CONFIDENTIAL

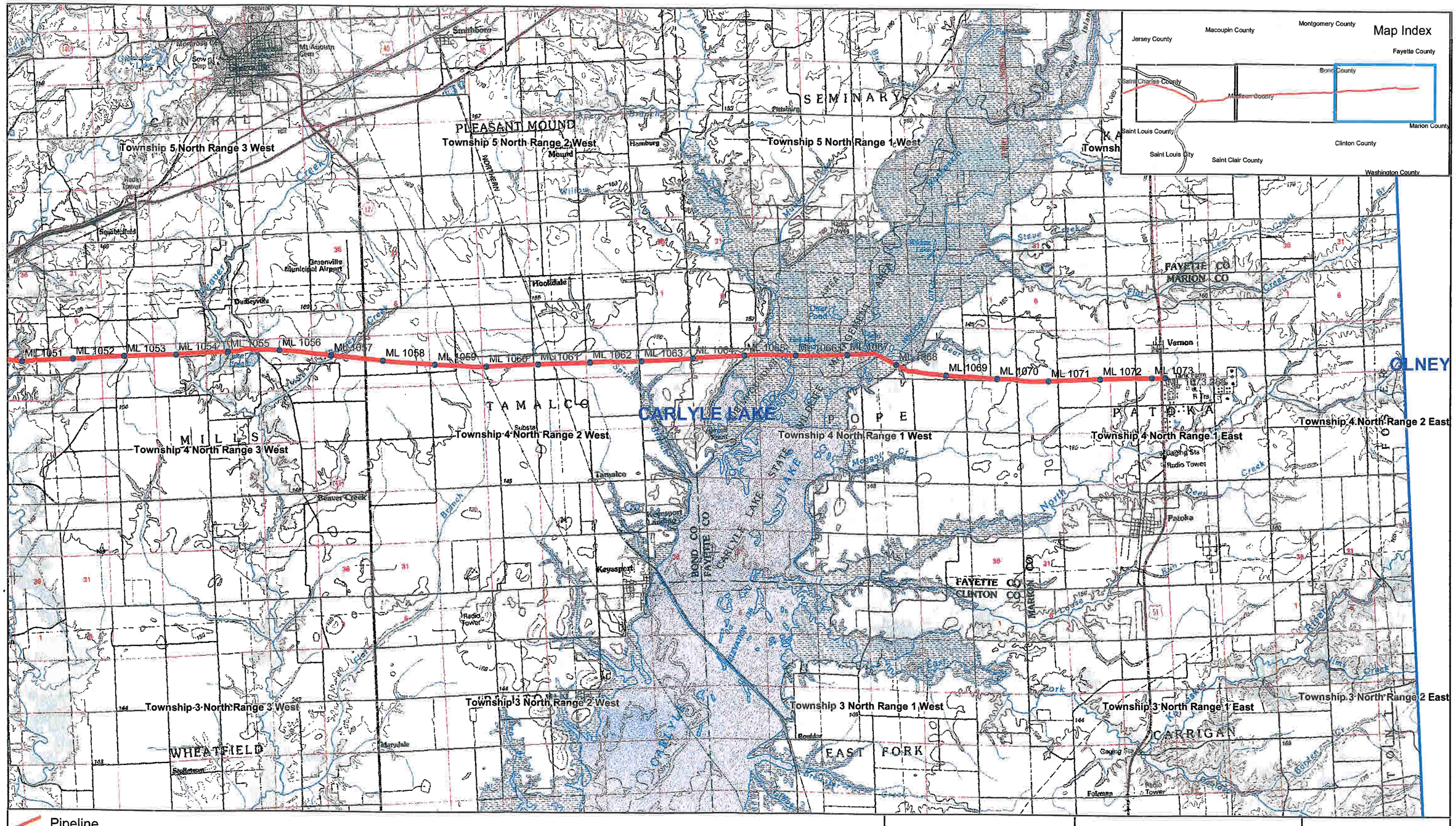


Table 1 Waterbodies Potentially Crossed by the Proposed Keystone Pipeline Project in Missouri and Illinois

State / County	Approximate Milepost	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification
MISSOURI				
Doniphan, KS/Buchanan, MO	743.4	Missouri River	Artificial Path	Irrigation Use; Livestock and Wildlife g; Protection of Warm Water Aquatic Life and Human Health-Fish Consumption; Whole Body Contact Recreation; Secondary Contact Recreation; Drinking Water Supply; Industrial Process and Industrial Cooling Water
Buchanan	749.01	Contrary Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of Warm Water Aquatic Life and Human Health-Fish Consumption; Whole Body Contact Recreation
Buchanan	752.02	Pigeon Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of Warm Water Aquatic Life and Human Health-Fish Consumption; Whole Body Contact Recreation
Buchanan	752.98	Unnamed	Perennial Stream/River	
Buchanan	757.07	Platte River	Perennial Stream/River	Irrigation Use; Livestock and Wildlife Watering; Protection of Warm Water Aquatic Life and Human Health-Fish Consumption; Whole Body Contact Recreation; Secondary Contact Recreation; Drinking Water Suopply
Buchanan	758.56	Unnamed	Intermittent Stream/River	
Buchanan	761.56	Malden Creek	Perennial Stream/River	No Data
Buchanan	763.49	Wolfpen Creek	Perennial Stream/River	No Data
Clinton	764.08	Jenkins Branch	Intermittent Stream/River	No Data
Clinton	767.7	Castile Creek	Perennial Stream/River	Class C, Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation; Secondary Contact Recreation; Drinking Water Supply
Clinton		Trib. Castile Creek	Perennial Stream/River	
Clinton		Unnamed	Intermittent Lake/Pond	

State / County	Approximate Milepost	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification
Clinton	773.47	Trib. Castile Creek	Intermittent Stream/River	Class C, Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation
Clinton	775.67	Little Platte River	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health0fish consumption; Whole Body Contact Recreation; Secondary Contact Recreation Class C
Clinton	776.72	Unnamed	Perennial Stream/River	
Clinton	780.41	Shoal Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation; Secondary Contact Recreation
Clinton	781.13	Unnamed	Perennial Stream/River	
Clinton	783	Deer Creek	Intermittent Stream/River	No Data
Clinton	784.42	Plum Creek	Intermittent Stream/River	No Data
Caldwell	785.71	Goose Creek	Intermittent Stream/River	Class C, Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption
Caldwell	789.21		Intermittent Stream/River	
Caldwell	790.26	Log Creek	Perennial Stream/River	No Data
Caldwell	791.08		Perennial Stream/River	Class C, Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation; Secondary Contact Recreation
Caldwell	793.28	Long Creek	Perennial Stream/River	
Caldwell	794.32	Unnamed	Intermittent Stream/River	
Caldwell	796.02	Brush Creek	Intermittent Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption
Caldwell	796.51	Unnamed	Intermittent Stream/River	

State / County	Approximate Milepost	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification
Caldwell	799.32	Crabapple Creek	Intermittent Stream/River	Class C, Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation
Caldwell	802.2	Unnamed	Intermittent Stream/River	
Caldwell	802.64	Unnamed	Intermittent Stream/River	
Caldwell	803.15	Unnamed	Intermittent Stream/River	
Caldwell	803.62	Unnamed	Intermittent Stream/River	
Caldwell	804.34	Unnamed	Intermittent Stream/River	
Caldwell	804.91	Unnamed	Intermittent Stream/River	
Caldwell	807.1	South Mud Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation
Caldwell	807.52	Unnamed	Intermittent Stream/River	
Carroll	810.9	Turkey Creek	Intermittent Stream/River	
Carroll	811.21	Unnamed	Intermittent Stream/River	
Carroll	811.48	Unnamed	Intermittent Stream/River	
Carroll	812.84	Unnamed	Intermittent Stream/River	
Carroll	813.37	Unnamed	Intermittent Stream/River	
Carroll	813.73	Unnamed	Intermittent Stream/River	
Carroll	813.82	Unnamed	Intermittent Stream/River	
Carroll	815.49	Unnamed	Intermittent Stream/River	
Carroll	816.61	Unnamed	Intermittent Stream/River	
Carroll	816.95	Unnamed	Intermittent Stream/River	
Carroll	817.74	Unnamed	Intermittent Stream/River	
Carroll	817.94	Unnamed	Intermittent Stream/River	
Carroll	820.14	Unnamed	Intermittent Stream/River	
Carroll	824.43	Unnamed	Perennial Stream/River	
Carroll	824.63	Unnamed	Intermittent Stream/River	
Carroll	826.55	Unnamed	Perennial Stream/River	

State / County	Approximate Milepost	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification
Carroll	826.89	Big Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation
Carroll	827.31	Unnamed	Intermittent Stream/River	
Carroll	827.67	Unnamed	Intermittent Stream/River	
Carroll	828.87	Wolf Branch	Intermittent Stream/River	
Carroll	830.36	Unnamed	Intermittent Stream/River	
Carroll	832.05	Unnamed	Intermittent Stream/River	
Carroll	832.37	Unnamed	Intermittent Stream/River	
Carroll	834.68	Unnamed	Intermittent Stream/River	
Carroll	835.48	Unnamed	Perennial Stream/River	
Carroll	835.48	Unnamed	Perennial Stream/River	
Carroll	835.51	Grand River	Artificial Path	Irrigation Use; Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation; Secondary Contact Recreation; Drinking Water Supply
Chariton	835.99	Unnamed	Intermittent Stream/River	
Chariton	837.7	Unnamed	Intermittent Stream/River	
Chariton	838.77	Unnamed	Intermittent Stream/River	
Chariton	840.81	Salt Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation
Chariton	841.8	Unnamed	Intermittent Stream/River	
Chariton	842.57	Unnamed	Intermittent Stream/River	
Chariton	843.21	Unnamed	Intermittent Stream/River	
Chariton	843.68	Unnamed	Intermittent Stream/River	
Chariton	844.09	Unnamed	Intermittent Stream/River	
Chariton	845.88	Unnamed	Intermittent Stream/River	
Chariton	846.54	Unnamed	Intermittent Stream/River	

State / County	Approximate Milepost	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification
Chariton	846.69	Lake Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation
Chariton	848.92	Unnamed	Intermittent Stream/River	
Chariton	849.15	Unnamed	Perennial Stream/River	
Chariton	849.51	Unnamed	Intermittent Stream/River	
Chariton	851.24	Unnamed	Intermittent Stream/River	
Chariton	852.41	Mussel Fork	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation
Chariton	852.76	Unnamed	Perennial Lake/Pond	
Chariton	853.07	Unnamed	Intermittent Stream/River	
Chariton	854.45	Unnamed	Intermittent Stream/River	
Chariton	855.68	Long Creek	Intermittent Stream/River	
Chariton	857.19	Unnamed	Intermittent Stream/River	
Chariton	857.27	Chariton River	Perennial Stream/River	Irrigation Use; Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation; Secondary Contact Recreation
Chariton	857.94	Unnamed	Intermittent Stream/River	
Chariton	858.29	Unnamed	Intermittent Stream/River	
Randolph	859.86	Puzzle Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation
Randolph	862.86	Middle Fork Little Chariton River	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation
Randolph	863.23	Lake Branch	Intermittent Stream/River	
Randolph	863.52	Lake Branch	Intermittent Stream/River	
Randolph	863.97	Unnamed	Intermittent Stream/River	

