or 250 tpy, depending on the source.

TABLE 3.12.1-3
Regional Background Air Quality Concentrations for the Keystone Project

Location	PM_{10} ($\mu g/m^3$)		$PM_{2.5}$ ($\mu g/m^3$)		SO_2 (ppm)			CO (ppm)	NO_2 (ppm)	O_3 (ppm)	
	24-Hr	Annual	24-Hr	Annual	24-Hr	3-Hr	8-Hr	1-Hr	Annual	8-Hr[a]	1-Hr
Wood River, Madison County, Illinois	76	12.5	32	0.003	0.011	0.037	NA	NA	NA	0.077	0.105
Highway 94, St. Charles County, Missouri	NA	11.9	31	NA	NA	NA	NA	NA	0.008	0.091	0.126
Aberdeen, Brown Country, South Dakota	57	8.3	22	NA	NA	NA	NA	NA	NA	NA	NA
Fargo, Cass County, North Dakota	73	8.4	24	0.000	0.002	0.003	NA	NA	0.006	0.065	0.071
Lincoln, Lancaster County, Nebraska	NA	9.0	25	NA	NA	NA	NA	NA	NA	NA	NA
Wichita, Sedgwick County, Kansas	71	9.0	26	NA	NA	NA	3.0	4.0	0.009	0.073	0.090
Highway 77, Kay County, Oklahoma	115	9.8	27	0.001	0.004	0.009	0.06	2.5	NA	0.085	0.104

Notes:

µg = Microgram(s).
CO = Carbon monoxide.
m^3 = Cubic meter(s).
NA = Not applicable.
NO_2 = Nitrogen dioxide.
O_3 = Ozone.
ppm = Part(s) per million.
PM_{10} = Particulate matter less than 10 microns in diameter.
$PM_{2.5}$ = Particulate matter less than 2.5 microns in diameter.
SO_2 = Sulfur dioxide.

[a] The 8-hour average ozone concentrations are the fourth-highest daily maximums.

Source: EPA. 2006. Monitor Values Report. Available online at: <http://www.epa.gov/air/data/reports.html>.

The proposed Keystone Project would not include construction of significant stationary sources of air pollutants[2]. In addition, mobile source emissions and fugitive emissions during the construction phase would be excluded from the determination of "potential to emit" for applicability purposes in accordance with the CAA. Therefore, the proposed Keystone Project would not trigger NSR or PSD review.

Air Quality Control Region

AQCRs are categorized as Class I, Class II, or Class III. Class I areas are designated specifically as pristine natural areas or areas of natural significance; these areas receive special protections under the CAA because of their good air quality. If a new source or major modification to an existing source is subject to the PSD program requirements and is within 62 miles (100 kilometers) of a Class I area, the facility is required to notify the appropriate federal officials and assess the impacts of the proposed project on the Class I area. Class III designations, intended for heavily industrialized zones, can be made only on request and must meet all requirements outlined in 40 CFR Part 51.166. The remainder of the United States is designated as Class II.

No Class I areas are within 62 miles (100 kilometers) of the Keystone Project ROW. The nearest Class I areas to the proposed project would be the Mingo National Wildlife Refuge near Puxico, Missouri (approximately 120 miles south of where the pipeline would cross into Illinois) and the Wichita Mountains Wildlife Refuge northwest of Lawton, Oklahoma (approximately 137 miles southwest of the Cushing Terminal). In addition, the proposed Keystone Project does not include construction or operation of significant stationary sources of air pollutants. Therefore, the Keystone Project would not trigger a federal Class I area impact assessment.

New Source Performance Standards

The NSPS, codified at 40 CFR Part 60, establish requirements for new, modified, or reconstructed units in specific source categories. NSPS-requirements include emission limits, monitoring, reporting, and record keeping. During construction, Keystone proposes to locate temporary fuel transfer stations at contractor yards. The stations would consist of two to three 10,000-gallon storage tanks for diesel fuel and one 10,000-gallon storage tank for gasoline. Details regarding the fuel transfer stations are provided in Section 2.1.1.3. Table 2.1-5 summarizes the maximum daily and annual throughput for each transfer station site. The regulatory applicability of 40 CFR 60 Subpart XX depends on the gasoline throughput of the transfer facility. As long as the throughput of Keystone's transfer facilities are less than 75,700 liters per day (i.e., 19,998 gallons per day), they would be exempt from Subpart XX. The regulatory applicability of 40 CFR 60 Subpart Kb depends on the construction date, size, and vapor pressure of the storage vessel and its contents. As long as Keystone stores only diesel fuel in tanks larger than 75 cubic meters (19,813 gallons) and constructed after July 23, 1984, the Keystone Project would be exempt from Subpart Kb. No other subparts would apply because the proposed Keystone Project does not include construction or operation of any specific source categories of air pollutants.

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[2] Keystone proposes to install one 5-kW backup gasoline-fired generator and one 200-gallon gasoline storage tank at each pump station. Although estimated operation of the generator would be 20 hours per year, full load operations at 8,760 hours per year would result in emissions of less than 10 tpy cumulative for all regulated pollutants.

National Emission Standards for Hazardous Air Pollutants/ Maximum Achievable Control Technology

NESHAPs—codified in 40 CFR Parts 61 and 63—regulate hazardous air pollutant (HAP) emissions. Part 61 was promulgated prior to the 1990 CAAA and regulates only eight types of hazardous substances (asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride). The Keystone Project would not include facilities that fall under one of the source categories regulated by Part 61; therefore, the requirements of Part 61 are not applicable.

The 1990 CAAA established a list of 189 additional HAPs, resulting in the promulgation of Part 63. Also known as the MACT standards, Part 63 regulates HAP emissions from major sources of HAPs and specific source categories that emit HAPs. Part 63 considers any source with the potential to emit 10 tpy of any single HAP or 25 tpy of HAPs in aggregate as a major source of HAPs. None of the Keystone Project facilities would have the potential to emit HAP emissions greater than 10 tpy for a single HAP, nor would they have the potential to emit 25 tpy of multiple HAPs. Thus, the proposed Keystone Project facilities would not be considered a major source of HAP emissions and would not be subject to NESHAPs.

Chemical Accident Prevention Provisions

The chemical accident prevention provisions, codified in 40 CFR Part 68, are federal regulations designed to prevent the release of hazardous materials in the event of an accident and to minimize potential impacts if a release did occur. The regulations contain a list of substances and threshold quantities for determining applicability to stationary sources. If a stationary source stores, handles, or processes one or more substances on this list in a quantity equal to or greater than specified in the regulation, the facility must prepare and submit a Risk Management Plan. If a facility does not have a listed substance onsite, or if the quantity of a listed substance is below the applicability threshold, the facility does not need to prepare a Risk Management Plan. No hazardous materials subject to the Chemical Accident Prevention Provision/ Risk Management Plan (40 CFR Part 68) would be stored at any of the Keystone Project aboveground facilities (TransCanada 2007c).

Title V Operating Permits

Title V of the federal CAA requires individual states to establish an air operating permit program. The requirements of Title V are outlined in 40 CFR Part 70, and the permits required by these regulations are often referred to as Part 70 permits. Because the proposed Keystone Project would not include operation of significant stationary sources of air pollutants, the Keystone Project would not trigger Title V permitting.

General Conformity Rule

The General Conformity Rule was designed to require federal agencies to ensure that proposed projects conform to the applicable State Implementation Plan (SIP). General Conformity regulations apply to project-wide emissions of pollutants for which the project areas are designated as nonattainment (or, for ozone, its precursors NO_x and VOC) that are not subject to NSR and that are greater than the significance thresholds. Federal agencies are able to make a positive conformity determination for a proposed project if any of several criteria in the General Conformity Rule are met. These criteria include:

- Emissions from the project are specifically identified and accounted for in the SIP attainment or maintenance demonstration; or

- Emissions from the action are fully offset within the same area through a revision to the SIP, or a similarly enforceable measure that creates emissions reductions so that there is no net increase in emissions of that pollutant.

A General Conformity analysis is required for pollutant emissions that will occur in nonattainment areas not subject to NSR. For the Keystone Project, Madison County, Illinois and St. Charles, Missouri are both designated as nonattainment for the 8-hour federal ozone (precursors are NO_x and VOC) and $PM_{2.5}$ standards. Therefore, emissions of NO_x, VOCs, and $PM_{2.5}$ from project-related sources would be considered under the General Conformity Rule. The required evaluation of the proposed Keystone Project under General Conformity includes an applicability analysis via a comparison of potential emissions to applicability threshold levels, as well as a conformity determination if the emissions are greater than applicability threshold levels. Each federal agency is required to make a Conformity Determination before the action is taken. For more details on Keystone's General Conformity analysis, see Section 3.12.1.3.

3.12.1.3 Potential Impacts and Mitigation

Two types of impacts on air quality were considered for this analysis: temporary impacts resulting from emissions associated with construction activities and long-term or permanent impacts resulting from emissions generated from continued operation of a stationary source.

Construction Impacts

Air quality impacts associated with construction of the proposed Keystone Project would include emissions from fugitive dust, fossil-fueled construction equipment, open burning, and temporary fuel transfer systems and associated storage tanks.

Fugitive Dust

Fugitive dust is a source of respirable airborne particulate matter, including PM_{10} and $PM_{2.5}$. Fugitive dust results from land clearing, grading, excavation, concrete work, blasting and dynamiting, and vehicle traffic on paved and unpaved roads. The amount of dust generated is a function of construction activities, silt, moisture content of the soil, wind speed, frequency of precipitation, vehicle traffic, vehicle types, and roadway characteristics. Emissions would be greater during drier summer and autumn months, and in fine-textured soils.

Emissions of particulate matter arising from fugitive dust are regulated by state and local agencies. Typically, the regulations require measures to prevent fugitive dust from becoming airborne and leaving the property boundary, such as application of dust suppressants. Specific requirements also can include development and approval of a fugitive dust control plan. The Keystone Project, including the Cushing Extension, would affect approximately 21,221 acres of land in seven states during the construction phase. The majority of pipeline construction activity would pass by a specific location within a 30-day period (completing approximately 14 to 22 miles per month), thereby resulting in short-term and temporary impacts at any one location during construction.

As described in its Mitigation Plan (Appendix B), Keystone would implement proven dust-minimization practices to control fugitive dust emissions during construction, such as applying water sprays and surfactant chemicals, and stabilizing disturbed areas. Additional dust control measures may be required by state or local ordinances.

In addition, **the following measure is recommended:**

- **Keystone should cover all open-bodied trucks while in motion to minimize fugitive dust emissions.**

Fossil-Fueled Construction Equipment

Large earth-moving equipment, skip loaders, trucks, and other mobile sources may be powered by diesel or gasoline and are sources of combustion emissions, including NO_x, CO, VOCs, SO_2, PM_{10}, $PM_{2.5}$, and small amounts of HAPs. Gasoline and diesel engines must comply with the EPA mobile source regulations in 40 CFR Part 86 for on-road engines and 40 CFR Part 89 for non-road engines; these regulations are designed to minimize emissions. Furthermore, to implement the CAA, EPA has established rules to require that sulfur content in on-road and off-road diesel fuel be significantly reduced. On June 1, 2006, 80 percent of diesel fuel for on-road use produced by U.S. refineries was required to be reduced from 500 to 15 ppm sulfur. Additionally, on June 1, 2007, diesel fuel for non-road engines must be reduced from 5,000 to 500 ppm sulfur. On June 1, 2010, EPA will require that all on and off-road (non-road) diesel fuel meets a limit of 15 ppm sulfur.

Keystone proposes to use the construction equipment listed in Table 3.12.1-4 in a typical construction spread. Keystone proposes to build the Mainline Project in four to five spreads and the Cushing Extension in one to two spreads. Each spread would be approximately 215 to 330 miles, and would require 15 months to complete. Construction would occur simultaneously on the four or five spreads.

Keystone would maintain all fossil-fueled construction equipment in accordance with manufacturer's recommendations to minimize construction-related emissions.

Open Burning

Open burning of land clearing materials from construction activities has the potential to affect air quality. All of the states along the route of the proposed Keystone Project regulate open burning through local permitting, approval, and notification processes. Keystone would obtain all necessary open burning permits, approvals, and notifications prior to conducting any open burning of land clearing materials. Keystone would follow all open burning regulations during such activities, including restrictions on burn location, material, and time, as well as consideration of local air quality.

Temporary Fuel Transfer Systems and Associated Storage Tanks

Temporary fuel transfer systems and tanks have the potential to release VOC emissions. However, because Keystone would be storing mainly diesel fuel with a low vapor pressure, releases of VOCs would be minimal.

Connected Action

In modifying or constructing transmission line substations to support the Keystone Project, Western would implement the following mitigation measures for Air Quality and Noise:

- Western or its contractor would utilize such practicable methods and devices as are reasonably available to control, present, and otherwise minimize atmospheric emissions or discharges of air contaminants. Dust control watering of access roads and work areas would occur during the project when air quality is compromised by construction activities. Disturbed areas would be scarified to facilitate natural revegetation, provide for proper drainage, and prevent erosion.

- Equipment and vehicles that show excessive emissions of exhaust gases due to poor engine adjustments, or other inefficient operating conditions, would not be operated until repairs or adjustments are made.

Conclusion

Because pipeline construction moves through an area relatively quickly, air emissions typically would be localized, intermittent, and short term. Emissions from fugitive dust, construction equipment combustion, open burning, and temporary fuel transfer systems and associated tanks would be controlled to the extent required by state and local agencies as explained above. If Keystone complies with applicable regulations, the Keystone Project emissions from construction-related activities would not significantly affect local or regional air quality.

TABLE 3.12.1-4 Construction Equipment per Spread for the Keystone Project	
Description of Equipment	**Units per Spread**
On-Road Equipment	
Automobiles	2
Bus	15
Pickup 4x4	235
Welding rig	85
Winch truck	2
Dump truck	2
Flatbed truck (one ton)	10
Fuel truck	2
Grease truck	2
Mechanic rig	10
Skid truck	2
Stringing truck and trailer	10
Lowboy (rig)	4
Off-Road Equipment	
Welding tractor D6	2
Angle dozer D6	4
Angle dozer D7	14
Angle dozer D8	8
Angle dozer LGP D6	4
Angle dozer LGP D7	2
Angle dozer with ripper D8	4
Backhoe 330	31
Backhoe 345	4
Backhoe rubber-tired	4
Bending machine 22-36	2
Crane LS-318 (60 ton)	4
Crane LS-98A (35 ton)	2
Farm tractor	6
Fork lift 980	2
Front-end loader 977	4
Motor grader 14G	3
Motor grader 16	1
Sideboom 571	6
Sideboom 572	24
Sideboom 583	16
Air compressor (1,750 cubic feet per minute)	2
Pressure pump	2
Water pump (4 inch)	4
Water pump (6 inch)	4
Fill pump	2

Source: TransCanada 2007b.

Operations Impacts

Keystone proposes that all pipeline pumps would be electrical, with a UPS-serving as backup. A 5-kW gasoline generator and 200-gallon gasoline storage tank would serve as extended backup to each UPS-for essential services. Consequently, there would be no long-term emissions from the proposed Keystone

Project operations, except for very minimal emissions from the backup gasoline generator[3] and small fugitive emissions from valves, tanks, and pumping equipment. Because operating emissions are minimal, no operational permits would be required. As a result, the Keystone Project would not cause or contribute to a violation of any federal, state, or local air quality standards.

Connected Action Impacts

ConocoPhillips operates the Wood River Refinery and Wood River Products Terminal located in Madison County, Illinois. Currently, the refinery is undergoing air quality permitting to authorize various changes. The refinery proposes to increase both the total crude processing and the percentage of heavier crude at the refinery because of the growing volumes of Canadian heavy crude (e.g., the Keystone Pipeline Project). The permitting accounts for the emissions increases related to the Wood River Products Terminal. The Illinois EPA is considering the refinery project and changes to the terminal as a single project for the purpose of permitting and applicability to federal and state regulations.

The proposed project triggers the PSD and NSR permitting requirements due to potential CO and VOC emissions increases. There are net emission decreases of NO_x, SO_2, and particulate matter (PM_{10} particulates and $PM_{2.5}$ particulates) after accounting for credible contemporaneous emission increases and decreases. The new and modified units that would contribute to the increase in CO emissions would undergo a Best Available Control Technology (BACT) analysis as part of PSD. The new and modified units that will contribute to the increase in VOC emissions would undergo a Lowest Achievable Emission Rate (LAER) analysis as part of NSR because the area is nonattainment for 8-hour ozone (precursor compounds are NO_x and VOCs).

The emissions associated with a major project in a nonattainment area must not interfere with the state plan to achieve attainment of the NAAQS. To account for the emissions increase from a major project proposed in a nonattainment area, the applicant must provide compensating emission reductions from other sources that have not been relied on in the attainment plan. These emission reductions commonly are referred to as emission offsets. ConocoPhillips must obtain creditable emission decreases or offsets from the existing sources in the St. Louis/Metro-East ozone nonattainment area. Because this area is a moderate nonattainment area, emission offsets must be provided at a ratio of 1.15:1.0 (i.e., for each ton of VOC emissions from the project, 1.15 ton of offsets must be provided). At this ratio, ConocoPhillips is required to provide VOC emission offsets of 440.1 tpy to account for the project net emission increase of 407.0 tpy. Acquisition of the emission offsets is required to be completed 90 days after issuance of the permit or prior to commencement of construction, whichever occurs later.

The application shows that the proposed project would readily comply with applicable state and federal emission standards, including the emission standards and regulations of the State of Illinois (35 Ill. Adm. Code: Subtitle B) and applicable federal emission standards adopted by EPA (40 CFR Part 60 and 40 CFR Part 63).

General Conformity

Section 176(c) of the CAA prohibits federal actions in nonattainment or PSD maintenance areas that do not conform to the SIP for the attainment and maintenance of NAAQS. Therefore, the purpose of the General Conformity determination is to ensure: (1) that federal activities do not interfere with the budgets

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[3] Each 5-kW gasoline backup generator would result in emissions of less than 10 tpy cumulative for all regulated pollutants, assuming full load operations (operations are not expected to be full load).

in the SIPs; (2) that actions do not cause or contribute to new violations; and (3) attainment and maintenance of the NAAQS. Conformity can be demonstrated by showing: (1) that emission increases are allowed in the SIP; (2) that the state agrees to include emission increases in the SIP; (3) that no new violations of NAAQS, or that no increase in the frequency or severity of violations would occur; (4) offsets; and (5) mitigation. Some actions that are excluded from the General Conformity determination include those already subject to NSR and those covered by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or other environmental laws.

The Keystone Project proposes to cross two regions that are designated as nonattainment for the federal ozone and $PM_{2.5}$ standards. Therefore, emissions of $PM_{2.5}$ and ozone precursor compounds (NO_x and VOCs) would be evaluated against the General Conformity applicability threshold levels. All Keystone Project emissions of $PM_{2.5}$, NO_x, and VOCs emitted during construction and operation would be evaluated because no emissions would be covered under air permit programs. In addition, those emissions from construction (i.e., mobile sources) of the Wood River Refinery and Wood River Products Terminal upgrades also would need to be evaluated because they are not included in the NSR permitting.

Written approval of conformance with the SIP would not be necessary for the Keystone Project because estimated emissions are below the General Conformity applicability threshold levels. See Table 3.12.1-5 for estimated emissions.

3.12.2 Noise

3.12.2.1 Environmental Setting

The ambient sound level of a region is defined by the total noise generated within the specific environment and is usually comprised of sound emanating from natural and artificial sources. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of the day and throughout the week. This variation is caused in part by changing weather conditions and the effects of seasonal vegetative cover.

The proposed Keystone Project would be constructed in primarily rural agricultural areas of North Dakota, South Dakota, Nebraska, Kansas, Missouri, Illinois, and Oklahoma. It is estimated that the existing ambient noise level in the Keystone Project area is approximately 35 dBA. This is an assumed noise level. Areas similar to the Keystone sites have background noise levels in the 35-dBA range. Field studies would be conducted prior to construction to confirm the background noise levels (TransCanada 2007c).

Noise Receptors near the Pipeline ROW

Approximately 1,196 residences (985 for the Mainline Project and 211 for the Cushing Extension) and 11 commercial/public assembly places (10 for the Mainline Project and 1 for the Cushing Extension) are within 500 feet of the proposed pipeline centerline (ENSR 2006a). See additional discussion of buildings close to the ROW in Sections 3.9.3.5 and 3.9.4.5.

TABLE 3.12.1-5
Estimated Emissions from Activities in Nonattainment Areas for the Keystone Project

Emission Source	$PM_{2.5}$ (tpy)	NO_x (tpy)	VOC (tpy)
Annual general conformity applicability threshold levels	100	100	50
St. Charles County, Missouri			
Construction emissions			
On-road equipment	<0.1	<0.1	<0.1
Off-road equipment	0.8	18.3	6.1
Open burning[a]	0	0	0
Fugitive dust	<0.1	0	0
Fugitive VOC	0	0	<1.0
Total construction emissions	<1.0	<18.4	<7.2
Below thresholds?	Yes	Yes	Yes
Operating emissions			
Pump station (PS-36)	<0.1	<0.2	<0.3
Total operating emissions	<0.1	<0.2	<0.3
Below thresholds?	Yes	Yes	Yes
Madison County, Illinois			
Construction emissions			
On-road equipment	<0.1	<0.1	<0.1
Off-road equipment	0.8	12.0	4.1
Open burning[b]	0	0	0
Fugitive dust	<0.1	0	0
Fugitive VOC	0	0	<1
Wood river refinery/terminal upgrade	NA	NA	NA
Total construction emissions	<1.0	<12.1	<5.2
Below thresholds?	Yes	Yes	Yes
Operating emissions			
Pump station (PS-37)	<0.1	<0.2	<0.3
Total operating emissions	<0.1	<0.2	<0.3
Below thresholds?	Yes	Yes	Yes

Notes:

$PM_{2.5}$ = Particulate matter less than 2.5 microns in diameter.
NA = Not available at the time of publication of the draft EIS.
NO_x = Oxides of nitrogen.
VOC = Volatile organic compounds.
tpy = Tons per year.

[a] Open burning is not permitted during summer months in St. Charles County, Missouri. In the remaining months, a permit may be required for the type and volume of open burning planned.

[b] Open burning is not permitted in Madison County, Illinois.

Source: TransCanada 2007c.

In addition, approximately 22 recreational and special interest areas (21 for the Mainline Project and 1 for the Cushing Extension) would be crossed by the proposed route (ENSR 2006a). Section 3.9.3 and Table 3.9.3-7 provide information on recreational and special interests lands intersected by the Mainline Project, the majority of which are privately owned. Section 3.9.4.7 and Table 3.9.4-7 provide information on the recreational and special interest land intersected by the Cushing Extension.

Fifty-two USFWS wetland easements in North Dakota and South Dakota would be crossed by the Mainline Project (see Table 3.9.3-8). As described in Section 3.9.4.7, the proposed Cushing Extension facilities would not cross any wetland easements. No other national, state, or local parks or forests are within 500 feet of the proposed centerline, including wilderness or wilderness study areas.

Noise Receptors near Pump Stations

Table 3.12.2-1 summarizes the nearest noise-sensitive areas (NSAs) and the number of residences/ structures within 1 mile of each proposed pump station. The proximity of the nearest NSAs ranges from 253 feet at pump station (PS-) 37 to 3,523 feet at PS-16. Keystone does not anticipate any structures being built closer to these ranges due to the land's long-term utility use and permanent pipeline ROW.

3.12.2.2 Regulatory Requirements

Two measurements used by federal agencies to relate the time-varying quality of environmental noise to its known effect on people are the 24-hour equivalent sound level (Leq[24]) and the day-night sound level (Ldn). The Leq(24) is the level of steady sound with the same total (equivalent) energy as the time-varying sound of interest, averaged over a 24-hour period. The Ldn is the Leq(24) with 10 decibels on the A-weighted decibel scale (dBA) added to nighttime sound levels between the hours of 10 p.m. and 7 a.m. to account for people's greater sensitivity to sound during nighttime hours.

In 1974, EPA published "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety." This document provides information for state and local agencies to use in developing their ambient noise standards. EPA identified outdoor and indoor noise levels to protect public health and welfare. An Leq(24) of 70 dB was identified as the level of environmental noise that would prevent any measurable hearing loss over a lifetime. An Ldn of 55 dBA outdoors and an Ldn of 45 dBA indoors were identified as noise thresholds that would prevent activity interference or annoyance. These levels are not "peak" levels but are 24-hour averages over several years. Occasional high levels of noise may occur. An Ldn of 55 dBA is equivalent to a continuous noise level of 48.6 dBA. None of the states that would be traversed by the proposed Keystone Project have a different regulatory noise limit (except Illinois, which has limits dependent on the land class and noise frequency as set out by Title 35 Subtitle H Chapter I of the Illinois Administrative Code), although many have local ordinances governing noise from construction or industrial activities.

3.12.2.3 Potential Impacts and Mitigation

Noise impacts for a pipeline project generally fall into two categories: temporary impacts resulting from operation of construction equipment, and long-term or permanent impacts resulting from operation of the facility.

TABLE 3.12.2-1
Structures within 1 Mile of Pump Stations for the Keystone Project

State/County	Pump Station	Milepost of Pump Station	Distance to Nearest Noise-Sensitive Area (feet)	Direction from Pump Station	Number of Structures within 1 Mile of Pump Station
MAINLINE PROJECT					
North Dakota					
Walsh	PS-15	33.0	1,200	SE	7
Nelson	PS-16	75.9	3,523	S-SE	4
Steele	PS-17	123.4	2,257	N-NW	3
Ransom	PS-18	170.2	650	E	10
Dickey	PS-19	216.8	1,148	NE	1
Sargent	PS-19	216.8	–	–	5
South Dakota					
Brown	PS-19	216.8	–	–	5
Day	PS-20	262.1	–	–	0
Clark	PS-21	308.9	2,700	NE	6
Miner	PS-22	356.8	–	–	0
Hutchinson	PS-23	404.8	2,650	SE	11
Nebraska					
Cedar	PS-24	452.7	354	NE	16
Stanton	PS-25	499.1	846	N-NW	12
Butler	PS-26	549.5	240	NW	10
Saline	PS-27	601.8	1,342	W-SW	4
Jefferson	PS-28	637.3	2,142	N	6
Kansas					
Nemaha	PS-29	688.2	850	S	19
Doniphan	PS-30	736.7	1,043	SW	13
Missouri					
Clinton	PS-31	782.3	3,400	W	31
Carroll	PS-32	829.8	920	SE	17
Chariton	PS-33	864.6	813	NW	12
Audrain	PS-34	903.8	1,300	S	14
Montgomery	PS-35	947.5	1,930	NE	18
St. Charles	PS-36	984.8	500	S	17
Illinois					
Madison	PS-37	1022.75	253	E	4
Fayette	PS-38	1049.8	545	N	7
CUSHING EXTENSION					
Kansas					
Dickinson	C 30	CE 94.4	1,112	E	8
Cowley	C 32	CE183.4	289	NE	17
Oklahoma					
Kay	C 33	CE 278.4	272	SE	37

Note: Manual count from aerial photos and numbers may differ in actuality due to features that appear to lead to buildings.

Source: ENSR 2006a.

Construction Impacts

Construction of the proposed Keystone Project would be similar to other pipeline projects in terms of schedule, equipment used, and types of activities. Construction would increase noise levels in the vicinity of project activities, and the noise levels would vary during the construction period, depending on the construction phase.

Pipeline construction generally proceeds at rates ranging from several hundred feet to 1 mile per day. However, due to the assembly-line method of construction, pipeline construction activities in any one area could last from 1 week to 30 days. Construction of aboveground facilities would take approximately 18 months to complete. Because the construction moves through an area relatively quickly, noise impacts typically would be localized, intermittent, and short term.

Residential, agricultural, and commercial areas within 500 feet of the Mainline Project and the Cushing Extension ROW would experience short-term inconvenience from the construction equipment noise. Although individuals and livestock in the immediate vicinity of the construction activities may be temporarily disturbed may be temporarily disturbed, the impact on the noise environment at any specific location along the proposed pipeline route would be short term. Similarly, noise associated with construction of the proposed aboveground facilities would be intermittent during the construction period, but the overall impact would be temporary and is not expected to be significant. Further, nighttime noise levels would normally be unaffected because most construction activities would be limited to daylight hours.

Noise impacts from construction would be mitigated in accordance with Keystone's Mitigation Plan (Appendix B) to minimize effects on individuals, sensitive areas, and livestock. During permitting activities for the project, Keystone would determine whether state, county, or local noise regulations exist for a given location. If local noise regulations exist, Keystone would develop site-specific noise mitigation plans to comply with any specific regulations and would seek any applicable authorizations or variances. Noise mitigation plans would be provided to the construction contractors for implementation and would be enforced by construction inspectors using portable sound meters. Because preliminary research has not identified any applicable state or county noise ordinances along the pipeline route, Keystone is not proposing any construction noise assessments or surveys at this time (TransCanada 2007c).

To ensure that residential and commercial areas within 500 feet of construction activities are not affected by noise levels, Keystone would give advanced notice to landowners prior to construction, limit the hours during which construction activities with high-decibel noise levels are conducted, and ensure that construction proceeds quickly through such areas. In the event that the contractor expects noise levels to exceed regulated noise standards—based on the types of construction equipment used or construction procedures, notice would be given to Keystone so that immediate noise attenuation could be achieved. In addition, **the following measure is recommended:**

- **Keystone should set up a hotline to enable individuals to contact Keystone in the event that construction noise levels affect them. In those instances, Keystone should conduct noise assessment surveys at the affected area to ensure that the noise attributable to construction does not exceed 55 dBA Ldn. In the event that construction noise cannot meet regulated levels, Keystone should work with these individuals to develop an acceptable alternative construction work plan. In addition, Keystone should ensure that construction equipment would be operated on an as-needed basis and would be maintained to manufacturers' specifications to minimize noise impacts.**

Operations Impacts

During operation of the pipeline, the noise associated with the electrically driven pump stations would be limited to the vicinity of the facilities. Keystone prepared a preliminary noise assessment survey for a typical pump station, as illustrated in Table 3.12.2-2. The assessment assumed wind speeds of 8 miles per hour, a temperature of 75 °F, and three pumps operating at 3,000 kW cumulative.

TABLE 3.12.2-2
Sound Attenuation from Proposed Pump Stations for the Keystone Project

Distance (feet)	Sound Level (dBA)
Background	35
300	55
700	49
1,000	46
1,300	43
1,600	42
2,000	41
2,300	40
2,600	39
3,000	38
3,300	38
3,600	38
3,900	37
4,200	37
4,600	37
5,000	37

Source: TransCanada 2007b.

Table 3.12.2-2 shows that sound levels would attenuate nearly to existing ambient noise levels (35 dBA) within 4,000 feet of the facility and would be considered minor. Although noise impacts from the electrically powered pump stations are projected to be minor, Keystone would perform a noise assessment survey during operations to confirm the level of noise at each listed noise-sensitive area. A Type I integrating sound level meter would be used to determine the sound levels near the proposed pump stations. The device can determine peak and average sound levels over specified time intervals and at various distances from the nearest noise sources to the nearest sensitive receptors (TransCanada 2007c).

If the noise attributable to operation of any pump station exceeds 55 dBA Ldn at any noise-sensitive area, Keystone would implement noise mitigation measures to ensure that regulation levels are not exceeded, as specified in its Mitigation Plan. Mitigation measures can include construction of berms around the facilities or planting vegetation screens. As such, Keystone would minimize noise impacts to ensure that project-related operations would not result in a significant effect on the noise environment.

3.12.3 References

EPA. See U.S. Environmental Protection Agency.

TransCanada. See TransCanada Keystone Pipeline, L.P.

TransCanada Keystone Pipeline, L.P. 2007b. Response to Data Request #1. Submitted to U.S. Department of State by TransCanada Keystone Pipeline, L.P. Application for Presidential Permit. January 29.

TransCanada Keystone Pipeline, L.P. 2007c. Response to Data Request #2. Submitted to U.S. Department of State by TransCanada Keystone Pipeline, L.P. Application for Presidential Permit. April 4.

U.S. Environmental Protection Agency. 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. (USEPA 550/9-74-004.) March.

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3.13 RELIABILITY AND SAFETY

Transportation of crude oil by pipeline involves some risk to the public and the environment in the event of an accident or an unauthorized action, and subsequent release of oil. Spills of crude oil from the proposed Keystone pipeline and appurtenant facilities have a finite rate of occurrence, might affect the environment to varying degrees, and are of concern to all of the stakeholders. This section includes a summary of:

- Safety standards,
- Safety history,
- Risk assessment,
- Impacts, and
- Mitigation.

Appendix L provides a detailed discussion of the reliability and safety issues summarized in this section.

3.13.1 Safety Standards

This section summarizes the regulatory and industry standards to which the proposed crude oil pipeline would be designed, constructed, operated, and maintained. Details related to safety standards are provided in Appendix L.

3.13.1.1 U.S. Department of Transportation Standards

DOT is mandated to provide pipeline safety under 49 USC Chapter 601. OPS administers the national regulatory program to ensure the safe transportation of hazardous liquids, including crude oil, by pipeline. It develops safety regulations and other approaches to risk management that mandate safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards that set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve safety. PHMSA ensures that people and the environment are protected from the risk of pipeline incidents.

The rules governing pipeline safety are included in 49 USC Chapter 601. Of those, Parts 190, 194, 195, 198, and 199 are relevant to hazardous liquid (including crude oil) pipelines. The following is a brief summary of the more important parts of 49 USC Chapter 601 with regard to the Keystone Project.

- Part 190 describes the procedures used by OPS in carrying out their regulatory duties, including inspection of pipelines and enforcement of the regulations.
- Part 194 contains requirements for oil spill response plans intended to reduce the environmental impact of oil discharged from onshore oil pipelines.
- Part 195 prescribes the safety standards and reporting requirements for hazardous liquid pipelines, including detailed requirements on a broad spectrum of areas related to the safety and environmental protection of hazardous liquid pipelines.
- Part 198 prescribes regulations governing grants-in-aid for state pipeline safety compliance programs.

- Part 199 requires operators of gas and hazardous liquid pipelines to establish programs for preventing alcohol misuse and to test employees for the presence of alcohol and prohibited drugs; it also provides the procedures and conditions for this testing.

Parts 194 and 195 specifically require Keystone to develop a comprehensive ERP for the pipeline, to be reviewed and approved by OPS prior to operation (the draft ERP is included as Appendix C). OPS also would conduct periodic inspections of the pipeline during operation, and would review and approve the pipeline Integrity Management Plan for high consequence areas (HCAs) that Keystone would be required to prepare. HCAs are defined as:

(1) A commercially navigable waterway, which means a waterway where a substantial likelihood of commercial navigation exists;

(2) A high population area, which means an urbanized area—as defined and delineated by the Census Bureau—that contains 50,000 or more people and has a population density of at least 1,000 people per square mile;

(3) Another populated area, which means a place—as defined and delineated by the Census Bureau—that contains a concentrated population, such as an incorporated or unincorporated city, town, village, or other designated residential or commercial area; and

(4) An unusually sensitive area—explicitly defined in 49 CFR Part 195.6 as drinking water or ecological resource areas that are unusually sensitive to environmental damage from hazardous liquid pipeline releases.

The HCA regulation requires that new hazardous liquid pipelines identify HCAs prior to operation and that a written integrity management program be in place within 1 year after the start of operation including baseline assessments by the date that pipeline operation begins. Depending on the findings of the assessment, the operator must take preventive and mitigating measures to protect the HCA from the consequences of a pipeline failure. These measures include conducting a risk analysis of the pipeline segment to identify additional actions to enhance public safety or for environmental protection.

Keystone has submitted a Risk Assessment and Environmental Consequence Analysis (ENSR 2006b) and a Frequency-Volume Study (DNV 2006); these serve as the risk analysis required for HCAs. The Risk Assessment and Environmental Consequence Analysis (ENSR 2006b) includes Table 4-13, which summarizes Keystone's estimate of pipeline miles within various types of HCAs. Keystone estimates that approximately 170 miles of the Keystone Mainline Project and 71 miles of the Cushing Extension would be within HCAs. Keystone has not submitted an Integrity Management Plan for HCAs, but will need to complete the baseline assessment prior to pipeline operation. The Keystone Risk Assessment and Environmental Consequence Analysis and the Frequency-Volume Study are discussed in more detail in Appendix L.

3.13.1.2 Standards and Regulations for Affected States

OPS is responsible for oversight and inspections of interstate pipelines, like the Keystone pipeline; in states where OPS and the state have a special agreement in place, the state may carry out these functions. OPS regulates, inspects, and enforces interstate liquid pipeline safety requirements in all the states that would be crossed by the proposed Keystone pipeline.

States may adopt regulations with requirements that supplement or exceed federal requirements. All the states that would be crossed by the proposed pipeline have adopted state One-Call systems to reduce the potential for third-party damage to utilities, including pipelines, during projects that involve excavations or soil borings. The laws and regulations of each state that would be affected by the Keystone Project contain no other requirements exceeding federal requirements, except for Administrative Code 165, Chapter 20 in the State of Oklahoma that regulates gas and hazardous liquid pipeline safety. Oklahoma assesses an annual fee on pipeline operators, has reporting requirements, and requires notices prior to construction.

3.13.1.3 Industry Standards

Pipeline design would comply with pertinent industry standards, including:

- American Society of Mechanical Engineers (ASME)/American National Standards Institute (ANSI) Code B31.4, "Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia, and Alcohols." This standard addresses requirements for materials of construction welds, inspection, and testing for cross-country hazardous liquid pipelines. It requires a mainline block valve on the upstream side of major river crossings and public water supply reservoirs, and either a block valve or a check valve on the downstream side.
- ANSI Standards CSA Z662-03 and Z662.1-03. This standard covers the design, construction, operation, and maintenance of oil and gas industry pipeline systems that convey various fluids, including crude oil.
- American Petroleum Institute (API) 570 Piping Inspection Code, Inspection, Repair, Alteration, and Re-Rating of In-Service Piping Systems. This code was developed for the petroleum refining and chemical processing industries but may be used for any piping system.
- API RP 1102, Recommended Practices for Liquid Petroleum Pipelines Crossing Railroads and Highways. This recommended practice is a requirement of ASME/ANSI B31.4.
- API RP 1109, Recommended Practice for Marking Liquid Petroleum Pipeline Facilities. ASME/ANSI B31.4 advises that this API RP 1109 shall be used as a guide.
- NACERP 01-69, Control of External Corrosion on Underground or Submerged Metallic Piping Systems. ASME/ANSI B31.4 refers to sections of this recommended practice as a guide for an adequate level of cathodic protection.

3.13.2 Safety History

This section summarizes the safety history of onshore hazardous liquid pipeline operations in the United States, including specific hazardous liquid pipeline operating experience in the states that would be traversed by the proposed pipeline. A more detailed review is found in Appendix L.

3.13.2.1 PHMSA's Oil Pipeline Statistics

Spills are reported to PHMSA on standard forms, in accordance with 49 CFR Section 195.50. PHMSA maintains a database of pipeline incident reports (available online: <http://primis.phmsa.dot.gov/comm/reports/psi.html>, accessed in February 2007). Pipeline incident reports encompass onshore and offshore

natural gas and hazardous liquid pipelines. In this section, the term "hazardous liquid pipelines" is used for information based on hazardous liquid pipeline data.

Hazardous liquid pipeline incidents include those that are categorized as "serious" or "significant." A "serious" hazardous liquid pipeline safety incident is one involving a fatality or an injury requiring in-patient hospitalization. "Significant" hazardous liquid pipeline safety incidents include spills releasing 2,100 gallons (50 bbls) or more; spills of 210 gallons (5 bbls) of highly volatile liquid; spills resulting in total costs of $50,000 or more (1984 dollars); or spills that include fire, explosion, injury, or death.

The PHMSA spill report data web site includes summary tables that provide overviews of serious incidents and significant incidents reported over the last 20 years, ending in 2005. Because the PHMSA data set is truncated on the lower end at the reporting limit of 50 bbls[1], the data understate the actual number of incidents and overstate the average spill volumes.

Table 3.13.2-1 shows the average number of serious incidents in a year for hazardous liquid pipeline operators. The summary data show a decreasing trend in serious pipeline incidents. The data include 113 serious incidents reported for 20 years (1986–2005).

TABLE 3.13.2-1
Nationwide Hazardous Liquid Pipeline Systems, Annual Averages of Serious Incidents (1986–2005)

Time Period	Serious Incidents per Year
5-year average (2001–2005)	3
10-year average (1996–2005)	5
20-year average (1986–2005)	6

Source: PHMSA 2007.

Table 3.13.2-2 shows the number of significant incidents in a year for all hazardous liquid pipeline operators. The summary data show a decreasing trend in annual incident frequency, injuries, and spill volume. Table 3.13.2-3 is a summary of PHMSA significant pipeline safety incidents for hazardous liquid pipelines (by cause) for the 20-year period from 1986 through 2005. The dominant incident cause is an outside force that results from one or more of the following:

- Excavation damage from encroachment of mechanical equipment (22 percent);
- Natural force damage such as earth movements due to soil settlement, washouts, or geologic hazards (5 percent); and
- Other outside force damage (1 percent) (Table 3.13.2-3).

Older pipelines have a higher frequency of outside force incidents partly because their location is less likely to be precisely known or marked, and because their diameters are in aggregate disproportionately smaller and therefore more easily crushed or broken.

[1] Of the 600 spills reported in the PHMSA database between 1996 and 2005, 16 percent were reported as less than 2,100 gallons (50 barrels).

TABLE 3.13.2-2
Nationwide Hazardous Liquid Pipeline Systems, Annual Averages for Significant Incidents (1986–2005)

Period	Number of Incidents	Fatalities	Injuries	Property Damage [a, b]	Gross Barrels Lost	Barrels Recovered	Net Barrels Lost
5-year average (2001–2005)	123	2	7	$73,426,467	99,526	35,724	63,802
10-year average (1996–2005)	138	2	8	$88,763,825	127,828	53,319	74,509
20-year average (1986–2005)	153	2	14	$62,509,194	160,347	64,460	95,888

Note:

Totals for the period from 1986 through 2005: 3,051 incidents; 44 fatalities; 272 injuries; $1,250,183,884 property damage; 3,206,945 barrels lost; 1,289,191 barrels recovered, and 1,917,754 net barrels lost.

[a] The costs shown in the tables are in 2005 dollars. Costs are adjusted via the Bureau of Economic Analysis, Government Printing Office inflation values.

[b] For years 2002 and later, property damage was estimated as the sum of all public and private costs reported in the 30-day incident report, adjusted to 2005 dollars. For years prior to 2002, accident report forms did not include a breakdown of public and private costs; therefore, property damage for these years is the reported total property damage field in the report, adjusted to 2005 dollars.

Source: PHMSA 2007.

TABLE 3.13.2-3
Nationwide Hazardous Liquid Pipeline Systems, Causes of Significant Incidents (1986–2005)

Cause	Number of Incidents	Percent of Total Incidents (%)	Fatalities	Injuries	Property Damage [a, b]	Percent of Property Damage (%)
All other causes	736	24	20	127	$239,498,819	19
Corrosion	724	24	1	17	$255,514,544	20
Excavation damage	675	22	15	85	$141,841,074	11
Human error	204	7	3	29	$28,032,680	2
Material failure	542	18	2	9	$304,928,405	24
Natural force damage	147	5	3	5[c]	$247,870,514	20
Other outside force damage	23	1	0	0	$32,497,848	3
Total	**3,051**	**100**	**44**	**272**	**$1,250,183,884**	**100**

Note:

Significant incidents are those incidents reported by pipeline operators that meet any of the following conditions: (1) fatality or injury requiring in-patient hospitalization; (2) $50,000 or more in total costs, measured in 1984 dollars; (3) highly volatile liquid releases of five barrels or more, or other liquid releases of 50 barrels or more; (4) liquid releases resulting in an unintentional fire or explosion

[a] The costs shown in the tables are in 2005 dollars. Costs are adjusted via the Bureau of Economic Analysis, Government Printing Office inflation values.

[b] For years 2002 and later, property damage is estimated as the sum of all public and private costs reported in the 30-day incident report, adjusted to 2005 dollars. For years prior to 2002, accident report forms did not include a breakdown of public and private costs; therefore, property damage for these years is the reported total property damage field in the report, adjusted to 2005 dollars.

Source: PHMSA 2007.

Corrosion is another dominant incident cause, constituting 24 percent of all hazardous liquid pipeline incidents over the past 20 years. The frequency of incidents is also strongly dependent on pipeline age because corrosion is a time-dependent process (Keifner and Trench 2001). Pipeline age is important when assessing risk based on records of incident frequencies. In 2004, the Transportation Research Board (TRB 2004) published a review of pipelines that included "Pipeline Safety Data and Trends" as an appendix and relied heavily on previous work done for API (Keifner and Trench 2001). The API work confirms that hazardous liquid pipeline age is a significant spill risk factor. Several industry standards and practices and DOT requirements would tend to reduce the potential for spill incidents associated with the proposed pipeline relative to industry experience.

Intentional acts do not appear as a specific causal item in the PHMSA data. Terrorism has become a very real issue for energy infrastructure. DHS has been involved with FERC and other federal agencies in developing a coordinated approach to protecting the energy facilities of the United States, and continues to coordinate with these agencies to address this issue.

3.13.2.2 TransCanada Company-Specific Oil Pipeline Operating History

TransCanada is a well known and longstanding natural gas transportation company in Canada and the Unites States, with limited experience operating crude oil pipeline systems. Through a 50/50 joint venture, TransCanada and Alberta Energy Company (now EnCana Corporation) purchased the Platte pipeline in February 1996 and developed and constructed the Express pipeline in 1996. Together, the Express and Platte pipelines constitute a 1,700-mile system between Hardesty, Alberta and Wood River, Illinois. The system became operational in February 1997, with commercial deliveries beginning in April 1997. Alberta Energy Company operated the Express and Platte systems on behalf of the joint venture partnership until October 2000, when TransCanada divested its 50-percent interest to Encana Corporation.

Although TransCanada did not operate the Express and Platte pipeline systems, Keystone has provided a search of all records available to it, as well as the Freedom of Information Act On-Line Library at the PHMSA website (available online: <http://ops.dot.gove/state/IA98.htm>), to identify pipeline incidents that occurred during TransCanada's ownership interest in the system. No incidents were found to have occurred in Canada. One incident occurred in the United States in 1996: in Section 8, T53N, R17W, Chariton County, (Salisbury Station), approximately 3 miles west on Highway 24 near Salisbury, Missouri. The DOT-assigned identification number was 19960027. Corrosion is listed as the cause of the release of 220 bbls of crude oil, of which an unknown amount was recovered. No habitat, resources, or human services were affected.

The limited operating history with oil pipelines precludes comparison of accident and oil spill incident rates specific to TransCanada with the industry average rates. The extent of specific operating experience does not affect the regulatory requirements to be met by the operator.

3.13.2.3 Oil Pipeline Incident History in States That Would Be Traversed by Keystone

Of the 600 crude oil spills reported in the PHMSA database between 1996 and 2005, 9 percent were very large (defined as greater than 100,000 gallons [2,380 bbls]). Five of the very large spills were reported in Oklahoma. No other very large spills were reported from states in the Keystone Project area. Insufficient incident data and pipeline mileage on a state-by-state basis prevent a statistical analysis with conclusions applicable to estimating very large spill incident frequencies for the proposed Keystone pipeline.

3.13.3 Risk Assessment

This section summarizes the potential for oil spills from the proposed Project, including potential types of spills and sources, and an evaluation of oil spill frequency and volume that may be expected. A more detailed description of the components and methods included in the risk assessment are found in Appendix L.

3.13.3.1 Construction Spills

The majority of construction spills tend to be relatively small, refined products (e.g., gasoline, diesel, and lubricating and hydraulic fluids); and most result from vehicle and construction equipment fueling and maintenance in construction staging areas or along the construction ROW. A tanker truck accident or a fuel storage tank failure is the most likely source of the largest construction spills. Fueling operations can be a source of frequent but small spills. Construction staging areas may include portable fuel and oil storage tanks, staged onsite during the course of the construction activity. The potential oil spill volume from these sources would be small relative to the potential oil spill volume from a pipeline incident. Specific preventive and mitigating measures and recommendations found in this section under "Mitigation Measures" address potential spills from construction activities.

3.13.3.2 Operations Spills

Spills from the pipeline or associated pump stations, valves, or pigging facilities could occur during operation and have the potential to result in larger-volume spills and could occur any time in the year.

A large spill is most likely to result from a major pipeline break. Although pipeline leak detection technology could identify a leak and shut down flow quickly, actual response with containment equipment and cleanup crews may be delayed for several reasons, including:

- The exact leak location may not be known;
- Snow or other factors may hinder visual detection; and
- The leak is remote from response capabilities, and reporting the leak may be delayed.

Pipeline operational spills can occur anywhere along a pipeline from leaks, drips, and spills. Oil releases from the pipeline can occur due to corrosion, damage caused by third parties performing excavation or soil borings, external forces due to landslides or washouts, or other causes. Pump station operational leaks can occur from causes similar to pipeline leaks or maintenance activities, such as changing filters and pig launching or receiving incidents.

3.13.3.3 Oil Spill Frequency and Volume

Risk of oil spills is expressed as a combination of spill frequency and spill volume, and is assessed using failure frequencies that are derived from general hazardous liquid pipeline operating history. General incident frequencies and spill volumes then were reviewed for relevance to the proposed Keystone Project. This risk assessment approach has been performed at different levels. As part of the NEPA review, a frequency-volume analysis was performed using PHMSA data specific to the states that would be crossed by the proposed pipeline. Incidents occurring in Canada have been documented by regulatory agencies and popularly reported (e.g., Glenavon oil spill; available online: <http://dogwoodinitiative.org/newsstories/pipelineoilspillraisesquestions>). However, data on these incidents are not readily available

or expected in formats amenable to pooling with PHMSA data for analysis. Keystone submitted a Project-specific analysis that used various reference frequencies for different types of incidents and was adjusted for Project-specific factors (ENSR 2006b, DNV 2006). Use of these different approaches results in a range of spill frequencies that "bracket" the number of spills expected from the proposed pipeline. Details of how the different approaches are used and variations in results are provided in Appendix L.

Spill frequencies and volumes estimated from PHMSA data and applied to the proposed Keystone pipeline are presented in Table 3.13.3-1. The frequency factors give an overall frequency (for spills or leaks greater than 50 bbls) between 1.1 and 1.49 spills per year, depending on which data set is used as the basis. The volume factors give an estimated annual gross spill volume between 18,000 and 60,000 gallons (429 and 1,420 bbls) per year, depending on the data set used as the basis.

Keystone submitted a frequency-volume study (DNV 2006) and a Risk Assessment and Environmental Consequence Analysis (ENSR 2006b) This study evaluated hypothetical pipeline releases from three hole sizes—small holes (<0.1-inch diameter), medium holes (1-inch diameter), and large holes (>10-inch diameter) from various failure causes. The report also evaluated the risk at two different pipeline flows—435,000 and 591,000 bpd. These are the nominal and maximum proposed throughputs for the Keystone pipeline. Spill frequencies were estimated from historical data and modified by factors specific to the Keystone Project in order to estimate spill frequencies for the Keystone pipeline system. The study produced an overall frequency for spills or leaks greater than 2,100 gallons (50 bbls) of 0.143 spill per year for the nominal flow of 435,000 bpd and 0.186 spill per year for the 657,000-bpd maximum flow case. Table 3.13.3-2 summarizes the results for both flows.

TABLE 3.13.3-1
Projected Spill Incidents (>50 Barrels) per Year for the Proposed Keystone Project

Spill Incidents per Year	Full PHMSA Hazardous Liquids Dataset [a]	PHMSA Data–Keystone States [b]	PHMSA Data–Crude Oil [c]
Incidents per mile per year	0.00081	0.0009	0.00109
Mainline Project(1,078 miles)	0.87	0.96	1.17
Cushing Extension (293 miles)	0.24	0.26	0.31
Keystone Project total (1,371 miles)	**1.10**	**1.23**	**1.49**

Notes:

PHMSA = Pipeline and Hazardous Materials Safety Administration.

Columns may not add due to rounding.

[a] "Full" includes all hazardous liquid pipelines in the United States, onshore and offshore.

[b] "Keystone states" includes data only for onshore hazardous liquid pipelines in the states that would be crossed by the Keystone pipeline.

[c] "Crude oil" includes data only for onshore crude oil pipeline incidents, all states.

Source: PHMSA 2007.

TABLE 3.13.3-2
Spill Frequency Associated with the Proposed Keystone Project—Keystone's Analysis

Pipeline	Spills per Year [a]	Spills per Year [b]
Mainline Project (1,078 miles)	0.112	0.146
Cushing Extension (293 miles)	0.031	0.040
Keystone Project total (1,371 miles)	**0.143**	**0.186**

[a] Calculated based on specific analysis for the Keystone Project of spill probabilities for 435,000 bpd (DNV 2006).

[b] Calculated based on specific analysis for the Keystone Project of spill probabilities for 657,000 bpd (DNV 2006).

Source: DNV 2006.

The PHMSA data gives a spill frequency that is an order of magnitude higher than that given by the analysis performed by Keystone for the Keystone Project. Although future events cannot be predicted with certainty, spill frequencies can be used to estimate the number of events that might occur. Actual frequency may differ from the predicted values of either analysis. Explanations for the differences between spill frequency estimates include:

- PHMSA data reflect incidents on existing pipeline infrastructure. With implementation of DOT's Integrity Management Rule, continually improving industry operating practices, and advancements in best available control technology (BACT), the number of spills is expected to decline from historical levels of older pipelines.
- The Keystone analysis (DNV 2006) used an additive method, starting from specific types of incidents and adding their respective frequencies. This approach would omit incidents from other causes.
- Based on these factors, the PHMSA data would tend to overestimate the Keystone spill frequency, and the DNV method would tend to underestimate the spill frequency. The expected frequency of incidents would probably be a value between the two estimates.

For purposes of the risk and impact assessment of the Keystone pipeline, a reasonable generalization is that small spills are likely to occur and very large spills are highly unlikely to occur. Although large to very large spills are highly unlikely to occur, they have occurred in the past (as indicated by the PHMSA data); therefore, the potential impacts of such events should be considered. It is also important to consider that, as additional engineering and design information and refinements become available, Keystone would update its risk assessment and submit the updated assessment in subsequent filings with DOS.

3.13.4 Impacts Related to Oil Spills

Crude or refined oil released into the environment (spills) may affect natural resources, human uses and services, and aesthetics to varying degrees, depending on the cause, size, type, volume, location, season, environmental conditions, and associated response actions. Small oil spills (e.g., intermittent leaks and drips from construction machinery and operating equipment) are almost certain to occur during construction and operation of the Keystone Project. There is also a finite potential for a spill of sufficient

magnitude to substantially affect natural resources and human uses of the environment. This section summarizes impacts from a range of potential oil spill scenarios associated with the proposed Keystone Project. Details on the potential scenarios are provided in Appendix L.

Oil spills are typically unpredictable in cause, location, time of occurrence, size, and duration (J.L. Mach et al. Hart Associates, Inc. 2000). The potential occurrence of oil spills can be assessed by analyzing the risk of spills based on historical operation of pipeline systems. When an oil spill occurs, the resulting environmental impact depends on a number of factors, including:

- Fate and behavior of the spilled oil (i.e., potential for a spill reaching an environmental receptor),
- Concentration and chemical composition of the oil, and
- Toxicity (hazard) of the oil to the receptor.

Given the range of potential events and environmental and released oil variables that could occur during an oil spill, an assessment of potential oil spill impacts requires a depiction of hypothetical potential spill scenarios and environmental variables that reasonably bracket spilled oil behavior and fate. These scenarios are provided with the caveat that they are necessarily simplified and do not represent the entire spectrum of possible values or combinations of values and events that might be realized in actual spills. The full assessment of spill scenarios and environmental variables prepared for this EIS (Appendix L) is summarized in the following sections.

3.13.4.1 Factors Affecting Oil Spill Impacts

Impacts related to oil spills can be affected by the release location, type of oil released, volume of oil released, nearby receptors and resource uses, seasonal variations, response time and response actions, weather, water levels, and other factors that are discussed below.

Location of Spill

Most spills would occur and be contained within, or in close association with, the pipeline ROW or the associated infrastructure, such as construction yards, pump stations, and maintenance yards. During construction, refined product spills also could occur from incidents such as tank truck accidents along roads leading to the construction sites. These spills typically would be small and would be promptly cleaned up as required by federal, state, and local regulations before they reached offsite lands or water bodies. Some spills from vehicles, including fuel and other tank trucks running off the roads, may result in much or all of a load being spilled to the land, wetlands, ponds and lakes, or flowing water bodies adjacent to the road or pad. Based on the pipeline spill data base, operational spills from the pipeline system itself would be more likely in areas where subsurface excavations are more frequent and in areas where corrosion potential is high.

Type of Oil

For the Keystone Project, the materials that could be released during the construction or operations phase include:

- Crude oil;
- Refined oil—diesel, gasoline, hydraulic fluid, transmission oil, lubricating oil and grease, waste oil, mineral oil, solvents, and other petroleum-based products; and

- Other hazardous materials—methanol, antifreeze, water-soluble chemicals, corrosion inhibitors, scale inhibitors, drag-reducing agents, and biocides.

Refined oil products could be released in relatively small quantities during construction or operation of the Keystone Project. Crude oil releases during operations could range from small to large volumes along the pipeline route. Corrosion inhibitors, scale inhibitors, drag-reducing agents, and biocides are considered part of the crude oil stream. Crude oil that would be transported by the Keystone Project originates as bitumen, a thick black oil extracted from the WCSB tar sands. For the bitumen to be transported by pipeline, an upgrading technology is applied to convert the bitumen to synthetic crude oil. The general chemical composition, solubility, toxicity, persistence, and other properties of the synthetic crude oil are described in Appendix L.

Volume

Spill volumes can be categorized as:

- Very small spills—less than 5 bbl (<210 gallons),
- Small spills—5–49.9 bbl (210–2,100 gallons),
- Significant[2] spills—50–499,9 bbl (2,100–21,000 gallons),
- Large spills—500–5,000 bbl (21,000–210,000gallons), and
- Very large spills—>5,000 bbl (>210,000 gallons).

This size classification is generally similar to the unofficial categories used by OPS for spill reporting. The very small spill and very large spill categories were added because the vast majority of spills are less than 210 gallons and very rarely spills do exceed 210,000 gallons.

Habitat, Natural Resources, and Human Use Receptors

The impact of an oil spill would be heavily influenced by the types of receptors (i.e., habitats, natural resources, and human uses) that might be exposed to the oil. Sensitive receptor categories, listed in order of increasing perceived sensitivity to an oil spill, include:

- Terrestrial–agricultural land—includes grazing, field and row crops, fallow fields, and similar land uses;
- Terrestrial–natural habitat—includes native and second-growth forests, naturally restoring grasslands, and similar areas that are not being used directly by people;
- Groundwater—emphasis is on areas where the water table is close to the surface and is overlain by soils permeable to oil or karst formations;
- Aquatic–wetland habitat—includes all areas that meet the definition of wetlands;
- Aquatic–lake/pond habitat—includes agricultural stock ponds, small and large lakes, reservoirs, and similar non-flowing water bodies;
- Aquatic–stream/small river habitat—includes smaller flowing water bodies and those that are intermittent or ephemeral;

[2] Terminology from OPS spill reporting requirements.

- Aquatic–large river habitat—includes large flowing water bodies (i.e., the Platte River and the Missouri River) that are perennial, support commercial traffic, and may be restricted by dams and major reservoirs;
- Threatened and endangered species and their critical habitat—a special case of resources that may be found in any of the habitats but are limited in population size or spatial distribution;
- Human use–residential—areas where the pipeline ROW is near rural, suburban, or urban populations;
- Human use–commercial—areas (especially large rivers) that may be closed to normal use during a spill response action and result in substantial economic impacts;
- Human use–recreational—areas (especially lakes, small and large rivers, and reservoirs and associated parks) used by people for various recreational activities;
- Human use–water intakes—usually in reservoirs, large rivers, and some groundwater aquifers from which drinking water, industrial cooling water, or agricultural water supplies are obtained.

Season

The season in which a spill occurs could dramatically influence its behavior, resulting impacts, and the cleanup response actions. Seasonal effects are categorized for spring through fall and for winter.

The duration of the spring–fall season depends on the location along the pipeline route and the weather regime of the year. In this analysis, the season generally is defined as the period when the ground is free of snow and access to the pipeline ROW is not restricted by snow and ice. Most of the rivers and creeks are flowing; ponds, lakes, and reservoirs are open water; land is mostly snow-free; and biological use of land and water bodies is high. Currents, winds, and passive spreading forces would disperse spills that reach the water bodies. Spills to land would directly affect the vegetation, although dispersal of the spilled material is likely to be impeded by the vegetation. Spills to wetlands may float on the water or be dispersed over a larger area than would spills to dry land or to snow-covered land.

In winter, water bodies may be covered with ice, and snow partially to completely covers the land surface. Dispersal of material spilled to the land generally would be slowed, although not necessarily stopped by freezing within the active layer and by the snow cover. Depending on the depth of snow cover, as well as the temperature and volume of spilled material, the spill may reach the underlying dormant vegetation or wetlands, ponds, and lakes. Similarly, spills to flowing rivers and creeks generally would be restricted in areal distribution by the snow and ice covering the water body, compared to seasons with little or no snow and ice cover. Spills under the ice to creeks, rivers, and ponds/lakes might disperse slowly as the currents are generally slow to non-existent in winter. Also, because of the snow and ice, winter spills may be harder to detect and, when found, more difficult to contain and clean up.

Spring melt is the short transition period between winter and spring when thawing begins and river flows increase substantially and quickly, often to flood stages. Major floods could cause bank erosion, and any released oil entering the river could be widely dispersed and difficult to contain or clean up.

Response Time and Actions

For the very small to most significant spills, response time and actions typically would prevent the oil from reaching sensitive receptors or would contain and clean up the spill before it causes significant environmental impacts. For large to very large oil spills and potentially some significant spills, especially those that reach aquatic habitats, the response time between initiation of the spill event and arrival of the

response contractors would influence the magnitude of impacts to the natural environment and human uses. Once the response contractors are at the spill scene, the efficiency, effectiveness, and environmental sensitivity of the response actions (e.g., containment and cleanup of oil, and protection of resources and human uses from further oiling) would substantially influence the type and magnitude of additional environmental impacts.

Weather and Water Levels

Weather, especially rapid warming periods and heavy rainfall, may cause snowmelt and runoff that could result in major flood flows in the larger rivers; these flood flows could breech levees, erode river banks and channels, and expose the pipeline to structural forces. If spilled oil is released to the flooded area, especially to flowing waters, the oil could be distributed to adjacent terrestrial, wetland, and aquatic habitats High wind velocity may result in widespread distribution of any material released under pressure., Major flooding or adverse weather conditions (e.g., high winds, tornadoes, blizzards, and extreme cold) also may limit the ability to detect a suspected release, as well as hinder or stop the spill response contractors from implementing oil spill containment and cleanup operations.

3.13.4.2 Factors Affecting the Behavior and Fate of Spilled Oil

The environmental fate of released oil is controlled by many factors, and persistence cannot be predicted with great accuracy. Major factors affecting the environmental fate include the type of product, spill volume, spill rate, temperature of the oil, terrain, receiving environment, time of year, and weather. Crude oil would weather differently than diesel or refined products in that both diesel and refined products would evaporate at a faster rate than crude oil.

The characteristics of the receiving environment, such as the type of land cover, soil porosity, land surface topography and gradient, type of freshwater body, presence of ice on water or snow on land, and flowing water current velocity, would affect how the spill behaves. In ice-covered waters, many of the same weathering processes are occurring as in open water; however, the ice changes the rates and relative importance of these processes (Payne et al. 1991).

The time of year when a spill occurs substantially affects the fate of the crude oil. The season controls climatic factors such as temperature of the air, water, or soil; depth of snow cover; whether there is ice or open water; and the depth of the active layer. During winter, the air temperature can be so cold as to modify the viscosity of the oil so that it would spread less and could even solidify. The lower the ambient temperature, the less crude oil evaporates. Frozen ground would limit the depth of penetration of any spill.

3.13.4.3 Types of Oil Spill Impacts

Oil spills can result in physical, chemical or toxicological, and biological impacts.

Physical Impacts

Physical impacts of oil spills to natural resources and human uses typically result from physical coating of soils, sediments, plants, animals, or areas used by people. Typical physical impacts include:

- Smothering living organisms so they cannot feed or obtain oxygen;
- Coating feathers or fur, which reduces their insulating efficiency and results in hypothermia;

- Adding weight to the organism so that it cannot move naturally or maintain balance;
- Coating sediments and soils, which reduces water and gas (e.g., oxygen and carbon dioxide) exchange and affects subterranean organisms; and
- Coating beaches, water surfaces, and other places used by people.

Chemical and Toxicological Impacts

Toxicological impacts are the result of chemical and biochemical actions on the biological processes of individual organisms. The results may include direct and acute mortality; sub-acute interference with feeding or reproductive capacity; disorientation; reduced resistance to disease; tumors; reduced or loss of various sensory perceptions; interference with metabolic, biochemical, and genetic processes; and a host of other acute or chronic effects. In general, these impacts are manifested in sick, dying, or dead organisms. Oil spills typically are not toxic to humans, although the fumes from the spilled oil may make people sick if they are exposed long enough to sufficiently high concentrations in the air. Other than response personnel, most people generally are restricted from areas where fumes from the spilled oil potentially would pose a health threat.

Biological Impacts

The physical and chemical impact processes described previously are manifested at the individual organism level. Additional biological and ecological impacts may affect the local population, community, or ecosystem, depending on the location, size, type, season, duration, and persistence of the spill, in addition to the type of habitats and biological resources exposed to the spilled oil. Loss or reproductive impairment of a substantial portion of a population or biological community from an oil spill would be considered a significant environmental impact. Potential biological impacts would be greater if the affected species have long recovery times (e.g., low reproductive rates), have limited geographic distribution in the affected area, are central species in the ecosystem, are key habitat formers, or are otherwise critical to the local biological community or ecosystem. If the species or community is a key recreational or commercial resource, biological impacts at the population or community level also would constitute a significant impact.

3.13.4.4 Oil Spill Scenarios

A range of spill scenarios is provided to facilitate the impact assessment. It is impractical to evaluate all the reasonably likely, let alone possible, combinations of factors that are associated with and constitute an oil spill impact assessment. Most of the spills that may result in significant environmental impacts are likely to be crude oil from the pipeline. For that reason and because a key criterion for the OPS spill reporting system is the volume of oil released, the spill scenarios are based on the spill volumes listed in Section 3.13.4.2.

Very Small and Small Spills

The most common scenarios are the very small (< 5 bbl) and small (5–49.9 bbl) spills of diesel, hydraulic fluid, transmission oil, and antifreeze on work pads, roads, and facility parking or work areas. Some small spills may result from slow and small leaks of crude oil from the pipeline. Most of these small spills would not reach non-facility land or water bodies. However, some of the spills could reach natural or cultivated land, or could seep into the soil toward groundwater or into nearby water bodies remote from the roads and pads. The few small spills that reached terrestrial habitats typically would affect a limited

area adjacent to the road, ROW, or pad. Even the small spills that reached water bodies generally would result in a limited impact because of the small volume of oil involved.

Significant and Large Spills

Significant (50–499.9 bbl) and large (500–5,000 bbl) spills are much less common. Significant spills are more likely to: (1) be caused by accidents at construction and operation/maintenance sites; (2) be composed of refined products; and (3) occur on or near roads, construction pads, facility sites, or along the ROW.

Large spills are more likely to be crude oil releases from the pipeline and typically would occur in the ROW. Both significant and large spills are likely to result from tanker truck accidents (during construction), outside forces such as excavators and major earth movement, or corrosion of the pipe. Significant and large spills are more likely than small ones to reach natural or agricultural lands and water bodies adjacent to the ROW, roads, and pads. For the spills that reach water bodies, especially flowing streams and rivers, the area of impact generally would be more extensive than for the small spills because of the larger volume of oil involved. Likewise, the potential for large spills to reach groundwater surfaces is greater than for small spills. Large spills that result from a rupture in the pipeline, for whatever reason, are likely to be detected quickly by the SCADA system; both automatic and manual responses would be quickly activated to stop and isolate the leak.

Very Large Spills

Very large (>5,000 bbl) spills are a highly unlikely, but nonetheless possible, event. They are likely to result from a major rupture or a complete break (referred to as a "guillotine rupture") in the pipeline and would release crude oil somewhere along the ROW. Causes could include corrosion; major earth movement resulting from slides, earthquakes, or flood flows eroding river banks at non-HDD crossings; mechanical damage from excavation work; or vandalism and terrorist actions. The actual volumes spilled could vary, depending on the location and the activation methods and times for valves, pressure in the line, actual location of the break, the extent to which the pipeline follows the topographic contours and presence of low spots in the pipeline, and other factors.

Very large spills are likely to reach both land and adjacent water bodies, especially if they occur in the ice-free seasons. The proximity of the pipeline to major streams and rivers may be the most important factor in the spill scenarios. In general, if the spilled material flows to dry land, natural or agricultural, the oil probably would not disperse very far. Crude oil is more viscous and would percolate downward more slowly than diesel fuel or other refined products. A substantial portion of crude oil may adhere to soil particles, thereby reducing the amount that reaches the groundwater. Once at the upper groundwater surface, most crude oil would float and may move downgradient with the groundwater. If a very large spill reaches a flowing creek or river, the oil could be dispersed for substantial distances downstream. In flood flows, the oil also could be distributed over the flooded natural, agricultural, or residential/ commercial lands and could flow into ponds, reservoirs, and lakes. Whether a very large spill would reach these rivers or streams would depend on several variables, including the type, temperature, and volume of oil spilled; the topographic relief and slope; air temperature; presence of snow or vegetation; and response time and actions.

3.13.4.5 Assessment of Impact Magnitude

Based on the worldwide literature accumulated over the past 50 years on oil spill impacts to ecosystems and human uses (e.g., NRC 1985, 2003a, 2003b), the magnitude of impact is primarily a function of the

size of the spill, type of oil, and sensitivity of the receptors affected. For the Keystone Project, the crude oil stream represents the most likely source of an oil spill release that could produce a significant environmental impact. The size of a crude oil spill and the receptor types therefore would be key variables for estimating the magnitude of potential environmental impacts from such a spill. The size of the spill, measured in barrels, is an objective variable that can be measured or estimated within a reasonable margin of error in most cases. Receptor sensitivity, however, is more subjective and is markedly influenced by the perspectives and biases of the evaluators. The relative sensitivities of receptors that could be affected by the Keystone Project are presented as a hierarchy in Table 3.13.4-1, based on historical spill sensitivity assessments and typical stakeholder input.

The magnitude of environmental impacts generally increases within a receptor type as spill size increases (i.e., from left to right in the table). Within a spill size, the magnitude of impact increases with increasing sensitivity of the receptors (i.e., from top to bottom in the table). Combining size and sensitivity, the magnitude of impacts generally increases from top left to bottom right in the table. In many oil spills, the relative value of impacts on natural resources, including wildlife and wildlife habitats, is perceived to be higher or lower than the value of impacts to human uses, depending on stakeholder biases. Table 3.13.4-1 attempts to reflect a consensus of the ranking of these values, recognizing that the concept of "impact assessment and magnitude" is an anthropogenic one and not a component of ecosystem function.

3.13.5 Resource-Specific Impacts

This section summarizes potential Project-related impacts on specific resources that could result from oil spills and leaks.

3.13.5.1 Geology

The proposed Keystone Project does not involve geological features that have received state or federal protection. Native American tribes along the proposed route have been consulted, and none have identified any geological features of tribal significance.

Paleontological Resources

Most spills are confined to a construction or facility pad, access roadway, or pipeline ROW—or to an adjacent area. The primary exceptions are large to very large spills from pipelines that affect areas beyond the ROW. For example, a large to very large spill may enter a river crossing the ROW, and oil may be carried for several miles downstream to a paleontological site, should any be found to be present. Although no known sensitive paleontological resources would be crossed by the pipeline, surficial materials along the proposed ROW may contain Quaternary vertebrate fossils. Glacial deposits in particular may contain fossils of mastodon, mammoth, horses, and other Pleistocene large vertebrates (Paleontology Portal). Vertebrate fossils are relatively rare, and locations containing vertebrate fossils are more likely to be scientifically significant than those containing invertebrate or plant fossils. Where exposed, bedrock may contain Cretaceous and earlier marine fossils. Upper Cretaceous bedrock outcrops may contain fossils of marine organisms, including turtles, fish, ammonites, and various invertebrates. Pennsylvanian bedrock outcrops may contain fossils of marine invertebrates, including mussels, echinoids, bryozoans, crinoids, snails, corals, and trilobites. Pennsylvanian rocks in Illinois may contain plant fossils. Permian outcrops may contain fish and shark fossils. Along the Cushing Extension route in Noble County, Oklahoma, the Wellington Formation has yielded non-mammal vertebrate, invertebrate, and plant fossils (Paleontology Portal).

Because no areas of known sensitive paleontological resources would be crossed by the Keystone pipeline ROW or facilities, the likelihood of impacts on these resources from an oil spill is remote. We have recommended that Keystone develop a Paleontological Resources Protection Plan to identify and protect significant fossil resources that may be encountered during construction (described in further detail in Section 3.1.2.2).

Mineral and Fossil Fuel Resources

The proposed route does not cross any active surface mines or quarries, but potentially valuable sand, gravel, clay, and stone resources may lie within the proposed Mainline Project ROW for the approximately 800 miles that traverse glacial deposits. Sand, gravel, crushed stone, and dimensional limestone are also present along the Kansas portion of the Cushing Extension ROW (ENSR 2006a). As discussed in preceding sections, impacts from spills vary with the type of oil, volume, site features (e.g., topography), season, hydrologic factors (e.g., spread by surface waters), degradation (e.g., volatilization), and the type and distribution of resources present. For surface and near-surface resources such as sand, gravel, clay and stone, small to significant spills may result in localized reduction in resource availability and value depending on actions involved in the incident response and subsequent remedial activities. For large and very large spills, the impacts may be proportionally greater. However, the distribution of these mineral resources and their relatively undeveloped state along the ROW indicate that the overall potential for impacts to the resources and their associated industries is small. In North Dakota, South Dakota, and Nebraska, the proposed route would cross deposits of sand, gravel, clay, and stone; but the acreage of deposits covered by the proposed ROW is insignificant compared to the total acreage of deposits present in each state. Thus, impacts from spills in the vicinity of these resources would be negligible for small or even significant spills that are rapidly contained. Even large spills would result in minor impact because of the distribution of these resources and their current state of development.

The proposed Mainline Project route does not cross the well pads of any active or proposed oil or gas wells (ENSR 2006a). The proposed Cushing Extension ROW in Kansas crosses or passes near several oil and gas fields. In addition to four abandoned oil fields in Clay County, the proposed route passes near the active El Dorado oil field (Brooks et al. 1975 in ENSR 2006a). In Oklahoma, numerous oil and gas fields are in the vicinity of the proposed Cushing Extension route. Oil and gas fields that would be crossed by the Mainline Project and Cushing Extension ROWs are identified in Table 3.1.3-1 (in Section 3.1.3). Impacts of spills of any size that are rapidly and effectively addressed, as expected, are not likely to result in any contamination or alteration of these oil and gas resources due to pipeline location and the depth and containment afforded by the extraction equipment, operations, and sites.

In Kansas, coal beds are present in Pennsylvanian rocks below the proposed route; they are too deep to mine, although coal bed methane production is a possibility (Charpentier and Rice 1995). The proposed route crosses approximately 40 miles of underlying coal seams between Wood River and Patoka, Illinois, where coal is mined with underground methods (USGS 2004 in ENSR 2006a). Coal fields that would be crossed by the Mainline Project are identified in Table 3.1.3-2 (in Section 3.1.3); no coal fields would be crossed by the Cushing Extension. Oil spills are not expected to affect coal resources.

Geologic Hazards

The proposed Keystone pipeline would be located entirely within the relatively flat and stable continental interior. Consequently, the potential for impacts from geologic hazards is lower than for facilities located in active mountain belts or coastal areas. Nonetheless, at some locations along the proposed route, seismic hazards, landslides, subsidence, or flooding may occur.

Seismic Hazards

As part of its National Pipeline Mapping System (NPMS) program, the DOT has compiled data from a variety of sources to identify areas of high geologic hazard potential for pipelines (DOT 1996). The Integrity Management Rule of 2002 states that segments of pipeline with a high geologic risk and the potential to affect HCAs must implement protective measures. HCAs are specific locales and areas where a release could result in more significant adverse consequences. No earthquake HCAs have been identified along the Keystone Project route.

In accordance with federal regulations (49 CFR 195), Keystone would conduct an internal inspection of the pipeline if an earthquake, landslide, or soil liquefaction event were suspected of causing abnormal pipeline movement. Thus, any damage to the pipeline would quickly be detected, and impacts resulting from crude oil releases would be minimized.

