3.0 SOCIOECONOMICS

Construction and operation of the project will result in both temporary and long-term socioeconomic impacts in the counties crossed by the project. During construction, there will be temporary increases in local population, demand for short-term housing, use of transportation systems, and expenditures in local economies for goods and services. Construction will also result in temporary impacts on agricultural production. Long-term impacts associated with the project include payment of local property and/or ad valorem taxes and the creation of both permanent and temporary jobs for pipeline operation and maintenance activities.

This section provides a description of the existing socioeconomic conditions in the counties along the project and an analysis of temporary and long-term impacts on those conditions.

3.1 EXISTING SOCIOECONOMIC CONDITIONS

The Applicants reviewed 2005 U.S. Census Bureau, 2004 Northwest Area Foundation Indicator Website, and 2005 Minnesota Department of Employment and Economic Development Local Area Unemployment Statistics data to gather information on existing socioeconomic conditions in the 13 counties to be affected by the project. The following paragraphs provide discussions on current population levels and density, per capita income, workforce, unemployment rates, and industry in these counties. Data on existing conditions also are summarized in table 3.1-1.

TABLE 3.1-1

Existing Socioeconomic Conditions in the Alberta Clipper/Southern Lights Diluent Projects Area

State/ County	Population Estimate [a]	Population Density (people per sq. mile) [a]	Per Capita Income [b]	Civilian Labor Force [c]	Unemploy-ment Rate (percent) [c]	2000 Major Employment Industries [a]
MINNESOTA	5,132,799	62	$37,411	2,974,779	4.2	Educational, health, and social services; Manufacturing; Retail Trade
Kittson	4,792	5	$28,671	2,582	5.4	Educational, health, and social services; Manufacturing; Agriculture, forestry, fishing and hunting, and mining
Marshall	9,965	6	$26,901	5,453	7.3	Educational, health, and social services; Manufacturing; Agriculture, forestry, fishing and hunting, and mining
Pennington	13,608	22	$32,284	8,283	5.9	Educational, health, and social services; Manufacturing; Retail Trade
Red Lake	4,317	10	$22,715	2,301	6.8	Educational, health, and social services; Manufacturing; Retail Trade
Polk	31,133	16	$27,260	18,188	4.6	Educational, health, and social services; Retail Trade; Manufacturing
Clearwater	8,476	9	$22,734	4,002	11.3	Educational, health, and social services; Retail Trade; Construction
Beltrami	42,871	16	$26,602	21,805	6.7	Educational, health, and social services; Retail Trade; Arts, entertainment, recreation, accommodation, and food services
Cass	28,910	14	$30,601	15,054	8.9	Educational, health, and social services; Retail Trade; Arts, entertainment, recreation, accommodation, and food services
Itasca	44,384	17	$27,098	23,163	8.1	Educational, health, and social services; Manufacturing; Retail Trade

TABLE 3.1-1

Existing Socioeconomic Conditions in the Alberta Clipper/Southern Lights Diluent Projects Area

State/ County	Population Estimate [a]	Population Density (people per sq. mile) [a]	Per Capita Income [b]	Civilian Labor Force [c]	Unemploy-ment Rate (percent) [c]	2000 Major Employment Industries [a]
St. Louis	197,179	32	$33,118	102,939	5.9	Educational, health, and social services; Retail Trade; Arts, entertainment, recreation, accommodation, and food services
Carlton	34,026	37	$28,028	17,297	6.7	Manufacturing; Arts, entertainment, recreation, accommodation, and food services

[a] U.S. Census Bureau, http://quickfacts.census.gov, 2005 (population) and 2000 (population density).
[b] Northwest Area Foundation Indicator Website, www.indicators.nwaf.org, 2004.
[c] Minnesota Department of Employment and Economic Development, LAUS Data, www.deed.state.mn.us.

The Applicants reviewed 2005 U.S. Census Bureau, 2004 Northwest Area Foundation Indicator Website, and 2005 Minnesota Department of Employment and Economic Development LAUS data to gather information on existing socioeconomic conditions in the counties affected by the project. Table 3.1-1 summarizes the population, unemployment rate, and income trends in the counties crossed by the project route. Population densities (an indicator of the extent of economic development) in the counties affected by the project averages 16.7 people per square mile. This is lower than the Minnesota average of 62 people per square mile and reflects the generally rural character of much of the project route.

County population levels within the project area range from a low of 4,317 persons in Red Lake County to a high of 197,179 persons in St. Louis County. In general, populations in affected counties in northern Minnesota have declined from 2000 to 2005, with Kittson County experiencing the greatest overall loss.

Per capita income in 2004 ranged from a low of $22,715 in Red Lake County to a high of $33,118 in St. Louis County. In general, per capita income is lowest in rural counties with low population densities and high unemployment rates, and highest in urban counties with high population densities and low unemployment rates.

The September 2006 unemployment rates in the project area varied from 4.6 percent in Polk County to 11.3 percent in Clearwater County (compared to a statewide average of 4.2 percent).

Employment in the project area is concentrated in the manufacturing, healthcare and social services, agricultural, and retail trade industries. Educational, health, and social service, manufacturing, and retail trade are the top employment industries in the northern counties. Agriculture, forestry, fishing and hunting, mining, and construction are also important industries in the counties along the pipeline route.

In general, the pipeline route avoids population centers and residential areas. Twenty-three municipalities are located within approximately 1 mile of the pipeline route and the municipal boundaries of 11 cities would be crossed by the pipeline route (see table 3.1-2). The majority of the cities within 1 mile of the route have populations less than 500. The largest community is the City of Bemidji, with a population of 13,296.

Construction of the project is scheduled to occur over a 14-month period beginning in 2008, with an in-service date of December 2009. The Applicants anticipate that the total workforce over this period would be approximately 1,500 workers. The Applicants, through their construction contractors and subcontractors, would attempt to hire local workers where the local workforce possesses the required skills. Construction personnel hired from outside the project area would augment the local workforce and consist of supervisors, environmental inspectors, and highly skilled mechanical, electrical, and instrumentation/control tradesmen. Non-local workers would relocate to the project area for the duration of construction.

TABLE 3.1-2
Municipalities within 1.0 Mile of the Alberta Clipper/Southern Lights Diluent Projects

County, State/Municipalities	Approximate Milepost	Population Estimate (2005) [a]
Kittson, Minnesota		
Donaldson	815	38
Marshall, Minnesota		
Viking	849	92
Pennington, Minnesota		
Saint Hilaire	866	273
Red Lake, Minnesota		
Plummer [b]	876	271
Oklee [b]	886	382
Polk, Minnesota		
Trail [b]	895	63
Gully	898	106
Clearwater, Minnesota		
Gonvick	903	297
Clearbrook	909	536
Leonard [b]	916	29
Beltrami, Minnesota		
Wilton [b]	D933	192
Bemidji	938	13,296
Cass, Minnesota		
Cass Lake [b]	D954	867
Bena [b]	974	110
Itasca, Minnesota		
Zemple [b]	994	77
Deer River	994	924
Cohasset [b]	D1004	2,508
Grand Rapids	D1008	8,277
La Prairie	D1011	592
Warba [b]	1023	182
St. Louis, Minnesota		
Floodwood [b]	1046	503
Carlton, Minnesota		
Cloquet	1070	11,476
Wrenshall	1079	349

[a] U.S. Census Bureau, www.quickfacts.census.gov.
[b] City or Township municipal boundary would be crossed by the proposed pipeline route.

3.2 GENERAL CONSTRUCTION AND OPERATION IMPACTS AND MITIGATION

3.2.1 Construction Schedule and Workforce

Construction of the project is scheduled to occur over a 14-month period, beginning in the fourth quarter of 2008, with an in-service date of late 2009. The Applicants anticipate that the total workforce over this period will be approximately 1,500 workers. Workers generally will be dispersed along the length of the construction route rather than concentrating at a single work site.

The Applicants, through their construction contractors and subcontractors, will attempt to hire local workers where the local workforce possesses the required skills. Construction personnel hired from outside the project area will augment the local workforce and consist of supervisors, environmental inspectors, and highly skilled mechanical, electrical, and instrumentation/control tradesmen. Non-local workers will relocate to the project area for the duration of construction.

Local workers will commute from their residences to project work sites on a daily basis. Non-local workers will reside in the vicinity of the project for short periods and they will not typically be accompanied by family members. As a result, incremental demand from non-local workers for public services will be small.

Local communities will benefit from monies paid to construction workers, both local and non-local, throughout the construction period. Workers will spend a portion of their earnings locally, thereby providing significant revenues to local communities. Both local and non-local workers will use hospitality services such as restaurants, grocery stores, and gasoline stations. Non-local workers will require temporary housing in addition to hospitality services. Additionally, the construction contractors and subcontractors may purchase materials from local vendors, and lease land and equipment for temporary field offices and material storage areas. Operation of the project will likely require the Applicants to hire at least four new full-time permanent employees.

Local communities also will benefit from periodic employment created by pipeline operation and maintenance activities. Workers for these activities may be local or non-local. Similar to the construction period, communities will benefit from the monies spent by temporary workers on local hospitality services and temporary housing. Additionally, construction contractors or Enbridge employees may purchase materials from local vendors.

3.2.2 Housing

The Applicants do not expect that construction crews will encounter difficulties finding temporary housing in the project area. Local workers will commute from their residences. Non-local workers will use hotels, motels, and apartments or bring their own mobile housing units (such as travel trailers or campers) and stay at local campgrounds. Because workers generally will be dispersed along the length of the pipeline route demands for temporary housing within local communities will be minimal.

3.2.3 Transportation

Short-term impacts on local transportation systems may result from construction of the pipeline across roads and railroads; movement of construction equipment and material to work

areas; and daily commuting of the construction workforce to work sites. These impacts are not expected to be significant.

Appendix D and table 4.3.6-1 lists the roads that will be crossed by the pipeline route. The Applicants typically will construct the pipelines across paved roadways and railroads using road-boring equipment. This equipment installs the pipeline beneath the road without closing it, thereby avoiding disruptions to vehicular or railcar movement and physical impacts on road/railroad beds. Unpaved roadways will typically be crossed by boring or by using the open-cut method. The latter method will temporarily disrupt road traffic as the pipe trench is excavated across the roadway. To minimize traffic delays at open-cut crossings, The Applicants will establish traffic detours before excavating the roadbed. If no reasonable detours are feasible, at least one traffic lane of the road will be maintained, except for brief periods when road closure is essential to install the pipeline. The Applicants will minimize the duration of open-cut crossings and in most cases complete these road crossings in 1 day or less. The Applicants will notify local residents prior to road closures. Additionally, the Applicants will attempt to avoid closing roads during peak traffic hours.

To maintain safe conditions, the Applicants will direct its construction contractors to adhere to local weight restrictions and limitations for its construction vehicles, and to remove soil that is left on the road surface by the crossing of construction equipment. In addition, when it is necessary for construction equipment to move across paved roads, mats or other appropriate measures will be used to prevent damage to the road surface.

The Applicants anticipate that up to 11 truck loads of pipe joints will be needed per mile of pipeline over area roads to deliver the pipe along the construction route. Truck traffic associated with transporting this pipe as well as other construction-related travel associated with the project may increase the workload of local authorities to assist with traffic control. In addition, local authorities may need to assist with short-term detours at pipeline road crossings or delays in traffic flow from large, slow-moving vehicles. The Applicants do not anticipate that these project-related demands on local authorities will be significant.

The movement of construction personnel, equipment, and materials from contractor and pipe storage yards to the construction work area will result in additional short-term impacts on the local transportation system. Several construction-related trips will be made each day to and from the job site. Traffic will remain fairly consistent throughout the construction period, and will typically peak during early morning and evening hours. The Applicants anticipate that road congestion will increase during these peak hours but will not significantly disrupt the normal flow of traffic in the project area.

Incremental road congestion could be caused by construction workers commuting to and from work sites on a daily basis. However, due to the generally rural location of the project, notable increases in rush hour traffic are not anticipated. Furthermore, because pipeline construction generally is scheduled to take full advantage of daylight hours, most workers will commute during off-peak hours (i.e., early morning and evening). In addition, construction workers typically will leave their personal vehicles at contractor yards and participate in share rides to work sites with other workers; this will help reduce road congestion in the vicinity of work sites. Finally, as stated previously, workers generally will be dispersed along the entire length of the pipeline route, as opposed to concentrating at a single work site, thereby reducing impacts on traffic at any one location.

3.2.4 Loss of Agricultural and Timber Production

Construction of the project will affect approximately 1,993 acres of agricultural land, including hayfields and pasture (see section 4.3.1). Landowners will be compensated for agriculture-related losses according to agreements negotiated between each landowner and the Applicants. Long-term effects on crop yields are not expected because the Applicants will use construction and restoration techniques designed to protect or restore soil productivity. These techniques are described in the the Applicants' Agricultural Mitigation Plan (AMP) (see Appendix E).

Construction also will result in the removal of approximately 1,343 acres of forest resources within the construction right-of-way. Merchantable timber will be salvaged and sold if possible, unless otherwise agreed to by the landowner. If a commercial buyer cannot be found, the timber may be considered non-merchantable and disposed of by mowing, chipping, grinding, and/or hauling off site to an approved disposal facility. Burning of non-merchantable wood may be allowed only where the contractor has acquired all applicable permits and approvals (*e.g.*, agency and landowner) and in accordance with all federal, state and local regulations. No burning will be allowed in wetlands.

3.2.5 Tax Revenues

Long-term economic benefits associated with operation of the pipeline will include increased tax revenues at the state and county level in the form of property and/or ad valorem taxes. The Applicants estimate that the project will generate approximately $14.8 million in annual local tax revenues for the counties, depending on the number of pipeline miles within the county and the placement of pipeline-related facilities such as pump stations.

4.0 LAND USE

4.1 EXISTING LAND USE

Land use along the pipeline route was classified using the USGS Land Use/Land Cover Classification System. In 2001 this system utilized satellite imagery to classify land use into 29 categories. For the Alberta Clipper Project, these USGS land use categories were combined into five general categories: open land, forest land, agricultural land, developed land, and wetland/open water based on prevalent land use and vegetation cover types. Land use along the pipeline route was classified by milepost into one of the five categories. Definitions of the five land use categories include:

- Forest Land consists of areas classified as deciduous forest, evergreen forest, and mixed forest.
- Open Land consists of areas classified as barren land; developed open space; shrub/scrub; and grasslands or herbaceous areas.
- Agricultural Land consists of areas classified as cultivated crops and pasture.
- Developed Land consists of areas classified as low intensity developed, medium intensity developed, and high intensity developed.
- Wetland/Open Water consists of areas classified as woody wetlands, emergent herbaceous wetlands, and open water.

4.2 LAND USE AFFECTED BY PIPELINE CONSTRUCTION AND OPERATION

The project will be constructed using a 140-foot-wide construction right-of-way in upland areas and a 125-foot-wide construction right-of-way in wetland areas with additional temporary extra workspaces at feature crossings (e.g., roads, waterbodies). For the 285.1-mile-long portion of the pipeline that will cross Minnesota, construction will affect approximately 4,742.7 acres of land. The predominant land use identified along the route is agricultural land, which accounts for 1,993.0 acres (or 42.0 percent) of the total construction area. Of the agricultural land affected, approximately 1,458.2 acres (or 30.7 percent of total land use) is cultivated and the remaining 534.8 acres (or 11.3 percent of total land use) is pasture land. Other land uses are forest land (1,342.6 acres or 28.3 percent), wetland/open water (762.2 acres or 16.1 percent), and developed land (97.1 acres or 2.0 percent). Table 4.2-1 provides a summary of the land uses to be affected by construction of the project in Minnesota.

No additional land use impacts are expected to occur with regard to aboveground facilities because all work of this nature will occur within the boundaries of Enbridge aboveground facilities. No pipe storage yards or private or new access roads have been identified at this time. This information will be filed when available, approximately July 2008.

TABLE 4.2-1

Land Uses Affected by the Construction of the Alberta Clipper/Southern Lights Diluent Projects [a]

	Forested		Agricultural		Developed		Open Land		Wetland/Water		Total	
County	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Kittson	0.4	<0.1%	242.5	5.1%	3.1	0.1%	13.5	0.3%	1.3	<0.1%	260.8	5.5%
Marshall	3.1	0.1%	550.4	11.6%	2.9	0.1%	27.2	0.6%	9.2	0.2%	592.8	12.5%
Pennington	4.6	0.1%	271.5	5.7%	0.0	<0.1%	21.3	0.4%	32.0	0.7%	329.3	6.9%
Red Lake	7.3	0.2%	225.4	4.8%	2.3	<0.1%	9.2	0.2%	18.5	0.4%	262.8	5.5%
Polk	22.0	0.5%	138.1	2.9%	0.5	<0.1%	49.8	1.1%	17.5	0.4%	227.9	4.8%
Clearwater	90.2	1.9%	206.8	4.4%	4.8	0.1%	32.2	0.7%	18.5	0.4%	352.5	7.4%
Beltrami	204.9	4.3%	60.1	1.3%	25.5	0.5%	73.0	1.5%	18.7	0.4%	382.2	8.1%
Hubbard	58.0	1.2%	8.5	0.2%	1.4	<0.1%	14.3	0.3%	45.2	1.0%	127.4	2.7%
Cass	284.0	6.0%	13.5	0.3%	45.5	1.0%	34.6	0.7%	183.2	3.9%	560.9	11.8%
Itasca	295.9	6.2%	135.1	2.8%	10.5	0.2%	126.6	2.7%	256.0	5.4%	824.1	17.4%
Aitkin	3.0	0.1%	0.0	<0.1%	0.0	<0.1%	0.0	<0.1%	14.2	0.3%	17.3	0.4%
St. Louis	187.1	3.9%	30.5	0.6%	0.3	<0.1%	78.3	1.7%	108.5	2.3%	404.7	8.5%
Carlton	181.9	3.8%	110.7	2.3%	0.3	<0.1%	67.8	1.4%	39.4	0.8%	400.1	8.4%
Total Acres/Total Percent	1,342.6	28.3%	1,993.0	42.0%	97.1	2.0%	547.8	11.6%	762.2	16.1%	4,742.7	100.0%

[a] Calculations are based on the right-of-way dimensions described in Section 4.2. In most cases, the right-of-way will be allowed to revert to the original land use during operation of the projects. Does not include additional temporary workspaces, aboveground facilities, access roads, or pipe storage and contractor yards.

Note: Due to rounding, totals may be off by 0.1 place.

Following construction, the Applicants will maintain additional permanent right-of-way beyond the existing right-of-way. The dimensions of the additional right-of-way used for environmental analysis purposes only are as follows:

- 35-foot-wide additional permanent right-of-way for all areas west of the Clearbrook terminal;
- 75-foot-wide permanent right-of-way in uplands east of the Clearbrook terminal;
- 75-foot-wide permanent right-of-way in small wetlands east of the Clearbrook terminal; and
- 110-foot-wide permanent right-of-way east of the Clearbrook terminal in areas where winter construction will be utilized (large wetland complexes).

For environmental analysis purposes only, Table 4.2-2 presents the land area permanently affected by operation of the pipeline. In actuality current right of way configurations vary due to features encountered along the route. It is the Applicants' intention to acquire permanent right of way for a distance of 75 feet from the outermost existing pipeline to accommodate construction of the Alberta Clipper and Southern Lights Diluent Projects (110 feet in winter construction areas).

4.2.1 Ownership Status of Lands Crossed by the Pipeline

As shown in table 4.2.1-1, the project route predominantly crosses private lands located outside of municipal areas (200.5 miles or approximately 70.3 percent of the route). The route also crosses federal (21.6 miles), state (18.3 miles) and county lands (33.3 miles) as well as incorporated areas (11.4 miles). County lands consist of tax-forfeited parcels. Incorporated areas crossed by the pipeline include the cities of Plummer, Oklee, Trail, Leonard, Wilton, Bemidji, Cass Lake, Bena, Zemple, Warba, and Floodwood.