State / County	Approximate Milepost	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification
Randolph	866.5	East Fork Little Chariton River	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation
Randolph	867.1	Unnamed	Intermittent Stream/River	
Randolph	869.33	Unnamed	Intermittent Stream/River	
Randolph	869.81	Unnamed	Intermittent Stream/River	
Randolph	871.08	Unnamed	Intermittent Stream/River	
Randolph	871.42	Unnamed	Intermittent Stream/River	
Randolph	872.01	Unnamed	Intermittent Stream/River	
Randolph	874.54	Unnamed	Intermittent Stream/River	
Randolph	877.21	Unnamed	Intermittent Stream/River	
Randolph	878.01	Unnamed	Intermittent Stream/River	
Randolph	878.67	Unnamed	Intermittent Stream/River	
Randolph	880.37	Moniteau Creek	Intermittent Stream/River	
Randolph	884.85	Unnamed	Intermittent Stream/River	
Randolph	886.37	Hardin Creek	Intermittent Stream/River	
Randolph	887	Unnamed	Intermittent Stream/River	
Randolph	887.65	Unnamed	Intermittent Stream/River	
Randolph	889.02	Big Creek	Perennial Stream/River	No Data
Audrain	889.42	Unnamed	Intermittent Stream/River	
Audrain	890.23	Boat Branch	Intermittent Stream/River	
Audrain	892.12	Saling Creek	Perennial Stream/River	No Data
Audrain	892.55	Unnamed	Intermittent Stream/River	
Audrain	894.56	Unnamed	Intermittent Stream/River	
Audrain	894.78	Unnamed	Intermittent Stream/River	
Audrain	895.01	Unnamed	Intermittent Stream/River	
Audrain	895.81	Long Branch	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation
Audrain	896.69	Unnamed	Intermittent Stream/River	
Audrain	897.28	Unnamed	Intermittent Stream/River	

State / County	Approximate Milepost	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification
Audrain	898.09	Unnamed	Intermittent Stream/River	
Audrain	898.59	Unnamed	Intermittent Stream/River	
Audrain	898.95	Goodwater Creek	Perennial Stream/River	No Data
Audrain	900.03	Unnamed	Intermittent Stream/River	
Audrain	900.48	Unnamed	Perennial Lake/Pond	
Audrain	900.69	Unnamed	Intermittent Stream/River	
Audrain	902.42	Unnamed	Intermittent Stream/River	
Audrain	903.21	Youngs Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation
Audrain	909.95	Unnamed	Intermittent Stream/River	
Audrain	911.43	Skull Lick Creek	Perennial Stream/River	No Data
Audrain	912.56	Unnamed	Intermittent Stream/River	
Audrain	913.39	South Fork Salt River	Perennial Stream/River	No Data
Audrain	916.63	Unnamed	Intermittent Stream/River	
Audrain	917.26	Bean Branch	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation
Audrain	918.59	Unnamed	Intermittent Stream/River	
Audrain	919.41	Unnamed	Intermittent Stream/River	
Audrain	919.44	Unnamed	Intermittent Stream/River	
Audrain	919.68	Unnamed	Intermittent Stream/River	
Audrain	919.69	Unnamed	Intermittent Stream/River	
Audrain	919.93	Unnamed	Intermittent Stream/River	
Audrain	920.81	Unnamed	Intermittent Stream/River	
Audrain	921.03	Littleby Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation
Audrain	923.46	West Fork Cuivre River	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation

State / County	Approximate Milepost	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification
Audrain	924.38	Unnamed	Intermittent Stream/River	
Audrain	925.71	Mams Slough	Intermittent Stream/River	
Audrain	926.56	Unnamed	Intermittent Stream/River	
Audrain	927.34	Johns Branch	Intermittent Stream/River	
Montgomery	929.47	Unnamed	Intermittent Stream/River	
Montgomery	932.32	Unnamed	Intermittent Stream/River	
Montgomery	933.21	Unnamed	Intermittent Stream/River	
Montgomery	933.36	Unnamed	Intermittent Stream/River	
Montgomery	933.4	Unnamed	Intermittent Stream/River	
Montgomery	934.1	Unnamed	Intermittent Stream/River	
Montgomery	934.66	Unnamed	Perennial Stream/River	
Montgomery	935.34	Unnamed	Intermittent Stream/River	
Montgomery	935.92	Unnamed	Intermittent Stream/River	
Montgomery	936.95	Crooked Creek	Intermittent Stream/River	
Montgomery	940.7	Unnamed	Intermittent Stream/River	
Montgomery	941.48	Unnamed	Intermittent Stream/River	
Montgomery	942.24	Long Branch	Intermittent Stream/River	
Montgomery	943.6	Unnamed	Perennial Stream/River	
Montgomery	945.48	Unnamed	Intermittent Stream/River	
Montgomery	945.93	Brush Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation
Montgomery	946.47	Unnamed	Intermittent Stream/River	
Montgomery	947.51	Unnamed	Intermittent Stream/River	
Montgomery	948.2	Unnamed	Intermittent Stream/River	
Lincoln	950.31	Bear Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation; Class C
Lincoln	950.5	Unnamed	Intermittent Stream/River	
Lincoln	951.85	Camp Creek	Perennial Stream/River	No Data

State / County	Approximate Milepost	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification
Lincoln	953.35	Unnamed	Intermittent Stream/River	
Lincoln	953.55	Unnamed	Intermittent Stream/River	
Lincoln	954.16	Unnamed	Intermittent Stream/River	
Lincoln	955.71	Unnamed	Intermittent Stream/River	
Lincoln	956.8	Turkey Creek	Intermittent Stream/River	
Lincoln	957.38	Unnamed	Intermittent Stream/River	
Lincoln	958.32	Unnamed	Intermittent Stream/River	
Lincoln	959.66	Cottonwood Branch	Intermittent Stream/River	
Lincoln	959.76	Unnamed	Intermittent Stream/River	
Lincoln	960.1	Unnamed	Intermittent Stream/River	
Lincoln	960.81	Unnamed	Intermittent Stream/River	
Lincoln	962.17	Unnamed	Intermittent Stream/River	
Lincoln	964.02	Spring Creek	Intermittent Stream/River	
Lincoln	964.49	Unnamed	Intermittent Stream/River	
Lincoln	967.38	Cuivre River	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation; Secondary Contact Recreation
Lincoln	968.11	Unnamed	Intermittent Stream/River	
Lincoln	968.97	Unnamed	Intermittent Stream/River	
Lincoln	969.5	Unnamed	Intermittent Stream/River	
Lincoln	969.92	Unnamed	Intermittent Stream/River	
Lincoln	970.42	Unnamed	Intermittent Stream/River	
Lincoln	971.79	Unnamed	Intermittent Stream/River	
Lincoln	972.28	Keelstone Branch	Intermittent Stream/River	
Lincoln	972.65	Unnamed	Intermittent Stream/River	
Lincoln	973.24	Groshong Branch	Intermittent Stream/River	
Lincoln	974.42	Campbell Branch	Intermittent Stream/River	
Lincoln	976.07	Unnamed	Intermittent Stream/River	

State / County	Approximate Milepost	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification
St. Charles	977.06	Cuivre River	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation; Secondary Contact Recreation
St. Charles	980.78	Unnamed	Intermittent Stream/River	
St. Charles	980.82	Unnamed	Perennial Stream/River	
St. Charles	981.4	Unnamed	Perennial Stream/River	
St. Charles	982.38	Unnamed	Intermittent Stream/River	
St. Charles	982.82	Unnamed	Swamp/Marsh	
St. Charles	984.71	Peruque Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation; Secondary Contact Recreation
St. Charles	985.85	Unnamed	Intermittent Stream/River	
St. Charles	986.9	Unnamed	Perennial Stream/River	
St. Charles	990.69	Unnamed	Intermittent Stream/River	
St. Charles	991.21	Dardenne Creek	Perennial Stream/River	Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation; Secondary Contact Recreation
St. Charles	993.4	Unnamed	Intermittent Stream/River	
St. Charles	993.89	Unnamed	Intermittent Stream/River	
St. Charles	995.37	Unnamed	Intermittent Stream/River	
St. Charles	995.51	Unnamed	Intermittent Stream/River	
St. Charles	996.45	Unnamed	Perennial Stream/River	
St. Charles	997.13	Unnamed	Intermittent Stream/River	
St. Charles	998.37	Unnamed	Perennial Stream/River	
St. Charles	998.76	Unnamed	Intermittent Stream/River	
St. Charles	1000.1	Unnamed	Intermittent Stream/River	
St. Charles	1016.64	Unnamed	Perennial Stream/River	
St. Charles	1016.64	Unnamed	Perennial Stream/River	
St. Charles	1016.64	Unnamed	Perennial Stream/River	

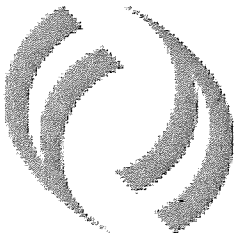
State / County	Approximate Milepost	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification
St. Charles	1016.82	Mississippi River	Artificial Path	Irrigation; Livestock and Wildlife Watering; Protection of warm water aquatic life and human health-fish consumption; Whole Body Contact Recreation; Secondary Contact Recreation; Drainking Water Supply; Industrialprocess water and cooling water
ILLINOIS				
Madison	1016.82	Mississippi River	Artificial Path	Aquatic Life; Fish Consumption; Public Water Supply; Primary Contact; Secondary Contact; Aesthetic Quality
Madison	1019.35	Unnamed	Intermittent Stream/River	
Madison	1019.45	Unnamed	Perennial Lake/Pond	
Madison	1021.72	Indian Creek	Perennial Stream/River	Aquatic Life; Fish Consumption; Primary Contact; Secondary Contact; Aesthetic Quality
Madison	1022.69	Cahokia Canal	Perennial Stream/River	Aquatic Life; Fish Consumption; Primary Contact; Secondary Contact; Aesthetic Quality
Madison	1023.91	Unnamed	Intermittent Stream/River	
Madison	1024.75	Unnamed	Intermittent Stream/River	
Madison	1025.37	Unnamed	Intermittent Stream/River	
Madison	1026.79	Mooney Creek	Perennial Stream/River	Aquatic Life; Fish Consumption; Primary Contact; Secondary Contact; Aesthetic Quality
Madison	1027.41	Unnamed	Intermittent Stream/River	
Madison	1028.51	Unnamed	Intermittent Stream/River	
Madison	1030.16	Unnamed	Intermittent Stream/River	
Madison	1032.24	Unnamed	Intermittent Stream/River	
Madison	1032.49	Silver Creek	Perennial Stream/River	Aquatic Life; Fish Consumption; Secondary Contact; Aesthetic Quality
Madison	1033.29	Unnamed	Intermittent Stream/River	
Madison	1034.13	Unnamed	Intermittent Stream/River	
Madison	1036.44	Sugar Fork	Perennial Stream/River	Aquatic Life; Fish Consumption; Primary Contact; Secondary Contact; Aesthetic