Landslides

Most of the proposed Keystone Project route is not located in landslide-prone terrain, but the proposed route does cross areas of high landslide potential as described by the NPMS at the Yankton and Mississippi crossings. Keystone has considered landslide potential in its routing work and has selected crossings of these areas where the landslide potential is considered minimal. Based on concerns for potential rock slope instability in the vicinity of the Whitewater River crossing in Kansas, we have recommended that Keystone submit a site-specific Construction Mitigation and Restoration Plan for the Whitewater River crossing.

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

Keystone plans to limit the potential for exacerbating landslide risk by preserving or improving the contour of native slopes; preserving or improving drainage patterns; and, in some circumstances, considering the use of light-weight granular material surrounding the pipe to insulate it from small ground movements. Keystone has proposed erosion and sediment control and reclamation procedures in its Mitigation Plan that are expected to limit the potential for erosion and enable slopes to remain in a stable configuration following construction. The proposed mitigation measures are sufficient to minimize risks to the pipeline and environment due to landslide hazards.

The potential for landslide activity would be monitored during operations through aerial and ground patrols and through landowner awareness programs, which are designed to encourage reporting from local landowners of events that may suggest instability or other threats to the integrity of the pipeline. In addition to the landowner/tenant communication measures contained in Keystone's Mitigation Plan, we have recommended that Keystone develop and implement a Landowner Awareness Plan that specifically addresses landslide awareness with landowners and complies with the recommendations in API Recommended Practice 1162 (Public Awareness Programs for Pipeline Operators).

Subsidence

Although a potential result of soil liquefaction during seismic events, subsidence hazard generally is a consequence of the presence of karst features, such as sinkholes and fissures. Keystone reviewed national

karst maps (Tobin and Weary 2005) to determine areas of potential karst terrain (i.e., areas where limestone bedrock is near the surface) along the proposed pipeline route (see Section 3.1 for a Karst map). Because national-scale karst maps may not incorporate the most recent field data, or be of sufficient resolution to determine local subsidence risk due to karst features, we have recommended that Keystone consult with the respective state geological survey departments to identify the most up-to-date sources of data on karst-related subsidence hazards along the proposed route.

The overall risk to the Keystone Project and environment from karst-related subsidence is expected to be minimal. This conclusion is based on Keystone's review of the sinkhole data base for the segment of the route in Missouri where limestone bedrock is at, or near to, the surface; the Missouri Environmental Geology Atlas indicates that the Keystone pipeline alignment would avoid all known sinkhole zones within the state (Missouri Division of Geology and Land Survey 2007, in TransCanada 2007b).

In Missouri, the proposed route runs through a region containing a considerable number of historic underground coal mines characterized by small shafts and adits. There is a risk of encountering mine-related shallow voids during pipeline construction, and those voids may collapse. Any such collapse is likely to be noticed and remediated during construction, and thus is not likely to pose a long-term subsidence hazard.

Floods

Floods can cause lateral and vertical scour that can expose the pipeline to damage. Keystone has not completed scour analysis for all stream crossings, but proposes to use HDD at major river crossings and to bury the pipeline under at least 5 feet of cover for at least 15 feet on either side of the bankfull width of all rivers, creeks, streams, ditches, and drains. Although there is a risk of pipeline exposure due to lateral or vertical scour at water crossings, Keystone's Mitigation Plan (Appendix B of the main document) details procedures that would be used at water crossings to minimize these potential risks.

3.13.5.2 Soils and Sediments

Soils

The impact of oil spills on soil is a function of several variables, including the type of oil, permeability of the soil, type and amount of vegetation and other surface cover, and the release point (e.g., above or on the surface or below ground). Crude oil, lubricating oil, and similar heavy oils would be less likely to penetrate through the surface soil layers than refined oil (for example, gasoline or diesel), which could infiltrate through the vegetation, debris, and litter cover. Refined products are more likely to reach the soil—especially in the warmer snow-free seasons because their low viscosity would allow penetration into the vegetation and even the thin snow layers.

Once the oil reaches the soil surface, the depth of penetration into the soil would depend on the viscosity of the spilled oil, the porosity of the soil, and the extent to which the soil is frozen or saturated with liquid water. Porous soils (e.g., sand, gravel, and moraines) are generally more permeable than clays and silts, especially if the latter are saturated. Karst areas may be especially vulnerable to impacts from a spill.

TABLE 3.13.4-1
Significance of Environmental Impacts of Crude Oil Spills with Increasing Oil Spill Size and Increasing Sensitivity of Receptors

Type Of Receptor [a]	Size of Spill (in barrels)				
	Very Small (<5 bbl)	Small (5–49.9 bbl)	Significant (50–499.9 bbl)	Large (500–5,000 bbl)	Very Large (>5,000 bbl)
Terrestrial–agricultural land	Negligible	Negligible to minor	Minor to substantial	Minor to substantial	Substantial
Terrestrial–natural habitat	Negligible	Minor	Minor to substantial	Substantial	Substantial
Groundwater	Negligible	Negligible	Negligible to minor	Minor to substantial	Substantial
Aquatic–wetlands	Negligible	Minor	Minor to substantial	Substantial	Major to catastrophic
Aquatic–lakes and ponds	Negligible	Negligible to minor	Minor to substantial	Substantial	Major
Aquatic–streams and small rivers	Negligible	Negligible to minor	Substantial	Major	Major to catastrophic
Aquatic–large rivers	Negligible	Negligible	Minor	Substantial to major	Major to catastrophic
Threatened and endangered species and habitat	Negligible to minor	Minor to substantial	Substantial	Substantial to major	Major to catastrophic
Human use–commercial	Negligible	Negligible to minor	Minor	Minor to substantial	Substantial to major
Human use–residential	Negligible	Negligible to minor	Minor	Minor to substantial	Substantial to major
Human use–recreational	Negligible	Negligible to minor	Minor to substantial	Substantial to major	Major to catastrophic
Human use– water intakes	Negligible to minor	Negligible to minor	Minor	Minor to major	Major to catastrophic

Notes:

Negligible impact—little to no detectable impact on most resources; maybe some visible presence of oil on land, vegetation, or water. No to very few organisms apparently killed or injured. Temporary (days) and very local to spill site.

Minor impact—measurable presence of oil and limited impacts on local habitats and organisms. Temporary (days to weeks) and local (acres). Some organisms (likely birds, fish, and aquatic macroinvertebrates) may be killed or injured in the immediate area.

Substantial impact—patchy to continuous presence of oil on terrestrial and aquatic habitats near the spill site. Impacts may be present for weeks to a few months and may affect tens of acres or a few miles of stream/river habitat. Local community- and population-level effects on organisms and human uses of the area.

Major impact—patchy to continuous and heavy presence of oil on terrestrial and aquatic habitats near the spill site and for substantial distances downgradient of the spill site. Impacts may be present for weeks to months and potentially for a year or more. Area may include many acres to sections of land or wetlands and several miles of riverine habitat. Local community- and population-level impacts on organisms and habitats, and disruption of human uses of local oiled areas.

Catastrophic impact—mostly continuous or nearly continuous presence of oil on all habitats near and for substantial distances downgradient of the spill site. Impacts may be present for months to years. Area may include many acres to sections of land or wetlands, and several to numerous miles of river or other aquatic habitat. May cause local and regional disruption of human uses. May cause local and regional impacts to biological populations and communities.

[a] In increasing order of sensitivity from top to bottom.

Spills could affect soils indirectly by affecting the vegetation, which could die and expose the soil to water and wind erosion even if the soil was not directly affected by the spilled material. Spill cleanup is more likely to affect the soils than the presence of the spilled material itself, unless the cleanup is well controlled and heavy traffic and digging are minimized (especially for spills in summer).

Sediments

Sediments (defined here as submerged soils in wetlands and aquatic habitats) are typically fine grained and saturated with water. The sediment may be coarser grained in fast-flowing streams and rivers, and in areas where glacial moraines dominate the soil types. Crude or refined oils typically do not penetrate beyond the surface layer in sediments unless (1) there is a substantial amount of turbulence that mixes the oil and sediments, followed by deposition of the mixture in low-energy areas; (2) the interstitial spaces are large enough (e.g., in gravel and coarse sand) to allow for penetration of the oil as it sinks; or (3) physical activities associated with spill response actions mix the surface-deposited oil-sediment mixture into deeper subsurface levels of the sediment profile. Refined products also typically would not penetrate sediments because of their water content but may penetrate or be mixed further into the sediments under the same turbulent or cleanup actions as for crude oil.

3.13.5.3 Water Resources

Surface Water

An oil spill that reached a freshwater body could reduce DO and increase toxicity to aquatic organisms. Decreases in DO concentrations in wetlands, ponds, and small lakes could result from decreased oxygen influx from the air because of the relative impermeability of the oil slick to oxygen and the relatively high rate of natural sediment respiration in many shallow water bodies. In winter, even under ice, an oxygen deficit would not be expected to result from a small spill in most waters because low biological abundance and activity result in low to negligible respiration rates in the sediment and water column. Sediment respiration has even less relative effect in the thicker water column of lakes deep enough not to freeze solid in winter. Such lakes, even those that hold fish, tend to be supersaturated with DO in winter (BLM and MMS 1998). During open water periods in most of the water bodies, especially the larger lakes, rivers, and streams, spilled materials would result in no detectable impacts on DO levels. The relatively high river volume (relative to the volume of oil) and the high rate of water flow would disperse the oil before it affected DO concentrations.

Although spills are not considered a part of routine operations, there is the possibility of a crude oil release occurring with the potential to affect surface water bodies. A large spill could affect drinking water sources and irrigation water supplies. Implementation of the procedures in Section 3 of Keystone's Mitigation Plan (Appendix B of the main document) would minimize the potential for spills and leaks to affect surface water resources. Keystone's draft ERP (Appendix C of the main document) describes actions to reduce the potential for crude oil releases to affect surface water and groundwater resources.

Minor temporary to short-term surface water quality degradation is possible from maintenance equipment and vehicle spills or leaks. During all construction activities, all refueling would be conducted at least 100 feet away from all surface water bodies. Although washout-related spills are not considered a part of routine operations, in the event that channel migration or streambed degradation threatens to expose the pipeline, protective activities such as reburial or bank armoring are likely be implemented. In its Mitigation Plan (Appendix B of the main document), Keystone has committed to a minimum depth of cover of 5 feet below the bottom of all water bodies, maintained for a distance of at least 15 feet to either side of the edge of the water body. However, in Keystone's Frequency and Volume Analysis Report

(DNV 2007) the likelihood of washout-related spills for cover depths less than or equal to 10 feet is estimated to be twice that for cover greater than 10 feet. Channel incision of several meters is typical of many Midwestern streams and rivers; such incision would expose and threaten pipelines buried 5 feet below the channel bed. Furthermore, channel incision can sufficiently increase bank heights to destabilize the slope, ultimately widening the stream. Sedimentation within a channel also can trigger lateral bank erosion, such as the expansion of a channel meander opposite a point bar. Bank erosion rates can exceed several meters per year. Maintaining an adequate burial depth for pipelines only 15 feet beyond either side of the active stream channel may necessitate bank protection measures that would increase both maintenance costs and environmental impacts. Therefore, we have recommended that crossing-related cover depths should be maintained for at least 15 feet beyond the channel migration zone.

Control valves would be installed on both sides of larger perennial streams for the Mainline Project and the Cushing Extension pipelines. In the event of a crude oil release, the presence of valves and enactment of Keystone's ERP and spill containment measures would minimize the potential for any crude oil releases to affect surface water resources.

Groundwater

In the region of the proposed Keystone Project route, unconsolidated deposit aquifers in Quaternary-aged sediments are the most productive aquifers and are the source of water for thousands of shallow wells (Whitehead 1996). Shallow groundwater in this region is often used for agricultural, domestic, and industrial purposes. The Mainline Project route does not cross over any sole source aquifers, as designated by EPA Regions 5, 6, 7, and 8 (EPA 2007). (A detailed description of groundwater aquifers in proximity to the Project is presented in Section 3.3.1.1 and Appendix J.)

Significant spills of refined products, especially diesel, and significant to very large spills of crude oil may reach groundwater if the overlying soils are porous and not water saturated and if the water table is relatively near the surface. Areas near major wetlands and meandering streams or rivers are key examples where the water table may be close to the surface and the soils are wet to saturated, depending on rainfall and snowmelt conditions. In some of these areas, it may be difficult to distinguish between groundwater and surface water.

Diesel fuel has a low viscosity and likely would percolate toward the water table, where it would float on the water. It may move downgradient with the groundwater, although potentially at a lower rate than the groundwater. Some of the diesel may become dispersed in the groundwater, contaminating the groundwater for agricultural or domestic drinking supply uses. Also, the oil-contaminated groundwater may contaminate surface waters (e.g., wetlands, ponds and lakes, streams and rivers) if the groundwater surfaces and discharges into these surface water areas.

Crude oil is more viscous and would percolate downward more slowly. Also, a substantial portion of the crude oil may adhere to the soil particles, thereby reducing the amount that reaches the groundwater. Once the crude oil reaches the upper groundwater surface, most of it would float and may move downgradient with the groundwater—although probably more slowly. The oil also would undergo some biodegradation, adsorption to soil particles, and dispersion into the water—all of which effectively results in a natural attenuation remediation of the contamination. Like diesel fuel, the crude oil may reduce or eliminate agricultural or domestic uses of the groundwater and may contaminate surface water bodies if the contaminated groundwater discharges into these waters.

Overall, it is not anticipated that groundwater quality would be affected by disposal activities, spills, or leaks during construction activities. Many of the aquifers present in the subsurface beneath the proposed route are isolated by the presence of glacial till, which characteristically inhibits downward migration of

water and contaminants into these aquifers. However, shallow or near-surface aquifers are also present beneath the proposed route. Temporary fueling stations would be used to refuel construction equipment. To prevent releases, fuel tanks or fuel trailers would be placed within secondary containment structures equipped with impervious membrane liners. Implementation of procedures outlined in Sections 2 and 3 of Keystone's Mitigation Plan (Appendix B) would ensure that (1) contractors would be prepared to respond to any spill incident; and (2) all contaminants would be contained and not allowed to migrate into the aquifer during construction activities, regardless of the depth of the underlying aquifer.

During the life of the Keystone Project, potential minor short- to long-term groundwater quality degradation is possible from equipment and vehicle spills or leaks. Routine operation and maintenance is not expected to affect groundwater resources; however, if a crude oil release occurred, crude oil could migrate into subsurface aquifers and into areas where these aquifers are used for water supplies. Keystone's draft ERP (Appendix C of the main document) describes actions to be taken in the event of a crude oil release or other accident. As noted earlier, the ERP would be finalized prior to initiation of construction.

3.13.5.4 Wetlands

Impacts of spills of crude oil or refined products to wetlands are influenced primarily by the type of oil, the amount and proportion of water surface area covered, the type of vegetation present in the wetland, and cleanup response actions. Refined products tend to be more toxic than crude oil, while crude oil tends to cause more physical impacts (e.g., smothering). Because the oil tends to remain on the water surface, the slick may affect the oxygen exchange between water and air. A large and continuous slick may result in a low DO environment under the released oil. The slick of refined product also may result in toxic components being dissolved and dispersed in the underlying water column over a large area. Dense stands of emergent vegetation tend to act like an oil boom and collect oil at the edges of the stand because the oil adheres to the vegetation. As noted earlier, crude oil tends to infiltrate the vegetation stands less than refined products because the crude oil is more viscous. Aggressive and intrusive cleanup methods tend to mix the oil into the water and especially the sediments (which are often anoxic below the surface layer), where the oil may have long-lasting effects. Such cleanup methods may directly affect the vegetation, sediments, and animals more than the spilled oil. Passive cleanup methods, especially natural attenuation and biodegradation processes, generally result in much less impact on wetland resources.

Spills of refined product (e.g., diesel or gasoline) that affect wetlands are more likely to occur during construction and are more likely to be very-small to small-volume spills from construction pads or from access roads. If the spills occur in winter, the wetland may be covered in ice; the spilled product may be contained by snow and remain on top of the ice. In either case, it probably would be recovered before it directly affected the wetland habitat and associated vegetation or animals. For spills occurring during the rest of the year, most of the product would float on the water or wet soil surface—although some of the volatile fraction may dissolve or disperse in the water where it could injure or kill organisms. Although gasoline spills evaporate quickly, they may cause a short-term acute toxicological effect on animals in the wetland; and the vegetation may be chemically "burned" from the water line up. Diesel spills tend to be more persistent, and the oil may become incorporated into the sediments as well as adhere to the emergent vegetation.

Crude oil spills could occur only during operation. Most spills that could affect wetlands would occur in the ROW, where the pipeline crosses wetlands or water bodies such as ponds, lakes, reservoirs, streams, rivers, or adjacent riparian habitats. Crude oil spills that occur in winter may be restricted in the area affected because the cold plus the snow would increase the oil viscosity. In warmer seasons, large to very large spills of crude oil may flow into wetlands, where oil would cover the water surface, coat plants and

animals, and restrict oxygen exchange between air and water. Some of the crude oil may sink, become incorporated into the sediments, and remain there for years—depending on the amount of biodegradation and chemical or physical weathering that takes place.

Very small refined product or crude oil spills generally would cause negligible to minor impacts on wetlands unless the wetland is small and isolated from other water bodies. In these cases, the ecological impacts may be substantial because the majority of the wetland may be exposed to the oil. Some significant and many large to very large spills would result in substantial to catastrophic ecological impacts on wetlands because of the large size of the spill and the proportion of the wetlands that would be affected. Impacts may approach a catastrophic level in areas where the wetlands are heavily used by migratory waterfowl and the spill occurs during the spring or fall migration.

3.13.5.5 Biological Resources

Terrestrial

Vegetation

Because most spills are very small and would likely occur within the ROW, their effects would not reach natural or agricultural terrestrial habitats and would negligibly affect the vegetation and associated animals. However, some of the significant and the large to very large spills could reach the adjacent vegetation and habitat by directly flowing from the facility, or spilling from a pipeline leak in the ROW. During winter in the northern areas of the pipeline corridor, sufficient snow cover or sufficiently low temperatures may slow the flow of spilled oil and allow spill cleanup efforts to occur before oil spreads substantial distances from the spill source. Thus, even a large spill could result in a limited impact to vegetation and habitat. Cleanup operations, however, could cause impacts on vegetation and habitat if activities are not implemented carefully and with regard for minimal disturbance of the surface soils and vegetation. Whenever there are warmer temperatures and little to no snow cover, the spilled oil may flow a greater distance on the land surface thereby increasing the area where vegetation is potentially affected.

Most oil spills would cover less than an acre, but large to very large spills might cover several to tens of acres. After past spills, terrestrial habitats and ecosystems have shown a good potential for recovery; wetter areas have recovered more quickly (Jorgenson and Martin 1997, McKendrick 2000b). The length of time that a spill persists depends on several factors, including oil and soil temperature, availability of oleophilic microorganisms (organisms that biodegrade oil), soil moisture, and the concentration of the product spilled. For the most part, the effects of oil spills on land would be localized and are not expected to contaminate or alter the quality of habitat outside a limited area. Spills that occur within or near streams, rivers, and lakes could indirectly affect riparian vegetation and habitat along these water bodies.

Birds

Spills on or near the roads, pads, or facilities would not affect populations of birds, although a few individual shorebirds, waterfowl, and raptors (and very few passerine birds) could be exposed to the spilled oil. These exposed individuals are likely to die from hypothermia or from the toxic effects of ingesting the oil. Potential similar impacts would be limited to a few individual birds, especially waterfowl and shorebirds using the small ponds and creeks that could be affected by very small to small spills. These spills would not cause a population-level impact.

A substantial to very large spill onto dry land could cause the mortality of small numbers of shorebirds and passerines from direct contact. If the spilled material entered local or inter-connected wetlands,

water-dependent birds and waterfowl, plus additional shorebirds, could be exposed. The numbers of individuals oiled would depend primarily on wind conditions and on the numbers and location of birds following entry of the spill into the water. Impacts would be detectable at the local population level, especially for resident species with limited geographic distribution.

If the spill entered a wetland, stream, or small river, a variety of waterfowl and shorebird species could be present, particularly during the spring and fall migrations. Losses resulting from the spill in this case could be substantial and at the population level for resident species, but likely would be negligible for migrating species with large geographic distributions. If raptors, eagles, owls, vultures, and other predatory or scavenging birds are present in the spill vicinity, they could become secondarily oiled by eating oiled birds. Mortality of breeding raptors likely would represent a minor loss for the local population but is not likely to affect the regional population.

If a large spill moved into wetlands, adjacent riparian habitats, or the open water habitats of other major rivers along the ROW, several waterfowl species that breed, stage, or stop there during migration may be at risk. A spill entering a major river in spring, especially at flood stage could contaminate overflow areas or open water where spring migrants of several waterfowl species concentrate before occupying nesting areas or continuing their migration.

Lethal effects are expected to result from moderate to heavy oiling of any birds contacted. Oiled individuals could lose the water repellency and insulative capacity of their feathers and subsequently die from hypothermia. Light to moderate exposure could reduce future reproductive success because of pathological effects on liver or endocrine systems (Holmes 1985) that interfere with the reproductive process and are caused by oil ingested by adults during preening or feeding. Stress from ingested oil can be additive to ordinary environmental stresses, such as low temperatures and metabolic costs of migration. Oiled females could transfer oil to their eggs, which at this stage could cause mortality, reduced hatching success, or possibly deformities in young. Oil could adversely affect food resources, causing indirect, sub-lethal effects that decrease survival, future reproduction, and growth of the affected individuals.

In addition to the expected mortality due to direct oiling of adult and fledged birds, potential effects include mortality of eggs due to secondary exposure by oiled brooding adults; loss of ducklings, goslings, and other non-fledged birds due to direct exposure; and lethal or sub-lethal effects due to direct ingestion of oil or ingestion of contaminated foods (e.g., insect larvae, mollusks, other invertebrates, or fish). Population depression at the local or regional scale is greater than for smaller spills. However, the effects of even a large spill are attenuated with time as habitats are naturally or artificially remediated and populations expand to again utilize them.

Mammals

Typical oil spills, even large to very large ones, would result in a limited impact on most of the terrestrial mammals found in the pipeline area. The proportion of habitat affected would be very small relative to the size of the habitat utilized by most of the mammals. Most of the mammals would not be present in the immediate vicinity of the spill or would be limited in abundance and distribution in the general area.

A large to very large spill that reaches the land in or adjacent to the pipeline ROW could affect terrestrial mammals directly or indirectly through impacts to their habitat or prey. For example, a large spill likely would affect vegetation, the principal food of the larger herbivorous mammals—both wild (i.e., deer) and domestic (i.e., cattle). Some to most of these animals probably would not ingest oiled vegetation, because they tend to be selective grazers and are particular about the plants they consume. For most spills, control and cleanup operations (ground traffic, air traffic, and personnel) at the spill site would frighten animals

away from the spill and reduce the possibility of these animals grazing on the oiled vegetation. Nevertheless, the spilled oil could affect the vegetation and reduce its availability as food for several years. This impact would be limited in area and would not affect the overall abundance of food for the grazing mammals.

For large spills that are not immediately or successfully cleaned up, the potential for contamination would persist for a longer time and the likelihood of animals being exposed to the weathered oil would be greater. Cleanup success could vary, depending on the environment. Over time, any remaining oil would gradually degrade. Although oiling of animals likely would not remain a threat after cleanup efforts, some toxic products could remain for some time. Depending on the spill environment, part of the oil could persist for up to 5 years.

Small mammals and furbearers could be affected by spills due to oiling or ingestion of contaminated forage or prey items. These impacts would be localized around the spill area and would not cause population-level impacts.

3.13.5.6 Fisheries

If the oil reaches aquatic habitats, spills could affect fish, macroinvertebrates (e.g., mussels, crustaceans, insects, and worms), algae and aquatic plants, amphibians, and reptiles. Aquatic habitats include wetlands, ponds, lakes, reservoirs, drainage ditches, streams, rivers, and cavern lakes in karst formations.

For the majority of spills, especially very small to large spills, impacts likely would be negligible to minor. Spill response would contain and remove almost all of the oil from ice-covered water bodies prior to snowmelt during winter. During the rest of the year, spills could reach and affect water bodies and aquatic habitats before spill response is initiated or completed.

The effects of oil spills on freshwater fish, macroinvertebrates, and other aquatic organisms have been documented and discussed in numerous previous spills. The specific effect depends on the concentration of petroleum present, the length of exposure, and the stage of development involved (larvae and juveniles are generally most sensitive). If lethal concentrations are encountered (or sub-lethal concentrations over a long enough period), mortality of aquatic organisms might occur. Extensive mortality caused by oil spills is seldom observed except in small, enclosed water bodies and in the laboratory environment. Concentrations observed under the oil slick of oil spills usually have been less than the acute values for fish, macroinvertebrates, and plankton. The concentration in flowing rivers and creeks in the Keystone Project area also would be relatively low, even for most substantial to large oil spills.

If an oil spill of sufficient size occurred in a small body of water with restricted water exchange (e.g., ponds and small slow-flowing creeks) that contained fish or other sensitive aquatic species, lethal and sub-lethal effects could occur for the fish and food resources in that water body. Toxic concentrations of oil in a confined area would result in greater lethal impacts on larval/juvenile fish versus adults. If a large to very large spill reached a slow-flowing, small to moderate size river in summer, the impacts due to toxic exposures may be greater than in the same river when flows are higher and water temperatures are cooler.

McKim (1977) found that, in most instances, larval and juvenile stages were more sensitive than adults or eggs. Increased mortality of larval fish is expected because they are relatively immobile and are often found at the water's surface, where contact with oil is most likely. Adult fish would be able to avoid contact with oiled waters during a spill in the open water season, but survival would be expected to decrease if oil were to reach an isolated pool of ice-covered water. Barsdate et al. (1980) found that

photosynthesis was briefly reduced and then returned to normal levels after several months in a closed lake. *Carex aquatilis*, a vascular plant, was affected after the first year because of emerging leaves encountering oil. Certain aquatic insects and invertebrates that lived in these plant beds were reduced in numbers, presumably from entrapment in the oil on plant stems. Some of the insects were still absent 6 years after the spill. Reducing food resources in a closed lake or pond, as described above, would decrease fitness and potentially reduce reproduction until prey species recovered.

Another potential impact could occur if oil that spilled during a high-water event (e.g., spring floods or a dike failure) was dispersed into some of the adjacent wetlands or lakes with continuous or ephemeral connection to the rivers and large creeks. Lethal effects to fish in streams and some lakes are unlikely during high-water events such as floods because toxic concentrations of oil are unlikely to be reached. However, toxic levels may be reached in lakes that are normally not connected to the river/creek system except during the high-water periods. If the oil concentrations in the water column reach toxic levels, these fish could suffer mortality or injury.

Although lethal effects of oil on fish have been established in laboratory studies (Rice et al. 1979, Moles et al. 1979), large kills following oil spills are not well documented. This is likely because toxic concentrations are seldom reached. In instances where oil does reach the water, sub-lethal effects are more likely to occur, including changes in growth, feeding, fecundity, survival rates, and temporary displacement. Other possibilities include interference with movements to feeding, overwintering, or spawning areas; localized reduction in food resources; and consumption of contaminated prey.

Most oil spills are not expected to measurably affect fish populations in the Project area over the life of the Keystone Project. Oil spills occurring in a small body of water containing fish with restricted water exchange might be expected to kill a small number of individual fish but are not expected to measurably affect fish populations. The same assessment is generally applicable to many of the macroinvertebrates, amphibians, and reptiles because they are motile and generally have a wide geographic distribution. However, freshwater mussels, all of which are sedentary and many of which have limited geographic distribution could be affected at a population level in large to very large spills that affect a substantial segment of a stream or river.

Although very unlikely to occur, a large to very large spill from a break in the pipeline under or adjacent to a river could affect water quality, aquatic resources, and other water-associated resources (e.g., birds and riparian habitats), as well as subsistence and recreational uses of the down-current areas. If the spill is not detected—especially under ice, the volume of oil could be substantial compared to the volume of the receiving water downcurrent from the spill. Fish and macroinvertebrates in the deeper pools may be exposed and likely would die. In addition, containment and cleanup of a large or very large oil spill could be difficult, depending on the season of occurrence (e.g., winter freezeup compared to spring breakup or summer open water). The energized fluid released would mix with water and the oil is likely to emulsify, dissolve, disperse, and adhere to sediment particles. Fish and other aquatic animals and plants, and riparian habitats could be affected for a substantial portion of the down-current channel.

3.13.5.7 Threatened and Endangered Species

Most of the potential impacts to the habitats used by threatened, endangered, and protected species are included in the previous discussions of impacts on biological resources. The important additional consideration for these species is that, by definition, their distribution and population sizes are limited. Although exposure to oil may adversely affect only a few individuals or a small, localized population of individuals, such a loss may represent a significant portion of the population and gene pool. Consequently, even a very small or small spill could substantially affect a threatened or endangered

species. Spilled oil is more likely to affect species that heavily use or completely depend on aquatic and wetland habitats than those in terrestrial habitats.

3.13.5.8 Land Use, Recreation and Special Interest Areas, and Visual Resources

Agriculture is the predominant land use along the pipeline corridor, comprising about 94 percent of land crossed by the Keystone Project. As noted earlier, a large to very large spill could affect agricultural activities, including irrigation water supplies. Potential effects would be minimized by implementing Keystone's Mitigation Plan and ERP (Appendices B and C, respectively, of the main document).

Spills ranging from very small to very large would be confined to construction and maintenance pads, roads, facility sites, or the immediate vicinity of the pipeline ROW. Impacts on recreational uses and wilderness-type values (scenic quality, solitude, naturalness, or primitive/unconfined recreation) resulting from spills likely would be confined to the same areas and therefore would be negligible to minor. Should a significant to very large spill reach a stream or river, the impacts may be substantial to catastrophic. The spilled oil might be visible and thus could result in a short-term (and possibly long-term) impact on recreation values. Fishing, boating, kayaking, camping, scenic values, and other recreation pursuits could be affected as a result of an oil spill in a riverine environment that is used by recreationists. The obvious short-term effects would be the oil residues in areas of use. The long-term effects would possibly be reduction or loss of fishing and diminished scenic value of the area, as oil residue could take a long time to weather and not be detectable.

3.13.5.9 Socioeconomics

Oil spills may affect several components of the socioeconomic environment, including:

- Agricultural activities;
- Water intakes and water supplies (both drinking water and agricultural irrigation water);
- Other commercial activities; and
- Populated areas, especially residential areas, and other HCAs.

The risk to populated areas and other HCAs along the Keystone Project 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 2006; URL http://www.cdc.gov/nchs/fastats/pdf/mortality/nvsr54_13_t01.pdf) age-adjusted average annual death rate in the United States is approximately 830 per 100,000 (approximately 0.8 percent). The DOT reports the historical average risk to the general population per year associated with hazardous liquids transmission pipelines, such as the Keystone pipeline, is 1 in 27,708,096 (DOT 2006). 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 (approximately 0.000004 percent).

Short term disruption in local agricultural production could result from a spill that enters agricultural lands. The extent of the economic impact would depend on the number of productive acres affected. Crop losses likely would be reimbursed by Keystone; therefore, the short-term economic impact would be minor. If a spill affected recreational lands, businesses relying on hunting, fishing, and sightseeing activities could experience a short-term negative impact.

Response to oil spills could generate local economic activity for the duration of the spill response activity.

3.13.5.10 Cultural Resources

As noted, most spills are confined to maintenance or construction pads, roadways, facility sites, the pipeline ROW, or an adjacent area. Further, the type and location of historical and cultural resources would be identified before construction begins so that they would not be affected by most spills or by subsequent spill cleanup. The pipeline route and location of pump stations and other facilities have been selected to minimize proximity to and therefore any conflicts with identified cultural and historical resources

Although cleanup from these spills could be invasive, there is little chance that cultural resources would be affected by either the spill or cleanup. Because occurrence of most of the surface and subsurface cultural resources near the facilities and pipeline ROW would have been documented prior to construction, the risk of impact is low.

Depending on where the spill occurs, Keystone's Unanticipated Discoveries Plan approved for the spill area would address any potential cultural resources encountered during a spill or associated cleanup activities. Implementation of the plan(s) would avoid impacts on inadvertently encountered cultural resources.

3.13.5.11 Air

Impacts on air quality from an oil spill are localized and transient, even for very large spills. Evaporation of the lighter hydrocarbon fractions typically occurs within 1 or 2 days, and the vapors are usually dissipated below risk levels within a short distance of the source. The oil spill response contractors or Keystone pipeline health and safety personnel would monitor air for hydrocarbon vapors. They would restrict public access to areas exceeding specified risk levels while also ensuring that authorized personnel within the restricted areas are equipped with and using appropriate personal protective equipment.

Based on modeling work by Hanna and Drivas (1993), the majority of volatile organic compounds (VOCs) from crude oil spills likely would evaporate almost completely within a few hours after the spill occurred, especially during late spring-early fall, when many of the biological resources (including migratory birds) are present. The heavier compounds take longer to evaporate, particularly at the colder temperatures typical of the winter season, and might not peak until more than 24 hours after the spill. In the event of an oil spill on land, the air quality effects would be less severe than those for a spill on water because some of the oil could be absorbed by vegetation or into the ground.

A diesel spill would evaporate faster than a crude oil spill. Ambient hydrocarbon concentrations would be higher for a diesel spill than for a crude oil spill but would persist for a shorter time. Further, because any such spill would probably be smaller than potential crude oil spills, air quality effects from a diesel spill likely would be even lower than for other spills.

Impacts on air quality related to oil spills would be localized and short term. The associated VOC air emissions would result in little impact on the biological or physical resources of the Keystone Project area.

3.13.6 Mitigation Measures

The Keystone pipeline system would be designed, constructed, and maintained in a manner that meets or exceeds industry standards and regulatory requirements. The proposed Keystone Project would be built

within an approved ROW. Signage would be installed at all road, railway, and water crossings—indicating that a pipeline is located in the area—to help prevent third-party damage or impact to the pipeline. Keystone would manage a crossing and encroachment approval system for all other operators. Keystone would ensure safety near its facilities through a combination of programs encompassing engineering design, construction, and operations; public awareness and incident prevention programs; and emergency response programs.

To prevent or mitigate potential oil spills during pipeline construction, measures would be implemented at each construction or staging area where fuel, oil, or other liquid hazardous materials are stored, dispensed, or used. Implementation of the procedures in Section 3 in Keystone's Mitigation Plan (Appendix B) would minimize the potential for spills and leaks to affect surface water resources. During construction activities, all refueling would be conducted at least 100 feet away from all surface water bodies. Keystone's ERP (Appendix C of the main document) describes actions to reduce the potential for crude oil releases to affect surface water and groundwater resources. During all construction activities, all refueling would be conducted at least 100 feet away from all surface water bodies.

Because the exact quantity and specific locations of oil and fuel tanks and fueling trucks have not been determined, **the following measures are recommended:**

- **Keystone should prepare a site-specific oil Spill Prevention, Control, and Countermeasure (SPCC) Plan that contains all requirements of 40 CFR Part 112 for every location used for staging fuel or oil storage tanks and for every location used for fuel or oil transfer—even if the site-specific oil capacity is below the threshold stated in that rule to require such a plan. Each SPCC Plan is to be prepared and submitted prior to introducing the subject fuel, oil, or hazardous material to the subject location.**
- **Prior to construction, all project personnel will be given an orientation outlining the environmental permit requirements and environmental specifications including the requirement that fuel or oil storage tanks cannot be placed closer than 100 feet to wetlands or water bodies.**
- **Environmental inspectors will place signs a minimum of 100 feet from the boundaries of all wetlands and water bodies prior to construction. The construction contractor will not be allowed to place a fuel or oil storage tank without first getting the environmental inspector to inspect the tank site for compliance with the 100 foot set back requirement and receiving approval of the tank site from the environmental inspector.**
- **During construction, no fuel or storage tank will be allowed to be relocated within or to a newconstruction yard by the contractor without first getting the environmental inpsector to to inspect the tank site for compliance with the 100 foot set back requirement and receiving approval of the tank site from the environmental inspector.**
- **Fuel and storage tanks should be placed only at contractor yards. No fuel and storage tanks should be placed on the construction ROW.**
- **No oil or hazardous material storage, staging, or transfer with the exception of refueling stations should occur within 50 feet of any surface water body, surface drainage, storm drain drop inlet, or HCA. As described above, refueling stations should not be located within 100 ft of these areas.**
- **Any fuel truck that transports and dispenses fuel to construction equipment or Keystone Project-related vehicles along the construction ROW or within equipment staging and material areas should carry an oil spill response kit and spill response equipment onboard at all times. In the event that response materials are depleted through use, or their**

condition is deteriorated through age, the materials should be replenished prior to placing the fueling vehicle back into service.

- **Oil and other hazardous materials stored in 350-gallon totes, 55-gallon drums, 5-gallon pails, smaller retail-sized containers or other portable containers should be staged or stored in areas with a secondary means of containment.**
- **Fixed-fuel dispensing locations should be provided, with a means of secondary containment to capture fuel from leaks, drips, and overfills.**

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

Keystone's preventative maintenance, inspection, and repair program would monitor the integrity of the pipeline and make repairs if necessary. Keystone is required to prepare an Integrity Management Plan that would describe Keystone's Pipeline Maintenance Program in detail. In compliance with applicable regulations governing the operation of pipelines, periodic inline inspections would be conducted to collect information on the status of pipe for the entire length of the system. Inline inspections would be used to detect internal and external corrosion, a major cause of pipeline spills. From this type of inspection, suspected areas of corrosion or other types of damage (e.g., a scratch in the pipe from third-party excavation damage) can be identified and proactively repaired. Additional types of information collected along the pipeline would include cathodic protection readings, geotechnical investigations, aerial patrol reports, and routine investigative digs. In addition, line patrol, leak detection systems, SCADA, fusion-bond epoxy coating, and construction techniques with associated quality control would be implemented.

In summary, the reliability and safety of the Keystone project can be expected to be well within industry standards. Further, the low probability of large, catastrophic spill events and the routing of the pipeline to avoid most sensitive areas suggest a low probability of impacts to human and natural resources. Still, some potential for construction- and operation-related spills can be expected. Commitments and procedures described for reliability and safety in this section and in Appendixes B and C are intended to mitigate spill effects, particularly when considered in combination with rapid and effective response and clean-up procedures.

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3.14 CUMULATIVE IMPACTS

3.14.1 Methods

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

3.14.2 Past, Present, and Reasonably Foreseeable Projects

3.14.2.1 Past and Present Linear Projects

Several existing pipelines transport natural gas liquids and compressed natural gas across North Dakota, South Dakota, and Nebraska from hubs in Montana to the west or Illinois to the east. For example, the Williston Basin Pipeline carries compressed natural gas and crosses through the southern part of North Dakota (<http://www.wbip.com/wbip/contributed_images/WBI-Map.gif>). A natural gas liquid pipeline owned by Enterprise Product, LP, crosses the southeast corner of Nebraska and continues in a southwest direction through Kansas (<http://www.epplp.com/cp_sm.html>). Portions of this pipeline may parallel the Keystone Project but are likely to be well outside of the Keystone Project ROW.

The Express pipeline is an existing 24-inch-diameter pipeline that interconnects with the Platte Pipeline, an existing 20-inch-diameter pipe, at Casper, Wyoming. This 1,700-mile pipeline system transports crude oil from Alberta's oil sands in Hardisty, Alberta to refineries in the U.S. Rocky Mountain and Midwest regions. In the United States, the pipeline crosses Montana, Wyoming, Nebraska, Kansas, and Missouri, and terminates in Wood River, Illinois. The section known as the Platte pipeline was built in 1952; the proposed Keystone Project would be collocated with the existing Platte pipeline from the Nebraska/Kansas border to the Wood River, Illinois terminal. Additional information on the existing Express and Platte pipelines and their applicability as System Alternatives for the Keystone Project is provided in Section 4.2.1.2.

Along the proposed Keystone Project corridor, multiple existing utility corridors serve local and regional needs. For example, the WEB Water Development Association provides high-quality water service to 7,728 rural hookups, 100 towns and bulk users, and 5 ethanol plants in a 17-county service area, which includes 14 counties in South Dakota and 3 counties in North Dakota. The Keystone Project would cross WEB-owned PVC water pipelines at eight locations in Day and Clark Counties South Dakota. The Keystone Project ROW would cross a 12-inch-diameter PVC mainline near Andover, South Dakota that delivers treated water to 1,022 rural hookups and eight towns in Day County and six rural hookups in southeast Marshall County.

Numerous existing transportation projects, such as interstate and state highways and railroads, parallel or intersect the proposed Keystone pipeline ROW. Section 3.10.7.1 describes these transportation facilities and the locations where they coincide with the Keystone Project.

Reasonably Foreseeable Future Projects

The staff of the FERC has prepared a draft EIS for the natural gas pipeline facilities proposed by Rockies Express Pipeline LLC (Rockies Express), TransColorado Gas Transmission Company (TransColorado), and Questar Overthrust Pipeline Company (Overthrust) (FERC 2006). As currently proposed, the

Rockies Express Western Phase Project (REX) would include construction and operation of approximately 795.7 miles of natural gas pipeline that would transport natural gas from the Cheyenne Hub in Colorado to its terminus at the Panhandle Eastern Pipe Line Company interconnect in Audrain County, Missouri. A portion of the proposed REX pipeline would parallel the Keystone pipeline from the Nebraska/Kansas border to Troy, Missouri (approximately 280 miles).

The REX Project proposes to construct the Turney Compressor Station, a large aboveground facility near Plattsburg in Clinton County, Missouri that is up to several miles east of the proposed location for Keystone's Pump Station 31, and a compressor station near Steele City Gage County, Nebraska that is along the ROW for the Keystone Mainline Project.

Enbridge is proposing three expansion projects to help address current and future increases in refinery demand as supply from the WCSB increases. These include the:

- Southern Access, an expansion and extension of Enbridge's existing pipeline system, including new pipeline in Wisconsin and Illinois;
- Southern Lights, a petroleum products pipeline from Chicago through Wisconsin, Minnesota and North Dakota to bring light hydrocarbons or "diluents" to the Canadian oil sands area of Alberta; and
- Alberta Clipper, a proposed new crude oil pipeline from Alberta to Superior, Wisconsin. As presently planned, these pipelines would cross Minnesota and Iowa. The sections supplying Cushing, Oklahoma and Wood River, Illinois do not appear to be collocated with the proposed Keystone Project ROW. Additional information on the proposed Enbridge pipeline expansions and their applicability as System Alternatives for the Keystone Project is provided in Section 4.2.1.2.

Proposed projects collocated with the Keystone Project and the REX pipeline in Missouri include:

- An ethanol plant in Audrain County (unknown completion date), and
- A coal-fired power plant in Carroll County (anticipated completion in 2013) (FERC 2006).

3.14.3 Cumulative Impacts by Resource

3.14.3.1 Geology

Construction of the REX pipeline and the Keystone Project would require the commitment of granular borrow resources from areas along the pipeline corridors and areas near appurtenant facilities for the lifetime of the pipelines and related facilities. In addition, these projects and the proposed ethanol plant could result in a cumulative impact on clay pits in Audrain County, Missouri. Although the gravel and other mineral resources within the permanent ROWs of the proposed pipelines could not be extracted, oil and gas production could be accomplished through well pad offsets and directional drilling. Where it is collocated with the REX Project, the Keystone Project pipeline would be located adjacent to existing utility corridors that preclude mining in the permanent ROWS of the utility corridors. Given the limited areal extent of the Keystone Project in comparison to the potential mineral extraction areas along the corridor, construction of the Keystone Project is not likely to result in cumulative impacts that would affect future exploitation of mineral resources in that area.

Pleistocene-age mammal fossils may be discovered during construction of the Keystone pipeline and other reasonably foreseeable projects. These fossils generally are found in areas of glacial and glacial-derived surface deposits, which occur along the entire length of the proposed Mainline Project, except for

areas of bedrock outcrop. Along with construction of pipelines, roads, and other surface-disturbing activities, construction of the Keystone Project could contribute to the cumulative exposure and potential loss of scientifically valuable fossils in the project area. However, should Keystone prepare and follow a Paleontological Resources Protection Plan, as recommended in Section 3.1, significant fossil resources that may be encountered during Project construction would be identified and protected, thereby ensuring that the Keystone Project would not contribute to cumulative effects on these resources.

3.14.3.2 Soils and Sediments

Potential cumulative erosion effects could occur where construction disturbance areas overlap, or are located near each other, particularly along the sections of Keystone pipeline that are collocated with REX. However, the existing pipelines, utility, and roadway projects have been installed for a number of years and the construction ROWs have been partially or completely restored to pre-existing conditions. Irrigated hayfields and pasturelands have returned to their prior uses. Both the REX Project and the Keystone Project would apply best management practices (BMPs) for soil management and protection to the pipelines and appurtenant facilities. Revegetation mixtures that are appropriate to soil conditions and expected future uses (such as grazing and wildlife habitat) would be applied to the disturbed areas. Consequently, the potential for cumulative erosion effects caused by one or more of these projects is low because consistent erosion control practices would be applied, and structural erosion control measures would be integrated between and among adjacent projects.

3.14.3.3 Water Resources

Groundwater

Groundwater potentially would be used for Keystone, REX, and other collocated or nearby construction projects to control dust generated during construction. In addition, contaminant spills during construction could occur from any project in the cumulative impact study area during construction or operation. Each project would be required to implement spill containment and control plans as required by federal and state agencies. No additional cumulative impacts on groundwater volume or quality from the Keystone Project are expected.

Surface Water

Impacts due to crossing of surface waters by linear projects, such as highways and pipelines, are generally localized and short term. Cumulative effects would occur only if more than one project was being constructed at the same location at the same time. If construction activities of the Keystone Project and the collocated portion of REX pipeline follow a similar schedule, there could be a cumulative contribution to incremental sedimentation in adjacent surface waters. At present, the project schedules show construction of the two projects separated by at least a year. In addition, each project—as well as any other collocated construction projects—would be required to follow BMPs and permit conditions to protect surface waters.

Hydrostatic Testing

Keystone does not propose to use groundwater for hydrostatic testing; however, groundwater could be used for hydrostatic testing for certain portions of the REX Project (FERC 2006). Both the Keystone Project and other portions of the REX Project plan to use surface water for hydrostatic testing. In addition to the groundwater, REX proposes to withdraw hydrostatic test water from surface water bodies during fall and early winter 2007. This would not overlap with withdrawals planned for Keystone;

therefore, cumulative effects on surface water or groundwater due to hydrostatic test water withdrawals would not occur.

3.14.3.4 Wetlands

Cumulative impacts on wetlands would occur in locations where any of the Keystone Project and REX pipelines or other construction projects would be collocated while crossing wetlands. A portion of the REX Project would be collocated with the Keystone pipeline for about 280 miles. Within the Keystone Project pipeline collocation, the REX pipeline would disturb a total of 77.5 acres of wetlands (55.0 acres of forested wetland, 1.3 acres of scrub-shrub wetlands, and 21.2 acres of wet meadow and marsh) (FERC 2006). Should the Keystone pipeline affect the same or similar wetland habitats within the collocated area, but within its respective construction ROW, total wetland impacts within the collocated area could be 156.0 acres of wetlands. Both projects would follow mitigation measures to protect wetlands. In the case of REX, the FERC Procedures would apply. Other construction projects, such as town expansions, new roads and highways, and other industrial facilities—both within the section of the Keystone Project that is collocated with REX, and in other areas along the Mainline Project and Cushing Extension—could affect additional wetlands. However, applicants for any projects that would place fill in waters of the United States would be subject to conditions in the COE's Section 404 permits and to state and local water quality permits. None of the wetlands crossed by the Keystone Project would be permanently filled or drained. Therefore, the contribution of the Keystone Project on cumulative effects to wetlands in the Project area would be minor.

3.14.3.5 Terrestrial Vegetation

The total amount of vegetation that may be affected by all of the reasonably foreseeable projects, including the Keystone Project, is relatively small compared to the abundance of similar habitat in the Project area. Impacts resulting from construction of the pipelines and other linear and non-linear projects would result in the long-term and permanent loss of non-herbaceous vegetation and would cause a small incremental increase in fragmentation of forested areas. However, the effects generally would be small relative to the available habitat in the region. The effects would be further reduced by collocation of the linear projects with existing and proposed ROWs. All of the projects would implement mitigation measures designed to minimize the potential for erosion, revegetate disturbed areas, increase the stabilization of site conditions, and control the spread of noxious weeds—thereby minimizing the degree and duration of the cumulative impact on vegetation from these projects. In Missouri, permanent impacts on vegetation would result from the proposed construction of an ethanol plant and a coal-fired power plant in counties that also would be crossed by the Keystone and REX Projects.

Construction and operation of pumping stations for Keystone and compressor stations for REX also would permanently affect vegetation. Keystone would require a total of about 61 acres of land along the Mainline Project (for aboveground facilities, including pump stations, delivery facilities, densitometer sites, and mainline valves) and about 13 acres for similar facilities along the Cushing Extension. The two compressor stations for the portion of REX that is collocated with the Keystone Project (the Steele City, Nebraska and the Turney, Missouri sites) each would affect about 13 acres (FERC 2006).

3.14.3.6 Wildlife

Wildlife Habitat

Construction and operation of the Keystone Project, along with the reasonably foreseeable projects described in Section 3.14.2, would result in short-term disturbance to wildlife and long-term wildlife habitat modification. Keystone would incrementally add to the area of habitat disrupted and to the

disturbance of resident and migrating species, causing associated impacts on these species as they adjust to the changes brought about by the proposed projects. Increased movement or displacement of species dependent on the disturbed habitats could reduce carrying capacities, reproductive effort, or survival. This potential is greater for species for which suitable habitat is limited in the Project area or that are otherwise sensitive to disturbance.

Removal of woodlands and shrublands would result in a long-term reduction of wildlife habitat because the regeneration of woody species is typically slow in the Project region. However, construction of the Keystone pipeline is not likely to contribute significantly to cumulative impacts on wildlife, given that most of the Project area consists of relatively open fields or is presently used for agricultural purposes. Habitat types potentially crossed or affected are widely available for wildlife use outside of the immediate area of disturbance. In addition, each proposed project would be required to follow appropriate mitigation measures to minimize impacts on wildlife.

3.14.3.7 Fisheries

Stream channel disturbance and hydrostatic test water withdrawals from water bodies in Kansas and Missouri would occur during the Keystone Project, including in areas where the REX pipeline would parallel the Keystone pipeline. Because construction schedules for the REX pipeline and the other non-linear projects discussed in Section 3.14.2 are different from the Keystone Project, cumulative impacts on fisheries would not occur. If construction of facilities or other projects does become concurrent due to schedule changes, the Keystone Project would contribute to cumulative sedimentation impacts on fisheries. Nevertheless, these impacts would be short term and minor due to implementation of mitigation measures and the requirements of any individual state permits to minimize impacts while crossing water bodies.

3.14.3.8 Threatened and Endangered Species

Because the Keystone pipeline would parallel the REX pipeline across Kansas and Missouri, many of the species discussed in Section 3.8 potentially could be affected by construction and operation of these projects. Each project is required to consult with federal, state, and local agencies to determine which species may occur within each individual project area; evaluate potential impacts on those species as a result of construction and operation; and implement measures to avoid, minimize, or mitigate impacts on special-status species and their habitats. Because all applicants would be required to restore their respective construction ROWs and adhere to all applicable laws and regulations regarding special-status species and habitats, the contribution of the Keystone Project to cumulative impacts on special-status species and their habitats would not be significant.

3.14.3.9 Land Use, Recreation and Special Interest Areas, and Visual Resources

Land Use

New land requirements for construction and operation of the aboveground facilities for the Keystone pipeline would involve acquisition of about 61 acres of land along the Mainline Project and 13 acres for similar facilities along the Cushing Extension. Land use changes associated with the collocated portion of the REX pipeline would cumulatively add to the acreage of aboveground oil and gas facilities in the Project area. In addition, the ethanol and coal-fired power plants that would be constructed in Audrain County and Carroll County, Missouri, respectively, would further increase the amount of land in those counties that would be converted to industrial use.

If the aboveground facilities are located on active agricultural lands, any active farming practices would cease within the footprint of the facility. Construction of the aboveground facilities associated with the REX Project would affect about 29.9 acres of prime farmland soils and 13.5 acres of farmlands of statewide importance; however, much of this land is located west of the area where the REX pipeline would be collocated with Keystone (FERC 2006). Although it is not known to what extent the other projects identified in Section 3.14.2 would affect prime farmland soils, farmlands of statewide importance, active agricultural lands, or rangeland, all projects would be required to implement measures to avoid, minimize, or mitigate impacts on agricultural lands and rangeland—in consultation with state and local officials.

Overall, the Keystone Project would contribute to cumulative impacts on agricultural land use and farming practices along the extent of the proposed ROW. While construction of new pipelines parallel to existing corridors would incrementally reduce the area available for future development, use of established utility corridors would concentrate the cumulative land use impacts into a less extensive area.

Recreation and Special Interest Areas

The recreation and special interest areas to the west of Troy, Missouri that would be crossed by the Keystone pipeline (see Table 3.9.3-8) also would be potentially affected by the REX pipeline. This includes a number of conservation areas that are either privately or publicly owned. Hunting access to publicly and privately owned WMAs would be temporarily affected by both the REX and the Keystone Project construction schedules. The private duck clubs in St. Charles County, Missouri are situated on high-quality wetlands that wildlife and hunters depend on. Waterfowl and hunters using these areas could be temporarily affected during construction activities for the pipelines. Pipeline maintenance activities would occur sporadically and possibly simultaneously for collocated pipeline sections. These activities could disturb hunters and their prey. However, because the disturbances would temporary and the ROWs would be restored as close as possible to pre-existing conditions, significant cumulative impacts on recreational hunting are not expected over the long term.

Because the Jones-Confluence Point State Park is located east of the section of the Keystone pipeline that is collocated with REX, the park would not experience cumulative impacts from the projects. Mitigation measures created to protect the conservation area and parks would minimize the contribution of Keystone to recreational impacts.

Visual Resources

The various projects described in Section 3.14.2 would have varying impacts on visual resources. Pipeline projects would result in impacts similar to those discussed for the pipeline components of the Keystone Project (see Section 3.9). A significant contribution to cumulative effects on visual resources from the Keystone Project is not expected due to collocation with other linear projects, restoration of the ROW, and the lack of sensitive visual resource areas that would be crossed.

Visual impacts associated with aboveground facilities are dependent on facility type and size. Cumulative impacts on visual resources could occur at locations where a pumping station for the Keystone Project is constructed near a compressor station for the REX Project (possibly near Steele City, Nebraska and in Clinton County, Missouri), proposed ethanol plant (in Audrian County, Missouri), proposed coal-fired power plant in (Carroll County, Missouri), or other planned industrial facility.

Depending on the viewpoint, cumulative impacts on visual resources could be expected from the coal-fired power plant because it would be about 0.4 mile southeast of REX's Turney Compressor Station and several miles from Keystone's Pump Station 31. The majority of aboveground facilities associated with

both the Keystone and REX Projects would be located in agricultural or rangeland areas, or adjacent to existing industrial facilities. In addition, the new aboveground facilities associated with the projects would be limited in number and widely distributed. Thus, except for the instance noted earlier, facilities would not be concentrated in a particular area, and no significant impact at a given location is expected. Mitigation measures such as screening with vegetation and use of non-reflective paints that are similar in color to the surrounding terrain would help to minimize visual impacts.

3.14.3.10 Socioeconomics

Portions of the construction period and locations for the Keystone Project and the collocated portion of the REX Project could overlap due to delays or other issues. These projects, together with any other linear and non-linear projects planned for the Project area, would require workers to temporarily relocate to the Project area during construction, potentially inducing housing shortages at certain locations during certain periods of the construction schedule. Workers would be dispersed over the entire length of the pipeline route and throughout the counties and states crossed by the pipelines. Based on the review of the information regarding availability of local rental housing for both projects (see Section 3.10 and FERC 2006), the combined number of non-local workers may exceed the available housing in a given area. However, because workers are not expected to relocate to the area with their families, and their stay in any one community would be temporary, it is expected that most workers would use temporary housing, such as hotels/motels, RV parks, and campgrounds. The preference of most workers likely would be short-term accommodations, primarily in hotels and motels that would be found in the more populated, service-oriented communities located within a reasonable commuting distance from the work site.

Because the pipelines and some of the other projects would be constructed primarily in rural areas, a significant cumulative impact on traffic along the pipeline routes is not expected. In addition, it is unlikely that the traffic volumes related to the different projects would reach peak conditions at the same time and in the same locations. However, to the extent that other projects are being constructed concurrently with Keystone, the contribution of the Keystone Project to any cumulative traffic impacts or road closures would be for a short duration and would be coordinated with local officials.

During operations, the number of workers required to maintain pipeline facilities would be minimal, resulting in no additive impact on traffic levels. Therefore, the Keystone Project would not generate excessive traffic during construction or operations, and therefore would cause little to no cumulative impact on traffic.

During construction of the Keystone Project, the Applicants' expenditures for payroll, local purchases, and related tax revenues would provide a short-term beneficial impact to the affected counties. Similar benefits are likely to be associated with the REX Project and any other non-linear or industrial projects. The increased tax revenue paid to the state and local governments over the life of the projects also may result in a beneficial long-term cumulative impact.

Operation of the proposed facilities would require relatively few permanent employees; thus, there would be no long-term cumulative or additive impacts on population, housing, or municipal services in the Project area.

3.14.3.11 Cultural Resources

To date, the REX Project surveys have identified nine potential historic properties in Nebraska, Kansas, and Missouri that may also be in the vicinity of the Keystone Project. Federally regulated projects such as Keystone and REX are required to conduct cultural resources surveys and identify historic properties that may be affected by those projects. In accordance with 36 CFR 800, the ACHP's regulations for

implementing Section 106 of the NHPA, the lead federal agencies for those projects would consult with the appropriate SHPOs, Indian tribes, and other consulting parties, and would mitigate impacts on any historic properties that may be adversely affected. Other potential non-federal actions in the Project area would be required to comply with any identification procedures and mitigation measures required by the state where the action is proposed.

3.14.3.12 Air and Noise

Air Quality

Should construction periods overlap, the proposed Keystone Project would incrementally add to dust generation and combustion emissions from heavy equipment that also would be produced by the other reasonably foreseeable future projects discussed in Section 3.14.2. Cumulative fugitive dust (particulate) increases could occur where the REX, Keystone, and other non-linear construction projects use the same access road systems.

For the Keystone Project, Madison County, Illinois and St. Charles County, Missouri are both designated as nonattainment areas for the 8-hour federal ozone O_3 (precursors are NO_x and VOC) and $PM_{2.5}$ standards. Therefore, emissions of NO_x, VOCs, and $PM_{2.5}$ from Project-related sources would be considered under the General Conformity Rule. The REX Project terminates at Troy, Missouri, which is located in Lincoln County, northwest of St. Charles County, and would not be held to the nonattainment standards. It should be noted, however, Lincoln County borders on the St. Louis nonattainment area. According to recent census results, this is considered one of the fastest-growing counties in Missouri. All other existing and proposed industrial facilities or construction projects in these counties would fall under the requirements of the General Conformity Rule.

On a local scale, cumulative increases in air emissions could occur where new compressor or pump stations are located at or near existing or proposed compressor stations, or other existing industrial facilities. For example, Keystone's Pump Station 31 and REX's proposed Turney Compressor Station both would be located in Clinton County, Missouri, and it is possible that these facilities could be located near each other and other industrial facilities near Steele City, Nebraska. REX's Steele City Compressor Station would consist of two gas-fired turbines, ISO rated at 41,000 hp (FERC 2006). The compressor units at the Steele City Compressor Station would be equipped with LoNOx control technology, and clean-burning natural gas would be utilized exclusively at the station to reduce emissions.

Depending on the final locations for pump stations for the Keystone Project, facilities also could be located near a proposed ethanol plant in Audrain County, Missouri and the proposed coal-fired power plant in Carroll County, Missouri. Each pump or compressor station and ethanol or power plant would be required to obtain state construction and operation permits, and potential interactions with nearby emission sources would be considered in these permit applications. The proposed gas-fired power plant, which is about 40 miles from both the Turney Compressor Station and Keystone Pump Station 31, would emit criteria pollutants and small quantities of hazardous air pollutants (FERC 2006). Emissions from the power plant would be reduced by best available technology to remove byproducts such as SO_2, NO_x, and mercury from flue gas before exiting the plant's proposed 625-foot-tall stack.

The majority of the potential cumulative construction and operational effects on air quality due to the Keystone Project would be negligible because of the large geographical area over which the various existing and reasonably foreseeable projects presented in Section 3.14.2 are located, and the fact that these projects likely would be constructed over varying periods. Air emissions related to construction and operations are not expected to significantly affect air quality in the area. Because the projects listed in Section 3.14.2 are located over a large area; have varying construction schedules; and must follow

federal, state, and local regulations for the protection of ambient air quality, significant cumulative impacts related to air quality are not anticipated.

Noise

The Keystone Project, along with the projects discussed in Section 3.14.2, would contribute to ambient noise levels during construction. Construction noise impacts would be temporary and would occur only during the construction period for each facility. Because construction proceeds in sections along the pipelines, the duration of construction activities—and therefore noise impacts—at any given location at any given time would be limited and short term. Cumulative effects on ambient noise levels would occur only if construction on a congruent section of each pipeline occurred simultaneously. This is unlikely, given the proposed construction schedules, but could occur if construction of the REX pipeline was delayed.

No new major sources of noise are expected during operation of the Keystone facilities that would be near or collocated with REX facilities or other industrial facilities discussed in Section 3.14.2. Noise levels resulting from operation of the pump stations for Keystone and the meter and regulator facilities for REX would be minimal or not noticeable, as the proposed facilities would be located in areas of low population density. Consequently, no cumulative impacts are expected. Based on a review of available information, it appears that Keystone's Pump Station 31 could be located up to several miles west of REX's proposed Turney Compressor Station in Clinton County, Missouri. Taking into account the geographical locations of the two stations, the noise data available, and preliminary calculations, Keystone's contribution to cumulative noise impacts during operations would not be significant.

3.14.3.13 Reliability and Safety

Landowners have expressed concerns about the safety of collocating multiple pipelines in a common corridor across their property. As described in Section 3.13, Keystone is required to comply with USDOT and state and local regulations regarding pipeline safety, leak detection, and spill response. Because the REX Project will transport natural gas rather than any type of liquid material, cumulative effects caused by spills and leaks of crude oil are not expected from the two collocated pipelines. The Platte pipeline (which is collocated with both the REX and Keystone Projects from the Nebraska/Kansas border to Troy, Missouri and collocated with Keystone to Wood River, Illinois) could contribute to cumulative effects should an incident occur in relatively the same time frame from the Keystone pipeline and from one or several of the other pipelines or facilities.

3.14.4 Summary of Cumulative Impacts

The majority of cumulative impacts discussed above would be temporary and minor. However, long-term cumulative impacts on vegetation and land uses could occur if the other reasonably foreseeable future projects discussed in Section 3.14.2 would be constructed and affect similar vegetation or land uses. Long-term cumulative benefits would be realized from a boost to the local economies associated with tax revenues. Short-term cumulative benefits also would be realized through jobs and wages and purchases of goods and materials.

3.14.5 References

FERC. See Federal Energy Regulatory Commission.

Federal Energy Regulatory Commission. 2006. Draft Environmental Impact Statement for the Rockies Express Western Phase Project. (FERC/EIS – 0203D.) Office of Energy Projects. Washington, DC. November.

4.0 ALTERNATIVES

Alternatives to the Keystone Project were analyzed to determine whether they would be reasonable and environmentally preferable to the proposed action. A No Action Alternative, system alternatives, major route alternatives, route variations, and aboveground facility site alternatives are considered in the following sections. Identification of alternatives to the proposed project incorporated public comments and input received from federal, state, and local regulatory agencies.

The following evaluation criteria were used to determine whether alternatives would be environmentally preferable:

- Significant environmental advantage over the proposed Keystone Project,
- Ability to meet the proposed Keystone Project objectives, and
- Technical and economic feasibility and practicability.

Keystone participated in the process during the preliminary design stage for the Project. The process emphasized identification of potential stakeholder issues through open houses; scoping meetings held early in the development of the Project emphasized identification and evaluation of alternatives that may avoid or minimize these issues. As the preliminary analyses of possible routes was conducted, issues of concern were identified, and multiple stakeholders provided DOS with comments as route planning progressed. These early routes and analyses are described in detail in ENSR (2006a).

The alternatives development process for the draft EIS began by considering several objectives identified for the Keystone Project:

- Gas pipeline conversion: Converting an underutilized natural gas pipeline in Canada to crude oil. Use of this pipeline fixes the border crossing at Pembina County, North Dakota and constitutes a control point.
- Market endpoints at (a) Salisbury, Missouri; (b) a refinery at Wood River, Illinois; and (c) an interconnection point with other crude oil pipelines, as well as tank storage at Patoka, Illinois.
- An additional market endpoint at Cushing, Oklahoma to serve Gulf Coast refineries.

The following sections describes several types of alternatives (no action, system, and major route alternatives) and the proposed Project in terms of whether they would meet the stated purpose and need for the project and the above objectives.

4.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, the Keystone Project would not be constructed and operated as described in Section 2.0. Therefore, selection of the No Action Alternative would not require issuance of a DOS Presidential Permit for the specific action of building and operating the Keystone pipeline (the proposed action).

Denial of the proposed action would mean that the environmental impacts discussed in this draft EIS would not occur. While this alternative would eliminate the environmental impacts directly associated with the Keystone Project, it would not meet the purpose and need for the proposed action stated in

Section 1.0 of the EIS. The purpose and need for the project involves both supply and demand components.

Without the Keystone Project, the increasing supply of crude oil from the WCSB would not have a ready conduit for export to available refineries and markets in the United States. Additional export pipeline capacity above supply requirements also is required to avoid potential situations where short-term supply exceeds export pipeline capacity.

U.S. demand for petroleum products has increased, while domestic U.S. crude oil supplies continue to decline. The No Action Alternative would not provide the United States with a relatively stable and secure source of North American crude oil for Midwest and Gulf Coast markets, thereby continuing U.S. dependence on Middle Eastern oil supplies.

Although the Keystone Project would not be constructed and operated under this alternative, other reasonably foreseeable oil transportation projects may continue. Thus, the No Action Alternative would not necessarily result in an overall reduction in impacts to physical, biological, and human resources because crude oil likely would continue to be transported by other yet-to-be built pipelines, existing pipelines and routes, or alternative transportation methods (such as tank trucks or barges) to markets in the Midwest and Eastern United States.

While the increasing demand for refined crude oil products could be met by other projects or alternatives, it is purely speculative to predict the resulting effects and actions that could be taken by local governments and other suppliers or refineries in the region, as well as any associated direct and indirect environmental impacts of these actions. In addition, each of these actions may result in environmental impacts that are less than, equal to, or greater than those of the currently proposed Keystone Project. The No Action Alternative also could result in more expensive and less reliable crude oil supplies for Midwestern refineries, increasing costs and availability of the refined products for end-users. Because of these factors, the No Action Alternative is not considered preferable to the proposed action.

4.2 SYSTEM ALTERNATIVES

System alternatives are alternatives to the proposed action that would make use of other existing, modified, or proposed pipeline systems to meet the stated objectives of the proposed Project. A system alternative would make it unnecessary to construct all or part of the proposed Keystone Project, although some modifications or additions to other existing pipeline systems may be required to increase their capacity. These modifications or additions would result in environmental impacts that may be less than, similar to, or greater than those associated with construction of the proposed Project. The purpose of identifying and evaluating system alternatives is to determine whether potential environmental impacts associated with construction and operation of the proposed facilities would be avoided or reduced by using another pipeline system while still meeting the objectives of the proposed Keystone Project.

The analysis below examines several existing and proposed crude oil pipeline systems that currently or would eventually serve the markets targeted by the proposed Keystone Project. The analysis considers whether those systems would meet the proposed Project objectives while offering an environmental advantage over the proposed Project. Specifically, the system alternatives considered include:

- Expansion of existing pipeline systems (Express and Platte Pipeline System); and
- Construction of other pipeline systems (Alberta Clipper, Southern Lights, and Spearhead Cushing Expansion).

4.2.1 Existing Pipeline System - Express and Platte Pipeline System

Kinder Morgan operates the Express pipeline (an existing 24-inch-diameter pipe), which interconnects with the Platte pipeline (an existing 20-inch-diameter pipe) at Casper, Wyoming (http://www.terasenpipelines.com/bins/nosidebar_page.asp?cid=38-69-94). This 1,700-mile pipeline system transports crude oil from Alberta's oil sands in Hardisty, Alberta to refineries in the U.S. Rocky Mountain and Midwest regions. In the United States, the pipeline crosses Montana, Wyoming, Nebraska, Kansas, and Missouri and terminates in Wood River, Illinois. The Express system has been in operation from 1997, with a current capacity of 280,000 bpd. The Platte pipeline was built in 1952, and its current capacity is 164,000 bpd. As operated today, neither of these existing systems would have the capacity of the proposed Keystone pipeline (435,000 bpd, with a potential increase to 591,000 bpd). As they exist today, neither system could be considered as a system alternative for the proposed action, and additional comparison with other system alternatives is not required.

4.2.2 New Pipeline System Alternative – Enbridge Projects

Enbridge is proposing four expansion projects to help address current and future increases in refinery demand as supply from western Canada's vast oil sands increases (http://www.enbridge-expansion.com/expansion). The expansions include:

- Southern Access, an expansion and extension of Enbridge's existing pipeline system, including new pipeline in Wisconsin and Illinois, to increase crude oil capacity to Midwest refineries and beyond.
- Southern Lights, a petroleum pipeline from Chicago through Wisconsin, Minnesota, and North Dakota to bring light hydrocarbons, or "diluents" to the Canadian oil sands area of Alberta.
- Alberta Clipper, a proposed new crude oil pipeline from Alberta to Superior, Wisconsin that would, if approved, increase capacity of the Enbridge system by 450,000 bpd and later be expandable up to 800,000 bpd.
- Enbridge's existing Spearhead oil pipeline that extends southwest from Chicago, through Missouri, to Cushing, Oklahoma. The pipeline currently has a capacity of approximately 125,000 bpd.

The existing Spearhead system was evaluated and it has been determined that additional facilities, requiring about 655 miles of new 30-inch-diameter pipeline, would be needed to provide an equivalent volume of crude oil to Cushing, Oklahoma to that proposed by Keystone (see Table 4.2-1).

The Enbridge projects propose to deliver crude oil directly to Midwestern markets. However, the proposed Enbridge pipelines would provide a less direct route to the Cushing refineries than the Cushing Extension portion of the Keystone Project, involving the need for additional miles of pipe and likely incurring additional impacts to resources. In addition, these projects aim to fulfill other market demands and would not meet the market need and in-service date proposed by the Keystone Project. Therefore, it is possible that market demand and supply of WCSB crude could support construction of the Keystone Project and the Enbridge projects.

TABLE 4.2-1 Comparison of the Keystone Pipeline System with the Enbridge Projects		
Comparative Category	**Keystone Project**	**Enbridge Projects and Spearhead-Cushing Expansion**
Delivery points	Midwestern United States and Cushing, Oklahoma	Midwestern United States and Cushing, Oklahoma
Miles of pipe to Midwestern markets (Canada and United States)	1,078	955
Additional miles of pipe to Cushing, Oklahoma	292	655
Total miles of pipe	1,370	1,610

4.3 MAJOR ROUTE ALTERNATIVES

Major route alternatives were considered to determine whether they would avoid or reduce impacts on environmentally sensitive resources that would be crossed by the proposed pipeline and in response to suggestions by the public. The origin and delivery points of a major route alternative are the same as for the corresponding portion of a proposed pipeline (i.e., a border crossing at Pembina County, North Dakota and main delivery points at Wood River and Cushing). However, the alternatives would follow significantly different routes from the proposed pipeline. Major route alternatives would not modify or make use of other existing or new pipeline systems.

In addition to the objectives that dictate the border crossing and delivery point locations, primary and secondary constraints to route location were recognized early during the route development process. Route development attempted to avoid the following primary constraints as much as possible:

- Federal, state, Native American, and military lands;
- Large water bodies and wetland complexes;
- Extreme terrain;
- Urban areas; and
- Wildlife refuges.

Route development attempted to minimize the extent of crossings and impacts related to secondary constraints, which included:

- Water and wetland crossings;
- Waterfowl production areas;
- Irrigated croplands;
- Bedrock;
- Rural communities;
- Aquifers;

- Extensive forested areas; and
- Residences and associated features, such as driveways, outbuildings, and windbreaks.

The process also considered features (opportunities) that are favorable for pipeline routing and generally simplify construction and decrease disturbance, including:

- Existing ROWs for linear features, such as pipelines, power lines, and roadways; (pipelines typically are preferred);
- Flat or gently rolling terrain;
- Easily excavated soils; and
- Non-forested areas.

Control points at specific locations along the pipeline route serve to anchor the route at beginning, end, and midpoints, thereby defining specific portions of the final route. They were considered in the route development process together with primary and secondary constraints. Initial control points were identified at the U.S./Canada border crossing near Gretna, Manitoba; a pipeline interconnection and the presence of tank storage at Salisbury, Missouri; a delivery point at Wood River, Illinois; and a delivery point at Patoka, Illinois. The desire to remain competitive to serve Cushing, Oklahoma also was considered as a control point.

This EIS considers three major route alternatives that would meet the objectives of the Keystone Project: the Iowa Route Alternative, the Proposed Route, and the Direct Alternative.

4.3.1 Iowa Route Alternative

Initial route development identified a ROW that avoided Nebraska and crossed Iowa into northern Missouri (Figure 4.3-1). Desktop data analysis, along with limited aerial and ground reconnaissance, was used to identify this route. The Iowa Route entered the United States in Pembina County, North Dakota, just north of Walhalla, and ran due south to the North Dakota/South Dakota border. In South Dakota, the route ran generally south to the Spink County border before turning southeast toward Plymouth County, Iowa. From there, it crossed the South Dakota/Iowa border north of Sioux City, Iowa and continued in a southeasterly direction through Iowa and Missouri toward a delivery point at Salisbury, Missouri.

Here, the Iowa Route was collocated with the existing Platte pipeline to Troy, Missouri. North of Troy, the route was moved to a power line ROW to avoid areas where the city has expanded. East of Troy, the route again collocated with the Platte pipeline, running east to the Missouri/Illinois border—where it deviated from the Platte pipeline and crossed the Mississippi River south of Wood River, Illinois. From Wood River, the route ran eastward through the Carlyle Lake WMA into Patoka, Illinois.

While the Iowa Route would meet the objectives of crude oil delivery to the refineries in Illinois, it would not efficiently deliver crude oil to Cushing, Oklahoma and would not meet the Keystone Project purpose and need. Therefore, the Iowa Route Alternative is not considered further in the environmental consequences analysis for this EIS.

4.3.2 Proposed Route Alternative

The Proposed Route was developed because of shipper interest in providing crude oil transportation to storage terminals and pipeline interconnections in Cushing, Oklahoma. The objective of the Proposed

Route was to meet the original Project objective of delivering crude oil to Wood River and Patoka, Illinois as well as delivering oil to Cushing, Oklahoma.

Several key control points were considered during development of the Proposed Route:

- U.S./Canada border – Pipeline entry into the United States was at Pembina County, North Dakota.
- Delivery and interconnect points at Salisbury, Missouri and Wood River and Patoka, Illinois.
- Final delivery point at Cushing, Oklahoma.
- Missouri River – To economically serve Cushing, the Proposed Route would cross the Missouri river in South Dakota/Nebraska. Much of the Missouri River in this area is designated as recreational under the Wild and Scenic Rivers Act. A number of technical issues also dictated effective crossing locations. Crossing locations for the Missouri River that are technically appropriate and permittable were strongly considered in the overall routing process.

To accomplish the objective of delivering crude oil to Wood River and Patoka, and eventually to Cushing, the Proposed Route follows the shortest route possible between the Canadian border and Cushing. The route crosses the U.S./Canada border at Pembina County North Dakota, and follows a southerly track through North Dakota, South Dakota, and Nebraska (see Figure 2.1-1). At Steele City on the Nebraska/ Kansas border, the Mainline Project of the Proposed Route turns east through the northeast corner of Kansas and crosses Missouri to terminals at Wood River and Patoka, Illinois. The Cushing Extension continues south from Steele City through Kansas to Ponca City and Cushing, Oklahoma. This route would facilitate access to Cushing while preserving access to the original markets in Illinois, and would provide collocation opportunities along the existing Platte pipeline. It also meets the key control points outlined above. Specifically, the Proposed Route would:

- Allow an HDD crossing of the Missouri River that could be approved and completed at a technically feasible location near Yankton, South Dakota;
- Provide the shortest route of the three alternatives and consequently would represent the least amount of potential disturbance; and
- Require generally fewer water body, railroad, and road crossings.

Therefore, the Proposed Route would allow the economical extension of the pipeline into Oklahoma (Cushing Extension) and would provide for a feasible crossing of the Missouri River in South Dakota. In addition, the Mainline Project would be collocated with existing and proposed pipeline alignments through Missouri. Due to its ability to meet shipper demand in Oklahoma and its collocation with other previously permitted ROWs and developed utility alignments, the Proposed Route has been analyzed for environmental consequences as described in Section 3.0 of this EIS. Further localized route variations on the Proposed Route are described in Section 4.4.