TABLE 4.2-2

Land Uses Affected by the Operation of the Alberta Clipper/Southern Lights Diluent Projects [a]

	Forested		Agricultural		Developed		Open Land		Wetland/Water		Total	
County	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Kittson	0.0	<0.1%	17.3	1.2%	0.2	<0.1%	1.0	0.1%	0.1	<0.1%	18.6	1.3%
Marshall	0.2	<0.1%	39.3	2.7%	0.2	<0.1%	1.9	0.1%	0.7	0.1%	42.4	2.9%
Pennington	0.3	<0.1%	19.4	1.3%	0.0	<0.1%	1.5	0.1%	2.6	0.2%	23.8	1.7%
Red Lake	0.5	<0.1%	16.1	1.1%	0.2	<0.1%	0.7	<0.1%	1.5	0.1%	18.9	1.3%
Polk	1.6	0.1%	9.9	0.7%	0.0	<0.1%	3.6	0.2%	1.4	0.1%	16.4	1.1%
Clearwater	27.9	1.9%	42.7	3.0%	1.0	0.1%	7.6	0.5%	5.0	0.3%	84.2	5.8%
Beltrami	73.2	5.1%	21.5	1.5%	9.1	0.6%	26.1	1.8%	11.2	0.8%	141.0	9.8%
Hubbard	20.7	1.4%	3.0	0.2%	0.5	<0.1%	5.1	0.4%	27.1	1.9%	56.5	3.9%
Cass	101.4	7.0%	4.8	0.3%	16.2	1.1%	12.4	0.9%	131.9	9.1%	266.8	18.5%
Itasca	105.7	7.3%	48.2	3.3%	3.7	0.3%	45.2	3.1%	196.9	13.7%	399.7	27.7%
Aitkin	1.1	0.1%	0.0	<0.1%	0.0	<0.1%	0.0	<0.1%	12.5	0.9%	13.6	0.9%
St. Louis	66.8	4.6%	10.9	0.8%	0.1	<0.1%	28.0	1.9%	92.8	6.4%	198.6	13.8%
Carlton	65.0	4.5%	39.5	2.7%	0.1	<0.1%	24.2	1.7%	32.6	2.3%	161.5	11.2%
Total	464.5	32.2%	272.7	18.9%	31.5	2.2%	157.1	10.9%	516.4	35.8%	1,442.2	100.0%

[a] Calculations were based on the right-of-way dimensions described in Section 4.2 In most cases, the right-of-way will be allowed to revert to the original land use during operation of the projects. Does not include aboveground facilities.

Note: Due to rounding, totals may be off by 0.1 place.

TABLE 4.2.1-1

Ownership of Lands Crossed by the Alberta Clipper/Southern Lights Diluent Projects Route

Ownership	Crossing Length (miles)	Percentage of Route
Federal Lands	21.6	7.6
State Lands	18.3	6.4
County Lands	33.3	11.7
Incorporated Areas:		
Plummer	3.5	1.2
Oklee	2.0	<1
Trail	0.5	<1
Leonard	0.8	<1
Wilton	0.2	<1
Bemidji	1.0	<1
Cass Lake	1.3	<1
Bena	0.3	<1
Zemple	1.0	<1
Warba	0.7	<1
Floodwood	0.1	<1
Other[a]	200.5	70.3
Total	285.1	100

[a] Other lands include privately owned lands, tribal lands, and other lands not identified by public sources.
Sources: Minnesota Department of Natural Resources (MNDNR), 1998; MNDNR, MIS Bureau, 2003; MNDNR, 2005a.

4.2.2 Areas with Comprehensive Land Use Plans

The pipeline route will cross three watershed districts, ten counties, and one township where comprehensive land use plans have been established. These are the Two Rivers Watershed District, Middle-Snake-Tamarac Rivers Watershed District, Red Lake Watershed District, Marshall County; Polk County, Clearwater County, Carlton County, St. Louis County, Aitkin County, Itasca County, Cass County, Hubbard County, Beltrami County, Bemidji Township.

Both aboveground and buried utilities currently exist in these planning areas, and it is expected that the project will be consistent with these land use plans. The Applicants will consult with affected watershed districts and counties to ensure that the project is designed and constructed in a manner that minimizes impacts on the land use objectives for these areas.

4.3 GENERAL CONSTRUCTION AND OPERATION IMPACTS AND MITIGATION

4.3.1 Agricultural Land

Approximately 1,993 acres of agricultural land will be temporarily disturbed during construction of the Minnesota portion of the project. Construction activities will temporarily utilize active cropland within construction work areas. Construction activities may also interfere with planting or harvesting, depending on the construction season. Following construction, agricultural activities will resume within the permanent pipeline right-of-way.

The Applicants will maintain access to fields, storage areas, structures, and other agricultural facilities during construction, and will maintain irrigation and drainage systems that cross the right-of-way to the extent practicable. All drainage systems will be identified and repaired in accordance with the AMP (Appendix E). Agricultural land in the construction right-of-way will generally be taken out of production for one growing season and will be restored to previous uses following construction. Landowners will be compensated for crop losses and other damages caused by construction activities.

The Applicants will implement measures to avoid, minimize, or mitigate potential impacts on soil productivity in accordance with the AMP (see Appendix E). These measures include topsoil segregation, stone removal (>4-inch diameter), and measures to avoid compaction or loosen compacted soils. To prevent soil compaction, drainage alteration, and damage to crops, operation of maintenance equipment on agricultural lands will be limited to access routes agreed to with landowners.

Based on a review of publicly-available information, including aerial photos along the project route, the Applicants anticipate that no center-pivot irrigation systems will be crossed by the project.

The Applicants will also take appropriate measures to protect livestock during construction. To minimize short-term disruption to livestock operations, the Applicants will minimize the length of time that the trench is open and will coordinate with landowners to minimize disruption of access. Where appropriate, the Applicants will maintain temporary access ways across the trench as necessary to allow the passage of livestock, and will erect temporary fences (including gates) as necessary to contain and protect livestock from construction-related hazards. After completing construction, fences and gates will be rebuilt to their former condition or better.

4.3.2 Forest Land

Approximately 1,343 acres of forest land will be temporarily disturbed during construction of the Minnesota portion of the project. Following construction, approximately 464.5 acres of forest will be permanently converted to shrub and herbaceous cover types as the result of routine maintenance practices along the new pipeline. The remaining temporarily cleared forestland in the construction right-of-way will be allowed to revegetate.

Localized short- and long-term impacts will result from the construction of pipeline route through forested areas. Trees and brush will be removed from the construction right-of-way and temporary workspaces. Overlapping the construction right-of-way with Enbridge's maintained right-of-way to the greatest extent possible will minimize impacts on forest land. This permanent right-of-way is maintained in an herbaceous state to facilitate proper aerial inspection.

Following construction, forested areas located on the new permanent right-of-way will be seeded to promote herbaceous cover types. Consistent with previous practices, the new permanent right-of-way will be maintained in an herbaceous state. Forested areas on the temporary right-of-way and extra workspaces will be restored to allow the re-establishment of forest cover. The rate of forest reestablishment will depend upon the type and age of the vegetation cleared, as well as the natural fertility of the areas affected. It is anticipated that early successional species will begin to colonize the right-of-way within a few years after construction, followed by establishment of later successional species.

4.3.3 Wetland/Open Water

Approximately 762 acres of open water and wetlands will be affected by construction of the project. The open water will be affected at crossings of streams, rivers, and lakes. Wetlands will be allowed to revegetate naturally. Construction impacts associated with these crossings are discussed in section 9.3.4 and the EMP (see Appendix B).

4.3.4 Open Land

Approximately 548 acres of open land will be temporarily disturbed during construction of the project. Open land will be temporarily disturbed during grading, trenching, backfilling, and restoration. After final construction clean up, the open land in upland areas will be reseeded and mulched in accordance with the EMP (see Appendix B).

4.3.5 Developed Land

Approximately 97 acres of developed land will be affected during construction of the project. Based on examination of aerial photographs, there are approximately 430 residences within 500 feet of the route (see table 4.3.5-1). In addition, there are 36 residences within 50 feet of the route. Many of the residences and most of the residential land are located in or near the incorporated areas identified in section 4.2.1.

TABLE 4.3.5-1

Summary of Residences Within 50 and 500 Feet of the Proposed Pipeline

County	500 Feet	50 Feet
Kittson	3	0
Marshall	15	0
Pennington	13	0
Red Lake	6	2
Polk	9	0
Clearwater	39	0
Beltrami	89	16
Hubbard	6	0
Cass	84	1
Itasca	124	11
Aitkin	0	0
St. Louis	15	2
Carlton	37	4
Total	430	36

During construction, residences in proximity to construction activities may be exposed to short-term increases in construction-related noise and dust. Construction-related dust emissions will generally be of short duration and dependent on soil type, weather conditions, and the extent of ground disturbance. Some minor dust emission is inevitable in any construction project; however, the construction right-of-way and access roads near residential areas will be sprayed with water as needed to control dust during active construction. During periods of high winds, work will be temporarily suspended if control measures are ineffective and if dust is excessive for the area. After construction is completed, measures to stabilize and revegetate the right-of-way will prevent ongoing dust emissions.

The heavy construction equipment needed to construct the project will generate unavoidable short-term increases in ambient noise levels. Typical bulldozers, backhoes, and sideboom tractors used to install large-diameter pipelines generate 80 to 90 decibels within 50 feet of the equipment. Increases in ambient noise levels due to heavy equipment operation will be limited to the period of construction. Construction activities will generally be limited to daylight hours. No noise will be generated along the pipeline right-of-way during normal operation of the project.

4.3.6 Transportation Corridors

The pipeline route will cross federal, state, county, city/township, and private/commercial roads, and railroads. In total, the pipeline route will cross 318 roads as summarized in table 4.3.6-1 and a complete list of road crossings is included in Appendix D.

TABLE 4.3.6-1

Number of Roads Crossed by the Alberta Clipper/Southern Lights Diluent Projects Route

County, State	State or Federal	Local
Kittson, Minnesota	2	21
Marshall, Minnesota	0	57
Pennington, Minnesota	2	39
Red Lake, Minnesota	1	16
Polk, Minnesota	1	17
Clearwater, Minnesota	1	24
Beltrami, Minnesota	5	37
Hubbard, Minnesota	0	7
Cass, Minnesota	4	18
Itasca, Minnesota	5	41
Aitkin, Minnesota	0	0
St. Louis, Minnesota	2	18
Carlton, Minnesota	5	23
Total	28	318

Construction methods will vary among roadway types crossed by the project. Typical crossing methods are discussed in the the Applicants' EMP (see Appendix B). The Applicants propose to bore beneath most paved roads allowing them to remain open during construction. Open-cut construction is typically proposed for unpaved roads, which will require temporarily closing these roads and implementing detours. If no reasonable detour is feasible, at least one traffic lane will be maintained, except for brief periods essential to laying the new pipeline. Construction disturbance at each open-cut road crossing will typically be limited to 1 day, which is not expected to have a significant impact on local traffic patterns. Detour, warning, traffic control, and safety signs will be posted as prescribed by federal, state, and local (county) departments of transportation. Attempts will be made to avoid road closures during peak-traffic time periods.

The pipeline route will cross 15 railroads as identified in table 4.3.6-2. The Applicants plan to cross all railroads by boring beneath them, allowing them to remain operational during construction.

No long-term effects are expected on roads and railroads crossed by the project route because the function of these areas will be restored after construction.

TABLE 4.3.6-2

Railroads Crossed by the Alberta Clipper/Southern Lights Diluent Projects Route

County, Minnesota	Milepost	Description	Township	Range	Section
Kittson, Minnesota	817.0	Burlington Northern Santa Fe Railway	159	48	31
Marshall, Minnesota	846.5	Northern Plains Railroad	155	45	20
Pennington, Minnesota	863.8	Minnesota Northern Railroad, Inc.	153	43	29
Red Lake, Minnesota	875.7	Canadian Pacific Railway	151	42	9
Polk, Minnesota	896.0	Canadian Pacific Railway	150	39	28
Beltrami, Minnesota	D933.2	Burlington Northern Santa Fe Railway	147	33	34
Cass, Minnesota	951.7	Burlington Northern Santa Fe Railway	145	13	32
	D957.8	Burlington Northern Santa Fe Railway	145	13	31
	D957.9	Burlington Northern Santa Fe Railway	145	13	31
	D958.3	Burlington Northern Santa Fe Railway	145	18	30
Itasca, Minnesota	D995.4	Burlington Northern Santa Fe Railway	56	21	27
	1011.5	Burlington Northern Santa Fe Railway	55	23	25
	1016.5	Burlington Northern Santa Fe Railway	54	4	24
Carlton, Minnesota	1071.0	Burlington Northern Santa Fe Railway	48	6	17
	1084.8	Burlington Northern Santa Fe Railway	48	31	15

4.3.6.1 Designated Roadways

U.S. Scenic Highway 2

The pipeline route will cross U.S. Scenic Highway 2 thirteen times between MPs 932.5 and 1044.1 in Beltrami, Itasca, and St. Louis Counties. The Applicants propose to bore the pipeline crossing locations of U.S. Highway 2. This construction method will avoid disruption of the roadway surface and traffic flow. Revegetation requirements at the crossing locations will be addressed during the standard permitting process.

The Great River Road

The Great River Road in Minnesota has two components: a federally-designated 430-mile National Route and a 755-mile state-designated alternate route. Combined, the route provides 1,185 miles of scenic, historic, and recreational opportunities for travelers. The pipeline route will cross County Highway 7 (Division St.), a federally designated segment of the route at MP 937.6 in Beltrami County and Itasca County Road 18 at MP 988.9. The Applicants propose to bore these road crossings. The Applicants will consult with Beltrami and Itasca Counties and the MDOT during the permitting process regarding construction crossing techniques, restoration, and rerouting of traffic to area roadways during the construction period.

Edge of the Wilderness Scenic Byway

The pipeline route will cross Minnesota State Highway 38 (McKinney Lake Rd) at MP D1007.8, which is designated as a Minnesota Scenic Byway from Grand Rapids to Effie (47

miles). This designated scenic byway has an approved corridor management plan. The Applicants propose to bore the crossing of this state highway to mitigate disturbance to the roadway surface and traffic flow. Through the standard road crossing permit process, the Applicants will identify crossing techniques and revegetation plans.

Veterans Evergreen Memorial Scenic Byway

Commonly referred to as the scenic road to Duluth, this designated Minnesota Scenic Byway occurs along a 50 mile stretch of State Highway 23 that runs from Banning State Park to New Duluth. The pipeline will cross this Minnesota State Highway 23 at MP 1082.8. The Applicants will consult with the appropriate agencies regarding construction techniques and restoration of this area during the permitting process.

4.3.6.2 Airports

There are no airports within 1 mile of the project route in Minnesota.

5.0 TERRAIN / GEOLOGY

5.1 EXISTING TERRAIN AND GEOLOGY

The majority of the Alberta Clipper Project is located within the Western Lake Section of the Central Lowlands Physiographic Province. Surface features in this area were formed mainly during the Wisconsin Glaciation. Topography is characterized by large, gently rolling till plains, hilly areas formed by glacial moraines, and outwash plains. In addition, this area contains glaciolacustrine deposits from Glacial Lake Agassiz, which covered eastern North Dakota and northwestern Minnesota during the Wisconsin Glacial Age. The remainder of the project area is located in the Superior Upland physiographic province. Topography in this area is characterized by many low, rounded hills and rock-bottomed lakes formed in basins gouged in the rock by glaciers.

Surficial geology along the project route is characterized by glacial outwash, ground and end moraines, and glacial lake sediments deposited by the Des Moines, Wadena, and Superior Lobes of the Wisconsin Glaciation (Ojakangas and Matsch, 1982). The pipeline route will also cross areas of Holocene deposits including river sediments and peat (see figure 5.1-1). Topography includes nearly level to gently rolling glacial lake and outwash plains, rolling to steeply irregular moraine complexes, and low to fairly prominent drumlins as well as numerous lakes and wetland areas that have formed in depressions contained within the glaciated terrain. Elevations in the project area range from approximately 767 feet to 1,474 feet above mean sea level and generally increase from north to south (see table 5.1-1).

TABLE 5.1-1

Elevation Along the Alberta Clipper/Southern Lights Diluent Projects Routes

	Milepost		Elevation Above Mean Sea Level (feet)		
County	Beginning	Ending	Lowest	Average	Highest
Kittson	801.8	817.0	767	804	826
Marshall	817.0	851.7	826	933	1,074
Pennington	851.7	871.4	1,075	1,109	1,140
Red Lake	871.4	886.9	1,105	1,136	1,156
Polk	886.9	900.5	1,151	1,217	1,338
Clearwater	900.5	921.1	1,269	1,371	1,474
Beltrami	921.1	943.8	1,341	1,396	1,444
Hubbard	943.8	951.5	1,317	1,347	1,396
Cass	951.5	986.1	1,281	1,317	1,373
Itasca	986.1	1035.4	1,261	1,294	1,395
Aitkin	1035.4	1036.5	1,261	1,261	1,261
St. Louis	1036.5	1061.1	1,237	1,290	1,418
Carlton	1061.1	1084.8	906	1,182	1,422

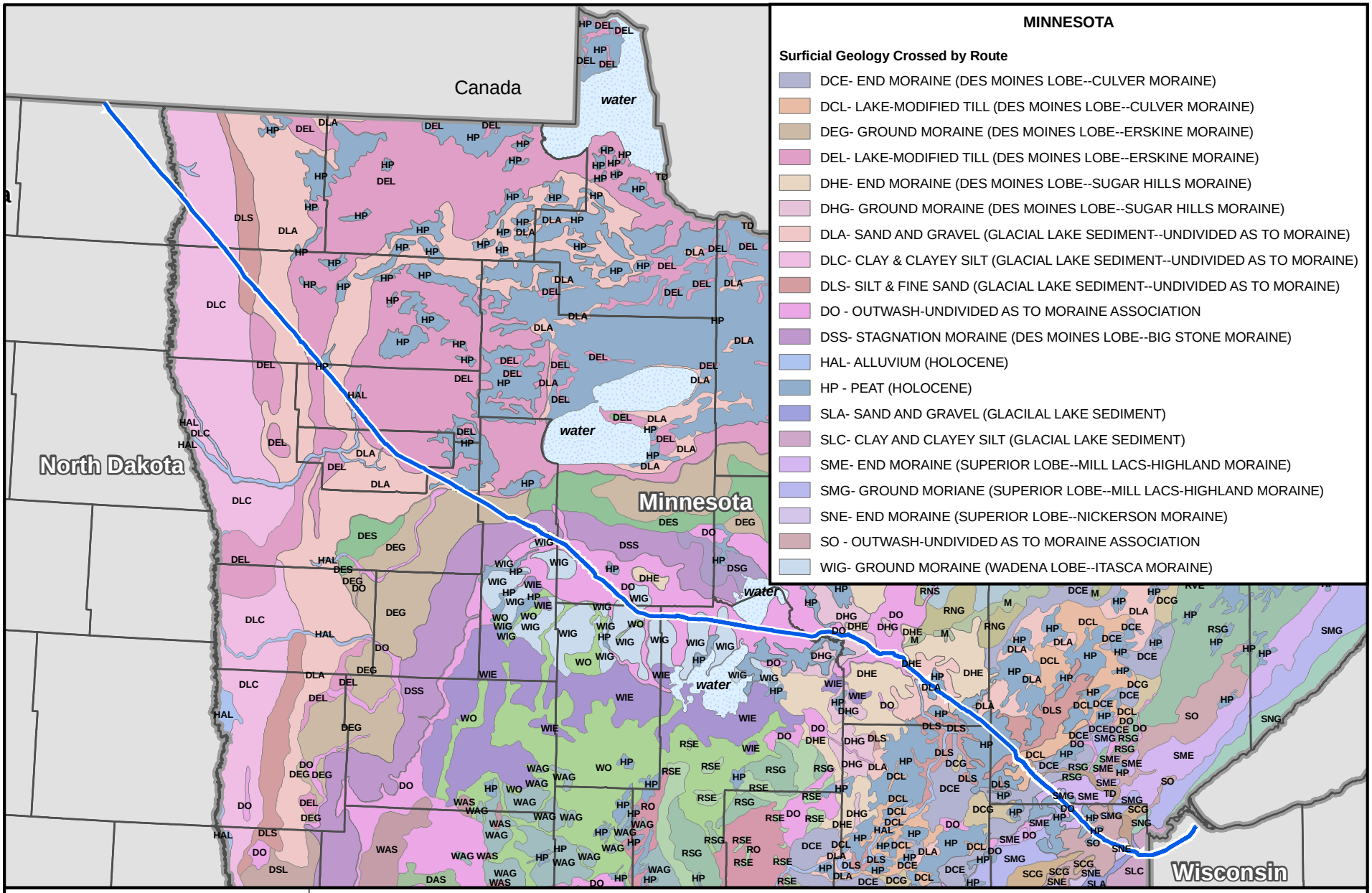

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Figure 5.1-1
Surficial Geology in Project Area

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The majority of the project region is underlain by Late Achean to Middle Proterozoic metamorphic and igneous rocks with areas of Cretaceous, Jurassic, and Ordovician sedimentary rocks (see figure 5.1-2). Bedrock along the pipeline route consists mostly of granite, shale, basalt, sandstone, siltstone, limestone, dolomite, gypsum, and anhydrite. Along the pipeline route, however, depth to bedrock can exceed more than 450 feet (Ojakangas and Matsch, 1982). Less than 1 percent of the route crosses areas with bedrock at depths of less than five feet (see section 6.3.5). These areas of shallow bedrock are located in St. Louis County and consist primarily of shale and siltstone. In areas where the pipeline is installed using HDD techniques, bedrock could be at a depth where it may be encountered during construction. These areas will be identified from geotechnical borings at the HDD crossings and will be factored into the design of the crossings.

