APPLICATION

to the

NORTH DAKOTA PUBLIC SERVICE COMMISSION

for a

CERTIFICATE OF CORRIDOR COMPATIBILITY

and a

ROUTE PERMIT

for the

TRENTON TO BEAVER LODGE LINE LOOP

by

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

on

JULY 26, 2006

ENBRIDGE™

VOLUME 1 OF 2

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LETTER OF INTENT & WAIVER REQUEST

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF NORTH DAKOTA

IN THE MATTER OF THE APPLICATION OF ENBRIDGE PIPELINES (NORTH DAKOTA) LLC FOR CONSTRUCTION OF AN APPROXIMATE 52 MILE TEN-INCH PIPELINE AND ASSOCIATED FACILITIES IN WILLIAMS COUNTY, NORTH DAKOTA.

CONSOLIDATED LETTER OF INTENT AND APPLICATION OF ENBRIDGE PIPELINES (NORTH DAKOTA) LLC FOR WAIVER OR REDUCTION OF PROCEDURES AND TIME SCHEDULES FOR A CORRIDOR CERTIFICATE AND ROUTE PERMIT

Enbridge Pipelines (North Dakota) LLC ("Enbridge") whose address for purposes of this Application is 2625 Railway Avenue, Minot, North Dakota 58703, pursuant to the Energy Conversation and Transmission Facility Siting Act codified at North Dakota Century Code Chapter 49-22 ("Act"), hereby submits this Consolidated Letter of Intent and Application for Waiver or Reduction of Procedures and Time Schedules and for a Corridor Certificate and Route Permit ("Application"). Enbridge requests the North Dakota Public Service Commission ("Commission") waive and/or reduce procedures and time schedules required by the Act or in the Commission's regulations set forth in Title 69-06 of the North Dakota Administrative Code to accomplish the purposes as requested herein. These include, but are not limited to: (1) waive or reduce the time period required for separate filing of a Letter of Intent and the one year time period provided for in § 69-06-03-01, North Dakota Administrative Code, for the filing of an Application; (2) waive, pursuant to North Dakota Century Code §§ 49-22-07.2, 49-22-13(2) and

North Dakota Administrative Code § 69-06-01-02(3) and Chapter 69-06-06, provisions of North Dakota Century Code §§ 49-22-08(5), 49-22-08.1(5), 49-22-13 and North Dakota Administrative Code § 69-06-01-02 which requires separate filings of such applications, separate notices of such application, separate hearings on such applications and certain time schedules as set forth in said statutes and rules; (3) approve a one mile wide corridor rather than a 5.2 mile wide corridor pursuant to North Dakota Administrative Code § 69-06-04-02(1)(b); (4) hold one expedited public hearing on this combined application; (5) find that the proposed facilities are of such design, location and purpose that they will produce minimal adverse effects; and (6) designate and approve the requested facilities as identified in this Application, and issue the appropriate corridor certificate and route permit.

The Commission's application guidelines for waiver of procedures and time schedules requires a description of the facility, the need for the facility, the cost of the facility and separate justification for each provision of the Act for which the Applicant is requesting a waiver, together with evidence that the project will produce minimal adverse effects or that a demonstrable emergency exists. As demonstrated in this Application, and summarized below, Enbridge's requests for waivers or reduction of procedures and time schedules and the issuance of a corridor certificate and route permit are justified as the proposed facilities are of such design, location and purpose that they will produce minimal adverse effects, and that the urgent demand for additional pipeline capacity in the Williston Basin requires immediate construction.

DESCRIPTION

On October 11, 1983, the Commission issued its Findings of Fact, Conclusions of Law and Order in Case No. 10,472 approving the construction of an eight-inch pipeline and associated facilities in McKenzie and Williams counties, North Dakota, by Portal Pipeline

Company. Enbridge has succeeded to the interest of Portal Pipeline Company in this pipeline and associated facilities. On the same date the Commission issued Certificate of Site Compatibility No. 40 and Route Permit No. 49 for that project. Enbridge hereby seeks amendments to said corridor certificate and route permit to allow the construction of the proposed facilities.

Due to increased oil production in the Williston Basin of North Dakota and Montana, greatly increased demand for additional pipeline capacity has been placed upon Enbridge. As a result, Enbridge has proposed to install a new ten-inch pipeline parallel 52 miles of the 1983 pipeline from the existing Trenton Station in Williams County, North Dakota, to its existing Beaver Lodge Station, also located in Williams County, North Dakota. This new pipeline will be located entirely within the corridor approved by the Commission in Case No. 10,472.

Enclosed with this Application are maps of the proposed pipeline and associated facilities. Enbridge requests that these maps be accepted as a substitute for mylar maps required by the Commission application guidelines.

Enbridge desires to begin construction as soon as possible. The time schedule for completion is set forth in this Application.

NEED

As previously stated, Enbridge has received urgent requests from oil producers in the Williston Basin of North Dakota and Montana for immediate additional pipeline capacity to transport increased production of crude oil. Additional pipeline capacity will be provided by this 52 mile ten-inch pipeline.

COSTS

The estimated cost of this pipeline and associated facilities is $25,122,000.

JUSTIFICATION

As previously noted in Case No. 10,472, the Commission issued a corridor certificate and route permit for the prior eight-inch pipeline project, including the Trenton Station in Williams County. In that case, a comprehensive environmental analysis, including cultural resource surveys, was completed. Enbridge has updated said environmental analysis and cultural resource surveys for the purpose of this new pipeline and associated facilities.

The updated environmental analysis and cultural resource surveys demonstrate that there will be minimal adverse effects by construction.

For the foregoing reasons, Enbridge submits there is substantial justification for waivers and/or reduction of time schedules and procedures as this pipeline and associated facilities will produce minimal adverse effects.

Enbridge respectfully requests the Commission to grant the aforementioned waivers and/or reductions of time schedules and procedures, and to render an expeditious decision approving the corridor certificate and route permit.

Dated this 25 day of July, 2006.

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

FLECK, MATHER & STRUTZ, Ltd.
Attorneys for Applicant
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P.O. Box 2798
Bismarck, North Dakota 58502

By _____
BRIAN R. BJELLA (#03549)

STATE OF NORTH DAKOTA)
)
COUNTY OF BURLEIGH)

Brian R. Bjella, being first duly sworn on oath, deposes and says that he is the attorney for the applicant herein named, that he has read the above and foregoing application, knows the contents thereof, and that the same is true to the best of this affiant's knowledge, information, and belief.

BRIAN R. BJELLA

Subscribed and sworn to before me this 25th day of July, 2006.

Beth Wald
Beth Wald, Notary Public
Burleigh County, North Dakota
My Commission Expires: 11/28/08

(S E A L)

BETH WALD
Notary Public, State of North Dakota
My Commission Expires November 28, 2008

APPLICATION FOR CORRIDOR CERTIFICATE

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SECTION A: Description of Transmission Facility

1. Type

Enbridge Pipelines (North Dakota) LLC ("Enbridge") owns and operates an existing underground petroleum pipeline system that extends from eastern Montana through North Dakota to Clearbrook, Minnesota. Part of the pipeline is within Williams and McKenzie counties, North Dakota. This part, known as the Beaver Lodge/Alexander segment, consists of an 8-inch-outer-diameter pipe, and was constructed in the mid 1980s by Portal Pipeline Company in accordance with the North Dakota Public Service Commission's ("Commission") Findings of Fact, Conclusions of Law and Order in Case No. 10,472; Certificate of Site Compatibility No. 40; and Route Permit No. 49 dated October 11, 1983. Enbridge acquired this pipeline from Portal Pipeline Company in 1996.

Enbridge proposes to construct a new crude oil pipeline adjacent to its existing Beaver Lodge/Alexander segment from the Trenton Pump Station in Williams County, North Dakota to the Beaver Lodge Pump Station in Williams County, North Dakota. The proposed pipeline will be called the Trenton to Beaver Lodge Line Loop and is approximately 52 miles in length. A map illustrating general location of the proposed pipeline is provided in Appendix A. Station upgrades necessary to operate the new pipeline, including installation of a new pump and motor at each of the existing Alexander and Trenton pump stations, was applied for under a separate application, as well as the addition of two storage tanks with nominal capacities of 55,000 barrels at Alexander Pump Station and 20,000 barrels at Trenton Pump Station.

2. Product

The new pipeline will transport crude oil. Enbridge will connect the proposed pipeline to the existing pipeline system to provide transportation for increasing amounts of crude oil supplies from south of the Missouri River in Richland and McKenzie counties. Installation of this pipeline will replace shipment of petroleum by tanker truck thus providing a safer, more economical method of transportation plus a savings of deterioration to public roads. Section C.2 contains a more detailed discussion of alternative methods of serving the project need. Section D.2.c.ii.6 contains a more detailed discussion of pipeline safety. Section D.2.d.iii contains a more detailed discussion of pipeline economics.

3. Size and Design

Design, construction and operation of the pipeline and related facilities will be in accordance with U.S. Department of Transportation regulations governing the transportation of hazardous liquids. These regulations are prescribed under Part

195 of Title 49 of the Code of Federal Regulations, Transportation of Hazardous Liquids by Pipelines.

a. Width of Right-of-Way

Enbridge is proposing to install the pipeline approximately 20 feet north and/or west of the existing pipeline, except at locations where crossovers of the existing pipeline or minor route variations were requested by landowners, are necessary to improve constructability, or will aid in minimizing impacts on sensitive resources. The alignment of the existing pipeline and the alignment of the proposed pipeline, including crossovers and route variations, are depicted on the maps included in Appendix B.

Enbridge plans to install the proposed pipeline within its existing 60-foot-wide right-of-way where practical. In total, about 37 miles (71 percent) of the proposed pipeline will utilize Enbridge's existing right-of-way easements. About 13 miles (or 25 percent) of the route will utilize Enbridge's existing right-of-way, but will require Enbridge to amend or supplement its easements to allow for the new pipeline. Crossovers and minor route variations will necessitate new right-of-way and easements for about 3 miles (6 percent) of the proposed pipeline.[1]

During construction, Enbridge proposes to use a construction work area that varies between 75 and 125 feet wide for a majority of the pipeline route. A work area up to 200 feet wide may be required at some at some locations, such as the beginning and end of the project; where the pipeline approaches wetlands, waterbodies, roads, and railroads; and in areas of rocky soil, steep slopes, and rugged terrain. Following construction, the work area generally will be allowed to revert to its previous use.

Enbridge will use existing roads to access to the construction right-of-way. Roads that are paved or graveled will not require modification. Dirt roads and two-track trails may require grading and filling to make the roads passable to construction equipment. Enbridge is also proposing to construct four temporary drives on this project. These drives are needed to allow convenient access to the entry and exit sides of two horizontal directional drill sites: the Burlington Northern-Santa Fe railroad crossing (milepost 18.0) and Little Muddy Creek (milepost 30.3). The drives will extend from County Road 8 to the work areas on each side of the drill sites.

To support construction activities, Enbridge proposes to temporarily use property at its existing East Fork Pump Station as a contractor staging area

[1] The sum of the addends does not equal 52 miles or 100 percent due to rounding.

and/or pipe storage yard. Additionally, Enbridge anticipates a need for a pipe offloading yard adjacent to a rail line to accommodate transportation of pipe from the mill to the general project vicinity. The location of the pipe offloading yard has not yet been determined, but likely will be within 100 miles of the project area.

b. Estimated Distance Between Surface Structures, such as Manholes or Block Valves

Enbridge is proposing to construct two types of surface structures on this project.

Launcher and Receiver Traps - two traps: one at the beginning of the proposed pipeline within the Trenton Pump Station (milepost 52.5) and one at the end of the proposed pipeline within the Beaver Lodge Pump Station (milepost 0.0).

Block Valves - three block valves: one within the East Fork Pump Station (milepost 25.3) and one on each side of Little Muddy River adjacent to existing block valves (mileposts 30.6 and 31.0).

c. Pipe Size

The proposed pipeline will have a 10-inch nominal pipe size diameter with 0.219-inch wall thickness and grade X-52. Heavier wall pipe, likely 0.312- or 0.365-inch wall thickness, will be used at most road and railroad crossings.

d. Approximate Length of Facility

The approximate length of the pipeline will be 52 miles.

e. Maximum Design Operating Pressure and Temperature

Maximum Operating Pressure: 1,480 pounds per square inch gauge.

Maximum Temperature: 100 degrees Fahrenheit.

f. Maximum Design Flow Rate

Maximum Design Flowrate: 51,000 barrels per day.

g. The Number and General Location of Compressor or Pumping Stations

Enbridge is not proposing to construct new pump stations as part of this project. The proposed pipeline will run approximately 52 miles and will

connect to two existing pump stations: Trenton and Beaver Lodge pump stations. The new pipeline will bypass the East Fork Pump Station.

Enbridge is proposing to install a new pump and motor at each of the existing Alexander and Trenton pump stations as well as adding storage tanks with nominal capacities of 55,000 barrels at Alexander Pump Station and 20,000 barrels at Trenton Pump Station. These station upgrades are being put forth to the Commission as part of the "Enbridge Pipelines (North Dakota) – Alexander to Clearbrook Expansion – Existing Station Upgrades" application. Work on the station upgrades needs to precede the pipeline expansion in order to successfully complete the work within the time period requested by shippers and producers. If the application for the new pipeline is not approved, all or part of the station upgrades may be suspended.

4. Time Schedule

a. Certificate of Corridor Compatibility

Enbridge is seeking a Certificate of Corridor Compatibility on or before September 20, 2006.

b. Route Application

Enbridge is seeking a waiver of Commission procedures to allow joint and simultaneous filing of its applications for a Certificate of Corridor Compatibility and Route Permit.

c. Route Permit

Enbridge is seeking a Route Permit on or before September 20, 2006.

d. Construction Start Date

Enbridge is proposing to start construction in mid to late October 2006.

e. Construction Complete

Enbridge is proposing to complete construction in mid to late June 2007.

f. In-Service Date

Enbridge is proposing to place its facilities in service in July 2007, or earlier if possible.

SECTION B: Studies

Enbridge consulted with several federal, state, and local agencies to identify environmental resources in the project area and determine what, if any, environmental studies or assessments would be required on the proposed project. A discussion of issues and concerns raised by agency personnel is included in Section B.11 of the Application for a Route Permit. Agencies Enbridge consulted include:

1. U.S. Army Corps of Engineers;
2. U.S. Department of Interior, Fish and Wildlife Service;
3. U.S. Department of Interior, Bureau of Reclamation;
4. U.S. Department of Agriculture, Natural Resource Conservation Service;
5. North Dakota Department of Health;
6. North Dakota Game and Fish Department;
7. North Dakota Public Service Commission;
8. North Dakota State Lands Department;
9. North Dakota State Water Commission;
10. State Historical Society of North Dakota (State Historic Preservation Office);
11. Williams County Auditor; and
12. Williams County Department of Equalization.

The U.S. Army Corps of Engineers was the only agency to require studies of the project area. The U.S. Army Corps of Engineers requested Enbridge conduct cultural resource investigations and complete a wetland assessment of the project area. Other than these studies, Enbridge does not anticipate submitting studies or assessments to any federal, regional, state, or local agency. Documentation of consultations with each agency is included in Appendix C.

Cultural Resource Investigations

In early June 2006, Enbridge commissioned cultural resource studies of the proposed corridor and route. Earthworks, Inc. ("Earthworks"), of Bismarck, North Dakota, completed a class 1 literature search of the proposed corridor. The results of the literature search are documented in:

Klinner, Duane and John G. Morrison. June 2006. *Archaeological Survey Plan for Enbridge Pipelines (North Dakota) LLC, North Dakota Pipeline Expansion Project: Overview of Known Cultural Resource and Potential for Discovery of Undocumented Cultural Resources in Williams County, North Dakota, Report of Investigation: 391*. Earthworks, Inc., Bismarck, North Dakota.

A copy of the report is included in Appendix D. A copy of the report was also provided to the U.S. Army Corps of Engineers and State Historical Society of North Dakota on June 14, 2006. On June 20, 2006, the State Historical Society of North Dakota informed the U.S. Army Corps of Engineers and the North Dakota Public Service Commission that it concurred with the findings of the report. On July 3, 2006, the U.S. Army Corps of Engineers informed Enbridge that it found the report acceptable. Copies of the concurrence letters are included in Appendix C.

Based on the findings of the literature search, Earthworks conducted a class 2 reconnaissance inventory on those parts of the proposed route likely to contain cultural resources. Earthworks also conducted a class 2 reconnaissance inventory of potential minor reroutes being considered at the time of the field work. Earthworks did not complete a class 2 reconnaissance inventory of the entire 1-mile-wide corridor because the scope, cost, and timing associated with completing such a far-reaching study would be prohibitive. The results of the inventory are documented in the draft report:

Klinner, Duane and John G. Morrison. July 2006. *DRAFT: Enbridge Pipelines (North Dakota) LLC, North Dakota Pipeline Expansion Project: A Class II Cultural Resource Inventory, Williams County, North Dakota*. Earthworks, Inc., Bismarck, North Dakota.

A copy of this draft report is included in Appendix E. The report will be finalized in mid August after Smithsonian Institute Trinomial System numbers are obtained from the State Historical Society of North Dakota for newly discovered sites. A copy of the final report will be provided to the U.S. Army Corps of Engineers, North Dakota Public Service Commission, and State Historical Society of North Dakota at that time. Concurrence that no listed, eligible, or potentially eligible historic properties will be affected is required from the U.S. Army Corps of Engineers and State Historical Society of North Dakota before Enbridge can proceed with the project.

Wetland Assessment

In July 2006, Enbridge commissioned a wetland assessment of the project area. Merjent, Inc. (“Merjent”), of Minneapolis, Minnesota, completed a “desktop” wetland review of the proposed corridor and field verified the wetland boundaries along the proposed route. The results are documented in:

Mackenthun, Jeff and Thomas Janssen. July 2006. *Enbridge Pipeline (North Dakota) L.L.C. Wetland Determination Report. North Dakota Pipeline Expansion Project*. Merjent, Inc., Minneapolis, Minnesota.

A copy of the delineation report is included in Appendix F. A copy of the report will provided to the U.S. Army Corps of Engineers and North Dakota Public Service Commission at the same time as the cultural resource class 2 reconnaissance inventory report. Concurrence on the wetland assessment from the U.S. Army Corps of Engineers is required before Enbridge can proceed with the project.

SECTION C: Need For Facility

1. Analysis of Need Based on Present and Projected Demand, Including System Studies

The existing pipeline infrastructure in North Dakota, Montana, and Wyoming is at capacity. In April 2006, the pipeline infrastructure was short about 15,000 barrels per day. Average per well production in both North Dakota and Montana has increased and the new vintages have more than replaced pre-1995 production in Montana; and, although not fully replaced in North Dakota, this North Dakota production is trending higher. Along with the new production, crude oil traditionally moving to the Guernsey market is facing greater competition with deliveries from the Express Pipeline, thus filling the Guernsey market. In addition, the Platte Pipeline is in 30 percent apportionment and unable to move more crude oil out of Guernsey.

The lack of space on existing pipelines has resulted in a significant drop in price for petroleum produced in North Dakota, Montana, and Wyoming. While national markets receive as much as $60 per barrel or more, producers in North Dakota, Montana, and Wyoming are seeing price differentials of up to $30 per barrel between the Guernsey and Clearbrook markets. This has prompted some producers to close wells and postpone production. This has also resulted in an increase in trucking of crude oil from gathering systems to Alexander and Trenton for entry into the Enbridge System to move to the Clearbrook market.

The need for the project stems from a lack of capacity to carry North Dakota, Montana, and Wyoming crude oil to market. Pipelines provide a safe and economic method for transporting crude oil. The installation of the proposed Trenton to Beaver Lodge Line Loop would accomplish these objectives. Adequate measures have been included in the design to allow for future expansion of the producing fields in this area.

2. Description of Feasible Alternative Methods of Serving the Need

The existing Trenton to Beaver Lodge 8-inch pipeline was increased to its maximum design flow in 2005 with a station upgrade at Trenton and a midpoint booster station at East Fork. The addition of new pumps or stations is not feasible because the existing pipeline is presently operating at or near maximum capacity and new pumps or stations would result in little, if any, additional throughput.

Truck unloading facilities could be installed at or downstream of Beaver Lodge. Beaver Lodge lacks real estate for both unloading facilities and additional tanks to support the capacity and to ensure ratability of trucking. Trucking results in increased traffic and long hauls, which are labor intensive and cost prohibitive.

Trucking costs escalate sharply with distance, making trucking the most expensive mode of petroleum transportation. In addition, the logistics of truck transport for high volume-long distance shipments are impractical. Assuming each truck holds 200 barrels (8,400 gallons) and can travel up to 500 miles per day, it would take a fleet of 64 trucks making 4 roundtrips daily, with one truck arriving and unloading every 5 minutes, to replace the proposed 51,000 barrels per day, 52-mile-long pipeline. In spite of the fact that trucks could be used, trucking is generally limited to short haul movements.

Railroad tank cars are also an alternative to pipelines. While railroad tank car costs do not rise as sharply as trucks with distance traveled, their costs are also many times greater than pipeline transportation. Replacing the same 51,000 barrel per day pipeline with a train of 2,000-barrel tank cars would require a 26-car train to arrive and be unloaded every day, again returning to the source empty, along separate tracks, to be refilled. Furthermore, rail transportation is not readily available at the pump stations that Enbridge is seeking to serve with its pipeline.

3. Statement Justifying Deviations from the Most Recent Ten-Year Plan

Enbridge's most recent Ten-Year Plan filed with the North Dakota Public Service Commission is included in Appendix G. When the Ten-Year Plan was filed with the North Dakota Public Service Commission, Enbridge did not anticipate the need for the proposed project. Enbridge attempts to anticipate pipeline capacity by working with shippers and producers to forecast future nominations on the system. However, multiple factors, such as the tremendous success of the drilling programs, the increased use of horizontal drilling versus vertical drilling, and the depressed Guernsey market, have made the Clearbrook market very attractive. Since Enbridge is only able to influence the cost of effective means by which petroleum can be transported, and not whether petroleum should be transported or to where it should be transported, Enbridge is trying to quickly respond to its customers' needs to move additional crude to the Clearbrook market.

SECTION D: Location

1. Study Area

Enbridge defined its study area as the certificated corridor of the existing Beaver Lodge/Alexander pipeline. Enbridge is proposing to install the proposed pipeline generally adjacent to its existing pipeline from its Trenton Pump Station to its Beaver Lodge Pump Station. The two main benefits of installing the new pipeline adjacent to the existing pipeline are: 1) it would reduce the overall size and cost of the project by allowing Enbridge to utilize existing pump stations along the proposed pipeline route; and 2) it would minimize the impacts on landowners and environmental resources by siting the project within existing easements of an already disturbed utility corridor. For these reasons, Enbridge defined its study area as the certificated corridor of the existing pipeline. This study area should be sufficient to allow the Commission to evaluate the factors addressed in Chapter 49-22-09 of the North Dakota Century Code (see the Tab 3 for further discussion of these factors).

Section 69-06-04-02.1.b. of the North Dakota Administrative Code requires that the width of the corridor for the proposed pipeline be at least 10 percent of its length, but not less than 1 mile and not greater than 6 miles unless approved by the Commission. The proposed project, therefore, requires a 5-mile-wide corridor. Enbridge, however, is requesting that the Commission reduce the width of the corridor to 1 mile, centered on the existing pipeline. Enbridge is requesting a reduced corridor width because the proposed pipeline would be routed adjacent to an existing pipeline that follows a previously approved route within a previously certificated 6-mile-wide corridor (see the Commission's Findings of Fact, Conclusions of Law and Order in Case Number 10,472; Certificate of Site Compatibility No. 40; and Route Permit No. 49 dated October 11, 1983). Presumably, the previously approved route represents a reasonable, if not ideal, location within the certificated corridor.

Enbridge has identified a few locations where changes to the environment over the past 23 years appear to warrant minor route variations. These variations are limited in number and scope. Most route variations are within 50 and 1,000 feet of the existing pipeline. There is one variation being proposed that extends about 2,640 feet from the existing pipeline. This variation is only being proposed at the request of the landowner. Should the Commission identify additional route variations, it seems unlikely that the variations would extend beyond a 1-mile-wide corridor.

2. Identify and Map Criteria

a. Exclusion Areas

Exclusion areas are areas excluded in the consideration of a route for a transmission facility. The following table and text identify and discuss exclusion areas within the proposed corridor and along the proposed route. Maps illustrating the location of exclusion areas within the proposed corridor and along the proposed route are included in Appendix H.

Exclusion Area	Within Proposed Corridor	Along Proposed Route
National Parks	No	No
National Memorial Parks	No	No
National Historic Sites	No	No
National Historic Landmarks	No	No
National Natural Landmarks	No	No
National Monuments	No	No
National Wilderness Areas	No	No
State Parks	No	No
State Historic Sites	No	No
State Monuments	No	No
State Historical Markers	No	No
State Archaeological Sites	No	No
State Nature Preserves	No	No
County Parks	No	No
County Recreational Areas	No	No
Municipal Parks	Yes	No
Parks Owned or Administered by Other Governmental Subdivisions	No	No
Areas Critical to the Lifestages of Threatened or Endangered Animal or Plant Species	No	No
Areas Where Animals or Plant Species that Are Unique or Rare to this State Would be Irreversibly Damaged	No	No

i. Designated or Registered National: Parks; Memorial Parks; Historic Sites and Landmarks; Natural Landmarks; Monuments; and Wilderness Areas

A review of the project study area did not identify any designated or registered national: parks; memorial parks; historic sites and landmarks; natural landmarks; monuments; or wilderness areas within the proposed corridor or route. The only such exclusion area in Williams County is the Fort Union Trading Post, which is about 13 miles southwest of the proposed corridor. The Fort Union Trading Post is a registered national historic site and national historic landmark. This exclusion area was not a factor in selecting the proposed corridor or route.

ii. Designated or Registered State: Parks; Historic Sites; Monuments; Historical Markers; Archaeological Sites; and Nature Preserves

A review of the project study area did not identify any designated or registered state: parks; historic sites; monuments; historical markers; archaeological sites or nature preserves within the proposed corridor or route. The nearest such exclusion area in Williams County is a state historical marker identifying the first oil well in North Dakota. The historical marker is about one-half mile south of the proposed corridor. This exclusion area was not a factor in selecting the proposed corridor or route.

iii. County Parks and Recreational Areas; Municipal Parks; and Parks Owned or Administered by Other Governmental Subdivisions

A review of the project study area identified one municipal park within the proposed corridor: City Park. City Park is in the City of Epping and is known as Tireville by local residents. The park occupies about one-quarter city block and consists of a slide, swing set, sand box, picnic tables, and restrooms. City Park is about one-half mile south of the proposed route, near the southern edge of the proposed corridor (see Appendix H). Construction of the proposed pipeline would not affect City Park. No other parks or recreational areas were identified within the proposed corridor or route.

iv. Areas Critical to the Lifestages of Threatened or Endangered Animal or Plant Species

A review of the project study area did not identify areas critical to the lifestages of threatened or endangered animal or plant species within the proposed corridor or along the proposed route. On May 25 and July 12, 2006, Enbridge sent letters to the U.S. Department of Interior, Fish and

Wildlife Service inquiring whether the proposed project would have adverse effects on federally listed threatened, endangered, or candidate species or their critical habitat. On July 14, 2006, the Fish and Wildlife Service provide a list of federally endangered, threatened, and candidate species and designated critical habitat that are found in Williams County, and may be present within the project's "area of influence," but concluded that federally endangered, threatened, or candidate species are not known to frequent the project area and no critical habitat currently exists within the proposed corridor or along the proposed route. Copies of these correspondence are included in Appendix C.

The list provided by the Fish and Wildlife Service included four endangered and two threatened species; it did not include any candidate species or critical habitat. Identified species include:

1. interior least tern (*Sterna antillarum*) - federally endangered;
2. whooping crane (*Grus Americana*) - federally endangered;
3. pallid sturgeon (*Scaphirhynchus albus*) - federally endangered;
4. gray wolf (*Canis lupus*) - federally endangered;
5. bald eagle (*Haliaeetus leucocephalus*) - federally threatened; and
6. piping plover (*Charadrius melodus*) - federally threatened.

Interior least tern (*Sterna antillarum*)

The interior least tern is the smallest member of the tern family with a wingspan of only 20 inches. They have a grayish back and wings, and snowy white undersides. Interior least terns can be distinguished from all other terns by their combination of a black crown, white forehead, and a variable black-tipped yellow bill.

Historically, the interior least tern inhabited the major river systems of the midwestern United States, including the Missouri River, where they would nest in the summer, then migrate to wintering areas in South America. Currently, the terns nest in small remnant colonies throughout their former range.

Interior least terns arrive at nesting sites from late April to early June where they typically spend four to five months. Least terns nest in small colonies on exposed salt flats, river sandbars, and reservoir beaches. Nests are small scrapes in the sand, and usually two or three eggs are

laid. The young are fairly mobile soon after hatching. Both parents feed the young and remain with them until fall migration. Terns will travel four or more miles from their breeding colonies to find the small fish that make up the major part of their diet.

Interior least terns are known to nest along midstream sandbars of the Missouri and Yellowstone rivers. The proposed project is more than 2 miles from the Missouri River and more than 10 miles from the Yellowstone River. The proposed project, therefore, would not affect the interior least tern.

Whooping crane (*Grus Americana*)

The whooping crane stands 5 feet tall and has a long, sinuous neck and long legs. Its snowy white body feathers are accented by jet-black wingtips and a red and black head with a long, pointed beak. The whooping crane's wings measure about 7 feet across. The whooping crane is named for its call, which has been described as a shrill, bugle-like trumpeting.

The historic nesting range of the whooping crane once extended across the Canadian provinces of Manitoba, Saskatchewan, and Alberta and into the north-central United States. Historic wintering grounds extended as far south as central Mexico. The current nesting range is restricted to Wood Buffalo National Park in Canada, with wintering grounds along the Texas gulf coast at Aransas National Wildlife Refuge and vicinity.

Whooping cranes normally laying two eggs in late April to mid May, with hatching occurring about one month later. After nesting, the cranes migrate south through northeastern Montana, the western half of North Dakota, central South Dakota, Nebraska, Kansas, Oklahoma, and east-central Texas. Whooping cranes use a variety of habitats during migration, including croplands for feeding and large marshy wetlands for roosting.

The proposed project does not cross large marshy wetlands where whooping cranes would be likely to roost, but does cross croplands where cranes may feed. If individuals were migrating through the project area during construction, they would likely avoid the project area and use adjacent croplands for feeding. The proposed project, therefore, would not likely affect the whooping crane.

Pallid Sturgeon (*Scaphirhynchus albus*)

The pallid sturgeon is similar in appearance to its more common aquatic cousin, the shovelnose sturgeon. Like other sturgeon, the pallid's mouth is toothless and positioned under the snout for sucking small fish and other food items from the river bottom. It is a large river fish with some individuals reaching lengths of 6 feet and weighing more than 80 pounds.

The pallid sturgeon's known habitat includes the Missouri River in central Montana to St. Louis, Missouri; the Yellowstone River of eastern Montana; and the Mississippi River from St. Louis, Missouri to the Gulf of Mexico. The pallid sturgeon is adapted to habitat conditions that existed in these large rivers before human activity changed the river's natural free-flowing, warmwater, and turbid characteristics.

The proposed project is more than 2 miles from the Missouri River and more than 10 miles from the Yellowstone River where pallid sturgeon is known to occur. Even if construction across tributaries and drainages to the Missouri River somehow resulted in increased sedimentation and turbidity to the river, the pallid sturgeon favors warm, turbid waters and the proposed project would not likely affect the pallid sturgeon.

Gray Wolf (*Canis lupus*)

Gray wolves are the largest of all wild canids. They can grow up to 30-inches tall (at their shoulders) and 60-inches long. Male wolves weigh on average 90 pounds and females generally weigh 80 pounds. Their fur may be gray, white, red, or black.

Gray wolves were once common throughout most of North America, but now only live in northern regions of Minnesota, Wisconsin, and Michigan, and the northern Rocky Mountains of Montana, Idaho, and Wyoming. Occasionally, wolves are sighted in North Dakota, South Dakota, and Washington.