4.3.3 Direct Alternative

The Direct Alternative was designed to take the shortest feasible route between the U.S./Canada border crossing and the delivery points at Patoka and Wood River, Illinois, and from there to take the shortest route to the delivery point at Cushing, Oklahoma (Figure 4.3-2). The straight-line path was modified to skirt populated areas and to minimize the number of stream crossings by traveling along drainage divides whenever possible. Between Wood River and Patoka, the Direct Alternative follows the same alignment as

Keystone's proposed route. Between Wood River and Cushing, the Direct Alternative roughly parallels Enbridge's Ozark pipeline corridor, but collocation was not assumed.

Based on a reconnaissance-level GIS analysis and comparison of the Direct Alternative with Keystone's Proposed Route (Table 4.3-1), there is no environmental advantage associated with the Direct Alternative. The Direct Alternative would require approximately 7 more miles of pipeline and three more pump stations. Construction of the Direct Alternative would require almost 100 more acres of construction ROW and when completed, it would require 40 more acres of permanent ROW than would the proposed alignment. Furthermore, although the Direct Alternative would cross 2 fewer miles of federal land, it would require crossing approximately 50 additional water bodies and 4 more miles of wetlands, according to available 1:100,000 National Wetlands Inventory data.

TABLE 4.3-1
Comparison of the Proposed Route and Direct Alternatives for the Keystone Project

Comparative Category	Unit	Proposed Route	Direct Alternative
Facility Requirements			
Pipeline length	Miles	1,373	1,380
Pump station requirements	Number	26	29
Land Requirements [a]			
Construction ROW	Acres	18,214	18,303
Permanent ROW	Acres	8,322	8,362
Environmental Considerations			
Water body crossings [b]	Number	211	261
Wetlands crossed [b]	Miles	36.2	40.0
Federal lands crossed	Miles	4.3	2.2

Note:

The Iowa Route described in Section 4.3.1 is not included in this table because the route does note meet the purpose and need for the Project and was rejected for further analysis.

[a] Assumes a 110-foot-wide construction right-of-way (ROW) for the entire Proposed Route, except for the segment between Wood River and Paloka, Illinois, where it is 95 feet wide. The permanent ROW is 50 feet wide.

[b] National Wetland Inventory (NWI) data are not available for all areas in Nebraska, Kansas, and Oklahoma. For 240 miles of the Proposed Route, no NWI data are available; for 66 miles of the Direct Alternative Route, no NWI data are available.

Sources: NWI: USFWS May 2006; water bodies: ESRI & USGS 2006; tribal lands: USGS 2005; federal lands: USGS 2005.

Unlike the proposed alignment, the Direct Alternative does not take advantage of collocation with the proposed Rockies Express pipeline. If both pipelines were built, the environmental impacts would be higher than for Keystone's proposed alignment that is collocated with the Rockies Express. In addition, Keystone's proposed alignment is predominantly oriented north-south and east-west, while the Direct Alternative is oriented northwest-southeast and northeast-southwest (see Figure 4.3-2). Alignment with the cardinal directions allows the Proposed Route to run parallel to section lines, property lines, and the boundaries of

agricultural fields rather than cutting diagonally across them as would the Direct Alternative. Consequently, disruption to existing land uses would likely be considerably higher under the Direct Alternative.

4.4 ROUTE VARIATIONS - PROPOSED ALTERNATIVE

Route variations differ from system or major route alternatives in that they are identified to resolve or reduce construction impacts to localized, specific resources such as cultural resource sites, wetlands, recreational lands, residences, landowner requests, and terrain conditions. While route variations may be a few miles in length, most are relatively short and in proximity to the proposed route. Because route variations are identified in response to specific local concerns, they are usually the result of landowner comments. A variety of factors are considered in identifying and evaluating route variations, including length, land requirements, and the potential for reducing or minimizing impacts to natural resources.

4.4.1 Initial Route Variations

As part of the Proposed Route development and selection process, 12 route variations to the initially planned Mainline Project route and one for the Cushing Extension route have been incorporated. These variations were developed based on discussions with landowners, resource stewards, and project engineers to avoid or minimize impacts to natural or cultural resources, reduce or eliminate engineering and constructability concerns, and avoid or minimize conflicts with existing or proposed residential and agricultural land uses. Each of these route variations is summarized in Table 4.4-1.

In addition to the route variations described above, the scoping process identified public concerns related to route location. Many of these comments addressed specific route variations related to avoiding shelterbelts and aesthetic features, such as bike paths and parks. The Scoping Report is provided as Appendix A for reference. The final design alignment would, where feasible, consider these minor route variations and would attempt to address additional landowner requirements, such as crossing property along quarter section lines.

Additional minor alignment shifts would be required prior to and during construction to accommodate unforeseeable site-specific constraints related to other engineering, landowner, and environmental concerns.

4.4.2 Seward Route Variation

The citizens of Seward, Nebraska, suggested an alternative route variation (the Seward Alternative) that would re-route the pipeline to the east of the city (Figure 4.4-1). According to the committee that proposed it, the Seward Alternative would avoid having the pipeline pass near the city's water-supply well fields, avoid a crossing of the water main that connects Seward to its water treatment plant, avoid wetlands and floodplain areas west of the city, and move the pipeline beyond the western boundary of the High Plains aquifer. Keystone has agreed to provide an analysis of the Seward Alternative for the Final Environmental Impact Statement; what follows below is a reconnaissance-level GIS-based comparison of the differences between the Seward Alternative and Keystone's proposed alignment in the vicinity of Seward, Nebraska.

The Seward Alternative would be approximately 1.7 miles longer than the proposed alignment, and would thus require 10 additional acres of permanent right-of-way and 22 additional acres of construction right-of-way (Table 4.4-2). The land east of Seward is generally steeper and more dissected than it is to

the west (Figure 4.4-1), and the maximum slope crossed by the Seward Alternative is greater, but neither alignment traverses overly-steep slopes. As drawn by the Seward citizens'' committee, the Seward Alternative would require 15 more road crossings and would be located directly adjacent to 6.9 more miles of road than would Keystone's proposed alignment. The number of railroad crossings would be unchanged.

Although the number of major stream crossings would also be unchanged, the Seward Alternative would require twelve minor stream crossings, three more than the nine that would be required by Keystone's proposed alignment. The alternative would cross two fewer wetlands, as indicated on National Wetlands Inventory (NWI) 1:100,000-scale quadrangles, but the total length of NWI wetlands traversed would be 0.07 miles greater. Despite its additional length, the Seward Alternative would cross 3.4 fewer miles of cultivated cropland than would Keystone's proposed alignment. The Seward Alternative would instead cross greater lengths of deciduous forest, low-intensity developed land and open space, grassland and pasture, open water and woody wetlands.

The Seward Alternative route would avoid the city's water-supply well fields, and would move the pipeline past the eastern boundary of the High Plains aquifer, until it crosses back over the Big Blue River, south of Seward (Figure 4.4-1). The Seward Alternative would be at a higher elevation than the eastern edge of the aquifer. The general direction of groundwater flow is to the east-southeast, however, and hydraulic connectivity between the Big Blue River and the High Plains aquifer is tenuous (Verstraeten *et al.* 1998). South of the Big Blue River crossing, the Seward Alternative and Keystone's proposed alignment are both within the boundary of the High Plains aquifer, so the environmental benefit of reduced risk to the aquifer is limited to the immediate vicinity of Seward.

As proposed by the citizens of Seward, the Seward Alternative may reduce risk to the High Plains aquifer and water-supply wells in the vicinity of Seward, and may reduce the length of cultivated croplands crossed. It does so at the cost of greater pipeline length, additional required right-of-way area, more road and stream crossings, and a greater total length of wetlands crossed.

TABLE 4.4-2
Comparison of the Proposed Route and Seward Alternative for the Keystone Project

Comparative Category	Unit	Proposed Route	Seward Alternative
Facility Requirements			
Pipeline length	Miles	22.3	23.9
Land Requirements [1]			
Construction ROW	Acres	297	319
Permanent ROW	Acres	135	145
Environmental Considerations			
Maximum slope [2]	Degrees	11	18
Road crossings [3]	Number	15	30
Length adjacent to roads [3]	Miles	1.0	7.9
Railroad crossings [4]	Number	2	2
Major stream crossings [5]	Number	2	2
Minor stream crossings [6]	Number	9	12
Wetlands crossed [7]	Number	6	4
Wetlands crossed [7]	Miles	0.10	0.18
Land-cover [8]			
Cultivated crops	Miles	20.17	16.74
Deciduous forest	Miles	0.25	0.62
Developed, low intensity	Miles	0.02	0.21
Developed, open space	Miles	0.76	1.48
Grassland/herbaceous	Miles	1.05	4.25
Open water	Miles	-	0.08
Pasture/hay	Miles	-	0.51
Woody wetland	Miles	0.04	0.06

Notes:

1 Assumes a 110-foot-wide construction right-of-way (ROW) and a 50-foot-wide permanent ROW.
2 Derived from National Elevation Dataset 1/3 arc-second data (United States Geological Survey [USGS], 1999).
3 U.S. Department of Transportation, BTS_Roads data (USGS 2002).
4 Derived from National Atlas of the United States, 200509, Railroads of the United States (National Atlas of the United States [NAUS] 2005).
5 Derived from National Atlas of the United States, 200512, Streams and Waterbodies of the United States (NAUS 2005).
6 Derived from National Elevation Dataset 1/3 arc-second data (USGS 1999).
7 Derived from National Wetland Inventory data (USFWS May 2006)
8 Derived from 2001 National Land Cover Database Zone 38 Land Cover Layer (USGS)

4.5 ABOVEGROUND FACILITY ALTERNATIVES – PROPOSED ALTERNATIVE

Pump stations, valve sites, temporary worksites, and pipe and contractor yards are identified in the Environmental Report filed on November 17, 2006 (ENSR 2006a). The filing identified 23 new pump stations, 42 pipe storage yards, 17 contractor yards, and 45 MLVs along the Mainline Project and 3 pump stations, 13 pipe storage yards, 6 contractor yards, and 12 MLVs along the Cushing Extension. Although the preferred locations for these facilities were chosen based on Project need, the proximity of public access, habitats, dwellings, and other land and ROW issues also were considered. Of the pump station locations identified in the November 17, 2006 filing (ENSR 2006a), three were identified in the January 24 filing (TransCanada 2007a) for alternative locations. These locations are described in the following sections.

4.5.1 Pump Station 19 – Hecla Sandhills

Pump Station 19 would be moved about 5 miles east of its previous location (Figure 4.5 1). As shown in Table 4.4-1, a route variation for the Hecla Sandhills Alternative (MP 192.3 to 247.5) is proposed to reduce impacts in this area. Pump Station 19 falls within this reroute and thus would be relocated. The previously filed location was situated over a mapped shallow aquifer; the new location avoids the aquifer, and the power line required by the alternative location is 5 miles shorter. A shift in local property tax benefits would result, as the alternative pump station location is located in Sargent County, North Dakota; the previously filed location was in Dicky County, North Dakota.

TABLE 4.4-1
Proposed Route Variations for the Keystone Project

Proposed Route Mileposts	Route Variation	Reason for Route Variation
Mainline Project		
Milepost (MP) 0 to 263	The current alignment is located west of the original alignment and continues on in a southerly direction.	Avoids aquifers in North Dakota, Coteau Des Prairie, and the Sisseton-Wahpeton Indian Lands. The southerly route reduces length. The reroute also avoids drainage ditches, woodlots, grain bins, shelter belts, wetland easements, and the Tongue River tributaries.
MP 192.3 to 247.5 (Hecla Sandhills Alternative)	In the November 2006 filing, the original alignment was shifted west from MP 0 to 263. In the January 2007 filing, the November route was shifted back east, near the original route.	Avoids U.S. Fish and Wildlife Service (USFWS) wetlands and grassland easements; also avoids shallow aquifers and an extensive area of wetlands in sandy substrates. The January route results in less surface disturbance in sensitive habitats.
MP 266 to 274.5	The current alignment is located west of the original alignment.	Avoids impact to the USFWS Day County Grasslands easement.
MP 279.3 to 295	The current alignment is located approximately 1 mile east of the original alignment.	Reduces impacts to the USFWS Raymond Prairie-Chicken Leks grassland.
MP 309 to 433	Several modulations were eliminated from the original alignment.	Reduces the overall length and provides a more direct path from MP 309 to the Missouri River crossing at Yankton, South Dakota.
MP 437 to 469	The current alignment is east of the original alignment.	Avoids high bluffs on the south side of the Missouri River, as well as general congestion.
MP 473 to 491	Several minor route refinements to the original route have occurred in this area.	Addresses engineering and construction concerns.
MP 495 to 501.5	The current alignment is west of the original alignment.	Avoids native grasslands per landowner request; also avoids a feedlot.
MP 501.5 to 512.5	The original alignment was moved approximately 1 mile east. The overall shift continues south to approximately MP 511.	Facilitates a better Elkhorn River crossing location; also reduces length and avoids the Nebraska Game and Parks Commission Lands.
MP 512.5 to 521	The current alignment was moved westward from the original alignment	Avoids the future site of Leigh Lake, as well as terraced farmlands.
MP 527 to 532	The current alignment is located west of the original alignment	Avoids future construction of a hotel.
MP 536 to 546	The current alignment is east of the original alignment.	Provides a better alignment for the Platte River crossing.
Cushing Extension		
MP 208.2 to 252	The original alignment crossed Native American tribal and allotted lands between these mileposts.	Minor route adjustments have been made to avoid crossing these lands.

4.5.2 Pump Station 36 – Chain of Rocks

Pump Station 36 would be moved northwest of its previously proposed location (Figure 4.5-2). As shown in Table 4.4-1, a route variation for the Chain of Rocks area (MP 976 to 987.5) is proposed. The new location for the pump station is situated in an upland area; the old location was close to a large wetland complex (Horseshoe Lake). The pump station alternative would be collocated with a utility substation, and no additional power lines would be required.

4.5.3 Pump Station 37 – Wood River

Pump Station 37 would be moved northeast of its previously proposed location (Figure 4.5-3). As shown in Table 4.4-1, a route variation for the tie-in to the Wood River Terminal area (MP 1020.6 to 1024.4) is proposed. As the route into the terminal was further refined, an opportunity to site Pump Station 37 adjacent to the Wood River Refinery became apparent. This would eliminate the need to construct an 0.8-mile lateral extension from the pump station to the terminus at the refinery.

Both the November 2006 location and the January 2007 location are situated on cropland near industrially developed areas. While it appears that the alternative pump station location may be sited on a farmed wetland, it is likely that the pump station could be oriented such that it is outside the wetlands but still close to the point of refinery storage. The exact orientation and location of Pump Station 37 would be refined at the completion of wetland field surveys.

While both the original and alternative locations for Pump Station 37 are located in an area with industrial development, the alternative location presented in the January 2007 filing is located within 1 mile of a larger number of residences, compared to the originally filed location. This pump station would represent a small addition to an existing refinery complex and, because additional laterals would not be needed, the overall footprint would be smaller. The incremental effect of Pump Station 37 on the residences would be minor based on the existing refinery setting.

4.6 REFERENCES

ENSR. 2006a. Keystone Pipeline Project Environmental Report. Prepared for the U.S. Department of State. April. Updated November 15, 2006.

TransCanada. See TransCanada Keystone Pipeline, L.P.

TransCanada Keystone Pipeline, L.P. 2007a. Keystone Pipeline Project: Environmental Report. Submitted to U.S. Department of State by TransCanada Keystone Pipeline, L.P. Application for Presidential Permit. January 24.

Verstraeten, I. M., V. L. McGuire, and K. L. Heckman. 1998. *Hydrogeology and Subsurface Nitrate in the Upper Big Blue Natural Resources District, Central Nebraska, July 1995 through September 1997*. U.S. Geological Survey Water-Resources Investigations Report 98-4207. Denver, Colorado.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The analysis presented in this draft EIS is based on information provided in eight filings by TransCanada and was further developed from data requests; public and agency scoping; literature research; alternatives analysis; and contacts with federal, state, and local agencies. The information provided in Section 3.0 of this draft EIS and summarized below for each resource category indicates that the proposed Keystone Mainline Project and Cushing Extension would result in limited adverse environmental impacts during both construction and operation, and would be an environmentally acceptable action. This conclusion does assume that the Keystone Mainline Project and Cushing Extension would be constructed and operated in accordance with applicable laws and regulations, and with Keystone's proposed Mitigation Plan (Appendix B). Additional mitigation recommendations have been developed through scoping and consultations with agency representatives, stakeholders, and the public; these measures are presented in detail in Section 3.0 for each resources category. The following subsections summarize these recommended measures for each resource category.

5.1 GEOLOGY

5.1.1 Conclusions

The proposed project would not involve substantial topographical alteration and would not disturb any geological features protected by federal or state laws, or tribal practice. Seismic activity is not expected to pose an unacceptable risk to the project.

The proposed pipeline route does not cross any active surface mines or quarries; however, it does cross 40 miles of underlying coal seams between Wood River and Patoka, Illinois, where coal is mined with underground methods (ENSR 2006a). The proposed route does not cross the well pads of any active oil and gas wells. Extraction of oil and gas resources would not be affected by routing operations because any new wells would be located outside of the pipeline ROW. The proposed pipeline would pass through deposits of sand, gravel, clay, and stone in North Dakota, South Dakota, and Nebraska but would restrict access to comparatively small areas of these deposits. In Kansas, Missouri, and Illinois, the proposed route lies adjacent to an existing pipeline, limiting impacts to potentially exploitable geologic resources.

A minimal risk of localized subsidence or collapse exists where the pipeline crosses karst formations or passes above historic coal mines. It is also possible that land clearing will increase the risk of erosion and localized landslides. Most of the proposed Keystone Project route is not located in landslide-prone terrain, but the proposed route does cross areas of high landslide potential, as described by NPMS at the Yankton and Mississippi River crossings. Keystone has considered landslide potential in its routing work and has selected crossings of these areas where the landslide potential is reduced.

5.1.2 Recommendations

(1) Blasting would be required at locations where shallow bedrock is present along the construction ROW. Keystone should develop a site-specific Blasting Specification Plan for any locations where blasting would be necessary. Minimum requirements for the plan are described in Section 3.1.1.2. The Blasting Specification Plan should be filed with state and local jurisdictions for review and written approval prior to the commencement of blasting.

(2) Excavation and blasting along the ROW may uncover paleontological resources that may be of scientific value. Keystone should develop a Paleontological Resources Protection Plan to identify and protect significant fossil resources that may be encountered during construction. Elements of the Paleontological Resources Protection Plan are described in Section 3.1.2.2. Except for reporting the initial find, all work conducted under the Paleontological Resources Protection Plan should be performed by qualified paleontologists with trained assistants. The plan should be filed with the respective states prior to construction.

(3) There is a potential for rock slope instability in the vicinity of the Whitewater River crossing in Kansas. Prior to crossing this water body and the water bodies identified in Section 3.3.2.2, Keystone should submit a site-specific Construction Mitigation and Restoration Plan for the identified water body crossings.

(4) Because national-scale karst maps may not be sufficiently detailed to identify all karst terrains along the pipeline corridor, Keystone should consult with the respective state geological survey departments to identify the most up-to-date sources of data on karst-related subsidence hazards along the proposed route.

(5) Because the proposed route does cross areas of high landslide potential, Keystone should develop and implement a Landowner Awareness Plan to specifically address landslide awareness with landowners. The plan should comply with the recommendations in API Recommended Practice 1162 (Public Awareness Programs for Pipeline Operators).

5.2 SOILS

5.2.1 Conclusions

Temporary or short term increases in soil erosion could occur during construction, particularly in areas classified as highly erosive. Receiving water bodies could be affected, and agricultural soils containing agrochemical products could be eroded. During construction, soil compaction is likely, increasing the possibility of runoff.

Approximately 17,000 acres of farmland or rangeland within the ROW would be taken out of production during the 18-month construction period. Some short- or long-term decreases in agricultural productivity are possible. In addition, tile drainage systems would be disturbed during construction. Keystone has proposed to avoid, replace, and/or repair any tile drainage system within the ROW.

There could be compaction-related decreases in productivity from non-agricultural vegetated land, particularly where soils are classified as hydric. It is also possible that boulders and rocks unearthed during construction would be concentrated near the surface at completion. There are also concerns that spills or leakage from equipment could contaminate soils. Keystone has proposed construction methods and mitigation measures to address these concerns, and additional recommended measures are described in Section 5.2.2.

In terms of operations impacts, differential settling around the proposed pipeline likely would be minor and would be addressed by mitigation measures. Soil temperature impacts would be limited to within 3 feet of the pipeline and would not result in serious soil moisture loss; mitigation would be adequately addressed through the recommendations included below.

5.2.2 Recommendations

(1) In its Mitigation Plan, Keystone has proposed construction methods that are designed to minimize impacts resulting from soil erosion (Appendix B). However, the plan does not include provisions for environmental inspection during construction, which would ensure effective implementation of the measures. Keystone should designate at least one Environmental Inspector (EI) per construction spread, who would have the authority to stop work and/or order corrective action in the event that construction activities violate the provisions of the Mitigation Plan, landowner requirements, or any applicable permit. Details regarding the recommended duties and authority of the EI, and the frequency of inspections, are provided in Section 3.2.2.1.

(2) Although as described in its Mitigation Plan (Appendix B), Keystone plans to minimize impacts on soil productivity that may result from construction activities, some short- to long-term decreases in agricultural productivity are possible. Prior to construction, Keystone should submit to DOS an Agricultural Impact Evaluation and Compensation Plan to document and compensate for decreases in productivity that may result from degradation of agricultural soils along the proposed ROW. Minimum requirements for the plan are described in Section 3.2.2.1.

(3) Because hydric and otherwise compaction-prone soils are particularly sensitive to the impact of construction activities during wet weather, Keystone should amend the Mitigation Plan to include a Wet Weather Construction Plan to address construction practices in agricultural areas during conditions of active precipitation or saturated ground. Minimum requirements of the plan are provided in Section 3.2.2.1.

(4) Procedures to alleviate soil compaction as described in Keystone's Mitigation Plan may result in relatively excessive soil aeration and subsequent settling of soils within the ROW. Therefore, prior to construction, Keystone should develop a Post-Construction Soil Monitoring Plan to ensure that any erosion or settling that does occur is detected and mitigated. This plan is described in more detail in Section 3.2.2.2.

5.3 WATER RESOURCES

5.3.1 Conclusions

Overall, it is not anticipated that surface water or groundwater quality would be significantly affected by normal disposal activities (such as disposal of hydrostatic test water), non-catastrophic spills, or leaks during pipeline construction and operation. Hydrostatic testing, which would involve the uptake and discharge of water, should not cause any adverse impacts if Keystone's Mitigation Plan is followed.

Many of the aquifers present beneath, or in the vicinity of, the proposed route are isolated by the presence of glacial till, which characteristically inhibits downward migration of water and contaminants into these aquifers. Although the pipeline has been routed to avoid most near-surface aquifers, in several areas shallow or near-surface aquifers are present beneath the proposed route. For these areas, measures have been proposed (such as containment structures) to reduce the potential impact of leaks and spills during construction. Keystone's Mitigation Plan outlines procedures for contractor preparedness and emergency spill response to reduce the potential for contaminants to migrate into the aquifer during construction activities. Additionally, the risk of dewatering shallow groundwater aquifers or reducing groundwater quality through an increase in TSS during construction likely would be temporary, and these aquifers are

expected to recover quickly following construction activities. Construction and normal operations therefore are not expected to result in a long-term significant impact on groundwater.

Keystone has proposed three construction methods for crossing surface water bodies: dry-cut methods, open cut wet crossings, and HDD. The HDD method would avoid any impacts on water bodies. The open cut wet method, involving trenching while water continues to flow, would entail a high risk of temporary siltation to streams and other water bodies. Dry-cut methods are not feasible for wider streams. The risks of open-cut trenching could be temporary (for the duration of construction) or longer term (where compromised stream bank stability or bank erosion occurs). Keystone's Mitigation Plan includes several measures to reduce siltation and erosion. Additional measures are recommended in Section 5.3.2.

5.3.2 Recommendations

(1) Keystone should include measures in each site-specific Blasting Specification Plan (Section 3.1.1.2) to avoid impacts on groundwater and incorporate post-blasting test procedures to ensure that groundwater resources are not negatively affected due to necessary blasting activities.

(2) To reduce impacts at crossings of larger water bodies where the HDD method is not proposed, Keystone should submit a site-specific Construction Mitigation and Restoration Plan for the following water body crossings: Pembina River-North Dakota (MP 7), Tongue River-North Dakota (MP 18), Sheyenne River-North Dakota (MP 167), James River-South Dakota (MP 418), Elkhorn River-Nebraska (MP 498), Shell Creek-Nebraska (MP 527), Big Blue River-Kansas (MP 653), Grand River-Missouri (MP 853), East Fork Silver Creek-Illinois (MP 1041), Smoky Hill River-Kansas (MP 76), Arkansas River-Kansas (MP 206), Salt Fork Arkansas River-Oklahoma (MP 239), and Cimarron River-Oklahoma (MP 285).

(3) Because the open-cut wet crossing method necessarily involves substantial disturbance and transport of sediments, Keystone should not use the open-cut wet method to cross water bodies upstream of HCAs, sensitive or protected water bodies, or water bodies where such temporary siltation may lead to exceedance of sediment TMDL. For these water body types, Keystone should consider implementing either the dry flume or dry dam-and-pump crossing methods described in Keystone's Mitigation Plan (Appendix B), or other method as approved by the pertinent regulatory authorities.

(4) The implementation of appropriate measures to protect pipeline crossings from channel incision and channel migration can reduce the likelihood of washout-related emergencies, reduce maintenance frequency, limit adverse environmental impacts, and—in some cases—improve stream conditions. Stream and river crossings should be evaluated by a qualified fluvial geomorphologist. Duties of the geomorphologist are described in detail in Section 3.3.2.2.

(5) Bank erosion rates can exceed several meters per year. Maintaining an adequate burial depth for pipelines 15 feet (5 meters) beyond either side of the active stream channel may necessitate bank protection measures that would increase both maintenance costs and environmental impacts. Therefore, crossing-related cover depths should be maintained for at least 15 feet beyond the channel migration zone, as determined by a qualified fluvial geomorphologist.

5.4 WETLANDS

5.4.1 Conclusions

Wetlands that would be affected within the ROW include emergent wetlands (658 acres), forested wetlands (148 acres), perennial riverine wetlands (54 acres), intermittent riverine wetlands (59 acres), and scrub-shrub wetlands (33 acres). While emergent wetlands would regenerate quickly after disturbance (within 3–5 years generally), forested and scrub-shrub wetlands would potentially experience long-term effects. Wetlands in parks or reserves have significant conservation value. Keystone would implement mitigation measures described in its Mitigation Plan (Appendix B), including restoration efforts in some cases. These are described in further detail in Section 3.4.3. Additional recommended mitigation measures are described in Section 5.4.2.

5.4.2 Recommendations

(1) Wetland areas within conservation lands or easements should be restored to a level consistent with any additional criteria established by the relevant managing agency.

(2) Implementation of the measures identified in Keystone's Mitigation Plan would reduce impacts on wetlands. In addition, several other recommendations were made by USFWS staff during consultation. These recommendations are described in detail in Section 3.4.3 and include replacing topsoil and spreading to original contours with no crown over the trench, removing excess spoil and stabilizing wetland edges and adjacent upland areas in shallow-farmed easement wetlands, leaving a gap in the spoil so that no fill material is left in the wetlands, establishing 100-foot minimum buffer zones around wetland mitigation areas, monitoring wetland restoration areas for noxious and invasive species, and developing a plan to compensate for permanent wetland losses.

(3) Keystone should mitigate permanent wetland impacts, including loss of forested wetlands, at ratios from 2:1 to 6:1 for affected acres, depending on the vegetation type and if mitigation would occur within the same watershed as the wetland loss.

5.5 TERRESTRIAL VEGETATION

5.5.1 Conclusions

Terrestrial vegetation classes include all the wetland classes in addition to grasslands, upland forest, and developed land. Grassland impacts due to pipeline construction are expected to be minimal, and affected vegetative communities generally are expected to reestablish within 2 years. Construction through 29 miles of previously untilled prairie could produce irreversible impacts, as prairie sod can take up to 100 years to recover. As described in Section 3.5.5, Keystone has identified several measures to limit impacts on vegetation, and additional measures are summarized below in Section 5.5.2.

Impacts on upland forest and shrubland would be longer term than those anticipated for grassland because of the time required for these plant communities to reestablish and reach mature pre-construction conditions.

5.5.2 Recommendations

(1) To reduce impacts on native prairie and native forest communities, Keystone should:

(a) Locate extra workspaces outside of these habitats, minimize the width of the construction area within native growth areas, and continue consultation with federal and state management agencies on avoidance of impacts to these habitats.

(b) Provide for a minimum replacement/restoration of 1 acre of native prairie and 2 acres of native forest for each acre of these habitats affected, respectively; mitigation compensation should occur offsite and onsite, which may involve a restoration or preservation program. Higher ratios may be applicable if mitigation ratios already have been determined for specific habitats by federal, state, or local resource agencies.

(c) Monitor restoration in native growth areas to ensure that native species become established and to ensure no net loss of native prairie habitats.

(2) Keystone should evaluate terrestrial vegetation impacts and habitat fragmentation impacts to COE lands in the Riverlands Management Area in St. Charles County, Missouri, and in the Carlyle Lake WMA in Fayette County, Illinois to determine compensatory mitigation for impacts to these specific habitats. Any compensatory mitigation proposed would require agreement and approval from pertinent local, state, and federal regulatory agencies.

(3) Keystone should develop a Project-wide noxious weed control plan, which should identify noxious weeds and exotic plants within the Project area and should describe prevention, early detection of invasion, and control procedures for each species. Keystone should further ensure that all construction equipment would be completely washed down before crossing the state line from Kansas into Oklahoma to avoid transfer of noxious or other invasive species across state lines.

(4) Keystone should identify any herbicides potentially proposed for use and any BMPs that would be implemented to minimize the impacts of herbicide use to maintain the pipeline ROW.

5.6 WILDLIFE

5.6.1 Conclusions

Pipeline construction would result in short-term disturbance and long-term modification to wildlife habitats. Increased habitat fragmentation would be experienced by white-tailed deer and other large mammals. Although disturbance of dens during winter hibernation could be potentially fatal for newborn black bears cubs, the probability of this event is extremely low, as black bear habitat minimally overlaps the ROW. Small game birds and rodents would be affected through destruction of nests and burrows, death of young or loss of eggs, and loss of foraging areas and cover. However, the total habitat loss is expected to be small in the context of total available habitat.

5.6.2 Recommendations

Mitigation measures that Keystone has agreed to for the protection of wildlife habitat are described in detail in Section 3.6.5. These mitigation measures should be implemented. In addition, the following recommendations relating to impacts associated with proposed transmission lines providing power to the pipeline pump stations should be implemented:

(1) Standard safe designs, as outlined in Suggested Practice for Avian Protection on Power Lines (APLIC 2006), should be included in the design of electrical distribution lines in areas of identified avian concern, to reduce collision and electrocution impacts on birds.

(2) Transmission line visibility should be increased using proven marking techniques, such as attached balls or flappers.

(3) Provide for a minimum 60-inch separation between conductors and/or grounded hardware and use recommended insulation materials and other applicable avian protection measures, depending on line configuration.

(4) Use standard raptor-proof transmission line designs, as outlined in Avian Protection Plan Guidelines, to prevent collision by foraging and migrating raptors in the Keystone Project area.

(5) Keystone should implement BMPs in the use of pesticides and herbicides along the pipeline corridor to reduce potential impacts to avian species.

5.7 FISHERIES

5.7.1 Conclusions

Possible impacts to fisheries could occur through siltation and disturbance of streams crossed by the proposed pipeline. Following the proposed mitigation procedures during construction would result in minor short-term impacts to aquatic habitats and organisms. Any short-term disturbance caused by instream activities likely would resemble natural high-flow events in the stream. To mitigate impacts, construction would involve dry-ditch techniques at crossings where the timing of construction does not adequately protect environmentally sensitive water bodies, as determined by the appropriate regulatory authority. HDD would be used at designated major and sensitive water bodies (ENSR 2006a). However, along the Cushing Extension through Kansas, Keystone has proposed to use HDD at only two of six locations designated as special use. Measures to address sensitive stream crossing have been proposed and are summarized in Section 5.7.2.

There is a risk that non-native species could be introduced into receiving waters during the disposal of hydrostatic testing water. Keystone has proposed to undertake hydrostatic testing during the spring, summer, and autumn months, overlapping with key spawning months of April to July. This overlap could affect some sensitive species during breeding. Additional mitigation measures are recommended in Section 5.7.2.

5.7.2 Recommendations

(1) To avoid breeding periods when fish and invertebrate larvae are present, Keystone should undertake instream work only between June 1 and November 30.

(2) To decrease the direct effects of sedimentation and contamination, Keystone should increase the distance from the water's edge at which sediment barriers are erected from 10 feet to a minimum of 50 feet, and to 100 feet whenever practicable.

(3) Keystone should increase the minimum distance from the wetted perimeter of the stream to material and equipment staging areas from 10 feet to a minimum of 50 feet.

(4) Keystone has proposed an open-cut crossing method for three large crossings in Kansas (Little Blue, Smokey Hill, and Whitewater Rivers). For the Cushing Extension, Keystone should consult with regulatory authorities for the best construction technique (e.g., potentially HDD), at the crossings of larger water bodies and water bodies classified as special use.

(5) Wherever possible, Keystone should avoid extracting hydrostatic test water from water bodies that contain commercially or recreationally important species for hydrostatic testing. If it is necessary to extract water from such sources, Keystone should obtain written permission from the appropriate federal, state, and local permitting agencies, as specified in its Mitigation Plan for hydrostatic test discharge locations.

(6) To avoid impacts on sensitive fish species and lifestages (e.g., newly hatched and small juvenile fish) Keystone should provide a detailed hydrostatic test plan that describes the specific test sections; quantities of water required by water source; location, timing, and duration of withdrawals; and location, timing, and duration of discharges. Keystone should maintain adequate flow rates in water bodies used for water withdrawal for hydrostatic testing to protect aquatic life, provide for all water body uses, and provide for downstream withdrawals of water by existing users. Keystone should avoid withdrawing water from sensitive areas that contain small fish with a high probability of being entrained or entrapped on the screen intake of the pumps. Keystone should ensure that hydrostatic test water is withdrawn and discharged in the same watershed, no chemicals are added to the hydrostatic test water, and the water is contaminant free.

(7) To avoid impacts from introduced species, Keystone should discharge the hydrostatic test water into the same water body that was used as the intake source, whenever possible. When this is not possible, BMPs should be enforced to reduce the possibility of transmission of introduced species into the receiving water body.

5.8 THREATENED AND ENDANGERED SPECIES

5.8.1 Conclusions

Preliminary data identified 55 federally or state-listed threatened, endangered, or candidate species potentially occurring in or near the Keystone Project ROW. These include mammals, reptiles, insects, birds, fish, mollusks, and plants. Most affected habitat would include croplands (13,594 acres) and grasslands (4,112 acres), followed by wetlands and open water (845 acres), and upland and riparian forests (1,078 acres). Loss of shrublands and wooded habitats would be long term (5–20 years) in reclaimed areas of the construction ROW.

Potential impacts on individual species are described in detail in Sections 3.8.1.6 and 3.8.2.6. These impacts include:

- Habitat loss, alteration, and fragmentation;
- Decreased breeding success due to disturbance from construction and operations noise and increased human activity;
- Direct mortality from project construction and operation and/or collision with or electrocution by power lines;
- Loss of individuals and habitats due to exposure to toxic materials or crude oil releases (addressed in Section 3.13);
- Reduced survival or reproduction due to decreased abundance of forage species; and
- Interruption of foraging activities due to exposure to construction and operations noise and increased human activity.

5.8.2 Recommendations

Additional mitigation measures for each of the federally or state-listed threatened, endangered, or candidate species have been suggested by agency reviewers during consultation and review activities. These recommendations are described in detail in Sections 3.8.1.6 (federally listed species) and 3.8.2.6 (state-listed species). Specific recommendations for certain notable listed species include:

(1) To avoid impacts on nesting or winter roosting bald eagles, Keystone should complete pre-construction surveys of suitable habitats within the pipeline ROW and along access roads and power line ROWs. Keystone should not construct within 1 mile of active bald eagle nests or within 0.5 mile of winter roosting sites identified during pre-construction surveys or from historical databases. Keystone should require all electric service providers to implement avian protection measures, including raptor-proof designs in areas of bald eagle activity.

(2) If construction occurs during either the spring or autumn whooping crane migration period and use areas for these birds are found within 1 mile of pipeline construction activities, these activities must cease immediately and Keystone must notify the respective USFWS state field office, including the Nebraska Field Office (which maintains the Cooperative Whooping Crane Tracking Project for the United States) to determine when construction can continue.

(3) A search for gray bat individuals should be conducted prior to any activity that would affect caves in Madison County, Illinois or in Lincoln County, Missouri.

(4) If cutting of identified potential roost trees in woodlands with a habitat suitability index of more than 0.6 for Indiana bats is necessary, Keystone should schedule this cutting prior to April 1, their expected arrival date. Also Keystone should not clear trees from April 1 to September 30 in woodlands that have not been surveyed to determine habitat suitability for this species. If any Indiana bat maternity roost trees are located, applicable mitigation for these trees should be developed in consultation with USFWS and state wildlife agency personnel. Keystone should implement conservation measures to address the loss of Indiana bat summer habitat by working with USFWS, MDC, Missouri Department of Natural Resources, IDNR, and other potential cooperators in development of conservation measures to potentially include onsite/offsite, and in-kind/out-of-kind measures based on acres of habitat impacts at a 2:1 ratio for conservation lands.

(5) Keystone should develop a mitigation plan for the massasauga rattlesnake in Illinois with guidance from IDNR and the Illinois Natural History Survey. If construction activity would occur in suitable rattlesnake habitat during the massasauga's active period (April through October), a survey of these habitats for the massasauga should be conducted by a qualified herpetologist, prior to construction in the year that construction will occur in the area.

(6) To avoid impacts on pallid sturgeon, Keystone should consult with individual states concerning potential water withdrawal from the Platte River drainage and should avoid water withdrawals from February 1 through July 31 in the Lower Platte region (Columbus, Nebraska to the Missouri River) (John Cochnar, USFWS, February 5, 2007).

(7) Topeka shiner streams should be crossed wherever feasible using HDD techniques. If the Topeka shiner streams cannot be bored, all work within the bed or banks of identified Topeka shiner streams is prohibited annually during the species' spawning season of May 15 through July 31. Work outside of the spawning season must include salvage and relocation efforts at all crossings. Salvage and relocation procedures for this species are described in detail in Section 3.8.1.6.

(8) To avoid impacts on federally protected species in the Lower Platte River basin, Keystone should provide a detailed hydrostatic test plan that describes the specific test sections; quantities of water required by water source; location, timing, and duration of withdrawals; and location, timing, and duration of discharges. Keystone should maintain adequate flow rates in water bodies used for water withdrawal for hydrostatic testing to protect aquatic life, provide for all water body uses, and provide for downstream withdrawals of water by existing users. Keystone should avoid water withdrawal from February 1 through July 31 in the Lower Platte region. Keystone should ensure that hydrostatic test water is withdrawn and discharged in the same watershed, that no chemicals are added to the hydrostatic test water, and that the water is contaminant free.

5.9 LAND USE, RECREATION AND SPECIAL INTEREST AREAS, AND VISUAL RESOURCES

5.9.1 Conclusions

Agricultural, rangeland, forestland, recreational/special use, commercial, and residential land use classes would be affected in areas intersected by the proposed ROW. The largest amount of acreage that would be affected by the Keystone Project would be agricultural land, followed by rangeland.

Keystone is planning to undertake construction over an 18-month period, during which agricultural lands in the ROW would not be farmed. Keystone has agreed to compensate landowners for crop and other losses on a case-by-case basis. Keystone also has developed mitigation plans for limiting impacts on soil drainage mechanisms, compaction, irrigation systems, farm access areas, windbreaks and living fences, and CRP lands. After construction, nearly all agricultural land along the ROW would be allowed to return to production, and productivity is not expected to be reduced significantly over the long term. Approximately 140 acres would be necessary for construction of aboveground facilities; these acres would be permanently removed from farming production. Keystone has further sought to minimize impacts on rangelands by developing range-specific mitigation measures.

Although it is unclear at present exactly how many CRP acres would be affected by pipeline construction and operation, FSA has estimated that, in a worst-case scenario, over 16,000 acres of CRP land would be

affected during construction, with over 6,500 acres remaining affected due to pipeline operation. It is likely that total affected CRP acreage would be less than these estimates. Impacts on CRP lands would include tilling of grasslands and clearance and tillage of forested lands; if within the operational ROW, these lands would not be allowed to regenerate during the life of the Project. Thus, impacts on these lands would be localized but long term. Keystone would address these impacts, and any impacts to Farmable Wetland Program Lands and WRP lands, with landowners on a case-by-case basis. Overall impacts on residential and commercial land uses are expected to be minor and would be addressed by Keystone through landowner negotiations on a case-by-case basis.

Recreational lands potentially affected include bike trails, sightseeing areas, hiking trails, and wildlife viewing areas; public lands are limited along the ROW. Construction activities are anticipated to cause only temporary impacts. Keystone would coordinate with agency and land use managers to reduce conflicts between construction activities and recreational uses.

5.9.2 Recommendations

To mitigate the impacts of land use changes and disturbance, the following measures, in addition to the mitigation already included in the Mitigation Plan (Appendix B), are recommended:

(1) For all verified enrolled acreage in CRP and other FSA conservation program areas intersected by the ROW, Keystone should provide the following to the appropriate FSA county office:

   (a) The program participant's name, location of affected program land, and FSA program(s) the affected land is currently enrolled in, obtained from the landowner.

   (b) A description of construction techniques to be used, including a sediment/erosion control plan, time schedule of proposed activities, and a contact person. The length of time the FSA program land would be affected.

   (c) Proposed site remediation to return the land to its condition before impacts. Remediation of the site should be consistent with the appropriate NRCS Field Office Technical Guide Standard (Appendix M). The contractor should meet with the appropriate NRCS State Agronomist/ Resource Conservationist to review the proposed sediment erosion control plan, time schedule of activities, remediation activities, and management requirements prior to the start of the Project.

   (d) The proposed maintenance plan for the permanent ROW, including weed control.

(2) To minimize the potential impacts of crossing the WRP easement, Keystone should utilize the state-specific NRCS Field Office Technical Guide (Appendix M) for mitigation and revegetation of areas damaged by construction. Keystone should consult with the local NRCS representatives to determine the adequacy of Keystone's Mitigation Plan and supplement the plan as needed.

(3) To ensure that impacts on windbreaks, shelterbelts, and living snow fences are reduced, Keystone should implement all Mitigation Plan measures pertaining to impacts, mitigation, and reclamation in forested areas for impacts on windbreaks, shelterbelts, and living snow fences. Keystone should provide non-vegetative remediation for affected windbreaks, shelterbelts, and living snow fences within the permanent and construction ROWs in the form of windbreak nets, mesh, or fencing and snow fencing.

(4) To ensure that impacts in residential areas are reduced, Keystone should prohibit all construction work during weekends and major holidays in the vicinity of residences.

(5) To further decrease the impact of forest clearance on recreation, Keystone should consult with state wildlife management and natural resource officials to schedule construction activities in order to avoid important recreational periods (such as hunting seasons), and to create a maintenance plan for the permanent ROW that avoids important recreational periods and results in less disturbance to the area. Where the pipeline follows an existing ROW in forested areas, Keystone should attempt to route the pipeline as close as possible to the existing ROW in order to reduce the overall Project footprint.

(6) To mitigate potential impacts on recreational resources in privately owned conservation areas, Keystone should consult with owners of private conservation areas and local advocacy groups to schedule construction activities in order to avoid important recreational periods (such as hunting seasons), and to create a maintenance plan for the permanent ROW that avoids important recreational periods and results in less disturbance to the area. Where the pipeline follows an existing ROW, Keystone should attempt to route the pipeline as close as possible to the existing ROW in order to reduce the overall footprint of these features in privately owned conservation areas.

(7) To mitigate possible impacts on the Riverlands area, Keystone should attempt to route the pipeline as close as possible to the existing ROW (Platte pipeline) in order to reduce the overall footprint of these features in Riverlands. Keystone should pay special attention to the soils in the Mississippi-Missouri confluence region and their uniqueness, taking care to avoid alteration of the hydrology of the area due to disruption of the ridge/swale topography. Keystone should reduce construction impacts by scheduling construction activities in Riverlands during early summer and ending construction prior to autumn.

(8) To decrease possible conflicts with hunting and other recreational activities in wildlife management and public conservation areas, Keystone should consult with public land managers to schedule construction activities in wildlife management and public conservation areas to avoid important recreational periods, and to create a maintenance plan for the permanent ROW that avoids important recreational periods and results in reduced disturbance to these areas. Where the pipeline follows an existing ROW in a wildlife management or public conservation area, Keystone should attempt to route the pipeline as close as possible to the existing ROW in order to reduce the overall footprint of these features in wildlife management and public conservation areas.

(9) To mitigate conflicts with general recreational uses, Keystone should use fencing and gates to prevent unauthorized access to the ROW immediately following the start of construction activities. Keystone should maintain and monitor fences and gates until permanent mitigation measures can be put in place. Keystone should commit to prevention of trespass in all of its potential forms on the construction and permanent ROW, using the stated mitigation measures, to be implemented at the time of restoration and mitigation.

(10) To further reduce visual impacts from aboveground pipeline facilities and structures, Keystone should require painting with a non-reflective coating similar in color to the surrounding terrain and several shades darker, using colors that account for seasonal change in landscape colors. Keystone should use a vegetative barrier to shield a facility from sight when it is within viewing distance of a residence, or when otherwise appropriate.

(11) For the Milford Wildlife Area, the primary concerns are limited access and conflicts with hunters during construction. Therefore, Keystone should develop a site-specific crossing plan for the Milford Wildlife Area and should work with Milford Wildlife Area managers to schedule construction activities in order to avoid seasonal hunting conflicts with the public hunting area.

5.10 SOCIOECONOMICS

5.10.1 Conclusions

The proposed pipeline construction has the potential to generate substantial direct and indirect economic benefits. Keystone is expected to utilize temporary local construction labor where possible; it is estimated that from 10 to 15 percent of the total construction work force could be hired from local communities. Likewise, it is estimated that from 2,800 to 3,600 non-local residents would temporarily move into the area of influence. This would translate into 2,900 housing units, 14,400 rental units, and 34,100 hotel rooms. Keystone estimates that, at the local level, construction income benefits are expected to total from $28 to $48 million. Approximately 40 percent of the cost of construction goods and services, or from $44 to $52 million, would be spent locally.

Potentially negative impacts include agricultural losses, which would be compensated by Keystone during the easement procurement process, and increased demands on local highways and emergency services. Keystone does not anticipate any other increased public expenditure. Some disruption of traffic flows would be expected; Keystone would use public and preexisting private roads to access most of the ROW. Any impacts on local roads would be repaired by Keystone.

Operations impacts also are expected to be positive. The cost of operational goods and services is estimated at $1.3 million per year, plus an additional $46.5 million for electricity. About 90 percent of this ($43 million) would be spent locally in the Project area. Approximately 26 permanent full-time jobs would be associated with operation of the pipeline, representing an annual payroll of $5.5 million. The project would generate additional property tax revenues of approximately $46.7 million throughout the Project area.

Agricultural losses along the pipeline corridor would likely be relatively low; however, in a very unlikely "worst case" scenario, over 16,000 acres of CRP enrolled lands could be affected. This scenario assumes that all acreage enrolled in the program along the corridor would be sufficiently affected that the land would need to be removed from the program according to the rules of the CRP program. In reality, the actual acreage that would be removed is likely to be a fraction of the overall enrolled acreage. Nonetheless, if all of the acreage were removed, affected landowners would lose $802,000 in annual rental income payments. Keystone has agreed to address the actual economic impacts resulting from crossing CRP lands on a case-by-case basis with the individuals potentially affected. Property value effects at the community or regional scale would likely be negligible for two reasons: (1) land uses on parcels adjacent to the pipeline would not be affected, and land could continue to be used in its highest and best use; and (2) the proposed pipeline would be underground and therefore would not adversely affect the regional amenity values that contribute to property values. In addition, as part of the ROW procurement process, Keystone would negotiate with the affected landowners to obtain an easement, compensating for any losses, including potential decreases in property values.

Expansion of the Wood River Refinery in response to increased crude oil deliveries from the Keystone pipeline is expected to generate both positive and adverse socioeconomic effects. Expansion of the Wood River Refinery is estimated to cost approximately $1 billion, which likely would include expenditures on

capital equipment, other goods and materials, services, and labor. To the extent that these expenditures are made in the local region, for example Madison County, and industries are present to meet Project demands, the Project would result in substantial regional economic benefits. Within an input-output model framework, these benefits would include increases in direct, indirect, and induced economic output; value added (i.e., labor income, other property income, and indirect business taxes); and employment in the region.

In the long term, expansion of the Wood River Refinery would result in greater refining capacity and increased production/output in the refined petroleum industry. Based on an estimated 340,000 bpd in increased crude oil shipments and an approximate crude oil contract price of $60 per barrel, the estimated value of refinery inputs is $20.4 million per day, or $744.6 million annually. Other socioeconomic parameters that could be affected by expansion of the Wood River Refinery include increases in fiscal revenues and increased demands for public services and other local resources.

Potentially adverse socioeconomic effects could occur—particularly during construction—as a result of increased demand for a range of public services, including law enforcement, fire protection, and medical aid. This could disproportionately affect lower income areas. Depending on the characteristics of the construction workforce, demands may increase for short-term housing in the region, such as hotels/motels and rental units, driving rents up and affecting lower income or minority populations. Other environmental justice concerns, such as disproportionate air and water quality impacts to communities, would not be expected.

5.10.2 Recommendations

Mitigation to address impacts on CRP lands is summarized in Section 5.9.2. No additional mitigation measures have been recommended, other than those proposed by Keystone in Sections 3.9 and 3.10.

5.11 CULTURAL RESOURCES

5.11.1 Conclusions

Section 106 of the NHPA, as amended, requires the lead federal agency with jurisdiction over a federal undertaking (i.e., a project, activity, or program that is funded by a federal agency or that requires a federal permit, license, or approval) must consider impacts to historic properties before that undertaking occurs. A historic property is defined as any Pre-contact (prehistoric) or historic district, archeological site, building, structure, or object included in, or eligible for, inclusion in the NRHP. Keystone, through its contractors, has examined all portions of the Keystone Mainline Project and Cushing Extension pipeline for which survey permission was obtained. Keystone also has purchased the rights to use cultural resources survey results for overlapping portions of the proposed Rockies Express (REX) natural gas pipeline project in Nebraska, Kansas, and Missouri. The appropriate SHPOs and DOS approved Keystone's use of the REX survey results for the Keystone Project.

Keystone estimates that its cultural resources inventory and geoarcheological studies will be completed and reported to DOS by April 2008. Reports filed by Keystone to DOS in July 2007 indicate that the combined Keystone and REX cultural resources field inventory studies have identified 257 cultural resources within the Project APE to date, of which:

- Three are sites that have been fully assessed by Keystone as being recommended eligible.

- Thirty-four are sites that have been assessed at a preliminary level as meeting one or more of the NRHP criteria, but have not been subjected to additional testing to verify their eligibility.
- Twenty-six are archeological sites that were initially assessed as meeting Criterion D of the NRHP but that were subsequently tested by Keystone's contractors and recommended as being not eligible for the NRHP.
- Twelve are archeological sites that lie partially within the Project APE, but a recommendation of NRHP eligibility under Criterion D for the site was not made by Keystone's contractors.
- Four are historic-era cemeteries that either do not currently meet NRHP Criterion D or were unevaluated; Keystone contractors have recommended avoidance in order to not adversely affect burials.
- One site is a known cultural resource that was previously recorded within the Project APE but could not be assessed by Keystone due to a landowner's refusal to enter the property.
- One hundred seventy-seven are cultural resources that were assessed by Keystone's contractors as not meeting any of the NRHP criteria.

An additional eight archeological sites and a single historic cemetery were discussed within documents filed by Keystone; however, their contractors determined through field investigations that these cultural resources did not extend into the Project APE.

All of the cultural resources identified to date have resulted from field studies conducted by Keystone's contractors. DOS is currently engaged in consultation with federally recognized Native American Tribes and other public groups to determine whether any traditional cultural properties (TCPs) that meet the definition of a historic property are situated within the Mainline Project or Cushing Extension APEs.

DOS, as the lead agency, will provide a final determination of eligibility for all identified cultural resources that have been, or that will be, reported by Keystone. This determination will be performed through consultation with each SHPO, as well as COE, USFWS, and Native American Tribes. DOS is currently working on a programmatic agreement (PA) that will be signed by consulting parties who want to enter into an agreement. This PA will outline the steps that will be conducted in order to complete the project, including the evaluation of NRHP eligibility, determination of Project effects, and mitigation measures as outlined below.

5.11.2 Recommendations

Keystone has stated that it will avoid adverse effects to all historic properties or potential historic properties that are identified within the Mainline Project and Cushing Extension APEs. This includes cultural resources and TCPs that are determined to be eligible or identified in this document as "potentially eligible "for listing in the NRHP. It also shall include cultural resources for which a determination of NRHP eligibility has not, or could not, be obtained. To ensure that this goal of no adverse effects is met, we recommend the following actions:

(1) Keystone has not yet completed cultural resource inventory and geoarcheological testing studies for portions of the Mainline Project and Cushing Extension where survey permission was denied by the landowner, route realignments, additional temporary workspaces located outside of the surveyed corridor, compressor station sites, associated aboveground appurtenant facilities, and access roads that will be used during construction of the project. Keystone shall defer construction and use of each area until:

(a) Keystone files the additional required cultural resources inventory or geomorphological reports to DOS and the relevant SHPO (or federal agency if federally-managed lands are involved);

(b) DOS has had the opportunity to consult with the SHPO and other interested agencies, where applicable, and make determinations of eligibility for all cultural resources identified within the currently unreported areas;

(c) DOS has had the opportunity to consult with Native American Tribes or other interested and consulting parties, where applicable, to ensure that the newly proposed project area does not conflict with NRHP-eligible or potentially NRHP-eligible TCPs;

(d) DOS is provided evaluation, avoidance, and/or treatment plans, as necessary, for any NRHP-listed, NRHP-eligible, or potentially NRHP-eligible historic properties that are identified within the APE;

(e) ACHP has been provided an opportunity to comment if any historic properties would be adversely affected by construction; and

(f) DOS reviews and approves all reports and plans and notifies Keystone in writing that it may proceed with the treatment plan or construction.

All material filed with DOS that contains location, character, and ownership information about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering: "**CONTAINS PRIVILEGED INFORMATION – DO NOT RELEASE**."

(2) Keystone has indicated that it will avoid adverse effects to some historic properties or potential historic properties by tunneling underneath using bores or HDDs. Keystone shall ensure that engineering and drilling teams that are responsible for said tunneling are aware of the presence of a historic or potential historic property. In the event that the bore tunnel collapses or the HDD fracs-out, Keystone shall cease work at the location. Keystone shall implement their filed Unanticipated Discoveries Plan for cultural resources and ensure that the archeological site or historic structure is assessed by an archeologist or architectural historian prior to construction re-commencing. Keystone shall submit a report to DOS and the SHPO (or federal agency, if federally-managed lands are involved) that documents the tunnel failure and the results of the site examination. If an adverse effect to the historic property has resulted from the drill failure, a mitigation plan shall be developed and implemented by Keystone in consultation with the SHPO, DOS, and any relevant Native American Tribe, or other federal agency.

(3) Keystone, DOS, Native American Tribes, SHPOs, and other consulting parties are currently negotiating a PA for addressing Section 106 cultural resource concerns. The PA is intended to create a binding protocol for its parties regarding the identification and management of historic properties during construction of the Mainline Project and Cushing Extension. If there is any disagreement between parties that have signed a PA and these recommendations, the process for resolving disagreements outlined in the PA shall be followed.

5.12 AIR AND NOISE

5.12.1 Conclusions

Two types of impacts on air quality were considered for this analysis: temporary impacts resulting from emissions associated with construction activities, and long-term or permanent impacts resulting from emissions generated from continued operation of a stationary source.

Construction of the proposed Keystone Project would be similar to other pipeline projects in terms of schedule, equipment used, and types of activities. Because pipeline construction would move through an area relatively quickly, air emissions typically would be localized, intermittent, and short term. Emissions from fugitive dust, construction equipment combustion, open burning, and temporary fuel transfer systems and associated tanks would be controlled to the extent required by state and local agencies, as explained above. Because Keystone will be required to comply with applicable regulations, emissions from construction-related activities would not significantly affect local or regional air quality. Project operations would not produce significant air quality impacts, and only minor emissions from the backup gasoline generator and fugitive emissions from valves, tanks, and pumping equipment would occur. Because operating emissions are expected to be minimal, no operational permits would be required.

Construction would increase noise levels in the vicinity of Project activities; noise levels would vary during the construction period, depending on the construction phase. Residential, agricultural, and commercial areas within 500 feet of the Mainline Project and the Cushing Extension ROW would experience short-term inconvenience from construction equipment noise. Noise impacts from construction would be mitigated in accordance with Keystone's Mitigation Plan (Appendix B) to reduce effects on individuals, sensitive areas, and livestock. To limit disturbance of residential and commercial areas within 500 feet of construction activities by increased noise levels, Keystone would give advanced notice to landowners prior to construction, limit the hours during which construction activities with high-decibel noise levels are conducted, and ensure that construction proceeds quickly through such areas. Additional recommendations are summarized in Section 5.12.2.

During operation of the pipeline, the noise associated with the electric pump stations would be limited to the immediate vicinity of the facilities. Although noise impacts from the electric pump stations are projected to be minor, Keystone would perform a noise assessment survey during operations to confirm the level of noise at each listed noise-sensitive area. Project-related operations therefore are not expected to result in a significant effect on the noise environment.

5.12.2 Recommendations

(1) In addition to the measures described in Section 3.12.2 to mitigate air quality impacts, Keystone should cover all open-bodied trucks while in motion to reduce fugitive dust emissions.

(2) In the event that the contractor expects noise levels to exceed regulated noise standards (based on the types of construction equipment used or construction procedures), notice would be given to Keystone so that immediate noise attenuation could be achieved.

(3) Keystone should set up a hotline to enable individuals to contact Keystone in the event that construction noise levels become problematic at a given location. In those instances, Keystone should conduct noise assessment surveys at the affected areas to ensure that the noise attributable to construction does not exceed 55 dBA Ldn.

(4) In the event that construction noise cannot meet regulated levels, Keystone should work with the affected individuals to develop an acceptable alternative construction work plan.

(5) Keystone should ensure that construction equipment is operated on an as-needed basis and is maintained to manufacturers' specifications in order to minimize noise impacts.

5.13 RELIABILITY AND SAFETY

5.13.1 Conclusions

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

The reliability and safety of the Keystone project can be expected to be well within industry standards. Further, the low probability of large, catastrophic spill events and the routing of the pipeline to avoid most sensitive areas suggest a low probability of impacts to human and natural resources. Nevertheless, some potential for construction- and operations-related spills can be expected. Commitments and procedures described for reliability and safety in this section and in Appendices B and C are intended to mitigate spill effects, particularly when considered in combination with rapid and effective response and clean-up procedures.

5.13.2 Recommendations

To prevent or mitigate potential oil spills during pipeline construction, measures would be implemented at each construction or staging area where fuel, oil, or other liquid hazardous materials are stored, dispensed, or used. In addition to the mitigation included in the Mitigation Plan (Appendix B), the following measures are recommended:

(1) Because the exact quantity and specific locations of oil and fuel tanks and fueling trucks have not been determined, Keystone should prepare a site-specific oil Spill Prevention, Control, and Countermeasure (SPCC) Plan that contains all requirements of 40 CFR Part 112 for every location used for staging fuel or oil storage tanks and for every location used for fuel or oil transfer—even if the site-specific oil capacity is below the threshold stated in that rule to require such a plan. Each SPCC Plan is to be prepared and submitted prior to introducing the subject fuel, oil, or hazardous material to the subject location.

(2) Prior to construction, all project personnel will be given an orientation outlining the environmental permit requirements and environmental specifications including the requirement that fuel or oil storage tanks cannot be placed closer than 100 feet to wetlands or water bodies.

(3) Environmental inspectors will place signs a minimum of 100 feet from the boundaries of all wetlands and water bodies prior to construction. The construction contractor will not be

allowed to place a fuel or oil storage tank without first getting the environmental inspector to inspect the tank site for compliance with the 100-foot setback requirement and receiving approval of the tank site from the environmental inspector.

(4) During construction, no fuel or storage tank will be allowed to be relocated within or to a new construction yard by the contractor without first getting the environmental inspector to inspect the tank site for compliance with the 100-foot setback requirement and receiving approval of the tank site from the environmental inspector.

(5) Fuel and storage tanks should be placed only at contractor yards. No fuel and storage tanks should be placed on the construction ROW.

(6) No oil or hazardous material storage, staging, or transfer other than refueling should occur within 50 feet of any surface water body, surface drainage, storm drain drop inlet, or HCA.

(7) Any fuel truck that transports and dispenses fuel to construction equipment or Keystone Project-related vehicles along the construction ROW or within equipment staging and material areas should carry an oil spill response kit and spill response equipment onboard at all times. In the event that response materials are depleted through use, or their condition is deteriorated through age, the materials should be replenished prior to placing the fueling vehicle back into service.

(8) Oil and other hazardous materials stored in 350-gallon totes, 55-gallon drums, 5-gallon pails, smaller retail-sized containers or other portable containers should be staged or stored in areas with a secondary means of containment.

(9) Fixed-fuel dispensing locations should be provided, with a means of secondary containment to capture fuel from leaks, drips, and overfills.

5.14 REFERENCES

APLIC. See Avian Power Line Interaction Committee.

Avian Power Line Interaction Committee. 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, DC. and Sacramento, CA. Available online at: <http://www.aplic.org/>. Accessed on December 6, 2006.

ENSR. 2006a. Keystone Pipeline Project Environmental Report. Updated November 15, 2006.

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Appendix A

Scoping Summary Report

U.S. Department of State
Scoping Summary
for the
Keystone Pipeline Project
Environmental Impact Statement

December 2006

1.0 INTRODUCTION

TransCanada Keystone Pipeline, L.P. has applied to the United States Department of State (DOS) for a Presidential Permit at the border of the United States for the proposed construction, connection, operation, and maintenance, of facilities for the importation of crude oil from Canada. DOS determined that the issuance of the Presidential Permit would constitute a major federal action that may have a significant impact upon the environment within the context of the National Environmental Policy Act of 1969 (NEPA), and on October 4, 2006 issued a Notice of Intent (NOI) to prepare an environmental impact statement (EIS) to address reasonably foreseeable impacts from the proposed action and alternatives.

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

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

The scoping period extended from the date of publication of the NOI in the Federal Register through November 30, 2006.

2.0 SCOPING MEETINGS

DOS held 13 separate scoping meetings in the vicinity of the proposed route to give the public the opportunity to provide comments regarding the scope of the EIS. The dates and locations of the meetings are listed below, along with the attendance at each meeting (in parentheses).

October 24 – Michigan, North Dakota (55)
October 25 – Lisbon, North Dakota (34)
October 26 – Clark, South Dakota (18)
October 24 – Yankton, South Dakota (36)
October 25 – Stanton, Nebraska (36)
October 26 – Seward, Nebraska (35)
November 1 – St. Charles, Missouri (32)
November 2 – Collinsville, Illinois (24)
November 8 – Carrolton Missouri (23)
November 9 – Seneca, Kansas (20)

November 14 – Abilene, Kansas (38)
November 15 – El Dorado, Kansas (34)
November 16 – Morrison, Oklahoma (31)

3.0 SCOPING COMMENTS

The verbal scoping comments and comment forms received during, or shortly after, the scoping meetings are summarized below. Other public and agency comment letters received by DOS are described in Section 3.2 of this report.

3.1 Comments Received at Scoping Meetings

DOS received a wide variety of comments at the scoping meetings, including concerns that were not related to environmental issues. All verbal comments formally presented at the meetings were recorded and transcribed. Additional written comments were received on comment forms provided to the public at the meetings. Comments that addressed environmental concerns are listed below under the major headings for the EIS. Comments have been summarized as appropriate, particularly for concerns that were raised by several commentors.

Purpose and Need

1. Provide information on the distances between the proposed pipeline alignment and pipelines that will be paralleled by the proposed route.
2. Provide information on the need for the pipeline, and address whether or not the planned Kinder Morgan expansion and the Enbridge pipeline would meet the needs that Keystone plans to meet with this project.
3. Discuss why it is important to bring a crude oil pipeline extension to Cushing, Oklahoma instead of building a refinery further north for oil to be shipped to the east coast.
4. Describe how the project could affect efforts to expand the use of renewable energy resources (such as ethanol and biodiesel).
5. Indicate what other agencies, municipalities, and counties would be involved in reviewing and approving the project, including specific permits, reviews, approvals, and variances required.
6. Indicate how long the oil supply for the pipeline is projected to last at the throughput volumes planned for the project.

Project Description

1. Describe the anticipated method – or optional methods – that would be used to abandon and remove the pipeline.
2. Describe the methods that would be used to cross under or over other pipelines and other utility lines.
3. Indicate whether or not pipe to be used for the project would be purchased from U.S. firms.
4. Provide a schedule for construction, including the estimated duration per pipeline mile, the duration of construction per pipeline spread, and duration of construction per day.
5. Describe horizontal direction drilling techniques and state the depth beneath the river bed that would be drilled.
6. Describe the maintenance procedures that would be used to ensure pipeline reliability during operation.
7. How long will the pipeline be in use and maintained?
8. Indicate whether or not heating units would be installed along the system.

9. Describe the regulatory restrictions regarding proximity to residences and other buildings, including historical buildings and sites.
10. Indicate what will be done with trees that are removed from the right-of-way.
11. Indicate what the temperature of the oil will be in the pipeline.
12. Describe any special protection measures that may be used in high-risk areas.
13. Provide information on the burial depth of the pipeline along all portions of the alignment.
14. If the pipeline is shut down for a period of time with crude oil in the line, describe the procedures that would be implemented to return the line to service.
15. Discuss construction techniques and depth of burial of pipeline in solid rock areas. Include potential to move the pipeline out of these areas.
16. Describe what would happen to farm fences during construction.
17. Discuss the potential to change the product shipped through the pipeline at a later date.
18. How will electricity be supplied to the pump stations?
19. Describe what maintenance and inspection activities are required by regulations and what specific activities Keystone will conduct as a part of maintenance and inspection; including the schedule for those activities.
20. Describe how maintenance activities would continue should the pipeline be sold.
21. Describe how the ROW will be protected from trespassers, off-road vehicles, vandals, and potshotters.
22. Use "cascading" water for hydrotesting. Address potential cross-watershed ecotoxicology concerns for testwater disposal. Consider using two inflatable pigs and test in between.
23. Describe locations of pump stations and pig removal point.

Environmental Consequences

Soils & Geology

1. Address the potential for soils settling in the permanent right-of-way during the life of the project.
2. Address the potential for soils settling along the route after abandonment of the project based on the anticipated abandonment procedures that would be used.
3. Evaluate the impact of soil compaction due to the use of heavy construction equipment and how the soils could be returned to their original structure.
4. Describe the methods to be used to separate topsoil from subsoil during excavation of the trench and the sequence of events to be followed during burial of the installed pipeline.
5. Demonstrate how the identity of the topsoil will be preserved and how it will be returned to the correct place.
6. Address the issue of restoring the right-of-way land to its previous state. Address the removal of boulders and other debris and proper disposal of the debris. Describe the size of stones that would be left behind.
7. Address the potential for erosion along the route, particularly in hilly areas.
8. Describe the methods to be used to stabilize stream banks and address the associated potential for erosion.
9. Address impacts and mitigation for wind erosion, especially if wind and shelter breaks are removed or disturbed.
10. Address the potential effects of the temperature of the pipeline on the surrounding soils, including effects on soil freezing and drying.
11. Address the potential for rock slope instability at or near crossing of Whitewater River in Kansas.

12. Address fault lines in Kansas and construction methods in areas subject to earthquake.

Groundwater

1. Evaluate the impacts of construction, normal operation, and upset conditions on springs and on groundwater wells used for drinking water.
2. Describe what procedures would be put in place to provide drinking water if groundwater is polluted due to a spill, including long-term procedures in the event that cleanup after a spill does not return groundwater to drinking water quality.
3. Address the potential for impacts to the West Oaks aquifer in North Dakota.
4. Address the potential for impacts to the aquifer in the vicinity of Carpenter, South Dakota.
5. Address the potential for impacts to the Oglala aquifer (near Seward County, Nebraska).
6. Evaluate the potential for impacts to the Fordville aquifer (in the vicinity of the Michigan, North Dakota).
7. Consider impacts to the Sand Lake aquifer in Dickie County, North Dakota. Consider a reroute further to the east of the current proposal.
8. Address impacts to septic systems.

Surface Water

1. Address the potential for erosion in creek beds during and after pipeline construction.
2. Consider whether or not there would be an effect on the dike near Seward, Nebraska as a result of installation of the pipeline. Floods are common in the area and altering the ground near the dike could impact its integrity. Consult with the Corps of Engineers on the issue.
3. Evaluate the potential impact of the project on reservoirs and in particular on the Matajeck Dam (in the vicinity of Lankin, North Dakota) and the Milford Reservoir in Kansas.
4. Evaluate the effects of leaks and construction on Sooner Lake Reservoir in Oklahoma.
5. Evaluate the impacts of construction, normal operation, and upset conditions on farm ponds.
6. Evaluate the effects of spills on surface impoundments used for domestic water, and also the effects of runoff during construction.
7. Address impacts in sewage treatment plants (in particular the Towanda Treatment Facility in Kansas) and individual septic systems.
8. Evaluate the effects on drain tiles and the potential for drained farmland to become inundated. Describe how drainage systems will be reconstructed.

Wetlands and Vegetation

1. Evaluate the impact on native prairie and other areas of native vegetation that the route might cross. Assess impacts on areas that are burned each year to ensure proper growth.
2. Evaluate the impacts of the project on wetlands and describe the mitigation procedures that would be implemented to offset impacts.
3. Evaluate the impacts of the project on woodland areas.
4. Indicate what regulations would require stream bank stabilization during and immediately after construction, as well as what regulations would require that Keystone repair stream bank stabilization structures that become damaged.
5. How will the temperature of the pipeline impact vegetation and crops in the right-of-way?

6. Evaluate whether or not the burial depth of the pipeline is sufficient to avoid problems with the roots of crops such as alfalfa and corn.
7. Discuss revegetation of the pastures and farm grounds. Include discussion of how the revegetated areas would be monitored to ensure that the vegetation becomes properly established.
8. Discuss potential for invasive and noxious weeds infestations and potential for outbreaks in future years.
9. Discuss the impacts of trenching on regrowth, particularly during drought periods.

Fish and Wildlife

1. Describe the impact of the project on game animals, such as deer and turkey, and on their woodland habitats.
2. Address impacts on bull frogs and toads.
3. Address disturbance impacts on bald eagles in Oklahoma.

Land Use, Recreation, and Visual Resources

1. Address the issue of eminent domain and how it may or may not apply to this project.
2. Evaluate the impact of restrictions on land-use over and near the pipeline, such as restrictions on constructing new buildings.
3. Address the potential impacts to bicycle trails in Madison County (South Dakota).
4. Evaluate the impacts of the project on daycare centers along the route in Missouri.
5. Evaluate the impact on special use areas (such as walnut tree groves in the Seward Nebraska area and a nursery in Sargeant County, North Dakota).
6. Evaluate the impact of soil compaction on farmland due to the use of heavy construction equipment.
7. Evaluate the impact of the proposed construction methods and schedule on agricultural activities, particularly in areas where center pivot irrigation is used, and the duration of time that it would not be possible to conduct agricultural activities during construction.
8. Evaluate the impacts of construction on agricultural uses, including impacts on surface and subsurface drainage, ponds, waterlines, and drainage ditches.
9. Evaluate the impact of the project on CRP program lands.
10. Address the potential for farmers to have difficult access to farmland during construction, particularly in areas with extensive amounts of wetlands surrounding the farmland.
11. Evaluate whether or not wetland impacts that occur during project construction would have an effect on farmers who are currently eligible for federal payments associated with protection of wetlands on farmland (USDA Farm Service Agency).
12. Evaluate the impact of the project on landowners with CRP lands.
13. What compensation would Keystone provide for impacts to crop production along the construction right-of-way?
14. How will cattle be protected during construction?

Cultural Resources

1. Address impacts on cemeteries (Native and non-Native) and historic burial grounds.

2. Address the impact of the project on archaeological sites (including ancient Indian campgrounds in the Cahokia Creek area, and artifacts and possible burial grounds in the Michigan, North Dakota area).
3. Address the potential impacts of the project related to cultural sites in northeast North Dakota, including those relevant to the Turtle Mountain band of Chippewa Indians.
4. Address the impacts on Native American graves in Oklahoma, and in particular on a cemetery for the Ponca Indians.
5. Ensure that grave site locations are not published in the EIS because to do so will invite grave robbers.
6. Address impacts of blasting and pipeline vibration on historic structures, particularly those constructed of limestone blocks.

Socioeconomics

1. Address the issue of perpetual easements versus annual rental fees.
2. Address the issue of the potential decrease in property value and impacts on planned development.
3. Describe the influence of the project on the U.S. trade deficit.
4. Evaluate the economic impact on special use areas (such as walnut tree groves in the Seward, Nebraska area, and a nursery in Sargeant County, North Dakota).
5. Indicate what the project-related tax revenues would be to the municipalities and counties along the pipeline route associated with construction and during operation for the life of the project.
6. Indicate whether or not the project-related tax revenues would offset costs to the principalities and counties along the route (such as the cost of road repairs due to damage caused by construction traffic).
7. Will electricity costs rise due to the need for additional power at the pump stations?
8. Discuss potential financial losses associated with destruction of grasslands.

Transportation and Traffic

1. Address the impacts associated with use of county and private roadways during construction, including how Keystone would restore or provide compensation for, or repair of the roadways.
2. Describe the methods that would be used to cross roadways, including the extent and duration of road closures associated with construction across roadways, and the impacts associated with each construction method.
3. Describe how access to ROW will happen.

Air Quality, Noise and Vibration

1. Address potential impacts of noise from pump stations to both human receptors and cattle.
2. Address air pollution abatement for pump stations.
3. Address potential for oil moving through the pipeline to cause vibration that would then impact nearby houses.
4. Address impacts of rock blasting and dynamiting during construction in rocky areas.

Reliability and Safety

1. Describe what procedures would be put in place to protect the pipeline from terrorist activities or vandalism. Delineate the parties responsible for pipeline safety.
2. Address the issue of unauthorized access to or use of the pipeline right-of-way.
3. Address the potential safety issues associated with crossing under or over other pipelines.
4. Describe how spills that reach rivers will be contained or cleaned up (such as the Red, Grand Forks, and Fargo Rivers), and indicate the anticipated likely extent of contamination (in terms of miles downstream of the spill site).
5. Provide information on cleanup methods that would be used in sub-zero temperatures.
6. Indicate what entity would be responsible for cleanup after a spill.
7. Describe how a release from the pipeline would be detected when there is snow cover throughout the area of the release.
8. Address the potential for deep frost to affect pipeline integrity.
9. Indicate whether or not Keystone would provide landowners with a written commitment to compensate them for releases that would affect the value of the land.
10. Provide information on the anticipated number of leaks per year.
11. Describe all pipeline safety requirements that Keystone would be required to comply with and any additional safety features that would be included in the project.
12. Provide information on environmental problems that have been documented for other pipelines in the area.
13. Describe TransCanada's safety record.

Alternatives

1. Describe how the alternatives were determined and screened.
2. Consider crossing property along routes such as quarterlines that would avoid cutting the land up so much that it would be difficult to work on.
3. In the Clark, South Dakota area, address the possibility of using the abandoned railway line as an alternative route.
4. Describe why an earlier route in Marshall County (North Dakota) was revised to move the pipeline closer to or over the West Oaks aquifer.
5. Describe why an earlier version of the pipeline route was moved in response to concerns raised by the U.S. Fish and Wildlife Service (in North or South Dakota).
6. Evaluate route alternatives or variations that would avoid crossing bicycle trails, particularly in Madison County (South Dakota).
7. Evaluate route alternatives or variations that would minimize the loss of trees and woodland areas.
8. Evaluate route alternatives that would avoid crossing over the Oglala aquifer (near Seward County, Nebraska).
9. Evaluate route alternatives that would avoid the flood plain west of Seward, Nebraska.
10. Include the planned Kinder Morgan pipeline expansion and the Enbridge pipeline in the consideration of systems alternatives.
11. Evaluate the alternative of expanding refining capacity in Canada, refining the oil from the source planned for shipment in the Keystone pipeline, and shipping petroleum products to the US instead of crude oil.
12. Evaluate the use of renewable energy sources to meet the market demands that the energy derived from the Keystone project would meet.
13. Evaluate the alternative of avoiding construction through agricultural areas in the spring and summer.