State / County	Approximate Milepost	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification
				Quality
Madison	1038.18	Sand Creek	Perennial Stream/River	Aquatic Life; Fish Consumption; Primary Contact; Secondary Contact; Aesthetic Quality
Madison	1041.51	Unnamed	Perennial Lake/Pond	
Madison	1041.54	East Fork Silver Creek	Artificial Path	
Madison	1043.56	Unnamed	Intermittent Stream/River	
Madison	1044.48	Sugar Creek	Intermittent Stream/River	Aquatic Life; Fish Consumption; Primary Contact; Secondary Contact; Aesthetic Quality
Bond	1046.39	Unnamed	Intermittent Stream/River	
Bond	1048.91	Unnamed	Intermittent Stream/River	
Bond	1050	Unnamed	Intermittent Stream/River	
Bond	1050.78	Shoal Creek	Perennial Stream/River	Aquatic Life; Fish Consumption; Public and Food Processing Water Supplies; Primary Contact; Secondary Contact; Aesthetic Quality
Bond	1051.54	Unnamed	Intermittent Stream/River	
Bond	1052.36	Unnamed	Intermittent Stream/River	
Bond	1053.4	Unnamed	Intermittent Stream/River	
Bond	1054.17	Unnamed	Intermittent Stream/River	
Bond	1054.89	Beaver Creek	Perennial Stream/River	
Bond	1057.07	Little Beaver Creek	Perennial Stream/River	Aquatic Life; Fish Consumption; Primary Contact; Secondary Contact; Aesthetic Quality
Bond	1058.8	Unnamed	Intermittent Stream/River	
Bond	1059.4	Flat Branch	Intermittent Stream/River	
Bond	1059.61	Flat Branch	Intermittent Stream/River	
Bond	1059.65	Flat Branch	Intermittent Stream/River	
Bond	1061.42	Unnamed	Intermittent Stream/River	
Bond	1062.59	Unnamed	Intermittent Stream/River	
Bond	1062.92	Unnamed	Intermittent Stream/River	

State / County	Approximate Milepost	Waterbody Name	Intermittent, Perennial, Reservoir, or Lake	State Water Quality Classification
Bond	1063.79	Unnamed	Intermittent Stream/River	
Fayette	1064.97	Unnamed	Inundation Area	
Fayette	1065.06	Unnamed	Inundation Area	
Fayette	1065.77	Hurricane Creek	Perennial Stream/River	
Fayette	1067.57	Unnamed	Perennial Lake/Pond	
Fayette	1067.59	Kaskaskia River	Artificial Path	Aquatic Life; Fish Consumption; Public Food and Processing Water Supplies; Primary Contact; Secondary Contact; Aesthetic Quality
Fayette	1067.61	Unnamed	Inundation Area	
Fayette	1069.76	Unnamed	Intermittent Stream/River	
Marion	1073.18	Unnamed	Intermittent Stream/River	

CONSTRUCTION MITIGATION AND RECLAMATION PLAN

WETLAND CROSSINGS AND WATERBODIES AND RIPARIAN LANDS (SECTIONS 6 AND 7)



TransCanada

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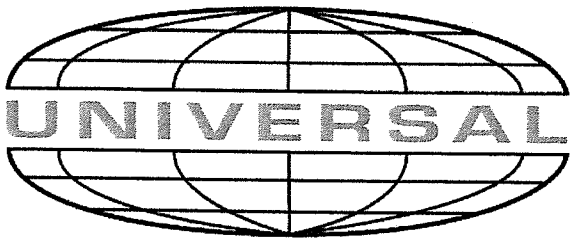


UNIVERSAL ENSCO, INC.

March 20, 2006
Rev. 1

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 are 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.

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:

- 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
- In "wet" wetlands, topsoil may be taken from the spoil side and ditchline, placed and spread on the working side, and allowed to dry to as a road base

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 consist of 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".

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:

- 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 trenchline. 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, topsoil will be restored to its original stratum.
- Dewatering the trench in such a manner that does not cause erosion and no heavily silt-laden water flows 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 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.

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 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 10** shall be used where this type of wetland is identified on the Construction Drawings.

Procedures unique to standard wetlands include:

- Limit construction right of way width to 85 feet
- Utilize low ground pressure construction equipment or support equipment on timber rip rap or timber mats
- Install 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 revegetation, 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 revegetation 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 the rate of 40 pounds/acre 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 revegetation shall be monitored after construction until wetland revegetation is successful except in circumstances where property is purchased and developed. At the end of 3 years after construction, a report shall be prepared identifying the status of the wetland revegetation efforts.

Wetland revegetation 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 revegetation is not successful at the end of 3 years, a remedial

revegetation plan shall be developed in consultation with a professional wetland ecologist to actively revegetate the wetland. Revegetation efforts shall continue until wetland revegetation 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 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 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.

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.

At swales, ditches, and incised drainages with no perceptible flow at the time of crossing and not adjacent to wetlands, the crossing method shall be similar to construction in upland areas except that topsoil and spoil shall not be stockpiled within the drainage.

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 1.2 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.

The Contractor shall dispose of any drilling fluid wastes associated with a drilled watercourse crossing in accordance with permit requirements.

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, 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 shall 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.

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 backfillling 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 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 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. Approach trenches shall be excavated prior to the installation of wet crossings to preserve as much dry soil as possible.

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. The base of slopes at intermittent waterbodies shall be assessed on-site and trench breakers installed 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.

If necessary, 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 banks 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 necessary, the integrity of the slope breakers shall be ensured by lining with erosion control blankets.

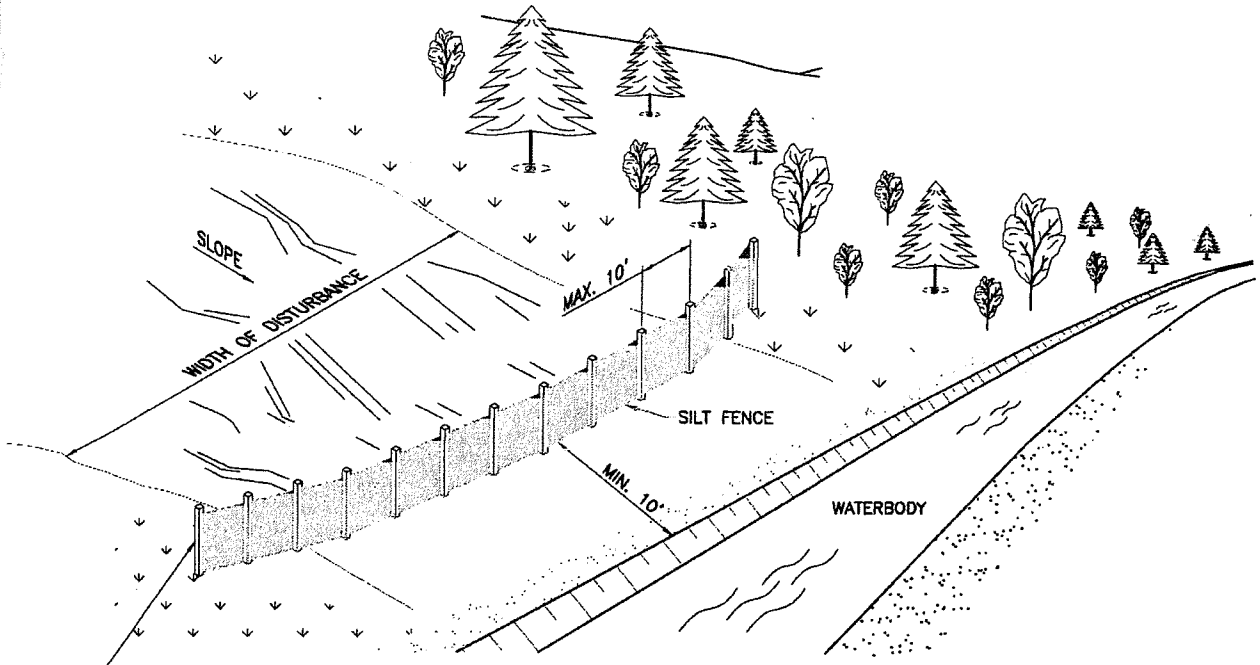
Immediately following reconstruction of the stream banks, the Contractor shall install seed and flexible channel liners on waterbody banks

The Contractor shall revegetate disturbed stream banks as expediently as practicable. If final bank re-contouring occurs outside of the specified seeding dates and the Contractor is not allowed to apply seed and the erosion control fabric, the Contractor shall install an open-weave coir fiber blanket with approximately 50 percent open area so that seed applied during the next specified seeding season can pass through the fabric and make contact with the soil. The Contractor shall use erosion control fabric made of biodegradable, natural fiber.

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.

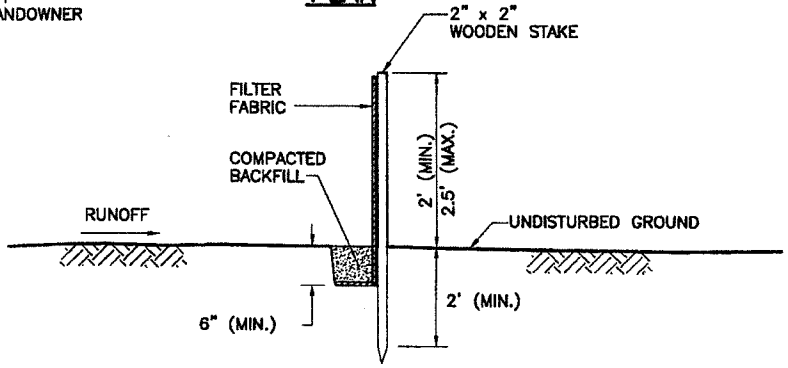
Stream bank riprap structures shall consist of a layer of stone, underlain with approved filter fabric or a gravel filter blanket in accordance with **Detail 20**. Riprap shall extend from the stabilized streambed to the top of the stream bank, where practicable, native rock shall be utilized.

The Contractor shall remove equipment bridges as soon as possible after final clean up.



EXTEND SILT FENCE A MINIMUM OF 5' BEYOND THE WIDTH OF DISTURBANCE WITH LANDOWNER PERMISSION

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 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 6" x 6" 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.

PREPARED BY:
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Trow

NO.	REVISION	DATE
0	ISSUED FOR DEPARTMENT OF STATE FILING	MAR.16.2006

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KEYSTONE PIPELINE PROJECT

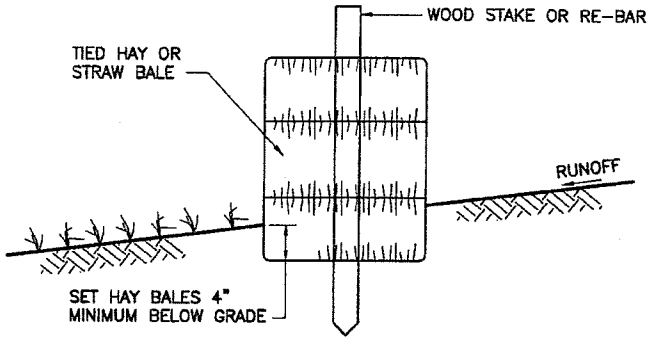
TYPICAL SILT FENCE BARRIER

PROJECT: 50388E

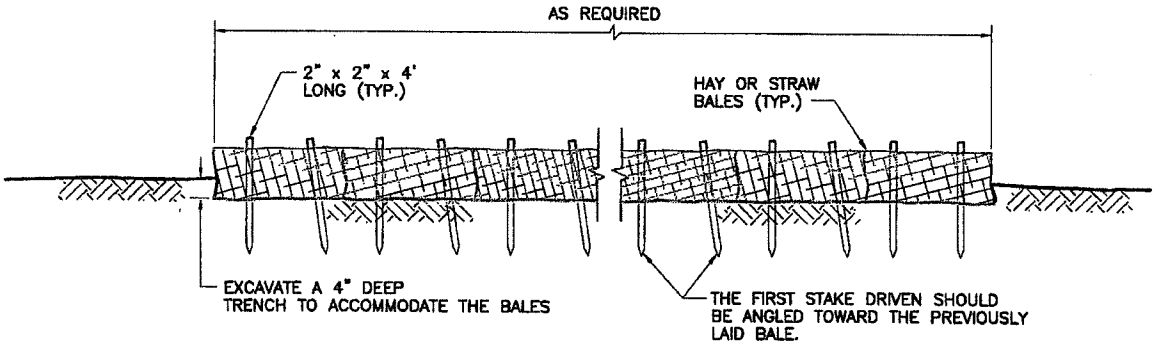
DETAIL 1

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

LAST PLOT DATE: Mon, 13 Mar 2006 – 4:38pm



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 A MINIMUM OF 18" IN THE GROUND. 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