Wolf packs usually consist of a set of parents (alpha pair), their offspring and other non-breeding adults. Packs usually contain 2 to 12 members that live within a specific territory that ranges in size from 50 square miles to more than 5,000 square miles, depending on how much prey is available and seasonal prey movement. The territory usually contains a mix of forested and open areas. However, the species habitat preferences appear to be more prey dependent than cover dependent. Prey of the wolf includes deer, antelope, small mammals, and sometimes domestic livestock. Gray wolves excavate natal dens in well-drained soils in meadows near water and may use the same den for several years.

The wolves may also den in hallow logs or under tree roots, rock outcrops, or beaver lodges.

Within the hierarchy of the pack, the dominant male and dominant female breed. Mating occurs from January to April. A litter of four to seven pups is born between early April and early May. Pups are raised within dens for one to two months. The natal dens are then abandoned for a rendezvous site (or open area), where the pups are guarded by a few adult pack members while the rest of the pack hunts. After about seven to eight months the pups are ready to travel and hunt with the adult pack.

Most wolf experts agree that wolves spotted in North Dakota are probably lone individuals in search of a new home. These individuals are highly mobile and would likely avoid the project area if present. The proposed project, therefore, would not likely affect the gray wolf.

Bald Eagle (*Haliaeetus leucocephalus*)

Bald eagles are one of the largest birds in North America. They are about 29 to 42 inches long, have a wing span of 6 to 8 feet, and can weigh 7 to 15 pounds. The feathers of newly hatched bald eagles are light gray, and turn dark brown before they leave the nest at about 12 weeks of age. During their third and fourth years, bald eagles have mottled brown and white feathers under their wings and on their head, tail and breast. The distinctive white head and tail feathers do not appear until bald eagles are about 4 to 5 years old. Their beak and eyes turn yellow during the fourth and fifth year, and are dark brown prior to that time.

The bald eagle historically ranged throughout North America except extreme northern Alaska and Canada and central and southern Mexico. The decline of the bald eagle coincided with the introduction of the pesticide dichloro-diphenyl-trichloroethane ("DDT") in 1947. Eagles contaminated with DDT failed to lay eggs or produced eggs with thin eggshells that broke during incubation. Other causes of decline included shooting, trapping, and poisoning. Once decimated to fewer than 500 individuals, the population has rebounded over the past six decades to ten times that number. The current range of the bald eagle again includes all of the contiguous 48 United States, Alaska, and Canada.

Bald eagles are associated with aquatic habitats (coastal areas, rivers, lakes, and reservoirs) with forested shorelines or cliffs. Throughout their range, they select large, super-canopy roost trees that are open and accessible (mostly conifers). They winter primarily in coastal estuaries and river systems of the lower 48 states and Alaska, where thousands of bald eagles migrate each fall to take advantage of salmon-spawning runs.

The bald eagle is uncommon in North Dakota and is usually only seen along the Missouri River in fall or spring during migration.

The proposed project is more than 2 miles from the Missouri River where the bald eagle is most likely to be encountered. Bald eagles might use the project area for hunting and foraging. It is possible that hunting and foraging could be enhanced during construction when small mammals and other prey are forced to move from cover into adjacent habitat. Bald eagles, however, would likely avoid the project area during active construction, and the proposed project would not likely affect the bald eagle.

Piping Plover (*Charadrius melodus*)

The piping plover is a small, stocky, sandy-colored bird resembling a sandpiper. The adult has yellow-orange legs, a black band across the forehead from eye to eye, and a black ring around the base of its neck. Like other plovers, it runs in short starts and stops. When still, the piping plover blends into the pale background of open, sandy habitat on outer beaches where it feeds and nests. The bird's name derives from its call notes, plaintive bell-like whistles which are often heard before the birds are seen.

Piping plovers breed on the northern Great Plains and Canadian prairies, along the Great Lakes, and along the Atlantic coast from Newfoundland to North Carolina. They winter on the Atlantic and Gulf of Mexico coasts from North Carolina to Mexico, and in the Bahamian West Indies. In North Dakota, piping plovers arrive in breeding areas at the beginning of May.

Plovers will form a depression in the sand for a nest. The nest is sometimes lined with small stones or fragments of shell. Occasionally, plovers will re-nest if the first clutch is lost. Fledglings from these late nesting efforts may not be flying until late August. Plovers often gather in groups on undisturbed beaches prior to their southward migration. By mid September, both adult and young plovers will have departed to their wintering areas.

Piping plover in North Dakota is known to nest on midstream sandbars of the Missouri and Yellowstone rivers and along shorelines of saline wetlands, especially where there are salt-encrusted areas of gravel, sand, or pebbly mud wetlands. They forage near the water where invertebrates are most readily available. The proposed project is more than 2 miles from the Missouri River and more than 10 miles from the Yellowstone River, and based on field verification of wetlands within the project area,

the project would not cross salt-encrusted wetlands. Therefore, the proposed project would not likely affect the piping plover.

v. Areas Where Animals or Plant Species that Are Unique or Rare to this State Would be Irreversibly Damaged

A review of the project study area did not identify areas where animals or plant species that are unique or rare to the state would be irreversibly damaged within the proposed corridor or along the proposed route. On May 25, 2006, Enbridge sent a letter to the North Dakota Game and Fish Department to determine whether the proposed project would have significant adverse effects on unique or rare animal or plant species. On June 30, 2006, the North Dakota Game and Fish Department indicated that the proposed project would not likely have significant adverse effects on unique or rare animals or plant species or their habitats and did not identify any species of concern or conservation priority. Copies of these correspondence are included in Appendix C.

The original letter sent to the North Dakota Game and Fish Department requested review of the entire proposed route, but did not cover a portion of the corridor south of County Road 8. On July 12, 2006, Enbridge sent a second letter to the North Dakota Game and Fish Department requesting that they review the portion of the corridor not previously considered. Enbridge has not yet received a response to the second letter, but does not anticipate any concerns. Nonetheless, the entire proposed route was reviewed under the original letter. A copy of the second letter to the North Dakota Game and Fish Department is included in Appendix C.

b. Avoidance Areas

Avoidance areas are areas that are not considered in the routing of a transmission facility unless there is no reasonable alternative. The following table and text identify and discuss avoidance areas within the proposed corridor and along the proposed route. Maps illustrating the location of avoidance areas within the proposed corridor and along the proposed route are included in Appendix H.

Avoidance Area	Within Proposed Corridor	Along Proposed Route
National Historic Districts	No	No
National Wildlife Areas	No	No

Avoidance Area	Within Proposed Corridor	Along Proposed Route
National Wild, Scenic, or Recreational Rivers	No	No
National Wildlife Refuges	No	No
National Grasslands	No	No
State Wild, Scenic, or Recreational Rivers	No	No
State Game Refuges	No	No
State Game Management Areas	No	No
State Management Areas	Yes	Yes[1]
State Forests	No	No
State Forest Management Lands	No	No
State Grasslands	No	No
Historical Resources Which Are Not Specifically Designated as Exclusion or Avoidance Areas	Potentially	No
Areas Which Are Geologically Unstable	Yes	No
Within Five Hundred Feet [152.4 Meters] of a Residence, School, or Place of Business	Yes	Yes[2]
Reservoirs and Municipal Water Supplies	No	No
Water Sources for Organized Rural Water Districts	No	No
Irrigated Land	No	No
Areas of Recreational Significance Which Are Not Designated as Exclusion Areas	No	No

[1] Three parcels of school trust land managed by the State Land Department are crossed by the proposed route.
[2] Six residences, one school, and one business are within 500 feet of the proposed route.

i. Designated or Registered National: Historic Districts; Wildlife Areas; Wild, Scenic, or Recreational Rivers; Wildlife Refuges; and Grasslands

A review of the project study area did not identify any designated or registered national: historic districts; wildlife areas; wild, scenic, or recreational rivers; wildlife refuges; or grasslands within the proposed corridor or route. Only two such avoidance areas were identified in Williams County. The first is Lake Zahl National Wildlife Refuge, which is

about 24 miles to the north of the proposed corridor. The second is a segment of the Missouri River within the Fort Union Trading Post, which is about 13 miles to the southwest of the proposed corridor. Although not an officially designated wild and scenic or study river, this segment of the Missouri River is on the Nationwide Rivers Inventory. The Nationwide Rivers Inventory 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. Under a 1979 Presidential directive and related Council on Environmental Quality procedures, all federal agencies must seek to avoid or mitigate actions that would adversely affect Nationwide Rivers Inventory segments. These avoidance areas were not factors in selecting the proposed corridor or route.

ii. Designated or Registered State: Wild, Scenic, or Recreational Rivers; Game Refuges; Game Management Areas; Management Areas; Forests; Forest Management Lands; and Grasslands

A review of the project study area identified only two types of designated state management areas within the proposed corridor and route: 1) school trust land and 2) private land open to sportsmen ("PLOTS"). Otherwise, there were no instances of other state-registered or state-designated: wild, scenic, or recreational rivers; game refuges; game management areas; forests; forest management lands; or grasslands within the proposed corridor or along the proposed route. It should be noted that there are five designated state game management areas (also known as wildlife management areas) in Williams County, but the nearest of these is the Trenton Wildlife Management Area, which is about 5 miles to the southwest of the proposed corridor.

School Trust Land

There are numerous school trust land parcels within Williams County. Three parcels occur within the proposed corridor and all are crossed by the proposed route (see Appendix H).

When the federal government granted states their statehood in the 1800s, it also gave land (usually sections 16 & 36) to each newly developed state to ensure the financial needs of education were not neglected. Each state created a governing body to manage those assets for education. In North Dakota, that body is the Board of University of School Lands, and the administering agency is the North Dakota State Land Department.

As part of its administering duties, the North Dakota State Land Department leases school trust lands to the private sector to generate

education revenue for the state. The land is generally managed for grazing and leased for livestock production in areas where land might otherwise be unavailable. Currently, school trust lands are nearly 100 percent leased; producing over $4 million in income each year for state-funded education. School trust lands are found in 50 counties statewide; are concentrated in the state's livestock-producing regions; and consist of 97 percent pasture and 3 percent crop or hay.

The effect of the proposed project on school trust lands would be short term. Livestock grazing and movement would be prohibited in the project area during construction. However, given the narrow, linear nature of the project and the alignment of the pipeline adjacent to most property boundaries, grazing reductions and livestock movement encumbrance would be minor. Following construction, the work area would be restored to its pre-construction contours and areas would be reseeded with mixtures approved by the North Dakota State Land Department. After successful revegetation of the right-of-way, livestock would be allowed to graze and roam freely over the permanent right-of-way following construction. Additionally, the North Dakota State Land Department already has a program for issuing easements for pipeline; electrical transmission lines; county roads and highways; and leases for gravel and aggregate mining. Easements for underground pipelines, such as the proposed pipeline, would benefit the program by generating additional education revenue for the state from the easement while allowing continued use of the land in the program.

To minimize temporary impacts of construction on school trust land, Enbridge would implement the following mitigation measures:

- make arrangements with leasees to keep livestock in fields not affected by the proposed project where practical;
- cut and brace fences crossed by the proposed pipeline in a manner to prevent slack, and install gates across the opening to prevent livestock passage where required;
- install temporary fences as necessary to prevent livestock from entering the construction area;
- where there is a poorly established sod layer, strip the existing amount of topsoil, up to a maximum depth of 12 inches, from over the trench and spoil side of the right-of-way (where there is less than 12 inches of topsoil, strip the existing amount);

- where there is a well established sod layer, strip the existing amount of topsoil, up to a maximum depth of 12 inches, from over the trench only (where there is less than 12 inches of topsoil, strip the existing amount);

- store topsoil and subsoil in a manner that prevents mixing, and return topsoil to its original horizon during backfilling;

- restore the work area its pre-construction contours and reseed with mixtures approved by the North Dakota State Land Department;

- where practical, defer grazing in the area until work area vegetation becomes reestablished;

- compensate leasees for temporary loss of land use; and

- compensate the North Dakota State Land Department for a permanent easement on its property.

School trust land could be avoided by rerouting the propose pipeline onto adjacent property. However, rerouting the pipeline onto adjacent property would not take advantage of the existing utility corridor in the area and would not allow the state to capitalize on additional education revenue for which the land was designated. Furthermore, rerouting the pipeline onto adjacent property would result in similar impacts on the adjacent land. Given the minor and short-term nature of the impacts, the preferred route is across school trust land.

PLOTS Parcels

There are a numerous PLOTS parcels within Williams County. Four parcels are within the proposed corridor, none of which are crossed by the proposed route (see Appendix H).

PLOTS parcels are private lands which the state pays owners to open to public access for recreation and hunting, and/or conserve as fish or wildlife habitat. In comparison to neighboring states, North Dakota does not have much public land. Only about 10 percent of the state is public land. Therefore, much of the state's outdoor recreation and wildlife conservation depends on suitable habitat found on private land.

Over the past several years, the North Dakota Game and Fish Department has developed and implemented a plan for conserving and enhancing fish and wildlife populations on private land. The PLOTS program is one of the primary components of this plan. The PLOTS

program provides financial incentives to landowners who are interested in wildlife conservation practices on their lands and allowing public access for hunting.

Although four PLOTS parcels are within the proposed corridor, no PLOTS parcels would be crossed by the proposed route and there would be no direct impacts on PLOTS parcels from the project (*i.e.*, conservation habitat would not be temporarily or permanently altered or removed). However, two of the four PLOTS parcels are near the proposed route, on the opposite side of County Road 8 from the pipeline. Increased noise and human activity during construction could affect wildlife on these parcels and lead to temporary displacement and lowered animal fitness. Hunting and other recreational experiences could also be diminished due to noise and human activity. County Road 8 separates these parcels from the project area, and wildlife species occupying the PLOTS parcels are likely already accustom to noise and human activity on the road. Therefore, no mitigation (*e.g.*, buffer zone) at these locations is proposed.

Other Management Areas

Although technically not state-designated or state-registered management areas, land in the federal conservation reserve program, grassland reserve program, or wetland reserve program could be affected by the proposed project. These programs are managed by the U.S. Department of Agriculture, Natural Resource Conservation Service and the U.S. Department of Agriculture, Farm Service Agency. Similar to the PLOTS program, these programs are voluntary programs whereby landowners can receive annual rental payments and cost-share assistance to establish long-term, resource conserving covers, such as grasslands or wetlands.

Enbridge contacted the Natural Resource Conservation Service regarding the location of program lands in the project vicinity. The Natural Resource Conservation Service responded that neither they nor the Farm Service agency would be able to provide information about the location of these lands due to landowner privacy concerns. They did indicated that conservation reserve program lands would be the only program lands in the project vicinity. To minimize the potential for impacts on conservation reserve program lands: Enbridge would:

- attempt to identify conservation reserve program lands during easement negotiations with landowners;

- restore conservation reserve program lands in accordance with the conservation plans for the land; and

- compensate landowners of conservation reserve program lands if rental payments or cost-share assistance are affected.

iii. Historical Resources Which Are Not Specifically Designated as Exclusion or Avoidance Areas

A review of the project study area identified several potential historical resources, which are not specifically designated as exclusion or avoidance areas, within the proposed corridor. There are numerous archaeological sites in Williams County. In July 2006, Enbridge completed a class 1 literature search of the proposed corridor and, based on the results of the class 1 literature search, conducted a class 2 reconnaissance inventory on those parts of the proposed route likely to contain cultural resources. Enbridge did not complete a class 2 reconnaissance inventory of the entire 1-mile-wide corridor because the scope, cost, and timing associated with completing such a far-reaching study would be prohibitive.

Based on the class 1 literature search of the proposed corridor, there are 37 sites, site leads, and/or isolated finds documented within the proposed corridor. Of these, 11 are very near the proposed route (see appendices E and H). None of the 11 site have been formally evaluated by the State Historic Preservation Office for nomination to the National Register of Historic Places.

The class 2 reconnaissance inventory identified an additional 19 sites, site leads, and/or isolated finds within the proposed corridor. Of the 19 sites, 5 are being recommended as not eligible for nomination to the National Register of Historic Places, meaning the sites are not significant to the history or pre-history of the state or community, and they are not worthy of preservation. Additionally, 5 of the previously unevaluated 11 sites from the class 1 literature search are now being recommended as not eligible. Enbridge is proposing to construct through the 10 sites being recommended as not eligible. Should the State Historic Preservation Office not agree with this approach, Enbridge would avoid or mitigate impacts on the sites.

No recommendation was made regarding eligibility for a total of 20 sites identified in the class 1 literature search and class 2 reconnaissance inventory. The significance of these sites and their value to the history and pre-history of the state and community have not yet been established. Therefore, Enbridge aligned its proposed route and construction work area to avoid these 20 sites. The realignment of the route and work area included a 50-foot buffer zone around each site

account for the possibility of subsurface expressions of the sites. The buffer zone would also minimize the risk of accidental disturbance during construction.

There is always potential during construction to encounter previously unknown cultural resources or human remains. Enbridge is proposing to implement mitigation measures that would minimize the potential impacts on unanticipated discoveries. Enbridge would:

- immediately stop work in the vicinity of an unanticipated discovery of cultural resources or human remains and notify appropriate personnel at the State Historic Preservation Office, North Dakota State Health Department, and/or law enforcement.

- prohibit work in the vicinity of the unanticipated discovery until all appropriate contacts, consultations, evaluations, disposition, treatments, and authorizations have been obtained.

iv. Areas Which Are Geologically Unstable

There are three types of geologic instabilities (or hazards) that are a concern to pipelines: earthquakes, landslides, and sinkholes.

Earthquakes

Earthquakes, including related hazards such as soil liquefaction, are not considered to be a significant risk in North Dakota. North Dakota lies within an area considered to be at the lowest possible risk for earthquakes in the United States. No earthquakes of a magnitude capable of damaging a welded steel pipeline have occurred within North Dakota during historical times. This type of avoidance area was not a factor in selecting the proposed corridor or route.

Landslides

Landslides pose a potential risk in certain parts of Williams County. A landslide occurs when a mass of soil and/or rocks tumble or slide down a slope under its own weight. Slopes may fail for various reasons, including the steepness or angle of the slope, soil and/or rock type, bedding, and moisture content of the soil and/or rocks. Landslides can damage buildings, roads, railroad tracks, pipelines, transmission lines, and other types of infrastructure. Landslides are generally identified in the field by steep, near-vertical slopes (the scarp) that are underlain by a mound of displaced soil and/or rock (the body).

According to state geologic hazard maps, most landslides in Williams County occur on steep slopes adjacent to streams and rivers. Small landslides have occurred along the north edge of the proposed corridor at an unnamed tributary to Little Muddy Creek (milepost 29.0) and Cow Creek (milepost 31.8). The proposed pipeline route is located away from steep slopes along these waterbodies. Therefore, there is low probability of landslides affecting the proposed project. These avoidance areas were not significant factors in selecting the proposed corridor or route.

Sinkholes

Sinkholes are considered a geologic hazard in parts of North Dakota. Sinkholes are becoming more common in areas where lignite (coal) mining occurred beneath soft sediments. Many of the early coal mines in the state were underground and the coal seams were not very deep. Very few of the mined areas have any rock strata to provide solid roofing for the mines, and the soil over most of the older mines does not add stability to the overburden. Roads, homes, and sometimes entire towns were constructed over abandoned coal mines, so when subsidence occurs, some degree of damage can occur. Generally, mine collapse is evident by a relatively small surface opening and the hole belling out to become wide and deep.

There are no active coal mines in Williams County. However, one historical, abandon coal mine is within the proposed corridor (see Appendix H). The exact location of the abandon mine is not known, except that is within the northeast quarter of Section 4 in Pherrin Township near milepost 29.0. Neither the state nor the county have records on the mine, including such basic information as the depth, distance, and direction of underground mining. Therefore, the risk of sinkhole development in the vicinity of the mine is unknown. County Road 8 was routed slightly to the north in this area, presumably to avoid conflicts with the mine. The existing pipeline lies just to the north of County Road 8 and closely follows its route. The area has not experience sinkhole development to date, and Enbridge is planning to route the proposed pipeline adjacent to the existing pipeline through this area.

v. Within Five Hundred Feet [152.4 Meters] of a Residence, School, or Place of Business

A review of the project study area identified 1 school, 2 places of business, and 68 occupied (not abandon) residences within the proposed corridor (see Appendix H). Of these structures, only the school, one business, and six residences are within 500 feet of the proposed route.

School

Enbridge is proposing to install the proposed pipeline adjacent to its existing pipeline along a majority of the proposed route, except at certain locations where minor route variations were requested by landowners, are necessary to improve constructability, or would aid in minimizing impacts on sensitive areas. One of these minor route variations is at Hidden Valley Elementary School at milepost 31.8. The school playground was built over the existing pipeline. Enbridge is proposing to route the proposed pipeline 320 feet to the north of the school building to avoid direct impacts on the school grounds. A 500 foot offset from the school is not being proposed because the terrain slightly further to the north slopes down into the Cow Creek drainage basin, which is known to be prone to landslides (see Section D.2.b.iv). Enbridge would implement mitigation measures to minimize the potential for the construction to become a nuisance or hazard to students and faculty. Enbridge would:

- if school is in session during construction, offer to meet with school faculty and students to inform them of the project and associated potential hazards;
- install a temporary fence and warning signs between the school and work area during construction;
- implement a safety watch on school days during active construction; and
- if school is in session during construction, control dust by watering the construction work area near the school where dust is creating a nuisance.

Business

Enbridge is also proposing to construct its pipeline within 500 feet of one business: a feed lot which is situated about 175 feet south of the existing pipeline at milepost 5.7. Enbridge is proposing to follow its existing pipeline at this location and not to vary its route because the proposed the feed lot is on the opposite side of County Road 8 and the existing pipeline. The feed lot would be buffered from construction by the road and existing pipeline and no additional benefit would be offered by varying the route at this location.

Residences

Enbridge is also proposing to construct its pipeline within 500 feet of six residences:

1. near milepost 5.9, about 490 feet north of the existing pipeline;
2. near milepost 8.4, about 300 feet south of the existing pipeline;
3. near milepost 14.9, about 295 feet south of the existing pipeline;
4. near milepost 19.4, about 175 feet south of the existing pipeline;
5. near milepost 43.0, about 165 feet north of the existing pipeline; and
6. near milepost 46.6, about 250 feet east of the existing pipeline.

Enbridge is proposing to follow its existing pipeline at these locations and not to vary its route. Where residences are south of the proposed line (residences 2, 3, and 4), they are on the opposite side of County Road 8 and the existing pipeline and are buffered from construction by the road and pipeline. A route variation would not provide additional benefits at these locations. Where the residences are north and east of the proposed route (residences 1, 5, and 6), Enbridge is proposing to keep the pipelines adjacent to one another. Landowners along the route have generally expressed a preference for keeping the lines close together because doing so would minimize the total amount of land burdened by a pipeline easement. Pipeline easements limit landowners full use of the land by restricting activities such as erecting structures and/or planting trees within the easement.

vi. Reservoirs and Municipal Water Supplies

A review of the project study area did not identify any water reservoirs or municipal water supplies within the proposed corridor or along the proposed route. The nearest reservoir is the Springbrook reservoir, which more than one-half mile south of the proposed corridor. The nearest municipal water supply is a well about 3 miles north and is owned by the City of Ray. The well, which is in the Ray aquifer of the Lake Sakakawea drainage basin, is 169 feet deep. The city does not have a permit to operate this well. This avoidance area was not a factor in selecting the proposed corridor or route.

vii. Water Sources for Organized Rural Water Districts

A review of the project study area did not identify any water sources for organized rural water districts within the proposed corridor or along the proposed route. The only rural water district within the proposed corridor is the Williams Rural Water District. The district purchases its waters from the City of Williston, which obtains its water from Lake Sakakawea. This avoidance area was not a factor in selecting the proposed corridor or route.

viii. Irrigated Land

According to Section 69-06-08-012.h of the North Dakota Administrative Code, this section does not apply to underground transmission facilities such as the proposed pipeline. Aboveground facilities (*i.e.*, tool traps and block valves) associated with the pipeline would be installed within or immediately adjacent to existing aboveground facilities.

ix. Areas of Recreational Significance Which Are Not Designated as Exclusion Areas

A review of the project study area did not identify any areas of recreational significance which are not designated as exclusion areas within the proposed corridor or along the proposed route. This type of avoidance area was not a factor in selecting the proposed corridor or route.

c. Selection Criteria

Selection criteria are those environmental resources on which the project must have an acceptable minimum amount of impact, as determined by the Commission.

i. The Impact Upon Agriculture

1. Agriculture Production

Agriculture is the predominant land use within the proposed corridor and along the proposed route. Agriculture land use comprises about 20,992 acres (62.6 percent) of the proposed corridor. Construction of the proposed pipeline would temporarily affect approximately 355

acres of crops along the proposed route.[2] Maps in Appendix I illustrate the location of agricultural land within the proposed corridor and along the proposed route.

The effects of construction on agriculture would be minor and short-term. The primary impact would be the loss of standing crops within the construction work area for the growing seasons during which project-related activities occur. It is possible for construction to result in soil compaction; mixing of topsoil and subsoil, including introduction of rocks into the topsoil from the subsoil; erosion; the introduction of weeds; and damage to irrigation and drainage systems. These impacts can lower soil productivity and reduce crop yields following construction.

Permanent impacts on agriculture production are not anticipated. Enbridge would bury the pipeline deeper than typical tillage depths to allow continued use of the land. Following construction, Enbridge would restore the right-of-way to its pre-construction contours and stabilize the ground until the next growing season. Planting and harvesting would be allowed to continue over the permanent right-of-way. Enbridge expects that fields would return to normal yields within a year or two following construction.

Enbridge is proposing to implement mitigation measures to minimize the potential for short-term impacts on agriculture productivity. Enbridge would:

- bury the pipeline deeper than typical tillage depths to allow continued use of the land for agriculture after construction;
- clean heavy equipment that is capable of transporting weed propagules or soil pest prior to use on the project;
- prohibit construction during periods of prolonged, heavy rainfall to minimize the potential for soil compaction and reduced soil productivity;
- alleviate soil compaction caused by construction by deep tilling or chisel plowing soils (or using other methods approved by the

[2] Construction impact acreages cited throughout this document are preliminary estimates. Actual acreages of impact may be greater or less depending on final route authorized by the Commission and the actual work space used during construction (see Section A.3.a).

landowner or land management agency) where compaction has been shown to have been caused by construction;

- strip the existing amount of topsoil, up to a maximum depth of 12 inches, from over the trench line and subsoil storage area to maintain topsoil integrity and minimize impacts on soil productivity (where there is less than 12 inches of topsoil, strip the existing amount or to the bottom of the plow layer, whichever is deepest);
- store topsoil and subsoil in a manner that prevents mixing, and return topsoil to its original horizon during backfilling;
- implement temporary erosion best management practices (*e.g.*, slope breakers, sediment barriers, and mulch) to minimize the potential for soil loss due to wind or water erosion during construction;
- compensate landowners for crop loss and other associated damages for the year of construction;
- coordinate with landowners to assess crop productivity following construction and provide compensation where crop yields show decline;
- coordinate the interruption of irrigation and drainage systems with each landowner and compensate the landowner for damages and lost production that result from interruption of irrigation and/or drainage;
- repair, replace, or compensate landowners where irrigation and/or drainage systems are damaged by construction; and
- compensate landowners for a permanent easement on their property.

2. Family Farms and Ranches

Family farms and ranches are prevalent within the proposed corridor and along the proposed route. Enbridge estimates that as many as 125 family farms and ranches are within proposed corridor, with up to 97 along the proposed route.

The effects of construction on family farms and ranches would be minor and short-term. The primary impact on family farms would be the loss of standing crops within the work area for the growing

seasons during which project-related activities occur, as well as potential diminished yields for a year or two following construction. Enbridge would mitigate these temporary effects by following the measures listed in Section D.2.c.i.1.

The primary impact on family ranches would be prohibition of livestock grazing in the project area and encumbrances on livestock movement across the project area during construction. Given the narrow, linear nature of the project and the alignment of the pipeline along property boundaries, livestock grazing reductions and livestock movement encumbrance would be minor.

Long-term or permanent impacts on family farms and ranches are not anticipated. The project would not result in changes of land ownership. Following construction, the work area would be restored and farming and ranching would be allowed to continue over the permanent right-of-way. Although grazing would be deferred where practical in disturbed areas until right-of-way vegetation becomes reestablished, landowners would be compensated for temporary loss of land use. Grazing would return to normal after revegetation.

Enbridge is proposing to implement mitigation measures to minimize the potential for short-term impacts on livestock grazing and movement. Enbridge would:

- make arrangements with landowners to keep livestock in fields not affected by the proposed project where practical;
- cut and brace fences crossed by the proposed pipeline in a manner to prevent slack, and install gates across the opening to prevent livestock passage, if required;
- install temporary fences as necessary to prevent livestock from entering the construction area;
- where there is a poorly established sod layer, strip the existing amount of topsoil, up to a maximum depth of 12 inches, from over the trench and spoil side of the right-of-way (where there is less than 12 inches of topsoil, strip the existing amount);
- where there is a well established sod layer, strip the existing amount of topsoil, up to a maximum depth of 12 inches, from over the trench only (where there is less than 12 inches of topsoil, strip the existing amount);

- store topsoil and subsoil in a manner that prevents mixing, and return topsoil to its original horizon during backfilling;
- restore the work area its pre-construction contours and reseed with mixtures approved by the landowner;
- where practical, defer grazing in the area until right-of-way vegetation becomes reestablished;
- compensate landowners for temporary loss of land use; and
- compensate landowners for a permanent easement on their property.

3. Land Which the Owner Can Demonstrate Has Soil, Topography, Drainage, and an Available Water Supply that Cause the Land to Be Economically Suitable for Irrigation

In addition to impacts on actively cultivated fields, the project could impact land capable of supporting future cultivation. This includes land which the owner can demonstrate has soil, topography, drainage, and an available water supply that cause the land to be economically suitable for irrigation.

Generally, land suitable for cultivation within the proposed corridor, regardless of whether it is actually cultivated or not, is designated as "prime farmland" or "farmland that is of statewide or local importance." The U.S. Department of Agriculture, Natural Resource Conservation Service has defined prime farmland and farmland that is of statewide or local importance as land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, and oilseed crops. These designations include cultivated land, pasture, woodland, and other land that is either used for food or fiber crops or are available for these uses. Urbanized land and open water are generally excluded from prime farmland and farmland that is of statewide or local importance.

Prime farmland and farmland that is of statewide or local importance typically contains few or no rocks; is not subject to excessive erosion; is relatively permeable to air and water; and is not subject to prolonged periods of flooding during the growing season. Soils that do not meet these criteria may be considered prime or important farmland if the limiting factor is mitigated (*e.g.* artificial drainage). The Natural Resource Conservation Service defines the specific criteria for determining prime farmland. State and local government

agencies define the criteria for determining farmland that is of statewide or local importance.

Prime farmland and farmland that is of statewide or local importance is only slightly more predominate than actual farmland within the proposed corridor and along the proposed route (see Appendix J). Prime and important farmland comprise up to 21,680 acres of the proposed corridor, as compared to 20,992 acres of actually cultivated farmland; a difference of only 688 acres (or 3 percent increase). Construction of the proposed pipeline would temporarily affect approximately 359 acres of prime farmland or farmland that is of statewide or local importance along the proposed route as compared to 355 acres of actually cultivated land; a difference of only 4 acres (or 1 percent increase).

A number of factors used to designated prime farmland and farmland that is of statewide or local importance would not be affected by the proposed project. For example, rainfall and the length of the growing season would not change. Criteria that could be affected by the proposed project are mainly related to soil productivity and are the same as those discussed for agriculture production. For example, it is possible for construction to result in soil compaction; mixing of topsoil and subsoil, including introduction of rocks into the topsoil from the subsoil; erosion; introduction of weeds; and damage to irrigation and drainage systems.