14. Consider alternative routes that are adjacent to or within existing interstate highway rights of way.
15. Consider alternative routes or route variations that would avoid sensitive areas such as cemeteries (for example, the Schickle Cemetery in the vicinity of Lisbon in North Dakota).
16. Consider alternative routes that would avoid potential impacts to the Sand Lake aquifer in Dickie County, North Dakota.
17. Discuss the feasibility of using existing rights-of-way, especially for the Cushing Extension.

Cumulative Impacts

1. Address impacts when combined with the Rockies Express pipeline.
2. Address past and present effects of the Platt Pipeline in conjunction with the proposed Keystone and other pipelines.
3. Consider the cumulative effects of the Stillwater pipeline in Oklahoma (domestic water) in conjunction with the proposed project.
4. Consider impacts in conjunction with other linear projects such as railroads and interstate highways.
5. Discuss the potential for developing another pipeline within the right-of-way for Keystone.

3.2 Comment Letters Received by DOS

DOS received additional written scoping comments from several agencies, individuals and organizations and are summarized below.

3.2.1 Agency Comment Letters

The DOS has received the following letters from state and/or federal agencies:

- State Historical Society of North Dakota, August 23, 2006 – "...we concur with the level and scope of identification efforts proposed for cultural resources in the TransCanada Keystone project area."

- United Keetoowah Band of Cherokee Indians in Oklahoma, August 21, 2006 – "We accept your invitation to become a consulting party in the matter with a government-to-government relationship."

- Sac and Fox Nation of Missouri in Kansas and Nebraska, September 28, 2006 – "No objections. However, if human skeletal remains and/or any objects falling under NAGPRA are uncovered during construction, please stop immediately and notify the NAGPRA representative....."

- Advisory Council on Historic Preservation (ACHP), Oct. 5, 2006 - "...the ACHP will enter consultation at this time to ensure that the purposes of Section 106 are met."

- Department of the Army, Corps of Engineers, Omaha District, October 26, 2006 – *Flood plains* – construction should not be located in the 100-yr flood plain. If this is not practicable, construction must be flood proofed. All construction should be designed to

minimize potential harm to or within the flood plain. "The goal of any construction in the flood plain is to achieve the highest level of flood protection with zero impact to adjacent property." Construction must follow Executive Order (EO) 11988. The project will encounter numerous counties/communities which participate in the National Flood Insurance Program. Construction in these areas must be compliant with state, county and/or local flood plain ordinances.
Groundwater – Your plans should be coordinated with the U.S. Environmental Protection agency, which is currently involved in a program to protect ground water resources.
Fish and Wildlife – If not already done, it is recommended you consult with the U.S. Fish and Wildlife Service, the South Dakota Game, Fish, and Parks Department, and the Nebraska Game and Parks Commission.
Cultural Resources – The South Dakota and Nebraska State Historic Preservation Offices should be contacted for information and recommendations.
Section 404 – If any construction activities involve any work in water of the United States, a Section 404 permit may be required. Preliminary and final project plans should be sent to both the Pierre Regulatory Office and the Wehrspann Regulatory Office.

- U.S. Environmental Protection Agency, Region 8, November 30, 2006 – "Region 8 is the lead region for the EPA on this project." "Our primary concerns are with any potential wetlands and water quality impacts, the control of noxious weeds and invasive plants, and impacts relation to Environmental Justice concerns." We offer specific mitigation recommendations (attached) for the following ten areas: 1)Protecting wetlands and riparian areas and associated ecosystems, 2) Mitigation of wetlands, river, stream, lake and riparian impact areas, 3) Protecting ground and surface water quality, 4) Protection of air quality, 5) Road and construction issues, 6) Environmental Analysis findings from Canada, 7) Noxious weeds and invasive plants, 8) Effects on vegetation, wildlife habitats, and area hunting /fishing, 9) Cumulative Impacts, and 10) Potential project effects on local communities, and reasonably foreseeable development considerations.

3.2.2 Public Comment Letters

In addition to verbal comments and comment forms (summarized in Section 3.1), public comment letters have been received from individual landowners and other concerned parties. The letters incorporate many of the comments and questions outlined above in Section 3.1. Additional topics not covered are summarized below:

Environmental Consequences

Soils

1. Discuss impacts on land within St. Charles County; soil instabilities created by the pipeline would have economic effects on farming in the county for 3-5 years.

Fish and Wildlife

1. Discuss impacts on pheasants and beaver in addition to quail and turkey.

Vegetation

1. Discuss the protection of old growth native timber especially in the vicinity of Lincoln Creek in Nebraska.

2. Address concerns related to maintain "chemically free" status as an organic farm.

Surface Waters and Flooding

1. Discuss impacts on flood protection such as dikes and the use of terracing especially in the area of Seward Nebraska. Farmland in the impacted areas would be more prone to aggressive flooding and erosion.

Groundwater

1. Address impacts to the Lone Bear Aquifer in North Dakota.

Other Issues

1. Address issues related to emotional stress of landowners in the right-of-way.

2. Senator John O. Jones 54th Legislative District, Illinois, wrote in support of the Keystone pipeline project on October 25, 2006.

3. On November 28, 2006, Curt Holm, WEB Water Development Association General Manager in North Dakota, wrote with several concerns regarding the impacts of the Keystone Pipeline on the rural water system and the rural community served by WEB. The concerns include that in the event of a spill or leak, the PVC waterlines could be breached and the water supply contaminated. The letter suggests that the oil pipeline be encased in a second steel pipe for 300 ft on either side of the water line were crossed. The letter also states that the EIS should address the emergency response measures in the event of a leak or spill. WEB recommends that emergency response personnel be stationed at intervals of not less than 70 to 90 miles. The EIS should also address the effects of a spill or leak on the James River basin. Before a permit is issued a sample of the crude oils should be taken and analyzed to determine potential impacts on PVC pipe, soils, water, air quality and the environment. Other issues discussed in the letter include giving sufficient prior notice for construction commencement (2-3 weeks), creating a dispute resolution process, requiring that all road crossings be bored rather than open cut, and providing a toll-free hot line for project concerns and complaints.

Appendix B

Construction, Mitigation and Reclamation Plans

1) **Keystone Pipeline Project Construction Mitigation and Reclamation Plan**

2) **Standard Mitigative Measures for Construction, Operation and Maintenance of Western Facilities**

3) **Western Area Power Administration Construction Standards - Standard 13**

KEYSTONE PIPELINE PROJECT

CONSTRUCTION MITIGATION AND RECLAMATION PLAN

TransCanada

In business to deliver

Prepared By

UNIVERSAL ENSCO, INC.

April 4, 2006
Rev. 3

1.0 INTRODUCTION

The construction mitigation and reclamation requirements described in this Plan apply to work on all project lands including the following:

- Uplands including agricultural (cultivated or capable of being cultivated) lands, pasture lands; range lands; grass lands; forested lands; lands in residential, commercial, or industrial areas; lands in public rights of way; and lands in private rights of way
- Wetlands
- Waterbodies and Riparian lands

Keystone shall implement the construction mitigation and reclamation actions contained in this Plan to the extent that they do not conflict with the requirements of any applicable federal, state and local rules and regulations and other permits and approvals that are obtained by Keystone for the Project. Additionally, Keystone may deviate from specific requirements of this Plan on specific private lands as determined through negotiations with Landowners or as required to suit actual site conditions as determined and directed by Keystone. All work must be in compliance with federal, State, and Local permits.

2.0 GENERAL CONDITIONS

2.1 Training

The Contractor shall ensure that all persons (Contractor's and Subcontractors' Personnel) engaged in work associated with the pipeline's construction are informed of the construction issues and concerns, and that they attend and receive training regarding these requirements as well as all laws, rules and regulations applicable to the work.

Different levels of training shall be required for different groups of Contractor personnel. Contractor supervisors, managers, field foremen and other Contractor personnel designated by Keystone shall attend a full-day, comprehensive environmental training session. All other Contractor personnel shall attend a one-to-two-hour group training session before the beginning of construction, and during construction as environmental issues and incidents warrant. Additional training sessions shall be held for newly assigned personnel.

All Contractor personnel shall attend the training session prior to entering the construction right-of-way. All Contractor personnel shall sign an acknowledgement of having attended the appropriate level of training and shall display a hard hat sticker acknowledging attendance at environmental training. In order to insure successful compliance, Contractor personnel shall attend repeat or supplemental training, if compliance is not satisfactory or as new, significant issues arise.

All visitors and any other personnel without specific work assignments shall be required to attend a brief safety and environmental awareness orientation.

Experienced, well-trained personnel are essential for the successful implementation of this Plan. Keystone and its Contractors shall undergo prevention and response, as well as safety training. The program shall be designed to improve awareness of safety requirements, pollution control laws and procedures and proper operation and maintenance of equipment.

2.2 Advance Notice of Access to Property Prior to Construction

Prior to the start of construction of the pipeline, Keystone shall provide the Landowner or tenant with a minimum of 24 hours prior notice (unless otherwise negotiated with the landowner and as described in the project line list) before accessing his/her property for the purpose of constructing the pipeline. Additionally, the Landowner or tenant shall be provided with Keystone contact information. Landowners may utilize contact information to inform Keystone of any concerns related to the work. Keystone

Prior notice shall first consist of a personal contact or a telephone contact, whereby the Landowner or tenant is informed of Keystone's intent to access the land. If the Landowner or tenant cannot be reached in person or by telephone, Keystone shall mail or hand deliver to the Landowner or tenant's home a dated, written notice of Keystone's intent. The Landowner or tenant need not acknowledge receipt of the written notice before Keystone can enter the Landowner's property.

2.3 Other Notifications

The Contractor shall notify, in writing, both Keystone's Representative and the authority having jurisdiction over any road, railroad, canal, drainage ditch, river, foreign pipeline, or other utility, at least 48 hours (excluding Saturdays, Sundays, and Statutory Holidays), or as specified on the applicable permit(s), prior to commencement of pipeline construction, in order that the said authority may appoint an Inspector to ensure that the crossing is constructed in a satisfactory manner.

The Contractor shall notify Keystone immediately of any spill of a potentially hazardous substance as well as any existing soil contamination discovered during construction.

The Contractor shall immediately notify Keystone of the discovery of previously unreported historic property, other significant cultural materials, or suspected human remains uncovered during pipeline construction activities.

2.4 Damages to Private Property

Pipeline construction activities shall be confined to the construction right-of-way, temporary work space, and additional temporary work space and approved access routes.

Keystone shall reasonably compensate Landowners for any construction-related damages caused by Keystone which occur on or off of the established pipeline construction right-of-way.

Keystone shall reasonably compensate Landowners for damages to private property caused by Keystone beyond the initial construction and reclamation of the pipeline, to include those damages caused by Keystone during future construction, operation, maintenance, and repairs relating to the pipeline.

2.5 Appearance of Worksite

The construction right-of-way shall be maintained in a clean neat condition at all times. At no time shall litter be allowed to accumulate at any location on the construction right-of-way. The Contractor shall provide a daily garbage detail with each major construction crew to keep the construction right-of-way clear of trash, pipe banding and spacers, waste from coating products, welding rods, timber skids, defective materials and all construction and other debris immediately behind construction operations unless otherwise approved by Keystone. Paper from wrapping or coating products or lightweight items shall not be permitted to be scattered around by the wind.

The traveled surfaces of roads, streets, highways, etc. (and railroads when applicable) shall be cleaned free of mud, dirt or any debris deposited by equipment traversing these roads or exiting from the construction right-of-way.

2.6 Access

Prior to the pipeline's installation, Keystone and the Landowner shall reach a mutually acceptable agreement on the route that shall be utilized by the Contractor for entering and exiting the pipeline construction right-of-way should access to the construction right-of-way not be practicable or feasible from adjacent segments of the pipeline construction right-of-way or from public highway or railroad right-of-way.

All construction vehicles and equipment traffic shall be confined to the public roads, private roads acquired for use by Keystone and the construction right of way. If temporary alternative private roads for access are constructed they shall be designed to not impede proper drainage and shall be built to minimize soil erosion.

Sufficiently sized gaps shall be left in all spoil and topsoil wind rows at all temporary private access roads and obvious livestock or wildlife trails unless agreed with the Landowner prior to construction that these access points can be blocked during construction.

All construction related private roads and access points to the right of way shall be marked with signs. Any private roads not to be utilized during construction shall also be marked.

2.7 Above-Ground Facilities

Locations for above-ground facilities shall be selected in a manner so as to be as unobtrusive as reasonably possible to on-going agricultural or other Landowner activities occurring on the lands adjacent to the facilities. If this is not feasible,

such facilities shall be located so as to incur the least hindrance to the adjacent agricultural operations (i.e., located in field corners or areas where at least one side is not used for cropping purposes) provided the location is consistent with the design constraints of the pipeline. Additionally, they shall be located to avoid existing drain tile systems to the extent possible.

2.8 Minimum Depth of Cover

The pipeline shall be installed so that the top of the pipe and coating is:

- A minimum depth of 4 feet below the surface of all uplands and wetlands except in consolidated rock where the minimum shall be 3 feet
- A minimum clearance of 1 foot below any existing foreign pipeline, utility, drain tile or any other existing underground facility and a minimum of 4 feet below the surface of all uplands and wetlands. Should any existing foreign pipeline, utility, drain tile or any other existing underground facility owner permit the pipeline to cross above, there must be a minimum 1 foot clearance and a minimum of 4 feet below the surface of all uplands and wetlands
- At a minimum depth of 5 feet below the bottom of road ditches
- At a minimum depth of 5 feet below the bottom of waterbodies including rivers, creeks, streams, ditches and drains. This depth shall normally be maintained over a distance of 15 feet on each side of the waterbody measured from the top of the defined stream channel

If concrete weights are utilized for negative buoyancy of the pipeline, the minimum depth of cover shall be measured from the top of the concrete weight to the original ground contour.

Depth of cover requirements may be modified by Keystone based on site specific conditions. However, all depths shall be in compliance with all established codes.

2.9 Threatened and Endangered Species

Keystone will contract a qualified biologist to conduct a survey of sensitive species associated with native tall-grass prairie. The biologist will document locations of the sensitive species found during the survey. If sensitive species are identified in the construction right of way, Keystone will work with the relevant regulatory authorities to determine if any additional protection measures would be required. Once construction is complete, disturbance in native prairie will be reclaimed to native prairie species using native seed mixes specified by applicable state and federal agencies with the intent there will be no net loss of native prairie habitat.

A number of sensitive species are associated with native tall-grass prairie, especially where larger remnant tracts are present. In order to minimize impacts to native prairie, no permanent developments such as access roads or pump stations will be constructed in native prairie tracts if possible. Where avoidance of native tall-grass prairie by the pipeline ROW is unfeasible, appropriate surveys

will be implemented to ensure populations of sensitive wildlife species are not affected.

Keystone will contract a qualified biologist to conduct a survey of breeding bird habitat within 330 feet (100 meters) from proposed surface disturbance activities that would occur within the breeding season. The biologist will document active nests, bird species, and other evidence of nesting (e.g., mated pairs, territorial defense, birds carrying nesting material, transporting of food). If an active nest for Important Migratory Bird Species (USFWS BCC, PIF Priority Bird Species, State Sensitive Species) is documented during the survey, Keystone will work with the relevant regulatory authorities to determine if any additional protection measures would be required.

Immediately prior to construction activities during the raptor breeding season (February 1 – July 31), breeding raptor surveys will be conducted by a qualified biologist through areas of suitable nesting habitat to identify any potentially active nest sites in the project area. If raptors are identified within 0.5 mile to the construction right of way, Keystone will work with the relevant regulatory authorities to develop mitigation measures. These measures will be implemented on a site-specific and species-specific basis in coordination with state agency wildlife biologists.

Along the ROW within historical range of Indiana bat and gray bat (Missouri, Illinois and eastern Oklahoma), Surveys shall be completed during the roosting season in suitable woodland habitats to determine if any active maternity roosts are present in or near the pipeline ROW. If a maternity roost is located, then applicable mitigation will be developed in consultation with USFWS and state wildlife agency personnel.

Prior to surface disturbance activities within karst terrain, a geological investigation will be completed to determine the presence and type of karst features. The investigation will identify the location, distribution, and dimensions of rock cavities within the potential influence zone of construction. In addition, a qualified biologist will conduct surveys for exposed caves that may contain sensitive resources (e.g., bat roosts and nesting raptors) within 0.25 mile from surface disturbance activities. In the event that cave features or sensitive resources are identified, the USFWS or appropriate state wildlife agency will be contacted and applicable mitigation measures developed.

2.10 Non-Hazardous Waste Disposal

Non-hazardous pipeline construction wastes include human waste, trash, pipe banding and spacers, waste from coating products, welding rods, timber skids, cleared vegetation, stumps, rock and all other construction debris.

All waste which contains (or at any time contained) oil, grease, solvents, or other petroleum products falls within the scope of the oil and hazardous substances control, clean up and disposal procedures. This material shall be segregated for handling and disposal as hazardous wastes.

The Contractor shall be responsible for human wastes to be handled and disposed of exclusively by means of portable self-contained toilets during all construction operations. Wastes from these units shall be collected by a licensed Contractor for disposal only at licensed and approved facilities.

The Contractor shall remove all trash from the construction right-of-way on a daily basis unless otherwise approved or directed by Keystone.

The Contractor shall dispose of all drill cuttings and drilling mud at a Keystone-approved location. Disposal options may include spreading over the construction right-of-way in an upland location approved by Keystone, hauling to an approved licensed landfill, or other site approved by Keystone.

The Contractor shall remove all extraneous vegetative, rock and other natural debris from the construction right-of-way by the completion of clean-up

The Contractor shall remove all trash and wastes from Contractor yards, pipe yards and staging areas when work is completed at each location.

The Contractor shall dispose of all waste materials at licensed waste disposal facilities. Wastes shall not be disposed of in any other fashion such as un-permitted burying or burning.

2.11 Hazardous Wastes

The Contractor shall ensure that all hazardous and potentially hazardous materials are transported, stored and handled in accordance with all applicable legislation. Workers exposed to or required to handle dangerous materials shall also be trained in accordance with the applicable legislation and the manufacturer's recommendations.

The Contractor shall dispose of all hazardous materials at licensed waste disposal facilities. Hazardous wastes shall not be disposed of in any other fashion such as un-permitted burying or burning.

All transporters of oil, hazardous substances, and hazardous wastes shall be licensed and certified according to the applicable state vehicle code. Incidents on public highways shall be reported to the appropriate agencies.

All hazardous wastes being transported off-site shall be manifested. The manifest shall conform to requirements of the appropriate state agency. The transporter shall be licensed and certified to handle hazardous wastes on the public highways. The vehicles as well as the drivers must conform to all applicable vehicle codes for transporting hazardous wastes. The manifest shall conform to regulations of the DOT 49 CFR 172.101, 172.202, and 172.203.

If toxic or hazardous waste materials or containers are encountered during construction, the Contractor shall stop work immediately to prevent disturbing or further disturbing the waste material and shall immediately notify Keystone. The Contractor shall not restart work until clearance is granted by Keystone.

2.12 Noise Control

The Contractor shall minimize noise during non-daylight hours and within 1 mile of residences or other noise-sensitive areas such as hospitals, motels or campgrounds. Keystone shall attempt to abide by municipal bylaws regarding noise near residential and commercial/industrial areas. The Contractor shall provide notice to Keystone if noise levels are expected to exceed bylaws for a short duration.

The Contractor shall minimize noise in the immediate vicinity of herds of livestock or poultry operations, which are particularly sensitive to noise.

Keystone shall install noise attenuation, if necessary, to ensure that noise levels from Keystone's above-ground facilities comply with the applicable state or local standards.

2.13 Weed Control

The Contractor shall thoroughly clean all construction equipment, including timber mats, prior to moving the equipment to the job site to limit the potential for the spread of noxious weeds, insects and soil-borne pests. The Contractor shall clean the equipment with high-pressure washing equipment.

Prior to construction, Keystone will mark all areas of the right of way which contain infestations of noxious, invasive species or soil borne pests. Such marking will clearly indicate the limits of the infestation along the right of way. During construction, the Contractor shall clean the tracks, tires, and blades of equipment by hand (track shovel) or compressed air to remove excess soil prior to movement of equipment out of weed and/or soil-borne pest infested areas.

The Contractor shall use mulch and straw or hay bales that are free of noxious weeds for temporary erosion and sediment control.

The Contractor shall implement pre-construction treatments such as mowing prior to seed development or herbicide application to areas of noxious weed infestation prior to other clearing, grading, and trenching or other soil disturbing work at the identified locations as indicated on the construction drawings.

The Contractor shall apply herbicides, where required, within 1 week, or as deemed necessary for optimum mortality success, prior to disturbing the area by clearing, grading, trenching or other soil disturbing work. Herbicides shall be applied by applicators appropriately licensed or certified by the state in which the work is conducted. All herbicides applied preconstruction shall be non-residual or shall have a significant residual effect no longer than 30 days. Herbicides applied during construction shall be non-residual.

The Contractor shall not use herbicides in or within 100 feet of a wetland or waterbody.

After pipeline construction, on any construction right-of-way over which Keystone has jurisdiction as to the surface use of such land (i.e., valve sites, metering

stations, pump stations, etc.), Keystone shall provide for weed control to limit the potential for the spread of weeds onto adjacent lands used for agricultural purposes. Any weed control spraying performed by Keystone shall be done so by a State licensed pesticide applicator.

Keystone shall be responsible for reimbursing all reasonable costs incurred by owners of land adjacent to above-ground facilities when the Landowners must control weeds on their land which can be reasonably determined to have spread from land with Keystone's above-ground facilities.

2.14 Dust Control

The Contractor shall at all times control air borne dust levels during construction activities to levels acceptable to Keystone. The Contractor shall employ water trucks, sprinklers or calcium chloride as necessary to reduce dust to acceptable levels. Utilization of calcium chloride would be limited to roads.

Dust shall be strictly controlled where the work approaches dwellings, farm buildings and other areas occupied by people and when the pipeline parallels an existing road or highway. This shall also apply to access roads where dust raised by construction vehicles may irritate or inconvenience local residents. The speed of all Contractor vehicles shall be controlled while in these areas.

The Contractor shall take appropriate precautions to prevent fugitive emissions caused by sand blasting operations from reaching any residence or public building. The Contractor shall place curtains of suitable material, as necessary, to prevent wind-blown particles from sand blasting operations from reaching any residence or public building.

2.15 Off Road Vehicle Control

Keystone shall offer to Landowners or managers of forested lands to install and maintain measures to control unauthorized vehicle access to the construction right-of-way where appropriate. These measures may include the following unless otherwise approved or directed by Keystone based on site specific conditions or circumstances:

- Signs;
- Fences with locking gates;
- Slash and timber barriers, pipe barriers, or boulders lined across the construction right-of-way; and
- Conifers or other appropriate trees or shrubs across the construction right-of-way.

2.16 Fire Prevention and Control

The Contractor shall comply with all Federal, State, County and Local fire regulations pertaining to burning permits and the prevention of uncontrolled fires. The following mitigative measures shall be implemented to prevent fire hazards and control of fires:

- A list of relevant Authorities and their designated representative to contact shall be maintained on the construction site by construction personnel
- Adequate fire fighting equipment in accordance with the regulatory requirements shall be available on site.
- The level of forest fire hazard shall be posted at the construction office (where visible for all workers) and make them aware of it and related implications.
- The Contractor shall provide equipment to handle any possible fire emergency. This shall include, although not be limited to, water trucks, portable water pumps, chemical fire extinguishers, hand tools such as shovels, axes, chain saws, etc. and heavy equipment adequate for the construction of fire breaks when required.
- Specifically, the Contractor shall supply and maintain in working order an adequate supply of fire extinguishers for each crew that is engaged in work such as welding, cutting, grinding, burning of brush or vegetative debris, etc.
- In the event of a fire, the Contractor shall immediately use resources required to contain the fire. The Contractor shall then notify local emergency response personnel.
- All tree clearing activities are to be carried out in accordance with local rules and regulations for the prevention of forest fires.
- Burning shall be done in compliance with state and/or county regulations and in the center of the right of way and in small piles to avoid overheating or damage to trees or other structures along the right of way.
- Flammable wastes shall be removed from the construction site on a regular basis.
- Flammable materials kept on the construction site must be stored in approved containers away from ignition sources.
- Smoking shall be prohibited around areas with flammable products.
- Smoking shall be prohibited on the construction site when the fire hazard is high.

2.17 Road and Railroad Crossings

Railroad and highway crossings shall be bored or where permitted by the local road authorities having jurisdiction, open-cut. The pipeline shall be installed without casing unless required by permit. Generally, secondary and unimproved roads, public and private roads, shall be open-cut.

The Contractor shall maintain access across all open-cut roads during construction where an alternate bypass is not available.

At all road crossings and/or contiguous construction where workers and equipment are working, approaching traffic shall be cautioned to reduce speed

by road signs. All signage shall be in accordance with crossing permits and state or county highway regulations.

2.18 Adverse Weather

The Contractor shall restrict certain construction activities and work in cultivated agricultural areas in excessively wet soil conditions to minimize rutting and soil compaction. In determining when or where construction activities should be restricted or suspended during wet conditions, the Contractor shall consider the following factors:

- the extent that rutting may cause mixing of topsoil with subsoil layers or damage to tile drains.
- excessive buildup of mud on tires and cleats.
- excessive ponding of water at the soil surface.
- the potential for excessive soil compaction.

The Contractor shall implement mitigative measures as directed by Keystone in order to minimize rutting and soil compaction in excessively wet soil conditions which may include:

- restricting work to areas on the spread where conditions are not prohibitive.
- using low ground weight or wide-track equipment or other low impact construction techniques.
- limiting work to areas that have adequately drained soils or have a cover of vegetation such as sod, crops or crop residues sufficient to prevent mixing of topsoil with subsoil layers or damage to drain tiles.
- installing geotextile material or construction mats in problem areas.

3.0 SPILL PREVENTION AND CONTAINMENT

Spill prevention and containment applies to the use and management of hazardous materials on the construction right-of-way and all ancillary areas during construction. This includes the refueling or servicing of all equipment with diesel fuel, gasoline, lubricating oils, grease, hydraulic and other fluids during normal upland applications and special applications within 100 feet of perennial streams or wetlands.

3.1 Spill Prevention

3.1.1 Staging Areas

Staging areas (including Contractor yards and pipe stockpile sites) shall be set up for each construction spread. Hazardous materials at staging areas shall be stored in compliance with federal and state laws. The following spill prevention measures shall be implemented by the Contractor:

- Contractor fuel trucks shall be loaded at existing bulk fuel dealerships or from bulk tanks set up for that purpose at the staging area. In the former case, the bulk dealer is responsible for preventing and controlling spills;

- Fuels and lubricants shall be stored only at designated staging areas. Storage of fuel and lubricants in the staging area shall be at least 100 feet away from the water's edge. Refueling and lubrication of equipment shall be restricted to upland areas at least 100 feet away from stream channels and wetlands;
- Contractors shall be required to perform all routine equipment maintenance at the staging area and recover and dispose of wastes in an appropriate manner;
- Temporary liners and berms and/or dikes (secondary containment) shall be constructed around the above-ground bulk tanks, so that potential spill materials shall be contained and collected in specified areas isolated from any waterbodies. Tanks shall not be placed in areas subject to periodic flooding or washout;
- Drivers of tank trucks are responsible for safety and spill prevention during tank truck unloading. Procedures for loading and unloading tank trucks shall meet the minimum requirements established by the Department of Transportation;
- Warning signs requiring drivers to set brakes and chock wheels shall be displayed at all tanks. Proper grounding of equipment shall be undertaken during fuel transfer operations. Drivers shall observe and control the fueling operations at all times to prevent over-filling the temporary tank;
- Prior to departure of any tank truck, all vehicle outlets shall be closely examined by the driver for leakage, and tightened, adjusted or replaced to prevent liquid leakage while in transit;
- A supply of sorbent and barrier materials sufficient to allow the rapid containment and recovery of any spill shall be maintained at the construction staging areas. Sorbent and barrier materials shall also be utilized to contain runoff from contaminated areas;
- Shovels and drums shall be kept at each of the individual staging areas. In the event that small quantities of soil become contaminated, shovels shall be utilized to collect the soil and the material shall be stored in 55 gallon drums. Large quantities of contaminated soil may be bio-remediated on-site, subject to government approval, or collected utilizing heavy equipment, and stored in drums or other suitable containers prior to disposal. Should contamination occur adjacent to staging areas as a result of runoff, shovels and/or heavy equipment shall be utilized to collect the contaminated material. Contaminated soil shall be disposed of in accordance with state and federal regulations;
- Temporary above-ground tanks shall be subject to visual inspection on a monthly basis and when the tank is refilled. Inspection records shall be maintained. Operators shall routinely keep tanks under close surveillance and potential leaks or spills shall be quickly detected;
- Visible fuel leaks shall be reported to the Contractors' designated representative and corrected as soon as conditions warrant. Keystone's designated representative shall also be informed;
- Drain valves on temporary tanks shall be locked to prevent accidental or unauthorized discharges from the tank.

Keystone may allow modification of the above specifications as necessary

to accommodate specific situations or procedures. Any modifications must comply with all applicable regulations and permits.

3.1.2 Construction Right-of-way

Rubber-tired vehicles (pick-up trucks, buses) shall normally refuel at the construction staging areas or commercial gas stations. Tracked machinery (backhoes, bulldozers) shall be refueled and lubricated on the construction right-of-way. Equipment maintenance shall be conducted in staging areas when practical. When impractical, repairs to equipment can be made on the construction right of way when approved by Keystone's representative.

The following preventive measures apply to refueling and lubricating activities on the construction right-of-way:

- Construction activities shall be conducted to allow for prompt and effective clean up of spills of fuel and other hazardous materials. Each construction crew, including clean-up crews shall have on hand sufficient tools and material to stop leaks and supplies of absorbent and barrier materials to allow rapid containment and recovery of spilled materials and must know and follow the procedure for reporting spills;
- Refueling and lubrication of construction equipment shall be restricted to upland areas at least 100 feet away from stream channels and wetlands. Where this is not possible (e.g., trench dewatering pumps), the equipment shall be fueled by designated personnel with special training in refueling and spill containment and clean up. The Environmental Inspector shall ensure that signs are installed identifying restricted areas;
- Spent oils, lubricants, filters, etc. shall be collected and disposed of at an approved location in accordance with state and federal regulations;
- Equipment shall not be washed in streams.

Keystone may allow modification of the above specifications as necessary to accommodate specific situations or procedures. Any modifications must still comply with all applicable regulations and permits.

3.2 Contingency Plans

The Contractor shall develop emergency response procedures for all incidents (e.g., spills, leaks, fires) involving hazardous materials which could pose a threat to human health and/or the environment. The procedures shall address activities in all work areas, as well as during transport to and from the construction right-of-way and to any disposal or recycling facility.

3.3 Equipment

The Contractor shall retain emergency response equipment that shall be available at all areas where hazardous materials are handled or stored. This equipment shall be readily available to respond to a hazardous material emergency. Such equipment shall include, but not be limited to, the following:

- first aid kit/supplies
- phone or communications radio
- protective clothing (tyvek suit, gloves, goggles, boots)
- hand held fire equipment
- absorbent material and storage containers
- non-sparking bung wrench and shovel
- brooms and dust pan

Hazardous material emergency equipment shall be carried in all mechanic and supervisor vehicles. This equipment shall include, at a minimum:

- first aid kit/supplies
- phone or communications radio
- 2 sets of protective clothing (tyvek suit, gloves, goggles, boots)
- 1 non-sparking shovel
- 6 plastic garbage bags (20 gallon)
- 10 absorbent socks and spill pads
- hand held fire extinguisher
- barrier tape
- 2 orange reflector cones

Fuel and service trucks shall carry a minimum of 20 pounds of suitable commercial sorbent material.

The Contractor shall inspect emergency equipment weekly, and service and maintain equipment regularly. Records shall be kept of all inspections and services.

3.4 Emergency Notification

Emergency notification procedures between the Contractor and Keystone shall be established in the preplanning stages of construction, and the Keystone representative shall be identified to serve as contact in the event of a: spill during construction activities. In the event of a spill which meets government reporting criteria, the Contractor shall notify the Keystone representative immediately who, in turn, shall notify the appropriate regulatory agencies.

If a spill occurs into navigable waters of the United States, Keystone shall notify the National Response Center (NRC) at 1-800-424-8802. For spills which occur on public lands, into surface waters or into sensitive areas the appropriate governmental agency's district office shall also be notified.

3.5 Spill Containment and Countermeasures

In the event of a spill of hazardous material, Contractor personnel shall:

- notify the appointed Keystone representative;
- identify the product hazards related to the spilled material and implement appropriate safety procedures, based on the nature of the hazard;

- control danger to the public and personnel at the site;
- implement spill contingency plans and mobilize appropriate resources and manpower;
- isolate or shutdown the source of the spill;
- block manholes or culverts to limit spill travel;
- initiate containment procedures to limit the spill to as small an area as possible, to prevent damage to property or areas of environment concern (e.g., watercourses);
- commence recovery of the spill and clean-up operations.

When notified of a spill, the Keystone representative shall immediately ensure that:

- action is taken to control danger to the public and personnel at the site;
- spill contingency plans are implemented and that necessary equipment and manpower are mobilized;
- measures are taken to isolate or shutdown the source of the spill;
- all resources necessary to contain, recover and clean up the spill are available;
- any resources requested by the Contractor from Keystone are provided;
- the appropriate agencies are notified. For spills which occur on public lands, into surface waters or into sensitive areas the appropriate federal or state managing office office shall also be notified and involved in the incident.

On a land spill, berms shall be constructed with available equipment to physically contain the spill. Personnel entry and travel on contaminated soils shall be minimized. Sorbent materials shall be applied or, if necessary, heavily contaminated soils shall be removed to an approved facility. Contaminated sorbent materials and vegetation shall also be disposed of at an approved facility.

On a spill threatening a water body, berms and/or trenches shall be constructed to contain the spill prior to entry into a water body. Deployment of booms, skimmers and sorbent materials shall be necessary if the spill reaches the water. The spilled product shall be recovered and the contaminated area shall be cleaned up with in consultation with spill response specialists and appropriate government agencies.

4.0 UPLANDS (AGRICULTURAL, FOREST, PASTURE, RANGE AND GRASS LANDS)

4.1 Interference with Irrigation Systems

If existing irrigation systems (pivot, wheel or other type spray irrigation systems), irrigation ditches, or sheet flow irrigation shall be impacted by the construction of the pipeline, the following mitigative measures shall be implemented unless otherwise approved or directed by Keystone:

- If it is feasible and mutually acceptable to Keystone and the Landowner or Landowner's designate, temporary measures shall be implemented to

allow an irrigation system to continue to operate across land on which the pipeline is also being constructed.

- If the pipeline and/or temporary work areas intersect an operational (or soon to be operational) pivot or other spray irrigation system, Keystone shall establish with the Landowner or Landowner's designate an acceptable amount of time the irrigation system may be out of service or if, as a result of pipeline construction activities, an irrigation system interruption results in crop damages, either on the pipeline construction right-of-way or off the construction right-of-way, the Landowner shall be reasonably compensated for all such crop damages.
- If the pipeline and/or temporary work areas intersect an operational sheet flow irrigation system, Keystone shall establish with the Landowner or Landowner's designate an acceptable amount of time the irrigation system may be out of service or if, as a result of pipeline construction activities, an irrigation system interruption results in crop damages, either on the pipeline construction right-of-way or off the construction right-of-way, the Landowner shall be reasonably compensated for all such crop damages.
- Irrigation ditches that are active at the time of construction shall not be stopped or obstructed except for the length of time to install the pipeline beneath the ditch (typically, one day or less) unless otherwise approved or directed by Keystone.

4.2 Clearing

The objective of clearing is to provide a clear and unobstructed right of way for efficient construction of the pipeline. The following mitigative measures shall be implemented:

- construction traffic shall be restricted to the construction right-of-way, existing roads and approved private roads
- construction right-of-way boundaries including pre-approved temporary workspace shall be clearly staked to prevent disturbance to unauthorized areas
- if crops are present, they shall be mowed or disced to ground level unless an agreement is made for the Landowner to remove for personal use.
- burning is prohibited on cultivated land.
- construction right of way at timber shelterbelts in agricultural areas shall be reduced to the minimum necessary to construct the pipeline

4.3 Topsoil Removal and Storage

The objective of topsoil handling is to maintain topsoil capability by conserving topsoil for future replacement and reclamation and to minimize the degradation of topsoil from compaction, rutting, loss of organic matter, or soil mixing so that successful reclamation of the right of way can occur. The following mitigative measures shall be implemented during topsoil removal and storage unless otherwise approved or directed by Keystone based on site specific conditions or circumstances However, all work shall be conducted in accordance with applicable permits.

- In cultivated agricultural lands, unless otherwise specified by the Landowner, the actual depth of the topsoil shall be stripped from the area to be excavated above the pipeline to a maximum of 12 inches. When grading is required, the topsoil shall be removed from the entire area to be graded and stored. When grading is required, the topsoil shall be removed from the entire area to be graded and stored.
- In non-cultivated agricultural lands, the actual depth of topsoil shall be stripped from the area to be excavated above the pipeline. When grading is required, the topsoil shall be removed from the entire area to be graded and stored.
- Stripped topsoil is to be stockpiled in a windrow along the edge of the right of way. The Contractor shall perform its work in order to minimize the potential for subsoil and topsoil to be mixed.
- Under no circumstances shall the Contractor use topsoil to fill a low area
- If required due to excessively windy conditions, following the removal of the topsoil, topsoil piles shall be tackified using either water or a suitable tackifier.
- The surface drainage network in the vicinity of the right of way shall be maintained by keeping gaps in the rows of topsoil in order to prevent any accumulation of water on the land.
- Topsoil shall not be utilized to construct ramps at road or waterbody crossings.

4.4 Grading

The objective of grading is to develop a right of way that allows the safe passage of equipment and meets the bending limitations of the pipe. The following mitigative measures shall be implemented during grading unless otherwise approved or directed by Keystone based on site specific conditions or circumstances. However, all work shall be conducted in accordance with applicable permits.

- All grading shall be undertaken with the understanding that original contours and drainage patterns shall be re-established during clean up.
- Agricultural areas that have been land formed with terraces shall be surveyed to establish pre-construction contours to be utilized for restoration of the terraces after construction.
- On steep slopes, or wherever erosion potential is high, temporary erosion control measures shall be implemented.
- Bar ditches adjacent to existing roadways that shall be crossed during construction shall be adequately ramped with grade or ditch spoil to prevent damage to the road shoulder and ditch.
- Where the construction surface remains inadequate to support equipment travel, timber mats, timber riprap or other method shall be used to stabilize surface conditions.

The Contractor shall limit the interruption of the surface drain network in the vicinity of the right of way, using the appropriate methods:

- Providing gaps in the rows of subsoil and topsoil in order to prevent any accumulation of water on the land.
- Preventing obstructions in furrows, furrow drains and ditches.
- Installing flumes and ramps in furrows, furrow drains and ditches to facilitate water flow across the construction right of way and allow for construction equipment traffic.
- Installing flumes over the trench for any watercourse where flow is continuous during construction.

4.5 Temporary Erosion and Sediment Control

4.5.1 General

Temporary erosion and sediment control measures shall be installed immediately after initial disturbance of the soil and maintained throughout construction (on a daily basis) and reinstalled as necessary until replaced by permanent erosion control structures or restoration of the construction right-of-way is complete.

Specifications and configurations for erosion and sediment control measures may be modified by Keystone as necessary to suit actual site conditions. However, all work shall be conducted in accordance with applicable permits.

The Contractor shall inspect all temporary erosion control measures at least daily in areas of active construction or equipment operation, weekly in areas with no construction or equipment operation, and within 24 hours of each significant rainfall event. The Contractor shall repair all ineffective temporary erosion control measures as expediently as practicable.

4.5.2 Sediment Barriers

Sediment barriers shall be constructed of silt fence, staked hay or straw bales, compacted earth (e.g., driveable berms across travel lanes), sand bags, or other appropriate materials.

The Contractor shall install sediment barriers in accordance with **Details 1 and 2** or as otherwise approved or directed by Keystone. The aforementioned sediment barriers may be used interchangeably or together depending on site specific conditions. In most cases, silt fences shall be utilized where longer sediment barriers are required.

Sediment barriers shall be installed below disturbed areas where there is a hazard of off-site sedimentation. These areas include:

- The base of slopes adjacent to road crossings
- The edge of the construction right-of-way adjacent to and up gradient of a roadway, flowing stream, spring, wetland or impoundment
- At trench or test water discharge locations where required

- Where waterbodies or wetlands are adjacent to the construction right-of-way, the Contractor shall install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil and sediment within the construction right-of-way
- Across the entire construction right-of-way at flowing waterbody crossings
- Right-of-way immediately upslope of the wetland boundary at all standard (saturated or standing water) wetland crossings as necessary to prevent sediment flow into the wetland. Sediment control barriers are not required at "dry" wetlands
- Along the edge of the construction right-of-way within standard (saturated or standing water) wetland boundaries as necessary to contain spoil and sediment within the construction right-of-way. Sediment control barriers are not required at "dry" wetlands

Sediment barriers placed at the toe of a slope shall be set with sufficient distance from the toe of the slope, if possible, in order to increase ponding volume.

Sediment control barriers shall be placed so as not to hinder construction operations. If silt fences or straw bale sediment barriers in lieu of driveable berms are placed across the entire construction right-of-way at waterbodies, wetlands, or upslope of roads, a provision shall be made for temporary traffic flow through a gap for vehicles and equipment to pass within the structure. Immediately following each day's shutdown of construction activities, a row of straw bales or a section of silt fence shall be placed across the up-gradient side of the gap with sufficient overlap at each end of the barrier gap to eliminate sediment bypass flow, followed by bales tightly fitted to fill the gap. Following completion of the equipment crossing, the gap shall be closed using silt fence or straw bale sediment barrier.

The Contractor shall maintain straw bale and silt fence sediment barriers by removing collected sediment and replacing damaged bales. If sediment loading is greater than approximately 40% full behind a straw bale or silt fence sediment barrier, or if directed by Keystone, sediment shall be removed and placed in an area where it shall not reenter the barrier. If straw bale filters cannot be cleaned out due to access problems, the Contractor shall place a new row of sediment barriers upslope.

The Contractor shall use mulch and straw bales that are free of noxious weeds. Mulch or straw bales that contain evidence of noxious weeds or other undesirable species shall be rejected by the Contractor.

The Contractor shall remove sediment barriers except those needed for permanent erosion and sediment control during clean up of the construction right-of-way.

4.5.3 Trench Plugs

The Contractor shall use trench plugs at the edge of flowing waterbody crossings and at the edge of wetlands with standing water to prevent diversion of water into upland portions of the pipeline trench and to keep any accumulated trench water out of the waterbody. Trench plugs shall be of sufficient size to withstand upslope water pressure.

4.5.4 Temporary Slope Breakers (Water Bars)

The Contractor shall not install temporary slope breakers (water bars) in cultivated land.

The Contractor shall install temporary slope breakers on slopes greater than approximately 5% in non-cultivated lands where the base of the slope is less than 50 feet from waterbody, wetland, and road crossings at the following recommended spacing:

Slope (%)	Spacing (feet)
5 - 15	300
>15 - 30	200
>30	100

The gradient of each slope breaker shall be 2 to 8 percent.

Temporary slope breakers shall be constructed of soil, silt fence, staked straw bales, sand bags or similar materials authorized by Keystone.

The Contractor shall direct the outfall of each temporary slope breaker to a stable, well vegetated area or construct an energy-dissipating device at the end of the slope breaker and off the construction right-of-way as shown in **Detail 3.** The outfall of each temporary slope breaker shall be installed to prevent sediment discharge into wetlands, waterbodies, or other sensitive resources.

Specifications and configurations for temporary slope breakers may be modified by Keystone as necessary to suit actual site conditions. However, all work shall be conducted in accordance with applicable permits.

4.5.5 Drainage Channels or Ditches

Drainage channels or ditches shall be used on a limited basis to provide drainage along the construction right-of-way and toe of cut slopes as well as to direct surface runoff across the construction right-of-way or away from disturbances and onto natural undisturbed ground. Channels or ditches shall be constructed by the Contractor during grading operations. Where there is inadequate vegetation at the channel's or ditch's outlet, sediment barriers, check berms or other appropriate measures shall be used to control erosion.

4.5.6 Temporary Mulching

The Contractor shall install temporary mulch before seeding if construction or restoration activity is interrupted for extended periods. The Contractor shall not apply temporary mulch in cultivated areas unless specifically requested by the Landowner. The Contractor shall not apply mulch within wetland boundaries.

Temporary mulch applied on slopes shall be spread uniformly to cover at least 75 percent of the ground surface at an approximate rate of 2 tons/acre of straw or its equivalent. Mulch application on slopes within 100 feet of waterbodies and wetlands shall be increased to an approximate rate of 3 tons/acre of straw or equivalent

4.5.7 Tackifier

When inordinately windy conditions result in excessive topsoil movement and topsoil piles wetted with water is not preventing wind erosion, the Contractor shall temporarily suspend topsoil handling operations and apply a tackifier to topsoil stockpiles at the rate recommended by the manufacturer.

Should construction traffic, cattle grazing, heavy rains, or other related construction activity disturb the tackified topsoil piles and there is a potential for wind erosion, additional tackifier shall be applied by the Contractor.

4.6 Stringing

The objective of stringing is to place the line pipe along the construction right of way for bending and welding in an expedient and efficient manner.

The Contractor shall utilize one or more of the following mitigation measures as applicable and when necessary to reduce compaction on the working side of the right of way or as directed by Keystone. However, all work shall be conducted in accordance with applicable permits.

- Prohibiting access by certain vehicles.
- Using only machinery possessing low ground pressure (tracks or extra-wide tires).
- Control access thus minimizing the frequency of all vehicle traffic.
- Hastening drainage through digging drainage ditch to re-establish surface drainage as required.
- Using timber riprap, matting, or geotextile fabric overlain with soil.
- Stopping construction entirely for a period of time.

4.7 Trenching

The objective of trenching is to provide a ditch of sufficient depth and width with a bottom to continuously support the pipeline. During trenching operations, the following mitigative measures shall be implemented unless otherwise approved or directed by Keystone based on site specific conditions or circumstances. However, all work shall be conducted in accordance with applicable permits.

- Segregating subsoil materials from topsoil in separate, distinct rows with a separation that shall limit any admixing of topsoil and subsoil during handling of these materials.
- Gaps must be left in the spoil piles that coincide with breaks in the strung pipe to facilitate natural drainage patterns and to allow the passage of livestock or wildlife.
- Trenching operation shall be followed as closely as practicable by lower-in and backfill operations to minimize the length of time the ditch is open
- Construction debris (e.g., welding debris) and other garbage shall not be deposited in the ditch.

Should blasting be necessary for removal of rock, the following mitigation measures shall be implemented:

- Where blasting is required, operations shall be done accordingly to laws and regulations governing explosives.
- Prior to using explosives, the Contractor shall advise residents of the immediate area, in order to prevent any risk of accidents or undue disturbances.
- Blasting mats or subsoil shall be piled over the trench line to prevent any rocks from being blown outside the construction right of way.
- Each blasting location shall be cleared and cleaned up before and after all blasting operations
- Blasting shall be carried out during regular daylight working hours.

4.7.1 Trench Dewatering/Well Points

The Contractor shall make all reasonable efforts to discharge trench water in a manner that avoids damage to adjacent agricultural land, crops and pasture. Damage includes, but is not limited to the inundation of crops for more than 24 hours, deposition of sediment in ditches, and the deposition of gravel in fields or pastures.

If trench dewatering is necessary in an area where salt damage to adjacent crops is evident, the Keystone Inspector shall conduct a field conductivity test on the trench water before it is discharged. If the conductivity of the trench water is determined to potentially affect soil quality, it shall not be discharged to areas where salt damage to crops is evident, but shall be directed as feasible so that water flows over a well vegetated, non-cropland area or through an energy dissipater and sediment barrier, then directed to nearby ditches or brackish wetlands or waterbodies.

When pumping water from the trench for any reason the Contractor shall ensure that adequate pumping capacity and sufficient hose is available to permit dewatering as follows:

- No heavily silt-laden trench water shall not be allowed to enter a waterbody or wetland directly but shall instead be diverted through a well vegetated area, a geotextile filter bag or a permeable berm (straw bale or Keystone approved equivalent); and

- Trench water shall not be disposed of in a manner which could damage crops or interfere with the functioning of underground drainage systems.

The Contractor shall screen the intake hose and keep the hose either one foot off the bottom of the trench or in a container to minimize entrainment of sediment.

4.8 Welding, Field Joint Coating, and Lower In

The objectives of welding, field joint coating and lower in are to provide continuous segments of pipeline, to provide corrosion protection to the weld areas of the pipeline, and to place the pipeline in the center of the trench, without stress, at the required depth of cover. The following mitigative measures shall be followed during pipe welding, field joint coating, and lower in, unless otherwise specified by Keystone in response to site specific conditions or circumstances. However, all work shall be conducted in accordance with applicable permits.

- Shavings produced during bevelling of the line pipe are to be removed immediately following this operation to ensure that livestock and wildlife do not ingest this material. When welding operations have created a continuous line of pipe that may be left on the right of way for an extended period of time due to construction or weather constraints, a gap in the welded pipe shall be provided to allow for access at farm road crossings and also for passage of livestock and/or wildlife.
- Prior to the application of epoxy powder, urethane epoxy or other approved pipe coatings, a tarp shall be placed underneath the pipe to collect any overspray of epoxy powder and/or liquid drippings. Excess powder and/or liquid or other hazardous materials (e.g. brushes, rollers, gloves, etc.) shall be continuously collected and removed from the construction right-of-way.

4.9 Padding and Backfilling

The objective of padding (when required) and backfilling is to cover the pipe with material that is not detrimental to the pipeline and pipeline coating. The following mitigative measures shall be utilized during backfilling, unless otherwise approved or directed by Keystone based on site specific conditions or circumstances. All work shall be conducted in accordance with applicable permits.

- Excessive water accumulated in the trench shall be eliminated prior to backfilling.
- In the event it becomes necessary to pump water from open trenches, the Contractor shall pump the water and discharge it into existing water drainages in a manner that shall avoid damaging adjacent agricultural land, crops, and/or pasture.
- If it is impossible to avoid water-related damages (including inundation of crops for more than 24 hours, deposition of sediment in ditches and other water courses, and the deposition of gravel in fields, pastures, and any water courses), Keystone shall reasonably compensate the Landowners for the damages or shall correct the damages so as to restore the land, crops, pasture, water courses, etc. to their pre construction condition.
- All pumping of water shall comply with existing drainage laws and local ordinances relating to such activities and provisions of the Clean Water Act.
- Prior to backfilling, all drain tile shall be permanently repaired, inspected and the repair documented as described in Section 5.5
- Prior to backfilling, trench breakers shall be installed on slopes where required to minimize the potential for water movement down the ditch and potential subsequent erosion.
- In backfilling the trench, the stockpiled subsoil shall be placed back into the trench before replacing the topsoil.
- Topsoil shall not be utilized for padding the pipe.
- Backfilling shall be done without mixing spoil with topsoil.
- Backfill shall be compacted to a minimum of 90% of pre-existing conditions where the trench line crosses tracks of wheel irrigation systems (pivots).
- To reduce the potential for ditch line subsidence, spoil shall be replaced and compacted by backhoe bucket and/or by the wheels or tracks of equipment traversing down the trench.
- The top 4 feet or the actual depth of top cover, whichever is less, within the pipeline trench, bore pits, or other excavations shall not be backfilled with soil containing rocks of any greater concentration or size than existed prior to the pipeline's construction.

4.10 Clean Up

The objective of clean up activities shall be to prepare the right of way and other disturbed areas to approximate pre-activity ground contours where appropriate and to replace spoil and stockpiled material in a manner which preserves soil capability and quality to a degree reasonably equivalent to the original or that of representative undisturbed land. The following mitigative measures shall be utilized during clean up, unless otherwise approved or directed by Keystone based on specific conditions or circumstances. However, all work shall be conducted in accordance with applicable permits.

- Clean up shall occur immediately following backfilling operations when weather allows it.
- All garbage and construction debris (i.e., lathing, ribbon, welding rods, pipe bevel shavings, pipe spacer ropes end caps, pipe skids, etc.) shall be collected and disposed of at approved disposal sites.

- The right of way shall be re-contoured with spoil material to approximate pre-construction contours and as necessary to limit erosion and subsidence. Loading of slopes with unconsolidated spoil material shall be avoided during slope re-contouring. Topsoil shall be replaced after re-contouring of the grade with subsoil. The topsoil shall be replaced on the subsoil storage area and over the trench so that after settling occurs, the topsoil's approximate original depth and contour (with an allowance for settling) shall be achieved.
- Surface drainage shall be restored and re-contoured to conform to the adjacent land drainage system.
- Erosion control structures such as permanent slope breakers and cross ditches shall be installed on steep slopes where necessary to control erosion by diverting surface run-off from the right of way, to stable and vegetated off right of way areas.
- After construction, all temporary access shall be returned to prior construction conditions unless specifically agreed with the Landowner or otherwise specified by Keystone.
- Installation of warning signs, aerial markers, and cathodic protection test leads in locations that shall not impair farming operations and are acceptable to the Landowner
- All bridges, fences and culverts existing prior to construction shall be restored to meet or exceed approximate pre-construction conditions. Caution shall be utilized when re-establishing culverts to ensure that drainage is not improved to a point that would be detrimental to existing waterbodies and wetlands.
- All temporary gates installed during construction shall be replaced with permanent fence unless otherwise requested by the Landowner.

4.11 Reclamation and Re-vegetation

The objectives of reclamation and re-vegetation are to return the disturbed areas to approximately pre-construction use and capability. This involves the treatment of soil as necessary to preserve approximate pre-construction capability and the stabilization of the work surface in a manner consistent with the initial land use. The following mitigative measures will be utilized unless otherwise approved or directed by Keystone based on site specific conditions or circumstances. However, all work shall be conducted in accordance with applicable permits.

4.11.1 Relieving Compaction

- Compaction shall be alleviated on all agricultural land traversed by construction equipment. Cropland that has been compacted shall be ripped a minimum of 3 passes at least 18 inches deep and all pasture and woodland shall be ripped or chiseled a minimum of three passes at least 12 inches deep.
- Areas of the construction right of way that were stripped for topsoil salvage shall be ripped a minimum of 3 passes (in cross patterns) prior to topsoil replacement. The approximate depth of ripping shall be 18 inches (or a lesser depth if damage may occur to existing drain tile systems). Following ripping, the subsoil surface shall be graded

smooth and any subsoil clumps broken up (disc and harrow) in an effort to avoid topsoil mixing.

- The decompacted construction right of way shall be tested by the Contractor at regular intervals for compaction in agricultural and residential areas disturbed by construction activities. Tests shall be conducted on the same soil type under similar moisture conditions in undisturbed areas immediately adjacent to the right of way to approximate pre-construction conditions. Penetrometers or other appropriate devices shall be used to conduct tests
- Topsoil shall be replaced to pre-existing depths once ripping and discing of subsoil is complete. Topsoil compaction on cultivated fields shall be alleviated by cultivation.
- If there is any dispute between the Landowner and Keystone as to what areas need to be ripped or chiseled, the depth at which compacted areas should be ripped or chiseled, or the necessity or rates of lime and fertilizer application, the appropriate county Soil and Water Conservation District's opinion shall be considered by Keystone and the Landowner.

Plowing under of organic matter including wood chips, manure, or planting of a new crop, such as alfalfa, to decrease soil bulk density and improve soil structure or any other measures in consultation with the Soil Conservation service shall be considered if mechanical relief of compaction is deemed not satisfactory.

4.11.2 Rock Removal

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

4.11.3 Soil Additives

If site specific conditions warrant and if agreed to by the Landowner, the Contractor shall apply amendments (fertilizer and soil pH modifier materials and formulations) that are commonly used for agricultural soils in the area in which they are applied and in accordance with written recommendations from the local soil conservation authority, land management agencies, or Landowner. Amendments shall be incorporated into the normal plow layer as soon as possible after application.

4.11.4 Seeding

- The final seed mix shall be based on input from the local Soil Conservation Services and the availability of seed at the time of reclamation. The Landowner may request specific seeding requirements during easement negotiations.
- Certificates of seed analysis are required for all seed mixes to limit the introduction of noxious weeds.
- Seed not utilized within 12 months of seed testing shall be approved by Keystone prior to use.Seeding shall follow clean up and topsoil replacement as closely as possible. Seed shall be applied to all disturbed surfaces (except cultivated fields unless requested by the Landowner) as indicated on the Consruction Drawings
- If mulch was applied prior to seeding for temporary erosion control, the Contractor shall remove and dispose of the excess mulch prior to seedbed preparation to ensure that seedbed preparation equipment and seed drills do not become plugged with excess mulch; to ensure that seed can adequately contact the soil surface; and to ensure that seed incorporation or soil packing equipment can operate without becoming plugged with mulch.
- The Contractor may evenly re-apply and anchor (straw crimp) the removed temporay mulch on the construction right-of-way following seeding.
- Identified seeding areas shall be seeded at a rate appropriate for the region and stability of the reclaimed surface. Seeding rates shall be based on Pure Live Seed.
- Weather conditions, construction right-of-way constraint, site access, and soil type shall influence the seeding method to be used (i.e., drill seeding versus broadcast seeding). All areas seeded by the Contractor, except for temporary cover crops, shall be drill seeded unless the right of way is too steep to facilitate drill seeding. Temporary cover crop seed shall be broadcast.
- The Contractor shall delay seeding as necessary until the soil is in the appropriate condition for drill seeding.
- The Contractor shall use a Truax (brand) or equivalent-type drill seeder equipped with a cultipacker designed and equipped to apply grass and grass-legume seed mixtures with mechanisms such as seed box agitators to allow even distribution of all species in each seed mix, with an adjustable metering mechanism to accurately deliver the specified seeding rate and with a mechanism such as depth bands to accurately place the seed at the specified depth.
- The Contractor shall operate drill seeders at an appropriate speed so the specified seeding rate and depth is maintained.
- The Contractor shall calibrate drill seeders so that the specified seeding rate is planted. The row spacing on drill seeders shall not exceed 8 inches.
- The Contractor shall plant seed at depths cosistent with the local or regional agricultural practices.
- Broadcast or hydro seeding used, in lieu of drilling, shall utilize double the recommended seeding rates. Where seed is broadcast, the Contractor shall use a harrow, cultipacker or other equipment

immediately following broadcasting to incorporate the seed to the specified depth and to firm the seedbed.

- The Contractor shall delay broadcast seeding during high wind conditions if even distribution of seed is impeded.
- The Contractor shall hand rake all areas that are too steep, or otherwise cannot be safely harrowed or cultipacked, in order to incorporate the broadcast seed to the specified depth.
- Hydro-seeding may be used, on a limited basis, where the slope is too steep or soil conditions do not warrant conventional seeding methods. Fertilizer, where specified, may be included in the seed, virgin wood-fiber, tackifier and water mixture. When hydro-seeding, virgin wood-fiber shall be applied at the rate of approximately 3,000 pounds per acre on an air-dry weight basis as necessary to provide at least 75% ground cover. Tackifier shall consist of biodegradable, vegetable-based material and shall be applied at the rate recommended by the manufacturer. The seed, mulch and tackifier slurry shall be applied so that it forms a uniform, mat-like covering of the ground.
- Keystone shall work with Landowners to discourage cattle from using the construction right-of-way during the first growing season by utilization of temporary fencing or deferred grazing.

4.11.5 Permanent Erosion and Sediment Control

The Contractor shall restore all existing Landowner soil conservation improvements and structures disturbed by pipeline construction to the approximate pre-construction line and grade. Soil conservation improvements and structures include, but are not limited to, grassed waterways, toe walls, drop inlets, grade control works, terraces, levees and farm ponds.

4.11.5.1 Trench Breakers

The Contractor shall install trench breakers in steep terrain where necessary to limit the potential for trench line erosion and at the base of slopes adjacent to waterbodies and wetlands.

Trench breakers shall be constructed of materials such as sand bags, sand/cement bags, bentonite bags, or polyurethane foam by the Contractor **(Detail 7)**. The Contractor shall not use topsoil in trench breakers.

4.11.5.2 Permanent Slope Breakers (Water Bars)

Permanent slope breakers (water bars) shall be constructed of soil or, in some instances, sand bags.

The Contractor shall construct permanent slope breakers (water bars) on the construction right-of-way where necessary to limit erosion, except in cultivated and residential areas. Slope breakers shall divert surface runoff to adjacent stable vegetated areas or to energy-dissipating devices as shown on **Detail 3.** Permanent slope breakers (water bars) shall be installed as specified on the Construction Drawings or generally with a minimum spacing as shown on the following table:

Slope (%)	Spacing (feet)
5 - 15	300
>15 – 30	200
>30	100

The gradient (fall) for each slope breaker shall be two percent (2%) to eight percent (8%) unless otherwise approved by Keystone based on site specific conditions.

The Contractor shall construct slope breakers to divert surface flow to a stable, well-vegetated area. In the absence of a stable area, the Contractor shall construct appropriate energy-dissipating devices at the end of the slope breaker and beyond the area disturbed by construction. .

4.11.5.3 Mulching

The Contractor shall apply mulch on all areas with high erosion potential and on slopes greater than 8 percent unless otherwise approved by Keystone based on site specific conditions or circumstances. The Contractor shall spread mulch uniformly over the area to cover at least 75 percent of the ground surface at an approximate rate of 2 tons/acre of straw or its equivalent.

Mulch application includes straw mulch or hydro mulch and tackifier. The Contractor shall not apply mulch in cultivated areas unless requested by the Landowner.

The Contractor shall use mulch that is free of noxious weeds.

The Contractor shall apply mulch immediately following seeding. The Contractor shall not apply mulch in wetlands.

If a mulch blower is used, the majority of strands of the mulching material shall not be shredded to less than 8 inches in length to allow anchoring. The Contractor shall anchor mulch immediately after application to minimize loss by wind and water.

When anchoring (straw crimping) by mechanical means, the Contractor shall use a tool specifically designed for mulch anchoring with flat, notched disks to properly crimp the mulch to a depth of approximately 2 to 3 inches. A regular farm disk shall not be used to crimp mulch.

In soils possessing high erosion potential, the Contractor may be required to make two passes of the mulch-crimping tool, passes must be as perpendicular to the others as possible.

When anchoring with liquid mulch binders (tackifiers), the Contractor shall use a biodegradable tackifier derived from a vegetable-based, organic source. The Contractor shall apply mulch binders at rates recommended by the manufacturer.

The Contractor shall limit the use of liquid mulch binders (tackifiers) for anchoring straw and the use of hydromulch and tackifier to areas that are too steep or rocky to safely or effectively operate mechanical mulch-anchoring tools.

4.11.5.4 Erosion Control Matting

Erosion control matting shall be applied where shown on the Construction Drawings as shown on **Detail 4.** The Contractor shall anchor the erosion control matting with staples or other approved devices.

The Contractor shall use erosion control matting made of biodegradable, natural fiber such as straw or coir (coconut fiber).

The Contractor shall prepare the soil surface and install the erosion control matting to ensure it is stable and the matting makes uniform contact with the soil of the slope face or stream bank underneath with no bridging of rills, gullies or other low areas.

4.11.5.5 Riprap and Stream Bank Stabilization

In most cases, the banks and streambeds of waterbodies shall be restored to their approximate original contours. Erosion protection shall be applied as specified in the construction drawings.

Generally most restored banks will be protected through the use of flexible channel liners installed as specified in **Detail 19.**

If the original stream bank is excessively steep and unstable and/or flow conditions are severe, a more stable final contour

may be specified and alternate stabilization measures may be installed.

Alternate stabilization measures may consist of rock rip rap, or bio-stabilization or engineered structures such as brush layering, logwalls, cribwalls, or vegetated geo-grids. See **Details 20, 22, 23, and 24.**

Stream bank riprap structures shall consist of a layer of stone, underlain with approved filter fabric or a gravel filter blanket. Riprap shall extend from the stabilized streambed to the top of the stream bank, where practicable, native rock shall be utilized.

4.11.6 Fences

Upon completion of all backfilling, clean-up and restoration including mulching and seeding of the construction right-of-way, permanent repairs shall be made to all fences by using either the original material or good quality new material similar to existing fences.

Early or historic fences shall be carefully reassembled by hand from the original material. Where the original material has deteriorated to a state that makes it unsalvageable, replacement material similar to the original shall be used if possible.

4.11.7 Right-of-way and Pipeline Markers

Upon completion of all backfilling, clean-up and restoration including mulching and seeding of the construction right-of-way and during the time when the Contractor is making permanent repairs to fences, the Contractor shall install pipeline markers on each side of all roads, railroads, fence lines, stream crossings and other areas where the pipeline markers do not conflict with intended land use.

4.12 Pasture and Range Lands

The following mitigative measures shall be implemented in addition to the requirements previously stated in Sections 4.1 thru 4.11 unless otherwise approved by Keystone based on site specific conditions or circumstances. However, all work shall be conducted in accordance with applicable permits.

- Access across the right of way during construction shall be provided at locations requested by Landowners, if practicable.
- Bevel shavings produced during pipe bevel operations are to be removed immediately to ensure that livestock and wildlife do not ingest this material.
- Litter and garbage shall be collected and removed from the construction site at the end of the day's activities.
- Temporary gates shall be installed at fence lines for access to the construction right of way. These gates shall remain closed at all times. Upon completion of construction, the temporary gates shall be removed and the permanent fence replaced.

- Feeding or harassment of livestock or wildlife is prohibited.
- Construction personnel shall not be permitted to have firearms or pets on the construction right-of-way.
- All food and wastes shall be stored and secured in vehicles and/or appropriate facilities.
- Areas of disturbance in native range shall be seeded with a native seed mix after topsoil re-placement.
- Improved pasture shall be seeded with a seed mix approved by individual Landowners.

4.13 Forested Lands

Mitigation measures are required to ensure that pipeline construction activities have a minimal impact on forested lands and their habitat.

Clearing, grubbing and grading of trees, brush and stumps shall be performed in accordance with the following mitigative measures in addition to the requirements previously stated in Sections 4.1 thru 4.11 unless otherwise approved or directed by Keystone based on site specific conditions or circumstances. However, all work shall be conducted in accordance with applicable permits.

- Prior to the start of clearing activity, right of way boundaries including pre-approved temporary workspaces shall be clearly staked to prevent disturbance to unauthorized areas.
- If trees are to be removed from the construction right-of-way, Keystone shall consult with the Landowner or Landowner's designate to see if there are trees of commercial or other value to the Landowner. Timber shall be salvaged as per Landowner request.
- If there are trees of commercial or other value to the Landowner, Keystone shall allow the Landowner the right to retain ownership of the trees with the disposition of the trees to be negotiated prior to the commencement of land clearing and included in the easement agreement.
- If not performed by the Landowner, the construction right of way Contractor shall salvage all merchantable timber from designated areas.
- Tree stumps shall be grubbed only 5 feet either side of the trench line and where necessary for grading a level surface for pipeline construction equipment to operate safely
- Keystone shall follow the Landowner's or Landowner designate's desires as stated in the easement agreement regarding the disposal of trees, brush, and stumps of no value to the Landowner by burning, burial, etc., or complete removal from any affected property.
- Timber salvage operations shall use cut off-type saw equipment. Felling shall be undertaken in a manner that minimizes butt shatter, breakage and off right of way disturbance. Skidders or alternate equipment shall be used to transport salvaged logs to stacking sites.
- Trees shall be felled in such a way that they fall toward the centre line of the right of way to avoid breaking trees and branches off right of way. Leaners or felled trees that inadvertently fall into adjacent undisturbed vegetation shall be salvaged.
- Trees and slash falling outside the right of way shall be recovered and disposed of

- Salvaged logs shall be limbed and topped before removal from the construction right-of-way. Log decks (if required) shall be oriented to best facilitate loading by picker trucks and be located adjacent to the working side of the right of way where possible.
- The Contractor shall not be allowed to dispose of woody debris in wooded areas along the pipeline right of way.
- Pruning of branches hanging over the right of way shall be done only when necessary for construction. Any branch that is broken or seriously damaged should be cut off near its fork and the collar of the branch preserved.
- All tree wastes, stumps, tree crowns, brushes, branches and other forest debris shall be either burned, chipped (using a mobile chipper) or removed from the right of way according to Keystone instructions contained in the specific mitigation measures. Burial of this waste material on the site by the Contractor shall require the Landowner's specific authorization. Chips must not be spread over cultivated land. However, they may be spread and incorporated with mineral soil over the forest floor at a density that shall not prevent re-vegetation of grass.
- Stump removal and brush clearing shall be done with bulldozers equipped with brush rakes to preserve organic matter.
- Decking sites shall be established, approximately 2000 feet apart in timbered areas, on sites located on approved temporary workspace in existing cleared areas, in non-merchantable stands of timber or, if no other options are available, in merchantable timber stands. Deck sites shall be appropriately sized to accommodate the loading equipment.
- The Contractor shall remove decked timber from the construction right-of-way and transport to a designated all weather access point or mill if the Landowner does not want the timber.

4.14 Residential and Commercial/Industrial Areas

4.14.1 Residential Area

The principal measures that shall be used to mitigate impacts on existing residential areas include the following unless otherwise directed or approved by Keystone based on site specific conditions or circumstances. However, all work shall be conducted in accordance with applicable permits.

- notifying Landowners prior to construction;
- posting warning signs as appropriate
- reducing the width of construction right of way, if practicable, by eliminating the construction equipment passing lane, reducing the size of work crews, or utilizing the "stove pipe" or "drag section" construction techniques;
- removing fences, sheds, and other improvements as necessary for protection from construction activities;
- preserving, to the extent possible, mature trees and landscaping while ensuring the safe operation of construction equipment;
- fencing the edge of the construction work area adjacent to a residence for a distance of 100 feet on either side of the residence to ensure that construction equipment and materials, including the spoil pile, remain within the construction work area;

- limiting the hours during which operations with high-decibel noise levels (i.e., drilling and boring) can be conducted;
- limiting dust impact through prearranged work hours and by utilizing dust minimization techniques;
- ensuring that construction proceeds quickly through such areas (thus, minimizing exposure to nuisance effects such as noise and dust);
- maintaining access and traffic flow during construction activities, particularly for emergency vehicles;
- cleaning up construction trash and debris daily;
- fencing or plating open ditches during non-construction activities;
- immediately after backfilling the trench, restoring all lawn areas, shrubs, specialized landscaping, fences and other structures, etc. within the construction work area consistent with its pre-construction appearance or the requirements of the Landowner. Restoration work shall be done by personnel familiar with local horticultural and turf establishment practices;
- If the pipeline centerline is within 25 feet of a residence, ensuring that the trench is not excavated until the pipe is ready for installation and that the trench shall be backfilled immediately after pipe installation.

4.14.2 Commercial / Industrial Area

Commercial/industrial areas traversed by the pipeline would be subjected to both short and long-term impacts similar to residential areas. Temporary, short-term construction impacts may include disruption, inconvenience, and loss of potential revenues.

The principal measures that shall be used to mitigate impacts on existing commercial/industrial areas are as follows unless otherwise directed or approved by Keystone based on site specific conditions or circumstances. However, all work shall be conducted in accordance with applicable permits.

- notifying business owners prior to construction;
- reducing the width of construction right of way, if practicable, by eliminating the construction equipment passing lane, reducing the size of work crews, or utilizing the "stove pipe" or "drag section" construction techniques;
- removing fences and other improvements as necessary for protection from construction activities;
- fencing the edge of the construction work area adjacent to a business for a distance of approximately 100 feet on either side of the commercial/industrial building to ensure that construction equipment and materials, including the spoil pile, remain within the construction work area;
- preserving, to the extent possible, mature trees and landscaping while ensuring the safe operation of construction equipment;
- limiting the hours during which operations with high-decibel noise levels (i.e., drilling and boring) can be conducted;
- limiting dust impact through prearranged work hours and by utilizing dust minimization techniques;

- ensuring that construction proceeds quickly through such areas (thus, minimizing exposure to nuisance effects such as noise and dust);
- maintaining access and traffic flow during construction activities, particularly for emergency vehicles;
- cleaning up construction trash and debris daily;
- fencing or plating open ditches during non-construction activities;
- immediately after backfilling the trench, restoring all lawn areas, shrubs, specialized landscaping, fences and other structures, etc. within the construction work area consistent with its pre-construction appearance or the requirements of the business owner. Restoration work shall be done by personnel familiar with local horticultural and turf establishment practices;
- If the pipeline centerline is within 25 feet of a commercial/industrial building, ensuring that the trench is not excavated until the pipe is ready for installation and that the trench shall be backfilled immediately after pipe installation.

4.14.3 Site – Specific Plans

For any residence or commercial/industrial building closer than 25 feet to the construction work area, Keystone shall prepare a site-specific construction plan. The plan shall include:

- a description of construction techniques to be used;
- a dimensioned site plan that shows, as a minimum:
    - the location of the residence or commercial/industrial area in relation to the new pipeline;
    - the edge of the construction work area;
    - the edge of the new permanent construction right-of-way; and
    - other nearby topographical obstacles including landscaping, trees, structures, roads, parking areas, or ditches/streams, etc.
- a description of how Keystone would ensure that the trench is not excavated until the pipe is ready for installation and that the trench is backfilled immediately after pipe installation.

Figure 1 represents a typical site specific plan.

4.14.4 Landowner Complaint Resolution Procedure

Keystone shall implement a Landowner complaint procedure as follows:

- Landowners should first contact the construction spread office to express their concern over restoration and/or mitigation of environmental damages on their property. The Construction Manager, or his designated representative, shall respond to the Landowner within approximately 24 hours of receipt of the phone call.
- If the Landowner has not received a response or are not satisfied with the response, they can then contact Keystone's representative at XXX-

XXX-XXXX. The Landowners should expect a response within 48 hours.

- If the Landowner has not received a response or is not satisfied with the response, they should contact Keystone's Hotline at XXX-XXX-XXXX.

4.15 Operations and Maintenance

Operations and maintenance programs such as vegetation management, pipeline maintenance, integrity surveys, hydrostatic testing or other programs may have an impact on the final reclamation of the right of way. To ensure that the integrity of the facility and land surface reclamation of the right of way is maintained after completion of construction and that regulatory requirements are adhered to during operations, the following measures shall be implemented unless otherwise directed by Keystone in response to site specific conditions or circumstances. However, all work shall be conducted in accordance with applicable permits.

- Keystone shall monitor the pipeline right of way and all stream crossings for erosion or other potential problems that could affect the integrity of the pipeline. Any erosion identified shall be reclaimed as expediently as practicable by Keystone or by compensation of the Landowner to reclaim the area.
- Trench depressions on ditch line which may interfere with natural drainage, vegetation establishment or land use shall be repaired as expediently as practicable by Keystone or by compensation of the Landowner to repair the area.
- Post construction monitoring inspections shall be conducted of disturbed areas after the first growing season to determine the success of revegetation. Areas which have not been successfully re-established shall be revegetated by Keystone or by compensation of the Landowner to reseed the area. If, after the first growing season, revegetation is successful, no additional monitoring shall be conducted.
- In non-agricultural areas, revegetation shall be considered successful if, upon visual survey, the density and cover of non-nuisance vegetation are similar in density and cover to adjacent undisturbed lands.
- In agricultural areas, revegetation shall be considered successful if crop yields are similar to adjacent undisturbed portions of the same field.
- Restoration shall be considered successful if the surface condition is similar to adjacent undisturbed lands, construction debris is removed (unless requested otherwise by the Landowner or land managing agency), revegetation is successful, and drainage has been restored.
- Weed control measures shall be implemented as required in conjunction with the Landowner.
- Keystone shall be responsible for correcting all tile line repairs or irrigation systems that fail due to pipeline construction, provided those repairs were made by Keystone. Keystone shall not be responsible for tile line repairs which Keystone compensates the Landowner to perform.
- When requested by Landowners, in cultivated land, Keystone shall monitor the yield of land impacted by construction with the help of agricultural specialists. If alterations are indicated from that of adjacent lands, Keystone

will compensate the Landowner for reduced yields and shall implement procedures to return the land to equivalent capability.

- In residential areas, Landowners may use the right-of-way provided they do not interfere with the rights granted to Keystone. Trees or bushes, structures, including houses, toolsheds, garages, poles, guy wires, catch basins, swimming pools, trailers, leaching fields, septic tanks, and any other objects not easily removable, shall not be permitted on the permanent construction right-of-way without the written permission of Keystone, because they could impair access for maintenance of the pipeline.
- Keystone shall maintain communication with the Landowner and or tenant throughout the operating life of the pipeline to allow expedient communication of issues and problems as they occur. Keystone shall provide the Landowners with corporate contact information for these purposes. Keystone shall work with Landowners to prevent excessive erosion on lands disturbed by construction. Reasonable methods shall be implemented to control erosion. This may not be implemented if the property across which the pipeline is constructed is bare cropland which the Landowner intends to leave bare until the next crop is planted.
- If the Landowner and Keystone cannot agree upon a reasonable method to control erosion on the Landowner's property, the recommendations of the appropriate county Soil and Water Conservation District shall be considered by Keystone and the Landowner.