There is a low probability of an earthquake of significant intensity or other seismic event in the project area. In addition, the pipeline route does not cross any Quaternary-age faults (National Atlas of the United States, 2006).

5.1.1 Mineral Resources

Mineral resources in Minnesota include industrial (e.g., sand, gravel, and crushed stone) and metallic (e.g., iron ore, nickel, and titanium) minerals. USGS topographic maps and 2006 aerial photography were used to identify surface features possibly associated with mining or mineral resources. Table 5.1.1-1 identifies mining and mineral resource areas within 1,500 feet of the pipeline route. All of the localities listed are associated with non-metallic resources and include four gravel pits and six sand/gravel pits.

TABLE 5.1.1-1

Mineral Resources within 1,500 feet of the Alberta Clipper/Southern Lights Diluent Projects Route [a]

State/County	Milepost	Operation	Distance and Direction from the Right-of-Way
Beltrami, Minnesota	937.5	Sand / Gravel Pit [b]	650 feet Southwest
	943.0	Sand / Gravel Pit [b]	1,300 feet East
Hubbard, Minnesota	948.0	Gravel Pit	350 feet North
Itasca, Minnesota	1003.9	Gravel Pit	400 feet Northeast
	D1007.0	Sand / Gravel Pit [b]	100 feet North / 500 feet South
	1027.5	Sand / Gravel Pit [b]	250 feet West
St. Louis, Minnesota	1051.4	Sand / Gravel Pit [b]	150 Southwest
	1052.5	Gravel Pit	150 Southwest
Carlton, Minnesota	1076.5	Sand / Gravel Pit [b]	250 feet North
	1080.0	Gravel Pit	750 feet East

[a] Based on a review of U.S. Geological Survey (USGS) topographic maps and 2006 aerial photography.
[b] Based on interpretation of 2006 aerial photography. Not identified on USGS topographic maps.

5.1.2 Paleontology

Based on consultations with Minnesota Geological Survey staff and the thickness of the unconsolidated glacial material in the project area, significant paleontological resources are not likely to be encountered during construction. However, the glacial deposits in the region may contain fossils of large vertebrates including mastodons and mammoths (Paleontology Portal, 2003).

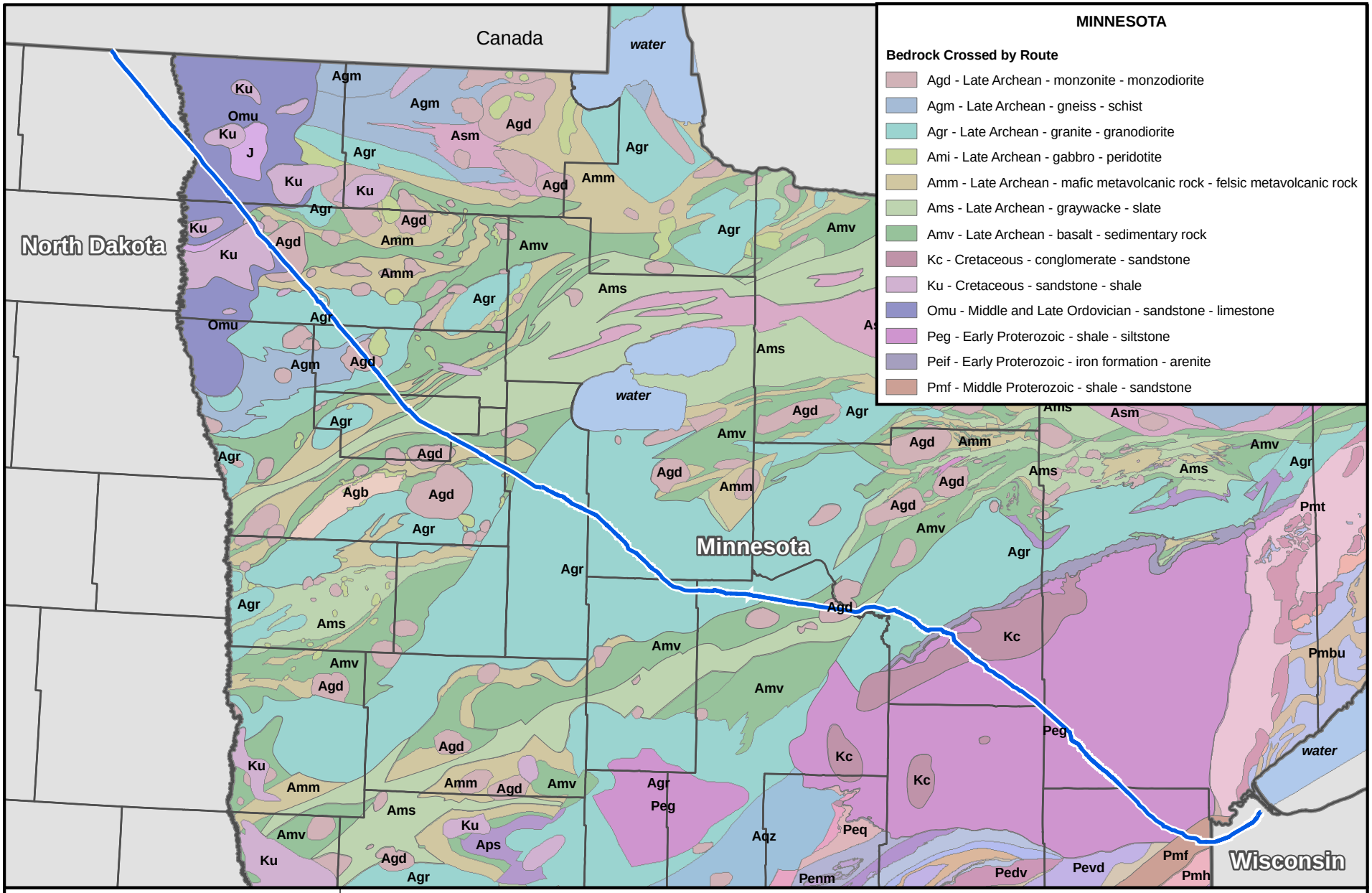

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Figure 5.1-2
Bedrock Geology in Project Area

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5.2 GENERAL CONSTRUCTION AND OPERATION IMPACTS AND MITIGATION

No unique geological features that have received state or federal protection will be disturbed by the Alberta Clipper Project. Construction and operation of the Alberta Clipper Project will result in minor impacts on topography and geology. Primary impacts will be limited to construction activities and consist of temporary alteration of slopes on the construction right-of-way due to grading and trenching operations. These disturbances will be necessary to create a level and safe construction corridor.

The Applicants will minimize impacts by returning contours to pre-construction conditions to the extent practicable. In addition, the Applicants will implement the erosion control measures described in the EMP (see Appendix B). These measures include the installation of slope breakers, temporary sediment barriers, permanent trench breakers, and the revegetation and mulching of the construction right-of-way.

Blasting may be required if bedrock is encountered within the depth of the trench. Less than 1 percent of the pipeline route will cross areas with shallow bedrock. If blasting is required, the Applicants will conduct these activities in accordance with applicable regulations.

Based on USGS topographic maps and 2006 aerial photography the pipeline route is located within 1,500 feet of ten mining operations. There is a potential that future use of sand and gravel resources will be precluded where the pipeline is installed across deposits of these resources. Generally, the pipeline will be installed adjacent to existing Enbridge pipelines; therefore, any sand and gravel deposits in the project area are currently unavailable for mining.

Construction of the pipeline route will not likely affect any significant paleontological resources. However, there is some potential for the discovery of Pleistocene-era fossils during pipeline grading and trenching. Any unique resources exposed or excavated during pipeline construction will be recovered and studied for the scientific record.

The Applicants do not anticipate impacts associated with seismic activity within the project area. Due to the limited potential for large, seismically induced ground movements, there is minimal risk of earthquake-related impacts on the pipeline. No additional mitigation beyond designing the pipeline to currently accepted industry specifications is appropriate.

No additional disturbance or loss of unique geological features, mineral resources, or scientifically important fossils will occur during operations because there will be no additional surface disturbance required beyond that used for construction.

6.0 SOILS

6.1 GENERAL SOIL COMPOSITION

The pipeline route will cross the following Major Land Resource Areas (MLRAs): Red River Valley of the North; Northern Minnesota Gray Drift; Northern Minnesota Glacial Lake Basins; and Superior Stony and Rocky Loamy Plains and Hills, Western Part. The Red River Valley of the North MLRA consists of a nearly level glacial lake plain that is bordered on the east by outwash plains, gravelly beaches, and dunes. The dominant soils in this area are Mollisols and Vertisols. The Northern Minnesota Gray Drift MLRA consists of a complex pattern of moraines, outwash plains, drumlins, lake plains, and drainages. The dominant soils in this area are Alfisols, Entisols, and Histosols, with some Mollisols in the westernmost part of the area. The Northern Minnesota Glacial Lake Basin MLRA consists of glacial lake plains with remnants of gravelly beaches, strandlines, deltas, and sandbars. The dominant soils in this area are Alfisols, Entisols, and Histosols. The Superior Stony and Rocky Loamy Plains and Hills, Western Part, MLRA consists of numerous drumlin fields, moraines, small glacial lakes, outwash plains, and bedrock-controlled uplands. The dominant soils in this area are Entisols, Inceptisols, and Histosols. The above mentioned MLRAs generally contain very deep, somewhat poorly to very poorly drained soils with a sandy to clayey texture, and have a frigid temperature regime, an aquic or udic soil moisture regime, and mixed, smectitic, or isotic mineralogy (USDA, 2006).

6.2 IDENTIFICATION OF SOIL CONDITIONS

6.2.1 Background and Methodology

Detailed soil characteristics along the project route were identified and assessed using the Soil Survey Geographic (SSURGO) Database (USDA, NRCS, 2003). The SSURGO database is a digital version of the original county soil surveys developed by the NRCS for use with GIS. It provides the most detailed level of soils information for natural resource planning and management. Mapping scales in the project area generally range from 1:12,000 to 1:24,000, with a minimum delineation size of 1.4 to 5.7 acres. SSURGO is linked to an attribute database that gives the proportionate extent of the component soils and their properties for each map unit (USDA, NRCS, 1995). The SSURGO database was used to define soil characteristics along the majority of the pipeline route.

The STATSGO was used for St. Louis County where spatial SSURGO data was unavailable. The STATSGO was compiled by combining geologically and topographically related soil series found in detailed county soil surveys (1:12,000 to 1:24,000 scale) into larger map units called Map Unit Identifiers (MUIDs). MUIDs are similar to the soil associations found in standard county soil surveys. The smallest MUID delineated at the 1:250,000-scale of the STATSGO maps is about 1,500 acres. Each MUID can consist of up to 21 individual component soil series. The NRCS determined the percentages of the soil series comprising each MUID in the database by sampling areas on the more detailed (e.g., 1:24,000 scale) maps and expanding the data statistically to characterize the whole MUID (USDA, 1994).

SSURGO and STATSGO attribute data consist of physical properties, chemical properties, and interpretive groupings. Attribute data apply to the whole soil (e.g., listed hydric, prime farmland soils or slope class) as well as to layer data for soil horizons (e.g., texture or permeability). The soil attribute data can be used in conjunction with spatial data to describe the soils in a particular area.

6.2.2 Soil Characteristics and Assessments

The Applicants digitized and overlaid the project route onto the SSURGO database to identify soil mapping units in the project area (additional temporary extra workspaces at feature crossings were not included in the soil analysis). Based on an analysis of these data, the Applicants identified soil characteristics that could affect or be affected by pipeline construction. These characteristics include: highly erodible soils; prime farmland and hydric soils; compaction-prone soils; presence of stones and shallow bedrock; droughty soils; depth of topsoil; and percent slope.

Tables 6.2.2-1 and 6.2.2-2 provide a summary of significant soil characteristics identified along the project route by county. Table 6.2.2-3 lists topsoil depths for prime farmland crossed by the project route. Individual soil characteristics are discussed separately below.

TABLE 6.2.2-1

Soil Characteristics in the Alberta Clipper/Southern Lights Diluent Projects Area [a]

County	Total Acres in County	Prime Farmland	Hydric Soils	Compact. Prone	Highly Erodible		Reveg. Concerns	Stony/ Rocky	Shallow to Bedrock
					Water	Wind			
		Acres (percent)							
Kittson	259.0	253.4	213.0	238.9	--	--	--	--	--
Marshall	588.8	419.5	250.9	220.2	1.9	147.1	218.1	--	--
Pennington	332.0	224.2	228.1	170.1	--	46.1	88.9	--	--
Red Lake	264.7	228.9	218.6	174.9	--	8.3	44.9	--	--
Polk	229.1	88.3	128.6	91.2	4.8	124.5	93.6	--	--
Clearwater	353.6	219.6	104.5	94.4	16.0	63.2	88.4	52.2	--
Beltrami	384.7	14.5	44.7	29.6	4.5	312.8	336.2	55.9	--
Hubbard	132.4	--	16.8	16.3	5.1	101.5	115.5	26.7	--
Cass	581.7	65.4	159.4	125.0	--	438.0	360.8	--	--
Itasca	853.8	312.9	409.3	223.0	10.9	400.7	148.2	--	--
Aitkin	18.7	--	18.7	--	--	--	--	--	--
St. Louis	418.0	182.3	255.0	--	30.7	105.9	5.9	3.0	2.0
Carlton	417.5	17.7	120.3	110.3	69.0	106.2	163.7	3.9	--
Pipeline Total	4,834.0	2,026.7 (42)	2,167.9 (45)	1,493.9 (31)	142.9 (3)	1,854.3 (38)	1,664.2 (34)	141.7 (3)	2.0 (<1)

[a] Acreage is based on a 140-foot-wide construction right-of-way and does not include access roads, additional temporary workspace, or open water, and does not account for reductions in the width of the right-of-way that the Applicants will implement in wetlands.

TABLE 6.2.2-2

Topsoil Depths and Slope Class in the Alberta Clipper/Southern Lights Diluent Projects Area [a]

County	Total Acres in County	Topsoil Depth (inches) in Acres (percent)				Slope Class (percent) in Acres (percent)				
		0-6	>6-12	>12-18	>18	0-5	>5-8	>8-15	>15-30	>30
Kittson	259.0	--	227.1	18.3	13.6	259.0	--	--	--	--
Marshall	588.8	47.9	338.5	70.5	132.0	586.9	--	--	1.9	--
Pennington	332.0	113.4	145.6	52.9	20.1	330.3	--	--	1.7	--
Red Lake	264.7	28.0	236.7	--	--	264.7	--	--	--	--
Polk	229.1	70.0	127.2	32.0	--	188.6	--	14.0	26.5	--
Clearwater	353.6	260.6	91.1	--	1.9	306.2	--	34.3	13.1	--
Beltrami	384.7	345.9	29.6	9.2	--	338.0	--	42.2	4.5	--
Hubbard	132.4	117.2	15.1	--	--	101.9	--	9.6	20.8	--
Cass	581.7	419.0	137.7	25.0	--	486.1	8.6	86.9	--	--
Itasca	853.8	563.7	283.0	--	7.1	726.0	114.2	--	13.6	--
Aitkin	18.7	--	18.7	--	--	18.7	--	--	--	--
St. Louis	418.0	305.7	100.6	9.6	2.0	386.3	20.4	9.4	1.8	--
Carlton	417.5	217.7	164.5	35.2	--	249.0	132.4	--	33.5	2.5
Pipeline Total	4,834.0	2,489.1 (51)	1,915.4 (40)	252.7 (5)	176.7 (4)	4,241.7 (88)	275.6 (6)	196.4 (4)	117.4 (2)	2.5 (<1)

[a] Acreage is based on a 140-foot-wide construction right-of-way and does not include access roads, additional temporary workspace, or open water, and does not account for reductions in the width of the right-of-way that the Applicants will implement in wetlands.

TABLE 6.2.2-3

Topsoil Depths on Prime Farmland in the Alberta Clipper/Southern Lights Diluent Projects Area [a]

County	Total Acres in County [b]	Topsoil Depth (inches) in Acres (percent)			
		0-6	>6-12	>12-18	>18
Kittson	253.4	--	223.4	18.3	11.7
Marshall	419.5	18.7	264.1	4.7	132.0
Pennington	224.2	62.4	110.4	32.3	19.1
Red Lake	228.9	23.3	205.6	--	--
Polk	88.3	24.6	34.8	29.0	--
Clearwater	219.6	177.5	42.1	--	--
Beltrami	14.5	4.4	0.9	9.2	--
Hubbard	--	--	--	--	--
Cass	65.4	--	40.4	25.0	--
Itasca	312.9	300.8	12.1	--	--
Aitkin	--	--	--	--	--
St. Louis	182.3	133.3	43.9	4.2	0.9
Carlton	17.7	17.7	--	--	--
Pipeline Total	2,026.7	762.7 (38)	977.7 (48)	122.7 (6)	163.7 (8)

[a] Includes land listed by the Natural Resources Conservation Service as potential prime farmland if a limiting factor is mitigated (e.g., artificial drainage).

[b] Acreage is based on a 140-foot-wide construction right-of-way and does not include access roads or additional temporary workspace.

6.3 GENERAL CONSTRUCTION AND OPERATION IMPACTS AND MITIGATION

Pipeline construction activities such as clearing, grading, trench excavation, and backfilling, as well as the movement of construction equipment along the right-of-way may result in impacts on soil resources. Clearing removes protective cover and exposes soil to the effects of wind and precipitation, which may increase the potential for soil erosion and movement of sediments into sensitive environmental areas (such as wetlands). Grading and equipment traffic may compact soil, reducing porosity and percolation rates, which could result in increased runoff potential. Trench excavation and backfilling could lead to a mixing of topsoil and subsoil and may introduce rocks to the soil surface from deeper soil horizons. Contamination from spills or leaks of fuels, lubricants, and coolants from construction equipment also could impact soils. The Applicants will minimize or avoid these impacts on soils by implementing the mitigation measures described in the EMP, SPCCP, and AMP (see Appendices B, C, and E, respectively). The Applicants have developed a petroleum contaminated soils plan to address issues from prior contamination if encountered during construction (Petroleum-Contaminated Soil Management Plan, Appendix F).