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KEYSTONE PIPELINE PROJECT

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TYPICAL STRAW OR HAY BALE BARRIER

PROJECT: 50388E

DETAIL 2

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

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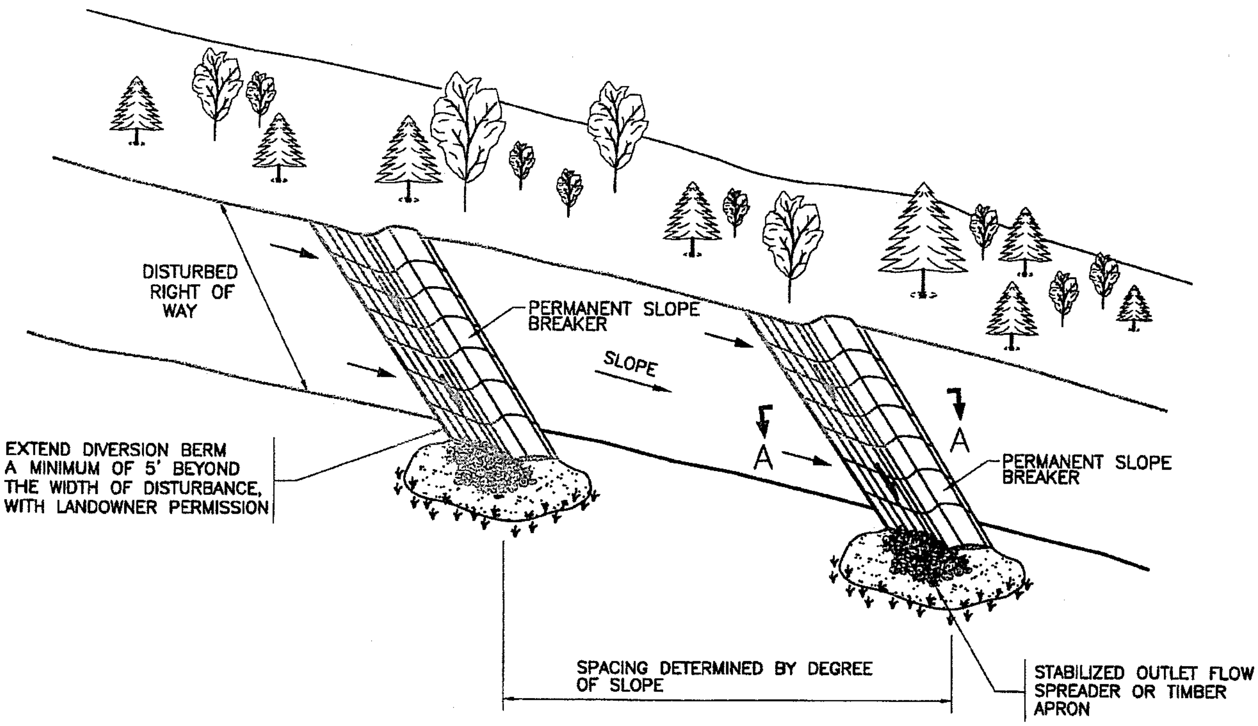
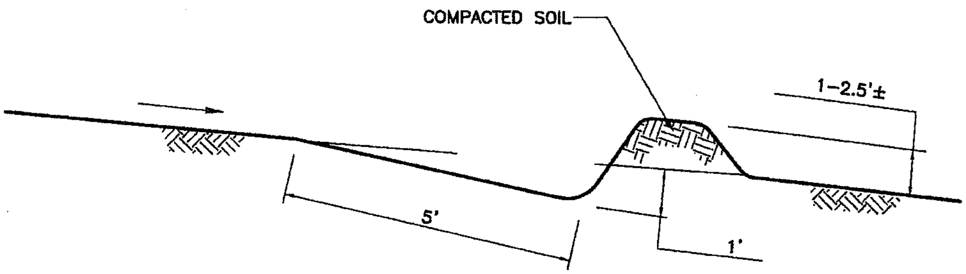


SECTION



SECTION A–A

PERMANENT SLOPE BREAKER DETAIL

NOTES:

1. PERMANENT SLOPE BREAKERS TO PROVIDE POSITIVE DRAINAGE TO A STABILIZED OUTLET.

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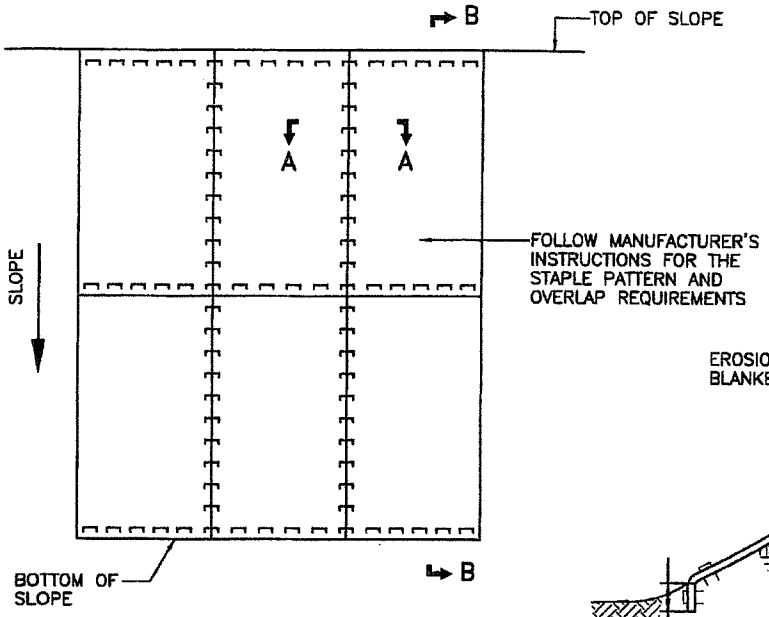
PERMANENT SLOPE BREAKERS (WATER BARS)

PROJECT: 50368E

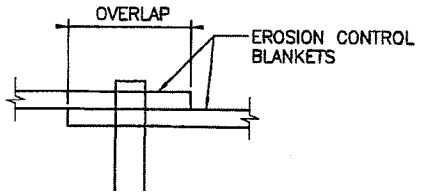
DETAIL 3

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

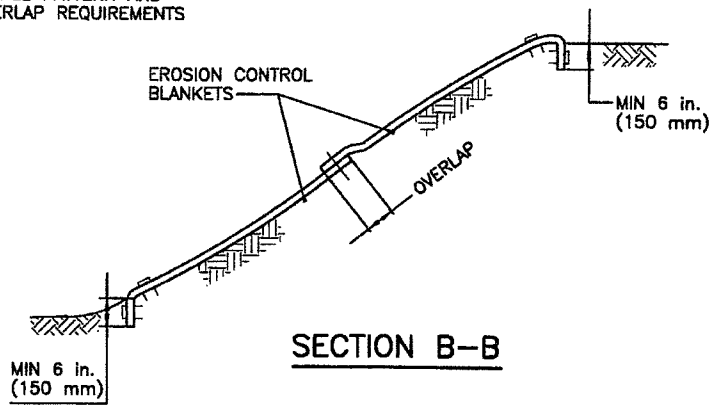
LAST PLOT DATE: Mon, 13 Mar 2006 – 4:36pm



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 MIN 6 in. (150 mm) WIDE AND 6 in. (150 mm) DEEP 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.

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EROSION CONTROL MATTING INSTALLATION

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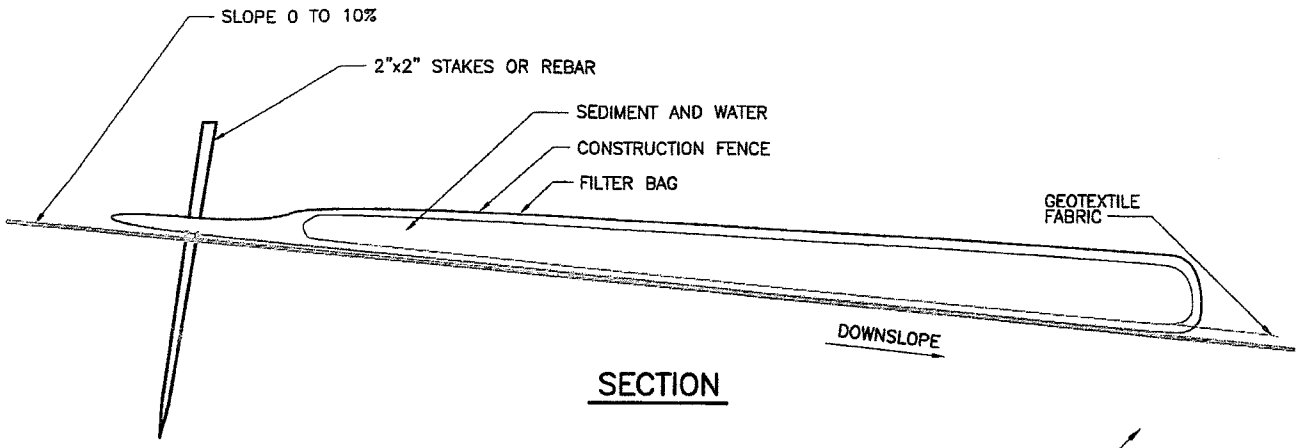
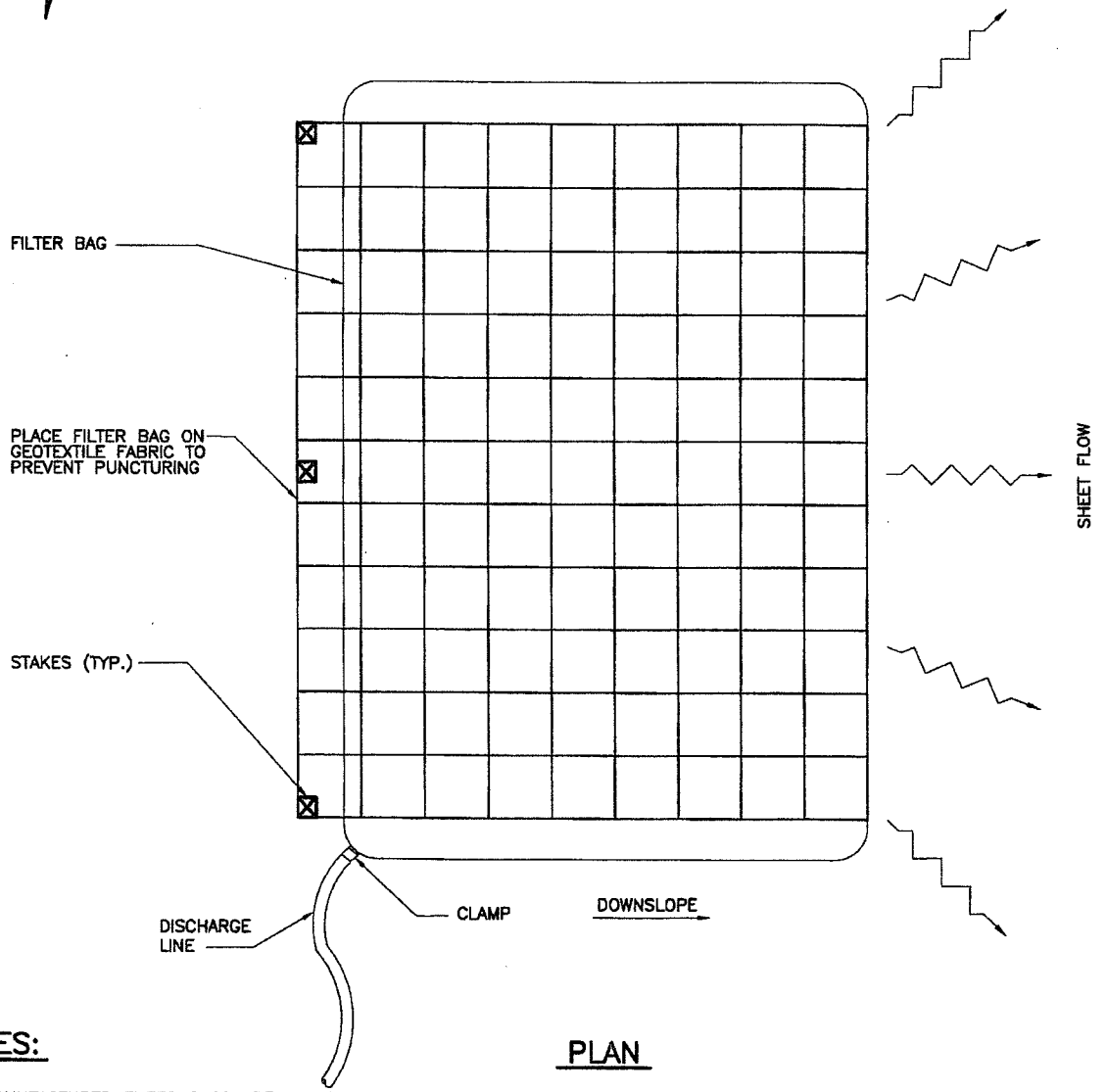
PROJECT: 50388E