The actual effects of the proposed project on prime farmland and farmland that is of statewide or local importance varies by the actual land use and/or land cover affected. For example, effects on actively cultivated land are different than uncultivated land. On actively cultivated land, Enbridge would implement mitigation measures to minimize effects on agriculture production as discussed in Section D.2.c.i.1 and there would be only minor, short-term impacts on the land. Where land is used for other purposes, Enbridge would implement other mitigation measures suitable to the current land use and/or land cover. For example, Enbridge would implement the measures discussed in Section D.2.c.i.2 on land used for grazing. Additionally, if construction activities were to adversely affect soil productivity in prime or important farmland, productivity could be reestablished by mitigating for the limiting factors in the future.

Long-term impacts on prime farmland and farmland that is of statewide or local importance would be minor. Following construction, the work area would be restored to its pre-construction condition and

stabilized. Future drain and irrigation systems would be allowed on the permanent right-of-way in accordance with specifications that allow for the safe and continued use of the pipeline. The only permanent impact would be the conversion of prime or important farmland to an industrial use where surface facilities are installed. Enbridge is proposing to install all surface facilities (*i.e.*, tool traps and block valves) within or immediately adjacent to existing aboveground facilities. With the exception of the block valves on each side of Little Muddy Creek (mileposts 30.6 and 31.0) all surface facilities would be installed within the fenced boundaries of existing facilities. The block valves proposed on each side of Little Muddy Creek would be installed adjacent to the existing block valves. The block valve on the east side is in uncultivated prime farmland that is presently being used for grazing. Construction of the block valve would permanently convert 0.03 acre of uncultivated prime farmland to an industrial use.

4. Surface Drainage Patterns and Ground Water Flow Patterns

Surface Drainage

The proposed corridor and route are within the Northwestern Glaciated Plains ecoregion, which marks the westernmost extent of continental glaciation. The morainal landscape has significant surface irregularity and generally high concentrations of wetlands. Within the Northwestern Glaciated Plains ecoregion, the proposed corridor and route cross the Missouri Coteau Slope (milepost 0 to 25) and Glaciated Dark Brown Prairie (milepost 25 to 52). Both of these subregions are characterized by gently rolling topography, a simple drainage pattern sloping toward the Missouri River, and, unlike most of the Northwestern Glaciated Plains ecoregion, relatively few wetlands. The dominant drainage feature crossed by the proposed route is Little Muddy Creek. Numerous intermittent drainages are also crossed.

The proposed pipeline would not materially alter Little Muddy Creek, intermittent drainages, or the geologic or physiographic conditions of the area. Enbridge is proposing to cross Little Muddy Creek using horizontal directional drilling as recommended by the North Dakota Game and Fish Department. Horizontal directional drilling involves drilling a hole under the creek and installing a prefabricated segment of pipe through the hole. Horizontal directional drilling is designed to avoid disturbing the bed or banks of the creek, and should have no effects on surface drainage.

Enbridge is proposing to cross other drainages using open-cut construction. Open-cut construction involves trenching through the drainage in a manner similar to upland construction. Construction effects on surface drainage patterns would include temporary disturbances to the natural topography; however, Enbridge is proposing to restore the project area to its pre-construction contours following construction and long-term impacts are not anticipated.

Groundwater

Groundwater aquifers within the project area include bedrock and glacial drift aquifers. Bedrock aquifers are generally found at a depth of 5,000 feet and are not suitable for human or livestock consumption or irrigation because of large amounts of dissolved solids in the water, including potash and sodium chloride.

Three glacial drift aquifers are crossed by the proposed project: Hofflund, Ray, and Little Muddy. Maps in Appendix J illustrate the locations of these aquifers. These aquifers are found at depths ranging from a few feet to more than 500 feet and are known to yield from 50 to 500 gallons per minute. The water quality of the Little Muddy aquifer is generally considered good, whereas the water quality of the other two aquifers is marginal because of high saline content. The City of Ray owns a municipal water well about 3 miles to the north of the proposed corridor within the Ray aquifer, but city does not have a permit to operate the well (see Section D.2.b.vi).

Ground disturbance associated with pipeline construction is generally limited to 6 feet or less below the existing ground surface, except where horizontal directional drilling is proposed. Where horizontal directional drilling is proposed, the pipeline may be installed as deep as 50 feet. Most construction would be above glacial drift aquifers and wells in the area. Nevertheless, construction activities such as trenching, blasting, drilling, dewatering, and backfilling could encounter shallow aquifers and cause minor fluctuations in groundwater levels and/or increased turbidity within the aquifer adjacent to the activity. Impacts on deeper aquifers are not anticipated. Since most shallow aquifers exhibit rapid recharge and groundwater movement, shallow aquifers would quickly reestablish equilibrium if disturbed, and turbidity levels would rapidly subside. Consequently, the effects of construction would be minor and short term.

There is a potential for groundwater contamination from accidental spills during vehicle refueling and maintenance; from other potential hazardous material spills that occur during construction; and from the potential disturbance of existing contaminated soils. The deterioration of groundwater quality by such factors could adversely affect groundwater. Enbridge is proposing to implement mitigation measures to minimize the potential for accidental spills or disturbance of contaminated soils during construction. Enbridge would:

- prepare and implement a spill prevention, containment, and countermeasure plan that describes procedures that would be followed to prevent, control, report, and clean up spills, including requirements for employee training, spill response equipment, equipment inspection, fuel dispensing, and fuel storage; and

- notify the affected landowner and coordinate with the appropriate federal and state agencies as mandated by law if contaminated soil and/or groundwater are encountered during construction.

ii. The Impact Upon:

1. Noise Sensitive Land Uses

A review of the project study area identified five types of noise sensitive areas and land uses within the proposed corridor and along the proposed route: residences, schools, places of business, grazing, and hunting. A total of 68 residences, 1 schools, and 2 places of business are within the proposed corridor. Six residences, one school, and one business are within 500 feet of the proposed route (see Appendix H). Grazing and hunting occur throughout the corridor and along the proposed route.

The proposed corridor and route are located in a predominately rural setting characterized by an inherently low ambient noise level. Most of the noise generated in any given area is due to human activity, mainly vehicle traffic. Lesser amounts of noise can be attributed to natural causes, such as wind, birds, and insects.

The effects of noise on people, livestock, and wildlife is strongly influenced by the level and timing of the noise. Some people become annoyed with noise levels during nighttime hours above 40 decibels (a quiet room). Livestock and wildlife may disperse from an area when the noise levels exceed about 50 decibels (a moderate rainfall).

The heavy equipment needed to construct the pipeline is expected to generate between 80 and 90 decibels within 50 feet of the equipment. Noise sensitive receptors close to construction would be exposed to temporary increases in noise. People living, working, teaching, learning, hunting, or otherwise occupying areas near the work area may become annoyed, and livestock and wildlife may relocate to adjacent areas. The effects of noise would be diminished where the project is adjacent to County Road 8 and other roads (about 37.5 miles or 71 percent of the proposed route) because these areas already experience increased noise levels from traffic (estimated between 60 and 70 decibels when cars and/or trucks are traveling on roads at higher speeds). Nighttime noise levels would normally be unaffected by construction, as most construction is typically restricted to daylight hours.

No new, permanent noise sources are being proposed as part of this project.

2. The Visual Effect on the Adjacent Area

A review of the project study area did not identify any designed scenic outlooks or viewing areas within the proposed corridor or along the proposed route. The nearest scenic outlook is at Williston Marsh, about 6 miles east of the proposed corridor. Fort Buford, which is about 10 miles southwest of the proposed corridor also has a scenic outlook overlooking the Missouri and Yellowstone rivers.

The proposed corridor and route traverse a landscape consisting primarily of grasslands and agricultural fields where the line of sight is broken only by rolling hills and the occasional wooded area or building. Viewing opportunities of the proposed project are greatest from the tops of hills and where residences and places of businesses are within sightlines of the proposed pipeline. Viewing opportunities are also present where the corridor parallels or crosses roads.

To minimize impacts on visual resources, Enbridge aligned the proposed pipeline adjacent to its existing pipeline along a majority of the route. This alignment minimizes impacts on visual sightlines and contrasts with adjacent vegetation communities. Visual effects would be greatest during active construction during which time heavy equipment, open trenches, and spoil piles would change the colors and textures of the landscape. The duration of visual impacts would be relatively short as the reestablishment of vegetation on grasslands and agricultural land following construction would be relatively fast.

The only permanent impact on visual resources would be the conversion of wooded areas to grasslands within the permanent right-of-way and the conversion grasslands to industrial use where new surface facilities are proposed. The visual effect of clearing wooded areas on this project would be minor. The only wooded areas within the proposed corridor occur as wooded draws in wetlands and as shelterbelts adjacent to farms, fields, and roads to block prevailing winds. The proposed route crosses 1 wooded draw and about 19 shelterbelts. Enbridge is proposing to implement mitigation measures to minimize the potential for impacts on wooded areas. Enbridge would:

- reduce the width of the construction work area to 75 feet or less in wooded areas;
- selectively cut and remove shrubs and trees within the 75-foot-wide construction work area leaving mature shrubs and trees in place where practical; and
- replace shrubs and trees affected by construction with bare root seedlings of similar species on a 2 to 1 basis as recommended by the North Dakota Game and Fish Department provided that the shrubs and trees replaced are outside the permanent right-of-way, not within other utility rights-of-way, and authorized by the landowner or land management agency.

The visual effect of installing new surface facilities along the proposed route would be minor. With the exception of the block valves on each side of Little Muddy Creek (mileposts 30.6 and 31.0) all surface facilities would be installed within the fenced boundaries of existing facilities. The block valves proposed on each side of Little Muddy Creek would be installed adjacent to the existing block valves at these locations.

3. Extractive and Storage Resources

A review of the project study area identified two types of actively mined extractive resources at various locations within the proposed corridor: oil and gas and sand and gravel. Neither of these extractive resources would be affected by the proposed route. Lignite, scoria (volcanic-like rock), and salt are also mined in Williams County. Although these resources may exist within the proposed corridor, mines for these resources were not identified. Additionally, storage resources within the proposed corridor were not identified.

Oil and gas

Known oil and gas reserves in North Dakota are associated with the Williston Basin in the western half of the state. The Williston Basin is a structurally simple basin. It is roughly circular, deepest in its center, and the strata become both shallower and thinner towards its margins. It is a large basin, covering approximately 300,000 square miles over parts of North Dakota, South Dakota, Montana, and the adjacent Canadian provinces of Saskatchewan and Manitoba.

The proposed corridor and route pass over the basin's deepest point where the Precambrian surface is more than 16,000 feet below the surface. There are an estimated 36 oil wells within the proposed corridor, with the majority of these concentrated near the corridor's beginning and end (see Appendix J). None are on the proposed route.

Typically, the pipeline trench would be less than 6 feet deep to account for the pipe and adequate cover, except where horizontal directional drilling is proposed. Where horizontal directional drilling is proposed, the pipe would be installed up to a depth 50 feet. Because oil and gas is generally produced from depths in excess of 1,000 feet, construction of the pipeline would not be expected to affect the ability of the wells to produce petroleum and/or natural gas. Rather, any construction-related damage that could occur would be limited to surface or near-surface components of the wells and gathering systems, which could temporarily disrupt production until repairs are made. To minimize the potential for impacting near-surface components, Enbridge would:

- identify any associated underground gathering lines along the proposed route and take appropriate precautions to protect the integrity of such facilities.

Sand and Gravel

There are a number of areas within the proposed corridor where surface sand and gravel are potentially mineable. A review of the project study area identified seven existing sand and/or gravel mining operations within the proposed corridor. All seven operations appeared to be abandoned. The existing pipeline already precludes surface mining in the immediate vicinity; therefore, neither short- nor long-term impacts associated with the proposed pipeline are anticipated.

4. Wetlands, Woodlands, and Wooded Areas

Wetlands

Enbridge completed a "desktop" wetland review of the proposed corridor and field verified wetland boundaries along the proposed route. Wetlands are scattered throughout the proposed corridor and along the proposed route (see appendices F and I). Wetlands occupy about 470 acres (1.4 percent) of the proposed corridor. Construction would temporarily affect about 5 acres of wetlands.

The most dominate wetland community within the project area are emergent wetlands, which are characterized by rooted herbaceous vegetation. Water sources for these wetland communities include seepage from ditches and drainages, irrigation runoff, and ponding on poorly drained soils. Common emergent wetland species along the pipeline route are foxtail barley, water smartweed, spike rush, curly dock, uptight sedge, inland rush, and bluegrass.

In addition to emergent wetlands, farmed and wooded wetlands occur within the proposed corridor and along the proposed route. Wetlands that are farmed meet specific hydrologic criteria of wetlands, but would be treated as agricultural land on this project for mitigation purposes (see Section D.2.c.i.1). Wetlands that wooded would be treated as wetlands, but also would be mitigated as wooded areas as discussed later in this section.

Construction in wetlands would primarily result in short-term impacts including temporary loss of wetland vegetation, soil disturbance, and increases in turbidity and fluctuations in wetland hydrology. Additionally, wetlands could be contaminated by accidental spills during vehicle refueling and maintenance, or from other potential hazardous material spills that might occur during construction. Enbridge is proposing to implement mitigation measures to minimize impacts on wetlands. To minimize impacts on wetlands, Enbridge would:

- mark wetland boundaries prior to construction;
- reduce the width of the construction work area to 75 feet or less through wetland areas;
- restrict the equipment working in and passing through wetlands to the extent practical;

- strip the existing amount of topsoil, up to a maximum depth of 12 inches, from over the trench in unsaturated wetlands (where there is less than 12 inches of topsoil strip the existing amount);

- in unsaturated wetlands, store topsoil and subsoil in a manner that prevents mixing, and return topsoil to its original horizon during backfilling;

- implement temporary erosion best management practices (*e.g.*, slope breakers, and sediment barriers) to minimize the potential for erosion and sedimentation in wetlands during and after construction;

- use equipment pads or timber riprap as needed to support construction equipment in saturated wetlands and reduce the potential for soil compaction;

- prohibit equipment refueling and the storage of fuels and hazardous substances in or within 100 feet of wetlands;

- reseed unsaturated wetlands with annual ryegrass or similar cover crop at a rate of 40 pounds per acre to temporarily stabilize the soils and allow native vegetation to reestablish without excessive competition; and

- prohibit installation of surface facilities within wetlands as requested by the North Dakota Game and Fish Department.

Woodlands & Wooded Areas

The only woodlands and wooded areas within the proposed corridor are wooded draws in wetlands and shelterbelts adjacent to farms, fields, and roads to block prevailing winds (see Appendix I). Together, wooded draws and shelterbelts occupy about 89 acres (0.3 percent) of the proposed corridor. Construction would affect 1 wooded draw and about 19 shelterbelts, totaling about 2 acres of wooded land.

Wooded areas are valuable wildlife habitat because they are relatively scarce in the region. Wooded draws within the proposed corridor support tree and shrub species such as cottonwood, willow, green ash, American elm, box elder, buckbrush, buffaloberry, and wild rose. Shelterbelts are composed of one to several rows of fast growing trees, usually Black Hills spruce, Russian olive, boxelder, American elm, Chinese elm, and green ash.

Clearing of woody vegetation within the construction work area would result in some long-term change. In this region, it is anticipated that regrowth of trees to mature conditions could take up to 50 years, depending on the species. Permanent impacts would be limited to the permanent right-of-way and easements, which Enbridge would maintain in an herbaceous state by occasional mowing or brush clearing. Impacts on wooded areas would be minimized by utilizing the existing right-of-way for about 50 miles (96 percent) of the proposed route. Enbridge is also proposing to implement additional mitigation to minimize impacts on wooded areas. Enbridge would:

- reduce the width of the construction work area to 75 feet or less in wooded areas;
- selectively cut and remove shrubs and trees within the 75-foot-wide construction work area leaving mature shrubs and trees in place where practical; and
- cut woody vegetation flush with the surface of the ground such that root stock is left in place to aid in revegetation after construction (except over the trench line, in areas requiring grading, and where necessary to provide a safe work surface);
- replace shrubs and trees affected by construction with bare root seedlings of similar species on a 2 to 1 basis as recommended by the North Dakota Game and Fish Department provided that the shrubs and trees replaced are outside the permanent right-of-way, not within other utility rights-of-way, and authorized by the landowner or land management agency.

5. Radio and Television Reception, and other Communication or Electronic Control Facilities

A review of the project study area did not identify radio, television, or other communication or control facilities within the proposed corridor or route. The nearest cell tower was located only about 80 feet south of the corridor at milepost 26.0. No effects on radio or television reception, or other communication or electronic control facilities are expected as a result of the proposed project.

6. Human Health and Safety

The United States has the largest network of petroleum pipelines of any country. Transporting large volumes of crude oil over long distances by pipeline is safer than by truck, railcar, or barge.

Pipelines are the safest, most reliable, and efficient manner of transporting crude oil. For example, truck accidents involving petroleum shipments result in deaths at least 87 times more often than pipeline accidents. Likewise, truck accidents result in fires and/or explosions about 35 times more frequently per barrel of petroleum transported per mile than pipelines.

The petroleum pipeline industry's spill record has improved substantially over the last 35 years. The annual number of spills or other safety incidents has decreased by over 50 percent and the volume of petroleum spilled has decreased by about 65 percent. In the six years from 1968 through 1973, the pipeline system experienced 359 incidents per year that were reportable to the U.S. Department of Transportation, Office of Pipeline Safety, resulting in an average annual volume of petroleum spilled of 368,000 barrels. The averages for the most recent five years, 2001 through 2005, have been reduced to 137 incidents and 99,600 barrels spilled per year (just a fraction of a percent considering the 14 billion barrels per year that are transported).

Despite its excellent safety record, the transportation of crude oil involves some risk to the public. Perhaps the most obvious risk to human health is the potential for fire in the event of an accident and subsequent release. Toxic exposure from crude oil through skin contact, ingestion, or vapor inhalation can also be a risk.

The U.S. Department of Transportation is mandated to provide for pipeline safety under Title 49, United State Code, Chapter 601. The Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, administers the national regulatory program to ensure the safe transportation of crude oil and other hazardous materials by pipeline. It develops safety regulations and other approaches to risk management that ensure safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards which set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve safety.

Enbridge would design, construct, test, operate, and maintain the proposed in accordance with all applicable laws and standards. The U.S. Department of Transportation's pipeline standards are published in Part 195 of Title 49 of the Code of Federal Regulations. The regulations are intended to ensure adequate protection of the public and to prevent accidents and failures. Part 195 specifically addresses

petroleum pipeline safety issues. It specifies material selection and qualification; minimum design requirements; and protection from internal, external, and atmospheric corrosion.

In 2001 and 2002, the U.S. Department of Transportation updated Part 195 of Title 49 of the Code of Federal Regulations. These new regulations, which are referred to as Rules on Pipeline Integrity Management in High Consequence Areas for Hazardous Liquid Operators, specify conventions for assessing, evaluating, repairing, and validating through comprehensive analysis the integrity of hazardous liquid pipeline segments that, in the event of a leak or failure, could high consequence areas. High consequence areas are populated areas, areas unusually sensitive to environmental damage, and commercially navigable waterways.

As a result of the new regulations, pipeline operators were required to develop a written integrity management program that includes identification of all pipeline segments that could affect high consequence areas, a baseline assessment plan to assure integrity of these segments, and a framework that identifies how each element of the integrity management program will be implemented. An operator's integrity management program must include methods to measure the program's effectiveness in assessing and evaluating integrity, and in protecting high consequence areas. Recognizing that the boundaries of high consequence areas will change over time, the U.S. Department of Transportation requires that any new high consequence areas must be incorporated into the plans in a timely manner.

In 2005, the U.S. Department of Transportation again updated Part 195 of Title 49 of the Code of Federal Regulations. These new regulations require pipeline operators to develop and implement public awareness programs consistent with the American Petroleum Institute's Recommended Practice 1162, Public Awareness Programs for Pipeline Operators. The purpose of Recommended Practice 1162 is to enhance the safety and security of pipelines by raising public awareness of the pipeline, increasing the public's understanding of the role of pipelines in transporting energy, informing the public how to recognize and respond to a pipeline emergency, and notifying the public of who to contact in the event of an emergency. It also contains provisions for enhancing liaison with emergency responders and public officials. Enbridge has a public awareness program in place, and will apply the relevant portions of the plan to construction and operation of the proposed pipeline.

7. Animal Health and Safety

Wildlife

A review of the project study area identified a variety of wildlife species likely to occur within the proposed corridor and along the proposed route. The predominant wildlife habitats are grasslands, wetlands, and wooded areas (see Appendix I). Wetlands and wooded areas are valuable wildlife habitat as they represent relatively scarce habitat types in the region. Agricultural land and developed land is not considered wildlife habitat because it supports only a limited diversity of plants and animals.

Wildlife within project area is generally represented by animals such as: white-tailed deer, pronghorn antelope, coyote, porcupine, woodchuck, badger, squirrel, cottontail, mink, muskrat, mouse, vole, hawk, kestrel, partridge, owl, flycatcher, thrush, vireo, warbler, wren, sandpiper, heron, turkey, pheasant, turtle, snake, toad, salamander, and a variety of other mammals, birds, reptiles, and amphibians.

In total, wildlife habitat occupies approximately 11,943 acres (or 36 percent) of the proposed corridor. Construction of the proposed pipeline would temporarily affect approximately 242 acres of wildlife habitat along the proposed route. Section D.2.c.ii.8 contains a breakdown of habitat type within the proposed corridor and along the proposed route. Due to the linear nature of the project over a large geographic area, these acreages represents only a very small percent of available wildlife habitat on a regional basis.

During construction, noise and activity would encourage movement of wildlife to adjacent habitat. More mobile species, such as larger mammals and birds, would relocated to adjacent habitat during construction. Less mobile or burrowing species, such as mice and frogs, may be killed as a result of construction activities. Some individuals may be permanently displaced and perish due to increased competition or other effects of being forced into suboptimal habitat, although suitable habitat within the project area would be available following construction and impacts on wildlife overall are expected to be temporary and minor.

Habitat fragmentation is frequently a concern when clearing rights-of-way. In general, fragmentation can result in an altered wildlife community as species more adaptable to edge habitats establish themselves, while species requiring undisturbed habitats are subject to negative effects. However, fragmentation disturbance to wildlife

and wildlife habitats from the proposed project is not expected to be significant because most of the pipeline (99.7 percent) would cross relatively open habitat types and a majority of construction (96 percent) would be adjacent to or overlap existing right-of-way. As such, the effects of habitat fragmentation would be minimal.

Fish

A review of the project study area identified only one potential fishery stream within the proposed corridor: Little Muddy Creek. Little Muddy Creek is a tributary of the Missouri River. The lower 5 miles of the creek form a small arm of Lake Sakakawea. Little Muddy Creek is designated as a class 2 stream by the North Dakota Department of Health,[3] meaning that the quality of water is suitable for non-salmonid fish species and other aquatic biota and for swimming, boating, and other water recreation. Resident fish in Little Muddy Creek include: white sucker, quillback carpsucker, brook stickleback fathead minnow, and creek chub. At times, particularly during the annual migrations in late fall and early spring when fish swim upstream to feed or spawn, fish in Little Muddy Creek may be typical of fish in Lake Sakakawea and could include trout, salmon, whitefish, catfish, paddlefish, sturgeon, gar, burbot, and lamprey, although they probably do not migrate as far upstream as the proposed project.

The proposed corridor and route cross Little Muddy Creek at about milepost 30.3. Enbridge is proposing to cross Little Muddy Creek using horizontal directional drilling as recommended by the North Dakota Game and Fish Department. Horizontal directional drilling involves drilling a hole under the creek and installing a prefabricated segment of pipe through the hole. Horizontal directional drilling is designed to avoid disturbing the bed or banks of the creek and should have no effects on fish. However, if a weak area in the ground is encountered during drilling, pressurized drilling mud (a mixture of water, bentonite, and cellulose) could be pushed to the surface and possibly escape into the creek and disturb bottom sediments near the release. The release of drilling mud, which is typically more than 90 percent water, could cause localized increases in sediment loads and could fill interstitial gaps in the streambed, covering habitat for benthic invertebrates, larval fish, and eggs. The amount of area impacted by

[3] In its June 20, 2006 letter to Enbridge, the North Dakota Game and Fish Department identified Little Muddy Creek as a class 1 fishery. A follow-up call with the North Dakota Department of Health confirmed Little Muddy Creek is a class 2 stream for the purpose of water quality permitting (see Appendix C).

a release of drilling mud would be relatively small because the consistency of drilling mud would prevent heavy deposition in any one area.

It is possible for horizontal directional drilling to fail, in which case construction across Little Muddy Creek would require open-cut construction. Open-cut construction involves trenching through the creek while water continues to flow across the work area. If open-cut construction were required, effects on fisheries would be more appreciable. During construction, clearing along the banks of the creek and excavation in the waterbody would result in increased sedimentation and turbidity. Sedimentation can congest and plug waterbodies and cover habitat important to fish and other aquatic organisms. Turbidity can burden fish by obstructing their gills, inhibiting their sight, and disrupting their feeding patterns. Additionally, the creek could be contaminated by accidental spills during vehicle refueling and maintenance or from other potential hazardous material spills that occur during construction. In the event horizontal directional drilling fails and open-cut construction is required, Enbridge would implement mitigation measures to minimize the potential for impacts on fish. Enbridge would:

- unless otherwise allowed in the dredge and fill permit from the U.S. Army Corp of Engineers, prohibit construction activities within the waterway between April 15 and June 1 (the main fish migration and spawning period) as recommended by the North Dakota Department of Game and Fish;

- prohibit equipment refueling (except for water pumps for hydrostatic test water appropriation) and the storage of fuels and hazardous substances in or within 100 feet of Little Muddy Creek;

- require all construction equipment to cross the creek on a temporary bridge (fording the creek would not be allowed);

- install erosion and sediment control devices, such as silt fence, straw bales, and diversion berms, as appropriate along the creek banks immediately after clearing the creek banks to minimize the potential for sediment delivery to the creek;

- use earthen trench plugs in the trench on both side of the creek until just before installing the pipe to prevent muddy water in the upland trench from draining into the creek;

- complete in-stream construction within 48 hours to minimize the duration of sedimentation and turbidity, unless site-specific conditions make this impractical;

- seed and stabilize disturbed creek banks immediately after recontouring the banks, weather and soil conditions permitting.

To verify the integrity of the pipeline before placing it into service, Enbridge would hydrostatically test the pipeline. The hydrostatic test would involve filling the pipeline with water, pressurizing it, and then checking for pressure losses due to pipeline leakage. Enbridge is proposing to use Little Muddy Creek as a source for hydrostatic test water.[4] Enbridge is proposing to acquire up to 1.7 million gallons of water, at a rate of up to 1,200 gallons per minute.

During water appropriation, fish and other aquatic organisms could become trapped by the water intake. Withdrawal could also temporarily lower the water levels in the creek and limit fish movement across the construction area. Impediments to movement would be the most significant during migration. Little Muddy Creek is presently experiencing a moderate hydrologic drought, meaning that it has an unusually low flow. The median mid July stream flow over the past 52 years is about 8.6 cubic feet per second (or 3,860 gallons per minute). Presently, it is about 3.5 cubic feet per section (or 1,571) gallons per minute. To minimize the potential for impacts from water appropriation, Enbridge would:

- install test water intakes with filtering and screening devices, and would suspend the intakes above the stream bottom to minimize the potential for entrapment of fish, aquatic organisms, and debris;

- limit withdrawal rates to 10 percent of the creek's flow, unless otherwise approved by the North Dakota State Water Commission; and

- acquire a water appropriation permit from the North Dakota State Water Commission and follow all permit requirements regarding appropriation rates, volumes, and timing.

Enbridge may also use Little Muddy Creek as a discharge location for hydrostatic test water. If discharge rates of hydrostatic test water are

[4] Water for horizontal directional drilling also would be obtained from Little Muddy Creek. The volumes would be on the order of 10,000 to 15,000 gallons for each of the four drill sites.

not carefully controlled, discharges into the creek could cause erosion of the creek banks and the creek bottom. Erosion could result in a temporary increase of sediment load and reduction of habitat. Discharges could also contaminate the creek if chemicals or additives are used in the test water or if the test water comes into contact with chemicals or debris inside the pipe during hydrostatic testing. Potential for contamination from chemicals inside the pipe would be low because the pipeline would be constructed entirely from new pipe. To minimize the potential for impacts from hydrostatic test water discharges, Enbridge would:

- use low discharge rates and/or energy dissipation devices (e.g., splash pups or splach boards) to minimize the potential for creek bed and bank scour;
- not use chemicals or additives to the test water (unless otherwise approved by the North Dakota Department of Health);
- remove debris from the inside of the pipe using an in-line cleaning tool prior to hydrostatic testing; and
- acquire a water discharge permit from the North Dakota Department of Health and follow all permit requirements regarding discharge rates, volumes, and timing; and
- sample and analyze the discharge water as required by the discharge permit.

8. Plant Life

A review of the project study area identified four general vegetation communities within the proposed corridor and along the proposed route: agricultural land, grasslands, wetlands, and woodlands (see Appendix I). The predominant vegetation community is agricultural land, followed by grasslands, wetlands, and woodlands.

Agricultural Land

Agricultural land comprises about 20,992 acres (62.6 percent) of the proposed corridor. Construction of the proposed pipeline would affect approximately 355 acres of agricultural land. The relative value of agriculture land, impacts of the proposed project on agricultural land, and mitigation measures proposed by Enbridge to minimize impacts on agricultural are discussed in Section D.2.c.i.1.

Grasslands

Grasslands comprises about 11,385 acres (33.9 percent) of the proposed corridor. Construction of the proposed pipeline would affect approximately 235 acres of grasslands.

Grasslands within the proposed corridor is primarily a mixed-grass prairie. Tall and midgrass species from moister rangelands in eastern North Dakota occur with short grass species which predominate in the drier grasslands of Montana and westward. The dominant species are western wheatgrass, needle-and-thread, blue grama, and green needlegrass. Much of the grasslands within the proposed corridor and route has experienced heavy grazing, which has dramatically affected the vegetation.

The primary impact of the proposed project on grasslands would be the temporary clearing of existing vegetation within the construction work area. Enbridge is proposing to implement mitigation measures to minimize the potential for impacts on grasslands. Enbridge expects the grasslands would recover within 1 to 3 years after construction. Long-term or permanent impacts on grasslands are not anticipated. To minimize impacts on grasslands, Enbridge would:

- strip, store, and replace topsoil in grasslands used for grazing according to sections D.2.b.ii and D.2.c.i.2;

- restore the work area to its pre-construction contours and reseed disturbed soils with grassland mixtures approved by the landowner and/or land management agency.

Wetlands

Wetlands comprise about 470 acres (1.4 percent) of the proposed corridor. Construction of the proposed pipeline would affect approximately 5 acres of wetland. The relative value of wetlands, impacts of the proposed project on wetlands, and mitigation measures proposed by Enbridge to minimize project impacts on wetlands are discussed in Section D.2.c.ii.4.

Woodlands

Woodlands comprises about 89 acres (0.3 percent) of the proposed corridor. Construction of the proposed pipeline would affect approximately 2 acres of woodlands. The relative value of woodlands, impacts of the proposed project on woodlands, and

mitigation measures proposed by Enbridge to minimize project impacts on woodlands are discussed in Section D.2.c.ii.4.

Developed Land

Developed land (mainly residential areas, farm/ranch operations, and oil well pads) comprises about 607 acres (1.8 percent) of the proposed corridor. Construction of the proposed pipeline would affect approximately 16 acres of developed land. Discussions of potential impacts on the various types of developed land, as well as mitigation measures proposed by Enbridge to minimize project impacts on these areas, are discussed in sections D.2.b.v, D.2.c.i.2, and D.2.c.ii.3.

d. Policy Criteria

Policy criteria are those factors which are positively affected by project that may lead the Commission to give preference to an applicant.

i. Location and Design

Enbridge has designed the proposed pipeline to take advantage of its existing facilities to the maximum extent practical. The existing Trenton to Beaver Lodge pipeline serves a vital link in connecting crude oil supplies south of the Missouri River in Richland and McKenzie counties to consumers in Clearbrook, Minnesota and beyond. The existing Trenton to Beaver Lodge pipeline is presently a bottleneck in the system. The system was increased to its maximum design flow in 2005 and is presently operating at or near maximum capacity. Enbridge considered other alternative locations and designs; however, installing a new pipeline from Trenton to Beaver Lodge is the safest, most economical way to transport crude oil supplies from south of the Missouri River in Richland and McKenzie counties to Clearbrook, Minnesota.