6.3.1 Prime Farmland and Topsoil Segregation

Prime Farmland

The USDA defines prime farmland as “land that is best suited to food, feed, fiber, and oilseed crops” (Soil Survey Division Staff, 1993). This designation includes cultivated land, pasture, woodland, or other lands that are either used for food or fiber crops or are available for these uses. Urbanized land and open water are excluded from prime farmland. Prime farmland typically contains few or no rocks, is permeable to water and air, is not excessively erodible or saturated with water for long periods, and is not subject to frequent, prolonged flooding during the growing season. Soils that do not meet the above criteria may be considered prime farmland if the limiting factor is mitigated (e.g., by controlling soil moisture conditions through artificial drainage). Approximately 16 percent of the pipeline route will cross prime farmland soils with no limiting factor. An additional 26 percent of the soils crossed are considered prime farmland if limiting factors are mitigated.

Impacts on prime farmland from construction of the project could include interference with agricultural drainage (if present), mixing of topsoil and subsoil, and compaction and rutting of soil. These impacts could result from right-of-way clearing, trench excavation and backfilling, and vehicular traffic within the construction right-of-way. With the mitigation measures specified in the AMP (see Appendix E), however, these impacts will be temporary and will not result in a permanent decrease in soil productivity.

The Applicants will implement the measures described in its AMP to minimize impacts on prime farmland and promote the long-term productivity of the soil. These measures will include topsoil segregation, compaction alleviation, removal of excess rock, and restoration of agricultural drainage systems and existing erosion control structures.

Topsoil Segregation

Topsoil thickness is the result of factors such as wetness, topography, climate, and the predominant vegetation present when the soil was being formed. Other factors being equal, prairie soils have more topsoil than forest soils; and wet soils have more topsoil than dry soils.

According to data presented in tables 6.2.2-2 and 6.2.2-3, topsoil depths along the majority of the pipeline route are generally less than 12 inches but are thicker in some areas.

To minimize topsoil disturbance and topsoil and subsoil mixing associated with pipeline construction, the Applicants will remove and segregate topsoil in cropland, hay fields, pasture, residential areas and other areas as requested by the landowner (see EMP figures 1.2, 1.3, and 1.4 in Appendix B). Topsoil will be segregated using the "ditch plus spoil" method in active cropland unless another topsoil segregation method is requested by the landowner. The "trench-line-only" method will be used in unsaturated wetlands or where the width of the construction right-of-way is insufficient for other methods to be used. In upland areas with a thick sod layer such as hay fields, pasture, and residential areas, the "trench-line-only" method will be used unless otherwise requested by the landowner. Topsoil will be stripped to a maximum depth of 12 inches, unless otherwise requested by the landowner. If less than 12 inches of topsoil are present, every effort will be made to segregate to the depth that is present. The segregated topsoil and subsoil will be stockpiled separately and replaced in the proper order during backfilling and final grading of the construction right-of-way.

Additional procedures may be developed in consultation with the Minnesota Department of Agriculture (MDA) to minimize adverse impacts on crop yields that could occur when thick, dark colored topsoil layers with markedly different soil properties are mixed. Deeper topsoil may be relatively dark in color, but tends to be less productive, contains more rocks, and may have unfavorable soil chemistry (e.g., high carbonate content) that can affect plant nutrient uptake.

Implementation of proper topsoil segregation as detailed in the AMP prepared by the Applicants in consultation with the MDA (see Appendix E) will minimize the loss of crop productivity, ensure successful post-construction revegetation, and minimize the potential for long-term erosion problems. In the event of a conflict between the Routing Permit application and the AMP, the provisions of the AMP will prevail.

6.3.2 Soil Compaction and Rutting

Soil compaction modifies the structure and reduces the porosity and moisture-holding capacity of soils. Construction equipment traveling over wet soils could disrupt the soil structure, reduce pore space, increase runoff potential, and cause rutting. The degree of compaction depends on moisture content and soil texture. Fine-textured soils with poor internal drainage that are moist or saturated during construction are the most susceptible to compaction and rutting. Approximately 31 percent of the pipeline route is underlain by soils that are prone to compaction. In addition, approximately 14 percent of the pipeline route will cross soils with organic surface horizons. These horizons also may be susceptible to rutting during pipeline construction.

The Applicants will minimize compaction and rutting impacts by implementing the measures described in its EMP and AMP (see Appendices B and E), respectively. These measures may include temporarily suspending certain construction activities on susceptible soils during wet conditions, or constructing from timber mats or using low-ground-weight equipment in wetlands. On agricultural land, compaction impacts will be mitigated through the use of deep tillage operations during restoration activities. If subsequent construction and cleanup activities result in further compaction, additional measures will be undertaken to reduce soil compaction.

6.3.3 Erosion by Wind and Water

Erosion is a continuing natural process that can be accelerated by human activity. Factors that influence the degree of erosion include soil texture, soil structure, length and percent of slope, vegetative cover, and rainfall or wind intensity. Soils most susceptible to erosion by water are typified by bare or sparse vegetative cover, non-cohesive soil particles with low infiltration rates, and moderate to steep slopes. Wind erosion processes are less affected by slope length or steepness. Clearing, grading, and equipment movement could accelerate the erosion process and, without adequate protection, result in discharge of sediment to adjacent waterbodies and wetlands.

The majority of the pipeline route (greater than 97 percent) is underlain by soils that are not likely to be susceptible to water erosion (see table 6.2.2-1); these soils are generally found on terrain with slopes that are less than or equal to 5 percent. Approximately 38 percent of the soils along the pipeline route have a wind erodibility group (WEG) classification of two or lower and, therefore, are considered susceptible to wind erosion.

The Applicants will implement the erosion control measures described in the EMP (see Appendix B) to minimize erosion both during and after construction activities. These measures may include construction of silt fences, installation of slope breakers, temporary sediment barriers, and permanent trench breakers, and revegetation and mulching of the construction right-of-way. Erosion and sedimentation controls will be inspected and maintained as necessary until final stabilization is achieved. The Applicants also will implement dust mitigation measures, including the use of water trucks to moisten the right-of-way, as needed, to reduce impacts from wind erosion.

6.3.4 Droughty Soils

Droughty, or dry, soils were identified on the basis of surface texture and drainage class. Well drained to excessively drained soils with a coarse surface texture (i.e., fine sand or coarser) may be difficult to revegetate. Drier soils contain less water to aid in the germination and eventual establishment of new vegetation. Coarser textured soils also have a lower water holding capacity, which could result in moisture deficiencies in the root zone, creating unfavorable conditions for many plants. Thirty-four percent of the pipeline route will cross soils classified as droughty soils.

The Applicants will minimize the impacts of pipeline construction on droughty, non-cultivated soils by timely reseeding using species adapted to dry conditions and by applying mulch to conserve soil moisture. The Applicants will consult with appropriate soil conservation authorities to develop seed mixes and seeding dates adapted to the project area, including droughty soil areas.

6.3.5 Stony/Rocky Soils and Shallow Bedrock Soils

Trenching or grading can bring stones or rocks to the soil surface where they can damage farm equipment. Similarly backfilling shallow bedrock could redistribute rock to an overlying soil horizon, which may reduce soil moisture-holding capacity. Less than three percent of the route will cross stony or rocky soils, the majority of which are located in Clearwater, Beltrami, and Hubbard Counties.

Based on the analysis of the SSURGO database, less than one percent of the soils crossed by the pipeline route contain shallow bedrock (i.e., bedrock within five feet of the surface). If bedrock is encountered within the trench, the Applicants only will backfill with this rock to the depth of the original bedrock layer. During clean up, the Applicants will use rock pickers or other rock removal equipment to remove rocks greater than four inches in diameter from the upper 12 inches of soil. Rock removal will be considered complete when the size and density of stones on the right-of-way are similar to undisturbed areas adjacent to the right-of-way.

7.0 VEGETATION, WILDLIFE, AND FISHERIES

7.1 VEGETATION

7.1.1 Existing Vegetation Resources

As described in section 4.0, approximately 42.0 percent of the area affected by the construction right-of-way will be agricultural land. This land consists of pastures and row crops such as corn, sunflowers, sugar beets, and soybeans. Potatoes also are a common crop in some of the counties in the project area (USDA, 2007). Approximately 28.3 percent of the area affected by the construction right-of-way will affect forest land, consisting of upland forests and forested wetlands. The construction right-of-way will also affect wetlands (approximately 16.1 percent of the total) and commercial land (approximately two percent of the total). The wetlands comprise emergent marshes and scrub-shrub wetlands, and the open lands consist of maintained rights-of-way and fallow fields.

7.1.2 Ecological Classifications

Based on the Ecological Classification System, the Alberta Clipper Project is located in the Prairie Parkland, Tallgrass Aspen Parklands, Eastern Broadleaf Forest and Laurentian Mixed Forest Provinces (MNDNR website http://www.dnr.state.mn.us/ecs/index.html).

Prairie Parkland Province

The pipeline route will cross the Red River Prairie subsection between approximate MPs 801.8 and 833.9. The majority of this subsection is a glacial lake plain with silty, sandy, and clayey lacustrine depositions. It is level, uniform, and relatively featureless, broken only by wetlands, meandering waterways, and old beach ridges. Much of this area has been converted to agriculture and is intensively ditched.

Tallgrass Aspen Parklands Province

The pipeline route will cross the Aspen Parklands subsection between approximate MPs 833.9 and 896.2. Well over 60 percent of this subsection is in agricultural production, mostly in the southern half. In the northern half, extensive areas have recently been cleared for farming. Some remnants of large contiguous patches of native plant communities, including wetlands, remain. Wild rice cultivation is common in the eastern edge of this area.

Eastern Broadleaf Forest Province

The pipeline route will cross the Hardwood Hills subsection within the Eastern Broadleaf Forest Province, between approximate MPs 896.2 and 909.5. Much of this area has been converted to agricultural production. Natural communities along the pipeline generally are limited to wetlands and small woodlots. Vegetation communities include aspen, mixed hardwood forests, emergent marshes, and scrub-shrub swamps.

Laurentian Mixed Forest Province

The pipeline route crosses several sections and subsections within the Laurentian Mixed Forest Province, between approximate MPs D915.4 and 1086.83. The pipeline crosses the

Northern Minnesota Drift and Lake Plains, the Northern Superior Uplands, the Western Superior Uplands, and the Southern Superior Uplands sections within this province.

7.1.3 Typical Vegetative Communities

As indicated by the descriptions of the ecological units crossed by the project, aspen-birch forest is the most common upland forest type in the project area. Northern mixed hardwood forests and pine forests also are present along the pipeline route in addition to some forested wetlands. The majority of the wetlands are emergent marshes and scrub-shrub swamps. The more common vegetative communities along the pipeline route are described below.

Aspen-Birch Forest

Aspen-birch forests dominate upland forested portions of the project. Quaking aspen and paper birch are primary components. A tall shrub layer may be present consisting of beaked hazel, mountain maple, and saplings of other tree species. Small shrubs such as bush honeysuckle, gooseberry, and raspberry may be present. The herbaceous layer is diverse and dominated by large-leaved aster, bunchberry, Canada mayflower, wild sarsaparilla, and lady fern.

Northern Hardwood Forest

Northern hardwood forests contain sugar maple, basswood, and birch as primary species. These forests often contain a conifer component and may also include red oak on drier sites. A shrub layer may be present depending on the amount of available sunlight. The species present in the shrub layer are typically fly-honeysuckle, beaked hazel, leatherwood, and mountain maple. Club mosses are frequent in the herbaceous layer.

Forested Wetlands

There are four types of forested wetlands in the vicinity of the project: black spruce swamps and bogs, tamarack swamps, cedar swamps, and hardwood swamps. Hardwood swamps are most frequent over the length of the project and are often intermixed with scrub-shrub swamps. Hardwood swamps in this region of Minnesota contain black ash as the primary component with green ash, paper birch, maple, balsam fir, and white cedar as secondary components. Sedges, grasses, and sphagnum moss are common in the understory of the conifer lowlands.

Scrub-shrub Swamps

Scrub-shrub swamps dominate lowland vegetation communities in the project area. In the northern region of Minnesota, scrub-shrub swamps contain speckled alder as the primary component. Shrubs such as willow and alder, and trees such as white cedars, tamaracks, black ash, and paper birch may also be present. Northern marsh fern, jewel-weed, and sedges are common in the herbaceous layer.

Chippewa National Forest

The projects are located within the boundaries of the Chippewa National Forest. The U.S. Forest Service (USFS) has developed land type associations specifically for the National Forest.

The Alberta Clipper Project crosses four of these associations: Bemidji Sand Plain, Guthrie Till Plain, Rosey Lake Plain, and Bena Dune and Peatlands. The Bemidji Sand Plain is crossed by the majority of the project. This area is composed of red pine forests that surround Pike Bay, jack pine and mixed boreal forests comprise the landscape in other places. The projects will cross the Guthrie Till Plain, which is characterized by conifer and boreal hardwood forest types in the project area. The Bena Dunes and Peatlands and Bemidji Sand Plain are crossed to a smaller extent. These regions are characterized by red pine and pine and boreal forests (Chippewa National Forest Web-site).

7.1.4 Sensitive Plant Communities

Information on sensitive plant species communities potentially found along the right-of-way was obtained from the U.S. Fish and Wildlife Service (FWS) and the MNDNR, Natural Heritage Program (NHP). Federal agencies provided information on special status species. Data on species of special concern were provided by the various state wildlife departments. The MNDNR NHP provided information on the status of various wildlife populations. The majority of these species are found primarily in wetland or native prairie habitats.

Mesic Prairie Remnant

This grassland community occurs on rich, moist, well-drained sites. The dominant plant is the tall grass, big bluestem (*Andropogon gerardii*). The grasses little bluestem (*Andropogon scoparius*), Indian grass (*Sorghastrum nutans*), porcupine grass (*Stipa spartea*), prairie dropseed (*Sporobolus heterolepis*), and tall switchgrass (*Panicum virgatum*) are also frequent. The forb layer is diverse in the number, size, and physiognomy of the species. Common taxa include the prairie docks (*Silphium spp.*), lead plant (*Amorpha canescens*), heath and smooth asters (*Aster ericoides* and *A. laevis*), sand coreopsis (*Coreopsis palmata*), prairie sunflower (*Helianthus laetiflorus*), rattlesnake-master (*Eryngium yuccifolium*), flowering spurge (*Euphorbia corollata*), beebalm (*Monarda fistulosa*), prairie coneflower (*Ratibida pinnata*), and spiderwort (*Tradescantia ohioensis*).

A review of the MNDNR NHP database indicated a mesic prairie remnant within the right-of-way of the Burlington Northern & Santa Fe Railroad near MP 817.0. A mesic and wet prairie remnant was also identified within the Canadian Pacific Railway near MPs 875.8 through 896.0.

Prairie Wetland

Grass-dominated but forb-rich herbaceous communities, often with a strong shrub component, on somewhat poorly drained to poorly drained loam soils formed in glaciolacustrine sediments, unsorted glacial till, or less frequently outwash deposits. Present primarily on level to very gently sloping sites. Flooded for brief periods at most; upper part of rooting zone is not saturated for most of growing season. Drought stress is infrequent, usually brief, and not severe. Fires were very frequent historically.

Mixed Cattail Marsh

The mixed cattail marsh community is typically dominated by cattails present on floating mats along shorelines in lakes, ponds, and river backwaters or rooted in mineral soil in shallow wetland basins. Vegetation is often composed of dense stands of cattails interspersed with pools of open water. Associated species are highly variable. Floating leaved and submergence

aquatic plant cover is sparse, with species such as duckweed (*Lemna* spp.) and greater duckweed (*Spirodela polyrhiza*) frequent and common bladderwort (*Utricularia vulgaris*) and common coontail (*Ceratophyllum demersum*) occasionally present. Forb cover is strongly dominated by cattails (*Typha* spp.), usually with greater than 50 percent cover. Shrubs are absent or very sparse.

Wet Brush-Prairie

A review of the MNDNR NHP database indicated a wet brush-prairie native plant community near MP 844. The wet brush-prairie community is typically dominated by graminoids with a strong shrub component to shrub-dominated communities with a strong graminoid component. Principal shrubs are slender willow, Bebb's willow, pussy willow, bog birch, and shrubby cinquefoil, red-osier dogwood is also frequent. Cluster of suckers or saplings of trembling aspen and balsam poplar are often present. The wet-brush prairie also supports Northern Singlespike Sedge (*Carex Scirpoidea).*

7.1.5 General Construction and Operation Impacts and Mitigation

Clearing of herbaceous vegetation during construction is anticipated to be a short-term impact. Active revegetation measures and rapid colonization by annual and perennial herbaceous species in the disturbed areas will restore most vegetative cover within the first growing season. Clearing of woody shrubs and trees will be the primary long-term impact on vegetation associated with the project. Woody shrubs and trees will be allowed to recolonize the temporary construction right-of-way and extra workspaces as described in the EMP (see Appendix B). However, recolonization of disturbed areas by woody shrubs and trees will be slower than recolonization by herbaceous species. As natural succession is allowed to proceed in these areas, the early successional or forested communities present before construction will eventually re-establish.

The clearing of trees in the construction right-of-way could affect uncleared forest vegetation growing along the edges of the cleared areas. By exposing some edge trees to elevated levels of sunlight and wind, evaporation rates and the probability of tree knockdown could increase. Due to the increased light levels penetrating the previously shaded interior, shade intolerant species will be able to grow and the species composition of the newly created forest edge will likely change. The proposed clearing could also temporarily reduce local competition for available soil moisture and light, and may allow some early successional species to become established and persist on the edge of the uncleared areas adjacent to the site.

The project will result in the clearing of approximately 1,342.6 acres of forest land during construction. Approximately 464.5 acres of this forest land will be maintained clear of trees for operational purposes.

Impacts on vegetation adjacent to the project area will be minimized through adherence to soil erosion control specifications and by confining clearing activities to the approved right-of-way and extra workspaces. To prevent damage to adjacent trees, the Applicants will fell trees toward the cleared right-of-way. Upon completion of construction, the Applicants will revegetate disturbed areas in accordance with the EMP (see Appendix B) for the project, unless otherwise directed by landowners or land managing agencies. Timely restoration of the construction right-of-way and reseeding with an appropriate seed mix will minimize the duration of vegetative disturbance.

7.2 WILDLIFE

7.2.1 Existing Wildlife Resources

The projects will be constructed through multiple biomes, including the deciduous and conifer-hardwood forest zones and the prairie zone. Wildlife habitats within these areas are diverse and include open areas, wetlands, and forested areas. Because the pipeline route will cross predominantly agricultural lands within these zones, wildlife habitat is more limited and confined primarily to the undeveloped areas. Existing wildlife resources in these areas are described below.

The projects will cross land that has been altered for agricultural production, including row crops, small grains, hayfields, and pastures. These agricultural fields provide limited wildlife habitat. A few common wildlife species, including white-tailed deer, pheasant, and raccoon, use these areas for feeding and occasional cover. A few bird species such as starlings, crows, eastern meadowlark, and sparrows are occasionally found in the agricultural fields.

Forested areas affected by the project are found primarily along the eastern portion of the pipeline route. Some of the common mammalian species in deciduous forests include white-tailed deer, bear, eastern cottontail rabbit, woodchuck, raccoon, skunk, gray and fox squirrel, gray and red fox, and several species of bat. The structural diversity of the forest provides a variety of habitats that can support a large number of avian species, including songbirds, hawks, and owls (Tester, 1995).

Wetlands affected by the project consist primarily of emergent, scrub-shrub, and forested wetlands. The emergent wetlands provide habitat for a variety of aquatic wildlife, including muskrat, beaver, mink, waterfowl, wading birds, and numerous species of reptiles and amphibians. The scrub-shrub wetlands and forested wetlands provide additional habitat for terrestrial wildlife, such as the white-tailed deer, moose, gray wolf, fox, bear, porcupine, and a variety of small mammals and songbirds.

Open land affected by the project consists primarily of open areas that serve as fallow fields or maintained rights-of-way. The open, grassy areas support several species of birds, numerous small rodents, and several species of snakes. Predatory species such as coyote, fox and variety of hawks hunt the grasslands for the abundant small rodents, birds and reptiles. Other common wildlife species that occasionally may use the open areas include white-tailed deer, raccoon, squirrel, striped skunk, eastern cottontail rabbit, and white-tailed jackrabbit.