DETAIL 4

LAST PLOT DATE: Mon, 13 Mar 2006 – 4:39pm



SECTION



PLAN

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.

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TYPICAL DEWATERING FILTER BAG

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K-00-P-7000-300	ALS	JTG	RG

PROJECT: 50388E

DETAIL 5

LAST PLOT DATE: Mon, 13 Mar 2008 - 4:39pm

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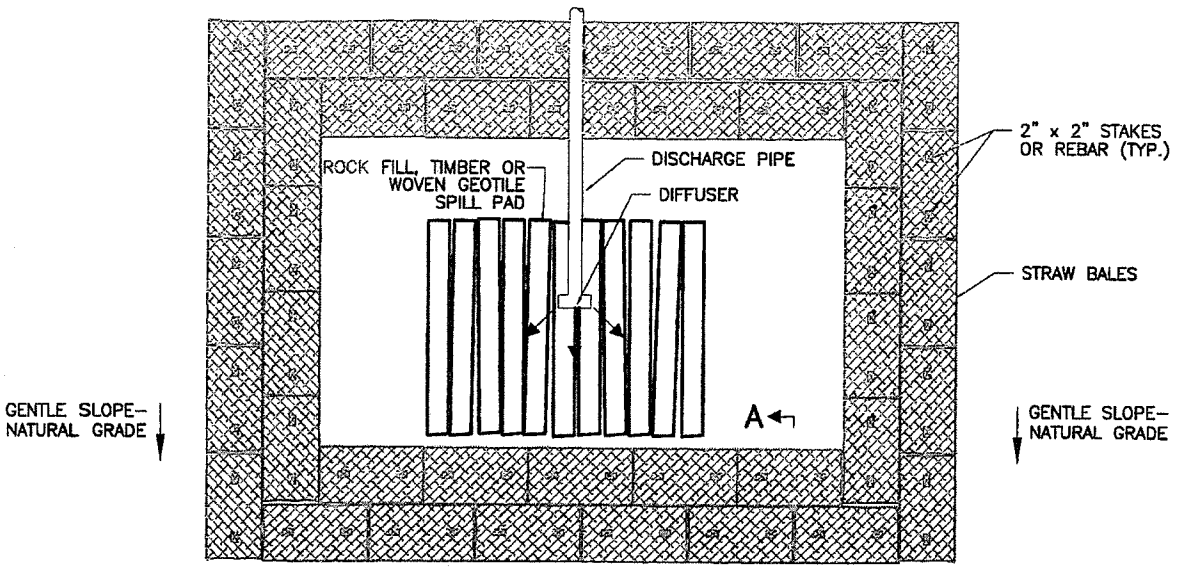
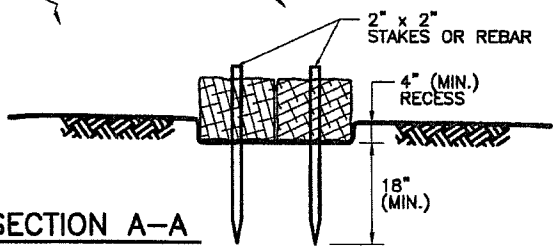
R:\Drawings\50388A KEYSTONE\



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 A MIN. OF FOUR (4) INCHES. DRIVE TWO (2) STAKES OR REBAR INTO EACH BALE TO ANCHOR THEM IN PLACE.

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KEYSTONE PIPELINE PROJECT

TYPICAL STRAW BALE DEWATERING STRUCTURE

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PROJECT: 50388E

DETAIL 6

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K-00-P-7000-300	ALS	JTG	RG

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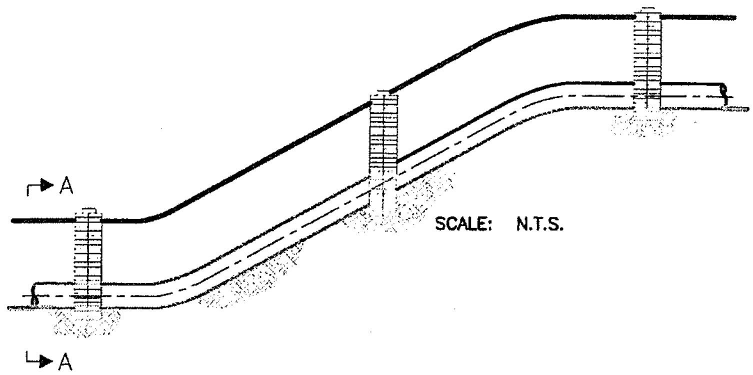

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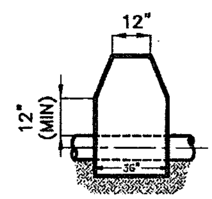
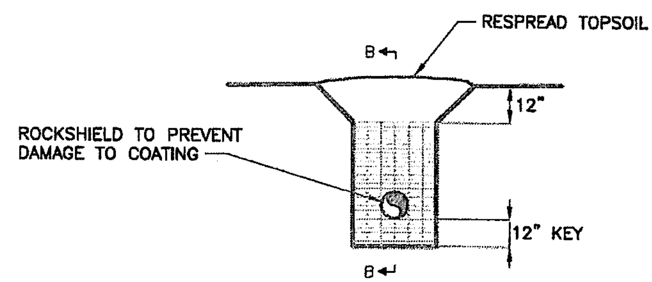
SCALE: N.T.S.



SECTION 'B-B'
SCALE: N.T.S.



SECTION 'A-A'
SCALE: N.T.S.

NOTES:

1. 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
   WITH JUST SUFFICIENT WATER TO PERMIT MIXTURE TO EXUDE AND BOND SACKS TOGETHER. TOPSOIL IS NOT TO BE USED IN SACKS.
2. KEY EACH TRENCH BREAKER A MINIMUM OF ONE (1) FT. INTO BOTTOMS AND SIDES OF TRENCH.
3. FOAM TRENCH BREAKERS MAY BE USED IN LIEU OF SAND SACK TRENCH BREAKERS.

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KEYSTONE PIPELINE PROJECT

TYPICAL PERMANENT TRENCH BREAKERS

NO.	REVISION	DATE
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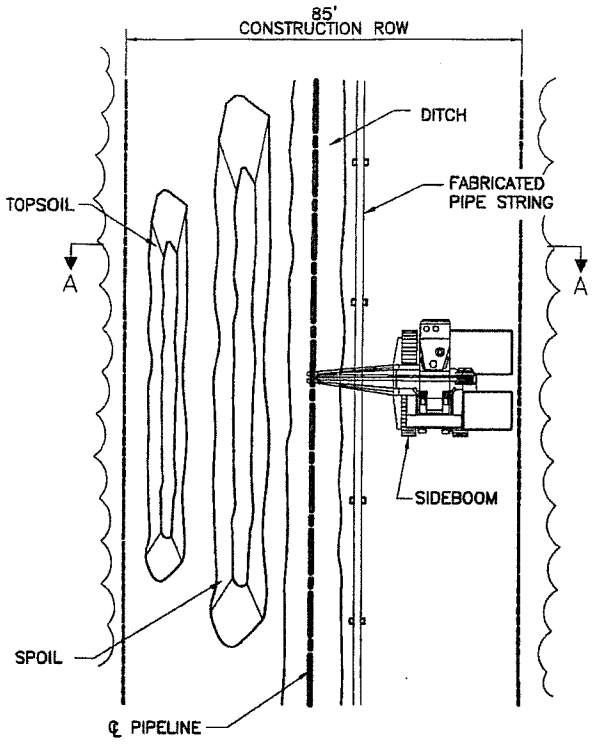
PROJECT: 50388E

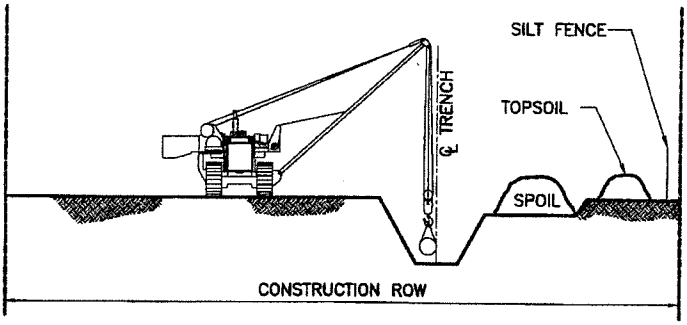
DETAIL 7

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

LAST PLOT DATE: Mon, 13 Mar 2006 – 4:30pm



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 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