Enbridge is proposing to install the proposed pipeline immediately adjacent to the existing pipeline, except where crossovers of the existing pipeline or minor route variations are necessary. Installing the pipeline in this manner would allow Enbridge to take advantage of its existing right-of-way and easement, and would minimize impacts on landowners and sensitive environmental resources. In total, about 50 miles (96 percent) of the pipeline would utilize Enbridge's existing right-of-way.

ii. Training and Utilization of Available Labor in This State for the General and Specialized Skills Required

The number of construction workers that would be employed during construction would vary greatly depending on the contractor that is chosen for the project, the construction approach taken by the contractor, and the phase of construction. Enbridge estimates that, on a typical project of this size, approximately 125 construction personnel would be employed during the peak of construction.

The number of construction workers that would be hired locally during construction would also vary depending on the contractor. Pipeline construction is a niche market and it is unlikely that there are qualified local pipeline contractors capable of completing the project. If a non-local contractor is awarded this project, it likely that up to 75 percent of the workers (94 workers) would be non-local. The remaining 25 percent (31 workers) would be hired from the local population currently residing in nearby areas of North Dakota. Due to the temporary nature of the work, most local hiring and training would be general labor. Specialized labor would likely be non-local.

Enbridge does not anticipate hiring permanent employees to operate the new pipeline. Operation of the pipeline can be managed by the existing workforce.

iii. Economies of Construction and Operation

The United States consumes about 20 million barrels per day of petroleum products. A complex transportation network is in place to move the raw materials, which is mainly crude oil, from where they are produced to where they are processed and consumed. Pipelines are in integral part of this network. Pipelines transport roughly two-thirds of the petroleum shipped in the United States, or about 14 billion barrels per year. Because many volumes are shipped first as crude oil and then reshipped as refined product, the annual pipeline shipments are more than double the actual consumption.

The United States has the largest network of petroleum pipelines of any country. Although petroleum pipeline shipments account for more than 17 percent of the freight, they account for less than 2 percent of the cost. Transporting large volumes of crude oil over large distances by pipeline is less expensive than by truck, railcar, or barge. It is also safer. Pipelines are the safest most reliable and efficient manner of transporting crude oil.

Crude oil and gas are North Dakota's leading mineral product, and North Dakota is the ninth largest producer of crude oil and gas in the country. The lack of space on existing pipelines in North Dakota has adversely affected the state's economy. It has resulted in a significant drop in price for petroleum produced locally and has prompted some local producers to close wells and postpone production. The proposed pipeline would help alleviate the space constraint in North Dakota pipelines, boost the economy, and allow the state to capitalize on tax revenue gathered from production and extraction taxes.

Beneficial impacts on the economy would also result during construction from temporarily hiring local employees, and from a relatively large-scale, temporary influx of non-local construction workers. Up to 31 local workers would be hired for a period of up to four months on this project. Unemployment in the area would see a temporary drop, and payroll taxes would temporarily rise. Enbridge anticipates that total payroll for the project would be $4.3 million, resulting in an increase in income tax revenue of about $168,560 for the state (based on a 3.92 percent state income tax rate).

Local businesses would benefit from demands for goods and services generated by the temporary workforce's need for food and lodging. This economic stimulus could result in a temporary need for local establishments to add staff or increase hours worked by existing staff to accommodate the increases in demand. Long-term construction projects may generate between 0.7 and 1.1 additional jobs for each direct job associated with the project. However, given the short nature of the proposed project, the additional jobs would be expected to be temporary and on the order of about 0.1 additional job for each direct job, or 13 total temporary jobs.

Enbridge has estimated that food and lodging expenditures of the workforce would be approximately $650,000. The state and City of Williston would benefit from an increase in sales, use, and lodging tax revenue. Based on the estimated retail purchases by temporary workers and current tax rates, the state and local governments would realize about $54,000 of additional tax revenue.

In addition to purchases by workers, Enbridge would purchase some materials necessary for construction of the project locally. Enbridge estimates that local purchases made for construction of the project would primarily include consumables, fuel, equipment rental, space leasing, and miscellaneous construction-related materials (*e.g.*, office supplies). The costs estimated for the purchase of local materials would be $750,000.

State and local governments would realize sale tax revenue from these purchases of about $53,000.

Of greater significance to state and local tax revenues would be the sales or use taxes on pipe and other materials and installed equipment associated with the project. Such purchases are subject to sales tax if the items are manufactured in-state, or use tax when purchased outside the state and imported into state. Typically project owners and contractors are entitled to a credit for taxes paid in another jurisdiction (*e.g.*, the point of purchase or manufacture), but generally have an option to specify the point of delivery as the location for purposes of taxation. Enbridge's estimated sales/use tax obligation, based on current tax rates and assuming it exercises the option for local taxation, would be $469,000.

During operation of the pipeline, Enbridge would pay *ad valorem* taxes to local governments crossed by the proposed pipeline. Pipelines are centrally assessed by the state, with the total valuation then allocated among the local counties based on their respective shares of the installed pipelines and facilities. Initially, the cost of construction provides a reasonable proxy for the assessed valuation of a pipeline system. Over time, the assessment focuses more on the facilities' contribution to system-wide income and depreciated value, generally resulting in lower assessment. Enbridge has not yet estimated *ad valorem* taxes that would be paid to local governments, but expects that the ongoing revenues would be a significant benefit associated with the project.

iv. Use of Citizen Coordinating Committees

Enbridge did not utilize citizen coordinating committees on this project.

v. A Commitment of a Portion of the Transmitted Product for Use in This State

Enbridge does not own any of the crude oil in its system, and does not determine the destinations for the products transported by its system. Enbridge's business is to provide transportation service to its customers as a common carrier, and to receive a fee for that service pursuant to tariffs authorized by the Federal Energy Regulatory Commission under the Interstate Commerce Act.

vi. Labor Relations

Enbridge does not anticipate adverse labor relations on this project. Should a labor dispute arise, it would be the contractor's obligation to resolve the dispute while completing construction.

vii. The Coordination of Facilities

As mentioned in section D.2.d.i, Enbridge has designed the proposed pipeline to take advantage of its existing facilities to the maximum extent practical. The existing Trenton to Beaver Lodge pipeline serves a vital link in connecting crude oil supplies south of the Missouri River in McKenzie County, North Dakota and Richland County, Montana to consumers in Clearbrook, Minnesota and beyond. The existing Trenton to Beaver Lodge pipeline is presently a bottleneck in the system. The system was increased to its maximum design flow in 2005 and is presently operating at or near maximum capacity. Enbridge considered other alternative locations and designs; however, installing a new pipeline from Trenton to Beaver Lodge is the safest, most economical way to transport crude oil supplies to their destinations.

viii. Monitoring of Impacts

Enbridge is committed to protecting the environment and complying with all applicable environmental laws, regulations, and standards. Enbridge is proposing to implement three types of monitoring on this project to help ensure environmental compliance: environmental training, environmental inspection, and post-construction monitoring.

Environmental Training

To communicate the environmental requirements of the project to project personnel, Enbridge would require environmental training of all project personnel prior to construction. Enbridge would:

- require environmental training of all personnel (both contractor and Enbridge) visiting or working at the job site;
- require everyone who attends training to sign an acknowledgement form and be issued, as a proof-of-training, a copy of the training booklet and a hardhat sticker; and
- require all personnel to display a hardhat sticker when on a job site or dismiss personnel from the job site until it is obtained through completion of training.

Environmental Inspection

To provide on-site documentation of environmental compliance during construction, Enbridge is proposing to conduct environmental inspection of the contractor's activities. To provide on-site documentation of environmental compliance, Enbridge would:

- use at least one full-time environmental inspector on the proposed project during active construction (if the environmental inspection is not available on site, the site supervisor would be responsible for carrying out the inspector's duties).

The environmental inspector would be responsible for overseeing the contractor's compliance with environmental requirements and permits during construction. The primary responsibility of the environmental inspector would be to observe construction-related activities and monitor compliance with, and provide interpretation of, the environmental requirements of the project. The inspector would be responsible for preparing written reports documenting compliance with project requirements, as well as instances where non-compliance is observed. The inspector would recommend corrective measures where non-compliance is observed. If environmental damage is imminent, the inspector would have the authority to stop the activity in question until the concern can be resolved.

Post-Construction Monitoring

To minimize the potential for long-term impacts of the environment, Enbridge would conduct post-construction monitoring of the project area. Enbridge would:

- conduct post-construction inspections of all disturbed areas to determine the success of revegetation; and

- consider revegetation successful if, upon visual inspection, the density and cover-type (species) of vegetation are similar in density and cover-type to adjacent lands not affected by construction, unless otherwise requested by the landowner or land managing agency.

ix. Utilization of Existing and Proposed Rights-of-Way and Corridors

As discussed in sections A.3.a D.2.d.i, Enbridge is proposing to install the proposed pipeline immediately adjacent to the existing pipeline, except where minor route variations are necessary. Installing the pipeline in this manner would allow Enbridge to take advantage of its existing right-of-

way and easements, and would minimize impacts on landowners and sensitive environmental resources. In total, about 50 miles (96 percent) of the pipeline would utilize Enbridge's existing right-of-way. The alignment of the existing pipeline and the alignment of the proposed pipeline are depicted on the maps included in Appendix B.

x. Other Existing or Proposed Transmission Facilities

The proposed project is one of several Enbridge projects aimed at providing additional pipeline capacity to the Clearbrook market.

Enbridge's first expansion was completed in 2005. This expansion was designed to transport an additional 25,000 barrels per day and involved upgrades of the Alexander and Trenton pump stations and construction of a new East Fork Pump Station. The Commission authorized this project in Case No. PU-05-274.

Following the first expansion, Enbridge proposed a second expansion. Construction of the second expansion is not yet complete. The second expansion was designed to transport an additional 7,000 barrels per day and involves upgrades to the Beaver Lodge Pump Station as well as raising the maximum operating pressure on several miles of existing pipe.

Following the second expansion, Enbridge proposed a third expansion. The third expansion was recently filed with the Commission, and construction has not yet started. The third expansion involves upgrades to the Beaver Lodge and Stanley pump stations and construction of a new pump station at Larimore. The third expansion was designed to increase Enbridge's throughput by 9,000 barrels per day.

Following the third expansion, Enbridge proposed a fourth expansion. The fourth expansion was recently, or will soon be, filed with the Commission. The fourth expansion involves constructing four new pump stations at Blaisdell, Denbigh, Penn, and Brooks. The fourth expansion was designed to increase Enbridge's throughput on the Beaver Lodge to Minot section by 9,000 barrels per day, and to increase Enbridge's throughput on the Minot to Clearbrook line section by 15,000 barrels per day.

The fifth expansion is the Trenton to Beaver Lodge Line Loop proposed here. The fifth expansion was designed to transport 55,000 barrels per day into Beaver Lodge via pipeline. In addition to the Trenton to Beaver Lodge Line Loop, Enbridge is also proposing to install a new pump and motor at each of the existing Alexander and Trenton pump stations as well as adding storage tanks with nominal capacities of 55,000 barrels at

Alexander Pump Station and 20,000 barrels at Trenton Pump Station. These station upgrades are being put forth to the Commission as part of a separate application.

A sixth expansion is presently being considered to move additional volumes to market. Details on the sixth expansion are not yet available.

e. Design and Construction Limitations

Refer to sections A.3, C.2 and D.1 for discussions of design and construction limitations.

f. Economic Considerations

Refer to Section D.2.d.iii for a detailed discussion of economic considerations.

3. Mitigative Measures

Mitigation measures to minimize adverse impacts of the proposed project are identified throughout this document in bulleted (●) text. In addition, Enbridge's Environmental Guidelines for Construction are included in Appendix K. Enbridge's Environmental Guidelines for Construction provides a more detailed discussion of the guidelines and mitigation measures that Enbridge would implement on this project. It was developed based on Enbridge's corporate experience implementing best management practices during construction.

4. List of Preparers

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Tom Hess, Merjent, Inc.

B.S. Geomechanics, College of Engineering, University of Rochester, Rochester, New York. Mr. Hess has over 20 years of experience in the pipeline and utility construction industries, including environmental management, environmental inspection, and permit acquisition. He has coordinated permitting activities associated with hundreds of operation and maintenance projects as well as larger expansion projects.

John Muehlhausen, Merjent, Inc.

B.A. Anthropology, University of Wisconsin-Madison. Mr. Muehlhausen has 15 years of experience specializing in large-diameter, interstate pipeline expansion and maintenance projects. He has managed pipeline feasibility studies; third-party Environmental Impact Statements, including those using the Federal Energy Regulatory Commission's pre-filing process; applicant-prepared Environmental Assessments and Wild and Scenic River Assessments; Federal Energy Regulatory Commission applications; state public service and utility commission applications; various environmental agency permitting applications.

Steve Elbert, Merjent, Inc.

B.A. Zoology, University of Wisconsin-Madison. M.S. Natural Resources, University of Wisconsin - Stevens Point. With 18 years of experience providing consulting services to the pipeline industry, Mr. Elbert conducts route evaluations; prepares environmental reports and biological assessments; develops agricultural mitigation plans; acquires federal, state, and local permits; and conducts compliance inspections during project construction. Mr. Elbert also has 12 years of related experience working at the Wisconsin Department of Natural Resources, Soil Conservation Service, and Soil and Water Conservations Districts, and in private business.

Jeff Mackenthun, Merjent, Inc.

B.S. Environmental Studies, Bemidji State University, Bemidji, Minnesota. Mr. Mackenthun has 9 years of experience in the preparation of fisheries, wildlife, groundwater, wetlands, waterbodies, vegetation, and special status species sections for environmental reports and Environmental Impact Statements. Mr. Mackenthun also manages and coordinates control of various field survey data and reports, and conducts and manages various wetland delineations and endangered surveys throughout the midwestern and northeastern United States. Mr. Mackenthun is a Professional Wetland Scientist.

Tom Janssen, Merjent, Inc.

B.A. Environmental Studies/Geography, University of St. Thomas, St. Paul, Minnesota. Tom Janssen has 10 years experience in the energy industry specializing in environmental project management for pipeline construction, operation, and maintenance projects in the Midwest. His responsibilities include project planning and scoping, coordinating regulatory agency consultations, environmental field survey management, permit and approval acquisition, environmental training, and coordination of environmental inspectors.

5. Maps

a. Maps

Maps identifying the criteria within the proposed corridor and along the proposed route are included in appendices H, I, and J.

b. Mylar Maps

Mylar maps have not been included with this application because this process for producing maps and drawing is no longer in use.

APPLICATION FOR ROUTE PERMIT

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SECTION A: Introduction

Enbridge is submitting to the Commission, as a single filing: a letter of intent; a request for waiver or reduction of procedures and time schedules; an application for a certificate of corridor compatibility; and an application for a route permit for its Trenton to Beaver Lodge Line Loop. The type of information required in both the application for a certificate of corridor compatibility and application for a route permit is the same, except the application for a route permit also requires a discussion of the factors listed in Section 49-22-09 of the North Dakota Century Code. To make both applications more comprehensible and the to make the filing more user-friendly, nearly all the information required in the application for a route permit has been included in the application for a certificate of corridor compatibility, and only a discussion of factors listed in Section 49-22-09 of the North Dakota Century Code is included in the application for a route permit. Where factors were discussed in the application for a certificate of corridor compatibility, a reference to the appropriate section is provided.

SECTION B: Factors Listed in Section 49-22-09 of the North Dakota Century Code

1. **Available research and investigations relating to the effects of the location, construction, and operation of the proposed facility on public health and welfare, natural resources, and the environment.**

   Please refer to Section B of the Application for a Certificate of Corridor Compatibility for a discussion of available research and investigations relating to the effects of the location, construction, and operation of the proposed facility on public health and welfare, natural resources, and the environment. Additionally, information about the project vicinity is available in Enbridge's previous applications for its existing facilities within Williams County (see the Commission's Findings of Fact, Conclusions of Law and Order in Case Number 10,472; Certificate of Site Compatibility No. 40; and Route Permit No. 49 dated October 11, 1983).

2. **The effects of new energy conversion and transmission technologies and systems designed to minimize adverse environmental effects.**

   Pipeline construction technology has developed in several ways over the past several decades. One particular recent advance that Enbridge is proposing to use on this project is horizontal directional drilling. Horizontal directional drilling involves drilling a hole under an area and installing a prefabricated segment of pipe through the hole. Horizontal directional drilling is designed to avoid disturbing the surface of the ground, thereby eliminating adverse environmental effects. Enbridge is proposing to avoid impacting the surface by horizontal directionally drill four sites on the proposed project: the crossing of the Burlington Northern-Santa Fe Railroad (milepost 18.0); the crossing of Little Muddy Creek (milepost 30.3); and two crossings of U.S. Highway 2 (mileposts 32.0 and 51.8).

3. **The potential for beneficial uses of waste energy from a proposed energy conversion facility.**

   The proposed project does not involve energy conversion facilities; therefore, there is no potential beneficial use of waste energy.

4. **Adverse direct and indirect environmental effects which cannot be avoided should the proposed site or route be designated.**

   Please refer to Section D of the Application for a Certificate of Corridor Compatibility for a discussion of adverse direct and indirect environmental effects which cannot be avoided should the proposed route be designated.

5. **Alternatives to the proposed site, corridor, or route which are developed during the hearing process and which minimize adverse effects.**

   Alternatives that Enbridge considered when planning the project are discussed in Section C.2 of the Application for a Certificate of Corridor Compatibility.

6. **Irreversible and irretrievable commitments of natural resources should the proposed site, corridor, or route be designated.**

   Technically, there are no irreversible or irretrievable commitments of natural resources associated with this project. However, the proposed facilities are being installed for an indefinite period of time, and arguably could have what are considered to be permanent impacts on the environment. The permanent impacts associated with the proposed project would be: 1) the conversion of wooded areas to open areas within the permanent right-of-way; and 2) the conversion of grassland to industrial land where block valves are proposed on each side of Little Muddy Creek (mileposts 30.6 and 31.0).

   <u>Conversion of Wooded Areas to Open Areas</u>

   Enbridge would maintain its permanent right-of-way in an herbaceous state after construction by occasional mowing or brush clearing. As a result, wooded areas within the permanent right-of-way would be converted to open areas. Enbridge is proposing to minimize impacts on wooded areas by utilizing its existing right-of-way for about 50 miles (96 percent) of the proposed route. The only wooded areas crossed by the proposed pipeline are wooded draws in wetlands and shelterbelts adjacent to farms, fields, and roads to block prevailing winds. Construction would affect about 2 acres of wooded land. After construction, wooded areas outside the permanent right-of-way would be replanted with shrubs and trees, and areas within the permanent right-of-way would be maintained in an herbaceous state. Refer to Section D.2.c.ii.4 of the Application for a Certificate of Corridor Compatibility for a more complete discussion of the

effects of the proposed project on wooded areas, and the additional mitigation measures Enbridge is proposing in these areas.

Block Valves

Enbridge is proposing to install block valves immediately adjacent to existing block valves on each side of Little Muddy Creek. Installation of the block valves would permanently convert 0.06 acre of grassland to an industrial use. The conversion of grassland to an industrial use represents a relatively small permanent impact.

7. **The direct and indirect economic impacts of the proposed facility.**

Please refer to Section D.2.d.iii for a discussion direct and indirect economic impacts of the proposed project.

8. **Existing plans of the state, local government, and private entities for other developments at or in the vicinity of the proposed site, corridor, or route.**

During an April 20, 2006 meeting with the U.S. Army Corps of Engineers, Enbridge was informed that the Tioga airport is considering expanding one of its runways and that the Williston airport is considering moving to a different location. On June 30, 2006, Enbridge personnel met with Gene Knutson, Chairman of the Board of Tioga Airport Authority. Mr. Knutson determined the proposed pipeline would not affect the proposed airport expansion. Discussions with Williston airport personnel have not yet occurred.

On July 11, 2006, Enbridge consulted with the Williams County Department of Equalization regarding upcoming developments in the vicinity of the proposed project. The Williams County Department of Equalization indicated that, at the time of the consultation, there were no applications for upcoming developments in the area.

9. **The effect of the proposed site or route on existing scenic areas, historic sites and structures, and paleontological or archaeological sites.**

Please refer to sections D.2.a.iv and D.2.a.v of the Application for a Certificate of Corridor Compatibility for a discussion of the effects of the proposed route on existing scenic areas, historic sites and structures, and paleontological or archaeological sites.

10. The effect of the proposed site or route on areas which are unique because of biological wealth or because they are habitats for rare and endangered species.

Please refer to sections D.2.a.iv and D.2.a.v of the Application for a Certificate of Corridor Compatibility for a discussion of the effects of the proposed route on areas which are unique because of biological wealth or because they are habitats for rare and endangered species.

11. Problems raised by federal agencies, other state agencies, and local entities.

Enbridge consulted with several federal, state, and local agencies to identify potential environmental resources in the project area. Following is a discussion of the results of each of these consultations and concerns that the agencies may have raised. Agencies with which Enbridge consulted include:

1. U.S. Army Corps of Engineers;
2. U.S. Department of Interior, Fish and Wildlife Service;
3. U.S. Department of Interior, Bureau of Reclamation;
4. U.S. Department of Agriculture, Natural Resource Conservation Service;
5. North Dakota Department of Health;
6. North Dakota Game and Fish Department;
7. North Dakota Public Service Commission;
8. North Dakota State Lands Department;
9. North Dakota State Water Commission;
10. State Historical Society of North Dakota (State Historic Preservation Office);
11. Williams County Auditor; and
12. Williams County Department of Equalization.

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers did not identify concerns with the proposed project that would not be addressed by the U.S. Army Corps of Engineers' permitting process.

U.S. Department of Interior, Fish and Wildlife Service

The U.S. Department of Interior, Fish and Wildlife Service provide a list of federally endangered, threatened, and candidate species and designated critical habitat that are found in Williams County and may be present within the project's "area of influence," but concluded that federally endangered, threatened, or candidate species are not known to frequent the project area and no critical habitat currently exists within the proposed corridor or along the proposed route. Section D.2.a.iv contains a more detailed discussion of federally endangered, threatened, and candidate species and designated critical habitat.

U.S. Department of Interior, Bureau of Reclamation

Initially the U.S. Department of Interior, Bureau of Reclamation informally indicated that the proposed project might cross canals within the Buford-Trenton Irrigation District. Upon further investigation, the Bureau of Reclamation determined that no canals or other facilities owned or leased by the bureau would be crossed by the project.

U.S. Department of Agriculture, Natural Resource Conservation Service

The U.S. Department of Agriculture, Natural Resource Conservation Service indicated that the proposed project might cross grassland reserve program and wetland reserve program lands. These are voluntary programs whereby landowners can receive annual rental payments and cost-share assistance to establish long-term, resource conserving covers, such as grasslands and wetlands. Upon following up with the Natural Resource Conservation Service, the service responded that it cannot provide information about the location of these lands to the Enbridge due to landowner privacy concerns, but stated that only conservation reserve program lands and not grassland reserve program or wetland reserve program lands would be affected. They stated that conservation reserve program lands are managed by the U.S. Department of Agriculture, Farm Service Agency, but that they would not be allowed to provide information about these lands either. Therefore, Enbridge will attempt to identify conservation reserve program lands during its easement negotiations with landowners. Enbridge will restore affected areas as appropriate and compensate landowners if rental payments or cost-share assistance are affected.

North Dakota Game and Fish Department

The North Dakota Game and Fish Department expressed a concern that the project would cross PLOTS parcels and could adversely affect land use agreements between the department and landowners. PLOTS parcels are private lands which the state pays owners to open to public access for recreation and hunting, and/or conserve as fish or wildlife habitat. Upon further investigation, Enbridge determined that no PLOTS parcels would be crossed by the proposed project (see Section D.2.b.ii).

The North Dakota Game and Fish Department indicated that they do not have wildlife concerns with the proposed project.[5] However, they recommended that steps be taken to protect wetlands that cannot be avoided; aboveground facilities not be placed in wetlands; and no alterations be made to existing drainage patterns. They also asked that every effort be made to prevent destruction of shrubs and trees, and that shrubs and trees cut during construction be replaced at a 2 to 1 ratio. Lastly, they requested that Little Muddy Creek be crossed by horizontal directional drilling.

Enbridge has agreed to: take steps to protect wetlands that cannot be avoided (see Section D.2.c.ii.4); prohibit siting aboveground facilities in wetlands; and restore drainage patterns to their pre-construction condition (see Section D.2.c.i.4). Enbridge also agreed to make an effort to prevent destruction of shrubs and trees, and that shrubs and trees cut during construction will be replaced at a 2 to 1 ratio where they are outside permanent rights-of-way (see Section D.2.c.ii.4). Lastly, Enbridge agreed to attempt to construct across Little Muddy Creek using the horizontal directional drill method.

North Dakota Public Service Commission

The North Dakota Public Service Commission has not yet concluded its evaluation of the proposed project, but has not yet identified concerns to Enbridge.

North Dakota State Lands Department

The North Dakota State Lands Department did not identify concerns with the proposed project .

[5] The North Dakota Game and Fish Department reviewed the entire proposed route and much of the proposed corridor. However, a portion of the proposed corridor was not reviewed. Enbridge initiated consultations for the unreviewed portion of the proposed corridor but has not yet received a response from the North Dakota Game and Fish Department.

North Dakota State Health Department

The North Dakota State Health Department did not identify concerns with the proposed project; however, applications for hydrostatic test water discharge permits have not yet been submitted to the department.

The North Dakota State Water Commission

North Dakota State Water Commission informally indicated they have no concerns with the proposed project, but have not yet provided these conclusions in writing.

State Historical Society of North Dakota (State Historic Preservation Office)

The State Historical Society of North Dakota has not identified concerns with the proposed project to date, but has not yet concluded its evaluation of the project. Enbridge completed a class 1 literature search of the proposed corridor. A copy of the report documenting the results of the literature search was provided to the State Historical Society of North Dakota and is included in Appendix D. The State Historical Society of North Dakota concurred with the findings of the report. Enbridge also completed a class 2 reconnaissance inventory on those parts of the proposed route likely to contain cultural resources. A copy of the report documenting the results of the reconnaissance inventory will be provided to the State Historical Society of North Dakota for concurrence and is included in Appendix E.

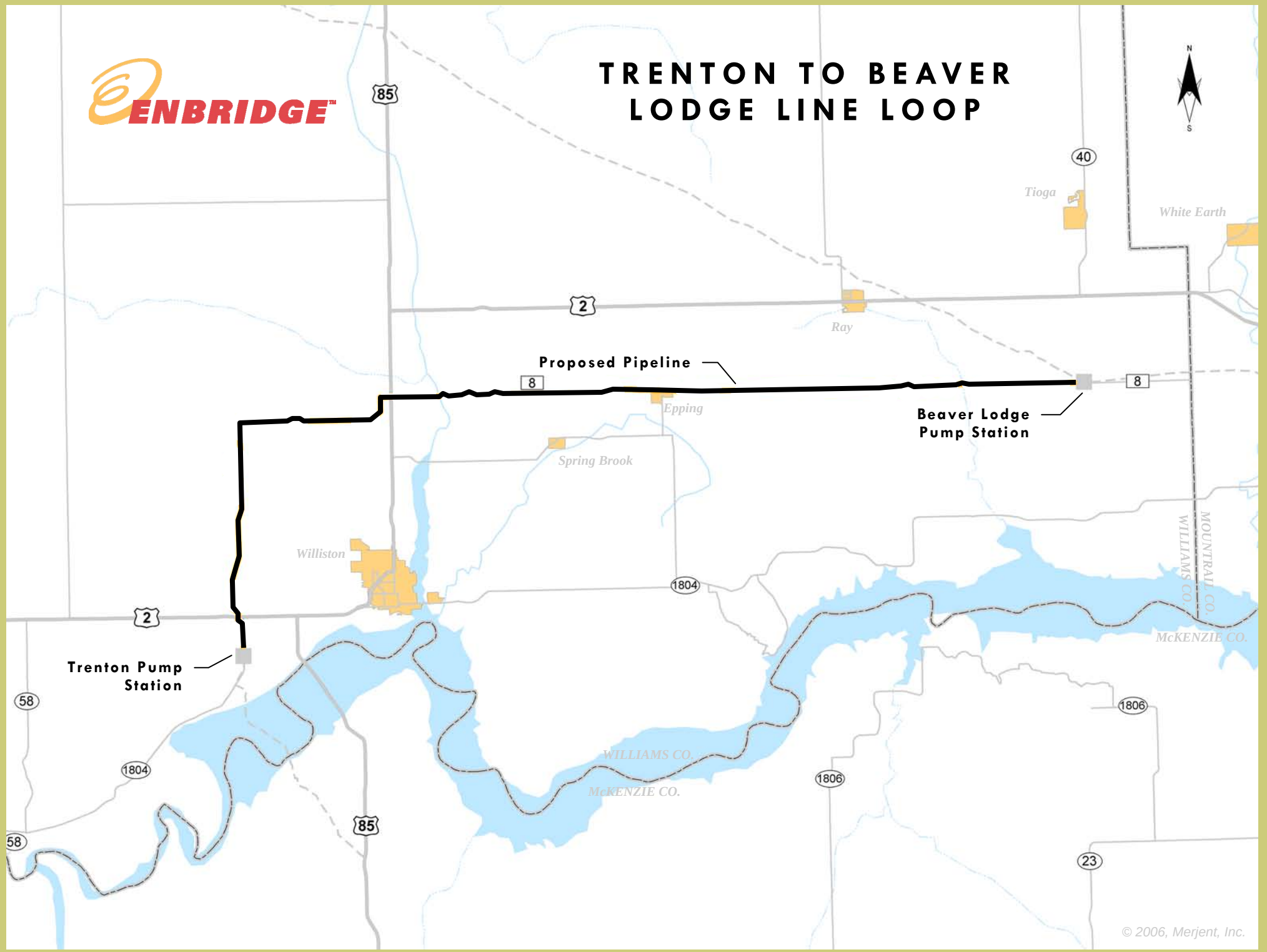
Williams County Auditor

The Williams County Auditor did not identify concerns with the proposed project.

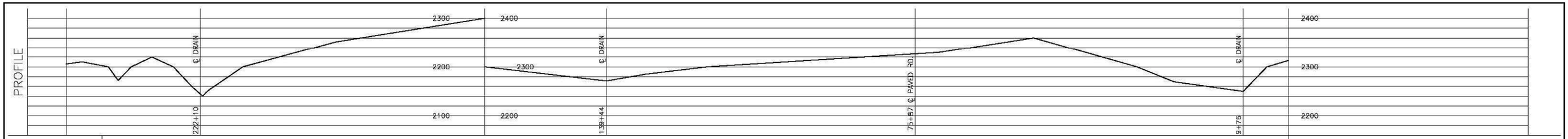
Williams County Department of Equalization

The Williams County Department of Equalization did not identify concerns with the proposed project.

APPENDIX A


ENBRIDGE
TRENTON TO BEAVER LODGE LINE LOOP
N
S
Proposed Pipeline
Beaver Lodge Pump Station
Trenton Pump Station
Tioga
White Earth
Ray
Epping
Spring Brook
Williston
WILLIAMS CO.
McKENZIE CO.
MOUNTRAIL CO.
85
40
2
8
1804
1806
58
23
© 2006, Merjent, Inc.