5.0 DRAIN TILE SYSTEMS

5.1 General

If underground drainage tile is damaged by the pipeline installation, it shall be repaired in a manner that assures the tile line's proper operating condition at the point of repair. Keystone may elect to negotiate a fair settlement with the affected county or Landowner for repair of the damaged drain tile. In the event the Landowner chooses to have the damaged tile repaired by Keystone, the Contractor shall follow these guidelines and procedures to identify the location of drain tiles; to mitigate damages to drain tiles prior to and during construction; to repair drain tiles damaged during installation of the pipeline; to inspect the proper repair of drain tiles; and to provide post-construction monitoring to determine any impacts caused by repair of drain tiles. Since all public and private drain tile systems are unique, i.e., varying age, depth of cover, type of material, geometry on the land, etc., it is not possible to develop a standard procedure for resolving each county's or Landowner's drain tile issues. These guidelines provide a basis on which to develop site specific methodology to mitigate damage and to repair drain titles affected by construction of the Keystone pipeline. Actual measures will be developed based on site specific information unique to specific installations. However, all work will be conducted in accordance with applicable permits.

5.2 Identification and Classification of Drain Tile Systems

Personnel shall attempt to identify and classify existing drain tile systems by meeting with local public officials and county engineers, and meeting with individual private Landowners and/or tenants.

5.2.1 Publicly Owned Drain Tiles

Personnel shall identify and meet with the responsible county or local authority responsible for publicly owned drain tiles. Publicly owned drain tiles shall be identified and documented onto Keystone's 1" = 2000' USGS quad strip maps and additional data collected for input into an electronic spreadsheet by county; township, range, and section; responsible agency; and size, type, and depth of cover (if known). This data shall be cross referenced to the centerline survey to be completed by Keystone. Additionally, any public records including maps or easement instruments on the drain tiles shall be acquired as well as any requirements of the local authority for installation of the Keystone pipeline.

5.2.2 Privately Owned Drain Tiles

Right-of-way agents shall meet with Landowners and tenants of privately owned land along Keystone's pipeline route. As a minimum, the right-of-way agents shall ascertain the data concerning drain tiles outlined on a Landowner questionnaire. The questionnaire requests data concerning type of drain tile system; size, type of material and depth of cover; preference for repair of drain tiles; and identification of local drain tile contractors. These data shall be collected into an electronic spreadsheet for utilization by right-of-way personnel in negotiating payments for easements and damages and by engineering/construction personnel for inclusion in specifications for the construction contractor.

5.3 Mitigation of Damage to Drain Tile Systems

Keystone shall undertake mitigation measures to reduce damage to publicly and privately owned drain tile systems prior to and during installation of the pipeline.

5.3.1 Non-interference with Drain Tile

Keystone's pipeline shall be installed at a depth of cover and elevation to not interfere with the elevation and grade of existing drain tiles where practicable. Where not practicable, Keystone shall pursue alternative mitigation measures mutually acceptable to the Landowner and jurisdictional agencies. Typically, the pipeline shall be installed below the elevation of drain tiles with a minimum clearance of 12 inches. **Detail 25**, Typical ROW Layout/Soil Handling, represents a typical drain tile crossing by the pipeline with additional temporary work space to facilitate handling of topsoil and trench spoil created by the additional depth of cover for the pipeline.

5.3.2 Non-disturbance of Drain Tile Mains

Publicly owned and privately owned drain tile mains shall be identified through the processes identified in Section 5.2. Drain tile mains are essential to the overall drainage system of a land area and may cause the pipeline construction Contractor excessive pumping/dewatering of the pipe

trench unless temporarily repaired and maintained until permanently repaired.

Keystone shall review drain tile mains and consider their size, flow rate, type of material, depth of cover, and geographic location. If determined to be practicable and reasonable for construction, the drain tile main shall not be cut and repaired during mainline installation (a pipe section shall be left out and installed by a tie-in crew without damaging the drain tile main).

5.3.3 Relocation or Replacement of Existing Drain Tiles Prior to Construction

In many instances, drain tile systems that have been installed after the installation of adjacent existing pipelines, were installed with "headers" parallel to the existing pipeline with periodic jumpovers as depicted on **Detail 26**, Header/Main Crossovers of Keystone Pipeline. The distance of these headers from the existing pipeline may vary.

Some of these drain tile headers may be most effectively relocated and/or replaced to the east of the Keystone pipeline and the existing header capped and made into a single drain tile as depicted on **Detail 27**, Relocate/Replace Drainage Header/Main. This could reduce the number of drain tile crossings on a particular Landowner by a significant quantity, thereby reducing the risk that repairs will fail.

5.3.4 Future Drain Tiles/Systems

Personnel shall attempt to determine where public agencies and private Landowners or tenants are proposing to install drain tile systems in the future to the extent possible. These locations shall be input into an electronic spreadsheet by county; township, range, and section; Landowner or responsible public agency; and proposed size and depth of cover. Keystone shall endeavor to construct the pipeline at a depth and elevation to accommodate the future installation of the proposed drain tile systems.

5.3.5 Other Mitigation Measures

Other mitigation measures that may be implemented during installation of the pipeline are as follows:

- Not removing topsoil from the working side of the construction right-of-way to prevent crushing of drain tile by heavy equipment
- Spreading ditch and spoil side topsoil (not subsoil) over the working side to provide additional soil depth to protect existing drain tiles.
- The Contractor shall restrict the work, if practicable, of the pipe lower-in crew if ground conditions are too wet to adequately support the heavy equipment.
- Travel of heavy equipment shall be limited to the working lane of the construction right-of-way where possible.

- Travel of heavy equipment shall be limited to one pass over the drain tile per work crew where possible.
- Should tile be crushed on the working side of the right of way, the topsoil would be removed and replaced during the drain tile replacement.

5.4 Responsibility for Repair of Drain Tile Systems

Temporary and permanent drain tile repairs shall be the responsibility of the Contractor. The physical repairs shall be made by qualified and experienced drain tile repair personnel.

5.4.1 Local Drain Tile Contractor Repair

Keystone shall identify and qualify local drain tile contractors in the geographical area of the pipeline route from interviews with local public officials and Landowners/tenants as well as the drain tile contractors. The preferred responsibility for permanent repair of drain tiles shall be for the pipeline Contractor to subcontract the supervision and repair to local reputable drain tile contractors that are acceptable to the local Landowners/tenants.

5.4.2 Pipeline Contractor Repair

In the event local drain tile contractors are not available to subcontract the supervision and repair, responsibility for permanent repair shall be with the pipeline contractor's supervision, equipment, and labor.

5.4.3 Landowner/Tenant Repair

Keystone shall allow the Landowner or tenant responsibility for the permanent repair of his drain tiles if requested during negotiations for the easement and if not precluded by jurisdictional regulatory agencies. The Landowner/tenant shall be requested to ensure their ability to coordinate and complete the drain tile repair in a timely manner to accommodate the pipeline Contractor to allow the pipeline Contractor to completely backfill the damaged drain tile for repair by Landowner/tenant in the immediate future. Keystone shall require that its representative be present to ensure the permanent drain tile repairs are made in accordance with the minimum requirements of this manual.

5.5 Drain Tile Repairs

The Contractor shall endeavour to locate all tile lines within the construction right-of-way prior to and during the pipeline's installation so repairs can be made if necessary.

5.5.1 Temporary Repairs During Construction

Drain tiles damaged/cut by excavation of the pipeline trench shall be marked with a lath and ribbon in the spoil bank. Care shall be taken to locate markers where the chance of disturbance shall be minimized and a written record maintained of each drain tile crossing. A work crew following the pipeline trench crew shall complete a temporary repair to allow continuing flow. **Detail 28**, Temporary Drain Tile Repair, depicts the materials and installation to complete the temporary repair. If a drain tile

line shall not be temporarily repaired, the open ends of the drain tile shall be screened to prevent entry of foreign materials and small animals.

5.5.2 Permanent Repairs

Permanent repairs shall be made for all drain tiles damaged by installation of the pipeline.

5.5.2.1 Ditch Line Only Repairs

If water is flowing through a damaged tile line, the tile line shall be immediately and temporarily repaired until such time that permanent repairs can be made. If tile lines are dry and water is not flowing, temporary repairs are not required if the permanent repair is made within 7 days of the time damage occurred. The temporary repair shall be removed just prior to lowering-in the pipeline.

Drain tiles must be permanently repaired before the pipeline trench is backfilled and within 14 days of construction completion, weather and soil conditions permitting. All tile lines shall be repaired with materials of the same or better quality as that which was damaged. The drain tile marker shall not be removed until the tile repairs have been inspected, approved, and accepted by Keystone's inspectors, the Counties' inspectors, where applicable, and/or the Landowner or tenant. **Detail 29**, Permanent Repair Method of Drain Tiles, depicts the minimum materials and installation to complete a permanent repair.

5.5.2.2 Ditch Line and Temporary Work Space Repairs

Prior to making the permanent drain tile repair, the Contractor shall probe a segmented sewer rod with a plug that is not more than 15% smaller than the internal diameter of the drain tile to determine if additional damage has occurred to the drain tile. If the probe does not freely insert into the drain tile across the temporary workspace of pipeline construction, the Contractor shall excavate, expose and repair the damaged drain tile to its original or better condition.

5.6 Inspection/Acceptance of Drain Tile Repairs

Drain tile repairs shall be inspected by Keystone pipeline construction inspectors, County inspectors, as applicable, and the Landowner or tenant or their representative.

Keystone pipeline shall designate inspector(s) for the sole purpose and responsibility for inspection of repair of drain tiles. These inspectors shall be, if possible, employed from local drain tile installation contractors, local farmers with extensive drain tile experience, or previously employed or retired employees of local

jurisdictions familiar with drain tile installation and repair. In the event that a sufficient quantity of inspectors from the prior described sources are not available, Keystone shall conduct in-the-field training seminars on drain tile repair for additional inspection personnel.

Inspection personnel shall observe the permanent repair of all drain tiles to ensure utilization of the proper type and size of replacement drain tile; the drain tile is installed at the proper grade; the drain tile is properly supported; backfill beneath the drain tile is properly placed and compacted; and the replacement drain tile is properly tied into the existing drain tile. The inspections shall be documented on the Drain Tile Inspection Report Forms.

A drain tile repair shall not be accepted until Keystone's construction inspector AND the Landowner or tenant or their designated representative approves the inspection form.

6.0 WETLAND CROSSINGS

6.1 General

Aboveground facilities shall not be located in a wetland, except where the location of such facilities outside of wetlands would preclude compliance with U.S. Department of Transportation pipeline safety regulations.

Wetland boundaries shall be clearly marked in the field with signs and/or highly visible flagging during construction.

In the event a waterbody crossing is located within or adjacent to a wetland crossing, the measures of Section 7 shall be implemented to the extent practicable.

A "dry" wetland typically has groundwater level existing some depth below the surface. Trench excavations are typically stable and normal in width. Equipment can traverse the wetland without the support of mats or timber rip-rap.

A "standard" wetland environment typically has soils that are saturated and non-cohesive. Difficult trenching conditions are likely resulting in excessively wide trenches. In these wetland environmental types, supplemental support in the form of timber rip-rap or prefabricated equipment mats may be required for construction equipment to safely and efficiently operate.

A "flooded" wetland involves the presence of standing water over much of the wetland area. Equipment typically cannot traverse the wetland and must generally move around that portion of the area. Access is typically limited to marsh backhoes or equipment working from flexi floats or equivalent.

Keystone may allow modification of the following specifications as necessary to accommodate site specific conditions or procedures. Any modifications must still comply with all applicable regulations and permits.

6.2 Easement and Workspace

The Contractor shall maintain wetland boundary markers in place during construction in all areas and until permanent seeding are completed in non-cultivated areas.

The width of the construction right-of-way shall be reduced to 85 feet or less in "standard" wetlands unless non-cohesive soil conditions require utilization of a greater width.

The Contractor shall locate all extra work areas (such as staging areas and additional spoil storage areas) at least 10 feet away from wetland boundaries, where topographic conditions permit.

The Contractor shall limit clearing of vegetation between extra work areas and the edge of the wetland to the construction right-of-way and limit the size of extra work areas to the minimum needed to construct the wetland crossing.

6.3 Vehicle Access and Equipment Crossing

The only access roads, other than the construction right-of-way, that the Contractor shall use in wetlands are those existing roads shown on the Construction Drawings.

The Contractor's construction equipment operating in saturated wetlands or wetlands with standing water shall be limited to that needed to clear the construction right-of-way, dig the trench, fabricate and install the pipeline, backfill the trench, and restore the construction right-of-way to the extent practicable

If equipment must operate within a wetland containing standing water or saturated soils, the Contractor shall use the following methods for equipment access unless otherwise approved by Keystone based on site specific conditions:

- Wide-track or balloon-tire construction equipment.
- Conventional equipment operated from timber and slash (riprap) cleared from the right of way, timber mats, or prefabricated equipment mats

6.4 Temporary Erosion and Sediment Control

The Contractor shall install sediment barriers across the entire construction right-of-way immediately upslope of the wetland boundary at all standard wetland crossings, as necessary, to prevent sediment flow into the wetland. Sediment barriers must be properly maintained by the Contractor throughout construction and reinstalled as necessary. In the travel lane, these may incorporate removable sediment barriers or driveable berms. Removable sediment barriers can be removed during the construction day, but shall be re-installed after construction has stopped for the day and/or when heavy precipitation is imminent The Contractor shall maintain sediment barriers until replaced by permanent erosion controls or restoration of adjacent upland areas is complete. The

Contractor shall not install sediment barriers at wetlands designated as "dry" unless otherwise specified by Keystone.

Where standard wetlands are adjacent to the construction right-of-way, the Contractor shall install sediment barriers along the edge of the construction right-of-way as necessary to prevent a sediment flow into the wetland.

6.5 Wetland Crossing Procedures

The following general mitigative procedures shall be followed by the Contractor in all wetlands unless otherwise approved or directed by Keystone based on site specific conditions. However, all work shall be conducted in accordance with applicable permits.

- Minimizing the duration of construction-related disturbance within wetlands to the extent practicable.
- Attempting to use no more than two layers of timber riprap to stabilize the construction right-of-way.
- Cutting vegetation off at ground level leaving existing root systems in place and remove it from the wetland for disposal.
- Limiting pulling of tree stumps and grading activities to directly over the trench line. Not grading or removing stumps or root systems from the rest of the construction right-of-way in wetlands unless safety-related construction constraints require removal of tree stumps from under the working side of the construction right-of-way.
- Segregating the top 12 inches of topsoil from the area disturbed by trenching in standard wetlands, where practicable. After backfilling is complete, restoring topsoil to its approximate original stratum.
- Dewatering the trench in such a manner that does not cause erosion and heavily silt-laden water does not flow directly into any wetland or waterbody.
- The Contractor shall avoid sand blasting in wetlands to the extent practicable. If sandblasting is performed within a wetland, the Contractor shall place a tarp or suitable material in such a way as to collect as much waste shot as possible and dispose of the collected waste. The Contractor shall clean up all visible deposits of wastes and dispose of the waste at an approved disposal facility.
- Removing all timber riprap and prefabricated equipment mats upon completion of construction.
- Locating hydrostatic test manifolds outside wetlands and riparian areas to the maximum extent practicable.
- Locating hydrostatic test manifolds outside wetlands and riparian areas to the maximum extent practicable.
- Not storing hazardous materials, chemicals, fuels, lubricating oils, or perform concrete coating activities in a wetland, or within 100 feet of any wetland boundary.
- Attempting to refuel all construction equipment in an upland area at least 100 feet from a wetland boundary. If construction equipment must be refueled in a wetland or within 100 feet of any wetland boundary, follow the procedures outlined in Section 3.

- Where the pipeline trench may drain a wetland, the Contractor shall construct trench breakers and/or seal the trench to maintain the original wetland hydrology.
- After backfilling is complete, restoring the segregated topsoil to its approximate original location over the trench.

Specific procedures for each type of wetland crossing method are listed below and shall be designated on the Construction Drawings but may be modified depending on site conditions at the time of construction. However, all work shall be conducted in accordance with applicable permits.

6.5.1 "Dry" Wetland Crossing Method

Topsoil shall be segregated. Pipe stringing and fabrication may occur within the wetland adjacent to the trench line or adjacent to the wetland in a designated extra workspace.

The "dry" wetland crossing procedure depicted in **Detail 8** shall be used where this type of wetland is identified on the Construction Drawings. The following are exceptions to "standard" wetland crossing methods:

- The width of the construction right-of-way for upland construction is maintained through the wetland.
- Where extra work areas (such as staging areas and additional spoil storage areas) are designated on the Construction Drawings, they may be placed no closer than 10 feet from the wetland's edge.
- Sediment barriers are not required across or along the edges of the construction right-of-way.
- If the wetland is cultivated, the topsoil shall be stripped using the trench and spoil side method at the same depth as the adjacent upland areas
- Seeding requirements for agricultural lands shall be applied to farmed wetlands.

6.5.2 "Standard" Wetland Crossing Method

Topsoil stripping is impracticable due to the saturated nature of the soil. Pipe stringing and fabrication may occur within the wetland adjacent to the trench line or adjacent to the wetland in a designated extra workspace. Based upon the length of a standard wetland crossing and presence of sufficient water to float the pipe, the Contractor may elect to install a standard wetland crossing utilizing the "push/pull" method.

The standard wetland crossing procedure depicted in **Detail 9** shall be used where this type of wetland is identified on the Construction Drawings.

Procedures unique to standard wetlands include:

- Limiting construction right of way width to a maximum of 85 feet unless site conditions warrant a wider width
- Utilizing low ground pressure construction equipment or support equipment on timber rip rap or timber mats
- Installing sediment barriers across the entire right of way where the right of way enters and exits the wetland

6.5.3 Flooded "Push/Pull" Wetland Crossing Method

In these wetlands, standing surface water or high groundwater levels are present. Difficult trenching conditions may exist, and trench widths of up to 35 feet are common. Topsoil stripping is impossible due to the flooded conditions. Pipe stringing and fabrication is required adjacent to the wetland in a designated extra workspace. And the pipe pushed and/or pulled with floatation into place.

The "Push/Pull" Wetland crossing procedure as depicted in **Detail 10** shall be used where water is sufficient to float the pipeline in the trench and other site conditions allow.

Clean metal barrels or styrofoam floats may be used to assist in the flotation of the pipe. Metal banding shall be used to secure the barrels or floats to the pipe. All barrels, floats and banding shall be recovered and removed upon completion of lower-in. Back fill shall not be allowed before recovery of barrels, floats and banding.

6.6 Restoration and Reclamation

All timber riprap, timber mats, and prefabricated equipment mats shall be removed upon completion of construction. The Contractor shall replace topsoil, as applicable, and spread to its original contours in the wetland as possible with no crown over the trench. Any excess spoil shall be removed from the wetland. The Contractor shall stabilize wetland edges and adjacent upland areas by establishing permanent erosion control measures and re-vegetation, as applicable, during final clean up.

For each standard wetland crossed, the Contractor shall install a permanent slope breaker and trench breaker at the base of slopes near the boundary between the wetland and adjacent upland areas. The Contractor shall locate the trench breaker immediately upslope of the slope breaker.

In the absence of detailed re-vegetation plans or until the appropriate seeding season for permanent wetland vegetation in standard wetlands, the Contractor shall apply a temporarily cover crop on the construction right-of-way at a rate adequate for germination and ground cover using annual ryegrass or oats unless standing water is present. The Contractor shall apply the temporary cover crop during final clean up. For farmed wetlands, apply seeding requirements for agricultural lands or as required by the Landowner.

The Contractor shall not use fertilizer, lime or mulch in wetlands unless required in writing by the appropriate land management or state agency.

6.7 Operations and Maintenance

Vegetation maintenance shall not be conducted over the full width of the permanent right-of-way in wetlands. However, to facilitate periodic pipeline corrosion/leak surveys, a corridor centered on the pipeline and up to 30 feet wide may be maintained in an herbaceous state. In addition, trees within 30 feet of the pipeline greater than 15 feet in height may be selectively cut and removed from the permanent right-of-way.

Herbicides and pesticides shall not be used in or within 100 feet of a wetland except as allowed by the appropriate land management agency or state agency.

The success of wetland re-vegetation shall be monitored after construction until wetland re-vegetation is successful except in circumstances where property is purchased and developed.

Wetland re-vegetation shall be considered successful if the cover of herbaceous and/or woody species is at least 80 percent of the type, density, and distribution of the vegetation in adjacent wetland areas that were not disturbed by construction. If re-vegetation is not successful at the end of 3 years, a remedial re-vegetation plan shall be developed in consultation with a professional wetland ecologist to actively re-vegetate the wetland. Re-vegetation efforts shall continue until wetland re-vegetation is successful.

7.0 WATERBODIES AND RIPARIAN LANDS

7.1 General

The Contractor shall comply with requirements of all permits issued for the waterbody crossings by Federal, State or local agencies.

"Waterbody" includes any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as ponds and lakes:

- "Minor Waterbody" includes all waterbodies less than or equal to 10 feet wide at the water's edge at the time of construction.
- "Intermediate Waterbody" includes all waterbodies greater than 10 feet wide but less than or equal to 100 feet wide at the water's edge at the time of construction.
- "Major Waterbody" includes all waterbodies greater than 100 feet wide at the water's edge at the time of construction.

In the event a waterbody crossing is located within or adjacent to a wetland crossing, the Contractor shall implement the provisions of Section 6, Wetland Crossings, to the extent practicable.

The Contractor shall supply and install advisory signs in a readily visible location along the construction right-of-way, a distance of approximately 100 feet on each

side of the crossing and on all roads which provide direct construction access to waterbody crossing sites. Signs shall be supplied, installed, maintained and then removed upon completion of the project. Additionally, signs shall be supplied and installed by the Contractor on all intermediate and major waterbodies accessible to recreational boaters warning boaters of pipeline construction operations.

The Contractor shall not store hazardous materials, chemicals, fuels, lubricating oils, or perform concrete coating within approximately 100 feet of any waterbody. The Contractor shall not refuel construction equipment within 100 feet of any waterbody. If the Contractor must refuel construction equipment within 100 feet of a waterbody, it must be done in accordance with the requirements outlined in Section 3.

Throughout construction, the Contractor shall maintain adequate flow rates to protect aquatic life and to prevent the interruption of existing downstream uses.

Keystone may allow modification of the following specifications as necessary to accommodate specific situations or procedures. Any modifications must comply with all applicable regulations and permits.

7.2 Easement and Work Space

The permanent easement, temporary work space, additional temporary work space and any special restrictions shall be depicted on the Construction Drawings. The work shall be contained within these areas and be limited in size to the minimum required to construct the waterbody crossing.

The Contractor shall locate all extra work areas (such as staging areas and additional spoil storage areas) at least 10 feet from the water's edge if practicable.

At all waterbody crossings, the Contractor shall install flagging across the construction right-of-way at least 10 feet from the banks prior to clearing and ensure that riparian cover is maintained where practicable during construction.

7.3 Vehicle Access and Equipment Crossings

The Contractor shall inspect equipment for fluid leaks prior to entering or crossing over waterbodies.

Equipment bridges are not required at minor waterbodies unless dry crossing procedures are specified or unless the waterbody supports a state designated fishery.

Equipment crossings shall be constructed as described in **Details 16, 17 and/or 18**.

Equipment crossings shall be perpendicular to drainage bottoms whenever possible.

The Contractor shall be responsible for the installation, maintenance and removal of all temporary access crossings including portable bridges, bridges made from timber or mats, flumes, culverts, sand bags, subsoil, or coarse granular material and riprap.

The Contractor shall ensure that culverts and flumes are sized and installed of sufficient diameter to accommodate the existing flow of water and those that may potentially be created by sudden runoffs. Flumes shall be installed with the inlet and outlet at natural grade if possible.

Where bridges, culverts or flumes are installed across the working area, the Contractor shall be responsible for maintaining them (e.g. preventing collapse, clogging or tilting). All flumes and culverts shall be removed as soon as possible upon completion of construction

The width of the temporary access road across culverts and flumes and the design of the approaches and ramps shall be adequate for the size of vehicle and equipment access required. The ramps shall be of sufficient depth and constructed to prevent collapse of the flumes, and the approaches on both sides of the flume shall be feathered.

Where culverts are installed for access and a waterbody is expected or possibly shall be constructed by the dry flume method, the culvert shall be of sufficient length to convey the stream flow through the construction zone.

The Contractor shall maintain equipment bridges to minimize soil from entering the waterbody.

7.4 Waterbody Crossing Methods

Construction methods pertinent to waterbody crossings are presented below. Selection of the most appropriate method at each crossing shall be depicted on the Construction Drawings but may be amended or changed based on site-specific conditions (i.e., environmental sensitivity of the waterbody, depth and rate of flow, subsurface soil conditions, site specific construction considerations, and the expected time and duration of construction) at the time of crossing. Each waterbody crossing shall be accomplished using one of the following construction methods:

- Non-flowing Open Cut Crossing Method - **(Detail 11)**
- Flowing Open Cut Crossing Method – Minor, Intermediate or Major Waterbody - **(Detail 12)**
- Flowing Open Cut Crossing – Dry Flume Method - **(Detail 13)**
- Flowing Open Cut Crossing – Dry Dam and Pump Method - **(Detail 14)**
- Horizontal Directional Drill Crossing - **(Detail 15)**
- Horizontal Bore Crossing - **(Detail 21)**

7.4.1 Non-flowing Open Cut Crossing Method

The Contractor shall utilize the Non-flowing Open Cut Crossing Method (**Detail 11**) for all waterbody crossings (ditches, gullies, drains, swales, etc.) with no perceptible flow at the time of construction. Should site conditions change and the waterbody is flowing at the time of construction, the Contractor shall install the crossing utilizing the flowing open cut crossing method unless otherwise approved by Keystone.

7.4.2 Flowing Open Cut Crossing Method of Minor, Intermediate and Major Waterbodies

For minor waterbody crossings, except where the flume method is used, the Contractor shall complete construction in the waterbody (not including blasting, if required) as shown on **Detail 12** within 24 hours if practicable.

For intermediate waterbodies, the Contractor shall attempt to complete trenching and backfill work within the waterbody (not including blasting if required) within 48 hours if practicable as shown on **Detail 12.**

The Contractor shall construct each major waterbody crossing in accordance with a Site Specific Plan as shown in the Construction Drawings. The Contractor shall complete in-stream construction activities as expediently as practicable.

7.4.3 Flowing Open Cut Crossing – Dry Flume Method

Where required, the Contractor shall utilize the Flowing Open Cut Crossing – Dry Flume Method as shown on **Detail 13** with the following "dry ditch" techniques:

- flume pipe shall be installed after blasting (if necessary), but before any trenching;
- sand bag or sand bag and plastic sheeting diversion structure or equivalent shall be used to develop an effective seal and to divert stream flow through the flume pipe (some modifications to the stream bottom may be required in order to achieve an effective seal);
- flume pipe(s) shall be aligned to prevent bank erosion and streambed scour;
- flume pipe shall not be removed during trenching, pipe laying, or backfilling activities, or initial streambed restoration efforts; and
- all flume pipes and dams that are not also part of the equipment bridge shall be removed as soon as final clean up of the stream bed and bank is complete

7.4.4 Flowing Open Cut Crossing – Dry Dam and Pump Method

Where specified in the construction drawings, the Contractor shall utilize the Flowing Open Cut Crossing – Dry Dam and Pump Method as shown

on **Detail 14**. The dam and pump crossing method shall meet the following performance criteria:

- sufficient pumps shall be used to maintain 1.5 times the flow present in the stream at the time of construction;
- at least one back up pump must be available on site;
- dams shall be constructed with materials that prevent sediment and other pollutants from entering the waterbody (e.g., sandbags or clean gravel with plastic liner);
- screen pump intakes shall be installed;
- streambed scour shall be prevented at pump discharge; and dam and pumps shall be monitored to ensure proper operation throughout the waterbody crossing.

7.4.5 Horizontal Directional Drill Crossings

Where required, the horizontal directional drill method **as shown on Detail 15** shall be utilized for designated major and sensitive waterbodies. The Contractor shall construct each directional drill waterbody crossing in accordance with a Site Specific Plan as shown in the Construction Drawings.

Drilling fluids and additives utilized during implementation of a directional drill shall be non-toxic to the aquatic environment.

The Contractor shall develop a contingency plan to address a frac-out during a directional drill. The plan shall include instructions for monitoring during the directional drill and mitigation in the event that there is a release of drilling fluids. Additionally, the waterbody shall be monitored downstream by the Contractor for any signs of drilling fluid.

The Contractor shall dispose of all drill cuttings and drilling mud at a Keystone-approved location. Disposal options may include spreading over the construction right-of-way in an upland location approved by Keystone, hauling to an approved licensed landfill, or other site approved by Keystone.

7.4.6 Horizontal Bore Crossings

Where required, the horizontal bore method **as shown on Detail 21** shall be utilized for crossing waterbodies. The Contractor shall construct each horizontal bore waterbody crossing in accordance with a Site Specific Plan as shown in the Construction Drawings.

7.5 Clearing

Except where rock is encountered and at non flowing open cut crossings, all necessary equipment and materials for pipe installation must be on-site and assembled prior to commencing trenching in a waterbody. All staging areas for materials and equipment shall be located at least 10 feet from the waterbody

edge. The Contractor shall preserve as much vegetation as possible along the waterbody banks while allowing for safe equipment operation.

Clearing and grubbing for temporary vehicle access and equipment crossings shall be carefully controlled to minimize sediment entering the waterbody from the construction right-of-way.

Clearing and grading shall be performed on both sides of the waterbody prior to initiating any trenching work. All trees shall be felled away from watercourses.

Plant debris or soil inadvertently deposited within the high water mark of waterbodies shall be promptly removed in a manner that minimizes disturbance of the waterbody bed and bank. Excess floatable debris shall be removed above the high water mark from areas immediately above crossings.

Vegetation adjacent to waterbodies which are to be installed by horizontal directional drill or boring methods shall not be disturbed except by hand clearing as necessary for drilling operations.

7.6 Grading

The construction right-of-way adjacent to the waterbody shall be graded so that soil is pushed away from the waterbody rather than towards it when possible.

In order to minimize disturbance to woody riparian vegetation within extra workspaces adjacent to the construction right-of-way at waterbody crossings, the Contractor shall minimize grading and grubbing of waterbody banks. Grubbing shall be limited to the ditchline plus an appropriate width to accommodate the safe installation of vehicle access and the crossing to the extent practicable.

7.7 Temporary Erosion and Sediment Control

The Contractor shall install sediment barriers across the entire construction right-of-way at all flowing waterbody crossings.

The Contractor shall install sediment barriers immediately after initial disturbance of the waterbody or adjacent upland. Sediment barriers must be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration of adjacent upland areas is complete.

Where waterbodies are adjacent to the construction right-of-way, the Contractor shall install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil and sediment within the construction right-of-way.

7.8 Trenching

The following requirements apply to all waterbody crossings except those being installed by the non-flowing open cut crossing method.

All equipment and materials shall be on site before trenching in the active channel of all minor waterbodies containing state designated fisheries, and in intermediate and major waterbodies. All activities shall proceed in an orderly manner without delays until the trench is backfilled and the stream banks stabilized. The Contractor shall not begin in-stream activity until the in-stream pipe section is complete and ready to be installed in the waterbody.

The Contractor shall use trench plugs at the end of the excavated trench to prevent the diversion of water into upland portions of the pipeline trench and to keep any accumulated upland trench water out of the waterbody. Trench plugs must be of sufficient size to withstand upslope water pressure.

The Contractor shall conduct as many in-stream activities as possible from the banks of the waterbodies. The Contractor shall limit the use of equipment operating in waterbodies to that needed to construct each crossing.

The Contractor shall place all spoil from minor and intermediate waterbody crossings, and upland spoil from major waterbody crossings in the construction right-of-way at least 10 feet from the water's edge or in additional extra work areas. No trench spoil, including spoil from the portion of the trench across the stream channel, shall be stored within a waterbody unless the crossing cannot be reasonably completed without doing so.

The Contractor shall install and maintain sediment barriers around spoil piles to prevent the flow of spoil into the waterbody.

Spoil removed during ditching shall be used to backfill the trench usually with a backhoe, clamshell or a dragline working from the waterbody bank. Sand, gravel, rockshield, or fill padding shall be placed around the pipe where rock is present in the channel bottom.

7.9 Pipe Installation

The following requirements apply to all waterbody crossings except those being installed by the non-flowing open cut crossing method.

A "free stress" pipe profile shall be used at all minor, intermediate, and major waterbodies with gradually sloping stream banks. The "box bend" pipe profile shall be used for intermittent and major waterbodies with steep stream banks.

The trench shall be closely inspected to confirm that the specified cover and that adequate bottom support can be achieved, and shall require Keystone approval prior to the pipe being installed. Such inspections shall be performed by visual inspection and/or measurement by a Keystone Representative. In rock trench, the ditch shall be adequately padded with clean granular material to provide continuous support for the pipe.

The pipe shall be pulled into position or lowered into the trench and shall, where necessary, be held down by weights, as-built recorded and backfilled immediately to prevent the pipe from floating.

The Contractor shall provide sufficient approved lifting equipment to perform the pipe installation in a safe and efficient manner. As the coated pipe is lowered in, it shall be prevented from swinging or rubbing against the sides of the trench. Only properly manufactured slings, belts and cradles suitable for handling coated pipe shall be used. All pipes shall be inspected for coating flaws and/or damage as it is being lowered into the trench. Any damage to the pipe and/or coating shall be repaired.

7.10 Backfilling

The following requirements apply to all waterbody crossings except those being installed by the non-flowing open cut crossing method.

Trench spoil excavated from waterbodies shall be used to backfill the trench across waterbodies.

After lowering-in has been completed, but before backfilling, the line shall be re-inspected to ensure that no skids, brush, stumps, trees, boulders or other debris is in the trench. If discovered, such materials or debris shall be removed from the trench prior to backfilling.

For each major waterbody crossed, the Contractor shall install a trench breaker at the base of slopes near the waterbody unless otherwise directed by Keystone based on site specific conditions. The base of slopes at intermittent waterbodies shall be assessed on-site and trench breakers installed only where necessary.

Slurred muck or debris shall not be used for backfill. At locations where the excavated native material is not acceptable for backfill or must be supplemented, the Contractor shall provide granular material approved by Keystone.

If specified in the Construction Drawings, the top of the backfill in the stream shall be armored with rock riprap or bio-stabilization materials as appropriate.

7.11 Stabilization and Restoration of Stream Banks and Slopes

The stream bank contour shall be re-established. All debris shall be removed from the streambed and banks. Stream banks shall be stabilized and temporary sediment barriers shall be installed within 24 hours of completing the crossing if practicable.

Approach slopes shall be graded to an acceptable slope for the particular soil type and surface run off controlled by installation of permanent slope breakers. Where considered necessary, the integrity of the slope breakers shall be ensured by lining with erosion control blankets.

Immediately following reconstruction of the stream banks, the Contractor shall install seed and flexible channel liners on waterbody banks as shown in **Detail 19**.

If the original stream bank is excessively steep and unstable and/or flow conditions are severe or if specified on the Construction Drawings, the banks

shall be stabilized with rock riprap, gabions, stabilizing cribs, or bio-stabilization measures to protect backfill prior to reestablishing vegetation.

Stream bank riprap structures shall consist of a layer of stone, underlain with approved filter fabric or a gravel filter blanket in accordance with **Detail 20**. Riprap shall extend from the stabilized streambed to the top of the stream bank, where practicable, native rock shall be utilized.

Bio-stabilization techniques which may be considered for specific crossings are shown in **Details 22, 23, and 24.**

The Contractor shall remove equipment bridges as soon as possible after final clean up.

8.0 HYDROSTATIC TESTING

8.1 Testing Equipment Location

The Contractor shall provide for the safety of all pipeline construction personnel and the general public during hydrostatic test operations by placing warning signs in populated areas.

The Contractor shall locate hydrostatic test manifolds 100 feet outside wetlands and riparian areas to the maximum extent practicable.

8.2 Test Water Source and Discharge Locations

Keystone is responsible for acquiring all permits required by federal, state and local agencies for procurement of water and for the discharge of water used in the hydrostatic testing operation. Keystone shall provide the Contractor with a copy of the appropriate withdrawal/discharge permit for hydrostatic test water. The Contractor shall keep the water withdrawal/discharge permit on site at all times during testing operations.

Any water obtained or discharged shall be in compliance with permit notice requirements and with sufficient notice for Keystone's Testing Inspector to make water sample arrangements prior to obtaining or discharging water. In some instances sufficient quantities of water may not be available from the permitted water sources at the time of testing. Withdrawal rates may be limited as stated by the permit. Under no circumstances shall an alternate water source be used without prior authorization from Keystone.

The Contractor shall be responsible for obtaining any required water analyses from each source to be used in sufficient time to have a lab analysis performed prior to any filling operations. The sample bottle shall be sterilized prior to filling with the water sample. The analysis shall determine the pH value and total suspended solids. Each bottle shall be marked with:

- Source of water with pipeline station number
- Date taken
- Laboratory order number

- Name of person taking sample

Staging/work areas for filling the pipeline with water shall be located a minimum of 50 feet from the waterbody or a wetland boundary if topographic conditions permit. The Contractor shall install temporary sediment filter devices adjacent to all streams that runoff may enter.

The Contractor shall screen the intake hose to prevent the entrainment of fish or debris. The hose shall be kept off the bottom of the waterbody. Refueling of construction equipment shall be conducted a minimum distance of 100 feet from the stream or a wetland. Pumps used for hydrostatic testing within 100 feet of any waterbody or wetland shall be operated and refueled in accordance with Section 3.

The Contractor shall maintain adequate flow rates in the waterbody to protect aquatic life, provide for all waterbody uses, and provide for downstream withdrawals of water by existing users.

The Contractor shall not use chemicals in the test water. The Contractor shall not discharge any water containing oil or other substances that are in sufficient amounts as to create a visible color film or sheen on the surface of the receiving water.

Potential hydrostatic water sources for the mainline and the Cushing Extension are as follows:

Table 1 – Mainline Drainage Basins and Water Sources

Drainage Basins & Water Sources	Approximate Location Where Pipeline Crosses Water Source (Mile Post)
Pembina River	7
Tongue River	17
Carter Creek	24
Branch Forest River	46
Sheyenne River	167
Logen Dam	290
Nat'l Wildlife Prod. Area	351
Rock Creek	358
Lutz Lake	363
Wolf Creek	387
James River	417
Missouri River	431
Elk Horn River	498
Shell Creek	527
Platte River	537
Big Blue River	568
West Fork Big Blue River	587
Big Blue River	652
Missouri River	743
Grand River	834
Mussel Fork River	850
Mussel Fork River	856
Silver Creek (East Fork)	865
South Fork Salt River	912
Culver River	972
Pardenne Creek Runs Into Miss. River	988
Mississippi River	1014
Cahokie Creek	1020
Shoal Creek	1048

Table 2 – Cushing Extension Drainage Basins and Water Sources

Drainage Basins & Water Sources	Approximate Location Where Pipeline Crosses Water Source (Mile Post)
Little Blue River	4.2
Republican River	52.1
Smokey Hill River	76.2
Cottonwood River	117.0
Whitewater River	158.0
Stewart Creek (0.3 mile upstream of Walnut River)	185.1
Arkansas River	206.1
Salt Fork Arkansas River	238.5
Cimarron River	284.4

Selected road, railroad, and river crossing pipe sections may be specified to be pre-tested for a minimum of 4 hours. The water for pre-testing of any road and railroad crossings shall be hauled by a tanker truck from an approved water source. Water for pre-testing of a river crossing may be hauled or taken from the respective river if it is an approved water source. Since the volume of water utilized in these pretests shall be relatively small, the water shall be discharged overland along the construction right-of-way and allowed to soak into the ground utilizing erosion and sediment control mitigative measures.

Selection of final test water sources will be determined based on site conditions at the time of construction and applicable permits.

8.3 Filling the Pipeline

After final positioning of the pipe, the Contractor shall fill the pipe with water. Pipe ends shall not be restrained during the fill. The fill pump shall be set on a metal catch pan of sufficient dimensions to contain all leaking lubricants or fuel and prevent them from entering the water source. The suction inlet must be placed in a screened enclosure located at a depth that shall not allow air to be drawn in with the water. The screened enclosure shall be such that the fill water is free of organic or particulate matter.

The Contractor shall provide a filter of the backflushing or cartridge type with a means of cleaning without disconnecting the piping. The filter shall have the specifications of 100 mesh screen. If the cartridge type is used, a sufficient quantity of cartridges shall be on hand at the filter location. The Contractor shall install the filter between the fill pump and the test header. The Contractor shall be responsible for keeping the backflush valve on the filter closed during the filling operation. The Contractor shall be responsible for the proper disposal of materials backflushed from the filter or filter cartridges. The Contractor shall not be allowed to backflush the filter into the stream or other water source.

During water-filling of the pipeline, the Contractor shall employ the use of fill pumps capable of injecting water into the pipeline at a maximum rate of approximately 0.7 to 1.0 mile per hour, except as limited by permits or the maintenance of adequate flow rates in the waterbody, as indicated approximately as follows:

Nominal OD	Max. GPM
30"	3000

The Contractor shall restrict flow rates if necessary to protect aquatic life, provide for all waterbody uses, and provide for downstream withdrawals of water by existing users.

8.4 Dewatering the Pipeline

The Contractor shall comply with state-issued NPDES permits for discharging test water.

The Contractor shall not discharge any water containing oil or other substances that are in sufficient amounts as to create a visible color film on the surface of the receiving water.

The Contractor shall not discharge into state-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate Federal, State, and local permitting agencies grant written permission.

The Contractor shall calculate, record and provide to Keystone the day, date, time, location, total volume, maximum rate and methods of all water discharged to the ground or to surface water in association with hydrostatic testing.

The Contractor shall regulate the pig velocity discharge rate (3000 gpm maximum), use energy dissipation device(s), and install sediment barriers, as necessary, to prevent erosion, streambed scour, suspension of sediments, or excessive stream flow. Water must be disposed of using good engineering judgment so that all federal, state, and local environmental standards are met. Dewatering lines shall be sufficient strength and be securely supported and tied down at the discharge end to prevent whipping during this operation.

To reduce the velocity of the discharge, The Contractor shall utilize an energy-dissipating device described as follows:

8.4.1 Splash Pup

A splash pup consists of a piece of large diameter pipe (usually over 20" O.D.) of variable length with both ends partially blocked that is welded perpendicularly to the discharge pipe. As the discharge hits against the inside wall of the pup, the velocity is rapidly reduced and the water is allowed to flow out either end. A variation of the splash pup concept, commonly called a diffuser, incorporates the same design, but with capped ends and numerous holes punched in the pup to diffuse the energy.

8.4.2 Splash Plate

The splash plate is a quarter section of 36-inch pipe welded to a flat plate and attached to the end of a 6-inch discharge pipe. The velocity is reduced by directing the discharge stream into the air as it exits the pipe. This device is also effective for most overland type discharge.

8.4.3 Plastic Liner

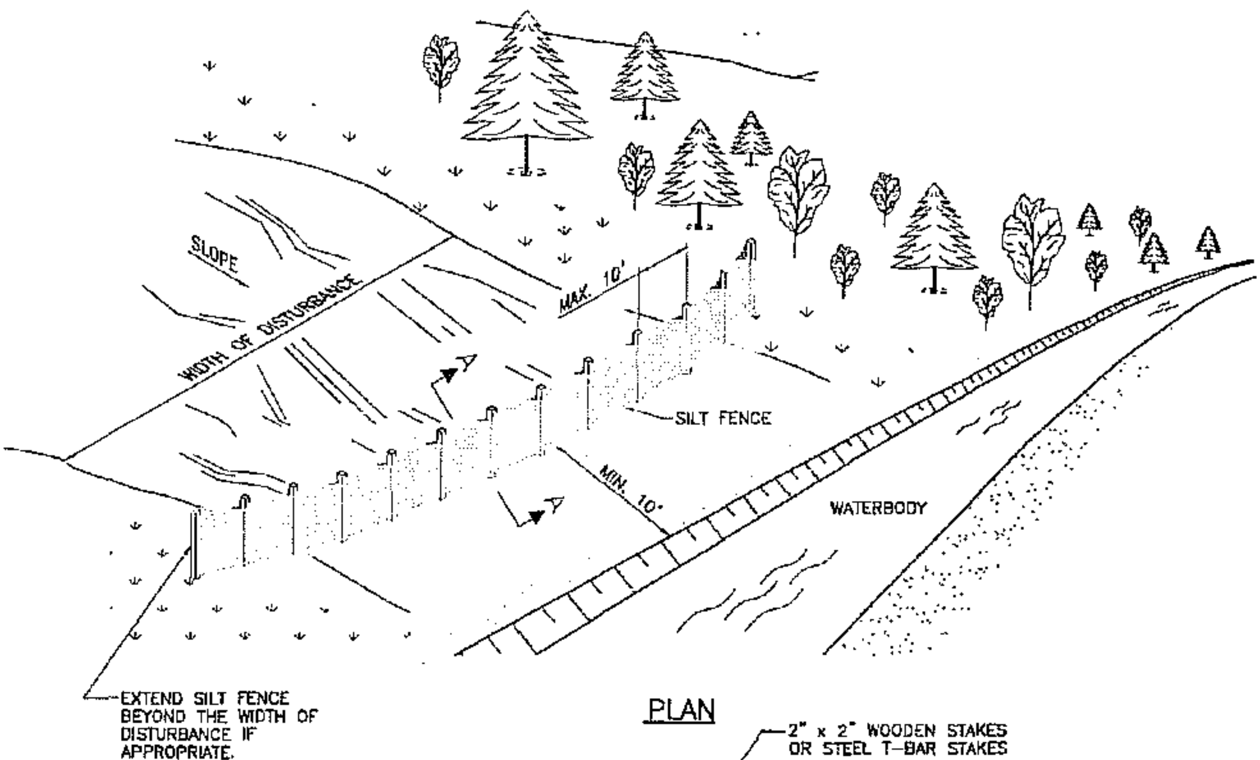
In areas where highly erodible soils exist or in any low flow drainage channel, it is a common practice to use layers of visqueen (or any of the new construction fabrics currently available) to line the receiving channel for a short distance. One anchoring method may consist of a small load of rocks to keep the fabric in place during the discharge.

8.4.4 Straw Bale Dewatering Structure

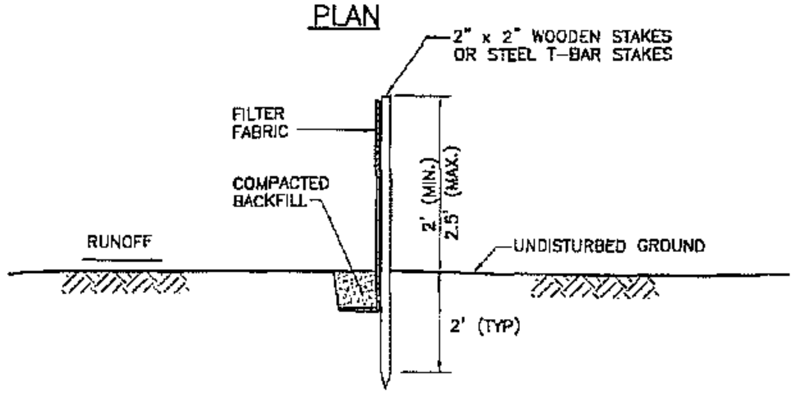
Straw bale dewatering structures are designed to dissipate and remove sediment from the water being discharged. Straw bale structures are used for on-land discharge of wash water and hydrostatic test water and in combination with other energy dissipating devices for high volume discharges. A straw bale dewatering structure is shown In Detail 6.

9.0 DRAWINGS AND FIGURES

Detail 1	Typical Silt Fence Barrier
Detail 2	Typical Straw or Hay Bale Barrier
Detail 3	Permanent Slope Breakers (Water Bars)
Detail 4	Erosion Control Matting Installation
Detail 5	Typical Dewatering Filter Bag
Detail 6	Typical Straw Bale Dewatering Structure
Detail 7	Typical Permanent Trench Breakers
Detail 8	"Dry" Wetland Crossing Method
Detail 9	Standard Wetland Crossing Method
Detail 10	Push/Pull Wetland Crossing Method
Detail 11	Non-Flowing Water Body Crossing Method
Detail 12	Typical Flowing Waterbody Crossing Method
Detail 13	Typical Dry Flume Crossing Method
Detail 14	Typical Dam & Pump Crossing
Detail 15	Typical Horizontal Drill (HDD) Site Plan & Profile
Detail 16	Typical Temporary Bridge Crossing
Detail 17	Typical Flume Bridge Crossing
Detail 18	Typical Railcar Bridge Crossing
Detail 19	Flexible Channel Liner Installation
Detail 20	Typical Rock Rip-Rap
Detail 21	Typical Road Bore Crossing
Detail 22	Streambank Reclamation – Brush Layer In Cross Cut Slope
Detail 23	Streambank Reclamation – Log Wall
Detail 24	Streambank Reclamation – Vegetated Geotextile Installation
Detail 25	Typical ROW Layout/Soil Handling
Detail 26	Header/Main Crossovers of Keystone Pipeline
Detail 27	Relocate/Replace Drainage Header/Main
Detail 28	Temporary Drain Tile Repair
Detail 29	Permanent Repair Method of Drain Tiles
Figure 1	Typical Site Specific Plan



PLAN



SECTION A–A

NOTES:

1. MATERIAL SHOULD BE WOVEN GEOTEXTILE FABRIC SUCH AS EXXON GTF 180 OR MIRAFI 600X, OR AN APPROVED EQUIVALENT. SECONDARY REINFORCEMENT, SUCH AS A CONSTRUCTION BARRIER FENCE OR WIRE MESH CAN ALSO BE USED BEHIND THE FILTER FABRIC.
2. SILT FENCE TO BE REINFORCED WITH 2" x 2" WOODEN STAKES OR STEEL T–BAR STAKES PLACED EVERY 8' OR CLOSER AS CONDITIONS REQUIRE.
3. ATTACH FILTER FABRIC AT EACH POST AT A MINIMUM OF 3 LOCATIONS.
4. THE FILTER FABRIC MINIMUM LENGTH OF 1' IS TO BE ANCHORED IN A TRENCH WITH WELL COMPACTED BACKFILL OVER THE FABRIC TO PREVENT UNDERMINING.
5. TO ELIMINATE POSSIBLE END FLOW, BOTH ENDS OF THE SILT FENCE SHALL BE TURNED AND EXTENDED UPSLOPE.
6. SILT FENCES ARE TO BE CHECKED AND MAINTAINED ON A REGULAR BASIS. REMOVE ANY BUILD–UP OF SEDIMENT.
7. WHERE ANCHORING CONDITIONS FOR THE SILT FENCE ARE POOR, PLACE STRAW BALES ON DOWNSTREAM SIDE OF THE SILT FENCE.
8. INSTALLATION TO BE MODIFIED BY KEYSTONE AS NECESSARY TO SUIT ACTUAL SITE CONDITIONS.

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Trow

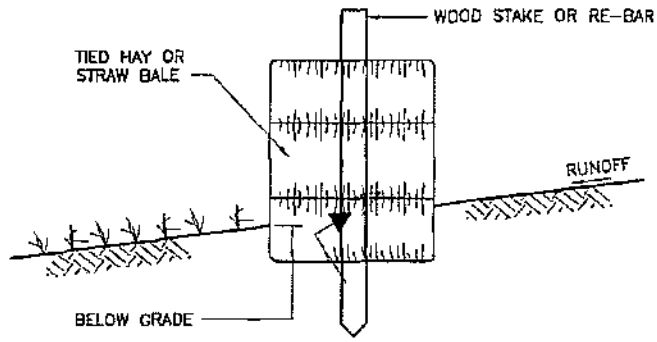
TransCanada
KEYSTONE PIPELINE PROJECT

TYPICAL SILT FENCE BARRIER

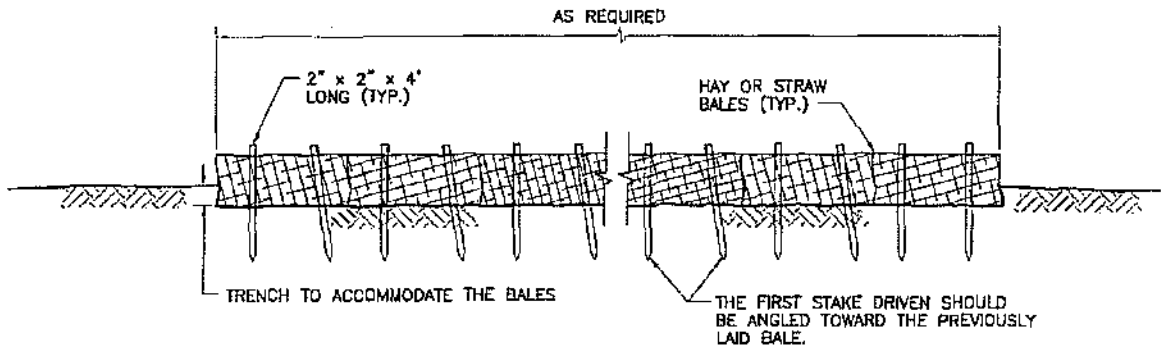
DETAIL 1

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

PROJECT 503805



SECTION



SECTION

NOTES:

1. TO ELIMINATE POSSIBLE END FLOW, BOTH ENDS OF THE STRAW BALE BARRIER SHOULD BE TURNED AND EXTENDED UPSLOPE.
2. EACH BALE SHOULD BE SECURED BY AT LEAST 2 STAKES. THE FIRST STAKE IN EACH BALE SHALL BE DRIVEN TOWARD THE PREVIOUSLY LAID BALE TO FORCE THE BALES TOGETHER. ANY GAPS CAN BE FILLED IN BY WEDGING LOOSE STRAW BETWEEN THE BALES. STAKES SHOULD BE DRIVEN. REBAR OR STANDARD "T" OR "U" STEEL POSTS CAN BE USED AS STAKES, BUT IT SHOULD BE NOTED THAT THEY MAY POSE A HAZARD TO EQUIPMENT IF THE BALES DISINTEGRATE.
3. COMPACT THE EXCAVATED SOIL AGAINST THE UPHILL SIDE OF THE BARRIER TO PREVENT PIPING.
4. STRAW OR HAY BALE BARRIERS REQUIRE CONTINUAL MAINTENANCE TO REMOVE COLLECTED SEDIMENT AND REPLACE DAMAGED BALES. PAY CLOSE ATTENTION TO THE REPAIR OF DAMAGED BALES, END RUNS AND UNDERCUTTING BENEATH BALES.
5. TO ELIMINATE POSSIBLE END FLOW, BOTH ENDS OF STRAW OR HAY BALE RUNS SHOULD BE TURNED AND EXTENDED UPSLOPE
6. INSTALLATION TO BE MODIFIED BY KEYSTONE AS NECESSARY TO SUIT ACTUAL SITE CONDITIONS.

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KEYSTONE PIPELINE PROJECT

TYPICAL STRAW OR HAY BALE BARRIER

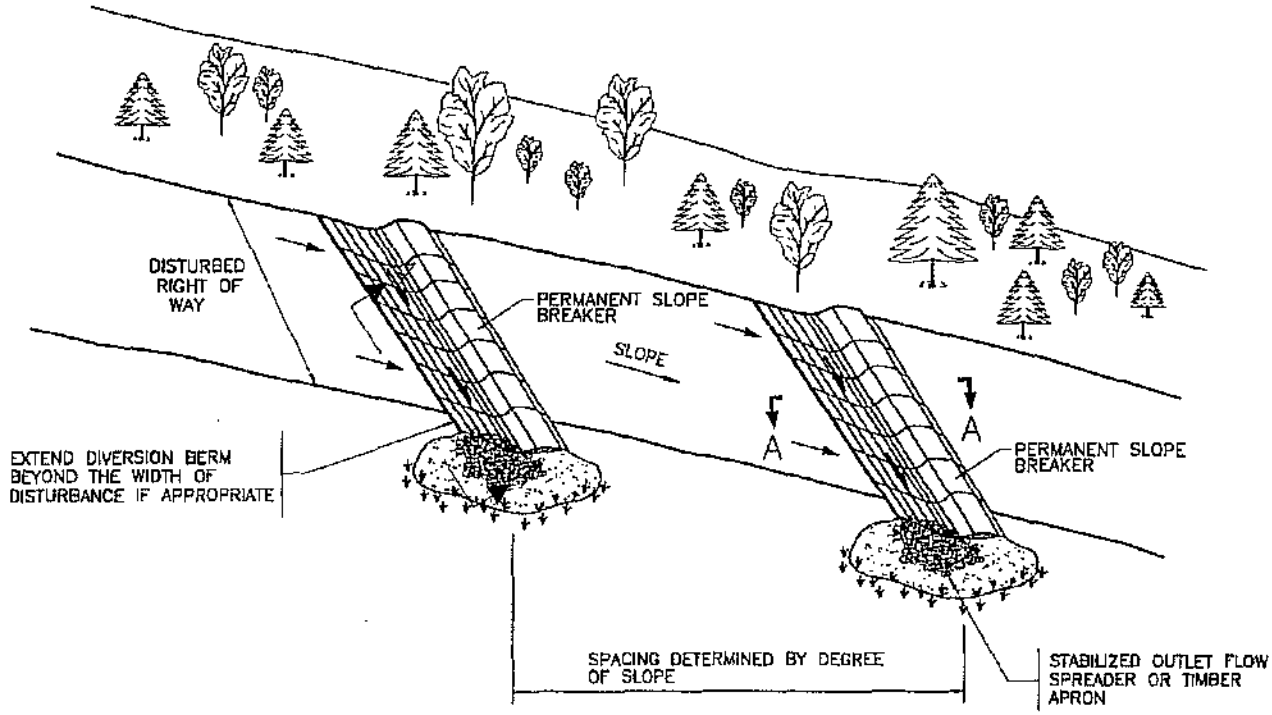
NO.	REVISION	DATE
1	GENERAL EDITORIAL REVISION	APR. 24, 2006
0	ISSUED FOR DEPARTMENT OF STATE FILING	MAR. 16, 2006

PROJECT: 50368E

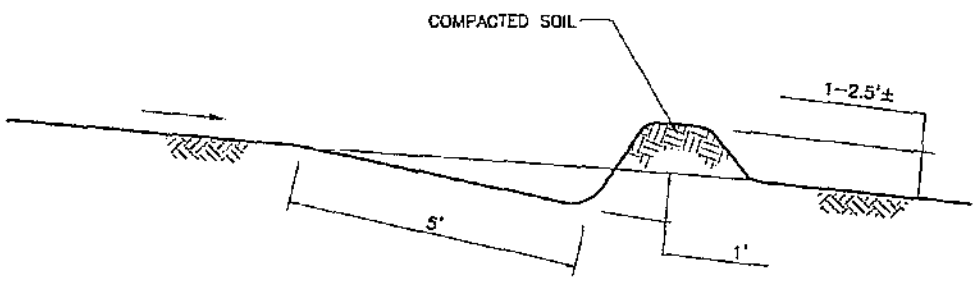
DETAIL 2

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

LAST PLOT DATE: Tue, 04 Apr 2006 – 3:29pm



SECTION



SECTION A–A

PERMANENT SLOPE BREAKER DETAIL

NOTES:

1. PERMANENT SLOPE BREAKERS TO PROVIDE POSITIVE DRAINAGE TO A STABILIZED OUTLET.
2. INSTALLATION SPECIFICATIONS TO BE MODIFIED BY KEYSTONE AS NECESSARY TO SUIT ACTUAL SITE CONDITIONS.

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NO.	REVISION	DATE
1	FINAL FEDERAL REVISION	APR.04.2006
0	ISSUED FOR DEPARTMENT OF STATE FILING	MAR.16.2006

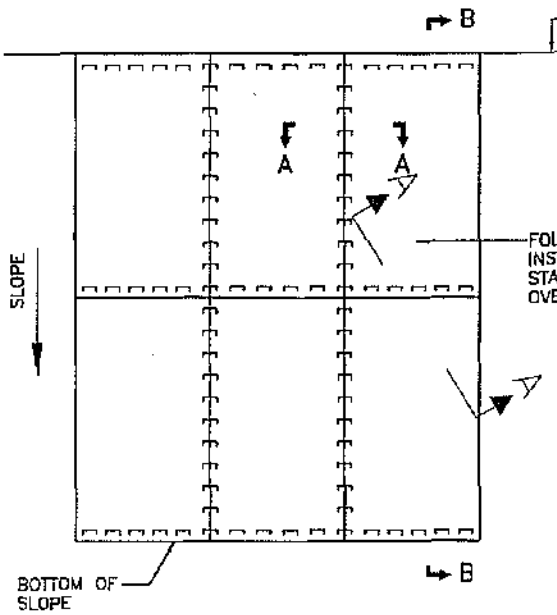
PERMANENT SLOPE BREAKERS (WATER BARS)

PROJECT: 50386E

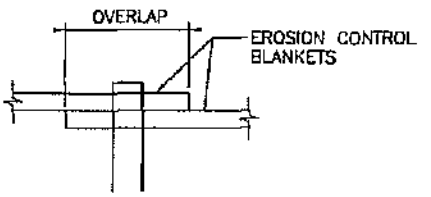
DETAIL 3

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

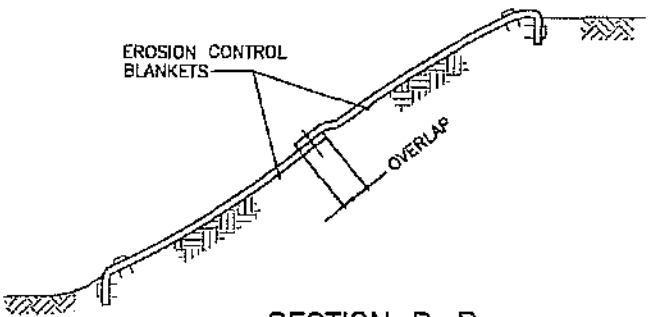
LAST PLOT DATE: Tue, 04 Apr 2006 – 3:23pm



PLAN VIEW



SECTION A–A



SECTION B–B

NOTES:

1. INSTALL MATTING IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
2. PREPARE SOIL BEFORE INSTALLING MATTING, INCLUDING GRADING, REMOVAL OF LARGE ROCKS AND DEBRIS, AND THE APPLICATION OF SEED AND FERTILIZER IF NOT USING PRE–SEEDED MATTING.
3. EROSION CONTROL MATTING SHALL EXTEND COMPLETELY ACROSS DISTURBED AREAS TO PROTECT ERODIBLE SURFACES.
4. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE MATTING IN A TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
5. ROLL THE MATTING DOWN THE SLOPE IN THE DIRECTION OF THE WATER FLOW.
6. AS AN ALTERNATIVE TO STAPLES, WOODEN STAKES CAN BE USED.
7. ENSURE COMPLETE CONTACT BETWEEN THE MATTING AND THE SLOPE FACE. ADDITIONAL STAPLES CAN BE USE TO ELIMINATE GAPS.
8. INSTALLATION SPECIFICATIONS TO BE MODIFIED BY KEYSTONE AS NECESSARY TO SUIT ACTUAL SITE CONDITIONS.

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1	PER FINAL EDITORIAL REVISIONS	APR 29 2004
0	ISSUED FOR U.S. DEPARTMENT OF STATE PERMIT	MAR 15 2004

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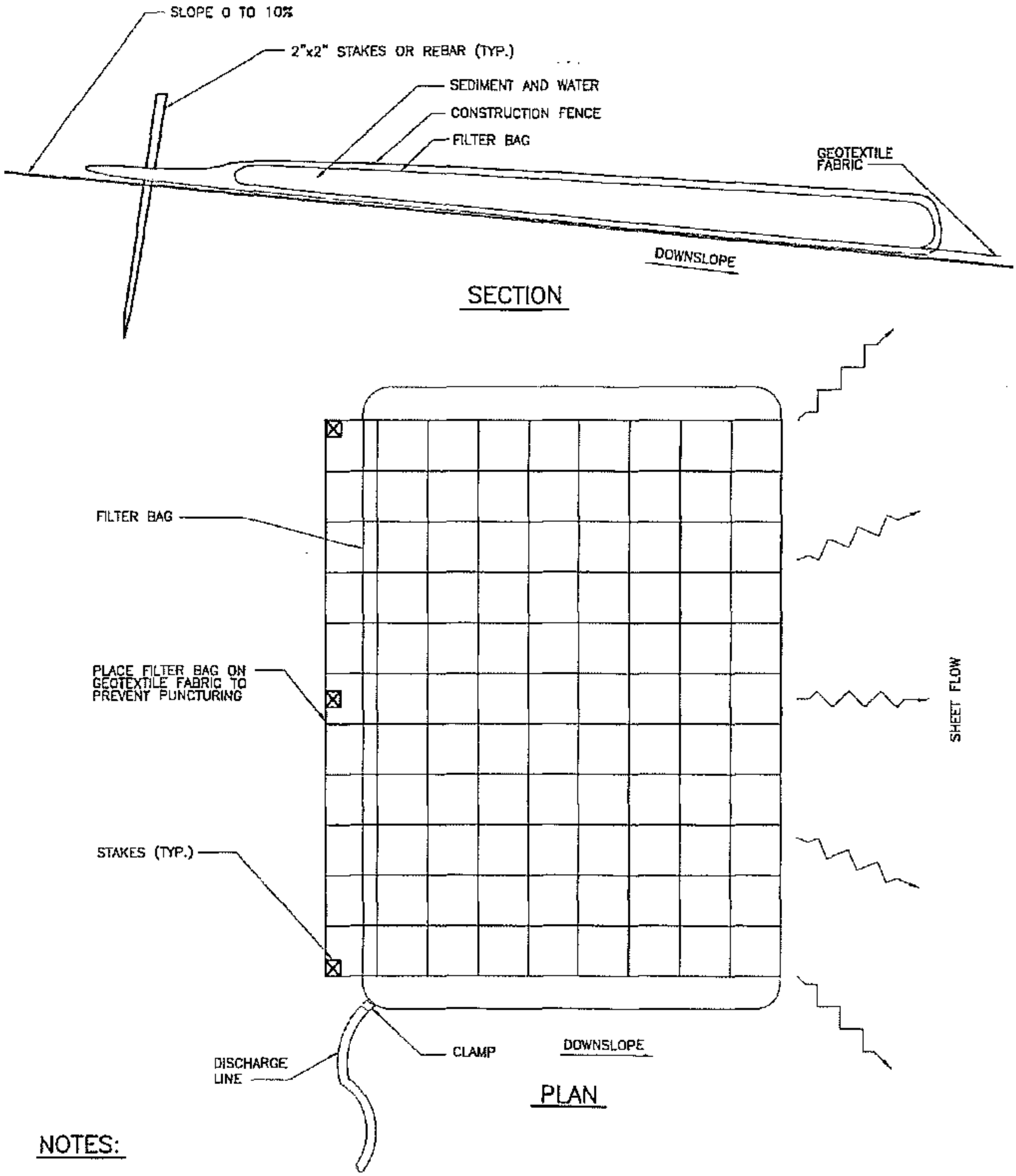
KEYSTONE PIPELINE PROJECT

EROSION CONTROL MATTING INSTALLATION

PROJECT 30308E

DETAIL 4

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7008-308	ALS	JTG	RG



NOTES:

1. MANUFACTURED FILTER BAGS ARE A SUITABLE ALTERNATIVE TO STRAW BALE STRUCTURES FOR TRENCH DEWATERING. FILTER BAGS SHALL BE INSTALLED AS SPECIFIED BY THE MANUFACTURER.
2. INSTALLATION SPECIFICATIONS TO BE MODIFIED BY KEYSTONE AS NECESSARY TO SUIT ACTUAL SITE CONDITIONS.

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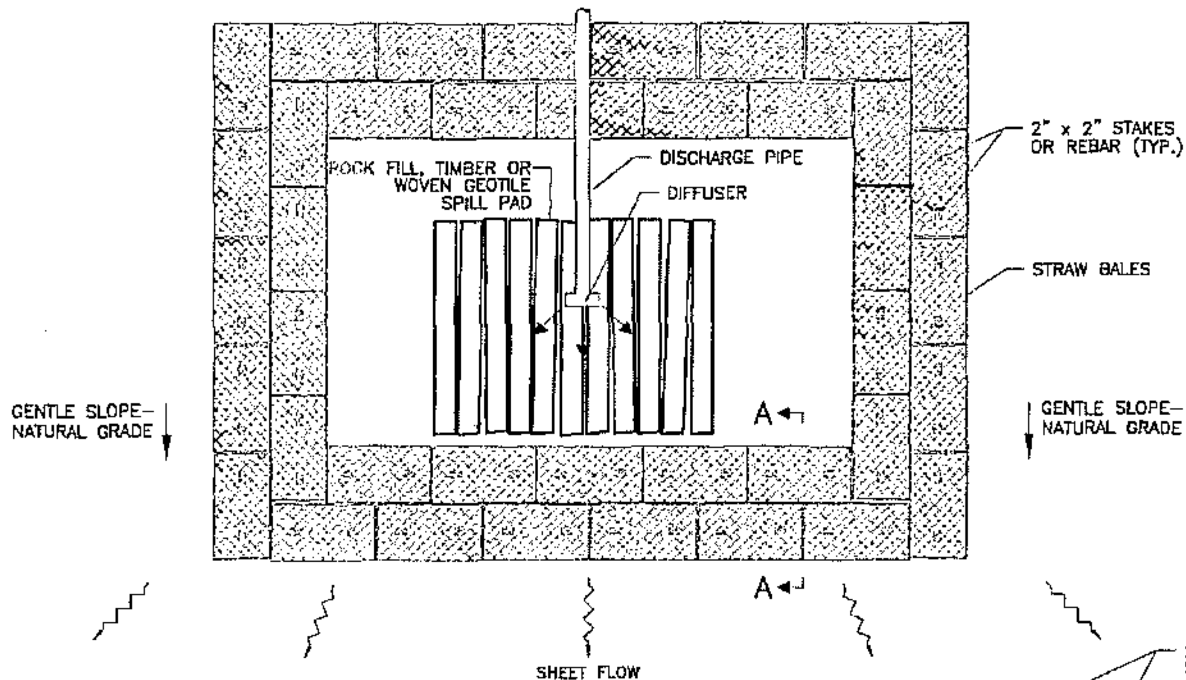
KEYSTONE PIPELINE PROJECT

NO.	REVISION	DATE

TYPICAL DEWATERING FILTER BAG

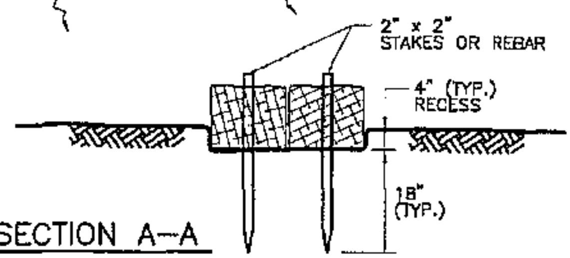
DETAIL 5

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG



PLAN

SCALE: N.T.S.



SECTION A–A

NOTES:

1. INSTALL A STRAW BALE DEWATERING STRUCTURE WHEREVER IT IS NECESSARY AND AS DIRECTED BY THE ENVIRONMENTAL INSPECTOR TO PREVENT THE FLOW OF HEAVILY SILT LADEN WATER INTO WATERBODIES OR WETLANDS.

2. DISCHARGE SITE SHOULD BE WELL VEGETATED AND LOCATED AT LEAST 50 FEET FROM ANY WATERBODY. THE TOPOGRAPHY OF THE SITE SHOULD BE SUCH THAT WATER WILL FLOW INTO THE DEWATERING STRUCTURE AND AWAY FROM ANY WORK AREAS. THE AREA DOWNSLOPE FROM THE DEWATERING SITE MUST BE REASONABLY FLAT OR STABILIZED BY VEGETATION OR OTHER MEANS TO ALLOW THE FILTERED WATER TO CONTINUE AS SHEET FLOW.

3. DIRECT THE PUMPED WATER ONTO A STABLE SPILL PAD CONSTRUCTED OF ROCKFILL, WEIGHTED TIMBERS, OR A WOVEN GEOTEXTILE STAKED TO THE GROUND SURFACE, SUCH AS MIRAFI 600X, TERRAFIX 400W, OR A COMPANY APPROVED EQUIVALENT. BEYOND THE SPILL PAD FORCE THE DISCHARGE WATER INTO SHEET FLOW USING STRAW BALES AND THE NATURAL TOPOGRAPHY.

4. DISCHARGE RATES SHOULD BE SUCH THAT THE CAPACITY OF THE STRUCTURE WILL NOT BE EXCEEDED.

5. DISCHARGE WATER SHALL BE FORCED INTO SHEET FLOW IMMEDIATELY BEYOND THE SPILL PAD USING A COMBINATION OF STRAW BALES AND THE NATURAL TOPOGRAPHY. RECESS STRAW BALES. DRIVE TWO (2) STAKES OR REBAR INTO EACH BALE TO ANCHOR THEM IN PLACE.

6. INSTALLATION SPECIFICATIONS TO BE MODIFIED BY KEYSTONE AS NECESSARY TO SUIT ACTUAL SITE CONDITIONS.

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KEYSTONE PIPELINE PROJECT

NO.	REVISION	DATE
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0	ISSUED FOR DEPARTMENT OF STATE FILING	MAR.17.2008

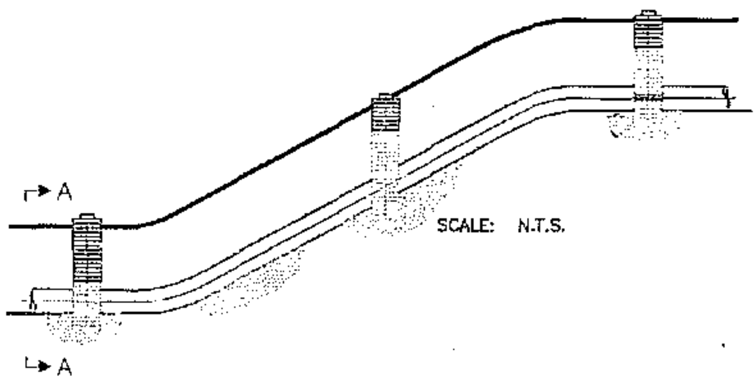
TYPICAL STRAW BALE DEWATERING STRUCTURE

PROJECT: 80368E

DETAIL 6

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

LAST PLOT DATE: Tue, 04 Apr 2008 – 3:25pm



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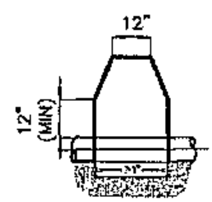
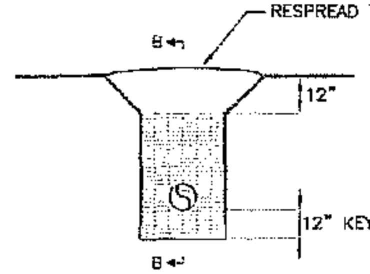


SECTION 'B—B'
SCALE: N.T.S.



SECTION 'A—A'
SCALE: N.T.S.

NOTES:

1. TRENCH BREAKERS TO BE INSTALLED AS SHOWN ON THE CONSTRUCTION DRAWINGS, WHERE DESCRIBED IN THE PLAN, AND AS DIRECTED BY KEYSTONE.

2. OPEN WEAVE HEMP OR JUTE SACKS SHALL BE FILLED WITH AN AVERAGE 55 LBS. MIXTURE OF:
   1) ONE (1) PART CEMENT AND SIX (6) PARTS SAND OR SUBSOIL, OR
   2) ONE (1) PART CEMENT, THREE (3) PARTS FLYASH, AND FIVE (5) PARTS SAND OR SUBSOIL
   3) SAND
   WITH JUST SUFFICIENT WATER TO PERMIT MIXTURE TO EXUDE AND BOND SACKS TOGETHER. TOPSOIL IS NOT TO BE USED IN SACKS.