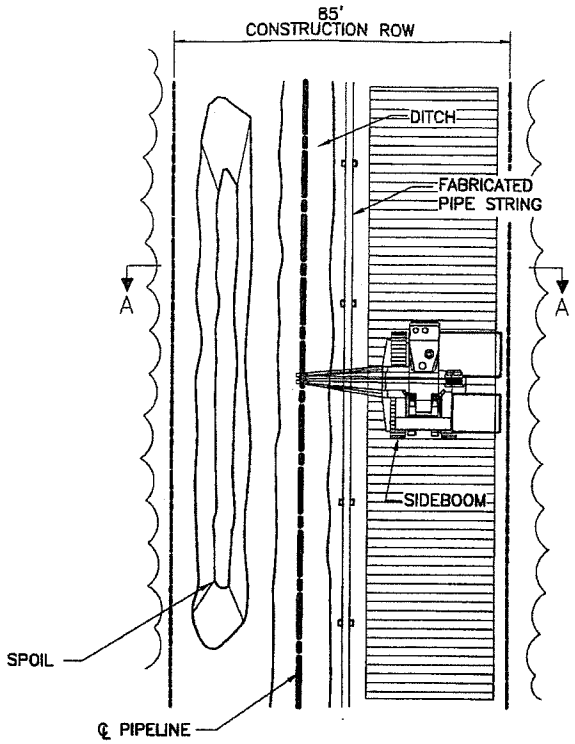
NO.	REVISION	DATE
0	ISSUED FOR DEPARTMENT OF STATE FILING	MAR.10.2006

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

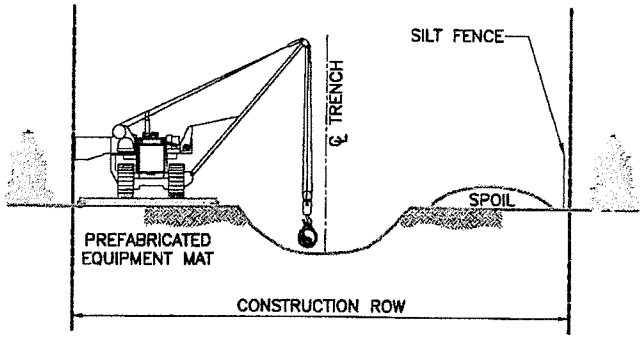
PROJECT: 50388E

DETAIL 8

LAST PLOT DATE: Mon, 13 Mar 2006 – 4:39pm



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 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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KEYSTONE PIPELINE PROJECT

STANDARD WETLAND CROSSING METHOD

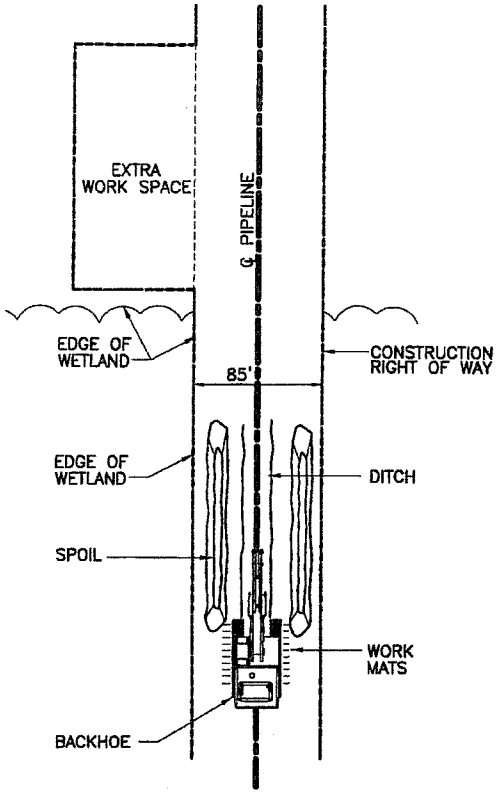
NO.	REVISION	DATE
0	ISSUED FOR DEPARTMENT OF STATE FILING	MAR.10.2005

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

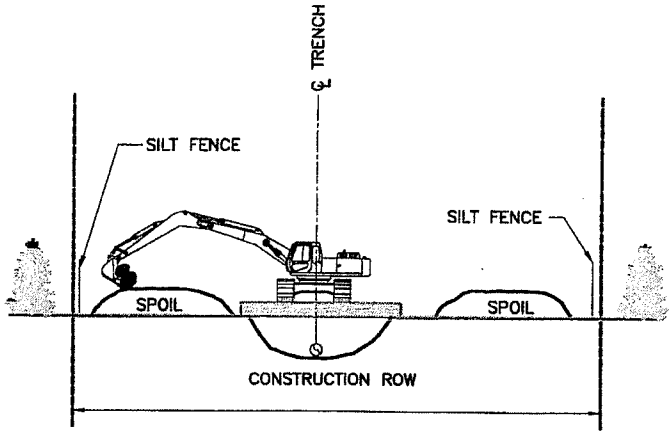
PROJECT: 50388E

DETAIL 9

LAST PLOT DATE: Mon, 13 Mar 2006 – 4:03pm



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 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

NO.	REVISION	DATE
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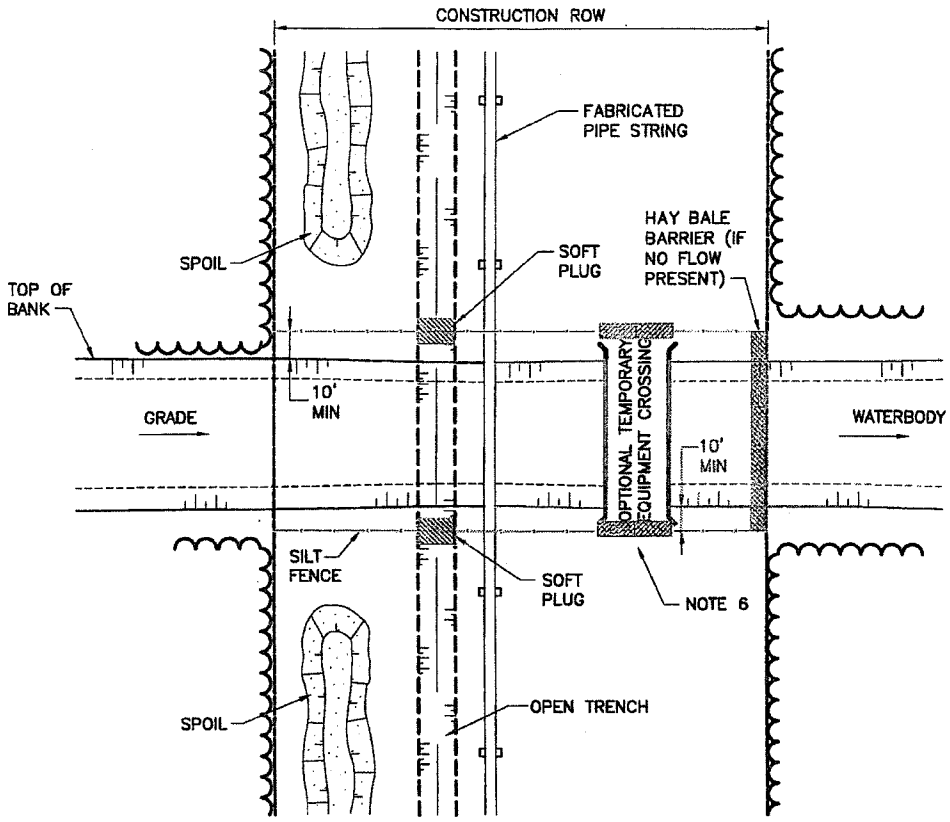
PUSH/PULL WETLAND CROSSING METHOD

PROJECT: 503886

DETAIL 10

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

LAST PLOT DATE: Mon, 13 Mar 2008 - 4:33pm



PLAN VIEW

CONSTRUCTION PROCEDURES:

1. METHOD APPLIES TO CROSSINGS WHERE NO FLOWING WATER IS PRESENT AT THE TIME OF CROSSING.
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 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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KEYSTONE PIPELINE PROJECT

NO.	REVISION	DATE
0	ISSUED FOR DEPARTMENT OF STATE FILING	MAR.10.2006

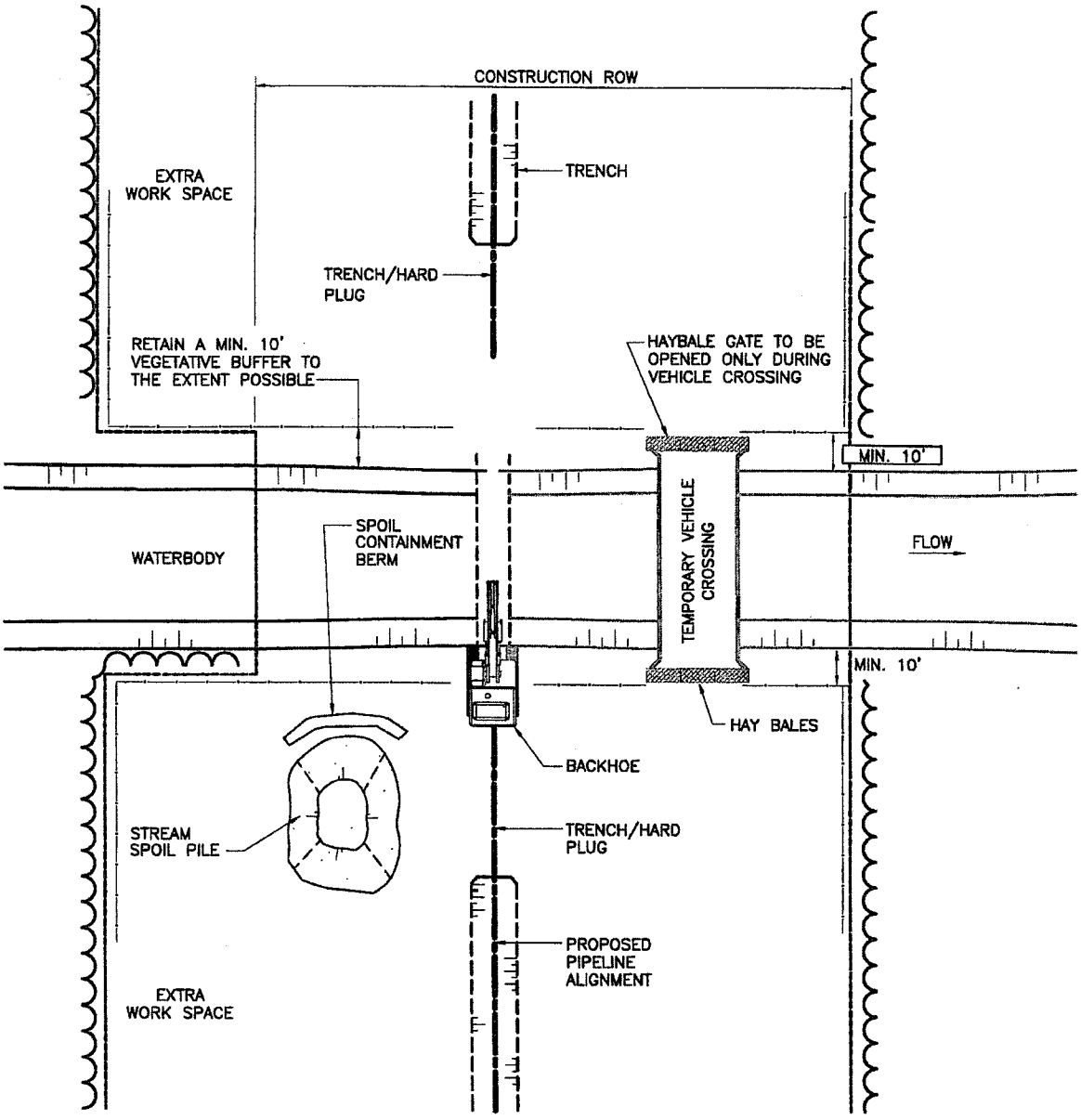
NON-FLOWING WATER BODY CROSSING METHOD

PROJECT: 50388E

DETAIL 11

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY	LAST PLOT DATE:
K-00-P-7000-300	ALS	JTG	RG	Mon, 13 Mar 2006 - 4:39pm