APPENDIX B


PROFILE
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2100
2400
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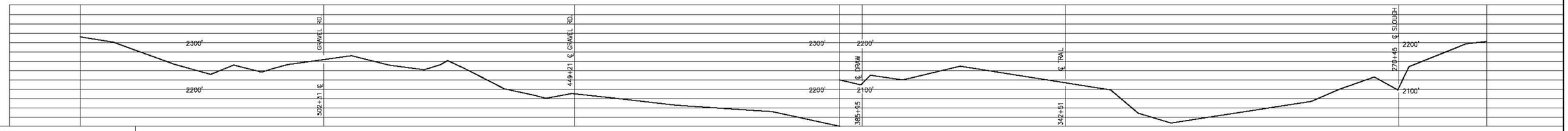
℄ PAVED RD.
℄ DRAIN
222+10
139+44
75+87
9+76

| | | |

PROFILE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2200'
GRAVEL RD.
502+31 ℄
449+21 ℄ GRAVEL RD.
2300'
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℄ DRAW
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℄ TRAIL
342+51
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2100'
270+46 ℄ SLOUGH
2200'
2100'

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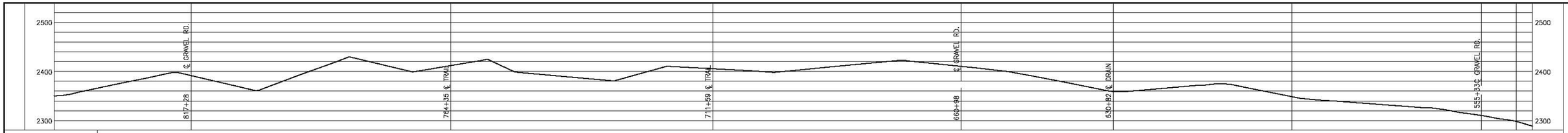
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711+59 ℄ TRAIL
660+98
630+82 ℄ DRAIN
555+33
℄ GRAVEL RD.

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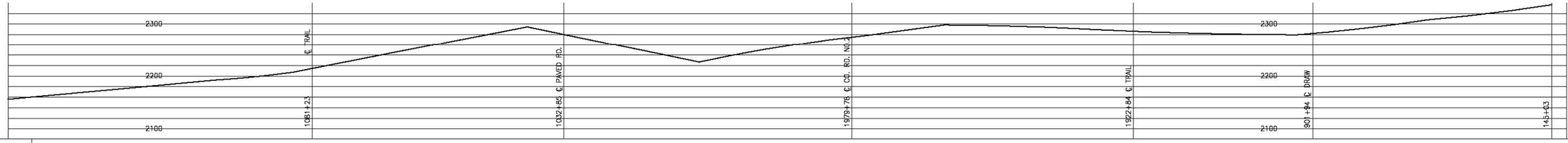
PROFILE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1032+85 ℄ PAVED RD.
1979+76 ℄ CO. RD. NO.2
1922+84 ℄ TRAIL
901+94 ℄ DRAW
1451+03

| | | |

PROFILE

2200
2100

435+95 ℄ COULEE
406+35 UNDG. TELE. CBL.
347+38 C.L. ROAD
295+91 C.L. GRAVEL ROAD
219+81 C.L. DRAIN
115+97 C.L. RD.
143+63 C.L. CREEK

| | | |

PROFILE

@ HWYS. 85 & 2 — @ PVT. RD. — U/G TEL. CABLE — @ GRAVEL RD.

1720+86 — 1867+42 — 1629+75 — 1563+24

2000 — 1900 — 2000 — 2100 — 1900 — 2000 — 2100 — 2000

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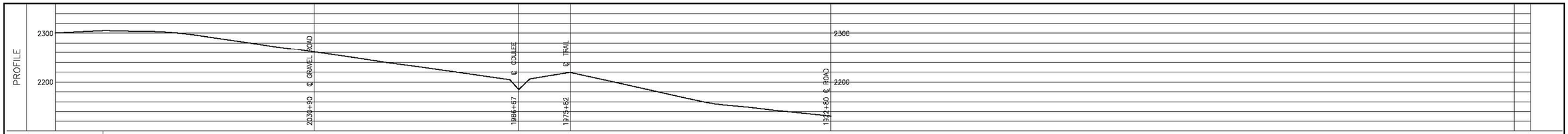
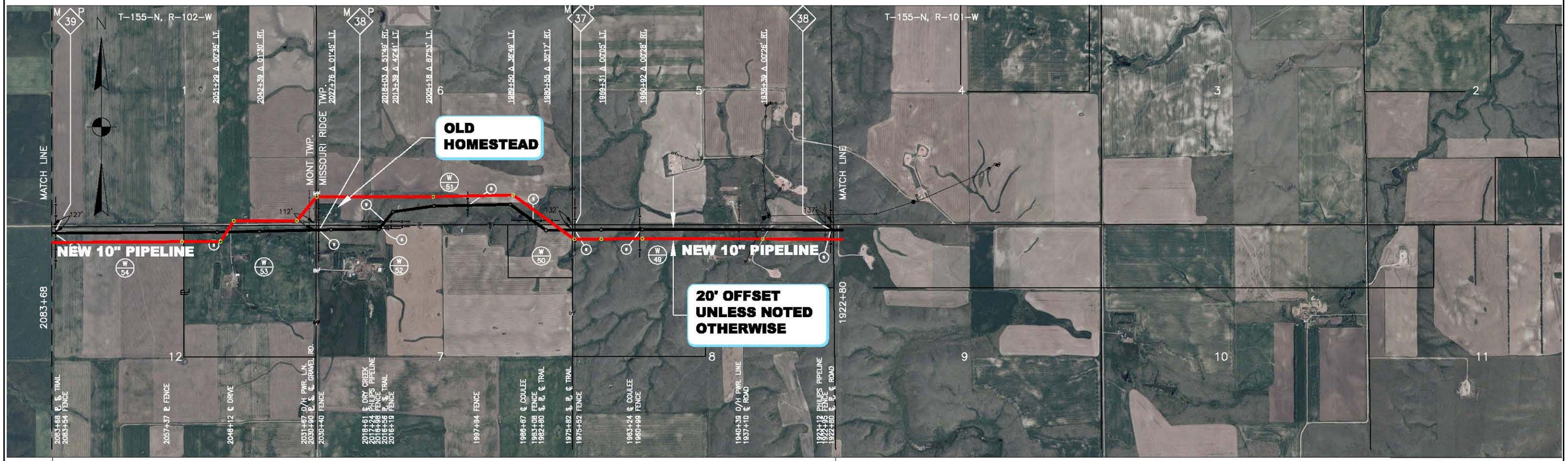


TERRAIN																	
VEGETATION	3		2	3			11			3	1		2		1	2	
OWNERSHIP	MATCH LINE 2083+68	GUDRUN L. JENSEN, ET AL		2057+37	WALTER M. JENSEN	2030+90	RICHARD E. JENSEN		2016+56	ARNOLD D. BOURRETT, ET AL		1982+80	LYDIA A. SCHMIDT		1975+82	CHARLES W. ALLISON	1922+80 MATCH LINE
R.O.W. NO.	W-54		W-53			W-52	W-51			W-50	W-49						
RODDAGE	159.5		160.4			86.9	204.6			42.3	321.3						



MATERIAL

SUMMARY

ITEM	REVISED	QUANTITY

VEGETATION LEGEND
1. GRASSLAND
2. SUMMER FALLOW
3. STUBBLE
4. ALFALFA
5. SUNFLOWER
6. OATS

T TEST LEAD INSTALLATION

REFERENCE DRAWINGS NUMBER	TITLE	REV. NO.	REVISION	BY	DATE

Rooney Engineering, Inc.
12201 E. Arapahoe Rd.
Centennial, CO 80112
(303) 792-5911

ENBRIDGE PIPELINES (ND)

TRENTON TO BEAVER LODGE
NEW 10" PIPELINE
WILLIAMS, CO. NORTH DAKOTA

SCALE	DRAWN	DATE	DRAWING NO.
NTS	ADJ	7/5/06	2424-A-0608

W:\Enbridge Pipelines\02424 - 10in Pipeline - Trenton to Beaver Lodge\CADD\Alignments\2424-A-0608.dwg, 7/21/2006 1:33:37 PM

PROFILE	2300 / 2200 / 2100		2300 / 2200 / 2100
TERRAIN			
VEGETATION		1	2
OWNERSHIP	2173+40 MATCH LINE	JOSEPH D. BARKIE	21.37+98 IVY LUELLA VOH, ET AL
R.O.W. NO.		W-56	W-55
RODDAGE		214.7	329.1

MATERIAL

SUMMARY

ITEM	REVISED	QUANTITY

VEGETATION LEGEND
1. GRASSLAND
2. SUMMER FALLOW
3. STUBBLE
4. ALFALFA
5. SUNFLOWER
6. OATS

T TEST LEAD INSTALLATION

REFERENCE DRAWINGS		REV. NO.	REVISION	BY	DATE
NUMBER	TITLE				

Rooney Engineering, Inc.
12201 E. Arapahoe Rd.
Centennial, CO 80112
(303) 792-5911

ENBRIDGE PIPELINES (ND)

TRENTON TO BEAVER LODGE
NEW 10" PIPELINE

WILLIAMS, CO. NORTH DAKOTA

SCALE	DRAWN	DATE	DRAWING NO.
NTS	ADJ	7/5/06	2424-A-0609

W:\Enbridge Pipelines\02424 - 10in Pipeline - Trenton to Beaver Lodge\CAD\Alignments\2424-A-0609.dwg, 7/21/2006 1:24:17 PM

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APPENDIX C

Enbridge Pipelines (North Dakota) LLC – North Dakota Pipeline Expansion Project

Appendix C – Agency Consultations

1) U.S. Army Corps of Engineers
   Nationwide Permit 12 (Utility Line Activities)

2) U.S. Department of Interior, Fish and Wildlife Service
   Threatened and Endangered Species Consultation

3) U.S. Department of Interior, Bureau of Reclamation
   Potential Impacts to Buford-Trenton Project Irrigation System

4) U.S. Department of Agriculture, Natural Resource Conservation Service
   Potential Impacts to NRCS Reserve Program Lands

5) North Dakota Department of Health
   Section 401 Certification

6) North Dakota Game and Fish Department
   Formal Solicitation of State Species and Habitat Concerns

7) North Dakota Public Service Commission
   Zoning and Planning

8) North Dakota State Lands Department
   North Dakota School Trust Lands

9) North Dakota State Water Commission
   Sovereign Lands, Solicitation of View

10) State Historical Society of North Dakota (State Historic Preservation Office)
    National Historic Preservation Act Consultation

11) Williams County Auditor

12) Williams County Department of Equalization
    Zoning and Planning

U.S. Army Corps of Engineers

Nationwide Permit 12 (Utility Line Activities)

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
NORTH DAKOTA REGULATORY OFFICE
1513 SOUTH 12TH STREET
BISMARCK ND 58504-6640

REPLY TO
ATTENTION OF

July 3, 2006

North Dakota Regulatory Office

Enbridge Pipelines (North Dakota) LLC
ATTN: Kris H. Benson, CHMM
119 North 25th Street East
Superior, Wisconsin 54880

Dear Ms. Benson:

This is in response to your request for review of *Archaeological Survey Plan for Enbridge Pipelines (North Dakota) LLC, North Dakota Pipeline Expansion Project: Overview of Known Cultural Resources and Potential for Discovery of Undocumented Cultural Resources in Williams County, North Dakota* prepared by Earthworks and dated June 2006. In addition, the letter from the State Historical Society of North Dakota dated June 20, 2006 was also taken into consideration.

While it may be in the best interest of Enbridge to conduct Class III surveys in all or most previously undisturbed areas having a moderate to high potential for containing cultural resources, I noted that you propose to survey areas which extend beyond Corps jurisdiction. In other instances, I note that the pipeline corridor appears to cross jurisdictional waters, however, as I understand, because the area has either been previously disturbed or classified as a low potential area, Class III surveys are not proposed. I would encourage your contractor to utilize best professional judgment for determining the need for additional survey work in disturbed areas near waterways that have a high potential for containing cultural resources. Because you propose to have survey crews begin as quickly as July 5th, I provide only general comments to your proposal.

Given the plan provided was submitted by Enbridge and accepted by the State Historical Society of North Dakota, it should fulfill the requirements of the nationwide permitting program. Should survey work begin and you have any questions regarding the extent of jurisdiction in a particular area, feel free to contact me at the above address or by telephone at (701) 255-0015.

Sincerely,

Toni R. Erhardt
Project Manager
North Dakota Regulatory Office

Printed on Recycled Paper

Enbridge Pipelines (Lakehead) LLC
119 N. 25th Street East
Superior, WI 54880
Tel 715 394 1400
Fax 715 394 1570
www.enbridgepartners.com

Scott W. Lounsbury Supervisor, Environment
Kris H. Benson Environmental Analyst II
Paul R. Meneghini Sr. Environmental Analyst
Rachael A. Shetka Environmental Analyst
David M. Hoffman Sr. Environmental Analyst
Joseph P. Peterson Environmental Analyst II

June 14, 2006

Toni R. Erhardt
U.S. Army Corps of Engineers
North Dakota Regulatory Office
1513 South 12th Street
Bismarck, ND 58504-6640

Dear Ms. Erhardt,

Enbridge Pipelines (North Dakota) LLC ("Enbridge") is providing the enclosed A*rchaeological Survey Plan* to the U.S. Army Corps of Engineers ("COE") as part its proposed North Dakota Pipeline Expansion Project. In a June 7, 2006 letter, Enbridge notified the COE of the proposed project and included key permitting milestones associated with obtaining project authorization from the COE under Nationwide Permit 12 (Utility Line Activities). Enbridge understands it must comply with the National Historic Preservation Act, and is planning to sponsor an archaeological survey for the project. Enbridge requests the COE review the survey plan and coordinate with the North Dakota State Historic Preservation Office as required. Due to the aggressive construction schedule, Enbridge plans to initiate the survey shortly after the plan is approved.

Enbridge has also provided a copy of the enclosed survey plan to the North Dakota State Historic Preservation Office. If you have questions or comments to the plan, please contact Tom Hess of Merjent, Inc., Enbridge's environmental consultant, at (612) 746-3667, or me at (715) 394-1572. In addition to mailing a response, please fax the plan approval letter to me at (715) 394-1570.

Sincerely,
Enbridge Pipelines (North Dakota) LLC

Kris Benson, CHMM
Environmental Analyst II

Enclosure: Archaeological Survey Plan

cc: Tom Hess, Merjent, Inc.
Fern Swenson, North Dakota State Historic Preservation Office
Enbridge project file

Enbridge Pipelines (Lakehead) LLC
119 N. 25th Street East
Superior, WI 54880
Tel 715 394 1400
Fax 715 394 1570
www.enbridgepartners.com

Scott W. Lounsbury Supervisor, Environment
Kris H. Benson Environmental Analyst II
Paul R. Meneghini Sr. Environmental Analyst
Rachael A. Shetka Environmental Analyst
David M. Hoffman Sr. Environmental Analyst
Joseph P. Peterson Environmental Analyst II

June 7, 2006

Mr. Daniel E. Cimarosti, Program Manager
U.S. Army Corps of Engineers
North Dakota Regulatory Office
1513 South 12th Street
Bismarck, ND 58504-6640

RE: Enbridge Pipelines (North Dakota) LLC - North Dakota Pipeline Expansion Project
Project Notification Letter

Dear Mr. Cimarosti,

The purpose of this letter is to formally notify the Corps of Engineers of the proposed pipeline project we discussed at your office on April 20, 2006. Enbridge Pipelines (North Dakota) LLC ("Enbridge") is presently evaluating a project to expand a portion of its North Dakota pipeline system. The proposed expansion involves the construction of a new pipeline that is anticipated to be co-located within the same corridor as its existing pipeline, extending approximately 53 miles between Enbridge's Beaver Lodge Pump Station (approximately seven miles south of Tioga) and Trenton Pump Station (approximately six miles southwest of Williston). USGS topographic maps are enclosed that depict the current pipeline route. Construction is anticipated to require three to five months to complete, with a tentative start date of August 2006. In addition, Enbridge may perform modifications at its existing aboveground facilities along the project route.

Because the proposed pipeline will cross waters of the United States, but will not permanently impact more than one half acre of wetlands, Enbridge intends to pursue project authorization from the Corps of Engineers under Nationwide Permit 12, Utility Line Activities. Enbridge anticipates the following tasks will be completed in support of its permit application.

Milestone dates associated with the Corps of Engineers

Task	Date [1]
Enbridge initiated threatened and endangered species consultations with U.S. Fish and Wildlife Service and North Dakota Game and Fish Department. [2]	May 25, 2006
Enbridge to submit a cultural resource survey plan to Corps of Engineers for Corps to review and forward to the NDSHPO. [3]	(mid-June)
Earthworks to conduct a cultural resource survey on behalf of Enbridge.	(mid-July)
Enbridge to submit forms to Corps of Engineers for newly discovered cultural resource sites. Corps to forward forms to SHPO to assign SITS number for each site. [3]	(mid- to late-July)
Enbridge to submit completed cultural resource survey report to Corps of Engineers [3] as part of its completed Nationwide Permit application.	(August 2006)

Notes
1. Anticipated dates are presented in parentheses.
2. Enbridge will include copies of consultation letters and agency responses as part of its Nationwide Permit application.
3. Corps of Engineers forward to tribal entities as appropriate.

Mr. Daniel E. Cimarosti, Program Manager
U.S. Army Corps of Engineers

June 7, 2006

At your convenience, please forward me the contact information for the individual from your office who will be designated as the point of contact for this project. If you have questions or require further information, please contact Tom Hess of Merjent, Inc., Enbridge's environmental consultant, at (612) 746-3667, or me at (715) 394-1572.

Sincerely,
Enbridge Pipelines (North Dakota) LLC

Kris Benson, CHMM
Environmental Analyst II

Enclosures: Project location maps

cc: Tom Hess, Merjent, Inc.

U.S. Department of Interior, Fish and Wildlife Service

Threatened and Endangered Species Consultation

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
3425 Miriam Avenue
Bismarck, North Dakota 58501

JUL 14 2006

Mr. Kris Benson
Environmental Analyst II, CHMM
Enbridge Pipelines (North Dakota), LLC
119 North 25th Street East
Superior, Wisconsin 54880

Re: North Dakota Pipeline Expansion Project
Amendment to May 25, 2006, Threatened
and Endangered Species Consultation

Dear Mr. Benson:

The U.S. Fish and Wildlife Service (Service) has reviewed the information provided in your July 12, 2006, request for a current list of threatened, endangered, and candidate species and critical habitat in Williams County, North Dakota. Enbridge Pipelines (North Dakota) LLC (Enbridge) is evaluating a project to expand a portion of its North Dakota pipeline system. The proposed project expansion would involve constructing a new underground pipeline adjacent to a portion of its existing underground pipeline, and potentially modifying aboveground facilities along the project route. Engridge anticipates the proposed pipeline will be collocated in the same corridor as its existing pipeline and will extend approximately 53 miles between its Beaver Lodge Pump Station (about 7 miles south of Tioga) and the Trenton Pump Station (about 6 miles southwest of Williston). Construction will require approximately 3-5 months to complete and will take place sometime between August 2006 and July 2007. We offer the following comments under the authority of and in accordance with the Endangered Species Act (ESA) (16 U.S.C. 1531 et seq.).

A list of federally endangered, threatened, and candidate species and designated critical habitat that may be present within the proposed project's area of influence is enclosed. This list fulfills requirements of the U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act. At this time, we are not aware that any species frequent the project area and no critical habitat currently exists within the proposed pipeline corridor.

If a Federal agency authorizes, funds, or carries out a proposed action, the responsible Federal agency, or its delegated agent, is required to evaluate whether the action "may affect" listed species. If the Federal agency determines the action "may affect" listed species, then the responsible Federal agency shall request formal section 7 consultation with this office. If the evaluation shows a "no effect" determination on listed species, further consultation is not

necessary. If a private entity receives Federal funding for a construction project, or if any Federal permit is required, the Federal agency may designate the fund recipient or permittee as its agent for purposes of section 7 consultation.

If you require further information, please contact Terry Ellsworth of my staff at (701) 250-4481, or at the letterhead address above.

Sincerely,

Jeffrey K. Towner
Field Supervisor
North Dakota Field Office

Enclosure

cc: NEPA Coordinator, Denver (MAIL STOP 60120)
(Attn: C. Young-Dubovsky)
Director, ND Game & Fish Department, Bismarck
(Attn: M. McKenna)

FEDERAL THREATENED AND ENDANGERED SPECIES
FOUND IN WILLIAMS COUNTY
NORTH DAKOTA
July 2006

ENDANGERED SPECIES

Birds

Interior least tern (Sterna antillarum): Nests along midstream sandbars of the Missouri and Yellowstone Rivers.

Whooping crane (Grus Americana): Migrates through west and central counties during spring and fall. Prefers to roost on wetlands and stockdams with good visibility. Young adult summered in North Dakota in 1989, 1990, and 1993. Total population 140-150 birds.

Fish

Pallid sturgeon (Scaphirhynchus albus): Known only from the Missouri and Yellowstone Rivers. No reproduction has been documented in 15 years.

Mammals

Gray wolf (Canis lupus): Occasional visitor in North Dakota. Most frequently observed in the Turtle Mountains area.

THREATENED SPECIES

Birds

Bald eagle (Haliaeetus leucocephalus): Migrates spring and fall statewide but primarily along the major river courses. It concentrates along the Missouri River during winter and is known to nest in the floodplain forest.

Piping plover (Charadrius melodus): Nests on midstream sandbars of the Missouri and Yellowstone Rivers and along shorelines of saline wetlands. More nest in North Dakota than any other state.

Enbridge Pipelines (Lakehead) L.L.C.
119 N. 25th Street East
Superior, WI 54880
Tel 715 394 1400
Fax 715 394 1570
www.enbridgepartners.com

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Kris H. Benson Environmental Analyst II
Paul R. Meneghini Sr. Environmental Analyst
Rachael A. Shetka Environmental Analyst
David M. Hoffman Sr. Environmental Analyst
Joseph P. Peterson Environmental Analyst II

July 12, 2006

Mr. Jeffrey Towner, Field Supervisor
U.S. Fish and Wildlife Service
North Dakota Field Office
3425 Miriam Avenue
Bismarck, ND 58501-7926

RE: Enbridge Pipelines (North Dakota) LLC - North Dakota Pipeline Expansion Project
Amendment to May 25, 2006 Threatened and Endangered Species Consultation

Dear Mr. Towner,

On May 25, 2006, Enbridge Pipelines (North Dakota) LLC ("Enbridge") submitted a consultation letter requesting U.S. Fish and Wildlife Service review the North Dakota Pipeline Expansion Project for concerns related to federally listed threatened or endangered species and critical habitat that could be affected by project activities. The consultation letter included USGS topographic maps and a legal description table of quarter sections that would be crossed by the proposed pipeline route. Since submitting our request, the North Dakota Public Service Commission (PSC) requested Enbridge review a mile-wide "evaluation corridor" along the proposed pipeline route for resources that could be affected by the proposed project.

Enbridge requests U.S. Fish and Wildlife Service review the evaluation corridor for concerns related to federally listed species and their critical habitats. USGS topographic maps are enclosed that depict the anticipated pipeline route and the one-mile-wide evaluation corridor. The townships, ranges, sections, and quarter sections of the evaluation corridor are listed on the enclosed legal description table. Highlighted text in the table indicates locations that were not submitted as part Enbridge's initial May 25, 2006 consultation letter.

As explained in Enbridge's first consultation letter, the proposed expansion would involve constructing a new 53-mile-long underground pipeline adjacent to its existing underground pipeline, and modifying aboveground facilities along the project route between its Beaver Lodge Pump Station (about seven miles south of Tioga) and Trenton Pump Station (about six miles southwest of Williston). Construction is anticipated to require approximately three to five months to complete, with a tentative start date of August 2006. Due to the tight project schedule, Enbridge would appreciate your reply by July 26, 2006 if possible.

Enbridge is also consulting with the North Dakota Game and Fish Department regarding protected species. If you have questions or require further information regarding this project, please contact Tom Hess of Merjent, Inc., Enbridge's environmental consultant, at (612) 746-3667, or me at (715) 394-1572. Thank you for your continued assistance on this project.

Sincerely,
Enbridge Pipelines (North Dakota) LLC

Kris Benson
Environmental Analyst II, CHMM

Enclosures: Legal description table
Project location maps

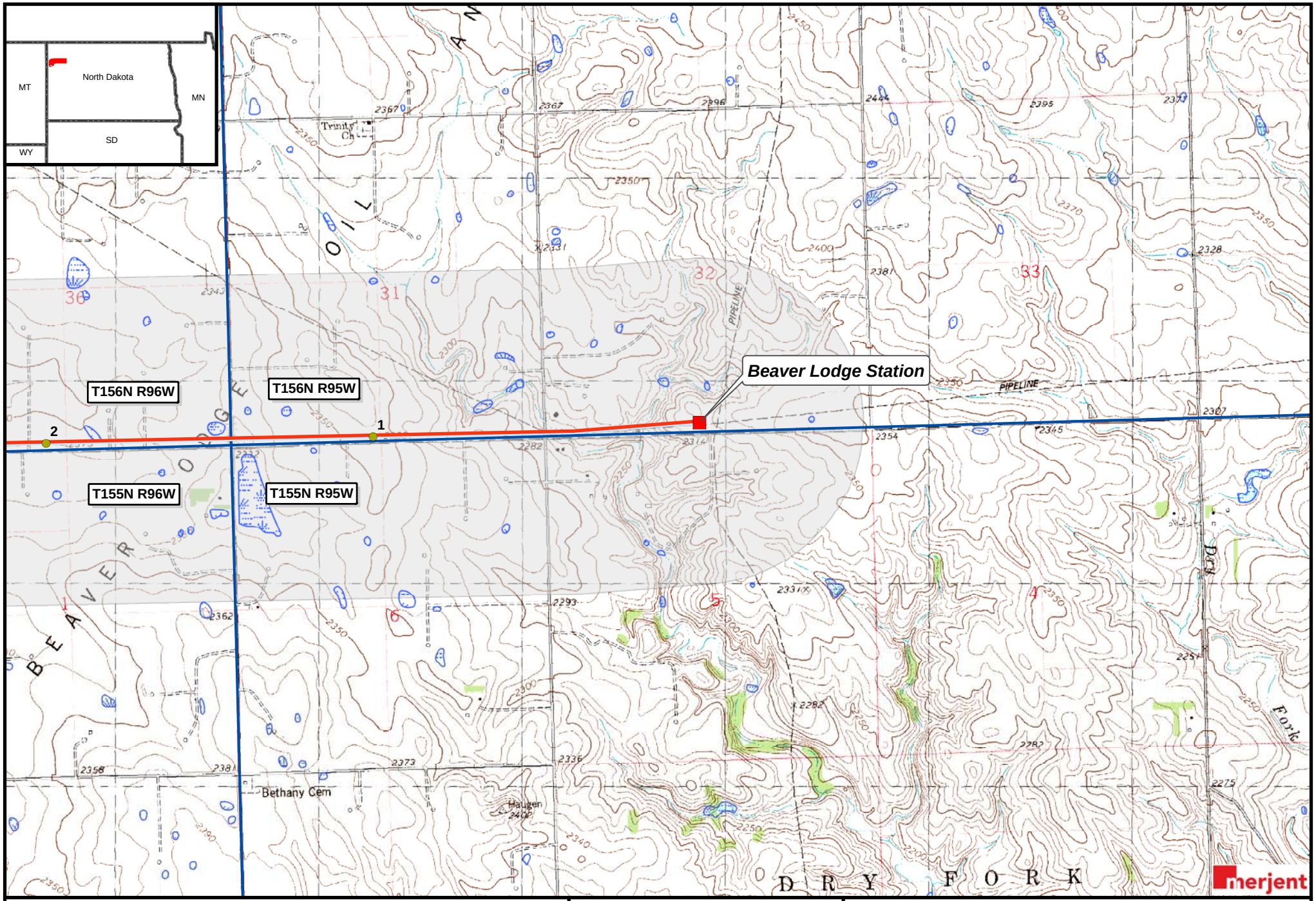
cc: Tom Hess, Merjent, Inc.