7.2.2 Special Wildlife Areas

Deer Yards

MNDNR Area Wildlife Managers were contacted for information on special wildlife areas in the project area. They identified deer yards in the vicinity of the project. A deer yard is an area where deer congregate during the winter months to seek shelter from the elements. Dense stands of northern white cedar are common habitat for deer yards. One yarding area identified by the MNDNR is located south of Floodwood, approximately 0.5 miles from the pipeline route (Staffon, 2000).

7.2.3 General Construction and Operation Impacts and Mitigation

Construction and operation of the project is not expected to have a significant impact on wildlife. Temporary impacts will occur during construction due to clearing of vegetation and disturbance of soils in the right-of-way. Long-term impacts will be limited to a loss of forest habitat because of clearing the temporary construction right-of-way and extra workspaces that are located in forested areas.

Long-term effects on wildlife species will be limited because the pipeline will be collocated with the existing pipeline right-of-way. Overall, construction and operation of the project will not significantly alter the character of the landscape along the pipeline route.

Clearing the construction right-of-way will remove vegetative cover and will cause temporary displacement of wildlife species along the pipeline route. The construction right-of-way and extra workspaces will remain relatively clear of vegetation until the project is completed. Some smaller, less mobile wildlife such as amphibians, reptiles, and small mammals may experience direct mortality during clearing and grading activities. The remaining wildlife, including the larger and more mobile animals, will disperse from the project area as construction activities approach. Displaced species may recolonize in adjacent, undisturbed areas, or re-establish in their previously occupied habitats after construction has been completed and suitable habitat is re-established. The intensity of construction-related disturbances will depend on the particular species and the time of year during construction.

Clearing of herbaceous and shrub communities in the open areas of the temporary right-of-way, both in upland and wetland areas, will be required for pipeline construction. This clearing will cause a short-term impact due to the relatively quick recolonization of plant species that comprise these communities. Herbaceous cover will be seeded on disturbed areas following the completion of pipeline construction and it is expected that pre-existing herbaceous and shrub habitats will quickly become re-established. Consequently, it is expected that the wildlife species that use these habitats will also return relatively soon after construction.

Temporary right-of-way and extra workspaces will be seeded with herbaceous species and allowed to revegetate naturally with tree and shrub species common to the area. The direct and long-term impacts on wildlife that use forests will be the temporary conversion of existing forested habitat to herbaceous-dominated habitat on the temporary construction right-of-way. It is expected that wildlife displaced from the cleared areas will relocate to nearby forests. Over time, natural growth and succession will restore the temporary portion of the construction right-of-way and extra workspaces to a forested community and wildlife typically inhabiting forest habitats will return.

A potential long-term impact on wildlife is associated with the clearing of forest vegetation. The project is parallel to an existing, maintained right-of-way thereby decreasing impacts on undisturbed forests. The project will involve the permanent removal of 464.5 acres of forested habitat for the maintained right-of-way. These areas will be permanently converted to non-forest habitat for the life of the pipeline. It is anticipated that the incremental loss of this forested habitat along the existing cleared right-of-way will not have a significant effect on wildlife species.

7.3 FISHERIES

7.3.1 Existing Fisheries Resources

In Minnesota, the project will cross 57 perennial waterbodies and 71 intermittent waterbodies (see table 9.2.1-1). Most of these waterbodies contain warm water fisheries. The pipeline route will also cross five designated trout streams near the eastern border in Minnesota. MNDNR Area Fish Managers will be contacted for information on fisheries in the waterbodies crossed by the pipeline. Table 7.3.1-1 provides the list of representative fish species identified by the MNDNR for the warm water waterbodies in the project area.

TABLE 7.3.1-1

Representative Fish Species in the Alberta Clipper/Southern Lights Diluent Projects Area

Game Fish	Other Fish
Walleye	Carp
Sauger	Bullhead
Northern pike	Suckers
Muskellunge	Sculpin
Sunfish	Burbot
Crappie	Redhorse
Perch	Minnows and other forage fish
Channel catfish	
Bluegill	
Smallmouth bass	
Largemouth bass	
Brown trout	

7.3.2 General Construction and Operation Impacts and Mitigation

Movement of fish upstream and downstream of the crossing site may be temporarily affected during installation of the pipeline across streams due to disturbances associated with construction. The physical disturbance of the streambed may temporarily displace adult fish and may dislodge other aquatic organisms, including invertebrates. Some limited mortality of less mobile organisms such as small fish and invertebrates may occur within the trenching area. Aquatic plants, woody debris, and boulders that provide in-stream fish habitat will also be removed during trenching. Noise disturbances upstream and downstream of the site will deter fish that may otherwise inhabit the area. These disturbances are temporary and are not expected to significantly affect fisheries resources. Studies have shown that natural re-colonization of the disturbed areas will begin soon after restoration of the streambed and will be completely re-colonized within one year after construction (Schubert et al., 1985; Anderson et al., 1997).

Sediment loads will be temporarily increased downstream during open-cut stream crossings. These increased loads may temporarily affect the more sensitive fish eggs, fish fry, and invertebrates inhabiting the downstream area. However, the suspended sediment levels will quickly attenuate both over time and distance and will not adversely affect resident fish populations or permanently alter existing habitat (McKinnon and Hnytka, 1988). The crossing will be completed as quickly as possible and the suspended sediment levels will return to preconstruction levels after in-stream work is completed.

Most streambank vegetation will be removed across the right-of-way during construction. After construction, an area over the pipeline will be maintained in an herbaceous state and trees that are located near the pipeline will be cut and removed from the right-of-way in accordance with the EMP (see Appendix B). Changes in the light and temperature characteristics of some streams may affect the behavioral patterns of fish, including spawning and feeding activities, at the pipeline crossing location. The maintained shorelines, however, are not wide enough to have a significant impact on general temperature and light conditions of the streams crossed by this project.

To minimize the potential for adverse impacts on the fisheries at river and stream crossings, the Applicants will implement erosion and sediment control measures specified in the EMP and limit the duration of construction in these waterbodies.

7.4 THREATENED AND ENDANGERED SPECIES

The MNDNR and the FWS were consulted on the potential presence of threatened and endangered species in the vicinity of the project. The MNDNR conducted a review of the Minnesota NHP database to determine if any federally or state-listed species are known to occur within approximately 1 mile of the project. The MNDNR provided information on specific occurrences for elements that may be impacted by the project. These occurrences are summarized in Table 7.4.1-1. The FWS indicated that the home ranges of two federally listed species (gray wolf and Canada lynx) are located in the vicinity of the project but no know occurrences of these species have been recorded in the project area (MNDNR, 2006b; FWS, 2006). The U.S. Department of Agriculture, Forest Service (USFS) maintains a list of sensitive wildlife and plant species for the National Forests. The Applicants are working with USFS biologists from the Chippewa National Forest (CNF) to identify habitats along the CNF portion of the pipeline route that have the potential to support any of the designated sensitive species. The Applicants will be working with the USFS to complete a Biological Evaluation for the portion of the project crossing the Chippewa National Forest. The Applicants are also consulting with biologists at the Leech Lake Band of Ojibwe (LLBO) to identify any additional sensitive species in the Leech Lake Reservation not included on the MNDNR, FWS, and USFS lists.

TABLE 7.4.1-1

Natural Heritage Information in the Vicinity of the Alberta Clipper/Southern Lights Diluent Projects

County, State	Feature	Species/Issue
Kittson, Minnesota	Pipeline crossing of a mesic prairie remnant that runs adjacent to the Burlington Northern & Santa Fe Railroad.	Protected ecosystem..
Marshall, Minnesota	Pipeline runs adjacent to wet brush-native prairie community and prairie wetland complex.	Northern Singlespike Sedge (*Carex scirpoidea*).
Marshall, Minnesota	Pipeline runs through a wet brush-native prairie community and in the vicinity of a calcareous seepage fen..	Northern Singlespike Sedge (*Carex scirpoidea*).
Pennington, Minnesota	Pipeline runs through a "Site of Outstanding Biodiversity Significance" which includes a mixed cattail marsh native plant community.	Nelson's sharp-tailed Sparrow (*Ammodramus nelsoni).*
Pennington, Minnesota	Pipeline is adjacent to mesic brush prairie and mesic oak woodland.	Sterile sedge (Carex sterilis)
Pennington, Minnesota	Pipeline crossing of the Red Lake River.	Freshwater mussels: Creek Heelsplitter (*Lasmigona compressa*); Black Sandshell (*Ligumia recta*); Fluted Shell (*Lasmigona costata*).
Red Lake/Polk, Minnesota	Pipeline crossing of Lost River.	Creek Heelsplitter mussels (*Lasmigona compressa*).
Red Lake/Polk, Minnesota	Pipeline runs adjacent to of the Canadian Pacific Railway right-of-way which includes a several mesic and wet prairie remnants.	Protected ecosystem..
Beltrami, Minnesota	Pipeline crossing of Clearwater River	Creek Heelsplitter mussels (*Lasmigona compressa*).
Cass, Minnesota	Pipeline runs adjacent to the existing pipeline right-of-way	*Botrychium* species
Cass, Minnesota	Pipeline right-of-way encroachment of nesting areas	Bald Eagle (*Haliaeetus leucocephalus*)
Itasca, Minnesota	Pipeline right-of-way encroachment of nesting site	Bald Eagle (*Haliaeetus leucocephalus*)
Itasca, Minnesota	Pipeline crossing of Prairie River	Black Sandshell mussels
Itasca, Minnesota	Pipeline crossing of Swan River	Black Sandshell mussels
St. Louis, Minnesota	Pipeline run through or adjacent to several areas identified as "Sites of Moderate Biodiversity Significance"	Aspen-birch forests northern hardwood forests, conifer bogs, cedar swamps, wet meadows, ash and alder swamps, and rich and poor fens
Carlton, Minnesota	Pipeline runs through or adjacent to several areas identified as "Sites of Moderate Biodiversity Significance"	Aspen-birch forests, northern hardwood forests, conifer bogs, cedar swamps, wet meadows, ash and alder swamps, and rich and poor fens

7.4.1 General Construction and Operation Impacts and Mitigation

The Applicants will continue to consult with the MNDNR, FWS, USFS, and the LLBO on the status of mitigative strategies for these species. If any of the species are identified in the construction right-of-way during the surveys, the Applicants will work with these agencies to develop mitigation plans to avoid and minimize impacts on the potentially affected species.

The Applicants will also continue to consult with the MNDNR, FWS, USFS, and the LLBO to determine the exact location of the bald eagle nesting sites. If these sites are located in close proximity to the construction area, the Applicants will develop mitigation plans to avoid adverse effects on the bald eagle. Possible mitigation may include conducting surveys before construction to determine if any bald eagle nests within 0.25 mile of the pipeline route are active and/or avoiding construction within 0.25 mile of active nests during the bald eagle's nesting season between February 1 and August 15.

8.0 GROUNDWATER RESOURCES

Groundwater is the primary source of water for private, public, and industrial uses in residences, communities, and commercial facilities located along the pipeline route. Groundwater occurs in surficial aquifers (water-bearing unconsolidated material deposited above the bedrock surface), buried drift aquifers, and bedrock aquifers. Groundwater quality and quantity is primarily a function of the regions geologic and hydrogeologic setting.

8.1 GLACIAL AQUIFERS

Thick glacial sediments, including till, outwash, and lacustrine deposits, cover much of the project area. Groundwater yields from these glacial deposits vary but typically range from less than 1 gallon per minute (gpm) in till and lacustrine deposits to greater than 500 gpm from outwash deposits (Kanivetsky, 1979). Well depths in the glacial deposits typically range from approximately 30 to 380 feet (USGS, 1985).

Surficial aquifers occur above the bedrock in unconsolidated sediments deposited by glaciers, melt water runoff, and lakes. The depth of the material is generally less than 100 feet, but may reach several hundred feet in some areas (Adolphson et al., 1981). Short-term groundwater yields from unconfined surficial aquifers vary, but can range from 10 gpm to approximately 3,000 gpm.

Surficial aquifers are an important source of groundwater for much of the northern half of the project area and can provide adequate water volumes to supply municipalities and irrigation systems. There are few surficial drift aquifers near the southern end of the project, except in alluvium deposits along the major drainage ways. Water quality of these surficial aquifers can be affected by surface activities, including industrial and agricultural land use, due to the relatively shallow depth of the water table and the relatively coarse texture of the material overlying the aquifer.

Buried drift aquifers occur in well sorted sands and gravels deposited in bedrock valleys, alluvial channels, and outwash plains formed by advancing and retreating glaciers. These deposits subsequently were covered by fine texture materials (generally glacial till), which form a confining layer above the aquifer. The confined buried sand and gravel deposits typically are less than 30 feet thick but may locally occur up to 150 feet thick. Buried drift aquifers have limited potential use for high capacity wells, but constitute an important source of groundwater in the region (Minnesota Pollution Control Agency (MPCA), 1999). Well yields range from approximately 10 gpm to 1,000 gpm (Adolphson et al., 1981). The confining layer (e.g., glacial till) above the aquifer generally protects it from contamination resulting from human activity at the surface. Water quality is typically very good in buried drift aquifers.

8.2 CRETACEOUS AQUIFER

The Cretaceous Aquifer in western and southwestern Minnesota were formed between 65 to 136 million years ago and consist of sandstone lenses near the base of predominantly gray, soft, argillaceous shale (solidified mud and clay) sections. This aquifer was generally confined and where present, ranges from 280 to 620 feet below the surface. Wells using this aquifer commonly yield 10 to 250 gpm, with local yields ranging up to 1,000 gpm. This aquifer is not widely used for ground water except where drift aquifers are absent or where well yields are poor. Most water use from this aquifer is for rural domestic and livestock supplies, and the potential for development of large municipal and industrial water supplies is low.

8.2.1 Red River-Winnipeg Aquifer

The Red River-Winnipeg Aquifer underlies several hundred feet of till and lake sediment of Glacial Lake Agassiz in northeastern North Dakota and northwestern Minnesota, and is composed primarily of sandstone, limestone, and shale formed during the Paleozoic age (225 to 600 million years ago). Water is under confined conditions throughout most of the aquifer. Artesian wells into this aquifer have recorded flows of 60 gpm and pumping wells commonly range from 100 to 250 gpm, with localized flows to 500 gpm. The aquifer, which has a great potential for providing large supplies of water, however, the aquifer is seldom used because the water is highly mineralized and has dissolved-solids concentrations ranging from 3,000 to 60,000 milligrams per liter (mg/l) and has large iron, sodium, and chloride concentrations.

8.2.2 Cambrian-Ordovician Aquifer

The Cambrian-Ordovician aquifer system is a complex multi-aquifer system with individual aquifers separated by leaky confining units. The aquifer/leaky layer sequence is capped by the Maquoketa Shale, a regional confining unit that hydraulically isolates the aquifer system from overlying strata. The Alberta Clipper Project will cross a portion of the Mount Simon aquifer, which is the lowermost aquifer of the Cambrian-Ordovician aquifer system and consists of the coarse- to fine-grained Mount Simon Sandstone and the permeable Hinckley Sandstone in Minnesota. The aquifer is extensively used in the southeastern quarter of Minnesota. The Alberta Clipper project will also cross the Biwabik Iron Formation which water is generally fresh and suitable for drinking except for large concentrations of iron and manganese (USGS, 1985).

8.2.3 Precambrian Undifferentiated Aquifer

The Precambrian undifferentiated aquifer consists of granite, greenstone, and slate, which yield limited supplies of water to rural domestic and livestock wells in southwestern, central, and northeastern parts of Minnesota where fractures, faults, and weatherized zones provide porosity and permeability. These rocks generally do not support aquifers in the rest of the region. Wells using this aquifer are generally at a depth of 30 to 450 feet and provide flows of 5 to 25 gpm with some wells locally exceeding 100 gpm. Yields generally increase where the bedrock is overlain by thick drift, and some wells are drilled several hundred feet into the rocks so that the drilled hole acts as reservoir. Calcium magnesium bicarbonate water is more common in this aquifer and dissolved-solids concentrations are generally less than 300 mg/l.

8.3 EXISTING GROUNDWATER RESOURCES

8.3.1 Public Water Supply Wells

The Applicants reviewed the Minnesota Department of Health (MDH) water well database to identify public water supplies (both groundwater and surface water) potentially located near the pipeline route. This database identified no public water supply wells located in the vicinity of the pipeline route.

8.3.2 Federal and State Designated Aquifers

The pipeline route will not cross any EPA-designated sole-source aquifers (http://www.epa.gov/safewater/swp/ssa/reg5.html). The only EPA-designated sole-source aquifer in Minnesota is the Mille Lacs Aquifer, located more than 40 miles southwest of the

pipeline route. However, the pipeline will cross about 0.4 mile of a Drinking Water Supply Management Areas (DWSMA) near MP 886.4 in the vicinity of Oklee, Minnesota, and 2.8 miles, from MP D1006.8 to D1009.6, of the DWSMA near Grand Rapids. The MDH rates the vulnerability of the Oklee area as low and the Grand Rapids area as low and moderate. The pipeline will cross the Grand Rapids 2 Wellhead Protection Area (WPA), and the Grand Rapids Central WPA (MDH, 2006).

8.3.3 Domestic Water Supply Wells

The Applicants reviewed the Minnesota Geologic Survey and MDH water well information database (County Well Index or CWI) to identify domestic water supply wells along the pipeline route. The CWI is a computerized database that contains basic information for over 340,000 water wells drilled in Minnesota. CWI data is derived from water well contractors' documentation of geologic materials encountered during drilling.

The Applicants' review of the CWI database identified 27 domestic wells within 200 feet of the pipeline route (see table 8.3.3-1). The Applicants will ask landowners along the pipeline route if they are aware of the presence of cased wells in close vicinity to the right-of-way. If such wells are identified, the locations of these wells will be noted. The Applicants will develop site specific plans for wells that are located near the construction right-of-way.

TABLE 8.3.3-1

Domestic Water Supply Wells Identified Within 200 Feet of the Alberta Clipper/Southern Lights Diluent Projects [a]

Approximate Milepost	County	Approximate Distance (feet) from Pipeline Centerline	Direction from Pipeline Centerline
848.4 [b]	Marshall	23	Northeast
919.1	Clearwater	59	Northeast
931.6	Beltrami	52	Southwest
935.5	Beltrami	47	Northeast
937.4	Beltrami	47	Northeast
942.3	Beltrami	46	Southwest
D945.2	Hubbard	39	Northeast
D946.7	Hubbard	51	Southwest
950.4	Hubbard	35	Northeast
D955.2	Cass	50	Southwest
D955.4	Cass	51	Southwest
D958.2	Cass	28	Southwest
D958.2	Cass	57	Southwest
D995.0	Itasca	27	Southwest
D995.4	Itasca	45	Southwest
D995.5	Itasca	52	Northeast
D995.5	Itasca	32	Northeast
D1003.9	Itasca	32	Northeast
D1004.0	Itasca	47	Southwest
D1009.5	Itasca	46	Southwest
D1010.0	Itasca	60	Southwest
1016.0	Itasca	13	Northeast
1018.5	Aitkin	18	Northeast
1023.4	Aitkin	61	Northeast

TABLE 8.3.3-1

Domestic Water Supply Wells Identified Within 200 Feet of the Alberta Clipper/Southern Lights Diluent Projects [a]

Approximate Milepost	County	Approximate Distance (feet) from Pipeline Centerline	Direction from Pipeline Centerline
D1073.7	Carlton	38	Northeast
1078.5	Carlton	44	Southwest
1082.1	Carlton	57	Southwest

[a] Based on a search of Minnesota County Well Index, October 2006.
[b] Enbridge's Viking Pump Station.

8.3.4 Contaminated Groundwater

The Applicants accessed a MPCA database to identify sites with known or potential contamination within 0.5 mile of the project (MPCA, 2005a). This database included federal regulatory listings such as the National Priority List (NPL, or federal Superfund); Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS, or potential NPL sites); No Further Response Action Planned (NFRAP); Resource Conservation and Recovery Act (RCRA) Treatment, Storage, and Disposal (TSDs); and RCRA hazardous waste generators (RCRAGEN). State listings included the Permanent List of Priorities (PLP, or state-equivalent Superfund); Delisted PLP (DPLP); Voluntary Investigation and Cleanup (VIC); Permitted Solid Waste Facilities (PSW); Unpermitted Dumps (UPD); Closed Landfill Program (CLP); and the State Assessment Program (SAP).