SEE DETAIL 12a FOR
CONSTRUCTION PROCEDURE



PLAN VIEW

PREPARED BY:
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KEYSTONE PIPELINE PROJECT

TYPICAL FLOWING
WATERBODY CROSSING
METHOD

NO.	REVISION	DATE
0	ISSUED FOR DEPARTMENT OF STATE FILING	MAR.10.2006

PROJECT: 50388E

DETAIL 12

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

LAST PLOT DATE: Mon, 13 Mar 2006 – 4:39pm

J:\DRAWINGS\AUTOCAD TEMPLATES\QUAD 24X BORDER ANSI-A ALL11.dwg 12/13/2005 12:05:14 PM EST

K:\Drawings\50388A KEYSTONE\

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 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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KEYSTONE PIPELINE PROJECT

TYPICAL FLOWING WATERBODY CROSSING METHOD

NO.	REVISION	DATE
0	ISSUED FOR DEPARTMENT OF STATE FILING	MAR.19.2006

PROJECT: 50388E

DETAIL 12a

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

LAST PLOT DATE: Mon, 15 Mar 2006 - 4:32pm

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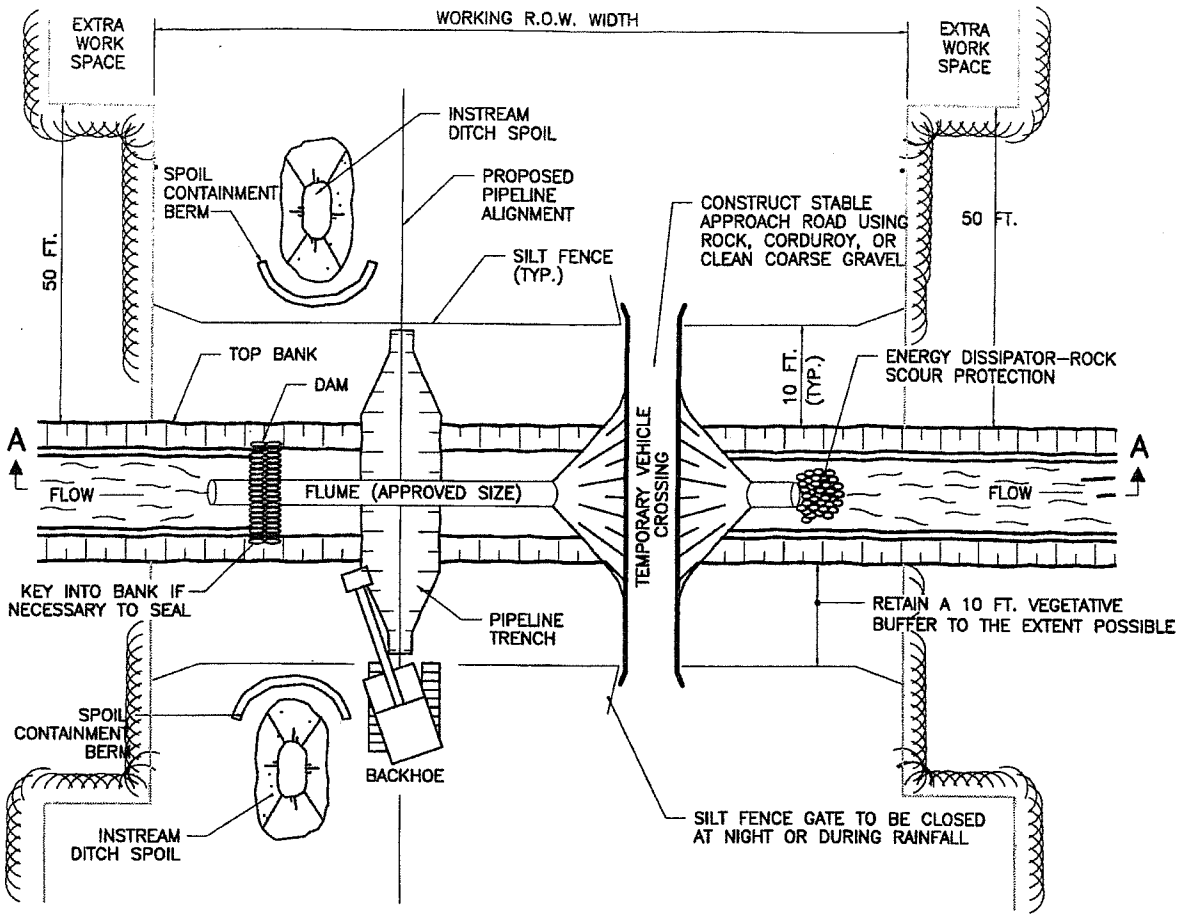
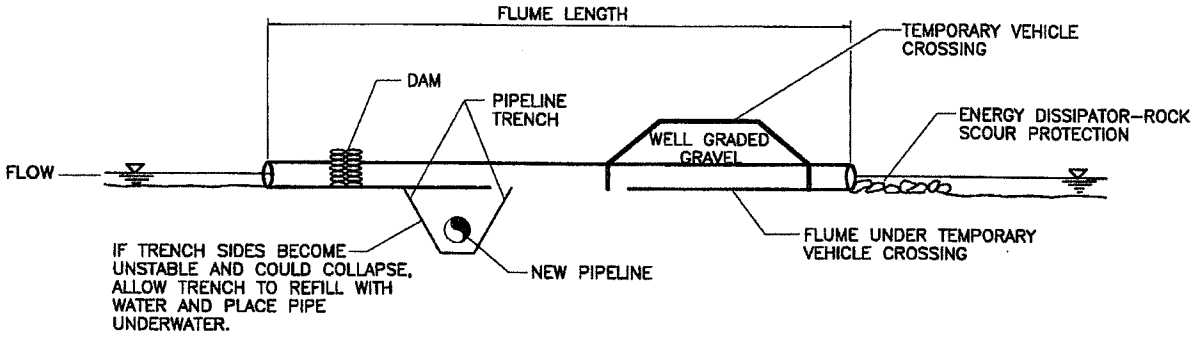


PLAN VIEW



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: 50388E

DETAIL 13

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

LAST PLOT DATE: Mon, 13 Mar 2005 – 4:32pm

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 OR INDIRECTLY 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 MUST BE CONTAINED WITHIN BERM CONTAINMENT, WITH SECONDARY SILT FENCE PROTECTION 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 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

TYPICAL DRY FLUME CROSSING METHOD

NO.	REVISION	DATE
0	ISSUED FOR DEPARTMENT OF STATE FILING	MAR.10.2006

PROJECT: 50388E

DETAIL 13a

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY	LAST PLOT DATE:
K-00-P-7000-300	ALS	JTG	RG	Mon, 13 Mar 2006 – 4:30pm

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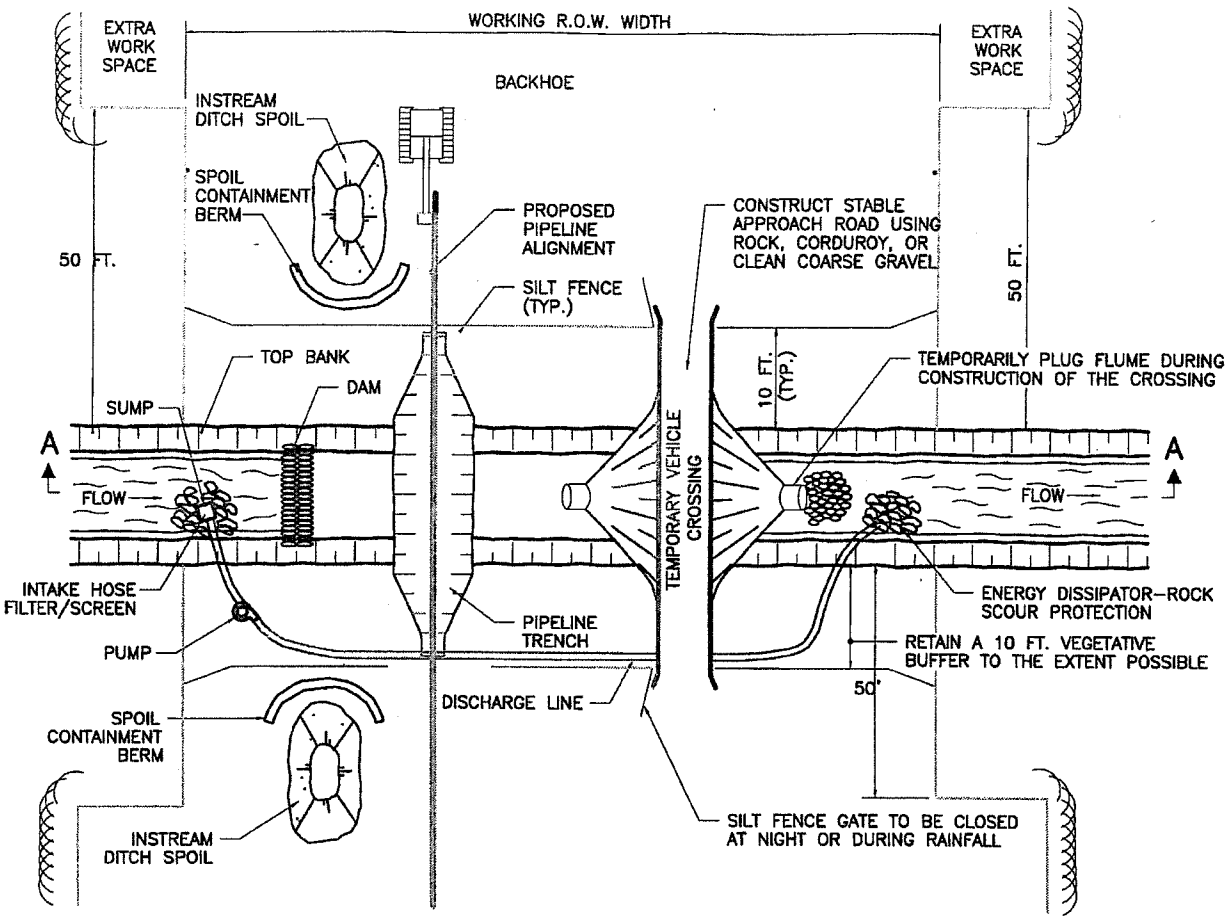
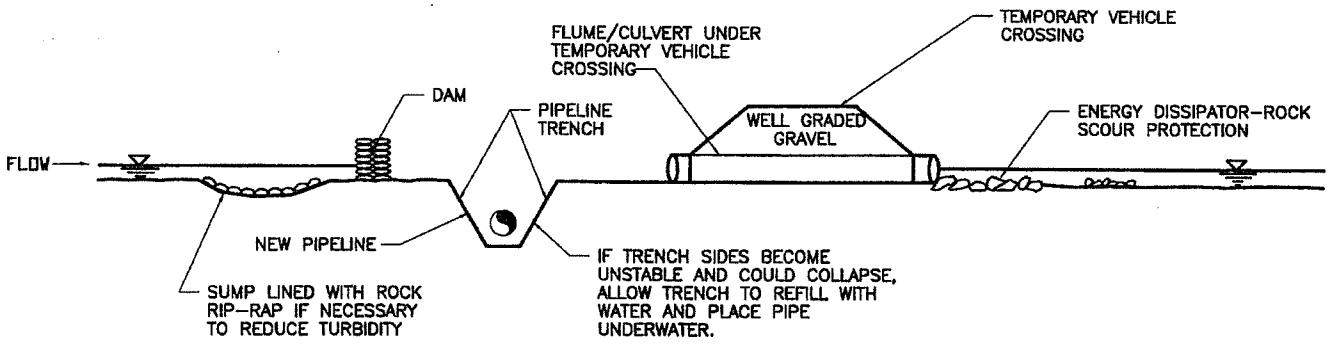