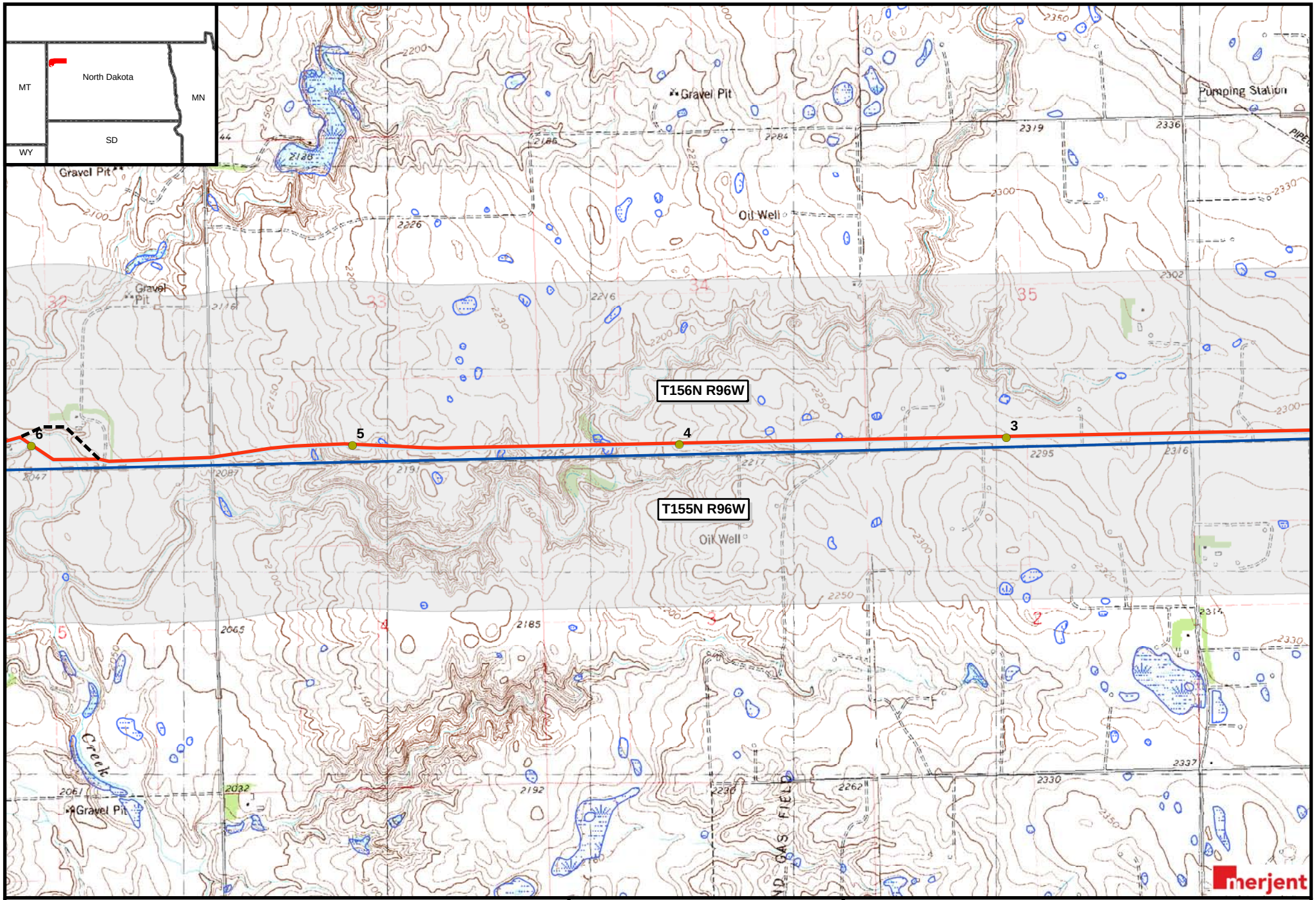
Enbridge Pipelines (North Dakota) LLC - North Dakota Pipeline Expansion Project
Legal Description Table

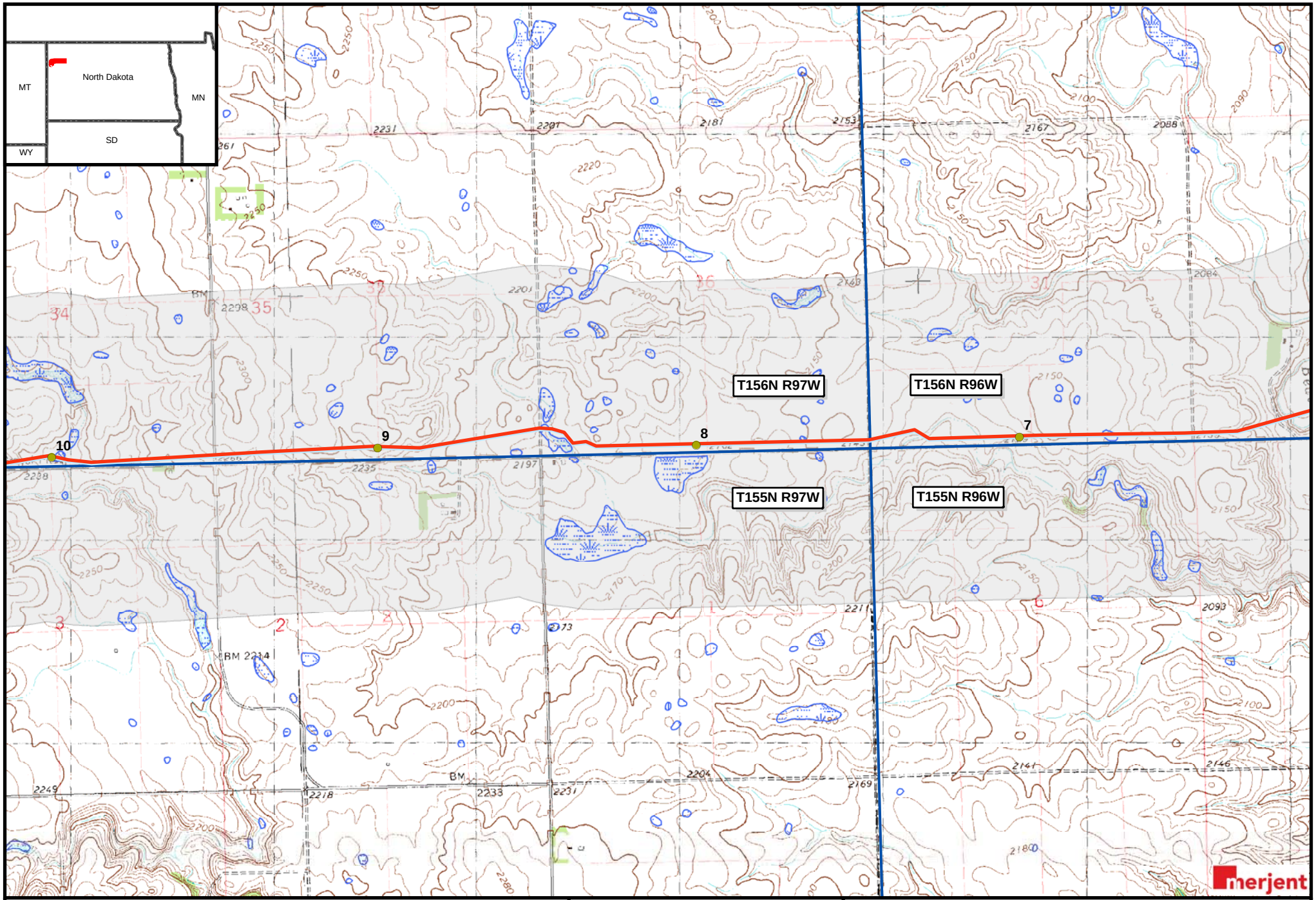
Township	Range	Section	Quarter Section [1]	Approximate Milepost
156N	95W	31 32	SW, SE SW, SE	0.0 – 1.5
155N	95W	5 6	NW, NE NW, NE	0.0 – 1.5
156N	96W	31 32 33 34 35 36	SW, SE NW, NE, SW, SE SW, SE SW, SE SW, SE SW, SE	1.5 – 7.5
155N	96W	1 2 3 4 5 6	NW, NE NW, NE NW, NE NW, NE NW, NE NW, NE	1.5 – 7.5
156N	97W	31 32 33 34 35 36	SW, SE SW, SE SW, SE SW, SE NE, SW, SE NW, SW, SE	7.5 – 13.5
155N	97W	1 2 3 4 5 6	NW, NE NW, NE NW, NE NW, NE NW, NE NW, NE	7.5 – 13.5
156N	98W	31 32 33 34 35 36	NW, SW, SE SW, SE SW, SE SW, SE SW, SE SW, SE	13.5 – 19.5
155N	98W	1 2 3 4 5 6	NW, NE NW, NE NW, NE NW, NE NW, NE NW, NE	13.5 – 19.5
156N	99W	31 32 33 34 35 36	SW, SE SW, SE NE SW, SE NW, NE SW, SE NW, NE SW, SE NW, NE, SW, SE	19.5 – 25.6
155N	99W	1 2 3 4 5 6	NW, NE NW, NE NW, NE NW, NE NW, NE NW, NE	19.5 – 25.6
156N	100W	31 32 33 34 35 36	NW, SW, SE SW, SE NW, NE SW, SE NW, NE SW, SE NW, NE SW, SE SW, SE	25.6 – 31.6

Township	Range	Section	Quarter Section [1]	Approximate Milepost
155N	100W	1 2 3 4 5 6	NW, NE NW, NE NW, NE NW, NE NW, NE NW, NE	25.6 – 31.6
156N	101W	35 36	SW, SE NW, NE SW, SE	31.6 – 33.1
155N	101W	1 2 3 4 5 6 7 8 9 10 11	NW, NE NW, NE, SW, SE SW, SE SW, SE SW, SE NW, NE SW, SE NW, NE NW, NE NW, NE NW, NE NW, NE	33.1 – 38.4
155N	102W	1 2 3 10 11 12 14 15 22 23 26 27 34 35	SW, SE SW, SE SE NE, SE NW, NE, SW NW, NE NW, SW NE, SW, SE NW, NE, SW, SE NW, SW NW, SW NW, NE, SE NW, NE, SW, SE NW, SW	38.4 – 46.2
154N	102W	2 3 10 11 14 15 22 23 26 27 34 35	NW, SW NW, NE, SW, SE NW, NE, SW, SE NW, SW NW NW, NE, SW, SE NW, NE, SW, SE SW NW, SW NW, NE, SE NE, SE NW, SW	46.2 – 52.5
153N	102W	2 3	NW, NE NW, NE	52.5

[1] Highlighted locations were not submitted as part Enbridge's initial May 25, 2006 consultation letter.


MT
North Dakota
MN
SD
WY
Beaver Lodge Station
T156N R96W
T156N R95W
T155N R96W
T155N R95W
PIPELINE
Bethany Cem
Haugen
DRY FORK
Existing Pipeline
Proposed Pipeline
Possible Reroutes
One Mile Evaluation Corridor
National Wetlands Inventory Data
ENBRIDGE
0 1,000 2,000 Feet
0 0.25 0.5 Miles
1:24,000
Enbridge Pipelines (North Dakota) LLC
North Dakota Pipeline Expansion Project
Location Map - Sheet 1 of 15
merjent


MT
North Dakota
MN
SD
WY
Gravel Pit
Pumping Station
Oil Well
T156N R96W
T155N R96W
6
5
4
3
Existing Pipeline
Proposed Pipeline
Possible Reroutes
One Mile Evaluation Corridor
National Wetlands Inventory Data
ENBRIDGE
0 1,000 2,000 Feet
0 0.25 0.5 Miles
1:24,000
Enbridge Pipelines (North Dakota) LLC
North Dakota Pipeline Expansion Project
Location Map - Sheet 2 of 15
merjent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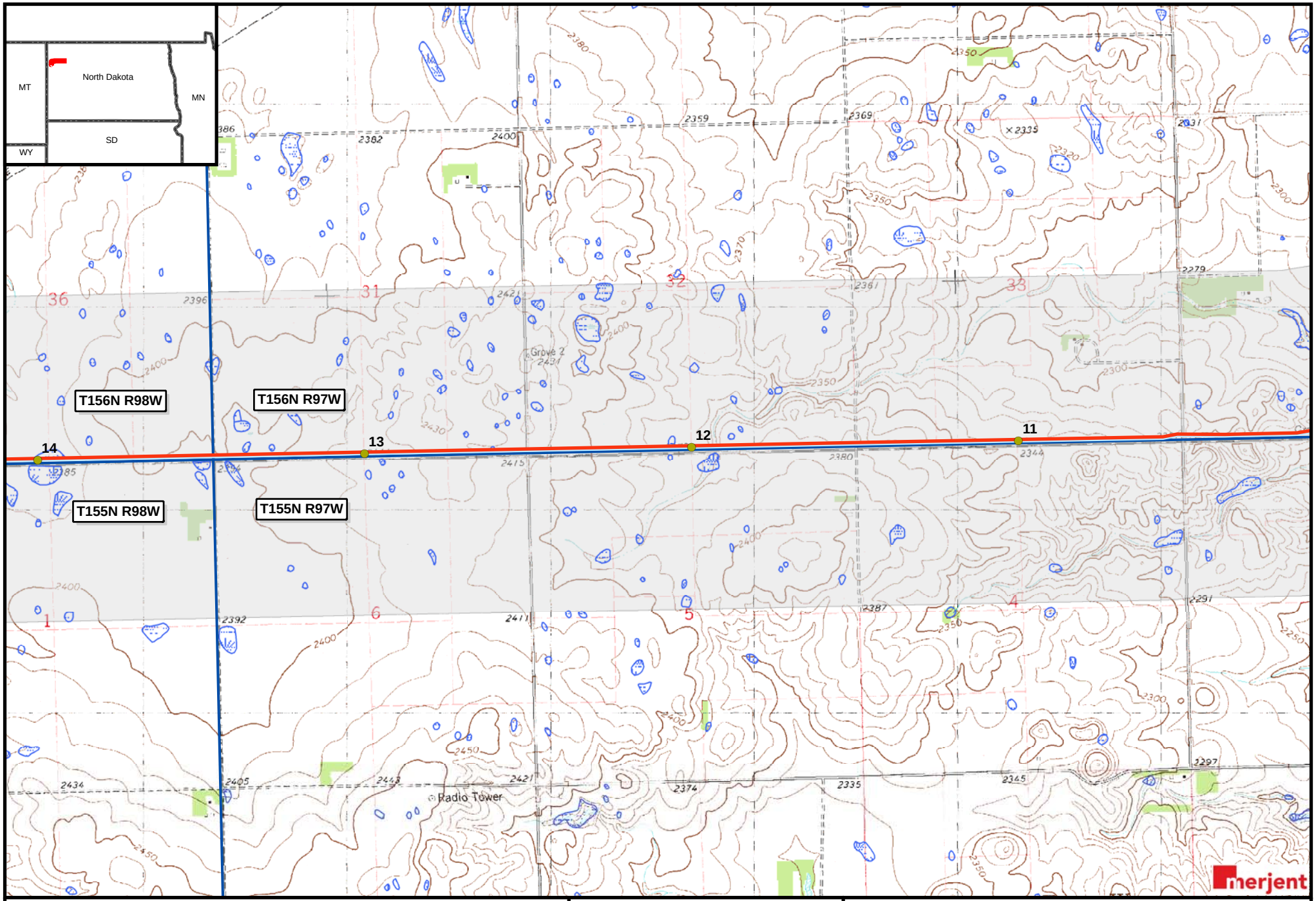
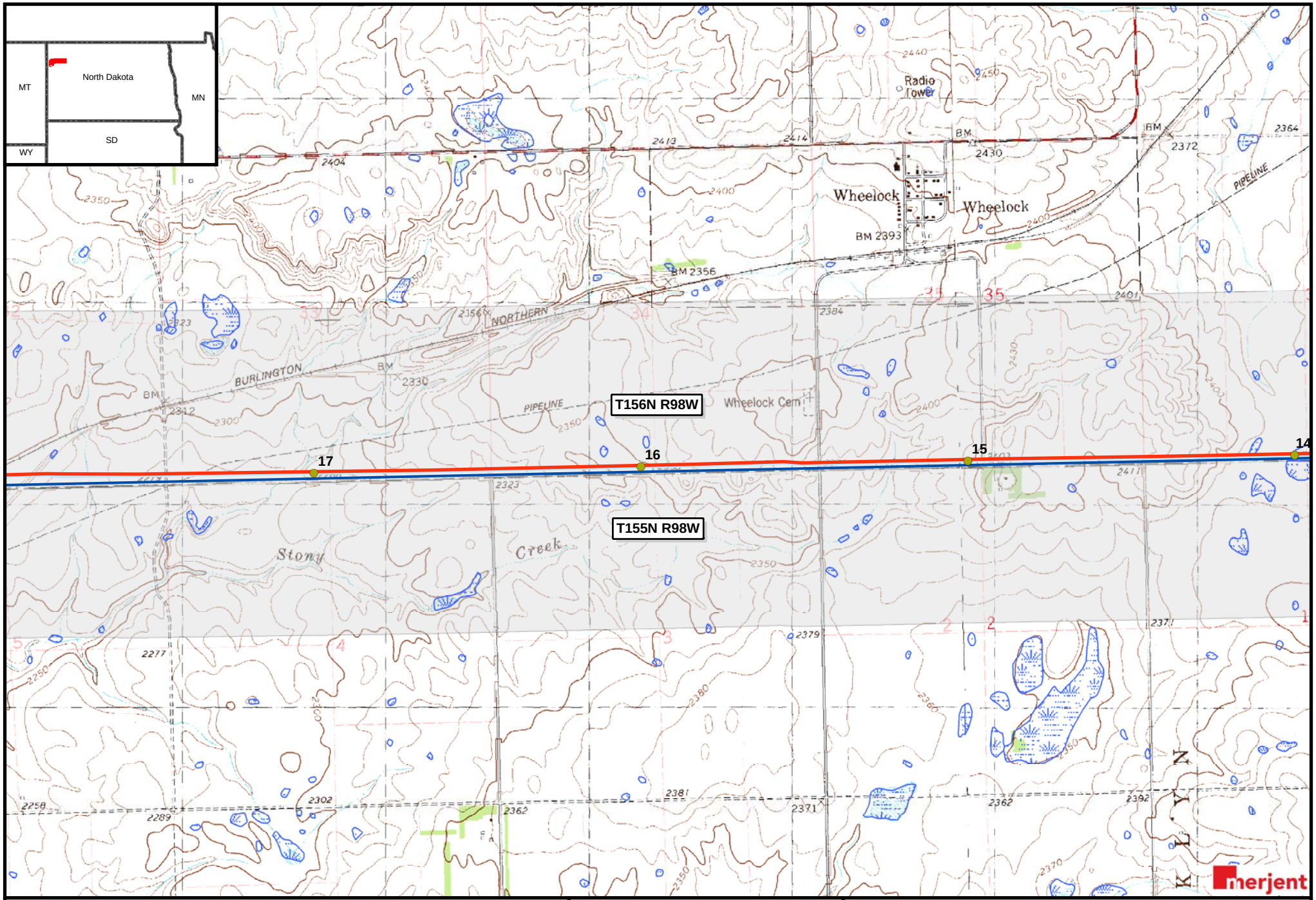
North Dakota
MN
SD
WY
T156N R97W
T156N R96W
T155N R97W
T155N R96W
10
9
8
7
BM 2214
BM 2233
Existing Pipeline
Proposed Pipeline
Possible Reroutes
One Mile Evaluation Corridor
National Wetlands Inventory Data
ENBRIDGE
0 1,000 2,000 Feet
0 0.25 0.5 Miles
1:24,000
Enbridge Pipelines (North Dakota) LLC
North Dakota Pipeline Expansion Project
Location Map - Sheet 3 of 15
merjent