Table 8.3.4-1 summarizes the contaminated sites within 0.5 mile of the project. Based on MPCA information and review of aerial photographs, 13 of the 16 sites were determined to be more than 500 feet from the pipeline route and, therefore, are not anticipated to affect the project. Prior to construction of the project, the Applicants will assess the potential for encountering contaminated groundwater near the sites that are within 500 feet of the pipeline route. If necessary, appropriate avoidance or mitigation measures will be developed and implemented in accordance with applicable state or federal regulations.

TABLE 8.3.4-1

Contaminated Sites within 0.5 Mile of the Alberta Clipper/Southern Lights Diluent Projects Route

County, State	Milepost	Distance from centerline (miles)	Entity Name	City	Listing Type
Pennington, Minnesota	854.6	<0.1	Unnamed Dump	Norden Township	Unpermitted Dump
Red Lake, Minnesota	885.6	<0.1	Red Lake County Demo Landfill	Oklee	Solid Waste Permit
Polk, Minnesota	897.1	0.3	Trail Dump	Trail	Unpermitted Dump
Polk, Minnesota	897.7	0.2	Gully Dump	Gully	Unpermitted Dump
Clearwater, Minnesota	902.9	0.2	Gonvick Dump	Gonvick	Unpermitted Dump
Beltrami, Minnesota	941.4	0.4	Cedar Serv Inc.	Bemidji	NFRAP
Beltrami, Minnesota	942.7	0.3	Beltrami County Demolition Landfill	Bemidji	SW_PERM
Cass, Minnesota	D954.9	0.3	Champion International Corp.	Cass Lake	NPL
Itasca, Minnesota	986.2	0.2	Unnamed Dump - Ballclub/2	Ball Club	Unpermitted Dump
Itasca, Minnesota	989.7	0.1	American Disposal Transfer Station	Morse	SW_PERM
Itasca, Minnesota	992.1	0.0	Deer River Dump - 1	Deer River	Unpermitted Dump
Itasca, Minnesota	D1003.6	0.3	Zenith Kramer Can-Do Recycling	Cohasset	SW_PERM
Itasca, Minnesota	1021.0	0.2	Warba Dump	Warba	Unpermitted Dump
Carlton, Minnesota	1071.2	0.3	Cloquet Salvage Yard	Iverson	NFRAP
Carlton, Minnesota	1080.0	0.3	Wrenshall Dump	Wrenshall	Unpermitted Dump
Carlton, Minnesota	1082.0	0.5	Conoco Inc. Lakehead Tank Farm	Wrenshall	CERCLIS

[a] Contaminated sites were identified through federal and state database searches.

One federal Superfund site, the St. Regis Paper Company site in the City of Cass Lake (listed in the above table as Champion International Corp.), exists near the project. The pipeline, which will be installed in the same corridor as the existing pipelines, is adjacent to, but outside of the Superfund site boundary. The Applicants will consult with the appropriate regulatory agencies to confirm the project will not encounter contamination from the site.

8.4 GENERAL CONSTRUCTION AND OPERATION IMPACTS AND MITIGATION

Construction of the Alberta Clipper Project is not expected to have long-term impacts on groundwater resources. Ground disturbance associated with pipeline construction is primarily limited to the upper 10 feet, which is above the water table of most of the regional aquifers. Construction activities such as trenching, backfilling, and dewatering that encounter shallow surficial aquifers may result in minor short-term fluctuations in groundwater levels within the aquifer. Once the construction activity is complete, the groundwater levels typically recover quickly.

8.4.1 Blasting

Blasting to install the pipeline in a bedrock aquifer has the potential to adversely affect water quality and water yields in nearby water wells. Less than one percent of the pipeline route, all of which is in St. Louis County, will cross areas with shallow bedrock. If blasting is required, the Applicants will conduct these activities in accordance with applicable regulations.

8.4.2 Spills and Leaks

The introduction of contaminants to groundwater due to accidental spills of construction related chemicals, fuels, or hydraulic fluid could have an adverse affect on groundwater quality, most notably near shallow water wells. Spill-related impacts from pipeline construction are primarily associated with fuel storage, equipment refueling, and equipment maintenance. The Applicants' SPCC outlines measures that will be implemented to prevent accidental releases of fuels and other hazardous substances. The SPCC also describes response, containment, and cleanup procedures. By implementing the protective measures set forth in the SPCC, long term contamination due to construction activities is not anticipated. A copy of the Applicants' SPCC is included as Appendix C.

Accidental leaks from the pipeline system during operations can also potential affect groundwater. As part of the pipeline operation, which is regulated by the Department of Transportation – Office of Pipeline Safety, the Applicants have an ongoing inspection program to monitor the integrity of the pipeline system. Monitoring activities include regular inspection of the cathodic protection system, which addresses the possible corrosion potential for a steel piped installed below the ground surface. In addition, the Applicants use computerized inspection tools that travel through the inside of the pipeline to check pipe integrity. The Applicants also perform regular aerial flyovers to inspect the pipeline right-of-way. As required by federal law, the Applicants maintain an Emergency Response Plan, which has been reviewed an approved by the Department of Transportation – Office of Pipeline Safety to address pre-planning, equipment staging, notifications, and leak containment procedures to be implemented in the event of a pipeline leak.

9.0 SURFACE WATER RESOURCES

Minnesota is known for its abundant surface water resources, including lakes, rivers, streams, and wetlands. From a water resource management perspective, Minnesota is divided into 10 major drainage basins which are used by governing agencies to identify and assess water quality issues and develop water quality protection goals.

9.1 MAJOR BASINS AND WATERSHEDS

Surface waters crossed by the pipeline route are located within the Red River of the North, Mississippi Headwaters, St. Croix River, and Western Lake Superior Basins. Table 9.1-1 summarizes the watersheds crossed by the projects, which are also shown on figure 9.1-1.

The Red River of the North Basin encompasses a 35,530-square-mile surface drainage area to the main stem of the Red River of the North within the United States. The basin represents an important hydrologic region where good quality water is a valued resource vital to the region's economy. Additionally, the drainage flows northward into Manitoba, Canada and is of international concern. The Red River of the North receives most of its flow from its eastern tributaries largely as a result of regional patterns in precipitation, evapotranspiration, soils and topography. Annual runoff varies greatly, but most runoff occurs in spring and early summer from rains falling on saturated soils.

The Mississippi Headwaters Basin covers approximately 20,100 square miles. The basin is a mixture of forest, prairie, agriculture and urban land areas. From the headwaters, the Mississippi River flows south 2,350 miles, to the Gulf of Mexico (MPCA, 2000).

The St. Croix River Basin covers approximately 7,760 square miles in Minnesota and Wisconsin, and extends from near Mille Lacs Lake in Minnesota on the west to near Cable, Wisconsin, on the east. Approximately 46 percent of the watershed is located in Minnesota (MPCA, 2007).

The Lake Superior Basin covers approximately 6,200 square miles. The Lake Superior Basin is Minnesota's only basin that is on a Great Lake coastline. Much of the land within the Lake Superior basin is forested, with very little agriculture due to the cool climate and poor soils. All streams within the basin eventually flow to Lake Superior (MPCA, 1997).

The project will cross three watershed management districts, the Two Rivers, Middle-Snake-Tamarac, and Red Lake districts, as discussed in section 4.2.2. The primary purpose of these watershed districts and organizations is to conserve the natural resources of the state through land use planning, flood control, and other conservation practices.

TABLE 9.1-1

Watersheds Crossed by the Albert Clipper/Southern Lights Diluent Projects Route

Basin Name [a]	Watershed Name	Hydraulic Unit Code (HUC) [b]	Milepost In	Milepost Out	Crossing Length (miles)
Red River of the North	Tamarac River	09020311	801.8	833.9	32.4
	Snake River	09020309	833.9	850.1	16.4
	Grand Marais Creek	09020303	850.1	853.0	2.9
	Red Lake River	09020303	853.0	874.8	21.8
	Clearwater River	09020305	874.8	924.5	50.1
Upper Mississippi	Mississippi River – Headwaters	07010101	924.5	941.6	17.0
	Leech Lake River	07010102	941.6	949.4	8.0
	Mississippi River – Headwaters	07010101	949.4	949.5	0.1
	Leech Lake River	07010102	949.5	949.6	0.1
	Mississippi River – Headwaters	07010101	949.6	960.7	10.7
	Leech Lake River	07010102	960.7	971.8	11.0
	Mississippi River – Headwaters	07010101	971.8	974.2	2.5
	Leech Lake River	07010102	974.2	976.1	1.9
	Mississippi River – Headwaters	07010101	976.1	976.9	0.8
	Leech Lake River	07010102	976.9	977.1	0.2
	Mississippi River – Headwaters	07010101	977.1	977.4	0.3
	Leech Lake River	07010102	977.4	982.1	4.6
	Mississippi River – Headwaters	07010101	982.1	983.0	0.9
	Leech Lake River	07010102	983.0	983.6	0.6
	Mississippi River – Headwaters	07010101	983.6	D1006.2	22.8
	Mississippi River – Grand Rapids	07010103	D1006.2	1028.6	23.4
Western Lake Superior	St. Louis River	04010201	1028.6	1068.7	40.1
St. Croix River	Kettle River	07030003	1068.7	1069.3	0.6
Western Lake Superior	St. Louis River	04010201	1069.3	1075.2	6.0
	Nemadji River	04010301	1075.2	1078.8	3.6
	St. Louis River	04010201	1078.8	1080.3	1.6
	Nemadji River	04010301	1080.3	1084.8	4.5

[a] Minnesota DNR - http://www.dnr.state.mn.us/watersheds/map.html

[b] USGS - http://gisdmnspl.cr.usgs.gov/cgi-bin/mapserv.exe?map=c:/apache2/htdocs/watershed/major_basins.map

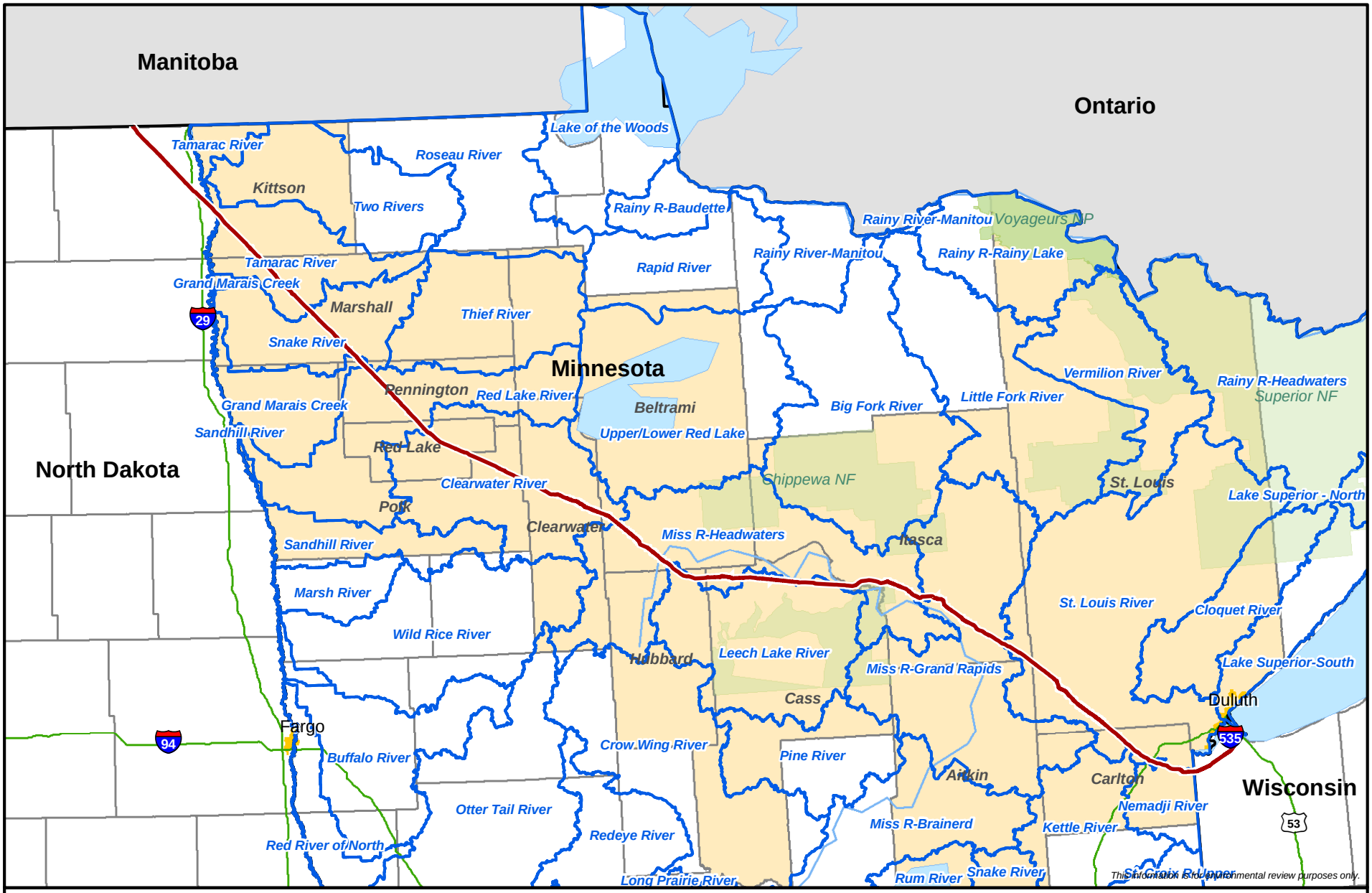

Figure 9.1-1
Alberta Clipper and Southern Lights Diluent Projects
Watershed Basins in the Project Area

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9.2 WATERBODY CROSSINGS

9.2.1 Existing Waterbodies

The Applicants reviewed existing maps, USGS 7.5-minute-series topographic maps, NWI Maps, MNDNR Protected Waters and Wetlands Maps, and Minnesota Public Recreation Information Maps, and aerial photography to identify waterbodies (lakes, streams, rivers, and drainage ditches) crossed by the route. This review identified 128 waterbodies crossed by the pipeline route including 57 perennial streams and 71 intermittent streams. Ten of these waterbodies are designated as Protected Waters by the MNDNR. Waterbodies crossed by the projects are summarized in table 9.2.1-1. A list of individual waterbodies crossed by the projects is included in Appendix H. Waterbody widths at the point of each crossing will be determined pending field review. The Applicants will determine the appropriate crossing method for each waterbody upon further consultation with appropriate regulatory agencies.

TABLE 9.2.1-1

Summary of Waterbodies Crossed by the Alberta Clipper/Southern Lights Diluent Projects Route [a]

County, State	Intermittent[b]	Perennial[b]	Protected[c]	Wild and Scenic Rivers	State/County Canoe Routes	Trout Streams[d]
Kittson, Minnesota	7	1	2	0	1	0
Marshall, Minnesota	15	3	4	0	0	0
Pennington, Minnesota	12	1	3	0	1	0
Red Lake, Minnesota	6	3	2	0	0	0
Polk, Minnesota	2	5	0	0	0	0
Clearwater, Minnesota	12	8	7	0	0	1
Beltrami, Minnesota	1	7	6	0	1	1
Hubbard, Minnesota	4	0	3	0	0	1
Cass, Minnesota	0	5	0	0	0	0
Itasca, Minnesota	6	12	7	0	1	0
Aitkin, Minnesota	0	2	0	0	0	0
St. Louis, Minnesota	2	6	5	0	0	0
Carlton, Minnesota	4	4	3	0	0	2
Total	71	57	42	0	4	5

[a] Based on review of U.S. Geological Survey (USGS) 7.5-minute-series topographic maps, Minnesota Department of Natural Resources (MNDNR) Protected Waters maps, National Wetland Inventory (NWI) maps, Minnesota Public Recreation Information Maps, and aerial photography.
[b] Perennial or intermitted as depicted on 1:24,000 USGS topographic maps.
[c] Protected as depicted on MNDNR Protected Waters and NWI maps.
[d] Trout as designated a Trout Stream, per Minnesota Rules 6264, Subp.4.

9.2.2 Water Quality

The CWA, Section 303(c), requires that each state review, establish, and revise water quality standards for all surface waters within the state. To comply with this requirement, each state crossed by the projects has developed its own beneficial use classification system to describe state designated use(s). Regulatory programs for water quality standards include default narrative standards, nondegradation provisions, a Total Maximum Daily Load (TMDL) regulatory process for impaired waters, and associated minimum water quality requirements for the designated uses of listed surface waterbodies within the state.

9.2.2.1 Minnesota

The projects will cross seven impaired rivers as identified by the Minnesota 2006 Integrated Water Quality Assessment Report list of impaired Waters Requiring a TMDL per Section 303 (d) CWA. Table 9.2.2-1 lists these waterbodies, their designated use, and reason for impairment.

TABLE 9.2.2-1

Proposed Crossings of Minnesota Impaired Waters

Waterbody	County	Milepost	Designated Use	Use Support [a]	Impairment
Red River of the North	Kittson	801.71	Aquatic Consumption	5A	Mercury Fish Consumptive Advisory (FCA), PCB FCA
Tamarac River	Marshall	828.81-829.08	Aquatic Life	5C	Fish IBiotic Impairment
Red Lake River	Pennington	864.4	Aquatic Consumption	5C	Mercury FCA
Clearwater River	Red Lake	875.45	Aquatic Recreation	5A	Fecal Coliform
			Aquatic Life	5A	Low Oxygen
			Aquatic Consumption	5A	Mercury FCA
Lost River	Red Lake	885.88	Aquatic Life	5C	Low Oxygen
Silver Creek	Clearwater	907.15-907.77	Aquatic Recreation	5C	Fecal Coliform
Swan River	Itasca	1024.32	Aquatic Life and	5A	Dissolved Oxygen
			Aquatic Consumption	5A	Mercury FCA

[a] Category 5 has the following three sub-categories: 1) 5A: Impaired by multiple pollutants and no total maximum daily load (TMDL) study plans are approved by the U.S. Environmental Protection Agency (EPA); 2) 5B: Impaired by multiple pollutants and at least one TMDL study plan is approved by EPA; 3) 5C: Impaired by one pollutant and no TMDL study plan is approved by the EPA.

9.2.3 Special Designated Waterbodies

Outstanding Resource Value Water

The project route will be approximately 400 feet south of a wetland designated as an Outstanding Resource Value Water (ORVW) by the MNDNR: the Viking Fen in Marshall County (based on review of Minnesota Rules 7050.0470). ORVW are provided an additional level of protection to preserve their values for recreational, cultural, aesthetic, or scientific resources. The Applicants are consulting with the MNDNR on measures to properly identify and avoid this resource.

Wild and Scenic Rivers

The Nationwide Rivers Inventory (NRI) is a listing of more than 3,400 free-flowing river segments in the United States that are believed to possess one or more "outstandingly remarkable" natural or cultural values judged to be of more than local or regional significance. Pursuant to Section 5(d) of the National Wild and Scenic Rivers Act, the National Park Service (NPS) maintains a NRI of river segments that potentially qualify as national wild, scenic, or recreational river areas. Under a 1979 Presidential directive and related Council on Environmental Quality regulations, all federal agencies must seek to avoid or mitigate actions that will adversely affect NRI segments. NRI waterbodies are to be taken into consideration by

each federal agency in its normal planning and environmental review process. Impacts need to either be avoided or mitigated to prevent adverse effects on the river. In addition, federal agencies need to consult the NPS prior to review of actions which may adversely affect a river listed on the NRI.

The project will cross the Middle, Red Lake, Clearwater and Prairie Rivers in Minnesota, which are currently listed on the NRI. The Applicants will consult with the appropriate state and federal agencies prior to crossing any river listed on the NRI.

State and County Canoe/Boating Routes

The pipeline route will cross four waterbodies listed as state-designated canoe and boating routes. These waterbodies are the Red River of the North, the Red Lake River, and the Mississippi River, which will be crossed twice. The MNDNR manages canoe/boating routes in the state, and the Applicants will consult with the MNDNR regarding appropriate crossing plans.