3. KEY EACH TRENCH BREAKER A MINIMUM OF ONE (1) FT. INTO BOTTOMS AND SIDES OF TRENCH.

4. FOAM TRENCH BREAKERS MAY BE USED IN LIEU OF SAND SACK TRENCH BREAKERS.

5. INSTALLATION SPECIFICATIONS TO BE MODIFIED BY KEYSTONE AS NECESSARY TO SUIT ACTUAL SITE CONDITIONS.

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KEYSTONE PIPELINE PROJECT

NO.	REVISION	DATE
1	GENERAL EDITORIAL REVISION	APR.04.2006
0	ISSUED FOR DEPARTMENT OF STATE FILING	MAR.15.2006

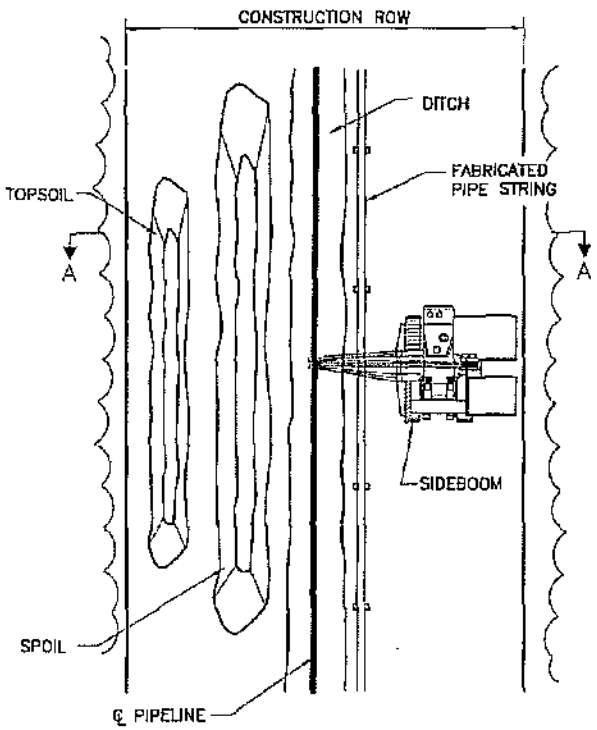
TYPICAL PERMANENT TRENCH BREAKERS

PROJECT: 50388E

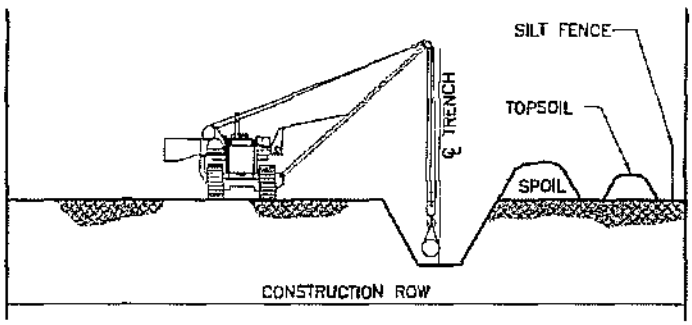
DETAIL 7

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

Tue, 04 Apr 2006



PLAN VIEW



SECTION "A–A"

CONSTRUCTION PROCEDURES:

1. IF A WETLAND IS BEING CULTIVATED AND BEING FARMED, NO WETLAND CONSTRUCTION PROCEDURES ARE REQUIRED.
2. FLAG WETLAND BOUNDARIES PRIOR TO CLEARING.
3. NO REFUELING OF MOBILE EQUIPMENT IS ALLOWED WITHIN 100 FEET OF WETLAND. PLACE "NO FUELING" SIGN POSTS APPROXIMATELY 100 FEET BACK FROM WETLAND BOUNDARY. REFUEL STATIONARY EQUIPMENT AS PER KEYSTONE'S SPILL PREVENTION PROCEDURES.
4. INSTALL TEMPORARY SLOPE BREAKER UPSLOPE WITHIN 100 FEET OF WETLAND BOUNDARY IF DIRECTED BY KEYSTONE.
5. CONSTRUCT WHEN DRY, IF POSSIBLE. IF SITE BECOMES WET AT TIME OF TRENCHING, AVOID SOIL COMPACTION BY UTILIZING TIMBER RIP–RAP OR PREFABRICATED EQUIPMENT MATS.
6. AVOID ADJACENT WETLANDS. INSTALL SEDIMENT BARRIERS (STRAW BALES AND/OR SILT FENCE) AT DOWN SLOPE EDGE OF RIGHT–OF–WAY ALONG WETLAND EDGE IF EVIDENT, OTHERWISE INSTALL BARRIER ON BOTH EDGES.
7. RESTRICT ROOT GRUBBING TO ONLY THAT AREA OVER THE DITCHLINE AND REMOVE STUMPS FROM WETLAND FOR DISPOSAL.
8. CONDUCT TRENCH LINE TOPSOIL STRIPPING (IF TOPSOIL IS NOT SATURATED). SALVAGE TOPSOIL TO ACTUAL DEPTH OR A MAXIMUM DEPTH OF 12 INCHES.
9. TRENCH THROUGH WETLANDS.
10. PIPE SECTION TO BE FABRICATED WITHIN THE WETLAND AND ADJACENT TO ALIGNMENT, OR IN STAGING AREA OUTSIDE THE WETLAND AND WALKED IN.
11. LOWER–IN PIPE. PRIOR TO BACKFILLING TRENCH, IF REQUIRED, TRENCH PLUGS SHALL BE INSTALLED AS REQUIRED. BACKFILL TRENCH.
12. RESTORE GRADE TO NEAR PRE–CONSTRUCTION TOPOGRAPHY, REPLACE TOPSOIL AND INSTALL PERMANENT EROSION CONTROL.
13. IF UTILIZED, REMOVE TIMBER MATS OR PREFABRICATED MATS FROM WETLANDS UPON COMPLETION.

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KEYSTONE PIPELINE PROJECT

"DRY" WETLAND CROSSING METHOD

PROJECT: 50388E

DETAIL B

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

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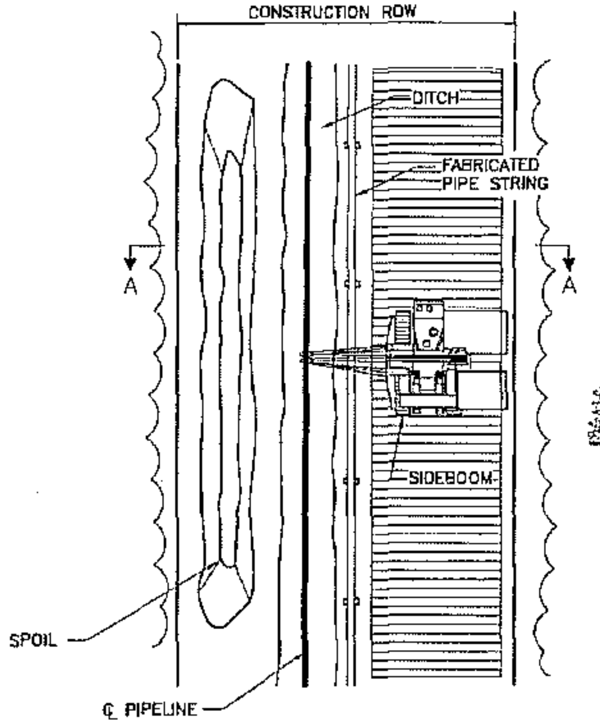
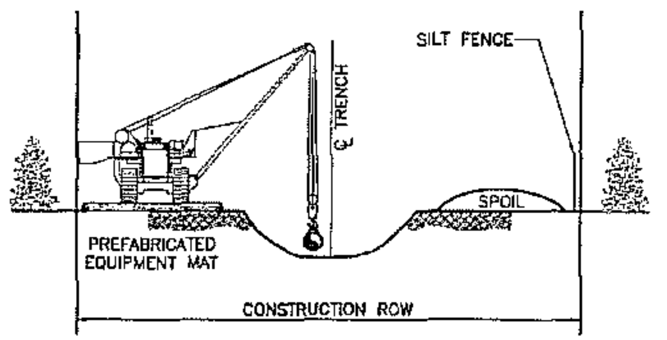


PLAN VIEW



SECTION "A–A"

CONSTRUCTION PROCEDURES:

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 APPROXIMIATLY 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/RIP–RAP 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 DOWN SLOPE 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 THE 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 WETLANDS.
11. LOWER–IN PIPE, INSTALL TRENCH PLUGS AT WETLAND EDGES AS REQUIRED AND BACKFILL IMMEDIATELY.
12. REMOVE TIMBER MATS OR PREFABRICATED MATS FROM WETLANDS UPON COMPLETION.
13. RESTORE GRADE TO NEAR PRE–CONSTRUCTION TOPOGRAPHY. REPLACE TOPSOIL AND INSTALL PERMANENT EROSION CONTROL.

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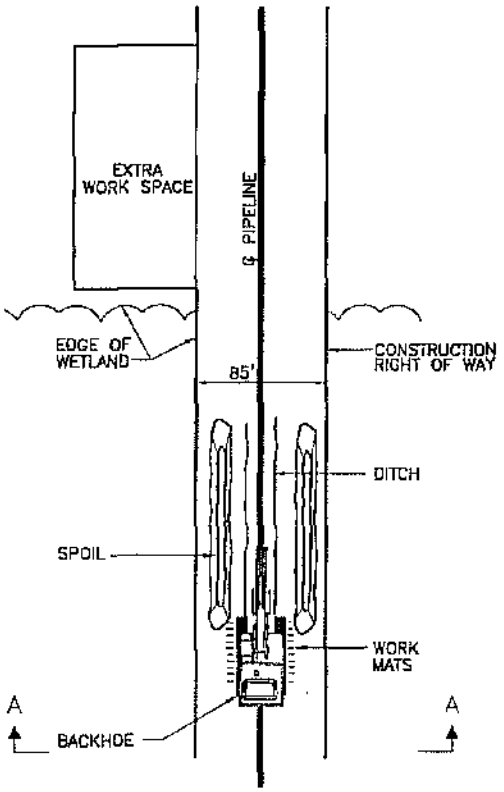
STANDARD WETLAND CROSSING METHOD

PROJECT: 50388E

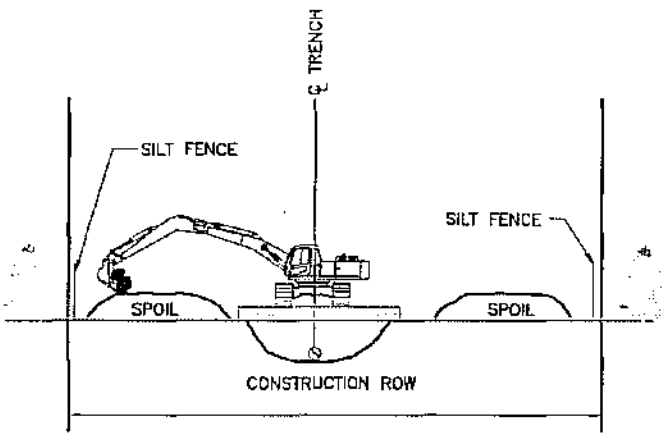
DETAIL 9

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

LAST PLOT DATE



PLAN VIEW



SECTION "A–A"

CONSTRUCTION PROCEDURES:

1. FLAG WETLAND BOUNDARIES PRIOR TO CLEARING.
2. NO REFUELING OF MOBILE EQUIPMENT IS ALLOWED WITHIN APPROXIMATELY 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 AS DIRECTED BY KEYSTONE.
4. RESTRICT ROOT GRUBBING TO ONLY THE AREA OVER THE DITCHLINE.
5. TOPSOIL STRIPPING SHALL NOT BE REQUIRED IN SATURATED SOIL CONDITIONS.
6. UTILIZE AMPHIBIOUS EXCAVATORS (PONTOON MOUNTED BACKHOES) OR TRACKED BACKHOES SUPPORTED BY FABRICATED TIMBER MATS OR FLOATS TO EXCAVATE TRENCH. IF FABRICATED TIMBER MATS ARE USED FOR STABILIZATION, THE BACKHOE SHALL GRADUALLY MOVE ACROSS THE WETLAND BY MOVING THE MAT FROM IMMEDIATELY BEHIND TO IMMEDIATELY IN FRONT OF THE BACKHOE'S PATH.
7. AVOID ADJACENT WETLANDS. INSTALL SEDIMENT BARRIERS (STRAW BALES AND/OR SILT FENCE) AT EDGE OF RIGHT–OF–WAY AND ALONG WETLAND EDGE IF PRACTICAL.
8. FABRICATE PIPE IN STAGING AREA OUTSIDE THE WETLAND IN THE EXTRA WORK SPACE AS INDICATED ON THE CONSTRUCTION DRAWINGS.
9. LEAVE HARD PLUGS AT THE EDGE OF THE WETLAND UNTIL JUST PRIOR TO PIPE PLACEMENT.
10. FLOAT PIPE IN PLACE, LOWER–IN, INSTALL TRENCH PLUGS AT WETLAND EDGES WHERE REQUIRED AND BACKFILL IMMEDIATELY.
11. REMOVE TIMBER MATS OR PREFABRICATED MATS OF NON–NATIVE MATERIAL FROM WETLANDS UPON COMPLETION.
12. RESTORE GRADE TO NEAR PRE–CONSTRUCTION TOPOGRAPHY AND INSTALL PERMANENT EROSION CONTROL.

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KEYSTONE PIPELINE PROJECT

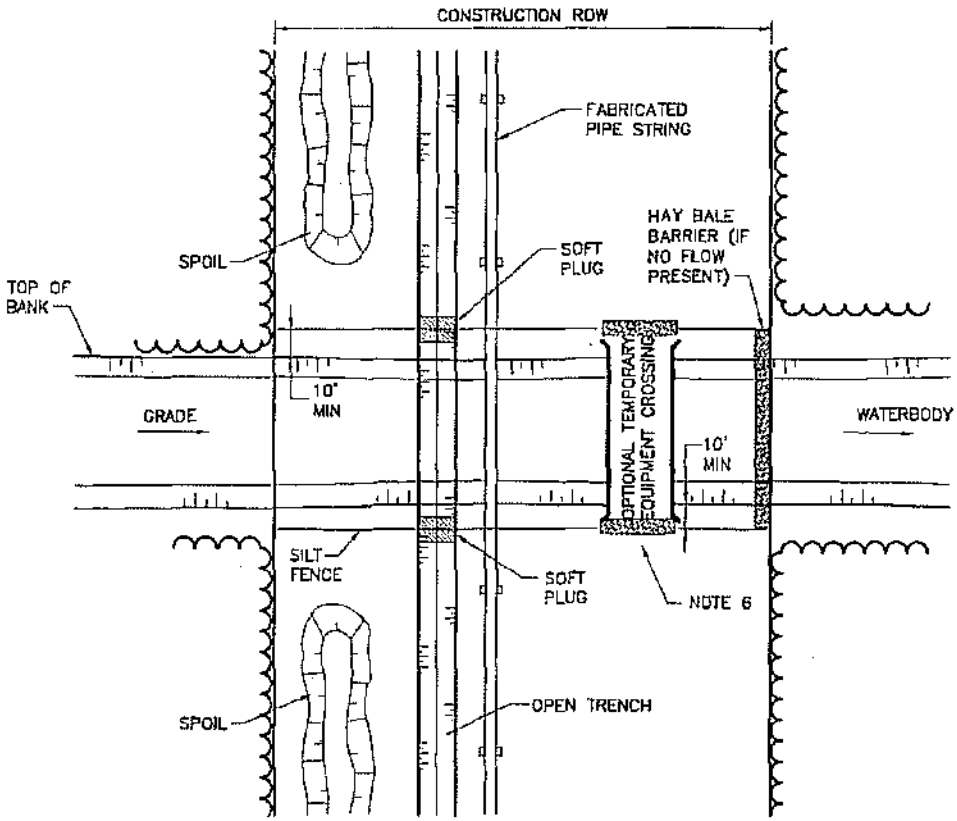
PUSH/PULL WETLAND CROSSING METHOD

PROJECT: 503886

DETAIL 10

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

LAST PLOT DATE: Tue, 04 Apr 2008 – 8:54am



PLAN VIEW

CONSTRUCTION PROCEDURES:

1. METHOD APPLIES TO CROSSINGS WHERE NO FLOWING WATER IS PRESENT AT THE TIME OF CROSSING OR AS OTHERWISE SHOWN ON THE CONSTRUCTION DRAWINGS.
2. CONTRACTOR MAY "MAINLINE THROUGH" THE CROSSING OR UP TO BOTH SIDES OF THE CROSSING; STRING, WELD, COAT AND WEIGHT (IF NECESSARY), USING THE MAINLINE CREW WITH THE PIPE SKIDDED OVER THE CROSSING.
3. NO REFUELING OF MOBILE EQUIPMENT WITHIN APPROXIMATELY 100 FEET OF DRY CHANNEL. REFUEL STATIONARY EQUIPMENT AS PER KEYSTONE'S SPILL PREVENTION PROCEDURES.
4. INSTALLATION OF TEMPORARY EQUIPMENT CROSSING IS OPTIONAL AT THE DISCRETION OF KEYSTONE.
5. IN AGRICULTURAL LAND, STRIP TOPSOIL FROM SPOIL STORAGE AREA. STOCKPILE TOPSOIL AND SPOIL SEPARATELY. TOPSOIL AND SPOIL WILL NOT BE STOCKPILED IN THE CROSSING CHANNEL AND WILL BE PLACED A MINIMUM OF 10 FEET FROM CROSSING BANKS WITHIN THE CONSTRUCTION RIGHT OF WAY.
6. CONSTRUCT SEDIMENT BARRIERS ACROSS THE ENTIRE CONSTRUCTION RIGHT OF WAY FOLLOWING CLEARING AND GRADING AND MAINTAIN UNTIL CONSTRUCTION OF THE CROSSING. EROSION CONTROL MEASURES SHALL BE REINSTALLED IMMEDIATELY FOLLOWING BACKFILLING OF TRENCH AND STABILIZATION OF BANKS. BARRIERS MAY BE TEMPORARILY REMOVED TO ALLOW CONSTRUCTION ACTIVITIES BUT MUST BE REPLACED BY THE END OF EACH WORK DAY.
7. IN-STREAM SPOIL TO BE STORED OUT OF THE STREAM CHANNEL A MINIMUM OF 10 FEET FROM HIGH BANK AND WITHIN THE CONSTRUCTION RIGHT OF WAY.
8. BACKFILL WITH NATIVE MATERIAL.
9. RESTORE CROSSING CHANNEL TO APPROXIMATE PRE-CONSTRUCTION PROFILE AND SUBSTRATE.
10. RESTORE CROSSING BANKS TO APPROXIMATE ORIGINAL CONDITION AND STABILIZE WITH EROSION CONTROL.

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0	ISSUED FOR DEPARTMENT OF STATE FILING	MAR.18.2008

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KEYSTONE PIPELINE PROJECT

NON-FLOWING WATER BODY CROSSING METHOD

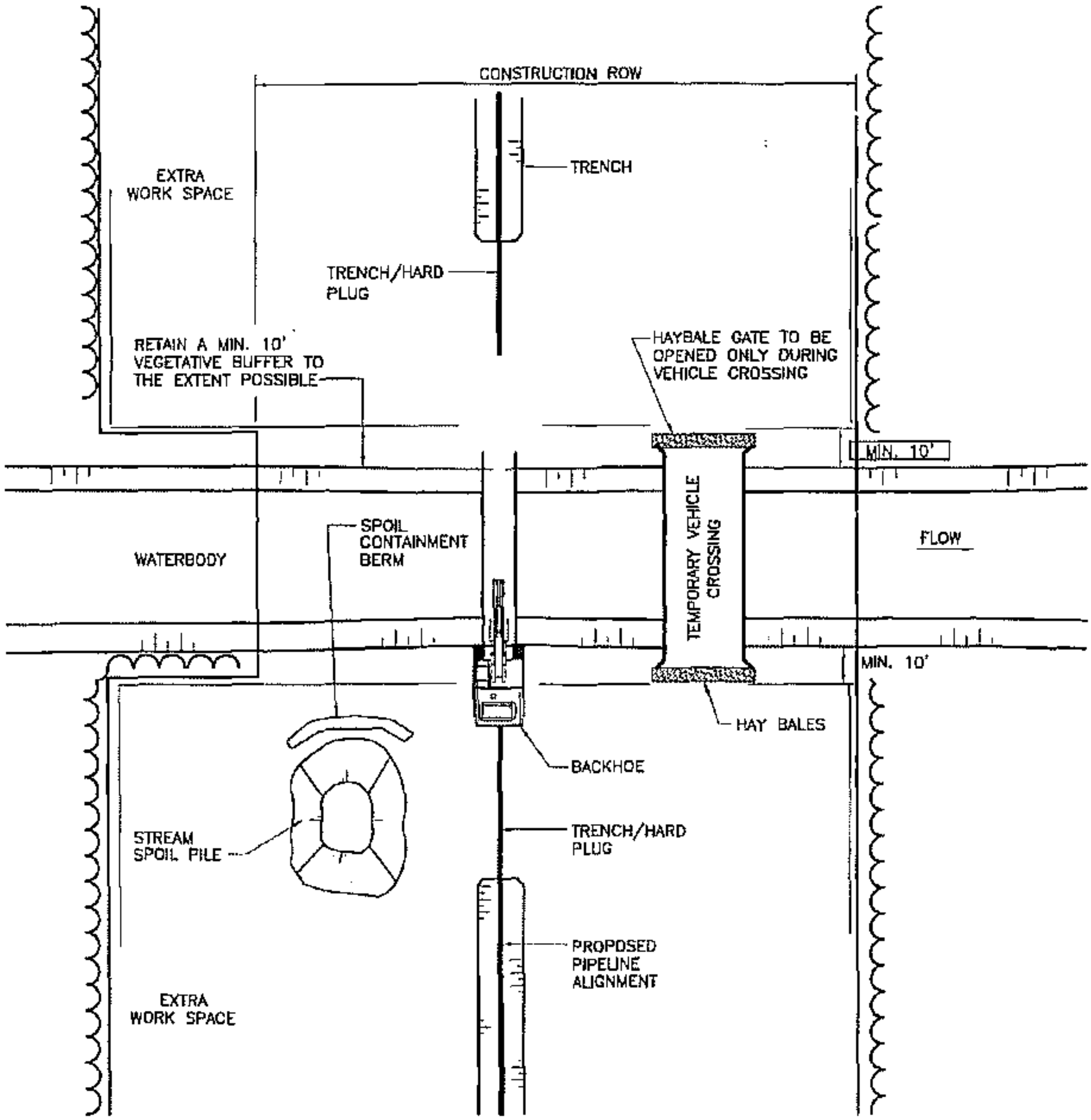
PROJECT: 50388E

DETAIL 11

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

LAST PLOT DATE: Tue, 04 Apr 2006 – 3:29pm

SEE DETAIL 12a FOR CONSTRUCTION PROCEDURE



PLAN VIEW

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	TransCanada KEYSTONE PIPELINE PROJECT	
NO. / REVISION / DATE	TYPICAL FLOWING WATERBODY CROSSING METHOD	
	PROJECT	DETAIL 12
DRAWING NUMBER: K-00-P-7000-300	DRAWN BY: ALS	CHECKED BY: JTG
APPROVED BY: RG		

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.

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NO.	REVISION	DATE

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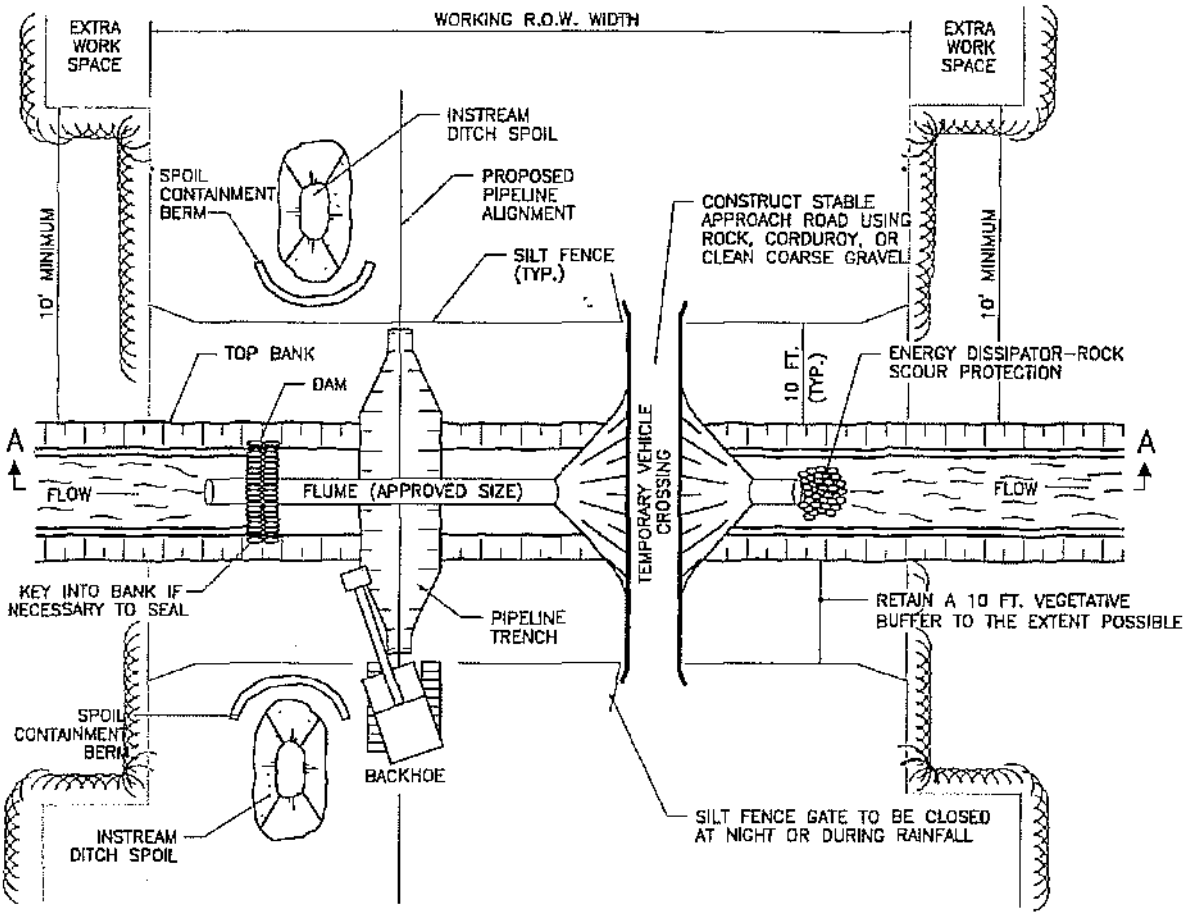
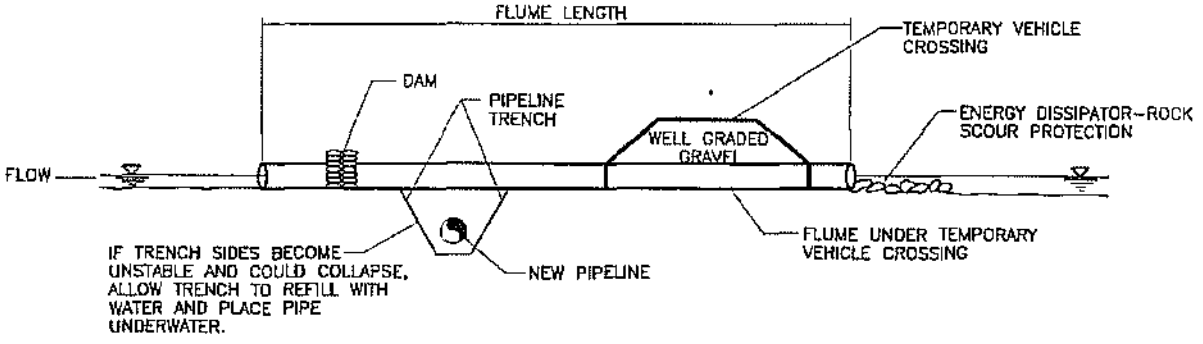
KEYSTONE PIPELINE PROJECT

TYPICAL FLOWING WATERBODY CROSSING METHOD

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY	DETAIL 12a
K-00-P-7000-300	ALS	JTG	RG	



PLAN VIEW



SECTION 'A-A'

NOTES:
1. PIPELINE PLACEMENT WITHIN RIGHT-OF-WAY CONCEPTUAL ONLY.
2. SEE DETAIL 13a FOR CONSTRUCTION PROCEDURES.

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KEYSTONE PIPELINE PROJECT

TYPICAL DRY FLUME CROSSING METHOD

PROJECT: 60386E

DETAIL 13

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

LAST REVISED: Tue, 04 Apr 2006 - 3:34pm

CONSTRUCTION PROCEDURES:

1. MARK OUT AND MAINTAIN LIMITS OF AUTHORIZED WORK AREAS WITH FENCING OR FLAGGING TAPE TO AVOID UNNECESSARY DISTURBANCE OF VEGETATION. ENSURE EQUIPMENT OPERATORS WORKING ON THE CROSSING HAVE BEEN BRIEFED ABOUT THIS PLAN AND THE MEASURES NEEDED TO PROTECT WATER QUALITY.

2. ALL NECESSARY EQUIPMENT AND MATERIALS TO BUILD THE FLUME MUST BE ON SITE OR READILY AVAILABLE PRIOR TO COMMENCING IN-WATER WORK.

3. TO THE EXTENT POSSIBLE, MAINTAIN A MINIMUM 10 FT. VEGETATIVE BUFFER STRIP BETWEEN DISTURBED AREAS AND THE WATERCOURSE. INSTALL AND MAINTAIN A SILT FENCE OR STRAW BALE BARRIER UPSLOPE OF THE BUFFER STRIP ON EACH SIDE OF THE WATERCOURSE.

4. 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 STREAM.
   a. NO HEAVILY SILT LADEN WATER SHALL BE DISCHARGED DIRECTLY INTO THE STREAM.
   b. EROSION AND SEDIMENT CONTROL STRUCTURE LOCATIONS AS DEPICTED ARE APPROXIMATE AND MAY BE ADJUSTED AS DIRECTED BY THE COMPANY INSPECTOR TO ACTUAL SITE CONDITIONS.
   c. SILT FENCE OR STRAW BALE INSTALLATIONS SHALL INCLUDE REMOVABLE SECTIONS TO FACILITATE ACCESS DURING CONSTRUCTION. UTILIZE STRAW BALE BARRIERS ONLY IN LIEU OF A SILT FENCE WHERE FREQUENT ACCESS IS REQUIRED.
   d. 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.
   e. SEDIMENT CONTROL STRUCTURES MUST BE IN PLACE AT ALL TIMES ACROSS THE DISTURBED PORTIONS OF THE RIGHT-OF-WAY EXCEPT DURING EXCAVATION/INSTALLATION OF THE CROSSING PIPE.
   f. SOFT DITCH PLUGS MUST REMAIN IN PLACE AT CONVENIENT LOCATIONS TO SEPARATE MAINLINE DITCH FROM THE RIVER CROSSING UNTIL THE RIVER CROSSING IS INSTALLED AND BACKFILLED.

5. PIPE SHALL BE STRUNG AND WELDED FOR READY INSTALLATION PRIOR TO WATERCOURSE TRENCHING.

6. FLUME CAPACITY DURING DRY CROSSING SHALL BE SUFFICIENT TO ACCOMMODATE 1.5 TIMES THE FLOW MEASURED AT THE TIME OF CONSTRUCTION PROVIDED THAT THE FLUMES WILL BE IN PLACE NOT MORE THAN 96 HOURS AND NO PRECIPITATION IS FORECAST. FLUME CAPACITY FOR VEHICLE ACCESS SHALL BE SUFFICIENT TO PASS THE 2 YEAR DESIGN FLOW OR THE FLOW REASONABLY EXPECTED TO OCCUR DURING THE INSTALLATION. EXCESS FLUMES REQUIRED FOR LONGER TERM ACCESS SHALL BE CAPPED DURING DRY CROSSING PROCEDURES.

7. ENSURE THAT THE DAMS AND VEHICLE-CROSSING ARE LOCATED FAR ENOUGH APART TO ALLOW FOR A WIDE EXCAVATION. FLUMES ARE TO BE SET WITH 10 PERCENT OF THEIR DIAMETER BELOW STREAMBED LEVEL WHERE SOIL CONDITIONS PERMIT (OTHERWISE INSTALLED AT STREAM GRADE AND SLOPE).

8. PLACE IMPERVIOUS DAMS AT EACH END OF THE FLUME, UPSTREAM FIRST, THEN DOWNSTREAM. ACCEPTABLE ALTERNATIVES INCLUDE GRAVEL WITH RIP-RAP PROTECTION, SAND BAGS, STEEL PLATE AND ROCKFILL. DURING INSTALLATION, INSTALL AN IMPERVIOUS MEMBRANE, IF NECESSARY, TO LIMIT LEAKAGE. DAMS MAY NEED KEYING INTO THE BANK AND STREAMBED.

9. EXCAVATE TRENCH THROUGH PLUGS AND UNDER FLUME FROM BOTH SIDES. WORK IS TO BE COMPLETED AS QUICKLY AS POSSIBLE.
   a. LOWER IN PIPE BY PASSING UNDER FLUME AND BACKFILL IMMEDIATELY WITH SPOIL MATERIAL.
   b. IT IS NOT NECESSARY TO DEWATER THE IN-STREAM TRENCH, HOWEVER, DISPLACED WATER SHALL BE PUMPED TO A STABLE UPLAND AREA TO AVOID OVERTOPPING OF DAMS DURING PIPE PLACEMENT.
   c. IF THE SPOIL MATERIAL IS NOT SUITABLE, USE IMPORTED CLEAN GRANULAR MATERIAL.
   d. IF BLASTING IS REQUIRED, USE CONTROLLED BLASTING TECHNIQUES TO PREVENT DAMAGE TO THE FLOW CONVEYANCE SYSTEM. ALTERNATIVELY, BLASTING MAY BE ACCOMPLISHED PRIOR TO FLUME INSTALLATION BY DRILLING THROUGH THE OVERBURDEN.

10. EXCAVATED MATERIAL MUST NOT BE STOCKPILED WITHIN 10 FT. OF THE WATERCOURSE. THIS MATERIAL SHALL BE CONTAINED TO PREVENT SATURATED SOIL FROM FLOWING BACK INTO THE WATERCOURSE.

11. DEWATERING OF THE ONLAND TRENCH SHOULD OCCUR IN A STABLE VEGETATED AREA A MINIMUM OF 50 FT. FROM ANY WATERBODY. THE PUMP DISCHARGE SHOULD BE DIRECTED ONTO A STABLE SPILL PAD CONSTRUCTED OF ROCKFILL OR TIMBERS TO PREVENT LOCALIZED EROSION. THE DISCHARGE WATER SHOULD ALSO BE FORCED INTO SHEET FLOW IMMEDIATELY BEYOND THE SPILL PAD BY USING STRAW BALES AND THE NATURAL TOPOGRAPHY.

12. FLUMES SHOULD BE REMOVED AS SOON AS POSSIBLE, WHEN NO LONGER REQUIRED FOR PIPE LAYING OR FOR ROAD ACCESS, IN THE FOLLOWING MANNER:
   a. REMOVE THE VEHICLE CROSSING RAMP. BANKS ARE TO BE RESTORED TO A STABLE ANGLE AND PROTECTED WITH EROSION RESISTANT MATERIAL COMPATIBLE WITH THE FLOW CONDITIONS (E.G., EROSION CONTROL BLANKETS, CRIBBING, ROCK RIP-RAP, ETC.) TO THE MAXIMUM EXTENT POSSIBLE BEFORE REMOVING THE DAMS.
   b. REMOVE DOWNSTREAM DAM.
   c. REMOVE UPSTREAM DAM.
   d. REMOVE FLUME.
   e. COMPLETE BANK TRIMMING AND EROSION PROTECTION. IF SANDBAGS ARE USED FOR THE DAMS, PLACE AND REMOVE BY HAND TO AVOID EQUIPMENT BREAKING BAGS.

13. RESTORE THE STREAM BED AND BANKS TO APPROXIMATE PRE-CONSTRUCTION CONTOURS, BUT NOT TO EXCEED 2 HORIZONTAL TO 1 VERTICAL.
   a. INSTALL PERMANENT EROSION AND SEDIMENT CONTROL STRUCTURES AS INDICATED ON A SITE SPECIFIC BASIS. IN THE ABSENCE OF SITE SPECIFIC INFORMATION, A FLEXIBLE CHANNEL LINER SUCH AS NAG C125 OR C350 WHICH IS CAPABLE OF WITHSTANDING ANTICIPATED FLOW SHALL BE INSTALLED. ALTERNATIVELY, ROCK RIP-RAP SHALL BE INSTALLED.
   b. ANY MATERIALS PLACED IN THE STREAM 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.
   c. MAINTAIN A SILT FENCE OR STRAW BALE BARRIER ALONG THE WATER COURSE UNTIL VEGETATION IS ESTABLISHED IN ADJACENT DISTURBED AREAS.

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KEYSTONE PIPELINE PROJECT

NO.	REVISION	DATE
1	GENERAL EDITORIAL REVISION	APR.04.2008
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TYPICAL DRY FLUME CROSSING METHOD

PROJECT: 50388E

DETAIL 13a

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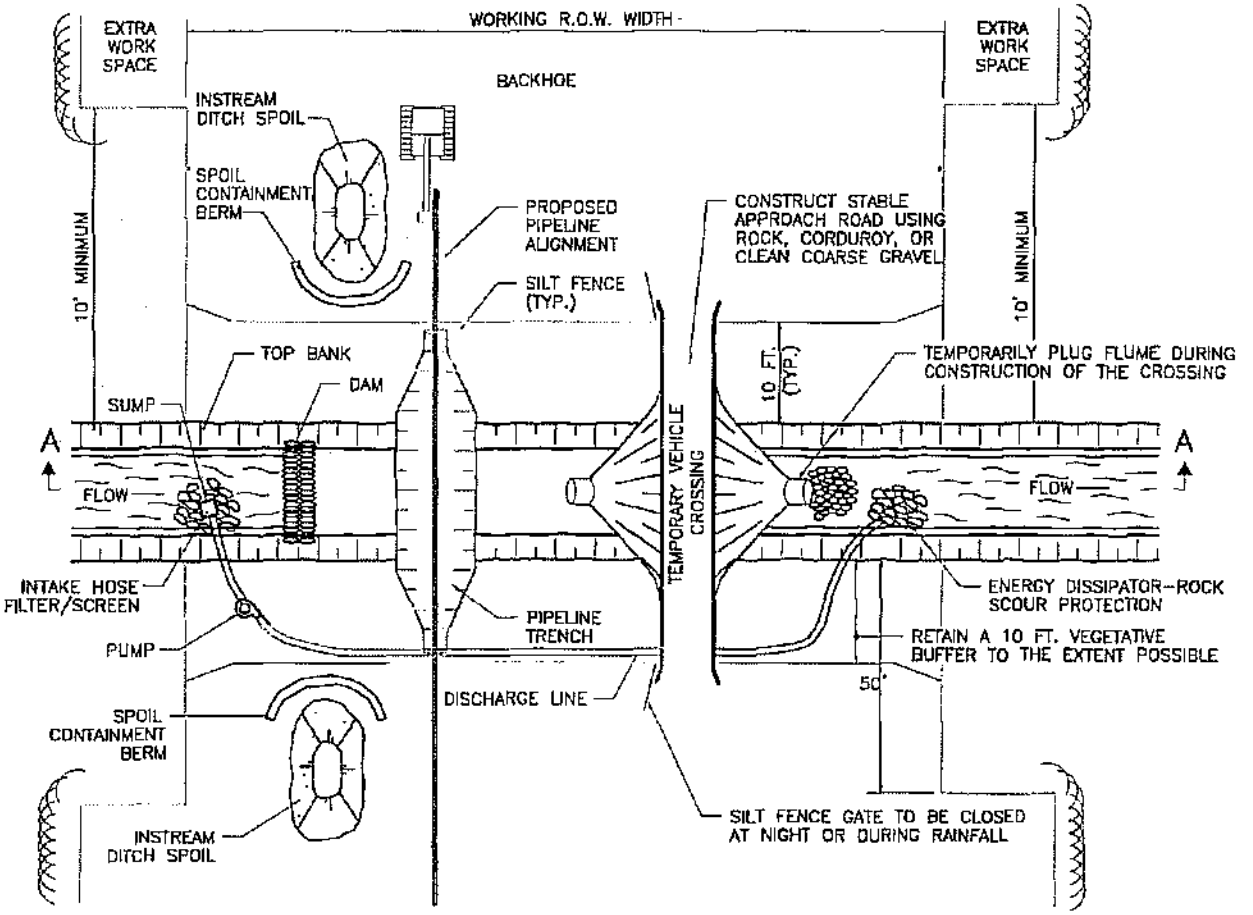
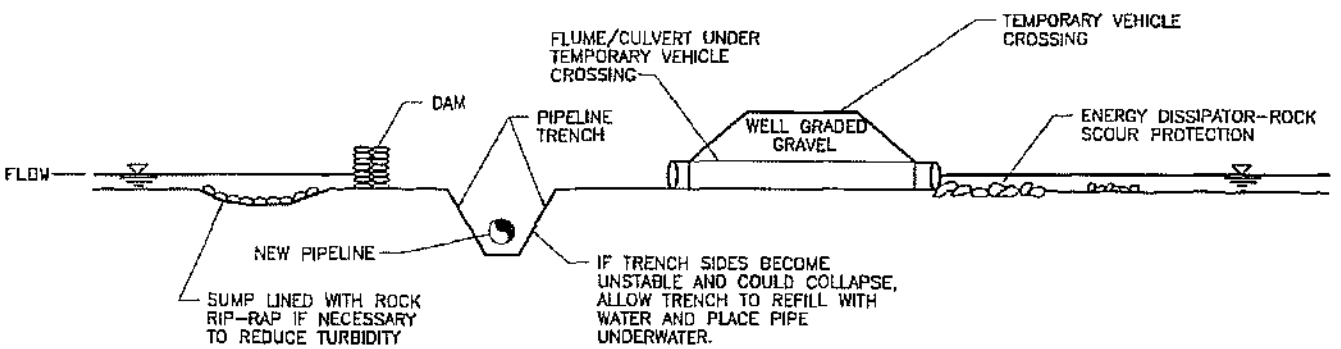
K-00-P-7000-300	ALS	JTG	RG	Tue, 04 Apr 2008 - 2:28pm



PLAN VIEW



SECTION 'A-A'

NOTES:
1. PIPELINE PLACEMENT WITHIN RIGHT-OF-WAY CONCEPTUAL ONLY.
2. SEE DETAIL 14a FOR CONSTRUCTION PROCEDURE

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KEYSTONE PIPELINE PROJECT

TYPICAL DAM AND PUMP CROSSING

PROJECT: 50388E

DETAIL 14

LAST PLOT DATE: Tue, 04 Apr 2006 - 3:29pm

CONSTRUCTION PROCEDURES:

1. WHERE NECESSARY, OBTAIN PRIOR APPROVAL BEFORE USING THE DAM AND PUMP METHOD.
2. IF THERE IS ANY FLOW IN THE WATERCOURSE, INSTALL PUMPS TO MAINTAIN STREAMFLOW AROUND THE BLOCKED OFF SECTIONS OF CHANNEL. THE PUMP IS TO HAVE 1.5 TIMES THE PUMPING CAPACITY OF ANTICIPATED FLOW. A SECOND STANDBY PUMP OF EQUAL CAPACITY IS TO BE READILY AVAILABLE AT ALL TIMES. AN ENERGY DISSIPATOR IS TO BE BUILT TO ACCEPT PUMP DISCHARGE WITHOUT STREAMBED OR STREAMBANK EROSION. IF THE CROSSING IS PROLONGED BEYOND ONE DAY THE OPERATION NEEDS TO BE MONITORED OVERNIGHT.
3. SCHEDULE INSTREAM ACTIVITY FOR LOW FLOW PERIODS IF POSSIBLE
4. MARK OUT AND MAINTAIN LIMITS OF AUTHORIZED WORK AREAS WITH FENCING OR FLAGGING TAPE TO AVOID UNNECESSARY DISTURBANCE OF VEGETATION. ENSURE EQUIPMENT OPERATORS WORKING ON THE CROSSING HAVE BEEN BRIEFED ABOUT THIS PLAN AND THE MEASURES NEEDED TO PROTECT WATER QUALITY. INSTALL PRE-WORK SEDIMENT CONTROL MEASURES AS SPECIFIED IN THE PLAN. ALL NECESSARY EQUIPMENT AND MATERIALS TO BUILD THE DAMS AND TO PUMP WATER MUST BE ON SITE OR READILY AVAILABLE PRIOR TO COMMENCING IN-WATER CONSTRUCTION. PIPE SHOULD BE STRUNG, WELDED AND COATED AND READY FOR INSTALLATION PRIOR TO WATERCOURSE TRENCHING.
5. CONTRACTOR SHALL SUPPLY, INSTALL AND MAINTAIN SEDIMENT CONTROL STRUCTURES, AS DEPICTED AND ALONG DOWN GRADIENT SIDES OF WORK AREAS AND STAGING AREAS SUCH THAT NO HEAVILY SILT LADEN WATER ENTERS STREAM.
   a. NO HEAVILY SILT LADEN WATER SHALL BE DISCHARGED DIRECTLY INTO THE STREAM.
   b. EROSION AND SEDIMENT CONTROL STRUCTURE LOCATIONS AS DEPICTED ARE APPROXIMATE AND MAY BE ADJUSTED AS DIRECTED BY THE COMPANY INSPECTOR TO ACTUAL SITE CONDITIONS.
   c. SILT FENCE OR STRAW BALE INSTALLATIONS SHALL INCLUDE REMOVABLE SECTIONS TO FACILITATE ACCESS DURING CONSTRUCTION. UTILIZE STRAW BALE BARRIERS ONLY IN LIEU OF A SILT FENCE WHERE FREQUENT ACCESS IS REQUIRED.
   d. 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.
   e. SEDIMENT CONTROL STRUCTURES MUST BE IN PLACE AT ALL TIMES ACROSS THE DISTURBED PORTIONS OF THE RIGHT-OF-WAY EXCEPT DURING EXCAVATION/INSTALLATION OF THE CROSSING PIPE.
   f. SOFT DITCH PLUGS MUST REMAIN IN PLACE AT CONVENIENT LOCATIONS TO SEPARATE MAINLINE DITCH FROM THE RIVER CROSSING UNTIL THE RIVER CROSSING IS INSTALLED AND BACKFILLED.
6. TO THE EXTENT POSSIBLE, MAINTAIN A MINIMUM 10 FEET VEGETATIVE BUFFER STRIP BETWEEN DISTURBED AREAS AND THE WATERCOURSE. INSTALL AND MAINTAIN A SILT FENCE UPSLOPE OF THE BUFFER STRIP ON EACH SIDE OF THE WATERCOURSE. THE SILT FENCE SHOULD INCORPORATE REMOVABLE "GATES" AS REQUIRED TO ALLOW ACCESS WHILE MAINTAINING EASE OF REPLACEMENT FOR OVERNIGHT OR DURING PERIODS OF RAINFALL.
7. CONSTRUCT A TEMPORARY SUMP UPSTREAM OF THE DAM AND LINE WITH ROCKFILL IF A NATURAL POOL DOES NOT EXIST. INSTALL THE PUMP OR PUMP INTAKE IN THE POOL OR SUMP. DISCHARGE WATER ONTO AN ENERGY DISSIPATOR DOWNSTREAM OF THE WORK AREA.
8. EXCAVATED MATERIAL MUST NOT BE STOCKPILED WITHIN 10 FT. OF THE WATERCOURSE. THIS MATERIAL MUST BE CONTAINED WITHIN BERM CONTAINMENT, WITH SECONDARY SILT FENCE PROTECTION TO PREVENT SATURATED SOIL FROM FLOWING BACK INTO THE WATERCOURSE.
9. CHEMICALS, FUELS, LUBRICATING OILS SHALL NOT BE STORED AND EQUIPMENT REFUELED WITHIN 100 FT. OF THE WATERBODY. PUMPS ARE TO BE REFUELED AS PER THE SPCC PLANS.
10. STAGING AREAS ARE TO BE LOCATED AT LEAST 10 FT. FROM THE WATER'S EDGE (WHERE TOPOGRAPHIC CONDITIONS PERMIT) AND SHALL BE THE MINIMUM SIZE NEEDED.
11. DAMS ARE TO BE MADE OF STEEL PLATE, INFLATABLE PLASTIC DAM, SAND BAGS, COBBLES, WELL GRADED COARSE GRAVEL FILL, OR ROCK FILL. DAMS MAY NEED KEYING INTO THE BANKS AND STREAMBED. ENSURE THAT THE DAM AND VEHICLE CROSSING ARE LOCATED FAR ENOUGH APART TO ALLOW FOR A WIDE EXCAVATION. CAP FLUMES USED UNDER VEHICLE CROSSING DURING DRY CROSSING.
12. DEWATER AREA BETWEEN DAMS IF POSSIBLE. DEWATERING SHOULD OCCUR IN A STABLE VEGETATIVE AREA A MINIMUM OF 50 FT. FROM ANY WATERBODY. THE PUMP DISCHARGE SHOULD BE DISCHARGED ONTO A STABLE SPILL PAD CONSTRUCTED OF ROCKFILL SANDBAGS, OR TIMBERS TO PREVENT LOCALIZED EROSION. THE DISCHARGE WATER SHOULD ALSO BE FORCED INTO SHEET FLOW IMMEDIATELY BEYOND THE SPILL PAD BY USING STRAW BALES AND THE NATURAL TOPOGRAPHY DISCHARGED WATER SHALL NOT BE ALLOWED TO FLOW INTO ANY WATERCOURSE OR WETLAND. IF IT IS NOT POSSIBLE TO DEWATER THE EXCAVATION DUE TO SOILS WITH A HIGH HYDRAULIC CONDUCTIVITY, THE EXCAVATION AND PIPE PLACEMENT IS TO BE CARRIED OUT IN THE STANDING WATER. PUMP ANY DISPLACED WATER AS DESCRIBED ABOVE TO PREVENT OVERTOPPING OF DAMS.
13. EXCAVATE TRENCH THROUGH PLUGS AND STREAMBED FROM BOTH SIDES, RE-POSITIONING DISCHARGE HOSE AS NECESSARY. LOWER THE PIPE IN THE TRENCH AND BACKFILL IMMEDIATELY. DURING THIS OPERATION WORK IS TO BE COMPLETED AS QUICKLY AS POSSIBLE.
14. CONTRACTOR SHALL RESTORE THE STREAM BED AND BANKS TO APPROXIMATE PRE-CONSTRUCTION CONTOURS, BUT NOT TO EXCEED 2 HORIZONTAL TO 1 VERTICAL.
   a. CONTRACTOR SHALL INSTALL PERMANENT EROSION AND SEDIMENT CONTROL STRUCTURES AS INDICATED ON A SITE SPECIFIC BASIS. IN THE ABSENCE OF SITE SPECIFIC INFORMATION, A FLEXIBLE CHANNEL LINER SUCH AS NAG C125 OR C350 WHICH IS CAPABLE OF WITHSTANDING ANTICIPATED FLOW SHALL BE INSTALLED. ALTERNATIVELY, ROCK RIP-RAP SHALL BE INSTALLED.
   b. ANY MATERIALS PLACED IN THE STREAM 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.
   c. MAINTAIN A SILT FENCE OR STRAW BALE BARRIER ALONG THE WATER COURSE UNTIL VEGETATION IS ESTABLISHED IN ADJACENT DISTURBED AREAS.
15. WHEN THE STREAMBED HAS BEEN RESTORED, THE CREEK BANKS ARE TO BE CONTOURED TO A STABLE ANGLE AND PROTECTED WITH EROSION RESISTANT MATERIAL COMPATIBLE WITH FLOW VELOCITY BETWEEN DAMS (E.G., EROSION CONTROL BLANKETS, CRIBBING, ROCK RIP-RAP, ETC.). THE DAMS ARE TO BE REMOVED DOWNSTREAM FIRST. KEEP PUMP RUNNING UNTIL NORMAL FLOW IS RESUMED. COMPLETE BANK TRIMMING AND EROSION PROTECTION. IF SANDBAGS ARE USED FOR THE DAMS, PLACE AND REMOVE BY HAND TO AVOID EQUIPMENT BREAKING BAGS.

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KEYSTONE PIPELINE PROJECT

TYPICAL DAM AND PUMP CROSSING

NO.	REVISION	DATE
A	ISSUED FOR DEPARTMENT OF STATE FILING	MAR.10.2006

PROJECT: 50380E

DETAIL 14a

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
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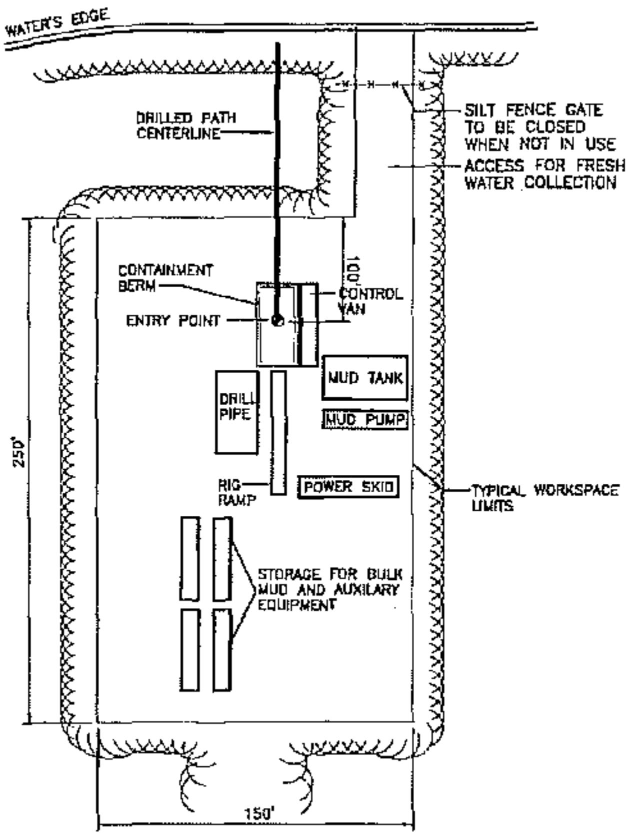
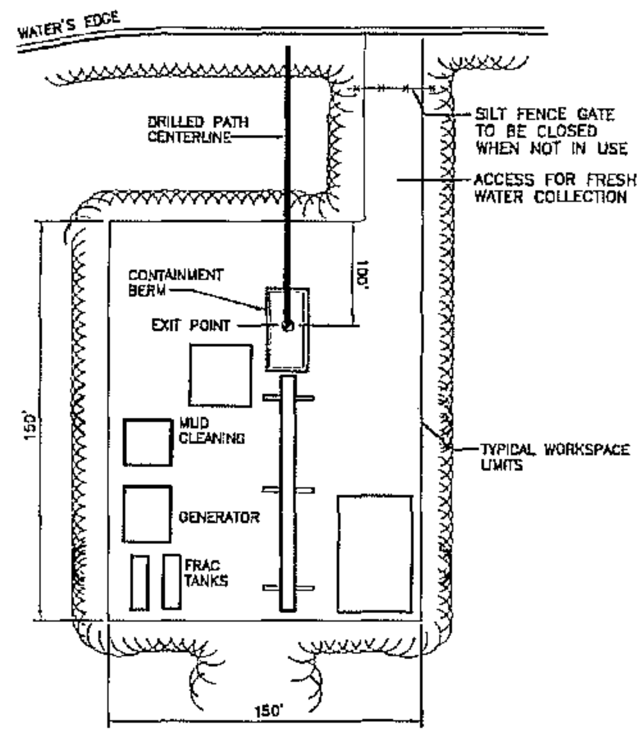
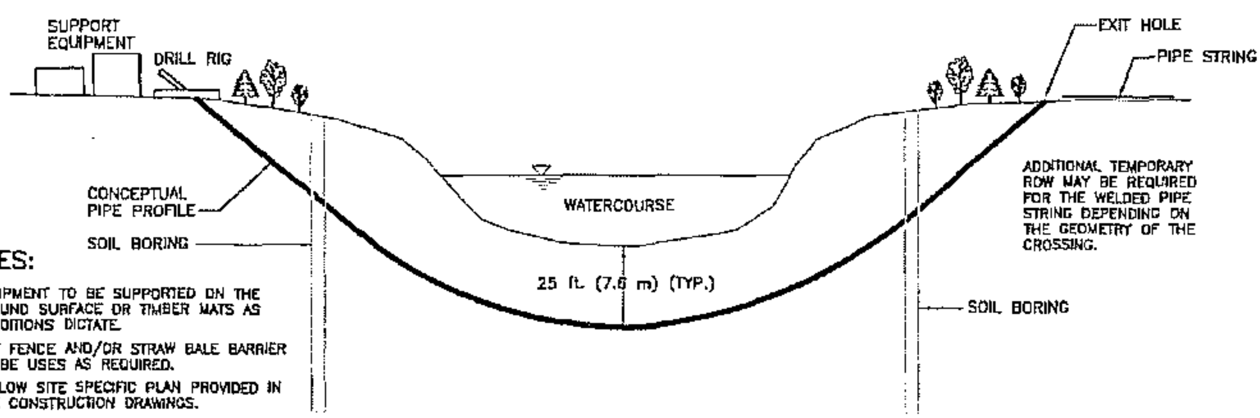


SITE PLAN
ENTER SIDE



SITE PLAN
EXIT SIDE



PROFILE

NOTES:

1. EQUIPMENT TO BE SUPPORTED ON THE GROUND SURFACE OR TIMBER MATS AS CONDITIONS DICTATE.
2. SILT FENCE AND/OR STRAW BALE BARRIER TO BE USES AS REQUIRED.
3. FOLLOW SITE SPECIFIC PLAN PROVIDED IN THE CONSTRUCTION DRAWINGS.
4. CONFIGURATIONS SHOWN ARE TYPICAL AND SHALL BE MODIFIED BY KEYSTONE AS NECESSARY TO SUIT ACTUAL SITE CONDITIONS

PREPARED BY:
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KEYSTONE PIPELINE PROJECT

NO.	REVISION	DATE
0	ISSUED FOR DEPARTMENT OF STATE FILING	MAR.[illegible]

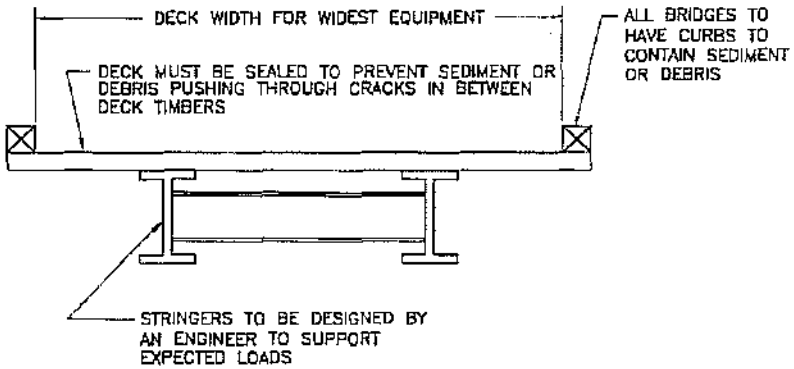
TYPICAL HORIZONTAL DRILL (HDD) SITE PLAN & PROFILE

PROJECT: 80388E

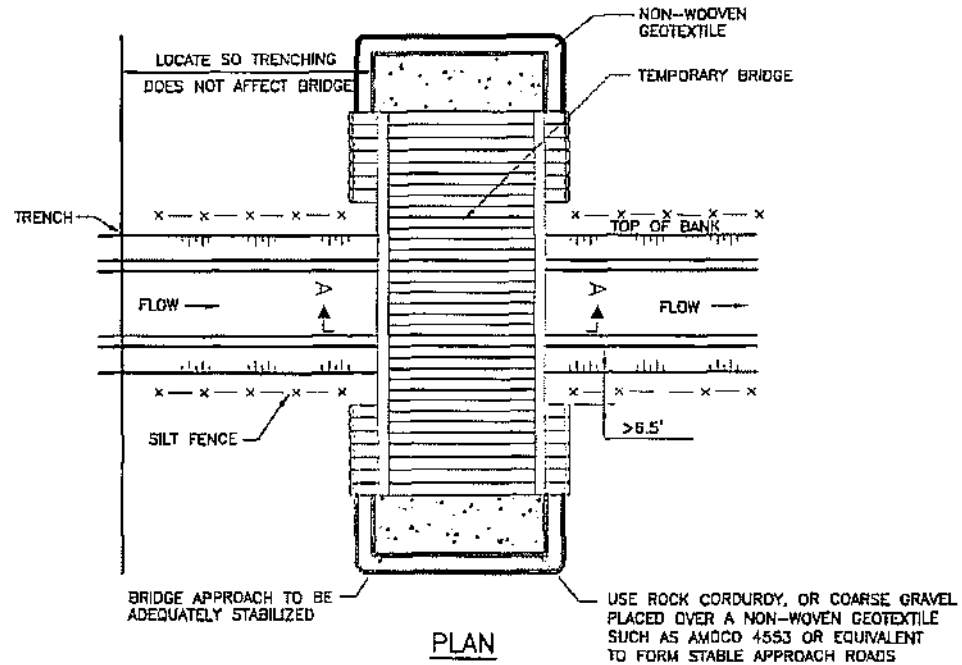
DETAIL 15

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

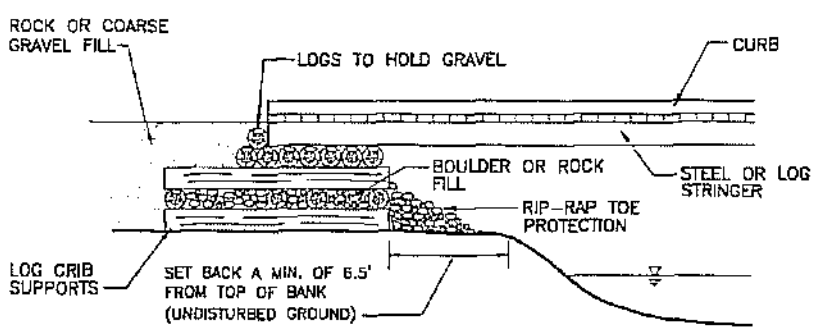
LAST MODIFIED: Tue, 04 Apr 2006 — 3:30pm



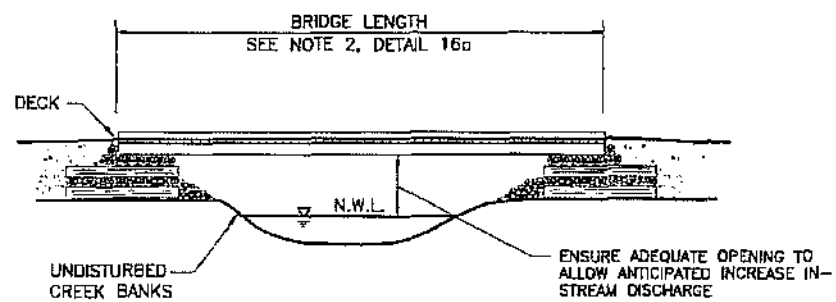
SECTION A–A



PLAN



TYPICAL TEMPORARY CRIB ABUTMENT



BRIDGE PROFILE

NOTES:

1. SEE DETAIL 16a FOR CONSTRUCTION PROCEDURES

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KEYSTONE PIPELINE PROJECT

TYPICAL TEMPORARY BRIDGE CROSSING

NO.	REVISION	DATE
1	GENERAL EDITORIAL REVISION	APR-04-2008
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DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

PROJECT: 60388E

DETAIL 16

LAST PLOT DATE:

CONSTRUCTION PROCEDURES:

IN GENERAL TERMS, THE FOLLOWING IS A SEQUENCE OF CONSTRUCTION PROCEDURES THAT ARE RECOMMENDED TO BE FOLLOWED FOR TEMPORARY BRIDGE CROSSINGS:

1. A PORTABLE BRIDGE, FLEXI-FLOAT, OR FLUMED VEHICLE CROSSING MAY BE SUBSTITUTED FOR THE TEMPORARY BRIDGE. IT IS IMPORTANT THAT THE SIZE OF THE TOTAL OPENING BE SELECTED SO THE STRUCTURE CAN SAFELY PASS FLOOD FLOWS THAT CAN REASONABLY BE EXPECTED TO OCCUR DURING THE LIFE OF THE CROSSING.

2. DETERMINE BRIDGE LENGTH REQUIRED AND FOLLOW EITHER METHOD A) OR B) FOR DETERMINING THE OPENING SIZE. IF A) IS FOLLOWED, A MINIMUM 6.5 ft. SETBACK FROM TOP OF BANK MUST BE PRESERVED AS A "NO DISTURBANCE AREA." IF ABUTMENTS OR PIERS IN THE STREAMBED ARE REQUIRED, METHOD B) IS TO BE FOLLOWED.

3. INSTALL THE BRIDGE IN A MANNER THAT WILL MINIMIZE SEDIMENT ENTERING THE WATER. STRINGERS MUST BE DESIGNED TO SUPPORT THE LOADS EXPECTED ON THE BRIDGE. CURBS MUST BE INSTALLED ALONG THE EDGE OF THE DECK TO CONTAIN SEDIMENT AND DEBRIS ON THE BRIDGE. FASTENERS CONNECTING COMPONENTS MUST BE STRONG ENOUGH TO HOLD THEM IN POSITION DURING THE LIFE OF THE BRIDGE. CRIBS ARE TO BE FILLED WITH ROCK OR COBBLE. RIP-RAP EROSION PROTECTION IS TO BE PLACED AROUND THE CRIBS AND ON ANY FILL SLOPES PROJECTING INTO THE WATERBODY.

4. ROAD APPROACHES LEADING TO THE BRIDGE MUST BE RAISED AND STABLE SO EQUIPMENT LOADS ARE SUPPORTED A SUFFICIENT DISTANCE BACK FROM THE WATER TO REDUCE SEDIMENT AND DEBRIS ENTERING THE WATERBODY FROM EQUIPMENT TRACKS. THIS MAY REQUIRE USING MATERIALS SUCH AS GRAVEL, ROCK OR CORDUROY. DO NOT USE SOIL TO CONSTRUCT OR STABILIZE EQUIPMENT BRIDGES. IF CUTS ARE NEEDED TO OBTAIN A SATISFACTORY GRADE, THEY ARE TO BE DUG WITH SIDE DITCHES AND STABLE SLOPES. EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE INSTALLED TO KEEP SEDIMENT ON LAND (E.G., SILT FENCING, FILTER CLOTH, RIP-RAP, SEED AND MULCH, ETC.)

5. MAINTAIN A SILT FENCE ON EACH SIDE OF THE WATERBODY EXTENDING A MINIMUM OF 10 ft. BEYOND THE WIDTH OF DISTURBANCE UNTIL VEGETATION HAS BEEN ESTABLISHED IN UPSLOPE AREAS.

6. PERIODICALLY CHECK BRIDGE INSTALLATION AND REMOVE ANY BUILD-UP OF SEDIMENT OR DEBRIS ON THE BRIDGE. DISPOSE OF THIS MATERIAL IN A LOW LYING AREA AT LEAST 100 ft. FROM THE WATERBODY.

7. REMOVE TEMPORARY CROSSINGS AS SOON AS POSSIBLE AFTER FINAL CLEAN-UP. MATERIALS PLACED ALONG THE WATERBODY SHOULD BE COMPLETELY REMOVED DURING FINAL CLEAN-UP. REMOVAL SHOULD NOT NOT OCCUR OUTSIDE THE CONSTRUCTION WINDOWS.
SURPLUS GRAVEL IS TO BE SPREAD ON THE RIGHT-OF WAY AS GRAVEL SHEETING, IF GRADATION IS SUITABLE, OR MOVED AT LEAST 100 ft. FROM TOP OF BANK FOR DISPOSAL. BRIDGE MATERIALS ARE TO BE REMOVED FROM THE CROSSING AREA. THE WATERBODY BED AND BANKS ARE TO BE RESTORED TO A STABLE ANGLE AND PROTECTED WITH EROSION RESISTANT MATERIAL COMPATIBLE WITH THE EXPECTED FLOW CONDITIONS.

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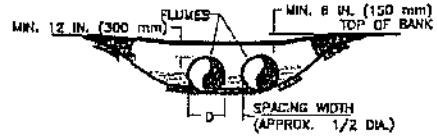
TYPICAL TEMPORARY BRIDGE CROSSING

PROJECT: 50388E

DETAIL 16a

LAST PLOTTED: Tue, 04 Apr 2006 - 3:27pm



SECTION 'A–A'

CONSTRUCTION PROCEDURES:

THE FOLLOWING IS A SEQUENCE OF CONSTRUCTION AND MITIGATION MEASURES TO BE FOLLOWED AT ALL TEMPORARY FLUME VEHICLE CROSSINGS.

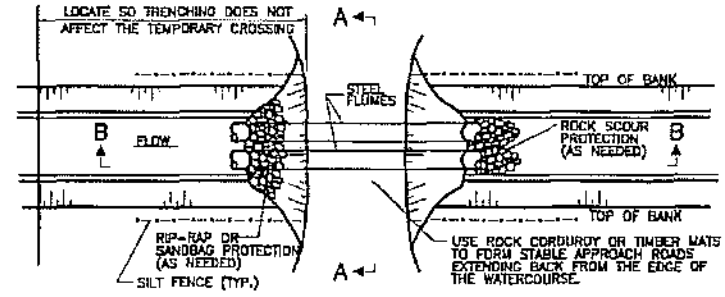
1. A PORTABLE FLEXI–FLOAT, OR TEMPORARY BRIDGE MAY BE SUBSTITUTED FOR THE TEMPORARY FLUME CROSSING.

2. THE LENGTH OF THE FLUME SHALL BE SUFFICIENT TO SPAN THE ENTIRE AREA REQUIRED FOR VEHICULAR ACCESS, EXTENDING 4 FT. BEYOND TOE OF FILL MATERIAL, SO TRENCHING WILL NOT AFFECT THE ROAD CROSSING. A LONGER PIPE IS TO BE USED, IF NEEDED, TO MAINTAIN STABLE SIDE SLOPES. FLUME CAPACITY TO BE BASED ON THE 2–YEAR DESIGN FLOW OR MAXIMUM FLOW ANTICIPATED TO OCCUR DURING INSTALLATION, AS SPECIFIED IN CONSTRUCTION DOCUMENTS.

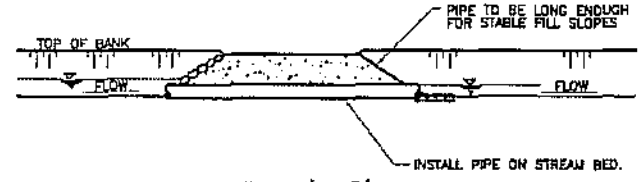
3. WHERE PRACTICAL, BACKFILL AROUND THE PIPES AT THE ROAD WITH CLEAN, COARSE ROCK FILL MATERIAL. IF SCOUR IS POSSIBLE, RIP–RAP IS TO BE PLACED ON THE STREAM BED DOWN–STREAM OF THE PIPE OUTLET EXTENDING A MINIMUM OF TWO PIPE DIAMETERS. ALTERNATIVELY, TIMBER EQUIPMENT MATS, SAND BAGS OR TIMBER CORDUROY MAY BE USED TO FORM THE TRAVEL SURFACE.

4. TO REDUCE MUD ENTERING THE WATER FROM EQUIPMENT TRACKS, THE APPROACH ROAD LEADING TO THE CULVERT CROSSING MUST BE RAISED AND STABLE SO EQUIPMENT LOADS ARE SUPPORTED A SUFFICIENT DISTANCE BACK FROM THE WATER. IF CUTS ARE NEEDED TO OBTAIN A SATISFACTORY GRADE, THEY ARE TO BE DUG WITH SIDE DITCHES AND STABLE SLOPES. EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE INSTALLED TO LIMIT THE POTENTIAL FOR SEDIMENT TO ENTER THE WATERBED (E.G., CHECK DAMS, SILT FENCE, RIP–RAP, SEED AND MULCH, SEDIMENT TRAPS, ETC.).

5. PERIODICALLY CHECK THE TEMPORARY CROSSING INSTALLATION AND REMOVE ANY BUILD–UP OF SEDIMENT OR DEBRIS ON THE BRIDGE. DISPOSE OF THIS MATERIAL AT LEAST 100 FT. FROM THE WATERCOURSE AND ABOVE THE HIGH WATER LEVEL.



PLAN VIEW



SECTION 'B–B'

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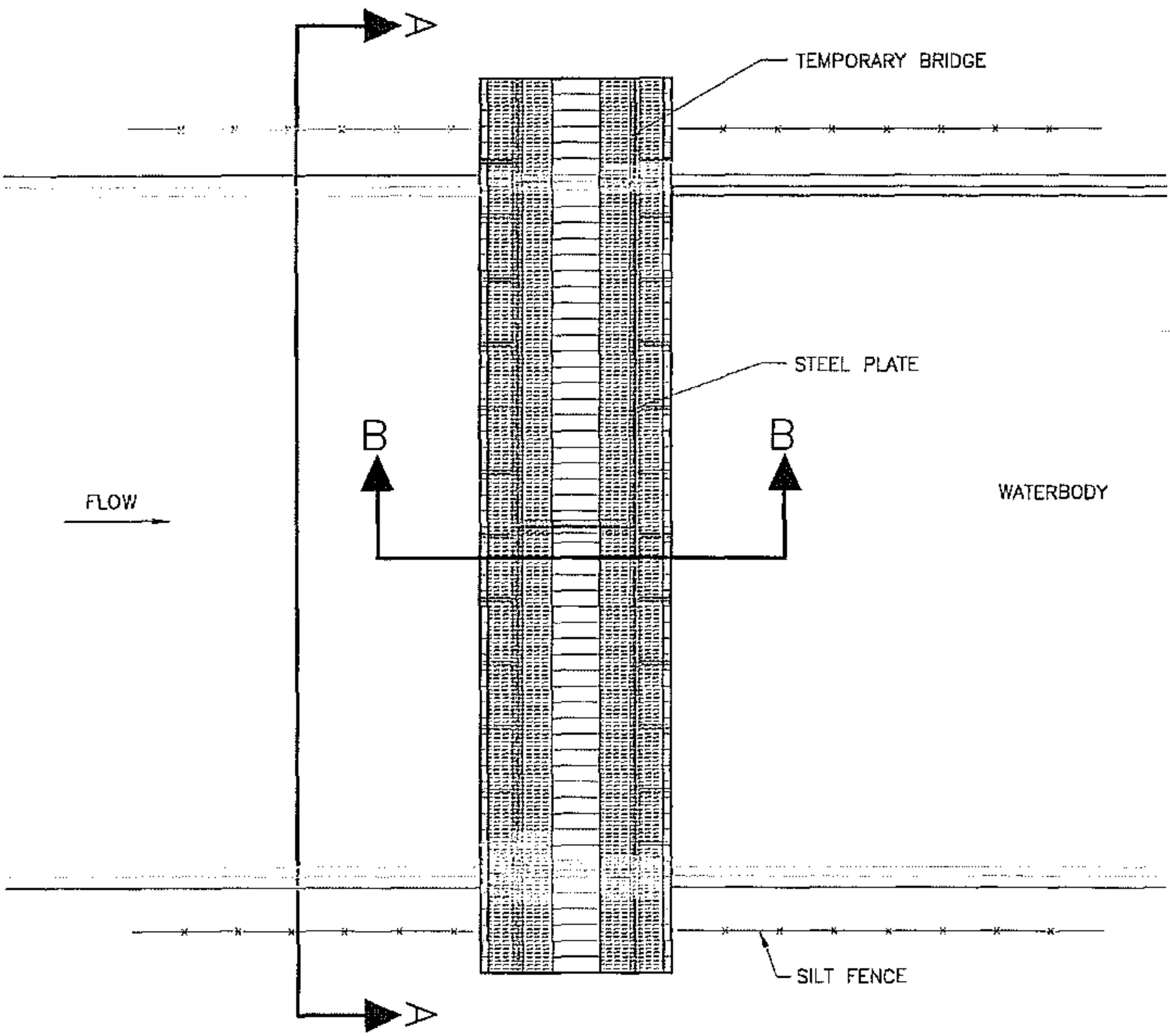
TYPICAL FLUME BRIDGE CROSSING

PROJECT: 60348E

DETAIL 17

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

LAST PLOT DATE:



NOTES:

1. SEE DETAIL 18a FOR CONSTRUCTION PROCEDURES

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NO.	REVISION	DATE
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TYPICAL RAILCAR BRIDGE CROSSING

PROJECT: 50388E

DETAIL 18

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

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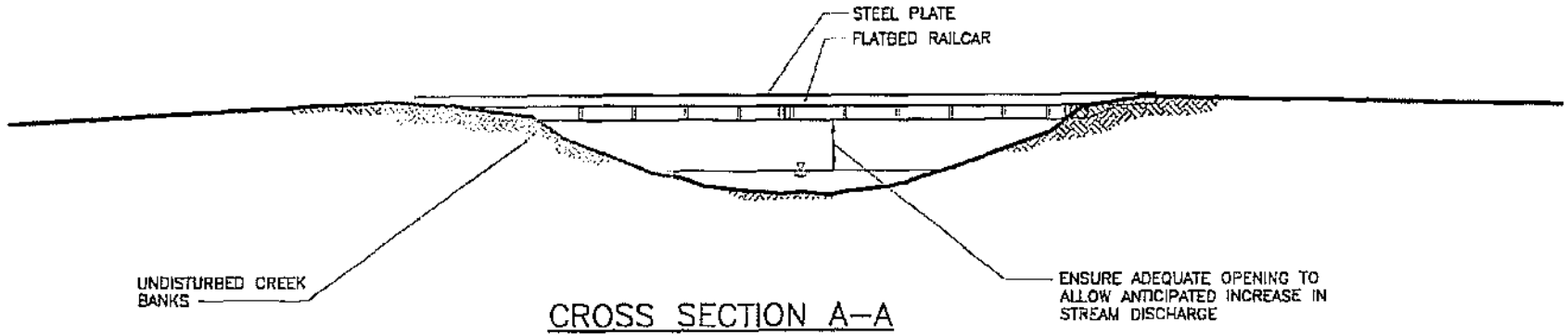
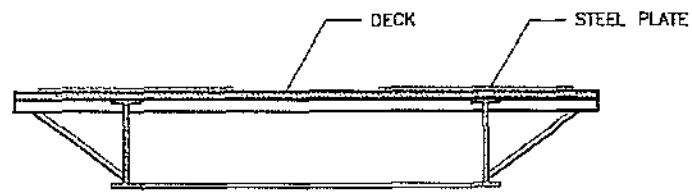


CROSS SECTION A–A

CONSTRUCTION PROCEDURES:

1. THIS TYPICAL DRAWING PROVIDES FOR A RAILCAR BRIDGE EQUIPMENT CROSSING.
2. BRIDGE SHOULD BE A MINIMUM OF 12 FEET LONGER THAN BANK TO BANK WIDTH.
3. BEST MANAGEMENT PRACTICES UTILIZING EROSION CONTROL DEVICES, SUCH AS HAY BALES AND SILT FENCE ARE REQUIRED TO PREVENT SEDIMENTATION OF THE STREAM. EROSION PROTECTION SHALL BE PLACED ON THE STREAM BANKS.
4. DURING FINAL CLEAN–UP, REMOVE TEMPORARY EQUIPMENT CROSSINGS AS SOON AS POSSIBLE. INSTALLED MATERIALS, SUCH AS HAY BALES AND SILT FENCE MUST BE REMOVED AND DISPOSED IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS AND REQUIREMENTS. THE STREAM BED, BANKS AND AREAS AFFECTED BY CONSTRUCTION OF THE TEMPORARY EQUIPMENT CROSSING SHOULD BE RESTORED TO A STABLE CONDITION. IF REQUIRED TO PREVENT TRANSPORT OF SEDIMENTATION TO THE STREAM, SILT FENCE SHOULD BE INSTALLED AT THE TOP OF THE BANKS.