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 4 of 15



Existing Pipeline
Proposed Pipeline
Possible Reroutes

One Mile Evaluation Corridor
National Wetlands Inventory Data

ENBRIDGE

0 1,000 2,000 Feet

0 0.25 0.5 Miles

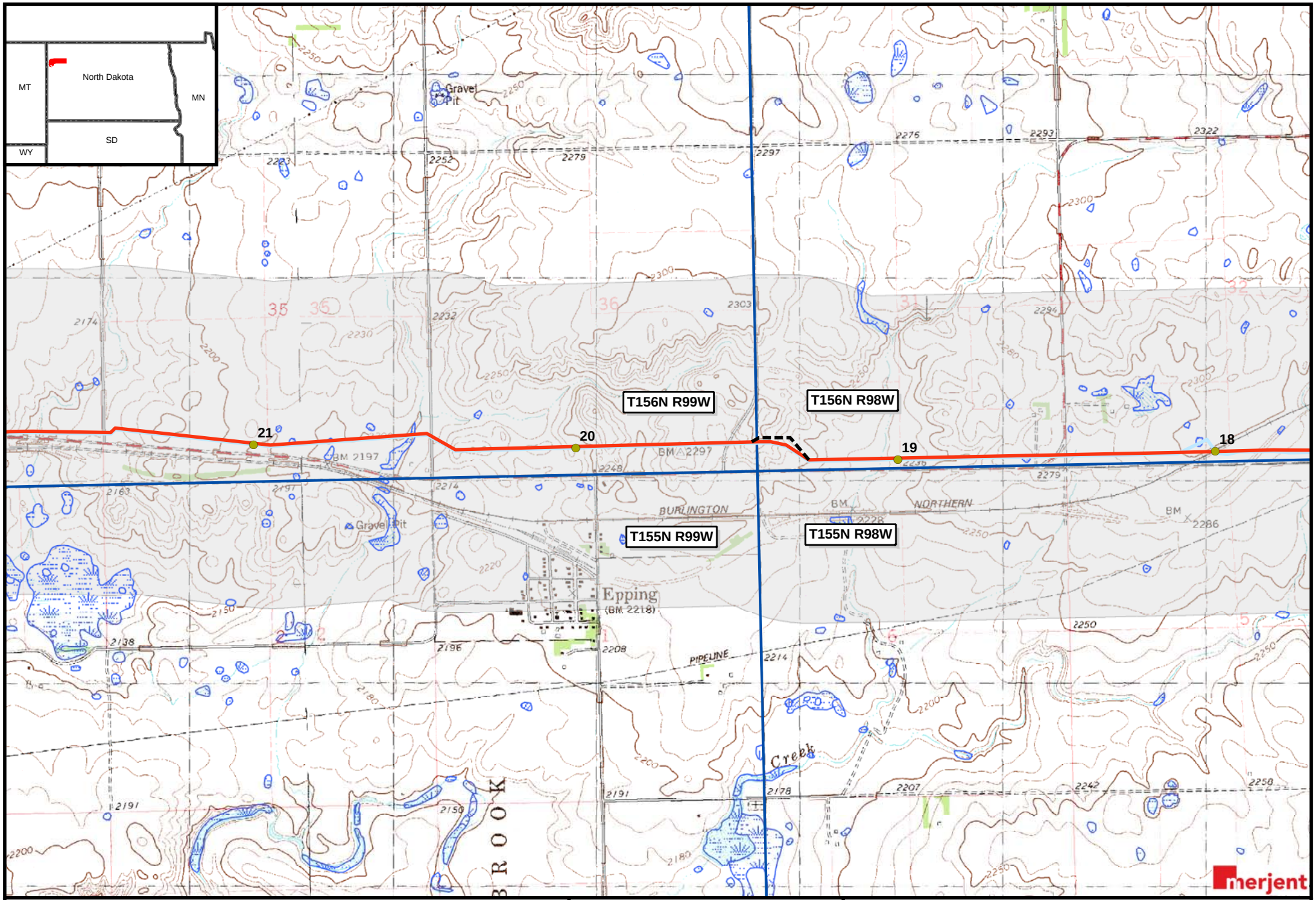
1:24,000

Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 5 of 15

merjent



Existing Pipeline

Proposed Pipeline

Possible Reroutes

One Mile Evaluation Corridor

National Wetlands Inventory Data

ENBRIDGE

0 1,000 2,000 Feet

0 0.25 0.5 Miles

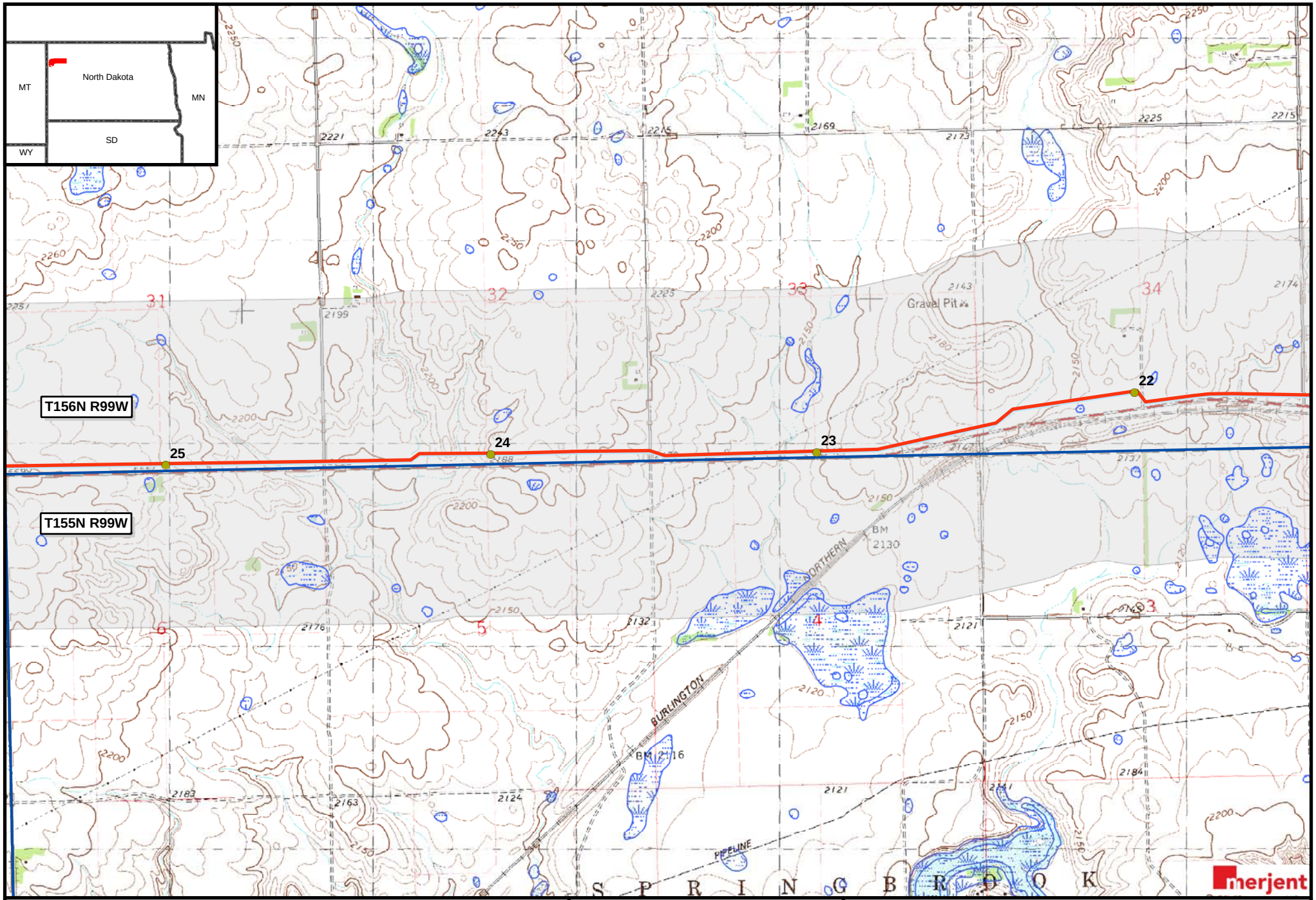
1:24,000

Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 6 of 15

merjent



Existing Pipeline
Proposed Pipeline
Possible Reroutes

One Mile Evaluation Corridor
National Wetlands Inventory Data

ENBRIDGE

0 1,000 2,000 Feet

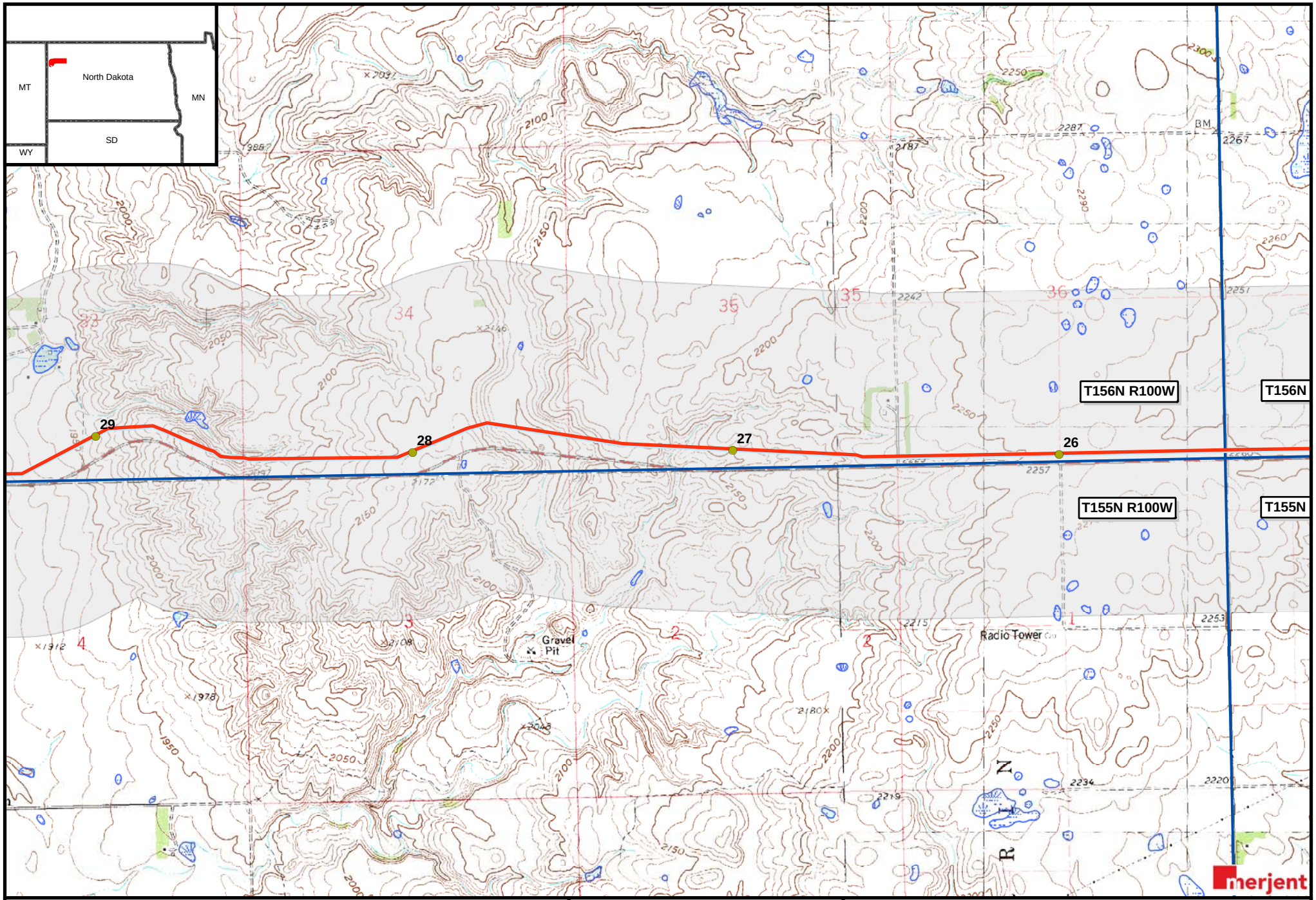
0 0.25 0.5 Miles

1:24,000

Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 7 of 15



Existing Pipeline
Proposed Pipeline
Possible Reroutes

One Mile Evaluation Corridor
National Wetlands Inventory Data

ENBRIDGE

0 1,000 2,000 Feet

0 0.25 0.5 Miles

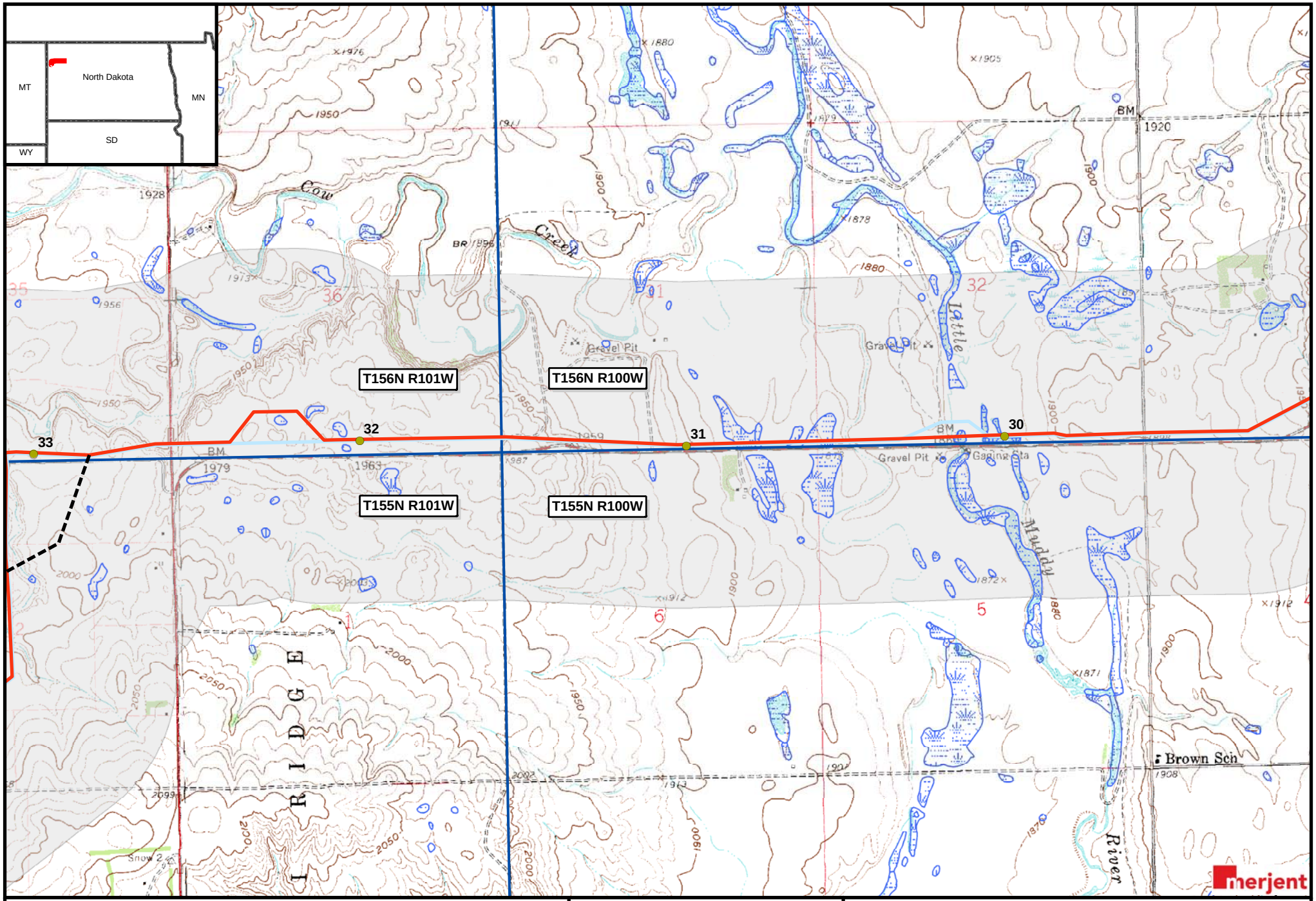
1:24,000

Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 8 of 15

merjent



Existing Pipeline
Proposed Pipeline
Possible Reroutes

One Mile Evaluation Corridor
National Wetlands Inventory Data

ENBRIDGE

0 1,000 2,000 Feet

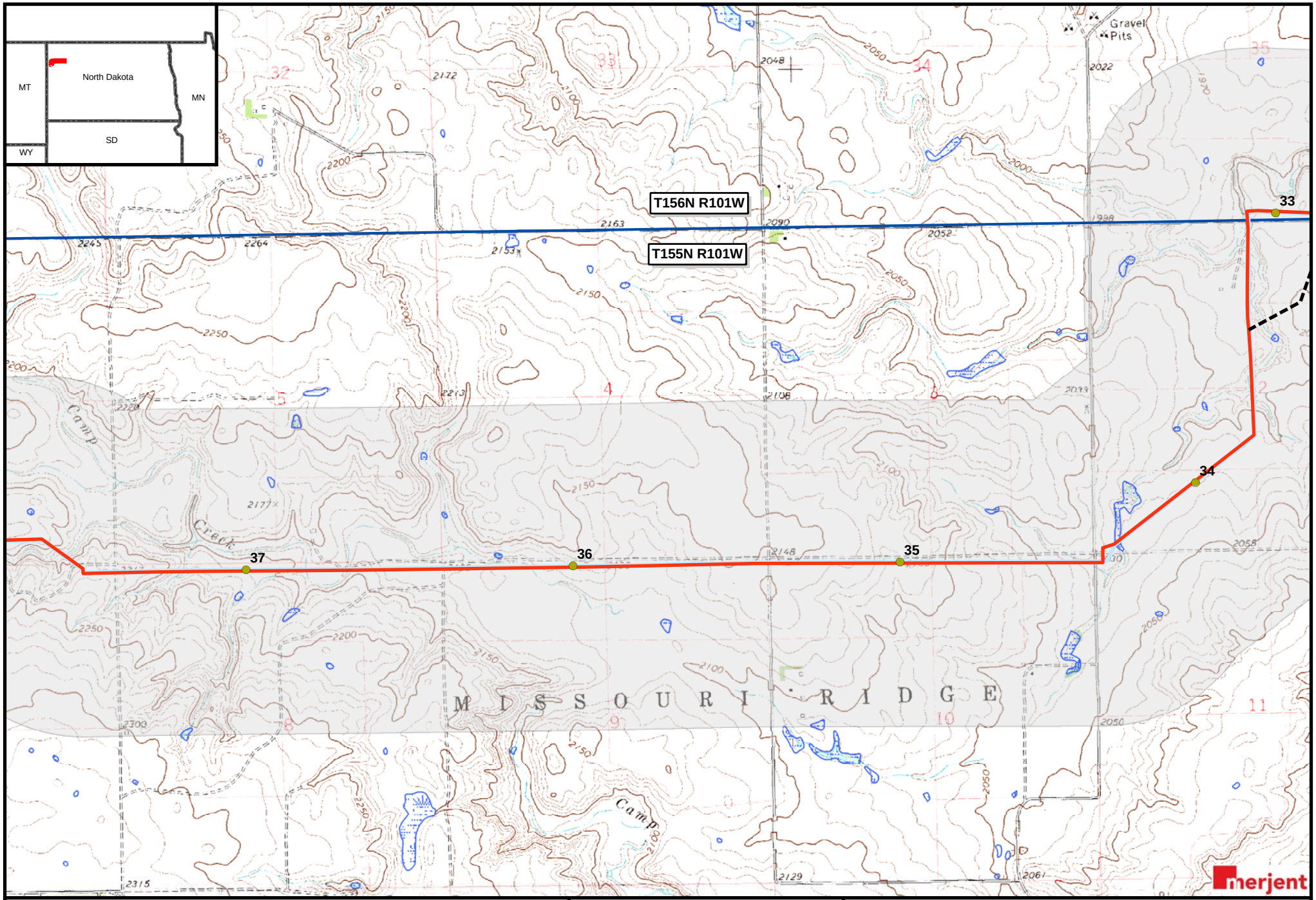
0 0.25 0.5 Miles

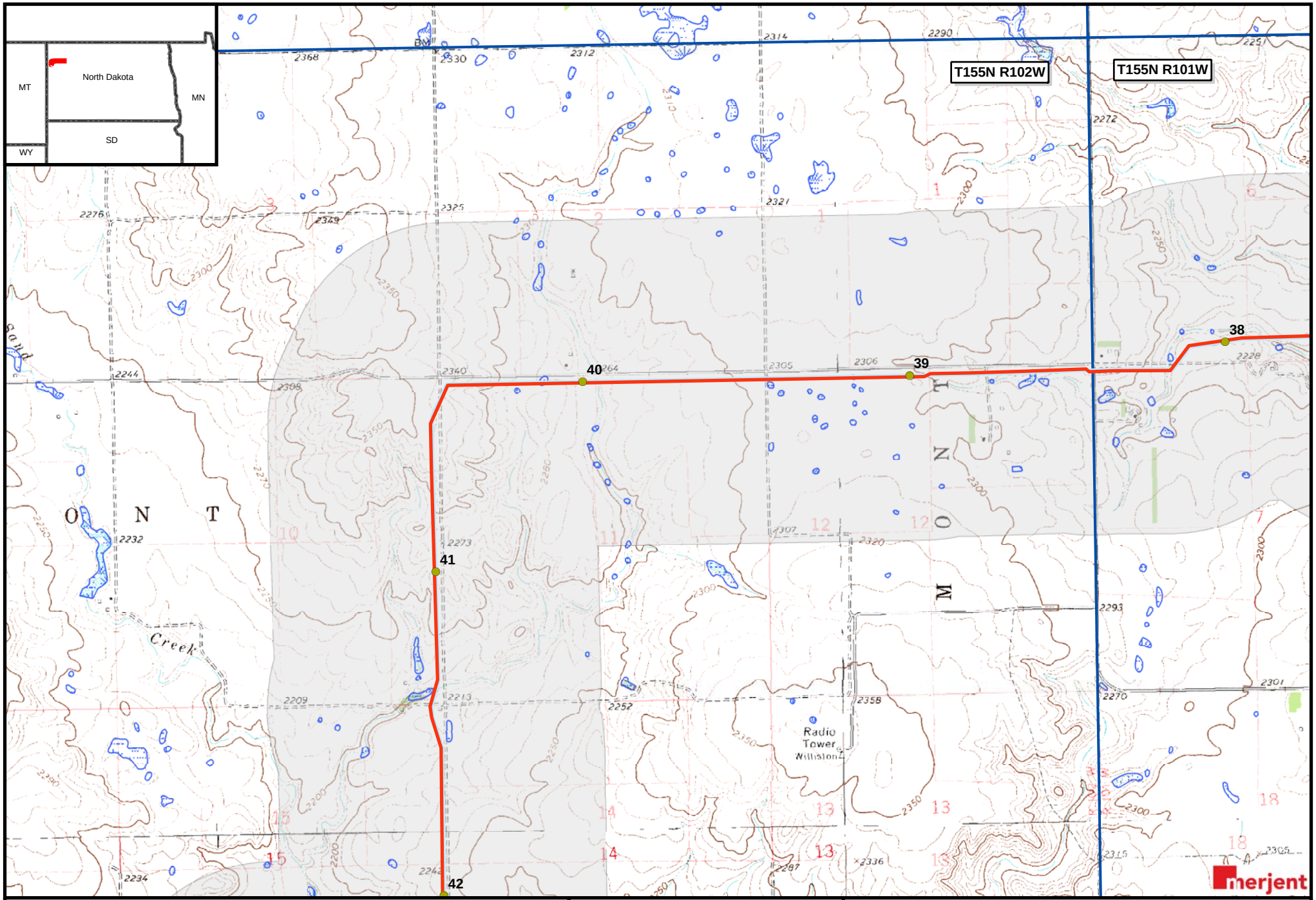
1:24,000

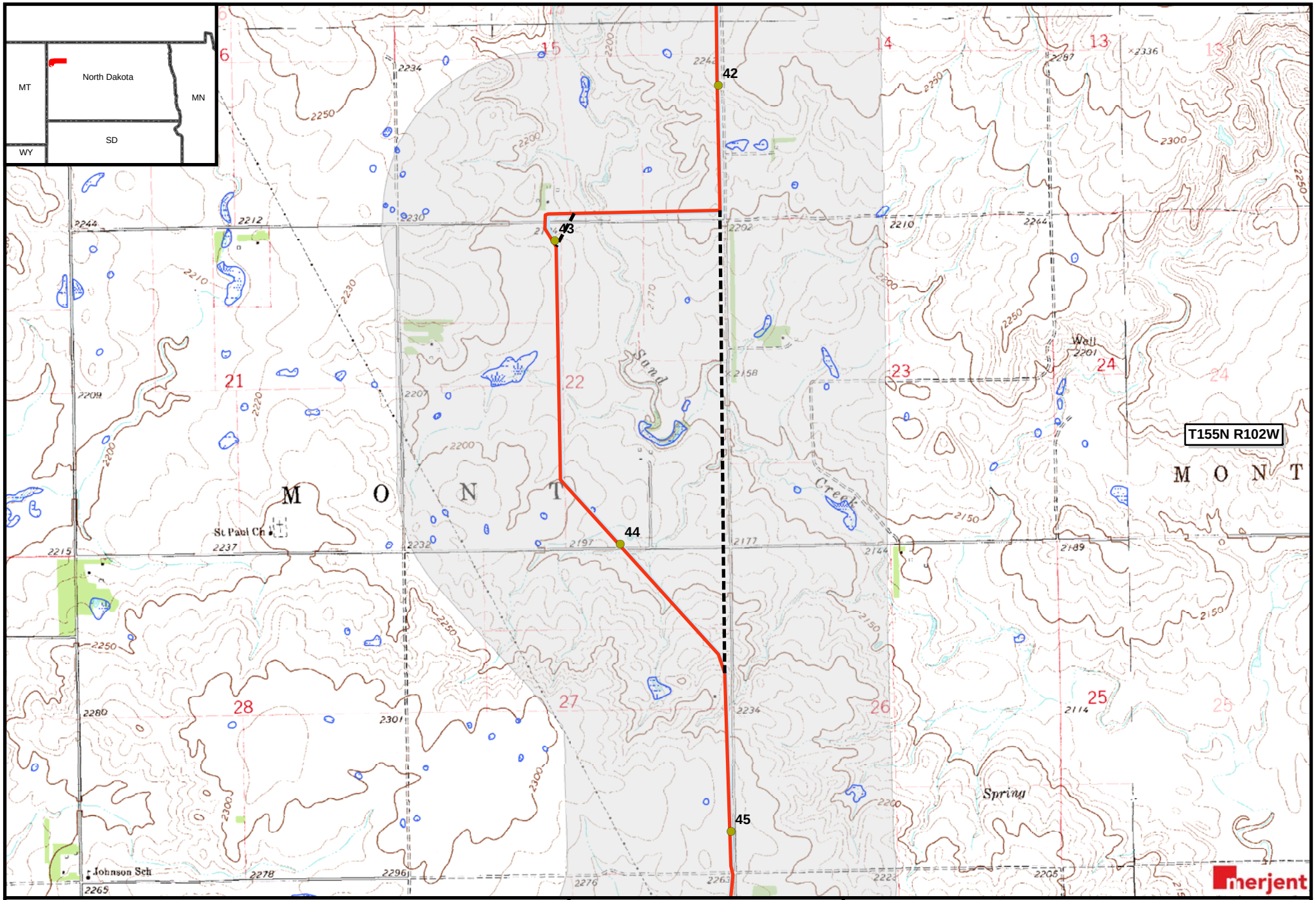
Enbridge Pipelines (North Dakota) LLC

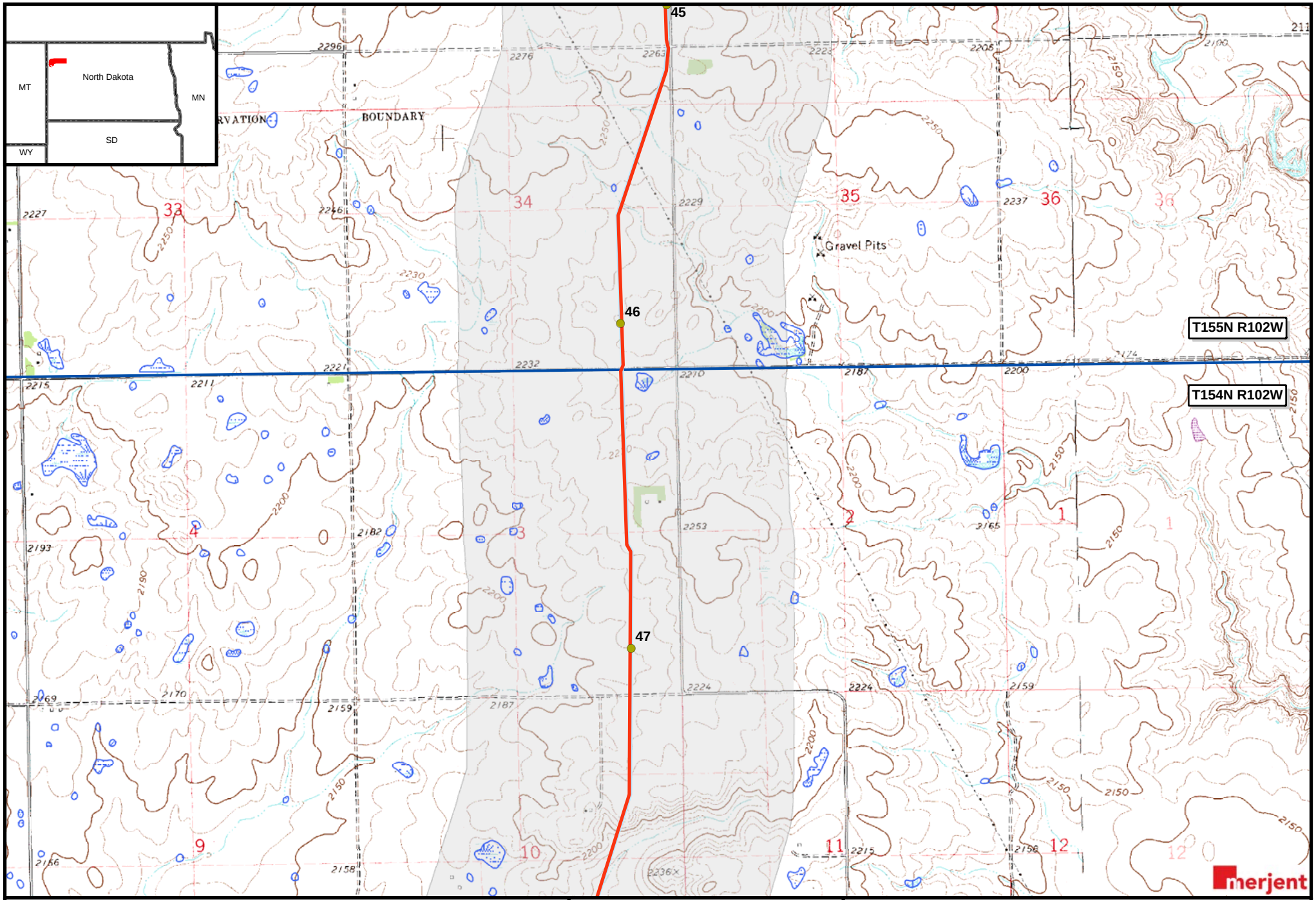
North Dakota Pipeline Expansion Project

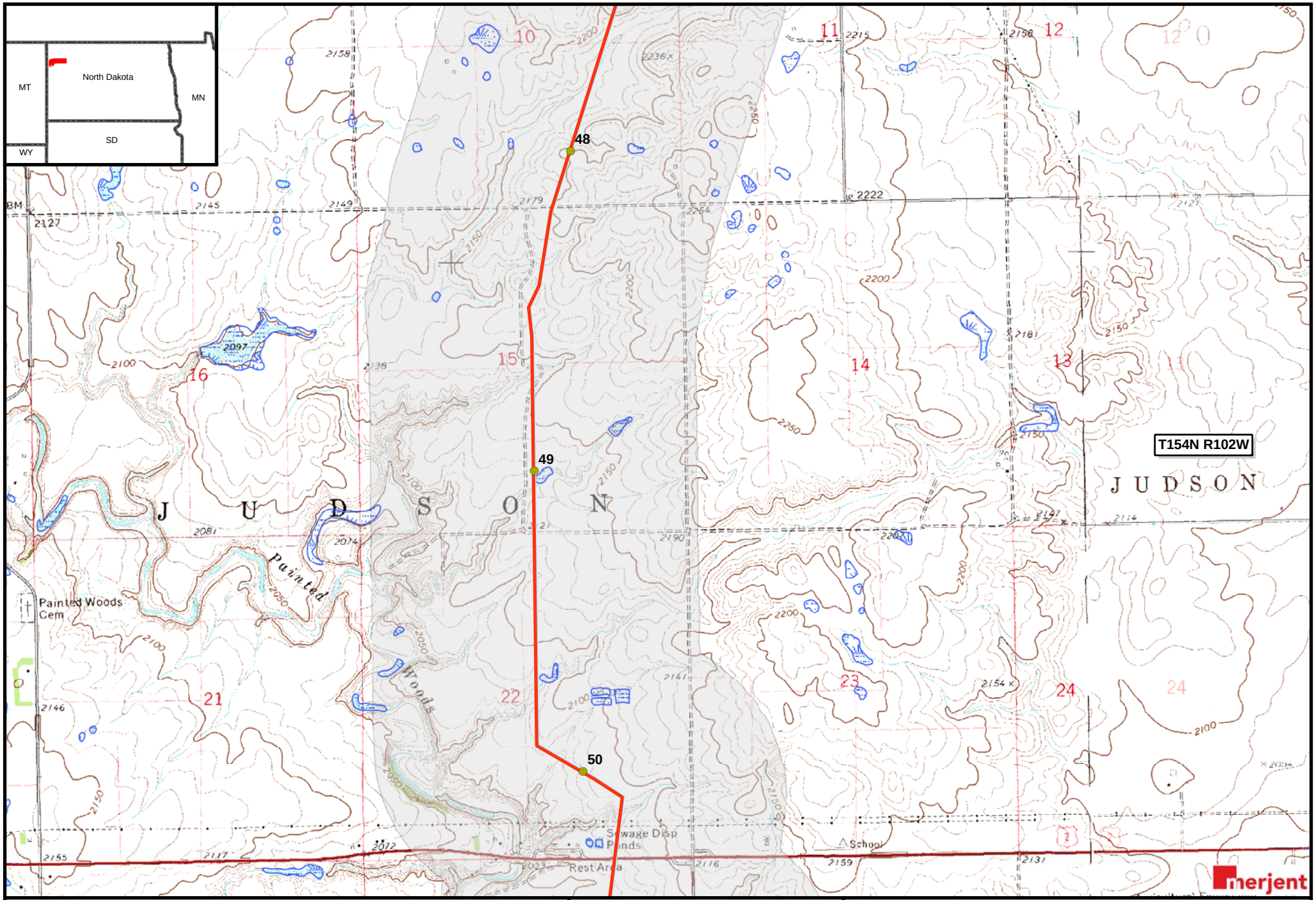
Location Map - Sheet 9 of 15


MT
North Dakota
MN
SD
WY
T156N R101W
T155N R101W
33
34
35
36
37
Gravel Pits
MISSOURI RIDGE
Camp Creek
Existing Pipeline
Proposed Pipeline
Possible Reroutes
One Mile Evaluation Corridor
National Wetlands Inventory Data
ENBRIDGE
0 1,000 2,000 Feet
0 0.25 0.5 Miles
1:24,000
Enbridge Pipelines (North Dakota) LLC
North Dakota Pipeline Expansion Project
Location Map - Sheet 10 of 15
merjent


MT
North Dakota
MN
SD
WY
T155N R102W
T155N R101W
38
39
40
41
42
Radio Tower
Williston
Creek
Existing Pipeline
Proposed Pipeline
Possible Reroutes
One Mile Evaluation Corridor
National Wetlands Inventory Data
ENBRIDGE
0 1,000 2,000 Feet
0 0.25 0.5 Miles
1:24,000
Enbridge Pipelines (North Dakota) LLC
North Dakota Pipeline Expansion Project
Location Map - Sheet 11 of 15
merjent


MT
North Dakota
MN
SD
WY
42
43
44
45
T155N R102W
M O N T
St Paul Ch
Johnson Sch
Sand Creek
Spring
Well
Existing Pipeline
Proposed Pipeline
Possible Reroutes
One Mile Evaluation Corridor
National Wetlands Inventory Data
ENBRIDGE
0 1,000 2,000 Feet
0 0.25 0.5 Miles
1:24,000
Enbridge Pipelines (North Dakota) LLC
North Dakota Pipeline Expansion Project
Location Map - Sheet 12 of 15
merjent


MT
North Dakota
MN
SD
WY
45
46
47
T155N R102W
T154N R102W
Gravel Pits
BOUNDARY
Existing Pipeline
Proposed Pipeline
Possible Reroutes
One Mile Evaluation Corridor
National Wetlands Inventory Data
ENBRIDGE
0 1,000 2,000 Feet
0 0.25 0.5 Miles
1:24,000
Enbridge Pipelines (North Dakota) LLC
North Dakota Pipeline Expansion Project
Location Map - Sheet 13 of 15
merjent



Existing Pipeline
Proposed Pipeline
Possible Reroutes

One Mile Evaluation Corridor
National Wetlands Inventory Data

ENBRIDGE

0 1,000 2,000 Feet

0 0.25 0.5 Miles

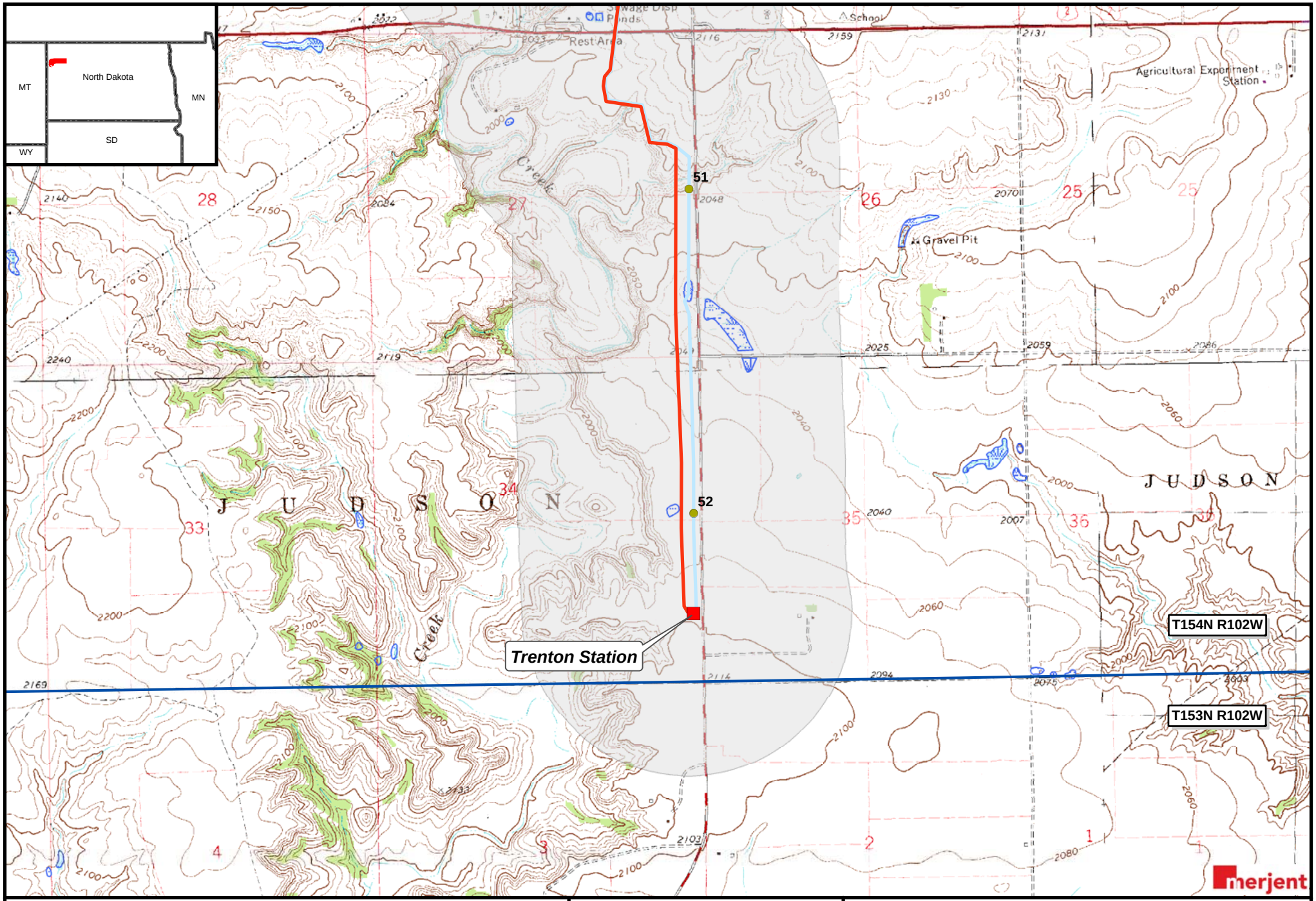
1:24,000

Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 14 of 15

merjent


MT
North Dakota
MN
SD
WY
51
52
Trenton Station
T154N R102W
T153N R102W
Gravel Pit
Agricultural Experiment Station
Rest Area
School
J U D S O N
Creek
Existing Pipeline
Proposed Pipeline
Possible Reroutes
One Mile Evaluation Corridor
National Wetlands Inventory Data
ENBRIDGE
0 1,000 2,000 Feet
0 0.25 0.5 Miles
1:24,000
Enbridge Pipelines (North Dakota) LLC
North Dakota Pipeline Expansion Project
Location Map - Sheet 15 of 15
merjent

Enbridge Pipelines (Lakehead) L.L.C.
119 N. 25th Street East
Superior, WI 54880
Tel 715 394 1400
Fax 715 394 1570
www.enbridgepartners.com

Scott W. Lounsbury Supervisor, Environment
Kris H. Benson Environmental Analyst II
Paul R. Meneghini Sr. Environmental Analyst
Rachael A. Shetka Environmental Analyst
David M. Hoffman Sr. Environmental Analyst
Joseph P. Peterson Environmental Analyst II

May 25, 2006

Mr. Terry Ellsworth
U.S. Fish and Wildlife Service
North Dakota Field Office
3425 Miriam Avenue
Bismarck, ND 58501-7926

RE: Enbridge Pipelines (North Dakota) LLC - North Dakota Pipeline Expansion Project
Threatened and Endangered Species Consultation

Dear Mr. Ellsworth,

Enbridge Pipelines (North Dakota) LLC ("Enbridge") is presently evaluating a project to expand a portion of its North Dakota pipeline system. The proposed expansion would involve constructing a new underground pipeline adjacent to a portion of its existing underground pipeline, and potentially modifying aboveground facilities along the project route. Enbridge anticipates the proposed pipeline will be collocated in the same corridor as its existing pipeline and will extend approximately 53 miles between its Beaver Lodge Pump Station (about 7 miles south of Tioga) and Trenton Pump Station (about 6 miles southwest of Williston). USGS topographic maps are enclosed that depict the anticipated pipeline route. Construction will require approximately 3-5 months to complete during a yet to be scheduled time period between August 2006 and July 2007.

The proposed pipeline will cross wetlands and waterbodies that are regulated under Section 404 of the Clean Water Act. Enbridge will pursue project authorization under the U.S. Army Corps of Engineers' Nationwide Permit program. The Corps of Engineers will be the lead federal agency for this project. In accordance with Section 404, Enbridge must comply with requirements of Section 7 of the Endangered Species Act by demonstrating the project will not likely affect federally threatened or endangered species.

Enbridge requests U.S. Fish and Wildlife Service review the anticipated project area for concerns related to federally listed threatened or endangered species and critical habitat that could be affected by project activities. The townships, ranges, sections, and quarter sections crossed by the anticipated workspace areas are listed on the enclosed legal description table. Enbridge will include the U.S. Fish and Wildlife Service's findings as part of its application materials to the Corps of Engineers.

Enbridge is also consulting with the North Dakota Game and Fish Department regarding protected species. If you have questions or require further information regarding this project, please contact Tom Hess of Merjent, Inc., Enbridge's environmental consultant, at (612) 746-3667, or me at (715) 394-1572. Thank you.

Sincerely,
Enbridge Pipelines (North Dakota) LLC

Kris Benson
Environmental Analyst II, CHMM

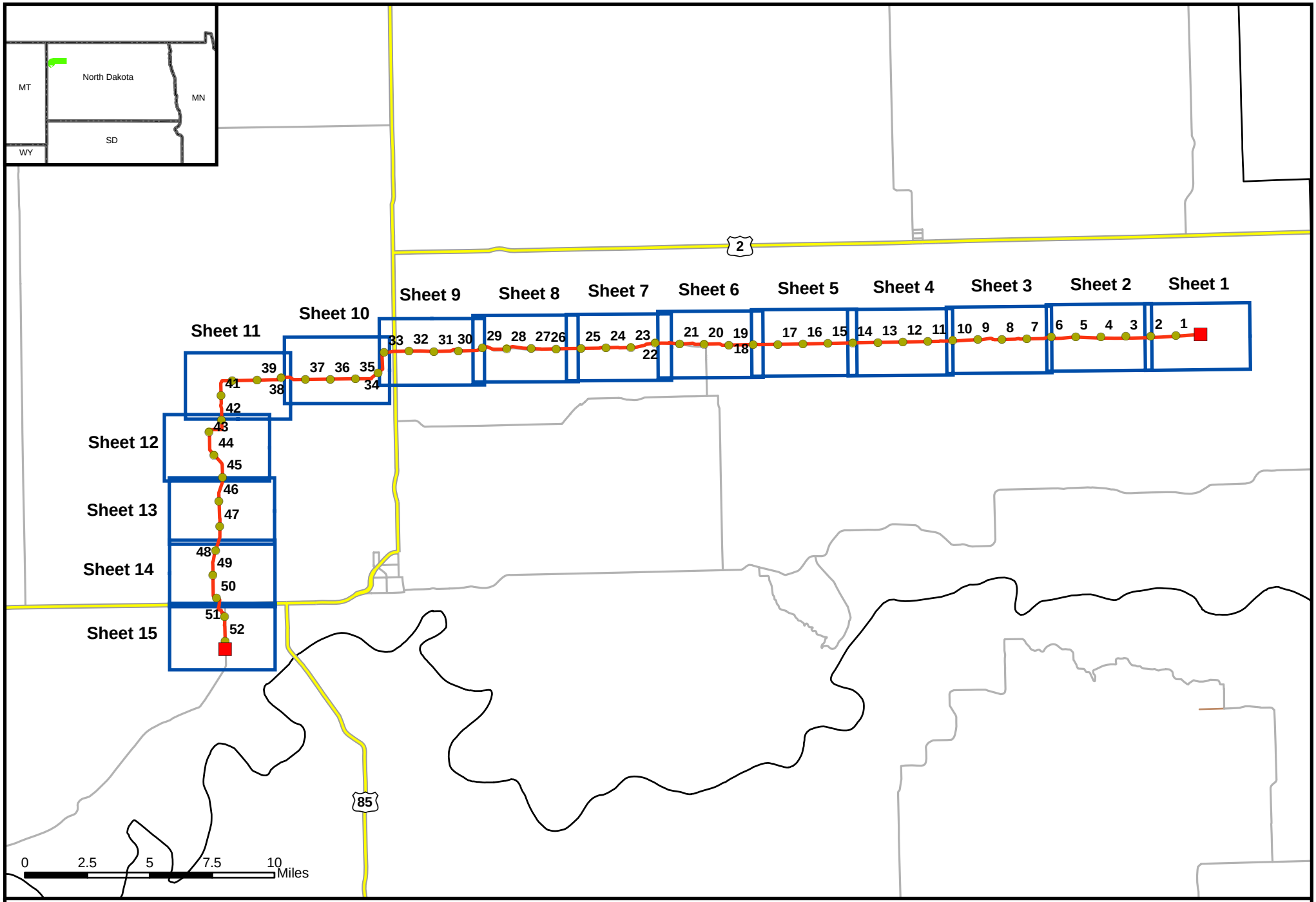
Enclosures: Legal description table
Project location maps

cc: Tom Hess, Merjent, Inc.