PLAN VIEW



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

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY	PROJECT:
K-00-P-7000-300	ALS	JTG	RG	50388E

DETAIL 14

LAST PLOT DATE: Mon, 13 Mar 2006 – 4:37pm

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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 1.2 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 OR INDIRECTLY 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 50 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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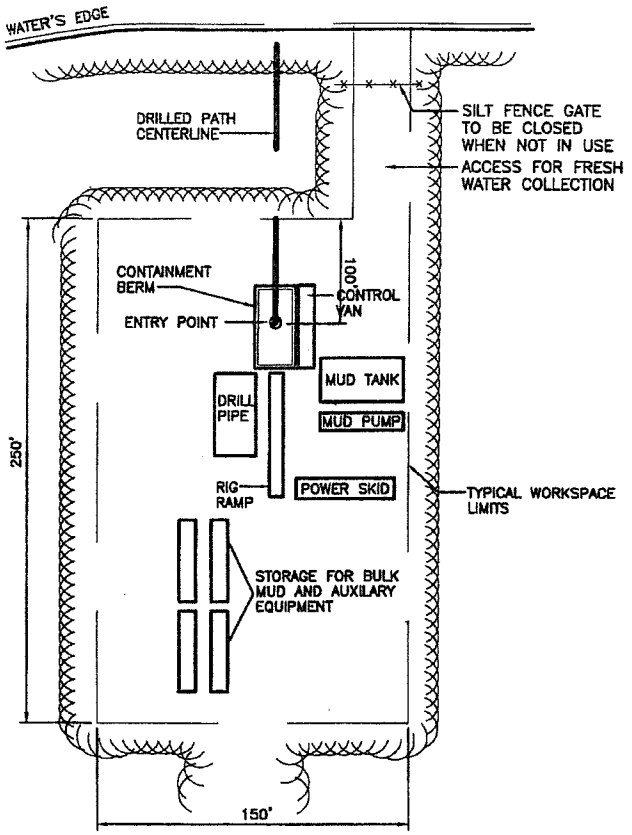
KEYSTONE PIPELINE PROJECT

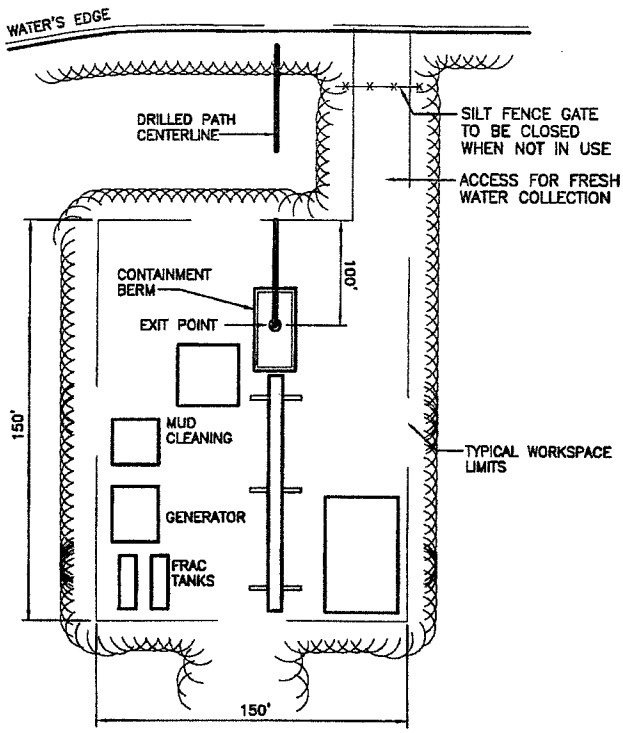
TYPICAL DAM AND PUMP CROSSING

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY	PROJECT:	
K-00-P-7000-300	ALS	JTG	RG	50388E	DETAIL 14a

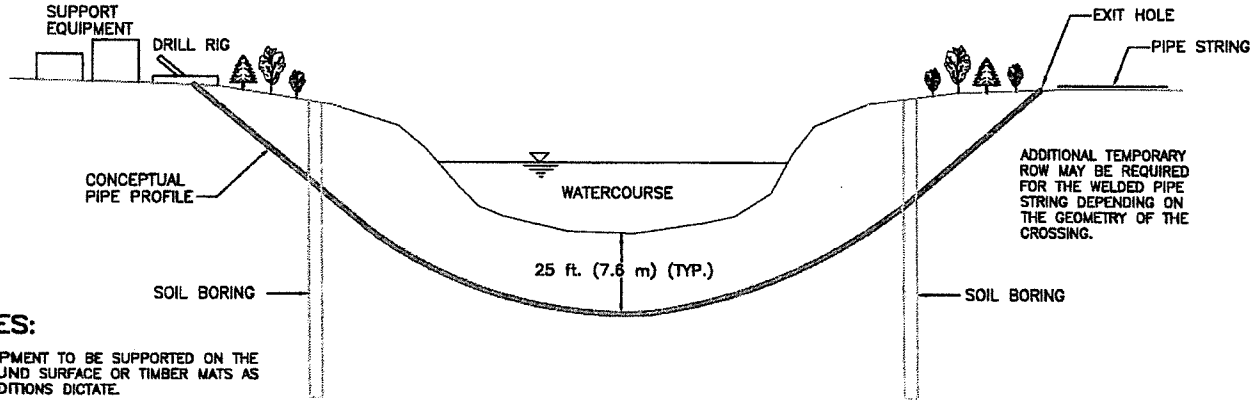
LAST PLOT DATE: Mon, 13 Mar 2006 - 4:37pm



SITE PLAN
ENTER SIDE



SITE PLAN
EXIT SIDE



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.

PROFILE

PREPARED BY:
TROW ENGINEERING CONSULTANTS, INC.
1300 Metropolitan Boulevard, Suite 200
Tallahassee, Florida 32308
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KEYSTONE PIPELINE PROJECT

TYPICAL HORIZONTAL DRILL (HDD) SITE PLAN & PROFILE

NO.	REVISION	DATE
0	ISSUED FOR DEPARTMENT OF STATE FILING	MAR.10.2006

PROJECT: 50388E

DETAIL 15

DRAWING NUMBER	DRAWN BY	CHECKED BY	APPROVED BY
K-00-P-7000-300	ALS	JTG	RG

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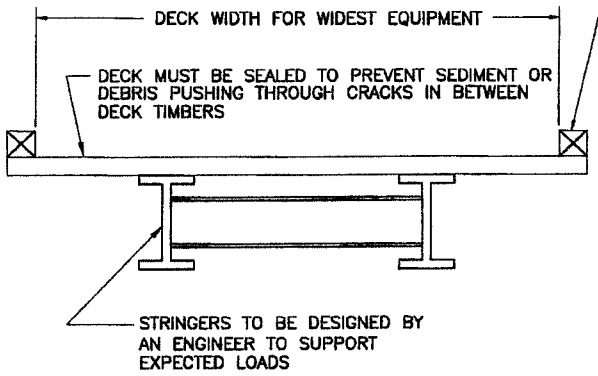
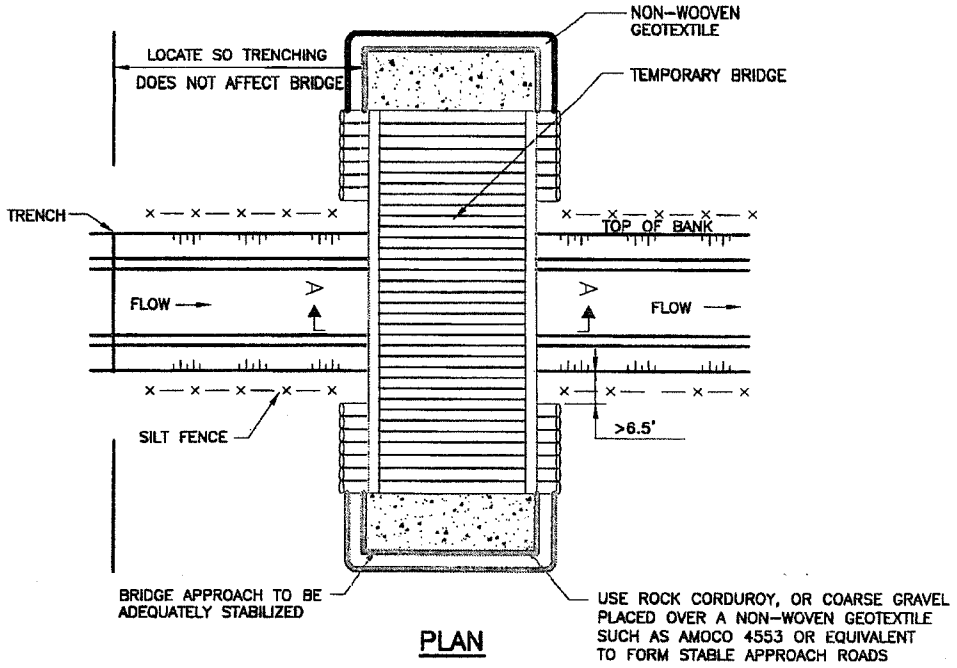
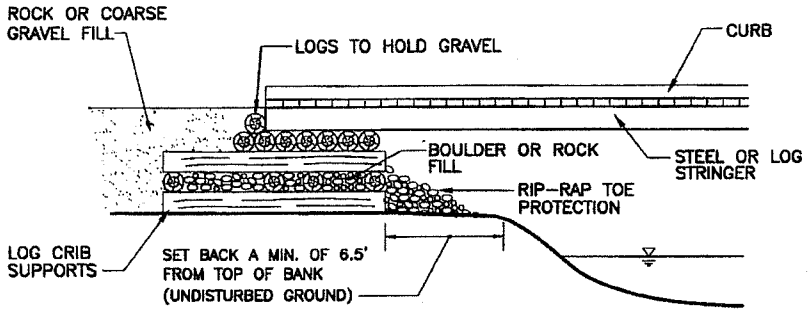


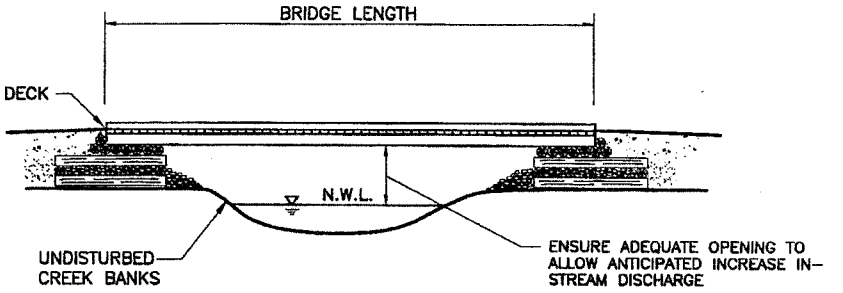
SECTION A–A



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

PROJECT: 50388E

DETAIL 16

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