CROSS SECTION B–B

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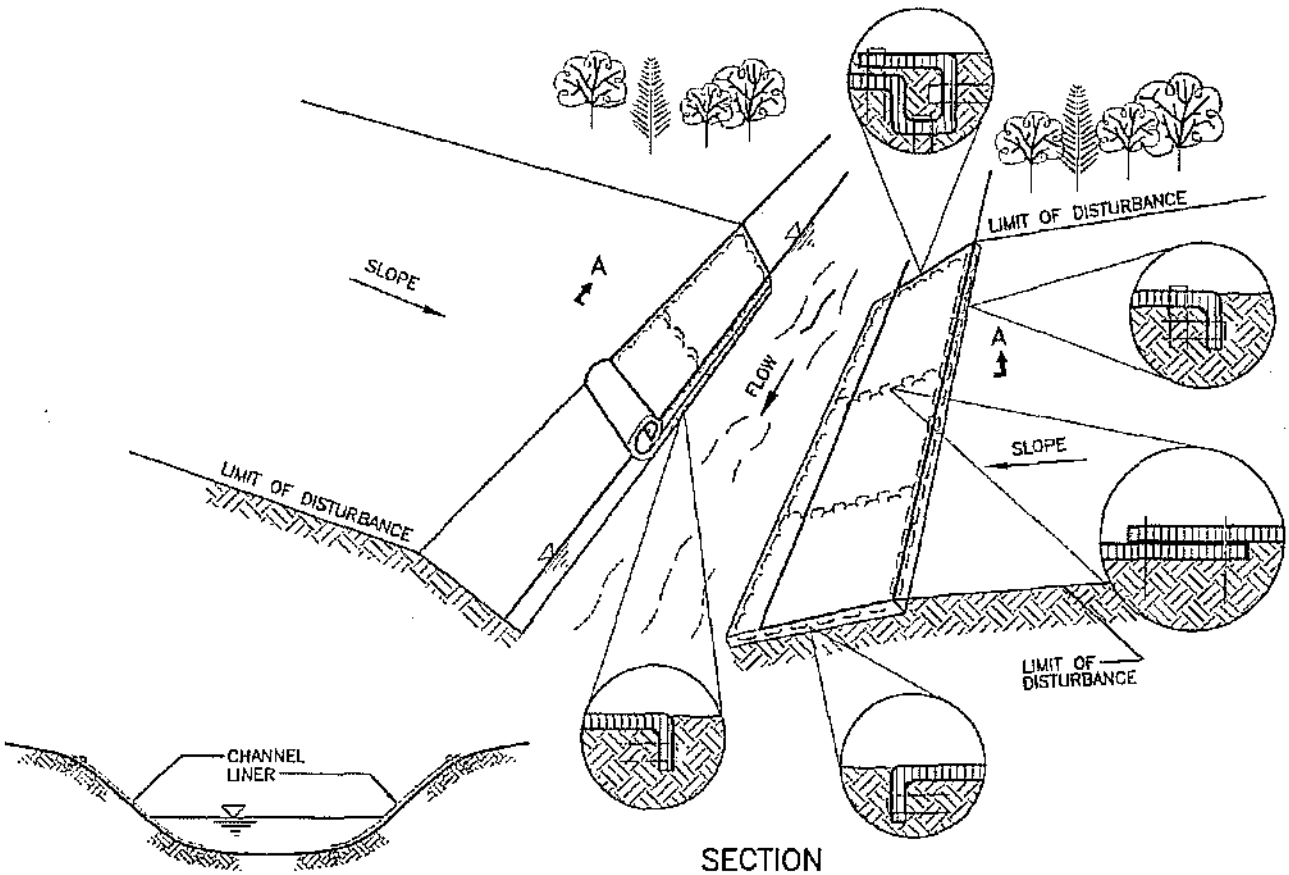
TYPICAL RAILCAR BRIDGE CROSSING

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY	PROJECT:
K-00-P-7000-300	ALS	JTG	RG	50388E

DETAIL 18a

LAST PLOT DATE: Tue, 04 Jul 2006 - 3:27pm



SECTION

SECTION A–A

NOTES:

1. INSTALL AND ANCHOR LINERS FOLLOWING MANUFACTURER'S INSTRUCTIONS.
2. PREPARE SOIL BEFORE INSTALLING CHANNEL LINER, INLCUDING THE APPLICATION OF FERTILIZER AND SEED. CHANNEL LINERS SHOULD EXTEND COMPLETELY ACROSS DISTURBED BANK AREAS TO PROTECT ERODIBLE SURFACES.
3. BEGIN AT THE END OF THE CHANNEL BY ANCHORING THE LINER IN A TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
4. ROLL LINER IN DIRECTION OF WATER FLOW.
5. INSTALL LINERS END–OVER–END (SHINGLE STYLE) WITH OVERLAP USEING A DOUBLE ROW OF STAGGERED STAPLES 4 in. (100 mm) APART TO SECURE LINER.
6. IN HIGH FLOW CHANNEL APPLICATIONS, A STAPLE CHECK SLOT IS RECOMMENDED AT 30 TO 40 ft. (9 TO 12 m) INTERVALS. USE A ROW OF STAPLES 4 in. (100 mm) BELOW THE FIRST ROW IN A STAGGERED PATTERN.
7. INSTALL CHANNEL LINER TO THE TOP OF THE DEFINED CHANNEL SECTION. TWO OR MORE ROWS OF BLANKETS MAY BE NECESSARY. THESE LINERS MUST BE OVERLAPPED 4 in. (100 mm) AND STAPLED.
8. THE CHANNEL LINER SHOULD EXTEND TO THE BASE OF THE CHANNEL AND STAPLED. FOR CHANNELS WITH VERY LITTLE OR NO FLOW, EXTEND A MIN. OF 1 ft. (300 mm) BELOW THE LOW WATER LEVEL AND STAPLE IN PLACE.
9. INSTALLATION SPECIFICATIONS TO BE MODIFIED BY KEYSTONE AS NECESSARY TO SUIT ACTUAL SITE CONDITIONS.

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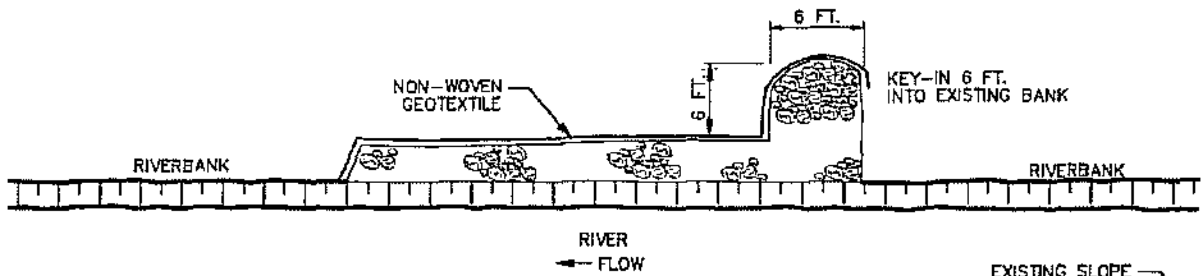
KEYSTONE PIPELINE PROJECT

FLEXIBLE CHANNEL LINER INSTALLATION

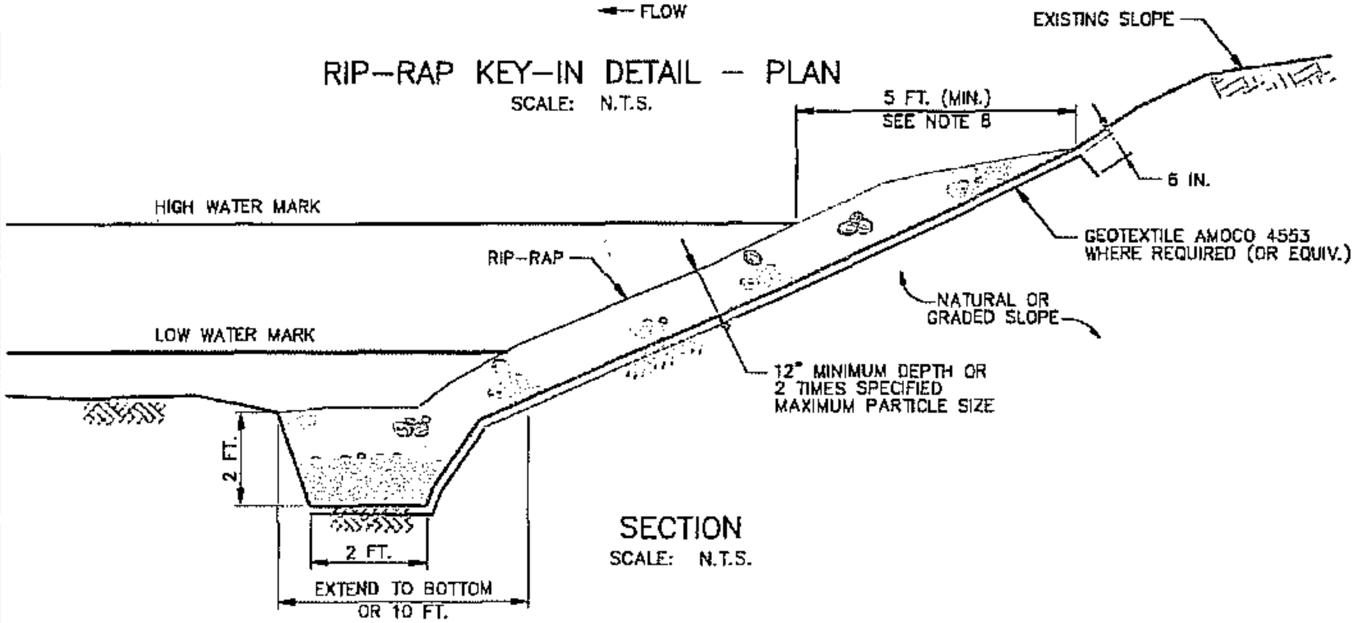
PROJECT: 50366E

DETAIL 19

LAST PLOT DATE: Tue, 04 Apr 2006 - 3:27pm



RIP-RAP KEY-IN DETAIL – PLAN
SCALE: N.T.S.



SECTION
SCALE: N.T.S.

NOTES:

1. REMOVE ALL STUMPS, ORGANIC MATERIAL, AND PREPARE BANKS TO A STABLE CONFIGURATION TO A MAXIMUM SLOPE OF 2 HORIZONTAL TO 1 VERTICAL.
2. CONSTRUCT TOE TRENCH TO KEY IN BOTTOM OF RIP-RAP PROTECTION.
3. INSTALL FILTER CLOTH (GEOTEXTILE), SUCH AS AMOCO 4553 OR EQUIVALENT, UNDER ROCK WHERE SPECIFIED OR AS DIRECTED BY THE COMPANY. ADJOINING EDGES OF CLOTH SHALL OVERLAP A MINIMUM OF 12"
4. ROCK UTILIZED FOR RIP-RAP SHALL CONSIST OF SOUND, DURABLE ROCK, AND RESISTANT TO WEATHERING. INDIVIDUAL PIECES SHOULD BE ANGULAR, BLOCK SHAPED, AND HAVE A MINIMUM SPECIFIC GRAVITY OF 2.2.
5. INSTALL RIP-RAP TO A THICKNESS OF APPROXIMATELY 2 TIMES THE MAXIMUM EQUIVALENT DIAMETER OF THE RIP-RAP. EACH LOAD SHOULD BE WELL GRADED. A WELL GRADED MIXTURE IS COMPOSED 60% (MINIMUM) OF LARGER SIZES WITH 40% OF SMALLER SIZES TO FILL THE VOIDS.
6. SIZE OF RIP-RAP IS DEPENDENT UPON THE PREDICTED FLOW CONDITIONS.
7. KEY IN THE EDGES OF THE RIP-RAP AND FILTER CLOTH TO NATURAL GROUND CONTOURS SO THAT UNDERMINING DOES NOT OCCUR.
8. RIP-RAP IS TO BE INSTALLED TO 2 FT. ABOVE THE NORMAL HIGH WATER MARK OR 5 FT. ALONG THE SLOPE, WHICHEVER IS LESS.
9. INSTALLATION SPECIFICATIONS TO BE MODIFIED BY KEYSTONE TO SUIT ACTUAL SITE CONDITIONS.

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TYPICAL ROCK RIP-RAP

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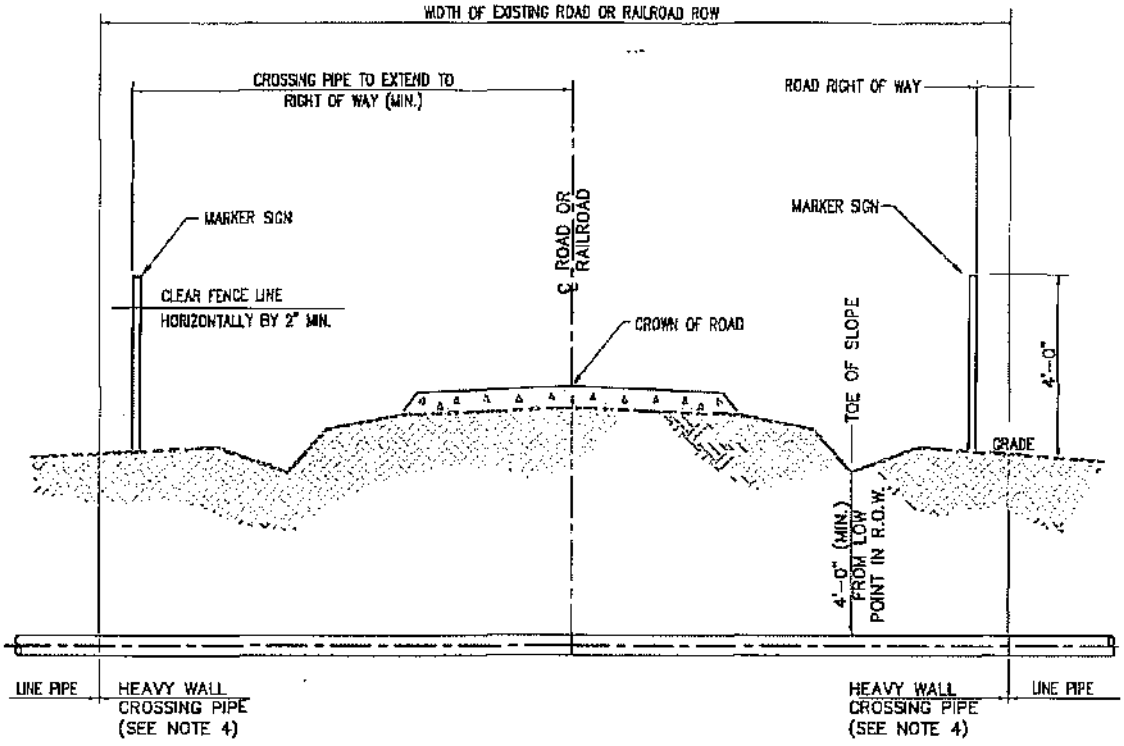
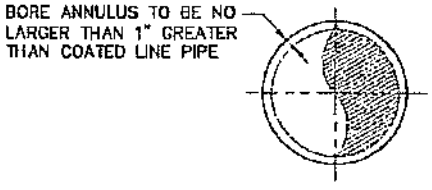
K-00-P-7000-300	ALS	JTG	RG	560456	DETAIL 20



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 UNLESS OTHERWISE SPECIFIED.
3. THE TYPE AND MINIMUM REQUIRED LENGTH OF PIPE FOR CROSSINGS OF ROADS SHALL BE AS SPECIFIED ON ALIGNMENT SHEETS.
4. PIPE FOR BORED CROSSINGS TO INCLUDE ABRASION–RESISTANT (ARB) COATING.
5. PIPELINE MARKER & 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 ROAD RIGHT OF WAY.

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KEYSTONE PIPELINE PROJECT

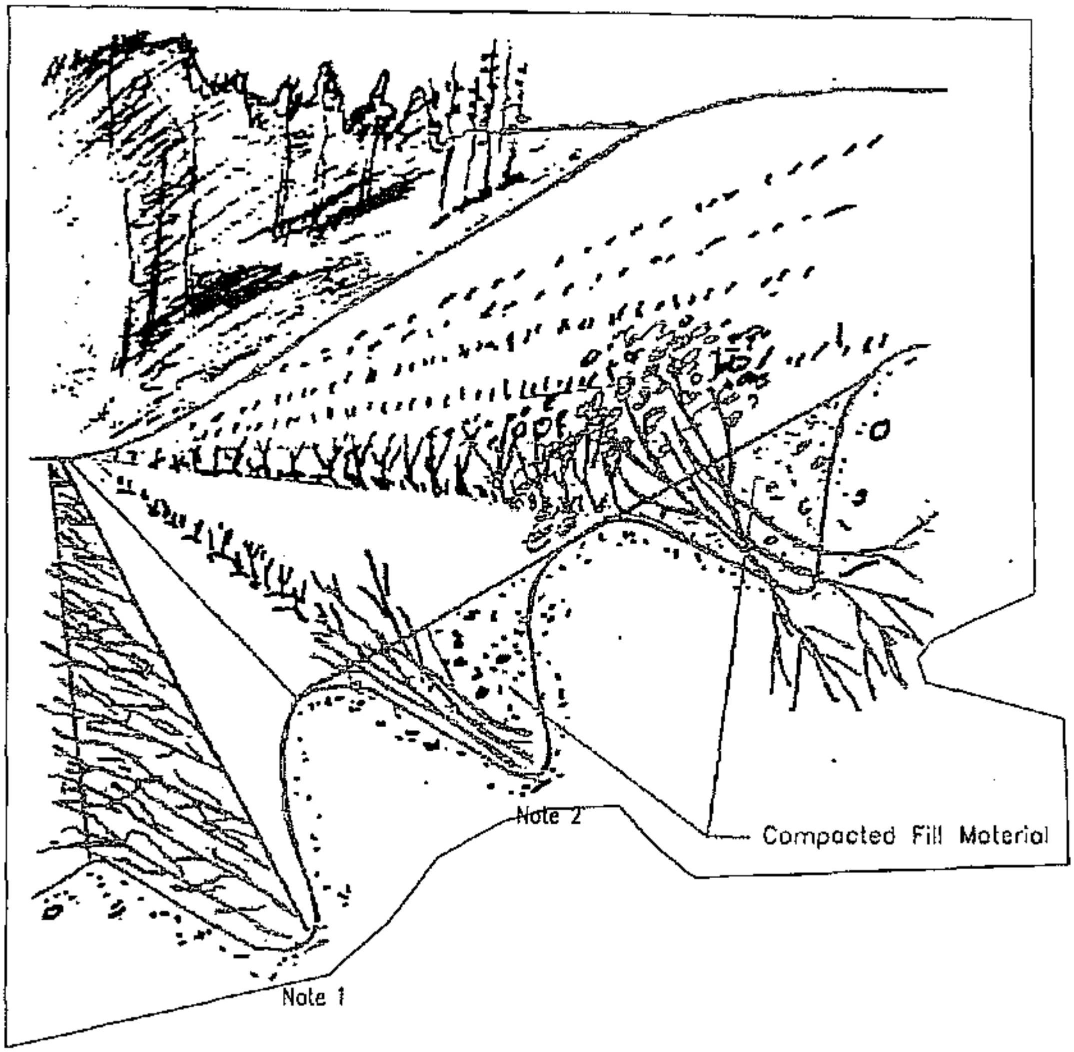
NO.	REVISION	DATE
1	GENERAL EDITORIAL REVISION	APR 04 2008
0	REVISION FOR DEPARTMENT OF STATE FILING	MAR 10 2008

TYPICAL UNCASED ROAD CROSSING BORE DETAIL

PROJECT: 60336E

DETAIL 21

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY	LAST PLOT DATE
K-00-P-7000-301	AH	JTG	RG	Tue, 04 Apr 2008 – 5:01pm



NOTES:

1. CUT TRENCH ACROSS SLOPE. FILL WITH DORMANT WOODY PLANT MATERIAL.
2. FILL IS PLACED ON TOP OF BRANCH LAYER AND COMPACTED.
3. INSTALLATION SPECIFICATIONS TO BE MODIFIED BY KEYSTONE AS NECESSARY TO SUIT SITE CONDITIONS.

PREPARED BY:
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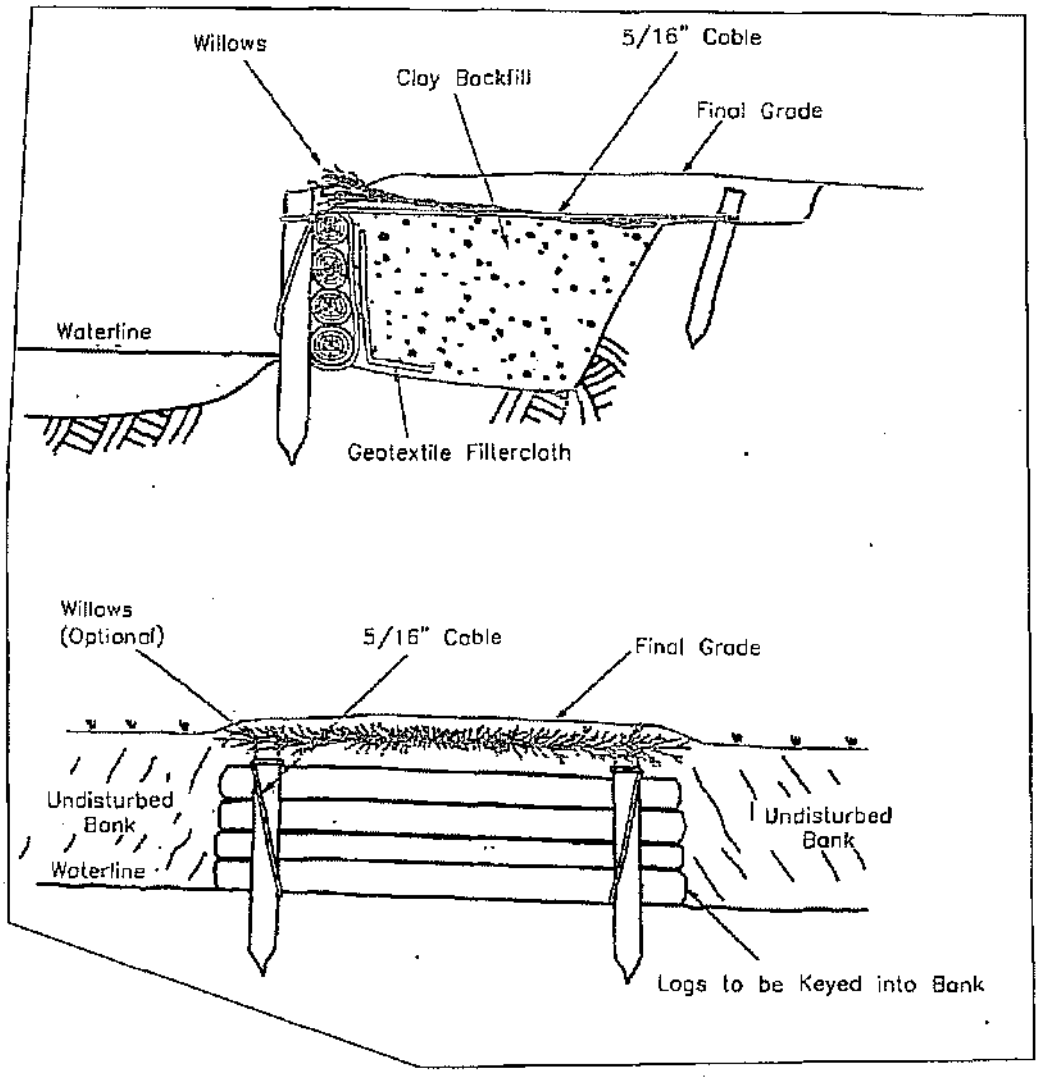
KEYSTONE PIPELINE PROJECT

STREAMBANK RECLAMATION-BRUSH LAYER IN CROSS CUT SLOPE

DETAIL 22

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-301	NY	GC	LAG



NOTES:

1. LOG WALLS TO BE CONSTRUCTED USING CONIFEROUS MATERIAL.
2. NATURE BACKFILL OR LOOSE GRADE MATERIAL SHOULD BE USED AS FILL MATERIAL.
3. ANCHOR PILINGS OR DEADMAN ANCHORS TO BE USED TO SECURE CABLE IN BANK.
4. NON-WOVEN FILTER CLOTH (NYLEX C34 OR EQUIVALENT) TO BE USED TO LINE LOG WALL.
5. INSTALLATION SPECIFICATIONS TO BE MODIFIED BY KEYSTONE AS NECESSARY TO SUIT ACTUAL SITE CONDITIONS.

PREPARED BY:
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KEYSTONE PIPELINE PROJECT

NO.	REVISION	DATE
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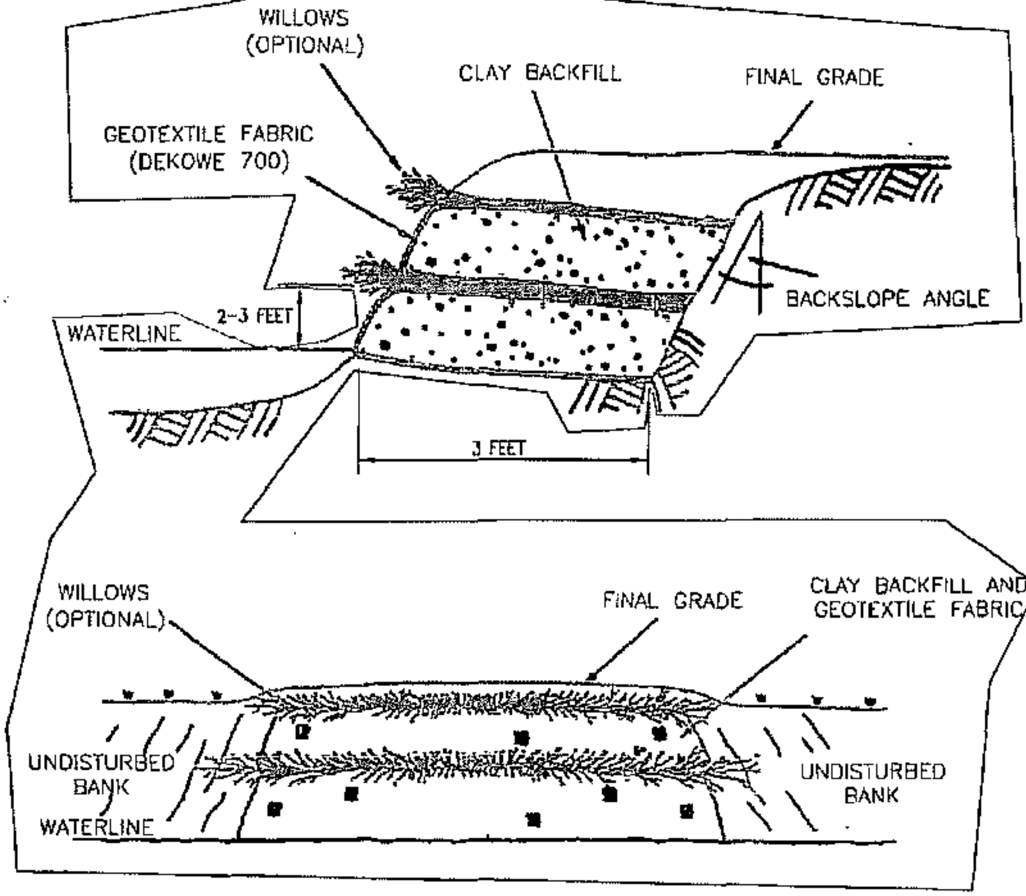
STREAMBANK RECLAMATION-LOGWALL

PROJECT: 60388E

DETAIL 23

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-301	NY	GC	LAG

LAST PLOT DATE: Tue, 04 Apr 2006 – 3:23pm



NOTES:

1. NATURE BACKFILL OR LOOSE GRADE MATERIAL SHOULD BE USED TO MINIMIZE AIR SPACES. THIS ALLOWS PROPER SOIL FABRIC CONTACT, WHICH MINIMIZES STEELING AND SCOURING DURING RUNOFF AND ENSURES SURVIVAL OF THE WILLOW CUTTINGS.
2. PLYWOOD FORMS (8X2 FEET) MAY BE REQUIRED TO HELP RECONSTRUCT STEEP OR VERTICAL BANKS.
3. GRID LAYERS SHOULD NOT EXCEED 3 FEET IN HEIGHT WITH A MINIMUM OF 3 FEET SET IN BANK.
4. WILLOWS SHOULD BE HARVESTED AS CLOSE TO INSTALLATION AS POSSIBLE, PREFERABLY THE PREVIOUS DAY BUT NO MORE THAN 2 DAYS EARLY.
5. WILLOWS SHOULD BE 0.5 TO 1 INCH IN DIAMETER AND 2 TO 3 FEET LONG WITH NO MORE THAN 10 INCHES LEFT EXPOSED.
6. PLANTING RATE SHOULD BE APPROXIMATELY 1 STEM PER 6 INCHES.
7. INSTALLATION TO BE MODIFIED BY KEYSTONE AS NECESSARY TO SUIT ACTUAL SITE CONDITIONS.

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KEYSTONE PIPELINE PROJECT

STREAMBANK RECLAMATION-VEGETATED GEOTEXTILE INSTALLATION

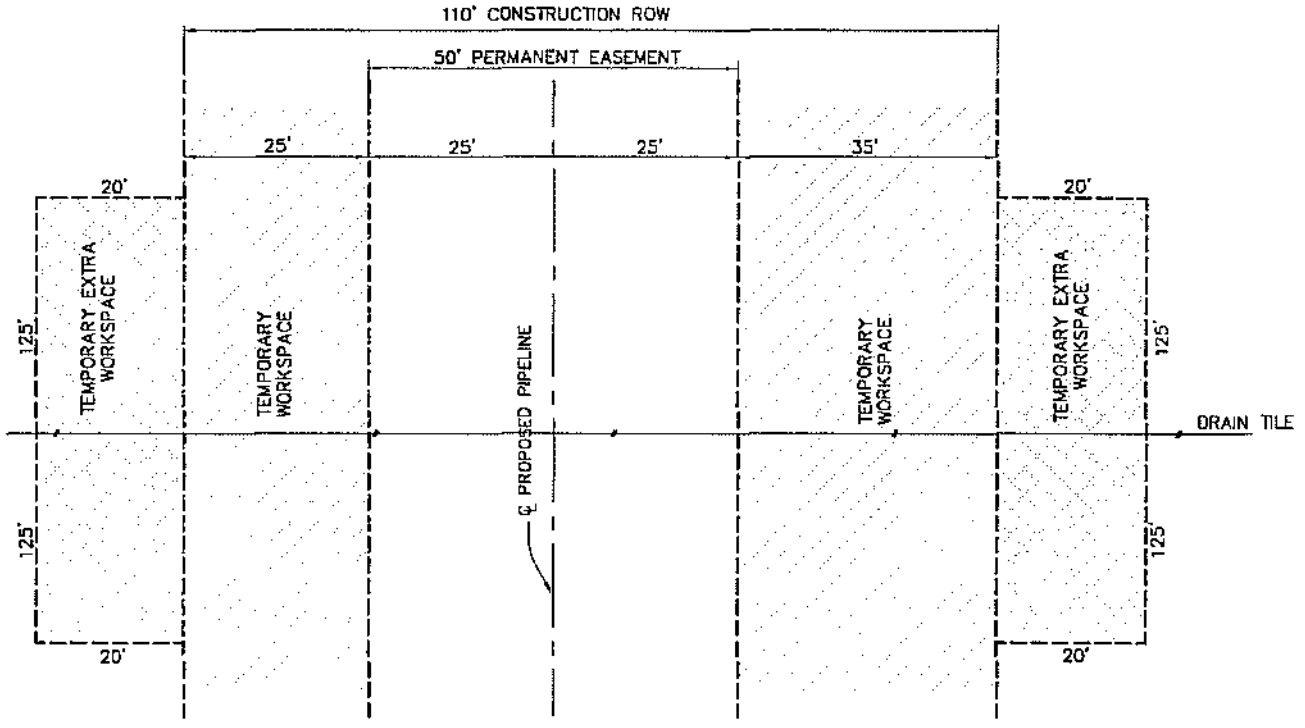
NO.	REVISION	DATE
1	GENERAL EDITORIAL [illegible]	APR.[illegible]
[illegible]	ISSUED FOR DEPARTMENT OF STATE FILING	MAR.[illegible]

PROJECT: 50388E

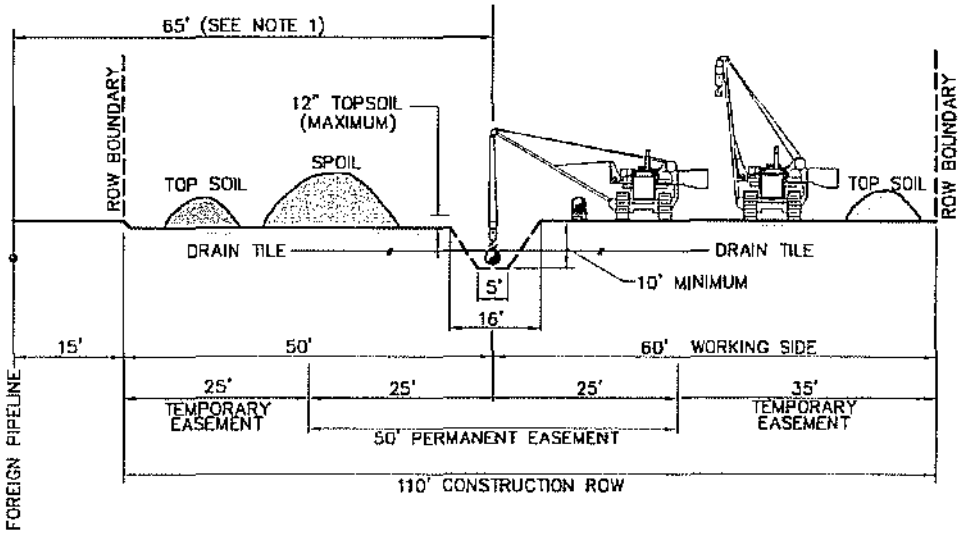
DETAIL 24

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-301	NY	GC	LAG

LAST PLOT DATE: [illegible]



PLAN



ELEVATION
N.T.S.

NOTES:

1. THE OFFSET FROM A FOREIGN PIPELINE, WHERE APPLICABLE, WILL BE 40' FOR MOST LOCATION. BUT MAY BE INCREASED OR DECREASED DEPENDING ON THE SITE SPECIFIC CONSTRUCTION REQUIREMENTS.
2. THE MINIMUM CLEARANCE BETWEEN THE TOP OF PIPE AND THE BOTTOM OF DRAIN TILE WILL BE 12 INCHES.
3. INSTALLATION SPECIFICATIONS TO BE MODIFIED BY KEYSTONE AS NECESSARY TO SUIT ACTUAL SITE CONDITIONS.

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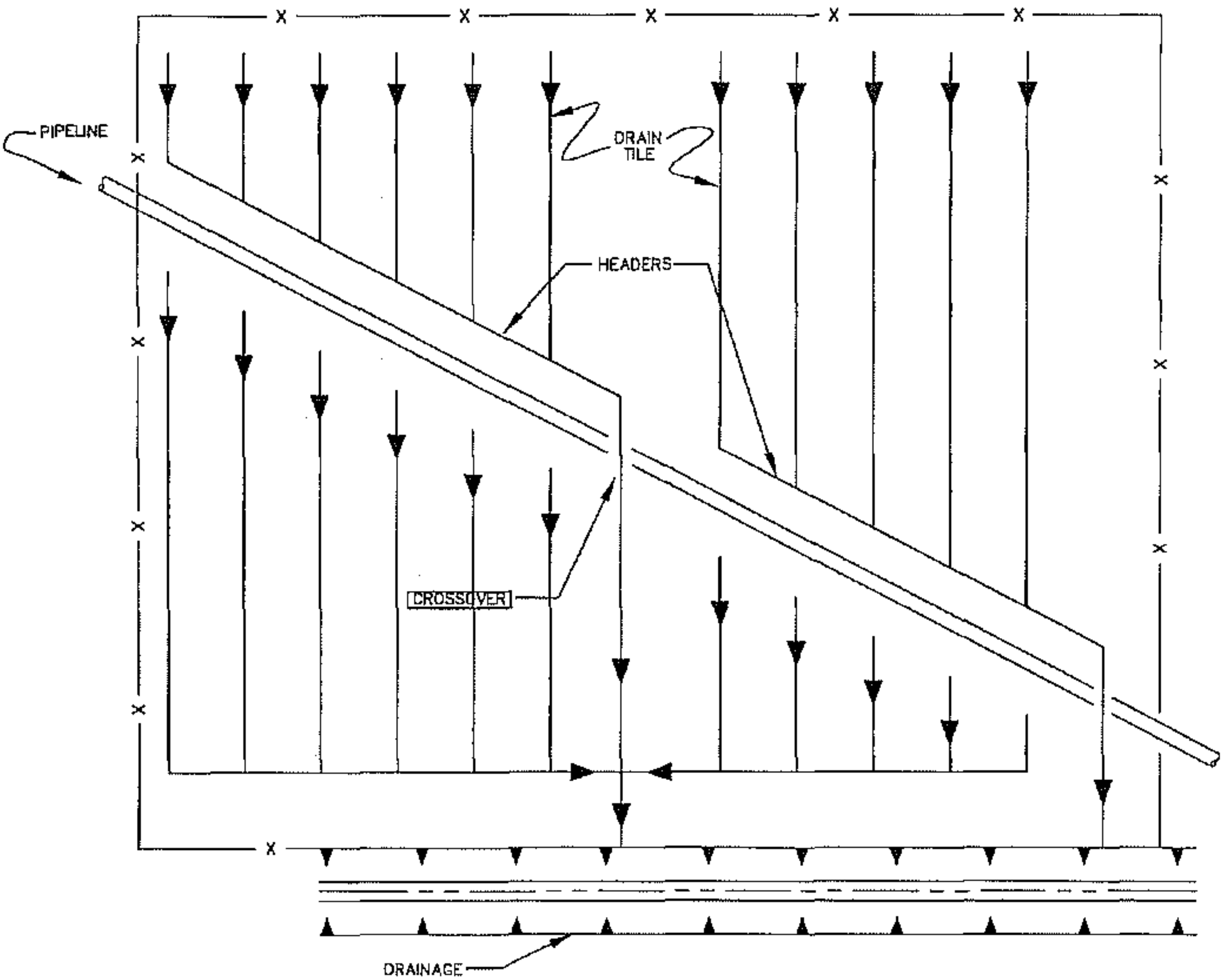
Trow

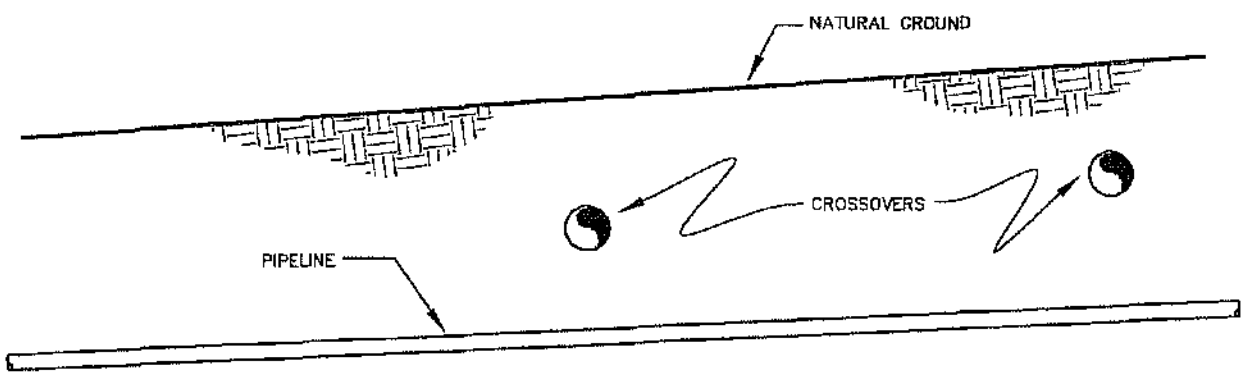
NO	REVISION	DATE
1	GENERAL EDITORIAL REVISION	APR.04.2006
0	ISSUED FOR DEPARTMENT OF STATE FILING	MAR.10.2006

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-305	ALS	BLS	RG

TransCanada
KEYSTONE PIPELINE PROJECT
TYPICAL ROW LAYOUT/SOIL HANDLING 110' CONST. R.O.W. 50' ESMT. DRAIN TILE CROSSING
PROJECT: 503BE
DETAIL 25
LAST PLOT DATE:

HEADER / MAIN CROSSOVERS OF PIPELINE





PROFILE

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KEYSTONE PIPELINE PROJECT

NO.	REVISION	DATE
0	ISSUED FOR DEPARTMENT OF STATE FILING	MAR.18.2006

HEADER / MAIN CROSSOVERS OF PIPELINE

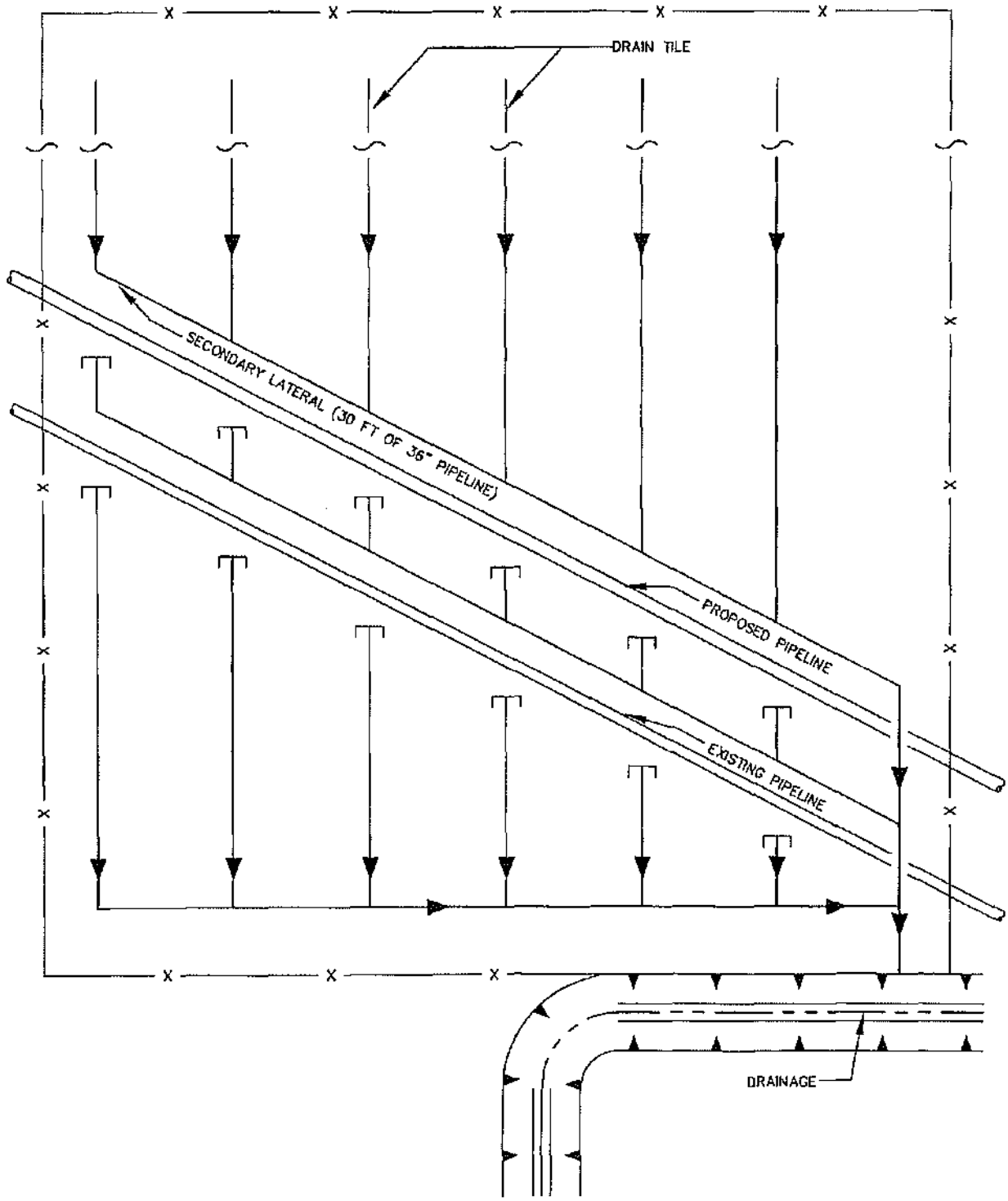
PROJECT: 60388E

DETAIL 26

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-304	ALS	JTG	RG

LAST PLOT DATE: Tue, 04 Apr 2006 – 3:43pm

RELOCATE / REPLACE DRAINAGE HEADER / MAIN



PREPARED BY:
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TransCanada
KEYSTONE PIPELINE PROJECT

NO.	REVISION	DATE
0	ISSUED FOR DEPARTMENT OF STATE FILING	MAR 19 2009

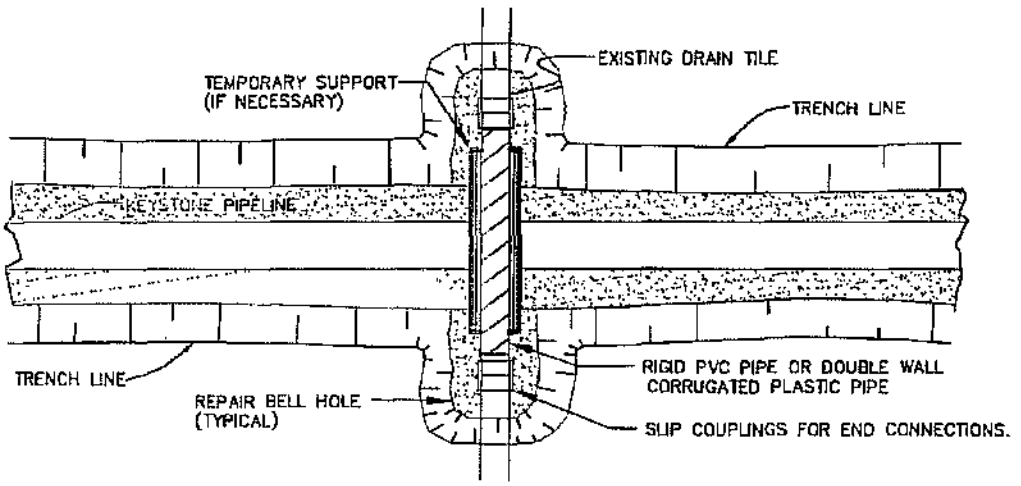
HEADER / MAIN
CROSSOVERS OF PIPELINE

PROJECT: 50388E

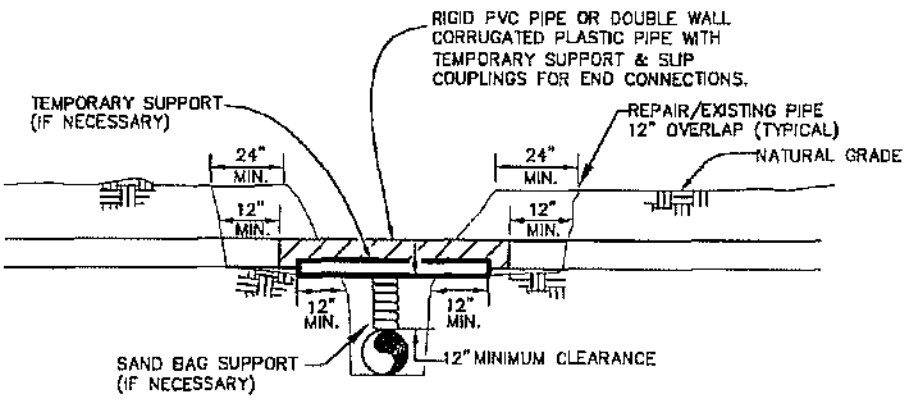
DETAIL 27

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-08-P-7000-304	ALS	JTG	RG

LAST PLOT DATE: Tue, 24 Apr 2009 – 3:48pm



PLAN



CROSS SECTION

NOTES:

1. IMMEDIATELY REPAIR TILE IF WATER IS FLOWING THROUGH TILE AT TIME OF TRENCHING.
2. SCREEN ALL EXPOSED ENDS OF TILE LINES.

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NO.	REVISION	DATE
0	ISSUED FOR DEPARTMENT OF STATE FILING	MARCH 2008

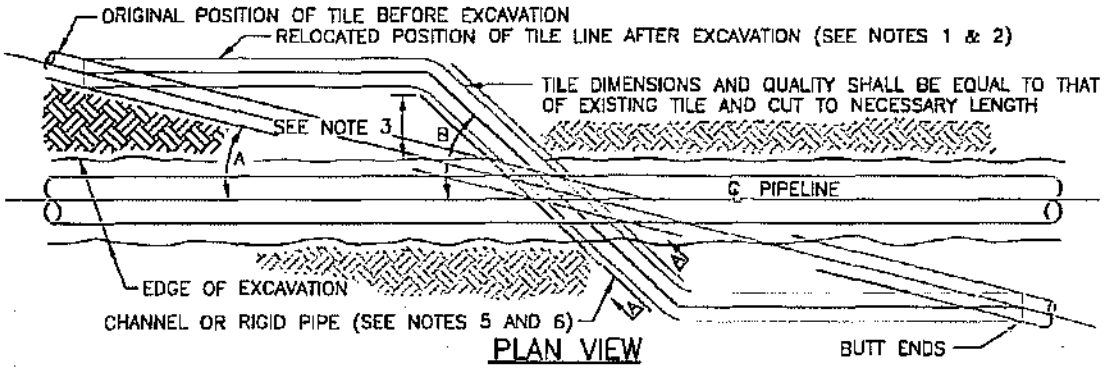
TransCanada
KEYSTONE PIPELINE PROJECT

DRAINAGE AND IRRIGATION
TEMPORARY DRAIN TILE
REPAIR

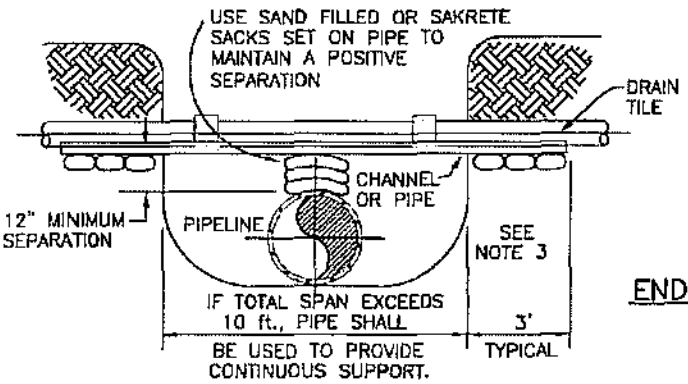
PROJECT: 583666

DETAIL 28

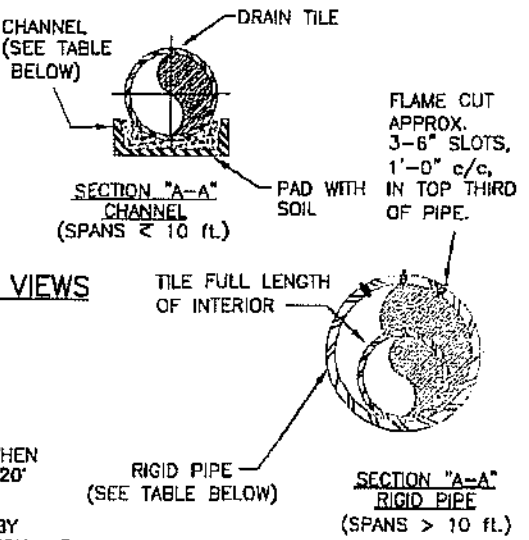
DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY	LAST PLOT DATE
K-00-P-7000-301	NY	GC	LAG	Tue, 04 Mar 2008 – 2:43pm



PLAN VIEW



END VIEWS



NOTES

1. TILE REPAIR SHALL MAINTAIN ORIGINAL ALIGNMENT AND GRADIENT WHEN ANGLE "A", BETWEEN PIPELINE AND ORIGINAL TILE, IS MORE THAN 20° UNLESS OTHERWISE DIRECTED BY KEYSTONE REPRESENTATIVE.
2. WHEN ANGLE A IS LESS THAN 20°, UNLESS OTHERWISE DIRECTED BY COMPANY, ANGLE "B" SHALL BE 45° FOR USUAL WIDTHS OF TRENCH. FOR EXTRA WIDTHS IT MAY BE GREATER AS DIRECTED BY KEYSTONE REPRESENTATIVE.
3. 3'-0" MINIMUM LENGTH OF CHANNEL OR RIGID PIPE SHALL BE SUPPORTED BY UNDISTURBED SOIL, OR IF CROSSING IS NOT AT RIGHT ANGLES TO GAS PIPELINE, EQUIVALENT LENGTH PERPENDICULAR TO TRENCH. SHIM WITH SAKRETE, SAND BAGS OR CONCRETE BLOCKS TO UNDISTURBED SOIL FOR SUPPORT AND DRAINAGE GRADIENT MAINTENANCE (TYPICAL BOTH SIDES).
4. DRAINAGE TILE SHALL BE REPLACED SO THAT ITS FORMER GRADIENT AND ALIGNMENT ARE RESTORED.
5. DIAMETER OF RIGID PIPE SHALL BE OF ADEQUATE SIZE TO ALLOW FOR THE INSTALLATION OF THE TILE FOR THE FULL LENGTH OF THE RIGID PIPE.
6. OTHER METHODS OF SUPPORTING DRAIN TILE MAY BE USED IF THE ALTERNATE PROPOSED IS EQUIVALENT IN STRENGTH TO THE CHANNEL/PIPE SECTIONS SHOWN AND IF APPROVED BY THE KEYSTONE REPRESENTATIVE IN ADVANCE. SITE SPECIFIC ALTERNATE SUPPORT SYSTEM TO BE DEVELOPED BY KEYSTONE REPRESENTATIVE AND FURNISHED TO CONTRACTOR FOR SPANS IN EXCESS OF 20 FEET, TILE GREATER THAN 10" DIAMETER, AND FOR "HEADER" SYSTEMS.
7. ALL MATERIAL TO BE FURNISHED BY CONTRACTOR.
8. PRIOR TO REPAIRING TILE, CONTRACTOR SHALL PROBE INTO THE EXISTING TILE TO THE FULL WIDTH OF THE RIGHT OF WAY TO DETERMINE IF ADDITIONAL DAMAGE HAS OCCURRED. ALL DAMAGED/DISTURBED TILE SHALL BE REPAIRED AS NEAR AS PRACTICABLE TO ITS ORIGINAL OR BETTER CONDITION.
9. "NIGHT CAP" OPEN ENDS OF PIPE AND/OR DRAIN TILES IF REPAIRS ARE NOT COMPLETED BY END OF WORK DAY.

MINIMUM SUPPORT TABLE			
TILE SIZE	CHANNEL SIZE	PIPE SIZE	
3"	4" @ 5.4 #/ft.	4"	STD. WT
4"-5"	5" @ 6.7 #/ft.	6"	STD. WT
6"-9"	7" @ 9.8 #/ft.	8"-10"	STD. WT
10"	10" @ 15.3 #/ft.	12"	STD. WT

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TransCanada
KEYSTONE PIPELINE PROJECT

NO.	REVISION	DATE
6	ISSUED FOR DEPARTMENT OF STATE FILING	MAR.18.2010

DRAINAGE AND IRRIGATION PERMANENT DRAIN TILE REPAIR

PROJECT: 50368E

DETAIL 29

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY	PLOT DATE
K-00-P-7000-301	NY	GC	LAG	Thu, 01 Apr 2010 - 3:30pm

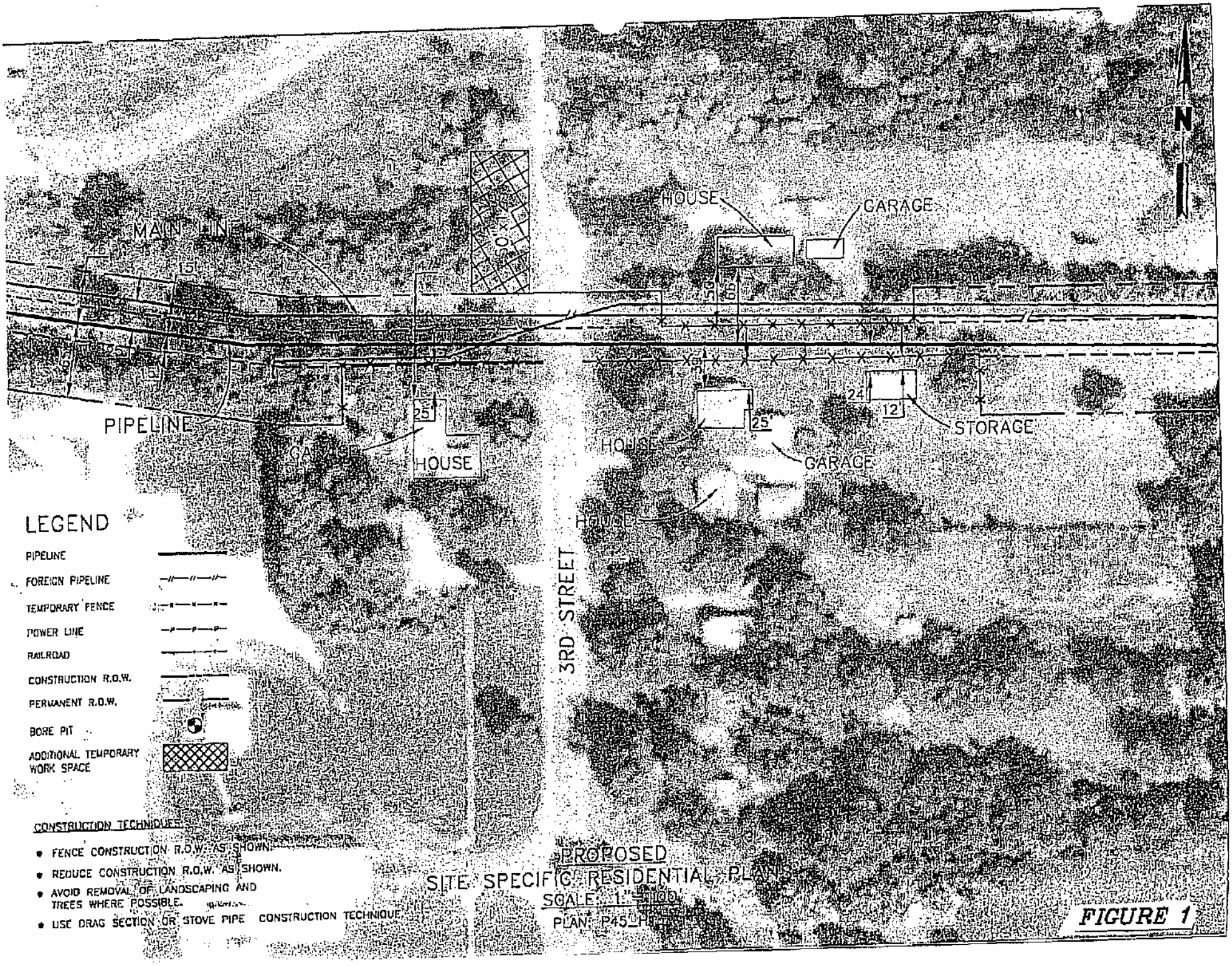
MAIN LINE
PIPELINE
HOUSE
GARAGE
HOUSE
GARAGE
STORAGE
HOUSE
HOUSE
3RD STREET
N
LEGEND
PIPELINE
FOREIGN PIPELINE
TEMPORARY FENCE
POWER LINE
RAILROAD
CONSTRUCTION R.O.W.
PERMANENT R.O.W.
BORE PIT
ADDITIONAL TEMPORARY WORK SPACE
CONSTRUCTION TECHNIQUES
• FENCE CONSTRUCTION R.O.W. AS SHOWN.
• REDUCE CONSTRUCTION R.O.W. AS SHOWN.
• AVOID REMOVAL OF LANDSCAPING AND TREES WHERE POSSIBLE.
• USE DRAG SECTION OR STOVE PIPE CONSTRUCTION TECHNIQUE
PROPOSED
SITE SPECIFIC RESIDENTIAL PLAN
SCALE: 1" = 100'
PLAN: P45_HP

FIGURE 1

STANDARD MITIGATIVE MEASURES

FOR CONSTRUCTION, OPERATION, AND MAINTENANCE

OF WESTERN FACILITIES

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WESTERN AREA POWER ADMINISTRATION
STANDARD MITIGATIVE PRACTICES

Mitigation Measures:

1. The contractor shall limit the movement of its crews and equipment to the right-of-way (ROW), including access routes. The contractor shall limit movement on the ROW so as to minimize damage to grazing land, crops, or property, and shall avoid marring the land.

2. When weather and ground conditions permit, the contractor shall obliterate all contractor-caused deep ruts that are hazardous to farming operations and to movement of equipment. Such ruts shall be leveled, filled, and graded, or otherwise eliminated in an approved manner. In hay meadows, alfalfa fields, pastures, and cultivated productive lands, ruts, scars, and compacted soils shall have the soil loosened and leveled by scarifying, harrowing, discing, or other approved methods. Damage to ditches, tile drains, terraces, roads, and other features of the land shall be corrected. Before final acceptance of the work in these agricultural areas, all ruts shall be obliterated, and all trails and areas that are hard-packed as a result of contractor operations shall be loosened, leveled, and reseeded. The land and facilities shall be restored as nearly as practicable to their original conditions.

3. Water bars or small terraces shall be constructed across all ROW and access roads on hillsides to prevent water erosion and to facilitate natural revegetation.

4. The contractor shall comply with all Federal, State, and local environmental laws, orders, and regulations. Prior to construction, all supervisory construction personnel and heavy equipment operators will be instructed on the protection of cultural and ecological resources.

5. The contractor shall exercise care to preserve the natural landscape and shall conduct its construction operations so as to prevent any unnecessary destruction, scarring, or defacing of the natural surroundings in the vicinity of the work. Except where clearing

is required for permanent works, approved construction roads, or excavation operations, all trees, native shrubbery, and vegetation shall be preserved and shall be protected from damage by the contractor's construction operations and equipment. The edges of clearings and cuts through tree, shrubbery, or other vegetation shall be irregularly shaped to soften the undesirable visual impact of straight lines. Where such clearing occurs in the Lake Mead National Recreation Area, the contractor shall consult with the on-site Park Representative.

6. On completion of the work, all work areas except access roads shall be scarified or left in a condition which will facilitate natural revegetation, provide for proper drainage, and prevent erosion. All destruction, scarring, damage, or defacing of the landscape resulting from the contractor's operations shall be repaired by the contractor.

7. Construction staging areas shall be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent. On abandonment, all storage and construction buildings, including concrete footings and slabs, and all construction materials and debris shall be removed from the site. The area shall be regraded as required so that all surfaces drain naturally, blend with the natural terrain, and are left in a condition that will facilitate natural revegetation, provide for proper drainage, and prevent erosion.

8. Borrow pits shall be excavated so that water will not collect and stand therein. Before being abandoned, the sides of borrow pits shall be brought to stable slopes, with slope intersections shaped to carry the natural contour of adjacent undisturbed terrain into the pit or borrow area giving a natural appearance. Waste piles shall be shaped to provide a natural appearance.

9. Construction activities shall be performed by methods that will prevent entrance, or accidental spillage, of solid matter contaminants, debris, any other objectionable pollutants and wastes into streams, flowing or dry watercourses, lakes, and underground water sources. Such pollutants and waste include, but are not restricted to refuse, garbage, cement, concrete, sanitary waste, industrial waste, radioactive substances, oil

and other petroleum products, aggregate processing tailing, mineral salts, and thermal pollution.

10. Dewatering work for structure foundations or earthwork operations adjacent to, or encroaching on, streams or watercourses, shall be conducted in a manner to prevent muddy water and eroded materials from entering the streams or watercourses by construction of intercepting ditches, bypass channels, barriers, settling ponds, or by other approved means.

11. Excavated material or other construction materials shall not be stockpiled or deposited near or on stream banks, lake shorelines, or other watercourse perimeters where they can be wasted away by high water or storm runoff or can in any way encroach upon the actual watercourse itself.

12. Waste waters from concrete batching, or other construction operations shall not enter streams, watercourses, or other surface waters without the use of such turbidity control methods as settling ponds, gravel-filter entrapment dikes, approved flocculating processes that are not harmful to fish, recirculation systems for washing of aggregates, or other approved methods. Any such waste waters discharged into surface waters shall be essentially free of settleable material. For the purpose of these specifications, settleable material as defined as that material which will settle from the water by gravity during a 1-hour quiescent detention period.

13. The contractor shall utilize such practicable methods and devices as are reasonably available to control, present, and otherwise minimize atmospheric emissions or discharges of air contaminants.

14. The emission of dust into the atmosphere will not be permitted during the manufacture, handling, and storage of concrete aggregate, and the contractor shall use such methods and equipment as necessary for the collection and disposal, or prevention, of dust during these operations. The contractor's methods of storing and handling cement and pozzolans shall also include means of eliminating atmospheric discharges of dust.

15. Equipment and vehicles that show excessive emissions of exhaust gases due to poor engine adjustments, or other inefficient operating conditions, shall not be operated until repairs or adjustments are made.

16. The contractor shall prevent any nuisance to persons or damage to crops, cultivated fields, and dwellings from dust originating from his operations. Oil and other petroleum derivatives shall not be used for dust control. Speed limits shall be enforced, based on road conditions, to reduce dust problems.

17. To avoid nuisance conditions due to construction noise, all internal combustion engines used in connection with construction activity shall be fitted with an approved muffler and spark arrester.

18. Burning or burying waste materials on the ROW or at the construction site will be permitted if allowed by local regulations. The contractor shall remove all other waste materials from the construction area. All materials resulting from the contractor's clearing operations shall be removed from the ROW.

19. The contractor shall make all necessary provisions in conformance with safety requirements for maintaining the flow of public traffic and shall conduct its construction operations to offer the least possible obstruction and inconvenience to public traffic.

20. Western will apply necessary mitigation to eliminate problems of induced currents and voltages onto conductive objects sharing a ROW, to the mutual satisfaction to the parties involved.

21. Structures will be carefully located to avoid sensitive vegetative conditions, including wetlands, where practical.

22. ROW will be located to avoid sensitive vegetation conditions including wetlands where practical, or, if they are linear to cross them at the least sensitive feasible point.

23. Removal of vegetation will be minimized to avoid creating a swath along the ROW.

24. Topsoil will be removed, stockpiled, and respread at all heavily disturbed areas not needed for maintenance access.

25. All disturbed areas not needed for maintenance access will be reseeded using mixes approved by the landowner or land management agency.

26. Erosion control measures will be implemented on disturbed areas, including areas that must be used for maintenance operations (access ways and areas around structures).

27. The minimum area will be used for access ways (12 feet to 15 feet wide, except where roadless construction is used).

28. Structures will be located and designed to conform with the terrain. Leveling and benching of the structure sites will be the minimum necessary to allow structure assembly and erection.

29. ROW will be located to utilize the least steep terrain and, therefore, to disturb the smallest area feasible.

30. Careful structure location will ensure spanning of narrow flood prone areas.

31. Structures will not be sited on any potentially active faults.

32. Structure sites and other disturbed areas will be located at least 300 feet, where practical, from rivers, streams (including ephemeral streams), ponds, lakes, and reservoirs.

33. New access ways will be located at least 300 feet, where practical, from rivers, ponds, lakes, and reservoirs.

34. At crossings of perennial streams by new access ways, culverts of adequate size to accommodate the estimated peak flow of the stream will be installed. Construction areas will minimize disturbance of the stream banks and beds during construction. The mitigation measures listed for soil/vegetation resources will be performed on areas disturbed during culvert construction.

35. If the banks of ephemeral stream crossings are sufficiently high and steep that breaking them down for a crossing would cause excessive disturbance, culverts will be installed using the same measures as for culverts on perennial streams.

36. Blasting will not be allowed.

37. Power line structures will be located, where practical, to span small occurrences of sensitive land uses, such as cultivated areas. Where practicable, construction access ways will be located to avoid sensitive conditions.

38. ROW will be purchased at fair market value and payment will be made of full value for crop damages or other property damage during construction or maintenance.

39. The Power line will be designed to minimize noise and other effects from energized conductors.

40. The precise location of all structure sites, ROW, and other disturbed areas will be determined in cooperation with landowners or land management agencies.

41. Crossing of operating railroads by construction vehicles or equipment in a manner that would cause delays to railroad operations will be avoided. Construction will be coordinated with railroad operators. Conductors and overhead wire string operations would use guard structures to eliminate delays.

42. Before construction, Western will perform a Class III (100 percent of surface) cultural survey on all areas to be disturbed, including structure sites and new access ways. These surveys will be coordinated with the appropriate land owner or land management agency. A product of the survey will be a Cultural Resources Report recording findings and suggesting mitigation measures. These findings will be reviewed with the State Historic Preservation Offices and other appropriate agencies, and specific mitigation measures necessary for each site or resource will be determined. Mitigation may include careful relocation of access ways, structure sites, and other disturbed areas to avoid cultural sites that should not be disturbed, or data recovery.

43. The contractor will be informed of the need to cease work in the location if cultural resource items are discovered.

44. Construction activities will be monitored or sites flagged to prevent inadvertent destruction of any cultural resource for which the agreed mitigation was avoidance.

45. Construction crews will be monitored to the extent possible to prevent vandalism or unauthorized removal or disturbance of cultural artifacts or materials from sites where the agreed mitigation was avoidance.

46. Should any cultural resources that were not discovered during the Class III Survey be encountered during construction, ground disturbance activities at that location will be suspended until the provisions of the National Historic Preservation Act and enabling legislation have been carried out.

47. Construction activities will be monitored or significant locations flagged to prevent inadvertent destruction of any paleontological resource for which the agreed mitigation was avoidance.

48. Clearing for the access road will be limited to only those trees necessary to permit the passage of equipment.

49. The access road will follow the lay of the land rather than a straight line along the ROW where steep features would result in a higher disturbance.

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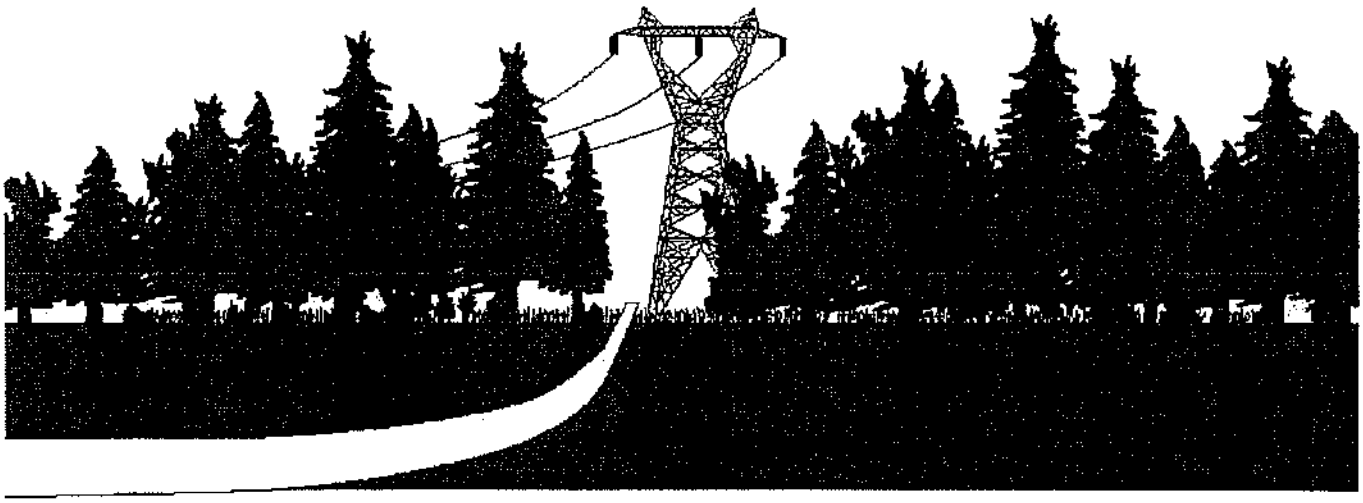
Western
AREA POWER
ADMINISTRATION

CONSTRUCTION STANDARDS

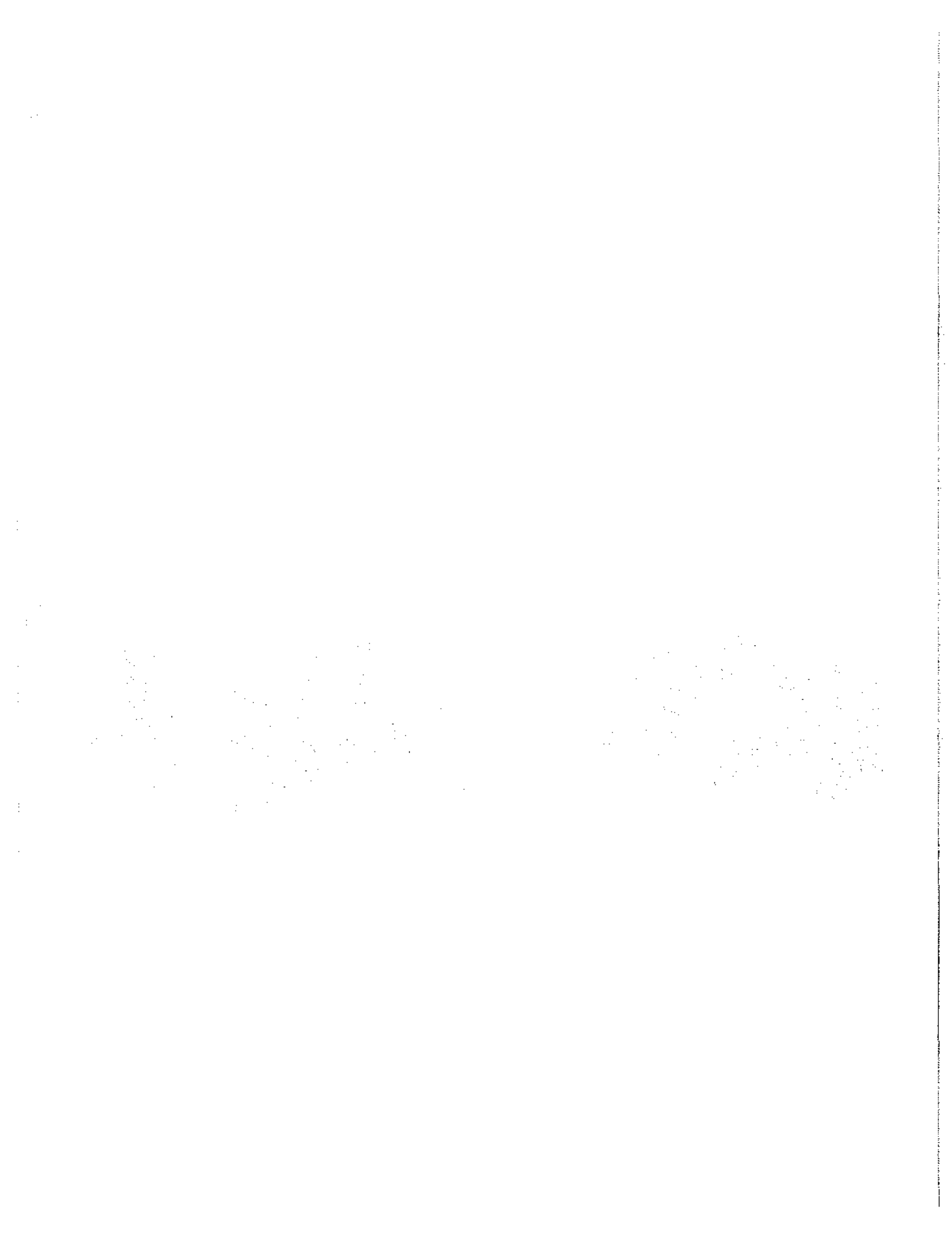
STANDARD 13

ENVIRONMENTAL QUALITY PROTECTION



June 2003

SAFETY
A HABIT TO LIVE BY



STANDARD 13 - ENVIRONMENTAL QUALITY PROTECTION

TABLE OF CONTENTS

STANDARD 13 - ENVIRONMENTAL QUALITY PROTECTION

SECTION 13.1--CONTRACTOR FURNISHED DATA

1. RECYCLED MATERIAL QUANTITY REPORT: Submit quantities for recycled material listed in Section 13.6, "Recycled Material Quantities", to the COR after completion and prior to submittal of final invoice.