9.2.4 Waterbody Construction Methods

The Applicants are planning to install the pipeline under most waterbodies using the open-cut method; however, a dry crossing method, such as the dam-and-pump or flume method, may be used where warranted by site conditions, stream type, and/or presence of sensitive species. The Applicants are evaluating the use of the HDD method to cross the Red River of the North and the Red Lake River. The following sections describe typical construction procedures that will be used to install the pipeline across waterbodies.

Clearing and Grading

The Applicants will clear existing vegetation from the construction right-of-way as necessary to prepare for grading operations. A 10-foot buffer of undisturbed non-woody vegetation will be maintained on stream banks until the trenching begins at the stream crossing. Woody vegetation within this buffer may be cut manually and removed during initial clearing of the right-of-way. Additionally, some limited grading at stream banks may be necessary to install temporary bridges across streams. Grading will be directed away from the waterbody to reduce the potential for material to enter the waterbody.

Prior to trenching, the Applicants may need to grade approaches to waterbodies to create a safe working surface and to allow for limitations on pipe bending. Temporary erosion control measures (e.g., silt fences, straw bales) will be installed as necessary to minimize the potential for disturbed soils to enter the waterbody from the right-of-way as discussed in the EMP (see Appendix B). Extra workspaces at waterbody crossings typically will be set back 50 feet from the water's edge where topographic and other site conditions permit.

Spoil containment devices such as silt fence and/or straw bales will be installed and set back from the waterbody bank to minimize the potential for sediment to migrate off the construction right-of-way and back into the waterbody.

Temporary Equipment Bridges

To allow the passage of equipment along the construction right-of-way, temporary bridges will be installed across waterbodies with the possible exception of: waterbodies that are too wide to bridge; minor waterbodies such as agricultural and intermittent drainage ditches; and

waterbodies that are not state-designated fishery streams. Equipment bridges generally will be installed during the clearing and grading phase of construction. Construction equipment, with the exception of clearing/bridge installation equipment, will be required to use the bridge to cross over the waterbody. The clearing equipment typically must cross the streams prior to bridge installation. Care will be taken to minimize bed and bank disturbance during bridge installation.

Equipment bridges will consist of one of the following: clean rock placed over flume pipes; prefabricated construction mats placed over the waterbody with or without a culvert; or flexi-float or other temporary bridging. Equipment bridges will be designed to pass the maximum foreseeable flow of the stream, and will be maintained to prevent flow restriction while the bridge is in place. Bridges will be cleaned as necessary to minimize loose soil from equipment entering the stream. Bridges will be removed during final cleanup of the right-of-way.

Trenching and Installation

After the initial clearing and grading is completed, the pipeline will be installed across the waterbodies using one of these four methods: open-cut, dam-and-pump, flume, or HDD as discussed in the EMP (see Appendix B). These methods are described below.

Open-cut Method

The open-cut method, also called the wet trench method, is a waterbody crossing technique that often minimizes total duration of in-stream disturbance. This method will involve excavating the trench through the waterbody or ditch using draglines or backhoes operating from the stream banks. Spoil excavated from the waterbody bed or banks will be temporarily placed on the right-of-way at least 10 feet from the water's edge or in extra workspaces typically set back 50 feet from the water's edge, except where the adjacent upland consists of actively cultivated or rotated cropland or other disturbed land. Spoil containment devices such as silt fences and/or straw bales will be installed to contain the spoil and to minimize the potential for sediment to migrate off of the construction right-of-way and back into the waterbody.

During excavation of the in-stream trench, earthen "trench plugs" will be left at each end of the excavation to isolate the in-stream trench segment from the adjacent pipeline trench and to prevent the stream flow from entering the adjacent excavated pipeline trench. When the trench through the waterbody is excavated to the appropriate depth, the trench plugs will be removed and a prefabricated section of pipe will be positioned and lowered into the trench. The trench then will be backfilled and the pipeline ends will be tied into the adjacent pipeline segments.

The Applicants will attempt to complete in-stream trenching and backfilling within 24 hours for minor waterbodies (<10 feet wide) and within 48 hours for waterbodies greater than 10-feet wide but less than 100 feet wide. Site-specific crossing conditions, permit requirements, or weather conditions may extend the completion of crossings beyond these time frames.

Dam-and-Pump Method

The dam-and-pump method is a dry crossing method used for sensitive streams with low gradients and flow or sensitive streams with meandering channels. This method involves constructing temporary dams, generally consisting of sandbags, plastic sheeting, and/or steel bulkheads, across the waterbody upstream and downstream of the crossing prior to excavation. Pumps will be used to transport the stream flow around the construction area. Pumping activities will commence simultaneously with dam construction to prevent interruption of downstream flow. The downstream discharge will be directed into an energy-dissipation device (e.g., splash pup, concrete weight, or equivalent) where required to prevent scouring of the waterbody bed or adjacent banks. The pump capacity will be greater than the anticipated flow of the waterbody being crossed. The pumping operation will be staffed continually and pumping will be monitored and adjusted as necessary to maintain the flow of water downstream and prevent excessive drawdown of the waterbody, upstream of the construction area. Additionally, a backup pump or pumps will be onsite in the event that the primary pump(s) fails.

Once the dams and pumps have routed the stream flow around the construction area, the water from the area between the dams will be pumped into a straw bale or similar dewatering structure. Dewatering structures will be located in well-vegetated upland areas, if present, and will be designed in a manner to prevent the migration of heavily silt-laden water into waterbodies or wetlands. Backhoes working from one or both waterbody banks, or within the isolated waterbody bed, will excavate the trench across the waterbody to the appropriate depth. Spoil will be temporarily stockpiled on the construction right-of-way at least 10 feet from the water's edge and/or in temporary extra workspaces at least 50 feet from the water's edge and contained by silt fence and/or staked straw bales.

After the trench is excavated to the proper depth, a prefabricated section of pipe will be positioned and lowered into the trench. The trench will then be backfilled with the material excavated from the stream, unless otherwise specified in federal or state stream crossing permits. The bottom contours of the streambed and the stream banks will be restored as near as practicable to preconstruction condition prior to removing the dams and restoring the stream flow. Water that accumulated in the construction area will be pumped into a straw bale or similar dewatering structure prior to backfilling and/or removal of the dams.

Flume Method

The flume method is a dry crossing method used for sensitive, relatively narrow waterbodies free of large rocks and bedrock at the trenchline and that have a relatively straight channel across the construction right-of-way. The flume method generally is not appropriate for wide, deep, or heavily flowing streams. This method will involve placing one or more pipes (i.e., flumes) in the waterbody bed to convey stream flow and isolate the construction area. The capacity of the flume(s) will be sufficient to transport the maximum flows that can be generated seasonally within the waterbody. Flume(s) typically will be 40 to 60 feet in length and will be installed before trenching. Flume pipes will be aligned to prevent impounding of water upstream of the construction area or to cause erosion downstream.

The upstream and downstream ends of the flume(s) will be incorporated into dams made of sandbags and plastic sheeting (or equivalent). The upstream dam will be constructed first and will funnel stream flow into the flume(s). The downstream dam will then be constructed to prevent water from flowing back into the area to be trenched. The dams will be monitored and adjusted as necessary to minimize leakage. The flume will remain in place until the portion of

the pipeline under the stream is installed, the trench is backfilled, and the stream banks are restored.

Prior to trenching, the area between the dams typically will be dewatered. Backhoes are located on one or both of the waterbody banks or work within the isolated segment of the waterbody bed and will excavate a trench across the waterbody and under the flume(s). Excavated spoil material will be placed on the construction right-of-way and/or in temporary extra workspaces and will be contained by silt fences and/or staked straw bales. Water that accumulates in the construction area will be pumped into a dewatering structure prior to backfilling or removal of the dams.

After the trench is excavated to the proper depth, a prefabricated section of pipe will be positioned and lowered into the trench beneath the flume pipe(s). The trench is then backfilled with the material excavated from the stream unless otherwise specified in federal or state stream crossing permits. The bottom contours of the streambed and the stream banks will be restored as near as practicable to preconstruction conditions prior to removing the dams and flume pipes and returning the stream flow.

Horizontal Directional Drilling Method

The Applicants will evaluate use of the HDD method at selected waterbody crossings. This method can be used to minimize or avoid impacts on the streambed, banks, and associated riparian vegetation at the waterbody crossing. The feasibility of this method is dependent on subsurface geology and length of the drill path. The HDD method also requires additional temporary extra workspaces on both sides of the drilled area for materials and equipment associated with the drilling operation and to fabricate the pipeline segment that will be installed under the waterbody.

The HDD method will be accomplished in three general stages. The first stage will consist of drilling a small diameter pilot hole along a pre-determined path under the waterbody. The second stage will involve incrementally enlarging or “reaming” the pilot hole to a diameter that will accommodate the pipeline. The third stage will involve pulling a prefabricated segment of pipeline through the enlarged hole and then welding the pipe segment to the adjoining sections of pipeline.

Throughout the process of drilling and enlarging the pilot hole, a bentonite clay slurry (“drilling mud”) will be circulated through the drilling tools to lubricate the drill bit, remove drill cuttings, and stabilize the open hole. Drilling mud will be recycled to the extent practicable, and after the pipeline is installed, the mud will be disposed of according to applicable regulations. The Applicants have prepared a Drilling Mud Containment, Response, and Notification Plan that identifies procedures to address the potential for the inadvertent release of drilling mud during HDD operations (see Appendix G).

The Applicants will conduct geotechnical investigations to evaluate the feasibility of using the HDD method at the selected waterbodies. Geotechnical investigations are necessary because the pipeline route will cross regions with soils that may not be conducive to HDD technology, such as soils containing cobbles, boulders, layers of gravel, and/or non-cohesive sands. If these investigations determine that there potentially could be installation problems using the HDD method at the waterbody crossing, an alternate, environmentally acceptable method will be specifically designed for the crossing.

Restoration and Revegetation

The following discussion on restoration and revegetation applies to streams crossed using the open-cut, dam-and-pump, and flume crossing methods. Typically, stream bank and streambed restoration and stream bank revegetation will not be necessary when the stream is crossed using the HDD method.

After the trench is excavated to the proper depth, a prefabricated section of pipe will be lowered into position and the trench will be backfilled with the material excavated from the stream. Backfilling will commence after the pipe is positioned in the trench at the desired depth. Backfill material will consist of the spoil material excavated from the trench unless otherwise specified in federal or state stream crossing permits. The bottom contours of the streambed and the stream banks will be restored as near as practicable to preconstruction contours and condition. Steep stream banks will be re-contoured to a more stable configuration. If there is a potential for significant bank erosion, the disturbed banks will be stabilized with rock riprap or other bank protection measures. Jute thatching or erosion control blankets will be installed on the stream banks upslope of the riprap or on the entire bank if no riprap is used. The banks and adjacent disturbed areas will be seeded in accordance with seeding recommendations and/or permit stipulations, and mulch will be applied as needed on slopes. Stream banks will be stabilized and temporary sediment barriers will be re-installed within 24 hours of completing the crossing (weather and soil conditions permitting) to minimize the potential for sedimentation. Trench breakers will be installed at the stream banks, as needed, where slopes are adjacent to the waterbodies.

Flumes and temporary dams will be removed from the streambed after the crossing has been returned to original grade and the banks have been reconstructed and stabilized with erosion control materials. Temporary erosion control measures will be installed and maintained until permanent erosion control measures are installed and effective. Permanent slope breakers will be installed, where needed, across the full width of the right-of-way during final clean-up.

Where necessary for access, the travel lane portion of the construction right-of-way and the temporary bridge will remain in place until final clean-up activities. Temporary bridges will be removed after final clean-up, seeding, mulching, and other right-of-way restoration activities have been completed. The temporary erosion control measures will be removed after vegetation has been re-established.

The pipe section installed under the stream will be connected (tied-in) to the pipeline. If trench dewatering is necessary during the tie-in process, the water will be pumped into a filtration device located in well-vegetated areas and in a manner to prevent the migration of heavily silt laden water into waterbodies or wetlands.

9.2.5 General Construction and Operation Impacts and Mitigation

Pipeline construction across rivers and streams can result in temporary and long-term adverse environmental impacts if not mitigated. Temporary impacts from in-stream trenching could include an increase in the sediment load downstream of the crossing location. Sustained periods of exposure to high levels of suspended solids have been shown to cause fish egg and fry mortality and other deleterious impacts on fisheries and other aquatic resources. Surface runoff and erosion from the cleared right-of-way also can increase in-stream sedimentation during construction resulting in the shallowing of pools and a reduction of the quality of

spawning beds and benthic substrate. The Applicants' proposed waterbody construction methods, specifically with respect to erosion control, bank stabilization, and bank revegetation, will minimize short- and long-term impact on the waterbodies along the pipeline route.

Long-term impacts on water quality can result from alteration of the streambanks and removal of riparian vegetation. Soil erosion associated with surface runoff and streambank sloughing can also result in the deposition of sediments in waterbodies. Sediments deposited on stream bed gravel could result in fish egg mortality and damaged spawning habitat. Removal of riparian vegetation also can lead to increased light penetration into the waterbody, causing increased water temperature, which potentially could be detrimental to coldwater fisheries.

The Applicants will avoid and minimize impacts on waterbodies by implementing the erosion and sediment control measures described in the EMP (see Appendix B). The Applicants also will limit the duration of construction within waterbodies and limit equipment operation within waterbodies to the area necessary to complete the crossing. Disturbed areas at crossings will be restored and stabilized as soon as practical after pipeline installation.

Alternative construction techniques (such as HDD or dry crossing methods) may be used at selected waterbodies to avoid and minimize impacts on these waterbodies. The HDD method is a well-established construction technique for installing pipeline under large waterbodies that avoids impacts associated with conventional open-cut methods. HDD installations have the potential to affect waterbodies, however, through inadvertent releases of drilling muds during construction. If HDD is used to cross waterbodies, the Applicants will follow the provisions of its Drilling Mud Containment, Response, and Notification Plan (see Appendix G) to prevent an inadvertent release of drilling mud or to minimize environmental effects in the event that a release occurs.

Spills from refueling operations, fuel storage, or equipment failure in or near a waterbody could affect aquatic resources and contaminate the waterbody downstream of the release point. The Applicants will minimize the potential impact of spills of hazardous materials by adhering to the relevant provisions in its SPCCP (see Appendix C).

9.2.6 Hydrostatic Testing

The Applicants will hydrostatically test the new pipe to verify its integrity prior to placing the pipeline in service. Hydrostatic testing will be conducted in accordance with the Office of Pipeline Safety regulations. The procedure consists of filling a section of pipe with water and maintaining a prescribed pressure for a prescribed period of time.

The Applicants are evaluating potential sources for appropriating hydrostatic test water, including major waterbodies crossed by or adjacent to the pipeline and/or groundwater sources such as high-capacity irrigation wells or municipal wells. The Applicants are also evaluating transferring water from one test section to another to minimize the total quantity of water needed to complete the hydrostatic test. The Applicants will obtain the applicable water appropriation and discharge permits for hydrostatic testing activities.

Water used for hydrostatic testing will be discharged on land, returned to the waterbody where it was appropriated, or discharged to a different waterbody after hydrostatic testing is completed, depending on the National Pollutant Discharge Elimination System permit stipulations. If the water is discharged to an upland area, energy dissipation devices such as

straw bale structures and controlled discharge rates will minimize the potential for erosion and subsequent release of sediment into nearby surface waters and wetlands. If hydrostatic test water is discharged directly into waterbodies, energy dissipation devices will be used to reduce the discharge energy to prevent stream bottom scour. The Applicants also will control the rate of discharge to prevent stream bottom scouring. No chemical additives will be introduced to the water used to hydrostatically test the new pipeline, and no chemicals will be used to dry the pipeline following the hydrostatic testing.

9.3 WETLAND CROSSINGS

9.3.1 Existing Wetland Resources

The Applicants identified wetlands along the pipeline route using NWI map data in digital format. This allowed digital analysis of wetland crossings using ArcView GIS® software. In addition, aerial photographs of the pipeline route were used in conjunction with the NWI maps to determine if wetlands adjacent to the right-of-way could be affected by pipeline construction.

For routing and planning purposes, the Applicants used the NWI data to estimate the number, size, and locations of wetlands along the pipeline route. The Applicants conducted wetland delineation surveys along the pipeline route in the fall of 2006 to more accurately identify the wetlands that will be affected during project construction. Additional wetland surveys will be conducted during the “growing season” of 2007, as necessary. Wetlands were identified and mapped in general accordance with the Routing Determination method as specified in the *Corps of Engineers Wetland Delineation Manual* (U.S. Army Corps of Engineers (COE), 1987). A total of 475 wetlands were identified within a 150-foot-wide survey corridor along the pipeline route. A summary of the wetlands crossed by the pipeline route is provided in table 9.3.1-1.

TABLE 9.3.1-1

Summary of NWI Wetland Types Crossed by the Alberta Clipper/Southern Lights Diluent Projects Route

County	Distance (miles)	Number of Wetlands
Kittson	0.0	3
Marshall	0.2	5
Pennington	0.8	20
Red Lake	0.6	14
Polk	2.3	14
Clearwater	2.1	42
Beltrami	1.3	26
Hubbard	0.9	14
Cass	9.8	89
Itasca	14.4	120
Aitkin	2.6	3
St. Louis	5.2	57
Carlton	5.7	66
Total	45.9	475

A total of approximately 45.9 linear miles of wetlands will be crossed by the pipeline route. Predominant wetland types crossed by the project are palustrine emergent (PEM), palustrine shrub-scrub (PSS), and palustrine forested wetlands (PFO). Common plant species identified in these wetlands include: broad-leaved cattail (*Typha latifolia*), reed canary grass

(*Phalaris arundinacea*), lake sedge (*Carex lacustris*), water sedge (*Carex aquatilis*), speckled alder (*Alnus rugosa)*, black willow (*Salix nigra*), black ash (*Fraxinus nigra*), tamarack (*Larix laricina*), and black spruce (*Picea mariana*). A summary of the wetlands types crossed, the total length of crossing, and area affected are presented in table 9.3.1-2.

TABLE 9.3.1-2

Summary of NWI Wetlands Affected by Construction of the Alberta Clipper/Southern Lights Diluent Projects

County	Wetland Type [a]	Distance (miles)	Acres Affected [b]	Number of Wetlands
Kittson				
	PEM	0.0	0.6	3
Kittson Total		0.0	0.6	3
Marshall				
	PEM	0.1	0.9	3
	PFO	0.1	1.6	3
	PSS	0.0	0.4	1
Marshall Total		0.2	2.9	7
Pennington				
	PEM	0.5	7.4	13
	PSS	0.2	2.5	4
	PUB	0.0	0.6	2
	R2U	0.0	0.6	1
Pennington Total		0.7	11.1	20
Red Lake				
	PEM	0.5	7.8	9
	PFO	0.1	1.6	2
	PUB	0.0	0.0	1
	R2U	0.0	0.6	2
Red Lake Total		0.7	9.9	14
Polk				
	PEM	1.5	22.8	8
	PSS	0.7	11.1	5
	PUB	0.0	0.6	1
Polk Total		2.3	34.4	14
Clearwater				
	L1U	0.0	0.0	1
	PEM	1.0	14.4	24
	PFO	0.5	7.2	3
	PSS	0.6	9.8	14
Clearwater Total		2.1	31.5	42
Beltrami				
	PEM	0.5	8.1	13
	PFO	0.4	6.3	4
	PSS	0.3	4.7	7
	R2U	0.0	0.6	2
Beltrami Total		1.3	19.8	26
Hubbard				
	PEM	0.3	3.9	7
	PFO	0.1	1.1	1

TABLE 9.3.1-2

Summary of NWI Wetlands Affected by Construction of the Alberta Clipper/Southern Lights Diluent Projects

County	Wetland Type [a]	Distance (miles)	Acres Affected [b]	Number of Wetlands
	PSS	0.5	8.2	6
Hubbard Total		0.9	13.3	14
Cass				
	L1U	0.0	0.2	1
	PEM	3.4	51.4	28
	PFO	2.2	32.9	21
	POW	0.1	1.2	2
	PSS	4.2	62.9	36
	PUB	0.0	0.1	1
Cass Total		9.8	148.7	89
Itasca				
	PEM	1.6	24.4	14
	PFO	6.4	97.2	48
	PSS	6.3	95.0	56
	R3O	0.1	1.6	2
Itasca Total		14.4	218.1	120
Aitkin				
	PFO	2.6	39.4	3
Aitkin Total		2.6	39.4	3
St. Louis				
	PEM	0.3	4.6	3
	PFO	3.0	45.9	34
	PSS	1.9	28.1	20
St. Louis Total		5.2	78.6	57
Carlton				
	PEM	0.6	9.7	7
	PFO	1.9	29.0	22
	POW	0.1	0.9	3
	PSS	3.1	47.4	34
Carlton Total		5.7	86.9	66
Grand Total		45.9	695.4	475

[a] PEM = Palustrine Emergent; PSS =Palustrine Scrub-Shrub; PFO = Palustrine Forested; PUB = Palustrine Unconsolidated Bottom; POW = Palustrine Open Water; R2U = Riverine; PAB = Palustrine Aquatic Bed; R3O = Riverine; L1U = Lacustrine (Cowardin Classification, 1979)

[b] Assumes a 125-foot-wide construction right-of-way in all wetland areas. Does not include additional temporary workspace, aboveground facilities, access roads, or pipe storage and contractor yards.