2. PRODUCTS CONTAINING RECOVERED MATERIAL REPORT: Provide the COR the following information for purchases of items listed in Section 13.7, "Use of Products Containing Recovered Material":

   (1) Quantity and cost of listed items with recovered material content and quantity and cost of listed items without recovered material content after completion and prior to submittal of final invoice.

   (2) Written justification 7 days prior to purchase of listed items if recovered material content products are not available: 1) competitively within a reasonable time frame; 2) that meet performance criteria defined in the Standards or Project Specifications; or 3) at a reasonable price.

3. RECLAIMED REFRIGERANT RECEIPT: A receipt from the reclaimer stating that the refrigerant was reclaimed, the amount and type of refrigerant, and the date shall be submitted to the COR after completion and prior to submittal of final invoice in accordance with Section 13.8.5, "Refrigerants And Receipts".

4. WASTE MATERIAL QUANTITY REPORT: Submit quantities of total project waste material disposal as listed below to the COR after completion and prior to submittal of final invoice in accordance with Section 13.8.8, "Waste Material Quantity Report".

   (1) Sanitary Wastes: Volume in cubic yards or weight in pounds.

   (2) Hazardous or Universal Wastes: Weight in pounds.

   (3) PCB Wastes: Weight in pounds.

   (4) Other regulated wastes (e.g., lead-based paint or asbestos): Weight in pounds (specify type of waste in report).

5. SPILL PREVENTION NOTIFICATION AND CLEANUP PLAN (Plan): Submit the Plan as described in Section 13.10.2, "Spill Prevention Notification and Cleanup Plan", to the COR for approval 14 days prior to start of work. Approval of the Plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations.

6. TANKER OIL SPILL PREVENTION AND RESPONSE PLAN: Submit the Plan as described in Section 13.10.3, "Tanker Oil Spill Prevention and Response Plan", to the COR for approval 14 days prior to start of work. Approval of the Plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations.

7. PESTICIDE USE PLAN: Submit two copies of a pesticide use plan as described in Section 13.11.3, "Pesticide Use Plan", to the COR for approval 14 days prior to use. Approval of the plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations. Within seven days

after application, submit a written report in accordance with Standard 2 – Sitework, Section 2.1.1.5, "Soil-Applied Herbicide".

8. TREATED WOOD POLE AND MEMBERS RECYCLING CONSUMER INFORMATION RECEIPT: Submit treated wood pole and members consumer receipt forms to the COR after completion and prior to submittal of final invoice (see 13.12, "Treated Wood Poles and Members Recycling or Disposal").

9. PREVENTION OF AIR POLLUTION: Submit a copy of permits, if required, from Federal, State, or local agencies to the COR 14 days prior to the start of work.

10. ASBESTOS LICENSES OR CERTIFICATIONS: Submit a copy of licenses and/or certifications for asbestos work as described in 13.14, "Handling and Management of Asbestos Containing Material" paragraph a., to the COR prior to work. Submit copies of certificates of disposal and/or receipts for waste to the COR after completion and prior to submittal of final invoice.

11. LEAD PAINT NOTICES: Submit a copy of lead paint notices as described in 13.15, "Material with Lead-based Paint" paragraph b., to the COR upon completion and prior to submittal of final invoice. Submit copies of certificates of disposal and/or receipts for waste to the COR after completion and prior to submittal of final invoice.

12. WATER POLLUTION PERMITS: Submit copies of any water pollution permits as described in 13.16, "Prevention of Water Pollution" paragraph b., to the COR prior to work.

13. PCB TEST REPORT: Submit a PCB test report as described in 13.17, "Testing, Draining, Removal, and Disposal of Oil-filled Electrical Equipment" paragraph b., prior to draining, removal, or disposal of oil or oil-filled equipment that is designated for disposal.

14. OIL AND OIL-FILLED ELECTRICAL EQUIPMENT RECEIPT: Obtain and submit a receipt for oil and oil-filled equipment transported and disposed, recycled, or reprocessed as described in 13.17, "Testing, Draining, Removal, and Disposal of Oil-filled Electrical Equipment", to the COR upon completion and prior to submittal of final invoice.

15. OSHA PCB TRAINING RECORDS: Submit employee training documentation records to the COR 14 days prior to the start of work as described in 13.18.1.

16. CLEANUP WORK MANAGEMENT PLAN: Submit a Cleanup Work Management Plan as described in 13.18, "Removal of Oil-contaminated Material" paragraph b., to the COR for approval 14 days prior to the start of work. Approval of the plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations.

17. POST CLEANUP REPORT: Submit a Post-Cleanup Report as described in 13.18, "Removal of Oil-contaminated Material" paragraph g., to the COR upon completion and prior to submittal of final invoice.

SECTION 13.2--ENVIRONMENTAL REQUIREMENTS

Comply with Federal, State, and local environmental laws and regulations. The sections in this Standard further specify the requirements.

SECTION 13.3--LANDSCAPE PRESERVATION

1. GENERAL: Preserve landscape features in accordance with the contract clause titled "Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements."

2. CONSTRUCTION ROADS: Location, alignment, and grade of construction roads shall be subject to the COR's approval. When no longer required, construction roads shall be restored to their original condition. Surfaces of construction roads shall be scarified to facilitate natural revegetation, provide for proper drainage, and prevent erosion. If revegetation is required, then use regionally native plants.

3. CONSTRUCTION FACILITIES: Shop, office, and yard areas shall be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent and prevent impact on sensitive riparian areas and flood plains. Storage and construction buildings, including concrete footings and slabs, shall be removed from the site prior to contract completion. The area shall be regraded as required so that all surfaces drain naturally, blend with the natural terrain, and are left in a condition that will facilitate natural revegetation, provide for proper drainage, and prevent erosion. If revegetation is required, then use regionally native plants.

SECTION 13.4--PRESERVATION OF CULTURAL AND PALEONTOLOGICAL RESOURCES

1. GENERAL: Do not remove or alter cultural artifacts or paleontological resources (fossils). Cultural artifacts are of potential scientific or cultural importance and include bones, tools, historic buildings, and features. Paleontological resources can be of scientific importance and include mineralized animals and plants or trace fossils such as footprints. Both cultural and paleontological resources are protected by Federal Regulations during Federal construction projects.

2. KNOWN CULTURAL OR PALEONTOLOGICAL SITES: Following issuance of notice to proceed, Western will provide two sets of plan and profile drawings showing sensitive areas located on or immediately adjacent to the transmission line right-of-way and/or facility. These areas shall be considered avoidance areas. Prior to any construction activity, the avoidance areas shall be marked on the ground in a manner approved by the COR. Instruct employees, subcontractors, and others that vehicular or equipment access to these areas is prohibited. If access is absolutely necessary, first obtain approval from the COR. Ground markings shall be maintained throughout the duration of the contract. Western will remove the markings during or following final cleanup. For some project work, Western will require an archaeological, paleontological or tribal monitor at or near cultural or paleontological site locations. The contractor shall work with the monitor to identify avoidance areas.

3. UNKNOWN CULTURAL OR PALEONTOLOGICAL SITES: On rare occasions cultural or paleontological sites may be discovered during excavation or other earth-moving activities.

   (1) Reporting: If evidence of a cultural or paleontological site is discovered, immediately notify the COR and give the location and nature of the findings. Stop all activities within a 50-foot radius of the discovery and do not proceed with work within that radius until directed to do so by the COR.

   (2) Care of Evidence: Do not damage artifacts or fossils uncovered during construction.

4. CONTRACT ADJUSTMENTS: Where appropriate by reason of delays caused by a discovery, the Contracting Officer may make adjustments to contract requirements.

SECTION 13.5--NOXIOUS WEED CONTROL

1. GENERAL: Comply with Federal, state, and local noxious weed control regulations. Provide a "clean vehicle policy" while entering and leaving construction areas to prevent transport of noxious weed plants and/or seed. Transport only construction vehicles that are free of mud and vegetation debris to staging areas and the project right-of-way.

SECTION 13.6--RECYCLED MATERIAL QUANTITIES

1. GENERAL: Record quantities of the following material by category that is salvaged, recycled, reused, or reprocessed:

   (1) Transformers, Breakers: Weight without oil.

   (2) Electrical Conductors: Length in feet and Type (for example, ACSR, Copper, and gauge).

   (3) Structural Steel: Weight in pounds or tons.

   (4) Aluminum Buswork: Weight in pounds or tons.

   (5) Other Metals: Weight in pounds or tons.

   (6) Oil: Gallons (separate by type - less than 2 ppm PCB, 2 to 50 ppm PCB, and 50 or greater ppm PCB).

   (7) Gravel, Asphalt, Or Concrete: Weight in pounds or tons.

   (8) Batteries: Weight in pounds.

   (9) Wood Poles and Crossarms: Weight in pounds.

   (10) Cardboard. Weight in pounds.

   (11) Porcelain insulators. Weight in pounds.

2. RECYCLED MATERIAL QUANTITY REPORT: Submit quantities for recycled material listed above to the COR after completion and prior to submittal of final invoice.

SECTION 13.7--USE OF PRODUCTS CONTAINING RECOVERED MATERIAL AND BIOBASED PRODUCTS

1. PRODUCTS CONTAINING RECOVERED MATERIAL: If the products listed below are obtained as part of this project, purchase the items with the highest recovered material content possible unless recovered material content products are not available: 1) competitively within a reasonable time frame; 2) that meet performance criteria defined in the Standards or Project Specifications; or 3) at a reasonable price.

   (1) Construction Products:

   - Building Insulation Products
   - Carpet
   - Carpet cushion
   - Cement and concrete containing coal fly ash, ground granulated blast furnace slag, cenosperes, or silica fume

- Consolidated and reprocessed latex paint
- Floor Tiles
- Flowable fill
- Laminated Paperboard
- Modular threshold ramps
- Nonpressure pipe
- Patio Blocks
- Railroad grade crossing surfaces
- Roofing materials
- Shower and restroom dividers/partitions
- Structural Fiberboard

(2) Landscaping Products:

- Compost made from yard trimmings or food waste
- Garden and soaker hoses
- Hydraulic Mulch
- Lawn and garden edging
- Plastic lumber landscaping timbers and posts

(3) Non-paper Office Products:

- Binders, clipboards, file folders, clip portfolios, and presentation folders
- Office furniture
- Office recycling containers
- Office waste receptacles
- Plastic desktop accessories
- Plastic envelopes
- Plastic trash bags
- Printer ribbons
- Toner cartridges

(4) Paper and Paper Products:

- Commercial/industrial sanitary tissue products
- Miscellaneous papers
- Newsprint
- Paperboard and packaging products
- Printing and writing papers

(5) Park and Recreation Products:

- Park benches and picnic tables
- Plastic fencing
- Playground equipment
- Playground surfaces
- Running tracks

(6) Transportation Products:

- Channelizers
- Delineators
- Flexible delineators
- Parking stops

- Traffic barricades
- Traffic cones

(7) Vehicular Products:

- Engine coolants
- Rebuilt Vehicular Parts
- Re-refined lubricating oils
- Retread tires

(8) Miscellaneous Products:

- Awards and plaques
- Bike racks
- Blasting grit
- Industrial drums
- Manual-grade strapping
- Mats
- Pallets
- Signage
- Sorbents

(9) For a complete listing of products and recommendations for recovered content, see http://www.epa.gov/cpg/products.htm

2. PRODUCTS CONTAINING RECOVERED MATERIAL REPORT: Provide the COR the following information for purchases of those items listed above:

(1) Quantity and cost of listed items with recovered material content and quantity and cost of listed items without recovered material content after completion and prior to submittal of final invoice.

(2) Written justification 7 days prior to purchase of listed items if recovered material content products are not available: 1) competitively within a reasonable time frame; 2) that meet performance criteria defined in the Standards or Project Specifications; or 3) at a reasonable price.

3. BIOBASED PRODUCTS: If the products listed below are obtained as part of this project, purchase the items with the highest biobased content possible and no less than the percent indicated for each product unless biobased products: 1) are not available within a reasonable period of time, 2) fail to meet performance criteria defined in the Standards or Project Specifications, or 3) are available only at an unreasonable price.

(1) Mobile Equipment Hydraulic Fluids (minimum 24% biobased content)
(2) Urethane Roof Coatings (minimum 62% biobased content)
(3) Water Tank Coatings (minimum 62% biobased content)
(4) Diesel Fuel Additives (minimum 93% biobased content)
(5) Penetrating Lubricants (minimum 71% biobased content)
(6) Bedding, Bed Linens, and Towels (minimum 18% biobased content)

(7) For additional information regarding biobased products, see **http://www.biobased.oce.usda.gov**

4. BIOBASED PRODUCTS REPORT: Provide the COR the following information for purchases of those biobased items listed above:

(1) Quantity and cost of listed items with biobased content and quantity and cost of listed items without biobased content after completion and prior to submittal of final invoice.

(2) Written justification 7 days prior to purchase of listed items if biobased products: 1) are not available within a reasonable period of time, 2) fail to meet performance criteria defined in the Standards or Project Specifications, or 3) are available only at an unreasonable price.

SECTION 13.8--DISPOSAL OF WASTE MATERIAL

1. GENERAL: Dispose or recycle waste material in accordance with applicable Federal, State and Local regulations and ordinances. In addition to the requirements of the Contract Clause "Cleaning Up", remove all waste material from the construction site. No waste shall be left on Western property, right-of-way, or easement. Burning or burying of waste material is not permitted.

2. HAZARDOUS, UNIVERSAL, AND NON-HAZARDOUS WASTES: Manage hazardous, universal, and non-hazardous wastes in accordance with State and Federal regulations.

3. USED OIL: Used oil generated from the Contractor activities shall be managed in accordance with used oil regulations.

4. RECYCLABLE MATERIAL: Reduce wastes, including excess Western material, by recycling, reusing, or reprocessing. Examples of recycling, reusing, or reprocessing include reprocessing of solvents; recycling cardboard; and salvaging scrap metals.

5. REFRIGERANTS AND RECEIPTS: Refrigerants from air conditioners, water coolers, refrigerators, ice machines and vehicles shall be reclaimed with certified equipment operated by certified technicians if the item is to be disposed. Refrigerants shall be reclaimed and not vented to the atmosphere. A receipt from the reclaimer stating that the refrigerant was reclaimed, the amount and type of refrigerant, and the date shall be submitted to the COR after completion and prior to submittal of final invoice.

6. HALONS: Equipment containing halons that must be tested, maintained, serviced, repaired, or disposed must be handled according to EPA requirements and by technicians trained according to those requirements.

7. SULFUR HEXAFLOURIDE (SF6): SF6 shall be reclaimed and not vented to the atmosphere.

8. WASTE MATERIAL QUANTITY REPORT: Submit quantities of total project waste material disposal as listed below to the COR after completion and prior to submittal of final invoice.

   (1) Sanitary Wastes: Volume in cubic yards or weight in pounds.

   (2) Hazardous or Universal Wastes: Weight in pounds.

   (3) PCB Wastes: Weight in pounds.

   (4) Other regulated wastes (e.g., lead-based paint or asbestos): Weight in pounds (specify type of waste in report).

SECTION 13.9--CONTRACTOR'S LIABILITY FOR REGULATED MATERIAL INCIDENTS

1. GENERAL: The Contractor is solely liable for all expenses related to spills, mishandling, or incidents of regulated material attributable to his actions or the actions of his subcontractors. This includes all

response, investigation, cleanup, disposal, permitting, reporting, and requirements from applicable environmental regulation agencies.

2. SUPERVISION: The actions of the Contractor employees, agents, and subcontractors shall be properly managed at all times on Western property or while transporting Western's (or previously owned by Western) regulated material and equipment.

SECTION 13.10--POLLUTANT SPILL PREVENTION, NOTIFICATION, AND CLEANUP

1. GENERAL: Provide measures to prevent spills of pollutants and respond appropriately if a spill occurs. A pollutant includes any hazardous or non-hazardous substance that when spilled, will contaminate soil, surface water, or ground water. This includes any solvent, fuel, oil, paint, pesticide, engine coolants, and similar substances.

2. SPILL PREVENTION NOTIFICATION AND CLEANUP PLAN (Plan): Provide the Plan to the COR for approval 14 days prior to start of work. Approval of the plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations. Include the following in the Plan:

   (1) Spill Prevention measures. Describe the work practices or precautions that will be used at the job site to prevent spills. These may include engineered or manufactured techniques such as installation of berms around fuel and oil tanks; Storage of fuels, paints, and other substances in spill proof containers; and management techniques such as requiring workers to handle material in certain ways.

   (2) Notification. Most States and the Environmental Protection Agency require by regulation, that anyone who spills certain types of pollutants in certain quantities notify them of the spill within a specific time period. Some of these agencies require written follow up reports and cleanup reports. Include in the Plan, the types of spills for which notification would be made, the agencies notified, the information the agency requires during the notification, and the telephone numbers for notification.

   (3) Employee Awareness Training. Describe employee awareness training procedures that will be implemented to ensure personnel are knowledgeable about the contents of the Plan and the need for notification.

   (4) Commitment of Manpower, Equipment and Material. Identify the arrangements made to respond to spills, including the commitment of manpower, equipment and material.

   (5) If applicable, address all requirements of 40CFR112 pertaining to Spill Prevention, Control and Countermeasures Plans.

3. TANKER OIL SPILL PREVENTION AND RESPONSE PLAN: Provide a Tanker Oil Spill Prevention and Response Plan as required by the Department of Transportation if oil tankers with volume of 3,500 gallons or more are used as part of the project. Submit the Tanker Oil Spill Prevention and Response Plan to the COR for approval 14 days prior to start of work. Approval of the plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations.

SECTION 13.11--PESTICIDES

1. GENERAL: The term "pesticide" includes herbicides, insecticides, rodenticides and fungicides. Pesticides shall only be used in accordance with their labeling.

2. ENVIRONMENTAL PROTECTION AGENCY REGISTRATION: Use EPA registered pesticides.

3. PESTICIDE USE PLAN: The plan shall contain: 1) a description of the pesticide to be used, 2) where it is to be applied, 3) the application rate, 4) a copy of the label, and 5) a copy of required applicator certifications. Submit two copies of the pesticide use plan to the COR for approval 14 days prior to the date of intended application. Approval of the plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations. Within seven days after application, submit a written report in accordance with Standard 2 – Sitework, Section 2.1.1.5, "Soil-Applied Herbicide".

SECTION 13.12--TREATED WOOD POLES AND MEMBERS RECYCLING OR DISPOSAL

Whenever practicable, treated wood poles and members removed during the project shall be recycled or transferred to the public for some uses. Treated wood poles and members transferred to a recycler, landfill, or the public shall be accompanied by a written consumer information sheet on treated wood as provided by Western. Obtain a receipt form, part of the consumer information sheet, from the recipient indicating that they have received, read, and understand the consumer information sheet. Treated wood products transferred to right-of-way landowners shall be moved off the right-of-way. Treated wood product scrap or poles and members that cannot be donated or reused shall be properly disposed in a landfill that accepts treated wood and has signed Western's consumer information sheet receipt. Submit treated wood pole and members consumer receipt forms to the COR after completion and prior to submittal of final invoice.

SECTION 13.13--PREVENTION OF AIR POLLUTION

1. GENERAL: Ensure that construction activities and the operation of equipment are undertaken to reduce the emission of air pollutants. Submit a copy of permits, if required, from Federal, State, or local agencies to the COR 14 days prior to the start of work.

2. MACHINERY AIR EMISSIONS: The Contractor and subcontractor machinery shall have, and shall use the air emissions control devices required by Federal, State or Local Regulation or ordinance.

3. DUST ABATEMENT: Dust shall be controlled. Oil shall not be used as a dust suppressant. Dust suppressants shall be approved by the COR prior to use.

SECTION 13.14--HANDLING AND MANAGEMENT OF ASBESTOS CONTAINING MATERIAL

1. GENERAL: Obtain the appropriate Federal, State or local licenses or certifications prior to disturbing any regulated asbestos-containing material. Submit a copy of licenses and/or certifications for asbestos work to the COR prior to work. Ensure: 1) worker and public safety requirements are fully implemented and 2) proper handling, transportation, and disposal of asbestos containing material.

2. TRANSPORTATION OF ASBESTOS WASTE: Comply with Department of Transportation, Environmental Protection Agency, and State and Local requirements when transporting asbestos wastes.

3. CERTIFICATES OF DISPOSAL AND RECEIPTS: Obtain certificate of disposals for waste if the waste is a hazardous waste or receipts if the waste is a non-hazardous waste. Submit copies to the COR after completion and prior to submittal of final invoice.

STANDARD 13 - ENVIRONMENTAL QUALITY PROTECTION

SECTION 13.15--MATERIAL WITH LEAD-BASED PAINT

1. GENERAL: Comply with all applicable Federal, State and local regulations concerning work with lead-based paint, disposal of material painted with lead-based paint, and management of these material. OSHA and General Industry Standards apply to worker safety and right-to-know issues. Federal EPA and State agencies regulate waste disposal and air quality issues.

2. TRANSFER OF PROPERTY: If lead-based paint containing equipment or material is to be given away or sold for reuse, scrap, or reclaiming, a written notice shall be provided to the recipient of the material stating that the material contains lead-based paint and the Hazardous Waste regulations may apply to the waste or the paint in some circumstances. The new owner must also be notified that they may be responsible for compliance with OSHA requirements if the material is to be cut, sanded, abraded, or stripped of paint. Submit a copy of lead paint notices to the COR upon completion and prior to submittal of final invoice.

3. CERTIFICATES OF DISPOSAL AND RECEIPTS: Obtain certificate of disposals for waste if the waste is a hazardous waste or receipts if the waste is a non-hazardous waste. Submit copies to the COR after completion and prior to submittal of final invoice.

SECTION 13.16--PREVENTION OF WATER POLLUTION

1. GENERAL: Ensure that surface and ground water is protected from pollution caused by construction activities and comply with applicable regulations and requirements.

2. PERMITS: Ensure that:

   (1) Streams, and other waterways or courses are not obstructed or impaired, unless the appropriate Federal, State or local permits have been obtained;

   (2) A National Pollutant Discharge Elimination System (NPDES) Permit is obtained if required by State or Federal regulation; and

   (3) A dewatering permit is obtained from the appropriate agency if required for construction dewatering activities.

   (4) Copies of any water pollution permits are submitted to the COR prior to work.

3. EXCAVATED MATERIAL AND OTHER CONTAMINANT SOURCES: Control runoff from excavated areas and piles of excavated material, construction material or wastes (to include truck washing and concrete wastes), and chemical products such as oil, grease, solvents, fuels, pesticides, and pole treatment compounds. Excavated material or other construction material shall not be stockpiled or deposited near or on streambanks, lake shorelines, ditches, irrigation canals, or other areas where run-off could impact the environment.

4. MANAGEMENT OF WASTE CONCRETE OR WASHING OF CONCRETE TRUCKS: Do not permit the washing of concrete trucks or disposal of excess concrete in any ditch, canal, stream, or other surface water. Concrete wastes shall be disposed in accordance with all Federal, State, and local regulations. Concrete wastes shall not be disposed on any Western property, right-of-way, or easement; nor on any streets, roads, or property without the owner's consent.

5. STREAM CROSSINGS: Crossing of any stream or other waterway shall be done in compliance with Federal, State, and local regulations. Crossing of some waterways may be prohibited by landowners, State or Federal agencies or require permits.

SECTION 13.17--TESTING, DRAINING, REMOVAL, AND DISPOSAL OF OIL-FILLED ELECTRICAL EQUIPMENT

1. SAMPLING AND TESTING OF INSULATING OIL FOR PCB CONTENT: Sample and analyze the oil of electrical equipment for PCB's. Use analytical methods approved by EPA and applicable State regulations. Decontaminate sampling equipment according to documented good laboratory practices (these can be contractor developed or EPA standards). Use only laboratories approved by Western. The COR will furnish a list of approved laboratories.

2. PCB TEST REPORT: Provide PCB test reports that contain the information below for disposing of oil-filled electrical equipment. Submit the PCB test report prior to draining, removal, or disposal of oil or oil-filled equipment that is designated for disposal.

   - Name and address of the laboratory
   - Description of the electrical equipment (e.g. transformer, breaker)
   - Serial number for the electrical equipment.
   - Date sampled
   - Date tested
   - PCB contents in parts per million (ppm)
   - Unique identification number of container into which the oil was drained (i.e., number of drum, tank, tanker, etc.)

3. OIL CONTAINING PCB: Comply with the Federal regulations pertaining to PCBs found at Title 40, Part 761 of the U.S. Code of Federal Regulations (40 CFR 761).

4. REMOVAL AND DISPOSAL OF INSULATING OIL AND OIL-FILLED ELECTRICAL EQUIPMENT: Once the PCB content of the oil has been identified from laboratory results, the oil shall be transported and disposed, recycled, or reprocessed according to 40 CFR 761 (if applicable), Resource Conservation and Recovery Act (RCRA) "used oil", and other applicable regulations. Used oil may be transported only by EPA-registered used oil transporters. The oil must be stored in containers that are labeled "Used Oil." Use only U.S. transporters and disposal sites approved by Western.

5. OIL AND OIL-FILLED ELECTRICAL EQUIPMENT RECEIPT: Obtain and submit a receipt for oil and oil-filled equipment transported and disposed, recycled, or reprocessed to the COR upon completion and prior to submittal of final invoice.

SECTION 13.18--REMOVAL OF OIL-CONTAMINATED MATERIAL

1. GENERAL: Removing oil-contaminated material includes excavating, stockpiling, testing, transporting, cleaning, and disposing of these material. Personnel working with PCBs shall be trained in accordance with OSHA requirements. Submit employee training documentation records to the COR 14 days prior to the start of work.

2. CLEANUP WORK MANAGEMENT PLAN: Provide a Cleanup Work Management Plan that has been approved by applicable Federal, State, or Local environmental regulation agencies. Submit the plan to the COR for approval 14 days prior to the start of work. Approval of the plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations. The plan shall address on-site excavation of contaminated soil and debris and include the following:

   - Identification of contaminants and areas to be excavated
   - Method of excavation
   - Level of personnel/subcontractor training

- Safety and health provisions
- Sampling requirements including quality control, laboratory to be used
- Management of excavated soils and debris
- Disposal methods, including transportation to disposal

3. EXCAVATION AND CLEANUP: Comply with the requirements of Title 40, Part 761 of the U.S. Code of Federal Regulations (40 CFR 761).

4. TEMPORARY STOCKPILING: Excavated material, temporarily stockpiled on site, shall be stored on heavy plastic and covered to prevent wind and rain erosion at a location designated by the COR.

5. SAMPLING AND TESTING: Sample contaminated debris and areas of excavation to ensure that contamination is removed. Use personnel with experience in sampling and, in particular, with experience in PCB cleanup if PCBs are involved. Use analytical methods approved by EPA and applicable State regulations.

6. TRANSPORTION AND DISPOSAL OF CONTAMINATED MATERIAL: The Contractor shall be responsible and liable for the proper loading, transportation, and disposal of contaminated material according to Federal, State, and local requirements. Use only U.S. transporters and disposal sites approved by Western.

7. POST CLEANUP REPORT: Provide a Post-Cleanup Report that describes the cleanup of contaminated soils and debris. Submit the report to the COR upon completion and prior to submittal of final invoice. The report shall contain the following information:

   - Site map showing the areas cleaned
   - Description of the operations involved in excavating, storing, sampling, and testing, and disposal
   - Sampling and analysis results including 1) Name and address of the laboratory, 2) sample locations, 3) sample dates, 4) analysis dates, 5) contents of contaminant (e.g. PCB or total petroleum hydrocarbons) in parts per million (ppm)
   - Certification by the Contractor that the cleanup requirements were met
   - Copies of any manifests, bills of lading, and disposal certificates
   - Copies of correspondence with regulatory agencies that support completion of the cleanup

SECTION 13.19—CONSERVATION OF NATURAL RESOURCES

1. GENERAL: Federal law prohibits the taking of endangered, threatened, proposed or candidate wildlife and plants, and destruction or adverse modification of designated Critical Habitat. Federal law also prohibits the taking of birds protected by the Migratory Bird Treaty Act. "Take" means to pursue, hunt, shoot, wound, kill, trap, capture or collect a protected animal or any part thereof, or attempt to do any of those things.

2. KNOWN OCCURRENCE OF PROTECTED SPECIES OR HABITAT: Following issuance of the notice to proceed, and prior to the start of construction, Western will provide training to all contractor and subcontractor personnel involved in the construction activity. Untrained personnel shall not be allowed in the construction area. Western will provide two sets of plan and profile drawings showing sensitive areas located on or immediately adjacent to the transmission line right-of-way and/or facility. These areas shall be considered avoidance areas. Prior to any construction activity, the avoidance areas shall be marked on the ground in a manner approved by the COR. If access is absolutely necessary, the contractor shall first obtain permission from the COR, noting that a Western and/or other government or tribal agency biologist may be required to accompany personnel and equipment. Ground markings shall be maintained through the duration of the contract. Western will remove the markings during or following final inspection of the project.

3. UNKNOWN OCCURRENCE OF PROTECTED SPECIES OR HABITAT: If evidence of a protected species is found in the project area, the contractor shall immediately notify the COR and provide the location and nature of the findings. The contractor shall stop all activity in the vicinity of the protected species or habitat and not proceed until directed to do so by the COR.

4. CONTRACT ADJUSTMENTS: Where appropriate by reason of delays caused by a discovery, the Contracting Officer may make adjustments to contract requirements.

Appendix C

Draft Emergency Response Plan

TransCanada
In business to deliver

TransCanada Keystone, LP

Keystone Pipeline

Emergency Response Plan

(Oil Spill Response Plan)

24 Hour Emergency No.
1(XXX) XXX-XXXX

Manual No: _____

Assigned to: _____

OIL SPILL RESPONSE PLAN DESCRIPTION

The Oil Spill Response Plan as prescribed under 49CFR§194 is divided into the following two parts, which function as an integrated document:

Core Plan (Sections 1 through 8)

The Core Plan (Sections 1 through 8) contains general information outlining Company oil spill response procedures.

Response Zone Appendices (Sections 9 through 11)

The response zone appendices contain the Individual Oil Spill Response Plans for each zone which are to be followed in the event of an oil spill.

Prior to completing the Response Zone Appendices, Keystone will also review the National Contingency Plan (NCP) and each applicable Regional Integrated Contingency Plan (RICP), to ensure the Keystone Oil Spill Response Plan is consistent with the applicable Environmental Protection Agency RICP and the NCP.

OIL SPILL RESPONSE PLAN

Revision Record

The purpose of this Revision Record is to document receipt and insertion of all revisions to the Oil Spill Response Plan, as well as to provide a record that the manual contains the most current information.

After you receive each revision and have updated your manual, please date and sign in the space provided, corresponding to the appropriate revision number.

Section	Revision Number/Effective Date	Date Inserted	Signature

LIST OF ACRONYMS

API	American Petroleum Institute
CE	Cushing Extension
EOC	Emergency Operations Center
EMS	Emergency Management System
EPA	Environmental Protection Agency
ESM	Emergency Site Manager
FOSC	Federal On Scene Coordinator
GPS	Global Positioning System
HAZWOPER	Hazardous Waste Operations and Emergency Response Standard
ICS	Incident Command System
MP	Mile Post
NCP	National Contingency Plan
NFPA	National Fire Protection Association
OCC	Operations Control Center
OSRO	Oil Spill Response Organization
PHMSA	Pipeline and Hazardous Material Safety Administration
PREP	National Preparedness for Response Exercise Program
QI	Qualified Individual
RICP	Regional Integrated Contingency Plan
SCADA	Supervisory Control and Data Acquisition

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 CORE PLAN INFORMATION SUMMARY

The TransCanada Keystone, LP (hereafter referred to as Keystone) Core Plan (Sections 1 through 8) provides the base information utilized to develop the specific Oil Spill Response Plans. These Oil Spill Response Plans are to be followed in the event of a spill and are found in each Response Zone Appendix.

1.1 Operator Information

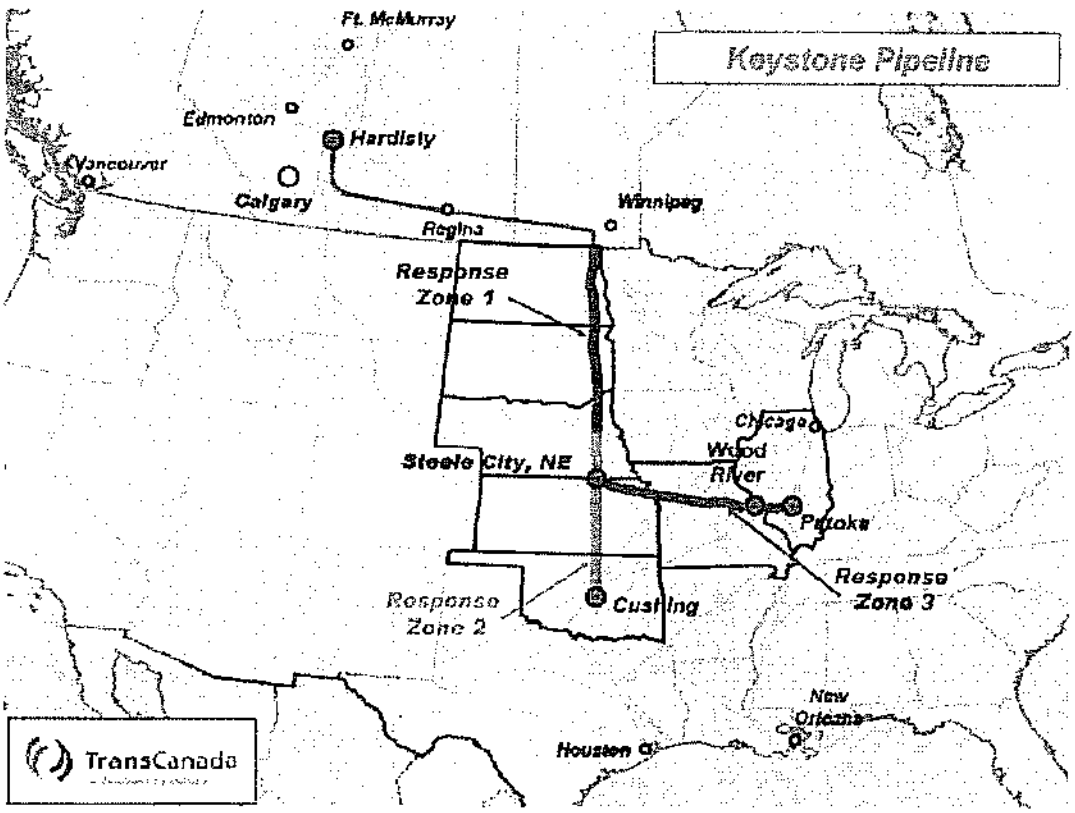
TransCanada Keystone, LP
450 – 1st Street S.W.
Calgary, Alberta, Canada T2P 5H1

1.1.1 Pipeline System Description

This document provides a preliminary Oil Spill Response Plan and outlines Keystone's processes and procedures established to comply with 49CFR§194. This plan will be updated upon completion of the detailed design of this project.

This Oil Spill Response Plan is intended to cover the U.S. segment of the pipeline system operated by Keystone. Three preliminary Response Zones have been established considering mileage and distribution of high consequence areas. Figure 1 provides a pipeline system map and illustrates the specific Response Zones.

Figure 1: Keystone Pipeline System and Oil Spill Response Zones.



The U.S. portion of the Keystone Pipeline consists of approximately 1,309 miles of 30-inch-diameter pipeline and 55 miles of 24-inch-diameter pipeline (located from Wood River to Patoka, Illinois). Crude oil receipts will initiate from an oil supply hub near Hardisty, Alberta, Canada for movement to delivery sites in Cushing, Oklahoma, as well as Wood River and Patoka, Illinois. For the purposes of developing this Oil Spill Response Plan and associated worst case discharge calculations, the maximum design capacity of 657,000 bpd will be utilized.

Primarily, crude oil transported by Keystone Pipeline will be derived from the Alberta oil sands region. The oil extracted from the sands is called bitumen. The bitumen is upgraded either through additional processing or by combining the bitumen with diluents. The upgraded product is then classified as synthetic crude oil. While the precise composition of synthetic crude will vary by shipper, and is considered proprietary information, Keystone expects to transport crude oils in the range of 12 to 45° API (American Petroleum Institute).

The Keystone Pipeline is controlled from the Operations Control Center (OCC), located in Calgary, Alberta, Canada. The OCC is staffed 24 hours per day 7 days a week, and utilizes a computer based Supervisory Control and Data Acquisition (SCADA) System to continuously monitor and control pipeline operations.

Keystone's 24 hour emergency contact phone number is 1 (XXX) XXX-XXXX and is posted on all pipeline marker posts and facility signs.

1.2 MSDS Information

This section will provide MSDS information on the slate of crude oils transported by Keystone.

1.3 Response Zone Summaries

For this preliminary Oil Spill Response Plan, the pipeline system has been segmented into 3 Response Zones. The specific Oil Spill Response Plans and information for each Response Zone is provided in the Appendices.

Changes to both the number and location of Response Zones are anticipated as the design is further developed and refined. For the purposes of this document Response Zones are defined as follows:

1.3.1 Response Zone One – North Dakota, South Dakota, Nebraska (part)

Milepost (MP) = 0 at U.S./Canadian Border to MP = 535

North Dakota (MP 0 to ≈ MP 215)

Counties:

Pembina, Cavalier, Walsh, Nelson, Steele, Barnes, Ransom, and Sargent

South Dakota (MP 215 to ≈ MP 431)

Counties:

Marshall, Day, Clark, Beadle, Kingsbury, Miner, Hanson, McCook, Hutchinson, and Yankton

Nebraska (MP 431 to ≈ MP 535)

Counties:

Cedar, Wayne, Stanton, Platte, Colfax

Table 1: Preliminary High Consequence Areas – Zone One

Each entry in the table below represents a unique location.

	Miles (Approximate)		
State	**Population**	**Drinking Water**	**Sensitive Areas**
North Dakota	0	6.96	2.03
South Dakota	0	1.96 5.87	9.36 5.95 7.15
Nebraska	0	5.38	6.19 0.99
TOTAL	**0**	**20.17**	**31.67**

1.3.2 Response Zone Two – Nebraska (part), Kansas, Oklahoma

Milepost (MP) = MP 535 to MP 634 and Cushing Extension (CE), CE MP 0 to CE MP 291

Nebraska (MP 535 to ≈ MP 634, CE MP 0 to ≈ CE MP 4)
Counties:
Butler, Seward, Saline and Jefferson

Kansas (CE MP 4 to ≈ CE MP 212)

Counties:

Washington, Clay, Dickinson, Marion, Butler, and Cowley

Oklahoma (CE MP 212 to ≈ CE MP 291)

Counties:

Kay, Noble, and Payne

Table 2: Preliminary High Consequence Areas – Zone Two

Each entry in the table below represents a unique location.

	Miles (Approximate)		
State	**Population**	**Drinking Water**	**Sensitive Areas**
Nebraska	0	0.70	2.13
Kansas	0	4.14 7.89 9.73 15.52 8.06	23.16 9.12 15.41
Oklahoma	0	9.11 9.17	7.71
TOTAL	**0**	**64.32**	**57.53**

1.3.3 Response Zone Three – Nebraska (part), Kansas, Missouri, Illinois

Milepost (MP) = MP 634 to MP 1073

Nebraska (MP 634 to ≈ MP 649)
Counties:
Jefferson, Gage

Kansas (MP 649 to ≈ MP 743)
Counties:

Marshall, Nemaha, Brown, and Doniphan

Missouri (MP 743 to ≈ MP 1016)

Counties:

Buchanan, Clinton, Caldwell, Carroll, Charlton, Randolph, Audrain, Montgomery, Lincoln, and St. Charles

Illinois (MP 1016 to ≈ MP 1073)

Counties:

Madison, Bond, Fayette, and Marion

Table 3: Preliminary High Consequence Areas – Zone Three

Each entry in the table below represents a unique location.

	Miles (Approximate)		
State	**Population**	**Drinking Water**	**Sensitive Areas**
Nebraska	0	1.86	0
Kansas	0	3.49	12.59
		4.91	5.68
Missouri	0	4.82	5.76
		12.01	12.08
			9.31
			7.38
			24.48
Illinois	0.64	1.08	5.22
	3.24	6.79	2.09
		3.10	
		5.67	
TOTAL	**3.88**	**43.73**	**84.59**

1.4 Certification

Pending completion of the final engineering design, Keystone will certify that it has obtained, through contract or other means, the necessary personnel and equipment to respond to the maximum extent practical, to the worst case discharge, or to the substantial threat of such a discharge.

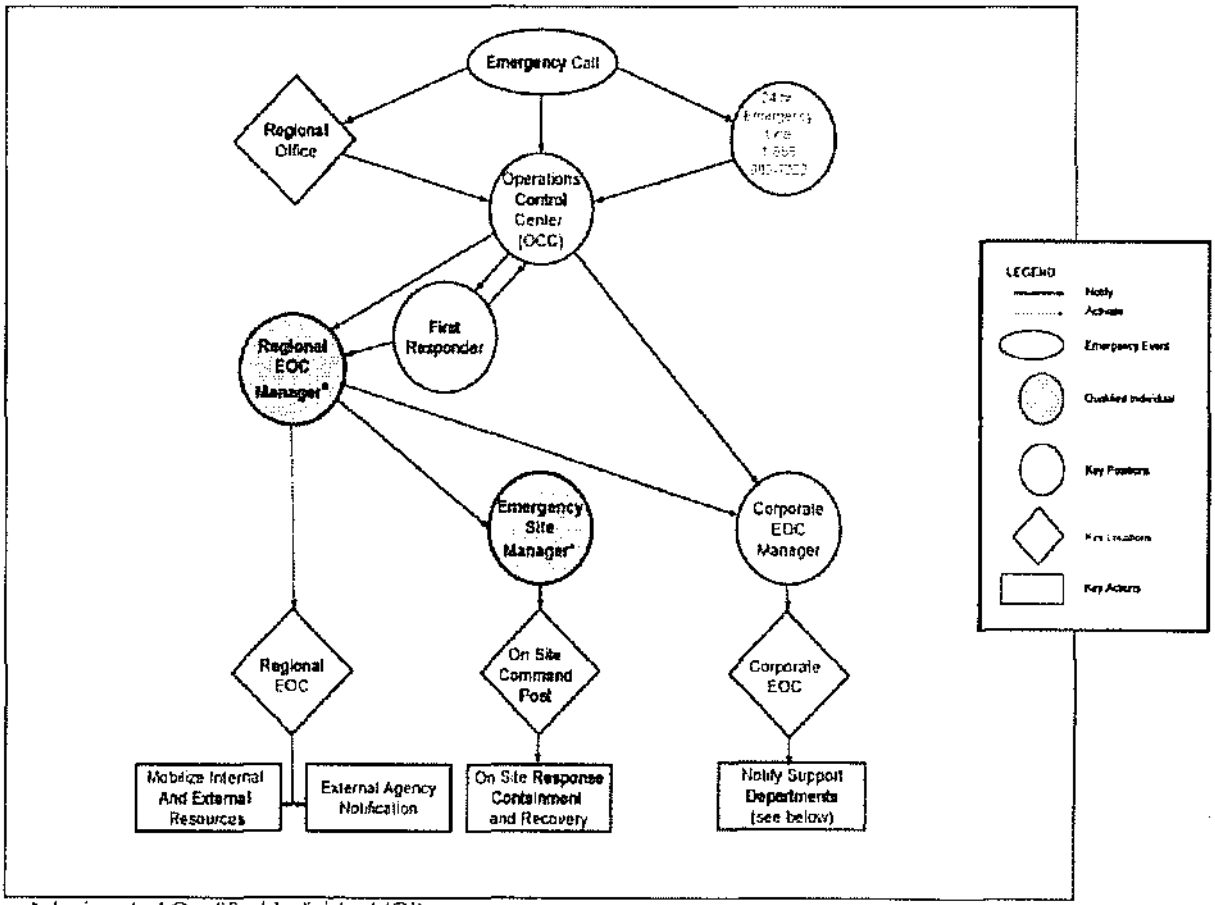
2.0 NOTIFICATION PROCEDURES

2.1 Notification Requirements

Figure 2 outlines the notification process for reporting and evaluating a potential oil spill, as well as activation of the Oil Spill Response Plan.

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

Figure 2: Basic Oil Spill Response Initial Notification Process



* designated Qualified Individual (QI)
EOC = Emergency Operation Center
Corporate EOC Support Departments (from above) include but are not limited to:

- Asset Protection
- Communications
- Land, Community and Aboriginal Relations
- Health Safety and Environment
- Legal
- Regulatory Compliance
- Corporate Security
- Customer Services
- Operations Control Center
- Asset Reliability
- Insurance and Risk Management
- Facility Services and Real Estate
- Information Systems
- Human Resources
- Administration Support

2.2 Prioritized Notification Checklist for Key Individuals

2.2.1 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

2.2.2 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

2.2.3 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

2.3 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.

2.3.1 Keystone

Table 4: 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		

2.3.2 Agency

Table 5: 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		

2.3.3 Emergency Services

Table 6: Emergency Services Notification

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

2.4 Procedures for Notifying Qualified Individuals

In the event of a suspected leak, the OCC activates the communications process and contacts the Regional EOC Manager (QI), as illustrated in Figure 2: Basic Oil Spill Response Initial Notification Process, Page 6. Qualified individuals are available on call 24/7 and on call list are maintained by the OCC. The Regional EOC Manager (QI) is responsible for activating the Oil Spill Response Plan and contacting the Emergency Site Manager (QI).

The Regional EOC Manager (QI) will be contacted primarily on a land line phone (home or office) or by cellular telephone backup. In the event that land and cellular communication are not functional, satellite phones are available. All on call Regional EOC Managers and Emergency Site Managers are equipped with cellular telephones.

2.5 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: _____

3.0 SPILL DETECTION AND ON-SCENE SPILL MITIGATION PROCEDURES

3.1 Methods of Initial Discharge Detection

The following outlines the concepts and philosophies currently under consideration at this preliminary stage in the design of the Keystone Pipeline. Upon completion of the required design details, this section of the document will be revised and updated accordingly.

Keystone will utilize a comprehensive SCADA system to monitor and control the pipeline. Data provided by the SCADA system may alert the OCC operator to an abnormal operating condition which may signify a possible spill or leak. A back-up communication system will also be available should SCADA communications fail between field locations and the OCC.

In addition, Keystone will utilize a dedicated Leak Detection System to alert the OCC operator of a potential leak or spill.

The SCADA system will continuously monitor pipeline conditions and update information provided to the OCC operator. Data received via the SCADA system will also be directed to the dedicated Leak Detection System, capable of independently alarming to the OCC operator.

Standard operating and response procedures will be utilized by OCC operator in responding to abnormal pipeline conditions including leak alarms. The OCC operator will have the full and complete authority to execute a pipeline shutdown.

Notification of a possible initial pipeline release may be received by the OCC operator as follows:

1. Employee reported
2. Abnormal pipeline condition observed by OCC operator
3. Leak Detection System alarm
4. Third party reported

Upon receipt of notification as outlined above, the OCC operator will execute the following procedures:

1. Follow prescribed OCC operating and response procedures for specific directions on abnormal pipeline condition or alarm response
2. Dispatch First Responder
3. Shutdown pipeline within a predetermined time threshold if abnormal conditions or leak alarm can not be positively ruled out as a leak
4. Complete internal notifications as outlined in Figure 2: Basic Oil Spill Response Initial Notification Process, page 6.

3.2 On Scene Spill Mitigation and Recovery Procedures

This section of the document provides a listing of response strategies and techniques currently contemplated for use on the Keystone pipeline system. Those selected will be fully developed within the final Oil Spill Response Plan.

Keystone recognizes that certain River crossings along the pipeline route are considered high volume areas and will ensure the final Oil Spill Plan delivers the resources to respond to a potential release, in a more rapid fashion as required.

3.2.1 Spills on Water

- Small Creeks, Ponds and Bogs
- Large Rivers and Floodplains
- Large Lakes
- Beach Berming
- Beach Sumps
- Boom Techniques
- Calm Water Containment Booms
- Flowing Water Containment Booms
- Open Water Containment Booms
- Marine Diversion Booming
- Exclusion Booms
- Cascading Booms Calm
- Skimmers
- Rotating Discs
- Weir Devices
- Dam Techniques
- Blocking Dams
- Flowing Water Dams
- Sorbent Booms and Barriers
- Spills on Ice
- Spills under Ice

- Spill during Freeze-up or Break-up

3.2.2 Spills on Land

- Open Land and Forests
- Streets and Highways
- Earth Containment Berms
- Street Containment
- Culvert Blocking
- Storm Drain Blocking
- Interception Barriers
- Heavy Equipment
- Suction Devices
- Rotating Discs
- Spills on Sensitive Areas

3.2.3 Spills in Sensitive Areas

- Historical or Archaeological Sites
- Natural Areas
- National, State and Local Parks
- Protected Waterways
- Recreational Sites
- Water Supply Intakes
- Wetlands
- Wildlife Refuges

3.3 Equipment for Response Activities

See Section 5.4 for a listing of equipment for response activities.

3.4 Personnel for Response Activities

See Section 5.4 for a listing of personnel for response activities

3.5 Oil Transportation and Reclamation Facilities and Services

See Section 5.4 for a listing of oil transportation and reclamation facilities and services.

4.0 RESPONSE ACTIVITIES

4.1 Oil Spill Initial Response

All Keystone employees are authorized to communicate directly with the OCC should they observe conditions that may signify a possible spill (see Figure 2: Basic Oil Spill Response Initial Notification Process, page 6).

OCC operators have the full and complete authority to shutdown the pipeline and proceed with pipeline segment isolation in the area of the leak. The OCC can designate any qualified Keystone field employee as a First Responder in order to mitigate the early impacts of the spill. The First Responder is required to immediately respond and investigate the suspected location.

The First Responder serves as the Emergency Site Manager until relieved of this task by the assigned Emergency Site Manager (QI).

4.2 Oil Spill Response Organization, Responsibilities, Roles and Authority

The Organizational Chart for the Keystone Oil Spill Response Team is presented in Figure 3: Keystone Oil Spill Response Team Organization Chart, Page 15. The Emergency Site Manager (QI) in conjunction with the Regional EOC Manager (QI) is responsible for creating an oil spill response organization to effectively manage the incident. Role assignments for the Regional EOC and the Command Post represent the specific functional areas that the Emergency Site Manager (QI) and Regional EOC Manager (QI) determine are necessary to address a specific spill.

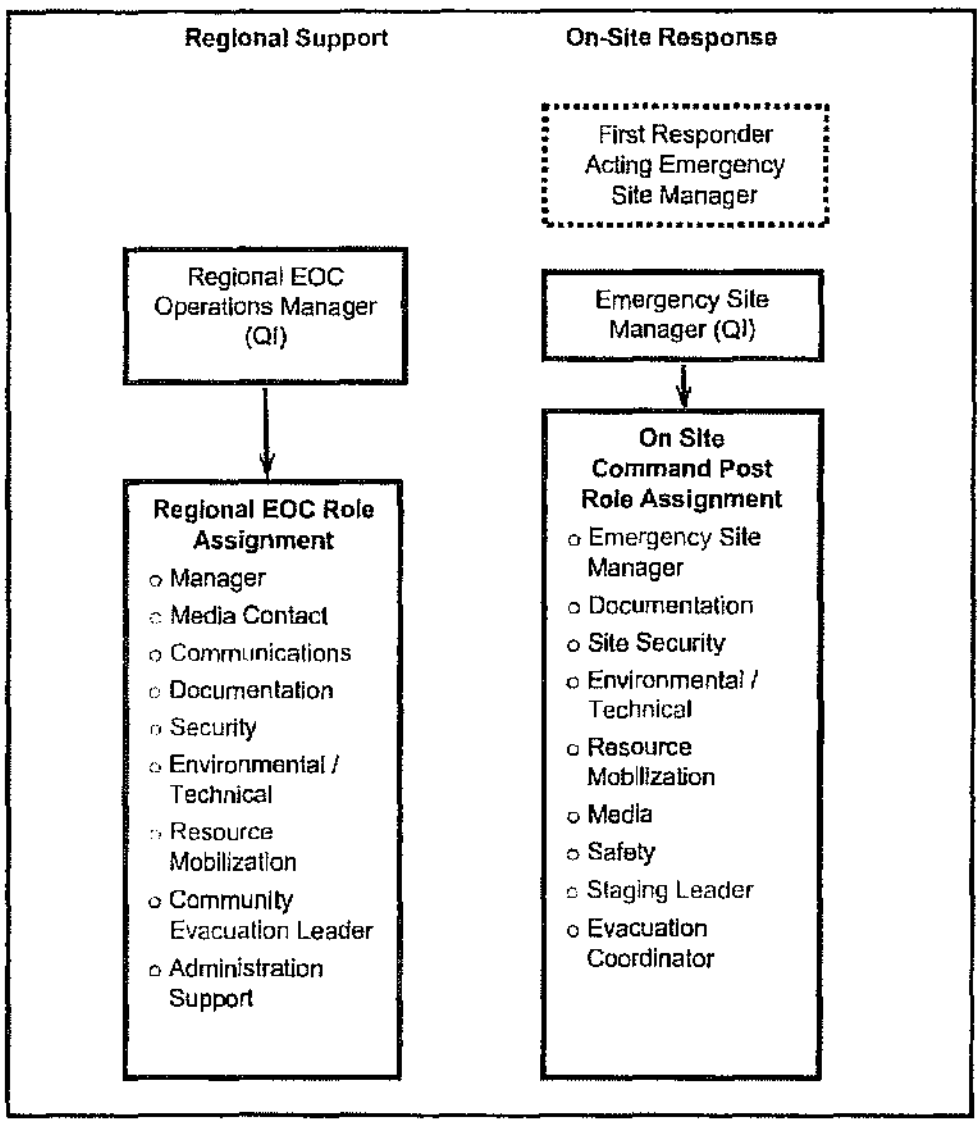
Procedures are established within Keystone outlining regular signing and financial authority limits. It is recognized that these standard authorities may not apply in an emergency due to the requirement to immediately contain and control the emergency situation.

Keystone has established the following policy related to Financial Authority in an emergency:

The Emergency Site Manager (QI) or Region EOC Manager (QI) has financial authority to obtain any and all resources necessary to contain and control the emergency situation.

Receipts, bills and invoices must be obtained for all supplies, services, equipment and contractors engaged as a result of the emergency, and submitted to the Emergency Site Manager (QI) or designated individual for cost management.

Figure 3: Keystone Oil Spill Response Team Organization Chart



4.2.1 First Responder

Responsibilities of the First Responder in priority include:

- Not putting yourself at risk
- Provide confirmation of emergency event and ensure pipeline isolation with the OCC
- Request emergency response personnel at the scene and advise the local authorities of a possible need for evacuation, as required
- Rescue if safe to do so
- Evacuate immediate area if necessary to preserve life and health
- Attempt to notify people at risk without entering the hazard area
- Secure the area and establish a perimeter at a safe distance

- Act as the Emergency Site Manager until relieved by the assigned Emergency Site Manager (QI)
- Work cooperatively with emergency response personnel and municipal authorities at the scene
- Instruct people not to touch or move anything
- Do Not disturb the scene except to preserve life or prevent injury

4.2.2 Regional EOC Manager (QI)

Following notification from the Operations Control Center of a possible oil spill, the Regional EOC Manager (QI) gathers information to assess the incident and is responsible for activation of the Oil Spill Response Plan.

The Regional EOC Manager (QI) determines the amount of resources required to address the emergency within the Regional EOC. Not all roles will be activated, or others may be added, in any given spill event. Furthermore, one person may take on several roles, and conversely one role may take several people.

The Regional EOC Manager (QI) contacts the Operations Control Center (OCC) to ensure that the Corporate EOC has been established. Specific responsibilities of the Regional EOC Manager (QI) in priority include, but are not limited to:

- Activate the Oil Spill Response Plan
- Establish and maintain contact with the Emergency Site Manager (ESM)
- Ensure all Regulatory notifications have been made
- Provide support as requested to the Command Post
- Document all actions using the Emergency Incident Log
- Establish contact with the Corporate EOC and communicate updates
- Remain advised of repair and restoration, accident and incident investigations, and other activities on site
- Assume financial authority to contain and control the emergency
- Ensure work order and other processes are established to track financial commitments

4.2.3 Regional EOC Roles

Regional EOC Communications

The Regional EOC Communications Role may make regulatory notifications if requested by the Regional EOC Manager (QI) and responds to requests for information. Notifications must be assigned a high priority. Specific responsibilities include but are not limited to:

- Document all actions using the Emergency Incident Log
- Have available all required contact lists for the specific incident in progress
- Assemble confirmed facts about the incident although it may not be possible to answer all the following questions:

  - Name of Pipeline:
  - Time of Discharge:
  - Location of Discharge:
  - 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 Consequences:

- Assemble information on relevant products
- Local municipal authorities must be advised immediately of any Keystone emergency in their area if:

  - A landowner or community is being evacuated (notifications must also be made to the evacuating community and receiving community)
  - Local services such as power, water or gas supply is disrupted as a result of the emergency
  - Media attention is occurring or likely to occur
  - When there is a 3rd party injury or death
  - Members of the community called to report incident or incident is visible to the community

- Log any requests for information and follow-up

Regional EOC Security

The Regional EOC Security priorities at the EOC are to prevent unauthorized entry into the center, to facilitate any requests from the Command Post including requests to obtain contract security forces in a timely manner and to liaison with law enforcement agencies. Specific responsibilities include but are not limited to:

- Document all actions taken using the Emergency Incident Log
- Prevent unauthorized entry
- Ensure you identify yourself as Keystone's EOC Security to any Emergency Services or municipal emergency personnel attending the EOC
- Staff the entrance door to the EOC at all times
- Provide those working in the EOC with identification cards (e.g., clipped to their shirts / chains around neck) to identify them as being a part of the Regional EOC response
- Refer all media inquiries to Media Relations
- Verify the identity of everyone entering the EOC and record those persons on the Visitor Log
- Maintain a list of authorized personnel attending the emergency site
- Notify the Security person at the Emergency Site of all persons authorized to attend the site

Regional EOC Resource Mobilization

The Regional Mobilization Role coordinates the movement to the site of equipment and materials, assembles and activates the relevant Mutual Aid agreements. Specific responsibilities include but are not limited to:

- Document all actions using the Emergency Incident Log
- Assemble and activate any relevant Mutual Aid agreements
- Coordinate the movement of personnel, material and equipment to site with the Resources contact at site
- Advise the Resources contact at site of any changes in resource availability or scheduled arrival
- Advise suppliers of any changes in the requirement for particular resources, or changes to the schedule of arrival at site

- Track hours worked by personnel at the EOC and at the site
- Advise the Regional EOC Manager (QI) of anticipated needs for relief personnel, etc.
- Setup work order structure to collect costs and prepare reports

Regional EOC Environmental / Technical

The Regional EOC Environmental / Technical role is to provide support and technical expertise to personnel at site. Specific responsibilities include but are not limited to:

- Document all actions using the Emergency Incident Log
- Provide specific technical expertise such as environmental, water management etc., depending on the nature of the emergency, to contain and control hazards
- Provide support to Environmental / Technical personnel at site
- Coordinate with Resources personnel in the EOC, identifying and mobilizing environmental resources to the site and other technical support as required
- Coordinate work with the Operations Control Center

Regional EOC Media Contact

The Regional EOC Media Contact responds to any media located at EOC and provides support to Media Contact working at the Command Post. Corporate Media Training is required for this position. Specific responsibilities include but are not limited to:

- Document all actions using the Media Contact Log and forward completed logs to documentation personnel in the EOC
- Document all requests for additional information on the Media Contact Log and forward to Corporate Communications
- Advise the media that Communications will respond as soon as possible to their inquiries
- Log all phone and personal contacts with media using Media Contact Log and provide to Corporate Communications
- Serve as media contact until advised of a Corporate Communications or Community Representative name and contact number off-site to which all media inquiries can be directed
- Ensure all telephone media inquiries go to Corporate Communications
- Maintain contact with Command Post Media Contact for regular factual updates, if no corporate media relations representative is in place
- Ensure Media representatives are not allowed into the EOC
- Provide factual updates to Media representatives, only when a corporate media relations representative is not in place

Regional EOC Documentation

The Regional EOC Documentation role consolidates information for electronic distribution, gathers and files all paper documentation. Specific responsibilities include but are not limited to:

- Prepare status reports for distribution on an electronic medium using information provided from EOC personnel logs
- Edit and consolidate the log information using the following general guidelines:
  - Major events and responses
  - Summary of actions taken by personnel
  - What is happening?
  - Who is involved?
  - Are there injuries?

- Is the public at risk?
- Where is the emergency?
- What is the magnitude of the situation?
- What has been done, so far?
- Obtain approval for status report from the Regional EOC Manager (QI) before sending

- Ensure all written instructions, logs, reports, telephone logs and related documentation are recorded and filed

Regional EOC Community Evacuation Leader

The Regional EOC Community Evacuation Leader coordinates and implements any resident notifications for evacuations. Specific responsibilities include but are not limited to:

- Document all conversations and activities using the Emergency Incident Log
- Determine whether residents should be initially alerted or evacuated (in consultation with the Regional EOC Manager (QI) and local Emergency Services
- Have available information on municipal evacuation centers and evacuee care should evacuation seem likely
- For evacuations:

  - Determine the priority for contacting the public taking into account the incident, the potential for the situation to deteriorate, weather conditions and potential sensitivities of neighbors
  - Determine best method of contacting the public (phone, personal visits or through municipal authority)
  - After contacting the public, initiate and coordinate the ongoing communications with neighbors and the public outside of the emergency awareness zone who may have been impacted by the incident

Regional EOC Administrative Support

The Regional EOC Administrative Support person provides general support to all Regional EOC personnel. Specific responsibilities include but are not limited to:

- Document all actions using the Emergency Incident Log
- Support all EOC personnel as required
- Record time, date and name of each person notified on the Emergency Incident Log
- Word-processing
- Telephones, faxing, etc
- Assist with gathering and distributing information

4.2.4 Emergency Site Manager (QI)

The Emergency Site Manager (QI) coordinates and manages all aspects of emergency operations including site security, site access, containment, control point selection, recovery and clean-up operations.

The Emergency Site Manager (QI) in conjunction with the Regional EOC Manager (QI) determines the amount of resources within the Command Post. Not all roles will be activated, or others may be added, in any given spill. Furthermore, one person may take on several roles, and conversely one role may take several people.

Specific responsibilities in priority include but are not limited to:

- Establish emergency organization (command post), assign and brief personnel on key tasks
- Ensure that all parties can clearly identify the Keystone Emergency Site Manager (QI)
- Assign the Documentation Role and determine what other roles are required
- Maintain primary contact with the Federal On Scene Coordinator (FOSC)
- Conduct an Emergency Incident Assessment, based on the information available about the incident, and identify priority issues and objectives
- Determine manpower and equipment resources required, based on the nature of the spill
- Notify and maintain contact with local emergency response agencies (e.g., police, fire, ambulance, government, etc.) and citizens or landowners immediately affected by incident
- Notify Regional EOC Manager (QI) regarding incident status and maintain contact, as required, throughout incident
- Assume duties and responsibilities related to the incident which have not been assigned to other emergency personnel
- Ensure documentation is kept related to incident costs, product recovery and a log of incident activities
- Anticipate potential changes to the incident, and identify any additional resources required (e.g., additional equipment or supplies, relief or back-up personnel, lighting for night operations, etc.)
- Work in conjunction with emergency response personnel and municipal authorities at the scene
- Determine when the emergency is over in consultation with the Corporate EOC Manager and the Regional EOC Manager (QI)

4.2.5 Command Post

Site Security

Security is responsible to secure the scene, preserve evidence, and prevent theft.

Site security should be established and routes into the site should be sealed to prevent unauthorized access, and protect the safety of the public. Site security personnel may be Company personnel, hired contractors or local police authorities who assist in the incident. Specific responsibilities include but are not limited to:

- Document all actions using the Emergency Incident Log
- Maintain and monitor a security perimeter established around the site
- Ensure the protection of equipment or supplies stored at the site
- Preserve and protect evidence related to the incident for investigation and follow-up
- Check-in of authorized personnel coming into the site
- Convey necessary information to authorized personnel entering the site
- Post signs, warnings or barricades on-site
- Supervise the contract security personnel
- Identify yourself as Keystone's Site Security to any Fire, Police, or Ambulance personnel at the scene
- Refer all media inquiries to the Media Contact person
- Staff the entry point at all times with a minimum of two people
- Record all personnel entering the emergency site using Visitor Log
- Restrict entry to the site to authorized persons only

- Once the perimeter is secure preserve any items (evidence) which you feel may be used in investigations of the emergency
- Photograph the area where any items are located prior to moving if area must be disturbed
- Prevent unauthorized persons from examining or photographing evidence items
- Cover the evidence items with plastic, tarps, cardboard, plywood, etc. to prevent damage if weather is inclement

Resource Mobilization

The Resource Mobilization person determines requirements for personnel, equipment and materials. This position also records hours worked by personnel on site and provides this information to the Regional EOC Resources contact as well as the Emergency Site Manager (QI). Specific responsibilities include but are not limited to:

- Document all actions using the Emergency Incident Log
- Serve as the "single window" contact at the site for all personnel requiring resources (e.g., safety equipment, technical supplies)
- Advise the Emergency Site Manager (QI) immediately of any cancellations or schedule changes
- Advise the Resources contact in the Regional EOC of any changes in the need for resources, or in the mobilization schedule

Staging Leader

The Staging Leader locates a suitable staging area, upwind from the emergency site and ensures the orderly deployment of equipment to the site. Specific responsibilities include but are not limited to:

- Document all actions using the Emergency Incident Log
- Document all resources entering or leaving staging area using the Emergency Incident Log
- Direct resources to proper locations
- Work closely with the Regional EOC Resources contact to ensure accurate information about the type, quantity, and arrival times of resources to the staging area
- Communicate to the Regional EOC Resources contact any difficulties, delays, etc. in supplying resources to the scene from the Staging Area

Environmental / Technical

The Environmental / Technical Roles work with the Regional EOC Environmental / Technical persons and provide technical expertise needed to contain and control hazards. This will require various areas of expertise depending on the type of emergency event being managed. Specific responsibilities include but are not limited to:

- Document all actions using the Emergency Incident Log
- Provide specific technical expertise such as environmental, water management etc., depending on the nature of the emergency, to contain and control hazards
- Conduct an environmental assessment to identify potential environmental issues or concerns, through review of environmental sensitivity information, site reconnaissance, and liaison with government officials
- Identify short term and long term environmental issues and recommend appropriate environmental procedures to the Emergency Site Manager (QI) for minimizing or mitigating environmental impacts at the site
- Coordinate environmental sampling, protection and clean-up efforts

- Advise Keystone personnel and contractors on environmental concerns or constraints related to site activities
- Coordinate post emergency site assessment and development of a site specific remediation plan
- Evaluate technical resources requirements and advise Resource Role of requirements

Safety

The Safety Role ensures safety of personnel, and use of safe practices on site. Specific responsibilities include but are not limited to:

- Document all actions using the Emergency Incident Log
- Ensure the site is initially inspected and monitored to ensure it is safe for workers, based on the product hazards involved and site conditions
- Monitor the safety of personnel at the emergency site by ensuring safe work practices are being followed and safety precautions are being taken
- Prepare and implement the site safety/evacuation plan for the site
- Identify the nearest medical facilities and transport method
- Ensure all personnel receive a site safety orientation identifying hazards and control measures including a product hazard briefing, prior to undertaking any emergency response activity
- Ensure all new contractors (i.e., contractors who have not worked for the company before, and are unfamiliar with company safety procedures), have completed the Contractor Safety Orientation and have a valid confirmation card
- Ensure proper safety equipment is available for workers and is used in a proper manner
- Ensure site monitoring is continued on a regular basis
- Ensure safety precautions are in place to protect the public
- Evaluate site safety operations on a continuous basis, and report concerns or recommendations to the Emergency Site Manager (QI)

Media Contact

The Media Contact responds to various media questions and ensures the safety of all media personnel. Completion of Media training is a requirement of this position. Specific responsibilities include but are not limited to:

- Document all actions using the Emergency Incident Log
- Gather media personnel in a single location at a safe, reasonable distance from the emergency site
- Work with the media until Keystone's media specialist arrives
- Maintain contact with Communications in the Corporate EOC to determine what is to be released to media
- Maintain a list of all media personnel on site using Media Contact Log
- Log all questions and requests for information from media using the Media Contact Log
- Maintain contact with Media Contact in the Regional Emergency Operations Center and provide regular factual updates
- Clear all requests for photo opportunities through the Emergency Site Manager (QI)

Documentation

The Documentation person works directly with the Emergency Site Manager (QI) and documents all activities on site. Specific responsibilities include but are not limited to:

- Document all actions of the Emergency Site Manager (QI), using the Emergency Incident Log
- Provide direct support to the Emergency Site Manager (QI)
- Log and handle all communications for the Emergency Site Manager (QI), as requested

Community Evacuation Coordinator

The Community Evacuation Coordinator works with the Regional EOC Community Evacuation Leader and the local authorities with evacuation at or near the emergency site. Specific responsibilities include but are not limited to:

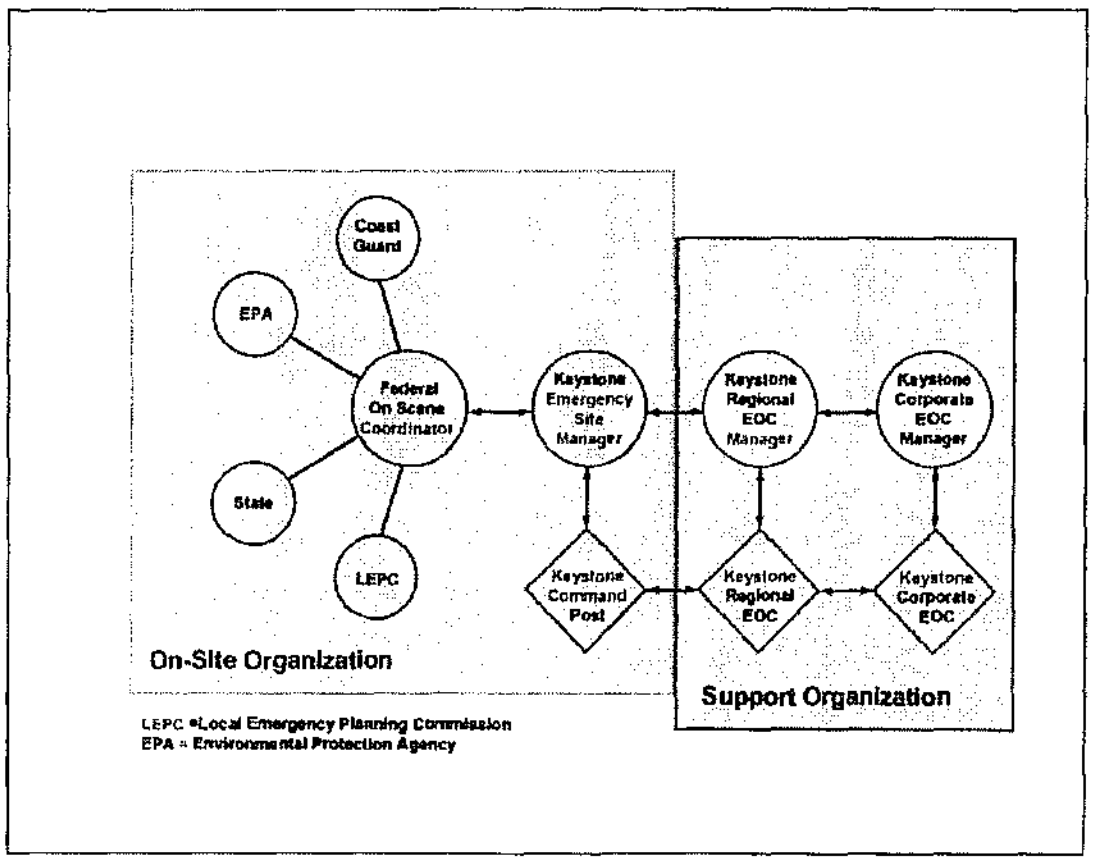
- Document all actions using the Emergency Incident Log
- Keep the Evacuation Leader at the Regional EOC informed of the evacuation center status and issues
- Work with local authorities who are managing the evacuation and evacuation center(s)
- Obtain a record of the evacuees' arrival at the designated evacuation center
- Keep the Regional EOC Evacuation Leader briefed on the status of the arrival of evacuees at the center
- In conjunction with Community Relations, provide information to the evacuees on the status of the incident
- Ensure there is a record kept of temporary destinations when evacuees leave the center
- Do not put yourself at risk

4.3 Federal On-Scene Coordinator Coordination Process

The Emergency Site Manager (QI) is the primary contact for the Federal On Scene Coordinator (FOSC). The FOSC is the lead agency and is responsible for monitoring and directing activities related to the spill.

A flow diagram outlining the action and communication paths under a Unified Command structure to be utilized in oil spill response is shown in Figure 4.

Figure 4: Basic Unified Command Structure



5.0 LIST OF 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, State and Local requirements and contacts along with contract resources and contacts have been determined.

5.1 Qualified Individuals for Each Response Zone

Table 7: Contact Information for Qualified Individuals

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

5.2 Agency Contacts

Table 8: Agency Contacts

Agency/Company	Contact	Telephone Numbers
Federal		
National Response Center		800-424-8802
State		
Local		

5.3 Corporate Financial Contact for each Response Zone

Table 9: Corporate Financial (Insurance)

Name	Company	Telephone Numbers

5.4 Oil Spill Response Organizations and Contractors, Services and Resources

Table 10: 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:			

5.5 Oil Transportation and Reclamation Facilities and Services

Table 11: Oil Transportation and Reclamation Facilities

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

6.0 TRAINING PROCEDURES

The requirements listed identify specialized training for individuals prior to taking on responsibilities under the Oil Spill Response Plan.

6.1 On Site Personnel

Table 12: Training Requirements – On Site Personnel

Position	Specialized Training to Meet Oil Spill Response Duties
First Responders	o HAZWOPER Training to Hazmat Technician Level 3 with annual refresher as required o Keystone Emergency Management System (EMS) training o National Fire Protection Association (NFPA) training
Emergency Site Manager – Qualified Individual	o HAZWOPER Training to Hazmat Level 4 Specialist with annual refresher as required o Incident Command System (ICS) Communication training o Keystone Emergency Management System (EMS) training o National Fire Protection Association (NFPA) training
Command Post Media	o Keystone Emergency Management System (EMS) training o Keystone Media Relations training
Command Post Safety	o Keystone Emergency Management System (EMS) training o Advanced safety related training
Command Post Documentation	o Keystone Emergency Management System (EMS) training
Command Post Site Security	
Command Post Resource Mobilization	
Command Post Technical	
Command Post Staging Leader	
Command Post Evacuation Coordinator	

6.2 Regional EOC

Table 13: Training Requirements - Regional EOC

Position	Specialized Training to Meet Oil Spill Response Duties
Regional EOC Manager – Qualified Individual	o HAZWOPER Training to the Level of Hazardous Materials Specialist with annual refresher as required o Incident Command System (ICS) training o Keystone Emergency Management System (EMS) training
Regional EOC Media Contact	o Keystone Emergency Management System (EMS) training o Keystone Media Relations training
Regional EOC Communications	o Keystone Emergency Management System (EMS) training
Regional EOC Documentation	
Regional EOC Security	
Regional EOC Technical	
Regional EOC Resource Mobilization	
Regional EOC Community Evacuation Leader	
Regional EOC Administration Support	

6.3 Training Records

Keystone will utilize an electronic system to track and maintain records of training, including refresher training, for all employees. The system will be located at Keystone's head office.

Contractors are responsible for maintaining all training records for their employees. Periodic audits will be conducted by Keystone, to ensure contractors training records comply with emergency training requirements. Audit documentation will be retained in Keystone's files.