9.3.2 Protected Wetlands

The pipeline route will cross 10 wetland (public water wetlands) listed on the MNDNR Protected Waters Inventory (e.g., Public Water Wetlands). Public Water Wetlands are Type 3, 4, and 5 wetlands, as defined in the FWS Circular No. 39 (1971 edition), that are 10 acres or larger in unincorporated areas or 2.5 acres or larger in incorporated areas. Type 3, 4, and 5 wetlands include inland shallow fresh marshes; inland deep fresh marshes; and inland open fresh water, shallow ponds, and reservoirs. These wetlands are regulated as public waters

under the MNDNR's Public Waters Permit Program. The protected wetlands are summarized in table 9.3.2-1.

TABLE 9.3.2-1

Summary of MNDNR Protected Wetlands Crossed by the Alberta Clipper/Southern Lights Diluent Projects

From Milepost	To Milepost	Crossing Length (miles)	Crossing Length (feet)	State ID	Name
853.7	853.8	0.1	666	57-3 W	Unnamed
916.7	917.0	0.2	1,211	15-28 P	West Four-Legged
917.7	917.8	0.1	561	15-27 P	East Four-Legged
D955.8	D955.8	<0.1	82	4-30 P	Cass
D956.2	D956.3	<0.1	87	11-415 P	Pike Bay
964.2	964.3	0.1	614	11-316 P	Upper Sucker
973.2	973.5	0.3	1,657	11-922 P	Unnamed
979.4	979.7	0.3	1,504	11-137 P	Nushka
D994.9	D995.3	0.4	2,235	31-776 P	White Oak
D1004.3	D1004.4	0.1	575	31-560 P	Forsythe

9.3.3 Wetland Construction Methods

Typical pipeline construction in most wetlands will be similar to construction in uplands and will consist of clearing, trenching, dewatering, installation, backfilling, cleanup, and revegetation. However, due to the unstable nature of some wetland soils, construction activities may differ somewhat from standard upland procedures. Construction activities will be minimized in wetlands and/or special construction techniques will be used to minimize the disturbance to vegetation and soils and to maintain wetland hydrology. Where a wetland cannot support construction equipment, construction activities will be accomplished from timber construction mats or by the use of low ground pressure equipment, thus limiting disturbance to the wetland. A typical construction schematic illustrating a wetland crossing is provided in the EMP in Appendix B.

Clearing and Grading

Vegetation within wetlands will be cut off at the ground level, leaving existing root systems intact to preserve natural sources of rootstock and to facilitate revegetation of the native wetland species after construction. Stumps will only be removed over the trench line and where necessary for safe operation of equipment. Trees, shrubs, and stumps that are removed will be properly disposed of outside wetlands. Timber construction mats, if needed and temporary erosion control measures will be installed at this time.

Trenching and Installation

The pipeline trench will typically be excavated in wetlands using a backhoe excavator. In unsaturated wetlands up to one foot of topsoil will be stripped from the trench line and stockpiled separately from trench spoil.

If the soils in the wetland area are stable and capable of supporting equipment with or without timber construction mats, the pipe will be strung, welded, and lowered into the trench as

in upland areas. When water is present in the trench, the trench may be temporarily dewatered and/or the pipe flooded to sink it into the trench.

It may not be feasible to use the construction methods described above for crossing large wetlands with standing water and saturated soils. In these wetlands, the trench will be dug by a backhoe supported on timber mats but it is often not feasible to separate topsoil. The pipe will be assembled in an upland area and floated across the wetland in the excavated trench using the "push-pull" and/or "float" techniques. When the pipeline is in position, floats, if used, will be removed and the pipeline will be sunk into position and the pipe tied into the upland portion of the pipeline.

After the pipe has been installed, the trench will be backfilled and the original contours will be restored to the extent practical. In areas where the topsoil has been segregated, the topsoil will be replaced after backfilling to facilitate the natural revegetation process. Any excess backfill material will be removed to an upland area.

Cleanup and Revegetation

Cleanup and rough grading will begin as soon as practical after the trench is backfilled. Timber mats, if used, will be removed during the cleanup operations. Disturbed wetland areas will be revegetated with a cover crop in accordance with Natural Resources Conservation Service or other agency recommendations, unless standing water is prevalent or as otherwise directly by landowners or regulatory agencies. No fertilizer, lime, or mulch will be applied in wetlands.

9.3.4 General Construction and Operation Impacts and Mitigation

A total of 475 wetlands will be crossed by the project in Minnesota, based on the review of NWI data. Pipeline construction across these wetlands will result in temporary impacts on approximately 762.2 acres. A summary of wetlands affected during construction is provided in table 9.3.1-2

Wetlands will not be permanently filled or drained as a result of constructing the project. Construction will result in temporary impacts and, in a few situations, minor changes in plant species composition. The temporary impacts include loss of wetland vegetation and wildlife habitat as a result of clearing and other construction activities; soil disturbance associated with clearing, trenching, and equipment traffic; and increases in turbidity and alterations of hydrology as the result of trenching, dewatering and soil stockpiling activities.

Approximately 156.0 acres of palustrine emergent wetland will be temporarily affected by pipeline construction. The Applicants anticipate that there will be no long-term impacts on emergent wetlands. The wetlands will be restored to preconstruction conditions and the herbaceous vegetation will be allowed to naturally revegetate in these areas.

Approximately 270.2 acres of palustrine scrub-shrub wetland and approximately 262.2 acres of palustrine forested wetland will be cleared and temporarily disturbed during pipeline construction. The impacts on scrub-shrub wetlands and forested wetlands will be of a longer duration than emergent wetlands because the woody vegetation will require a longer time to re-establish on the temporary right-of-way after restoration.

After the pipeline is constructed, additional right-of-way will be maintained relatively free of larger-diameter trees along the existing right-of-way. This additional maintained right-of-way will result in the permanent conversion of approximately 191.5 acres of forested wetland to emergent or scrub-shrub wetland, based on varying right-of-way widths (refer to Section 1.3).

The Applicants will minimize impacts in wetlands by implementing the mitigative measures specified in the EMP, including:

- wetland vegetation will be cut off at ground level and removed from the wetland areas;
- construction mats will be used, as needed, to facilitate equipment access and pipeline installation;
- temporary erosion control devices will be installed prior to trenching activities;
- the top 1 foot of topsoil or the amount of topsoil present, whichever is less, will be stripped over the trench line, segregated, and replaced in unsaturated wetlands;
- wetlands will be restored to preconstruction contours;
- wetland hydrology will be maintained by using trench breakers when necessary, and sufficiently compacting the pipeline trench; and
- wetland vegetation will be allowed to naturally revegetate with wetland plants common to the area.

10.0 CULTURAL RESOURCES

10.1 EXISTING CULTURAL RESOURCES

The Applicants reviewed existing site file data maintained by the Minnesota Historical Society to determine if any portion of the pipeline routes were surveyed previously for cultural resources. A total of eight previous archaeological studies have been completed that directly relate to the pipeline routes. The entire North Dakota/Minnesota border to Clearbrook portion of the corridor was first surveyed as part of Enbridge's 1994 Capacity Expansion Project. In 1998, portions of the previous survey corridor were included in an Enbridge project named Terrace I or Terrace Expansion Project. The Terrace I Project did not extend beyond the survey corridor for the 1994 Capacity Expansion and, therefore, no additional archaeological investigations were required for Terrace I. The reports of these previous surveys are as follows:

- Breakey, K. and C. Dobbs

  1993. *Files Search and Literature Review of Lakehead Pipeline Between Clearbrook, Minnesota and Neche, North Dakota*.

- Dobbs, C., K. Breakey, and H. Mooers

  1994. *A Model of Archaeological Sensitivity for Landforms Along the Lakehead Pipe Line Company Right-of-way from Neche, North Dakota to Clearbrook, Minnesota*.

- Breakey, K., C. Dobbs, and M. Murray

  1994a. *Phase I Archaeological Investigations of Selected Areas of the Lakehead Pipe Line Company Right-of-way between Neche, North Dakota and Clearbrook, Minnesota.*

  1994b. *Evaluation of the Archaeological Sites on the Lakehead Pipe Line Company Right-of-way between Neche, North Dakota and Clearbrook, Minnesota*.

- Kluth, Rose, and David Kluth

  2000 *A Phase I Archaeological Survey of the Lakehead Pipe Line Cass Lake Loop from Cass Lake to Bena, Cass County, Minnesota.*

- Leech Lake Heritage Sites Program

  2000 *Research Design for the Phase II Evaluation of Sites 21CA569, 21CA571, 21CA572, 21CA573, 21CA575, Located Along the Cass Lake Loop Project Area for the Lakehead Pipe Line Company, Inc., Cass County, Minnesota.*

- Leech Lake Heritage Sites Program

2001 *A Phase II Evaluation of Sites 21CA569, 21CA571, 21CA572, 21CA573, 21CA575, Cass Lake Loop Project Area, Lakehead Pipe Line Company Inc., Cass County, Minnesota*.

- Lakehead Pipe Line Company

  2001 *Lakehead Pipe Line L.P. Clearbrook, MN to Superior, WI Pipeline Expansion Project: Avoidance Plans for Sites 21CA315, 21CA569, 21CA575, Cass County, Minnesota.*

The Applicants also reviewed the Minnesota State Historic Preservation Office's (SHPO) site files to identify previously recorded cultural resources within the project construction rights-of-way. This review identified nine archaeological sites, three of which (21CE60, 21BL200, and 21MA39) have been determined eligible for nomination to the NRHP. Five of the remaining six sites (21CA569, 21CA571, 21CA572, 21CA573, and 21CA575) were assessed as potentially eligible and additional testing was recommended. The final site (21CA570) was assessed as ineligible and no additional testing was recommended.

10.2 CONSULTATION WITH FEDERAL AND STATE AGENCIES

The Applicants initiated consultation with the St. Paul District of the COE for this project. Pursuant to Section 106 of the National Historic Preservation Act (16 USC 470), the COE will review the project for effects to cultural resources that are listed on or eligible for listing on the NRHP prior to issuing Section 404 and Section 10 permits for the project. The U.S. Department of State (DoS) will be the lead federal agency for NEPA review and will direct overall responsibility for compliance with Section 106 requirements through the COE. It is expected that the COE will initiate consultation with the SHPO. The SHPO will assist the lead federal agency in reviewing the project for the potential to affect NRHP-listed or eligible properties.

In conjunction with the COE, the Applicants developed a survey implementation plan for the occurrence of undocumented cultural resources within the Alberta Clipper and Southern Lights Diluent Projects survey corridor, where pervious surveys have not been conducted. The plan was reviewed and approved by the COE and field survey has begun. The Applicants anticipate that the field survey will be completed in the summer of 2007. The survey results will be summarized in an inventory report and submitted to the DoS/COE and SHPO for review.

10.3 TRIBAL CONSULTATIONS

The lead federal agency is responsible for consulting with federally recognized Indian tribes as part of the Section 106 process. The DoS has directed the COE to proceed with these consultations, and to date the COE has contacted the following tribes in Minnesota: Fond du Lac Band of Lake Superior Chippewa, Red Lake Band of Chippewa, White Earth Band of Chippewa, Leech Lake Band of Ojibwe, Mille Lacs Band of Ojibwe, Grand Portage Band of Lake Superior Chippewa, Bois Forte Band (Nett Lake) of Chippewa, Shakopee Mdewakanton Sioux Community, Upper Sioux Community, Prairie Island Indian Community, and Lower Sioux Indian Community. The Applicants will continue to assist the DoS/COE with tribal consultations as directed.

10.4 GENERAL CONSTRUCTION AND OPERATION IMPACTS AND MITIGATION

As noted above, the Applicants are currently conducting field surveys to identify cultural resources along the pipeline routes. If the survey identifies any sites that are eligible for listing in the NRHP, the Applicants will consult with the DoS/COE and SHPO to identify measures to avoid, minimize, or mitigate adverse effects on these sites. These measures may include routing the pipelines around identified sites; installing the pipelines beneath the sites using conventional bore or HDD technology; fencing sites or portions of sites to ensure that they are not disturbed during construction; monitoring of construction activities by an archaeologist; or archaeological data recovery at the sites.

The Applicants will also develop and implement an unanticipated discoveries plan. This plan will describe measures to be followed in the event that a previously undocumented cultural resource site is discovered during construction activities. These measures will include documenting and evaluating the site; consulting with the DoS/COE and SHPO; and implementing measures to avoid, minimize, or mitigate adverse effects to the site if the site is eligible for listing on the NRHP.

11.0 FEDERAL, STATE, AND COUNTY RECREATIONAL AREAS

11.1 EXISTING DESIGNATED RECREATIONAL AREAS

The Alberta Clipper Project route will not cross any national parks, state parks, national wildlife management areas, state wildlife management areas, county parks, or state- or county-designated trails. However, the pipeline route will cross a national forest, state and county forests, designated scenic byways, and state-designated canoe and boating routes as discussed below.

11.1.1 Federally Designated Recreation Areas and Trails

The pipeline route will not cross any federal recreation areas or trails in Minnesota.

Nationwide River Inventory

As discussed in section 9.1.2, the pipeline route will cross four Minnesota rivers that are listed on the NRI. These rivers are the Middle River (MP 836.0) in Marshall County and the Red Lake River (MP 864.4) in Pennington County, Clearwater River (MP 922.9) in Beltrami County, and the Prairie River (MP 1011.4) in Itasca County. None of these are federally designated as National Wild and Scenic River. The Applicants will consult with the NPS prior to crossing these NRI rivers.

Federal Forest Land

The pipeline route will cross the Chippewa National Forest (35.9 miles) in Minnesota. The Applicants will consult with the USFS prior to crossing the Chippewa National Forest.

11.1.2 State-Designated Recreation Areas

State Forest Land

The route will cross the Mississippi Headwaters (5.2 miles), Bowstring (33.6 miles), and Fond du Lac (2.4 miles) State Forests in Minnesota. The Applicants will consult with the Minnesota Department of Forestry prior to crossing these forests.

State Wildlife Management Areas

Wildlife Management Areas (WMAs) are state lands that are actively managed for wildlife production and provide habitat for many wildlife species. WMAs are open to the public for recreational activities such as bird and wildlife watching, hunting, and trapping. WMAs generally are closed to motorized vehicles and horses. The route will not cross any WMAs but will be within approximately 0.5 mile of the Hangaard State WMA near MP 897.5, the Bemidji Slough WMA at MP 921.5 and the Swan River Deer Yard WMA at MP 1028.2.

State-Designated Trails and Canoe and Boating Routes

The route will not cross any state trails in Minnesota. However, it will cross three state canoe and boating routes, the Red River of the North at MP 801.8 and the Red Lake River at MP 864.4, the Mississippi River, twice, at MPs D955.9 and 987.0.

11.1.3 County-Designated Recreation Areas

County Forest Land

The pipeline route will cross approximately 33.3 miles of county-managed land. These lands are primarily forested, tax-forfeited parcels, but may be managed for various natural resource components in addition to providing recreational opportunities such as hunting and fishing. County-managed lands along the pipeline route are mostly located on the southern portion of the pipeline route in Clearwater County. The Applicants will consult with each county to minimize impacts on county lands.

11.1.4 Designated Scenic Byways

U.S. Scenic Highway 2

The pipeline route will cross U.S. Scenic Highway 2 thirteen times between MPs 932.5 and 1044.1 in Beltrami, Itasca, and St. Louis Counties, Minnesota. The Applicants proposes to bore the pipeline crossing locations of U.S. Highway 2. This construction method will avoid disruption of the roadway surface and traffic flow. Revegetation requirements at the crossing locations will be addressed during the standard permitting process.

The Great River Road

The Great River Road in Minnesota has two components: a federally-designated 430-mile National Route and a 755-mile state-designated alternate route. Combined, the route provides 1,185 miles of scenic, historic, and recreational opportunities for travelers. The pipeline route will cross County Highway 7 (Division St.), a federally designated segment of the route at MP 937.6 in Beltrami County and Itasca County Road 18 at MP 988.9. The Applicants proposes to bore these road crossings. The Applicants will consult with Beltrami and Itasca Counties and the MDOT during the permitting process regarding construction crossing techniques, restoration, and rerouting of traffic to area roadways during the construction period.

Edge of the Wilderness Scenic Byway

The pipeline route will cross Minnesota State Highway 38 (McKinney Lake Rd) at MP D1007.8, which is designated as a Minnesota Scenic Byway from Grand Rapids to Effie (47 miles). This designated scenic byway has an approved corridor management plan. The Applicants propose to bore the crossing of this state highway to mitigate disturbance to the roadway surface and traffic flow. Through the standard road crossing permit process, the Applicants will identify crossing techniques and revegetation plans.

Veterans Evergreen Memorial Scenic Byway

Commonly referred to as the scenic road to Duluth, this designated Minnesota Scenic Byway occurs along a 50 mile stretch of State Highway 23 that runs from Banning State Park to New Duluth. The pipeline will cross this Minnesota State Highway 23 at MP 1082.8. The Applicants will consult with the appropriate agencies regarding construction techniques and restoration of this area during the permitting process.

11.2 GENERAL CONSTRUCTION AND OPERATION IMPACTS AND MITIGATION

Construction and operation of the pipeline are not expected to have significant impacts on recreational lands crossed by the pipeline. In Minnesota, more than 99 percent of the pipeline route will be constructed within or generally adjacent to Enbridge's existing pipeline right-of-way, which will minimize potential impacts on public lands and recreational areas. The pipeline will have only minor and temporary impacts on public recreational areas. Impacts on recreational use of public land areas primarily will be limited to temporary inconveniences and localized disturbances, including noise, dust, and visual intrusions associated with construction activities. There will be no long-term impact on recreational activities within the public lands areas as the result of construction and operation of the pipeline. As discussed in section 7.1.5, vegetation maintenance of the permanent right-of-way will be required along the pipeline right-of-way, which could have limited visual impacts on public lands that are densely forested.

Project construction temporarily could restrict public use of the recreational areas crossed by the pipeline. Potential impacts on recreational activities will be dependent on the timing of construction, the season in which the recreational activity occurs, and the construction methods used. Public access to federal, state, and county lands will be maintained to the greatest extent possible during construction. Short-term closures of some areas may be necessary during construction. After construction is completed, the public lands will be restored to allow previous uses and recreational activities to continue. The Applicants will consult with the appropriate state and county land management agencies to avoid and minimize impacts on recreational areas.

Boating and recreational use of the waterbodies crossed by the project may be affected during construction of the pipeline, including state- and county-designated canoe routes. Depending on the crossing method used, impacts on waterbody users may include construction noise, downstream turbidity, or temporary obstructions such as sediment curtains or construction equipment at the crossing location. The Applicants will coordinate with the MNDNR and local governments regarding the waterbody crossings.

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