Enbridge Pipelines (North Dakota) LLC - North Dakota Pipeline Expansion Project
Legal Description Table

Township	Range	Section	Quarter Section	Approximate Milepost [1]
156N	95W	31 32	SW, SE SW, SE	0.0 – 1.5
156N	96W	31 32 33 34 35 36	SW, SE SW, SE SW, SE SW, SE SW, SE SW, SE	1.5 – 7.5
156N	97W	31 32 33 34 35 36	SW, SE SW, SE SW, SE SW, SE SW, SE SW, SE	7.5 – 13.5
156N	98W	31 32 33 34 35 36	SW, SE SW, SE SW, SE SW, SE SW, SE SW, SE	13.5 – 19.5
156N	99W	31 32 33 34 35 36	SW, SE SW, SE SW, SE SW, SE SW, SE SW, SE	19.5 – 25.6
156N	100W	31 32 33 34 35 36	SW, SE SW, SE SW, SE SW, SE SW, SE SW, SE	25.6 – 31.6
156N	101W	35 36	SW, SE SW, SE	31.6 – 33.1
155N	101W	2 3 6 7 8 9 10 11	NW, NE, SW, SE SE SW, SE NW, NE NW, NE NW, NE NW, NE NW	33.1 – 38.4
155N	102W	1 2 3 10 11 12 15 22 27 34	SW, SE SW, SE SE NE, SE NW, NE NW, NE NE, SW, SE NW, NE, SW, SE NE, SE NE, SE	38.4 – 46.2
154N	102W	3 10 15 22 27 34	NE, SE NE, SW, SE NW, NE, SW, SE NW, NE, SW, SE NE, SE NE, SE	46.2 – 52.5

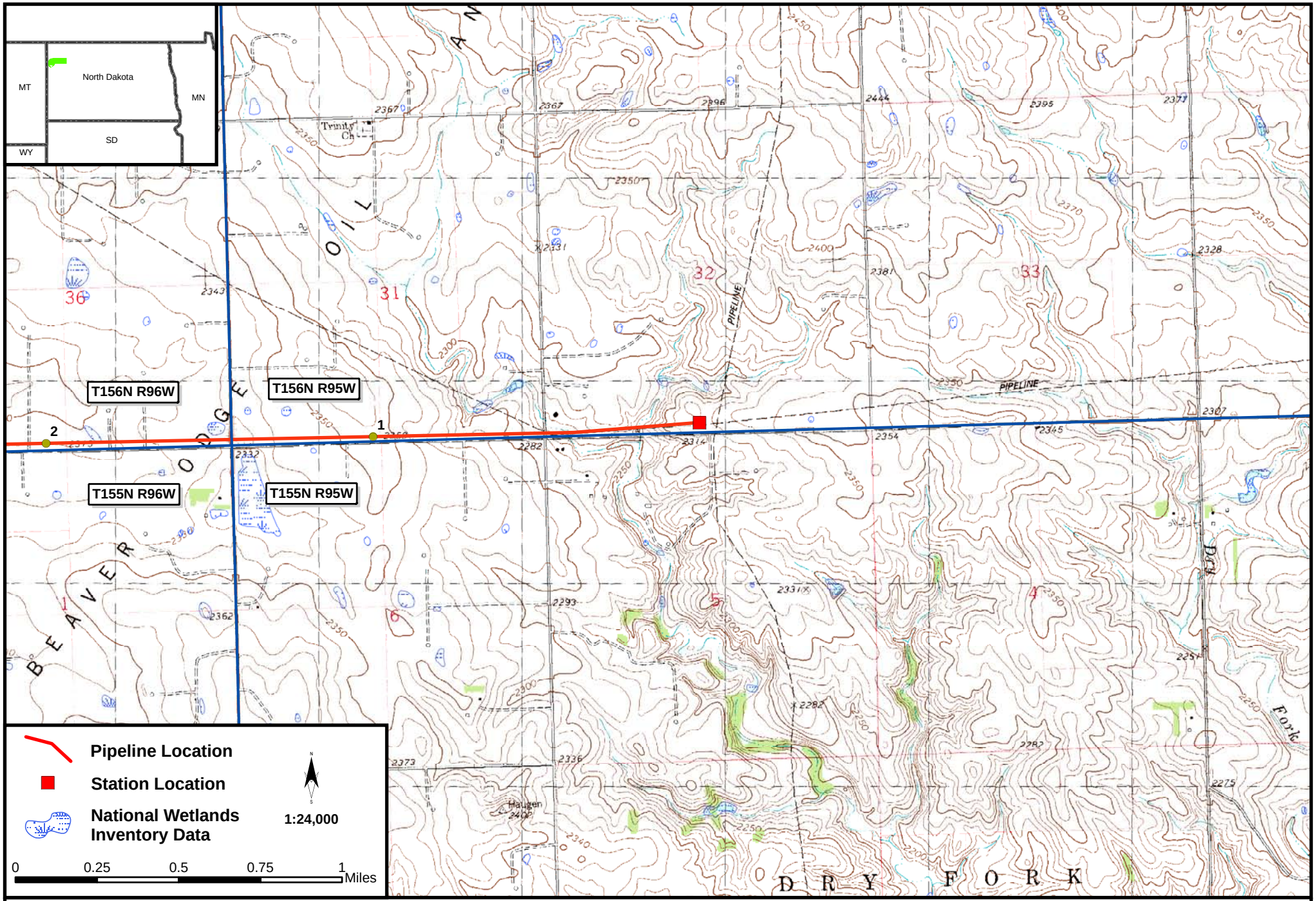
[1] The approximate milepost designations should be considered preliminary and only used for environmental review purposes as numeric identifiers of the proposed pipeline route. The final milepost designations will be determined by Enbridge just prior to construction and may vary from those provided in this table.



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

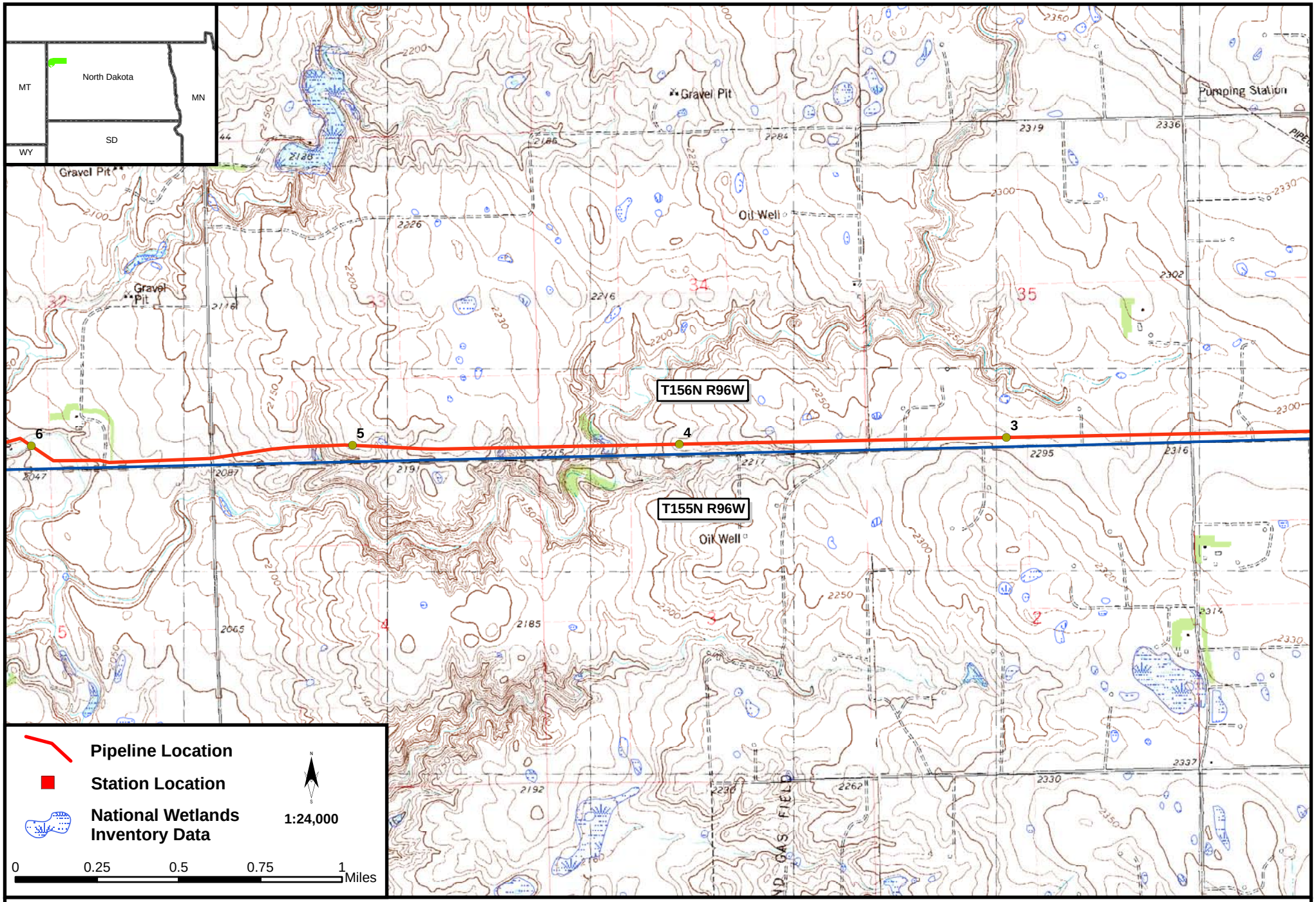
Location Map - Index



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

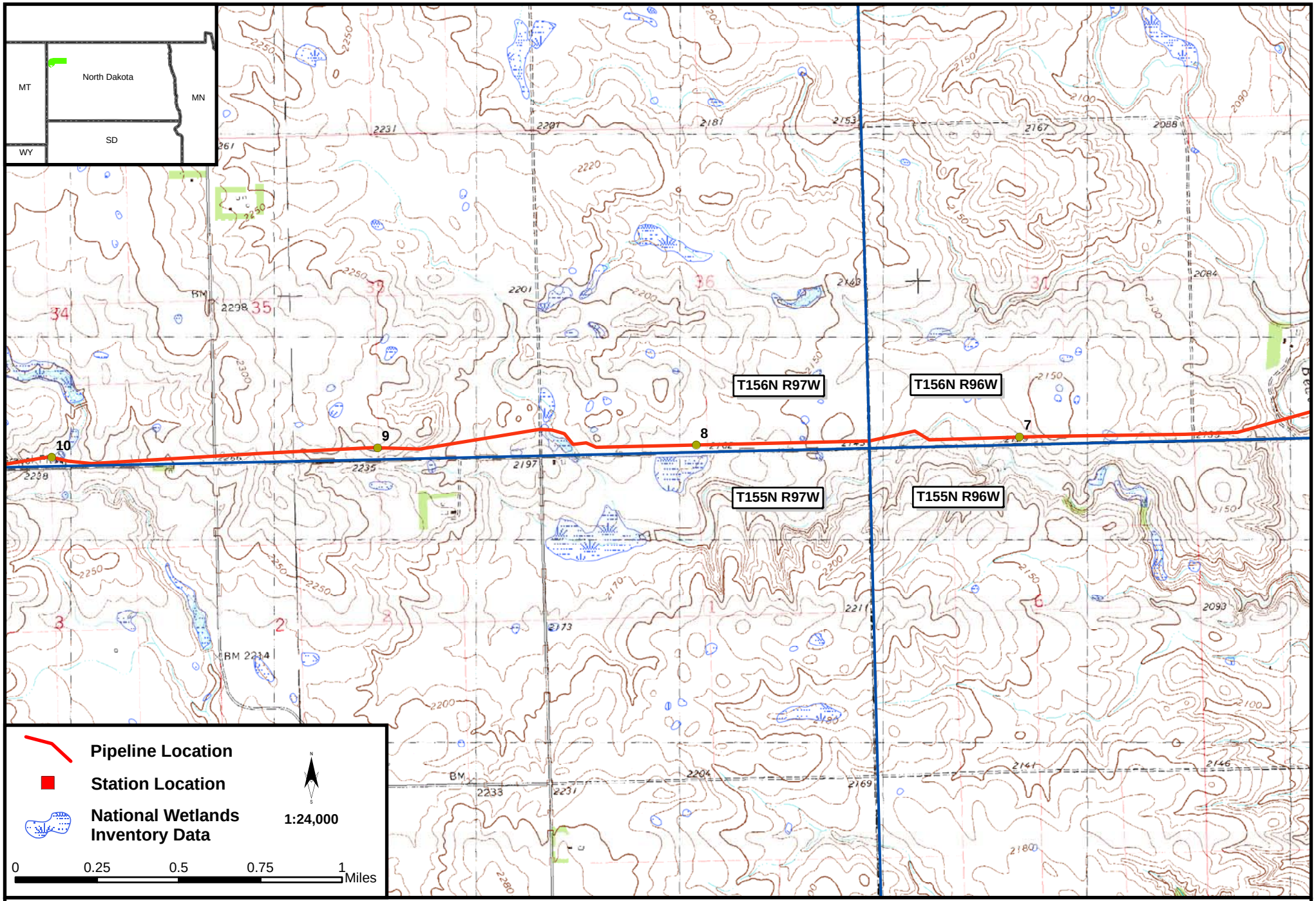
Location Map - Sheet 1 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

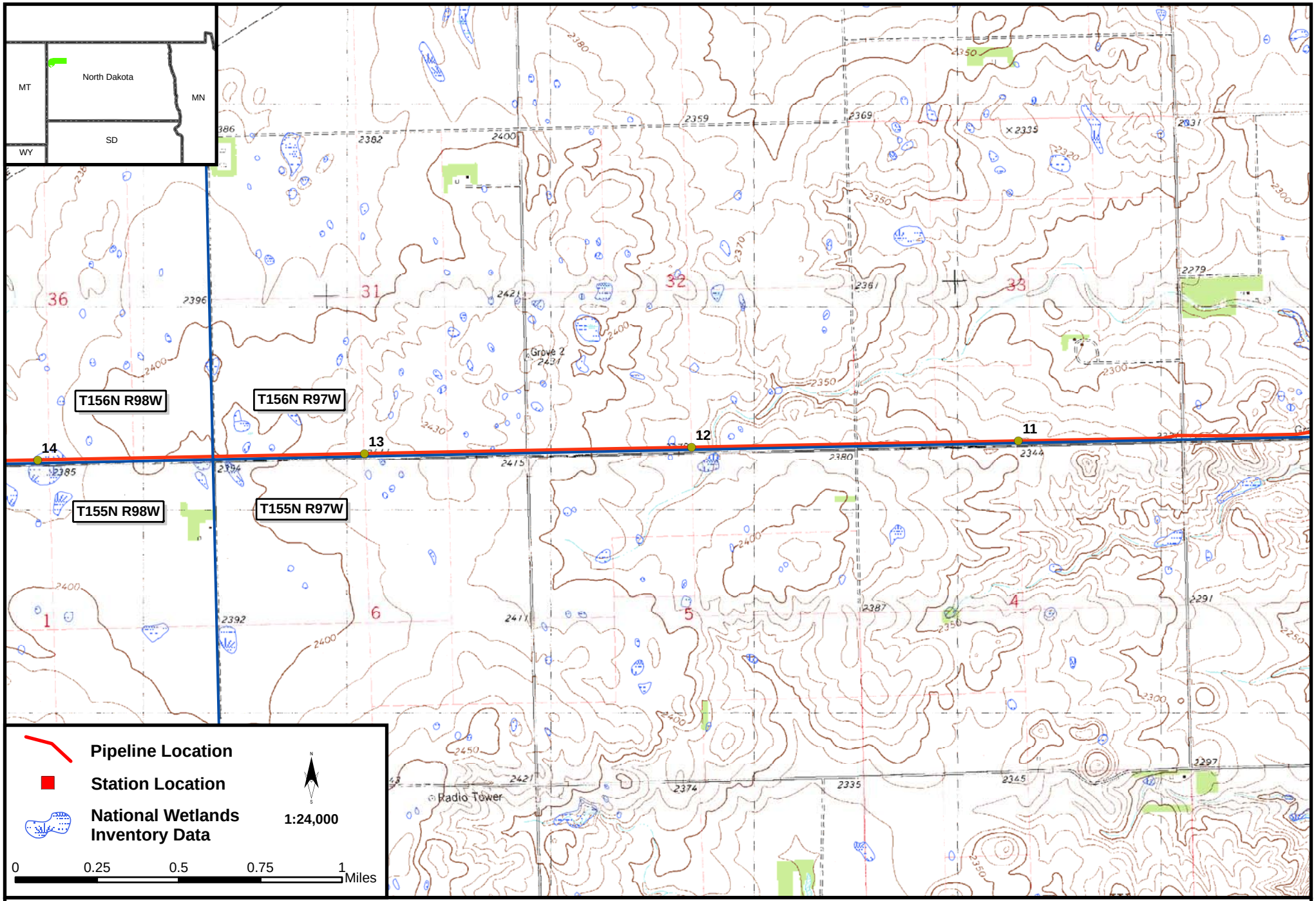
Location Map - Sheet 2 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

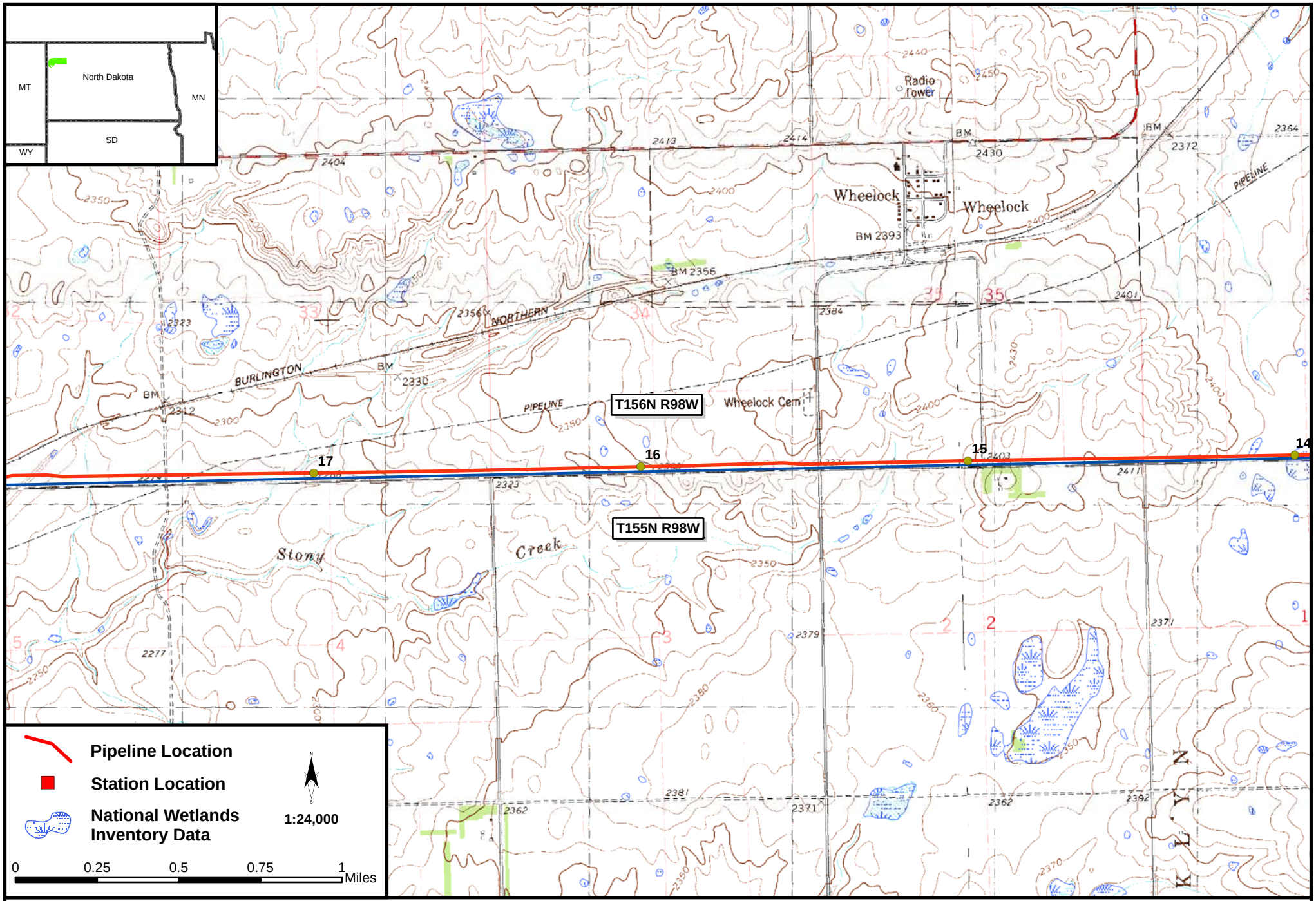
Location Map - Sheet 3 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

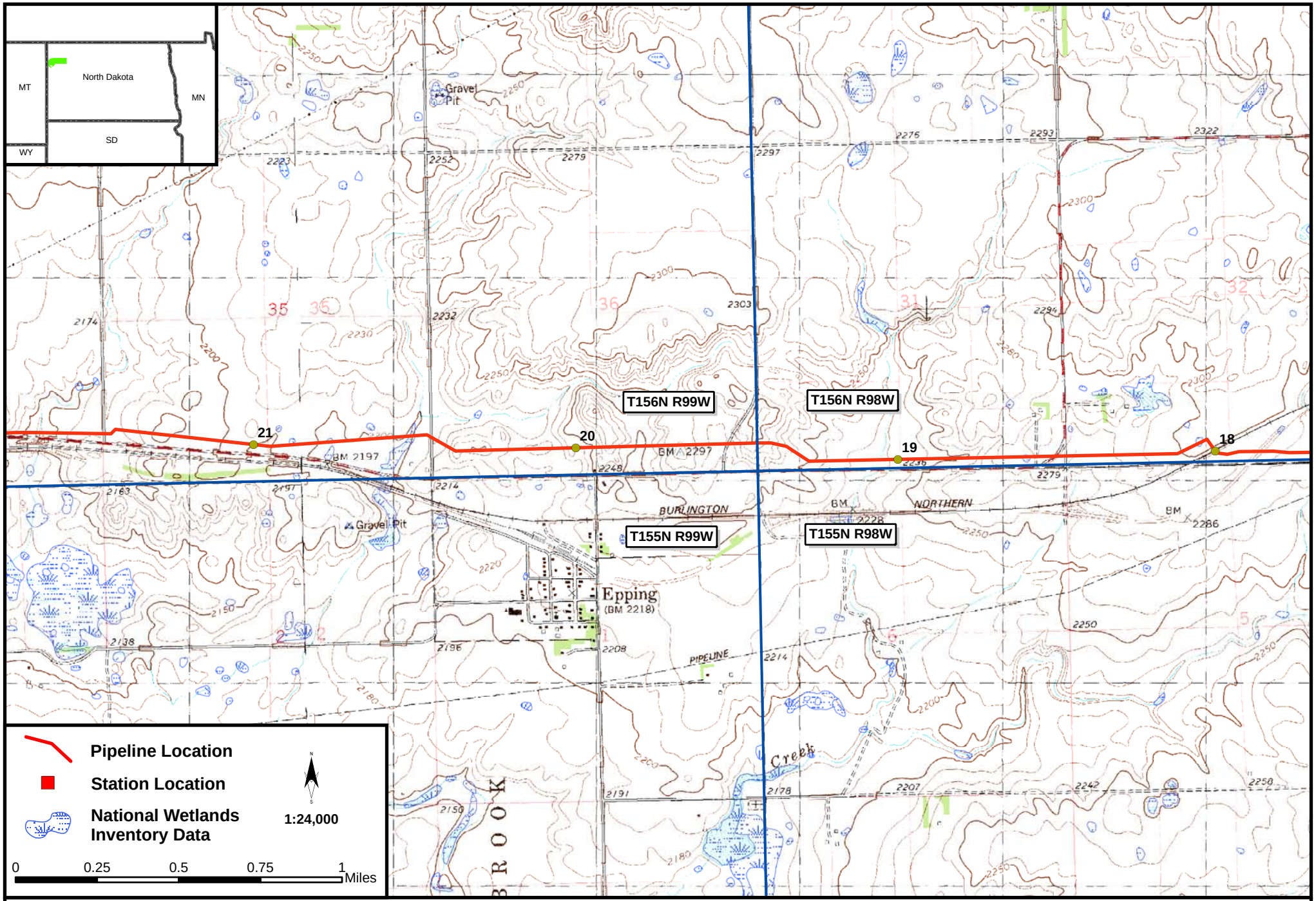
Location Map - Sheet 4 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

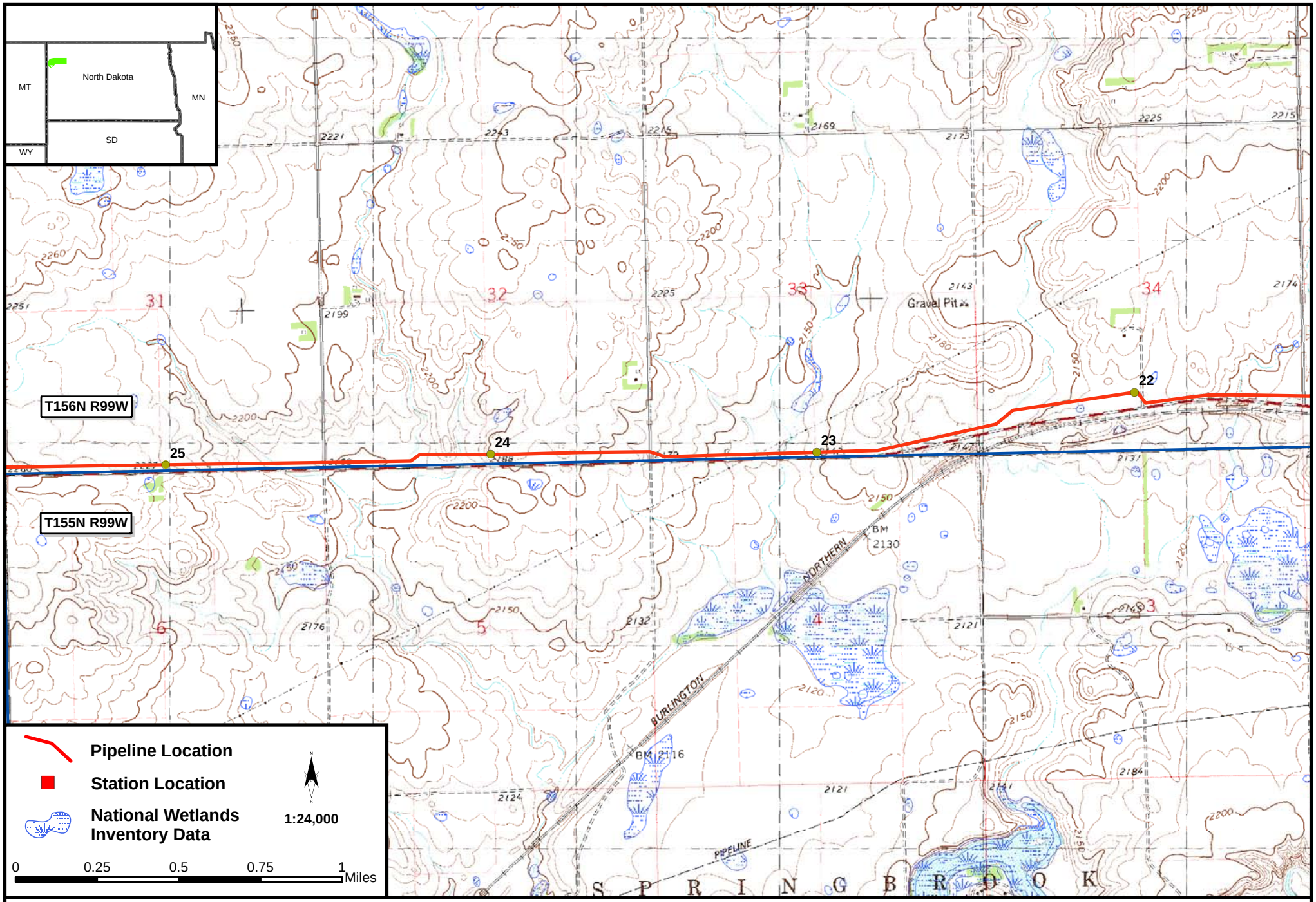
Location Map - Sheet 5 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

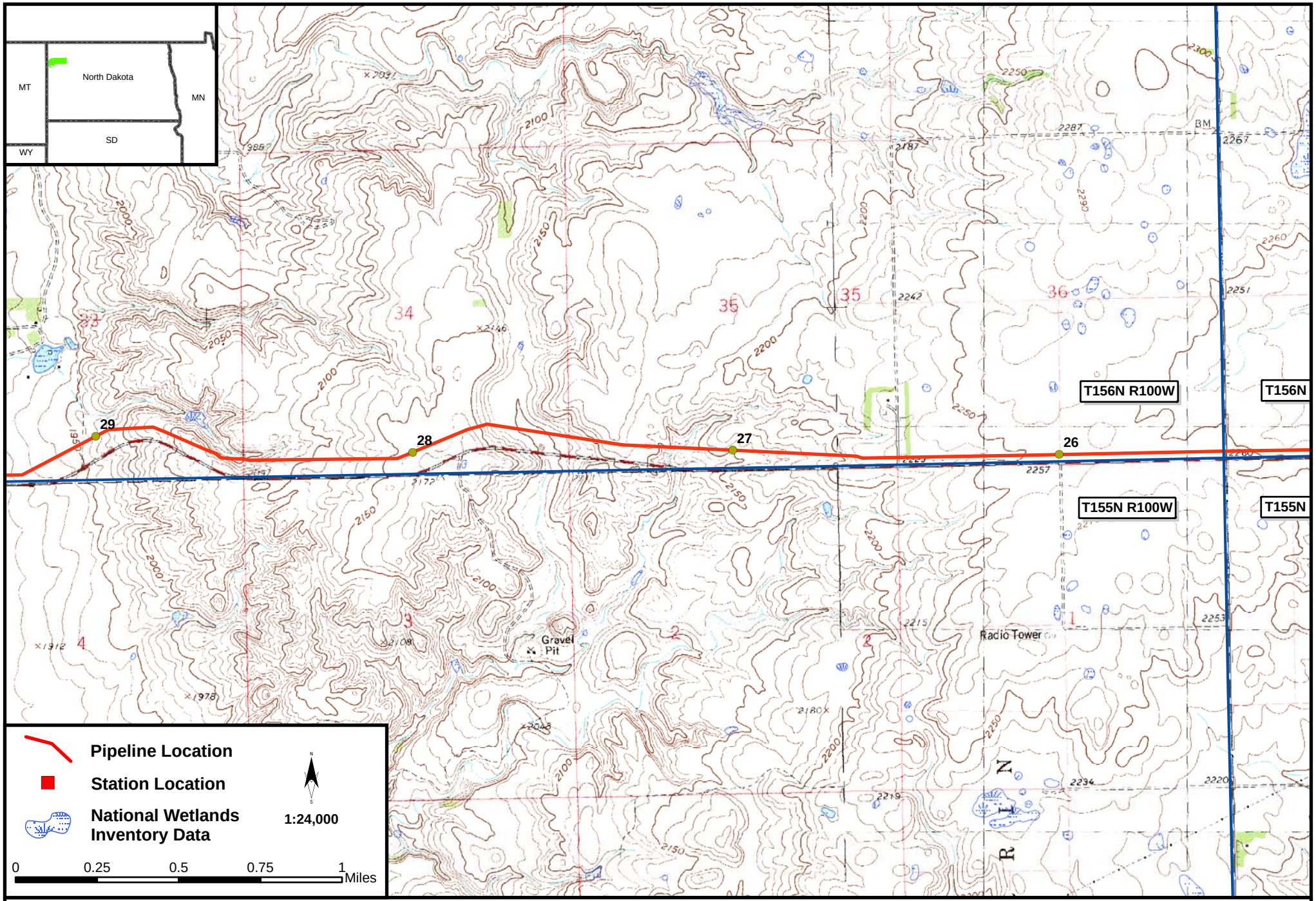
Location Map - Sheet 6 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

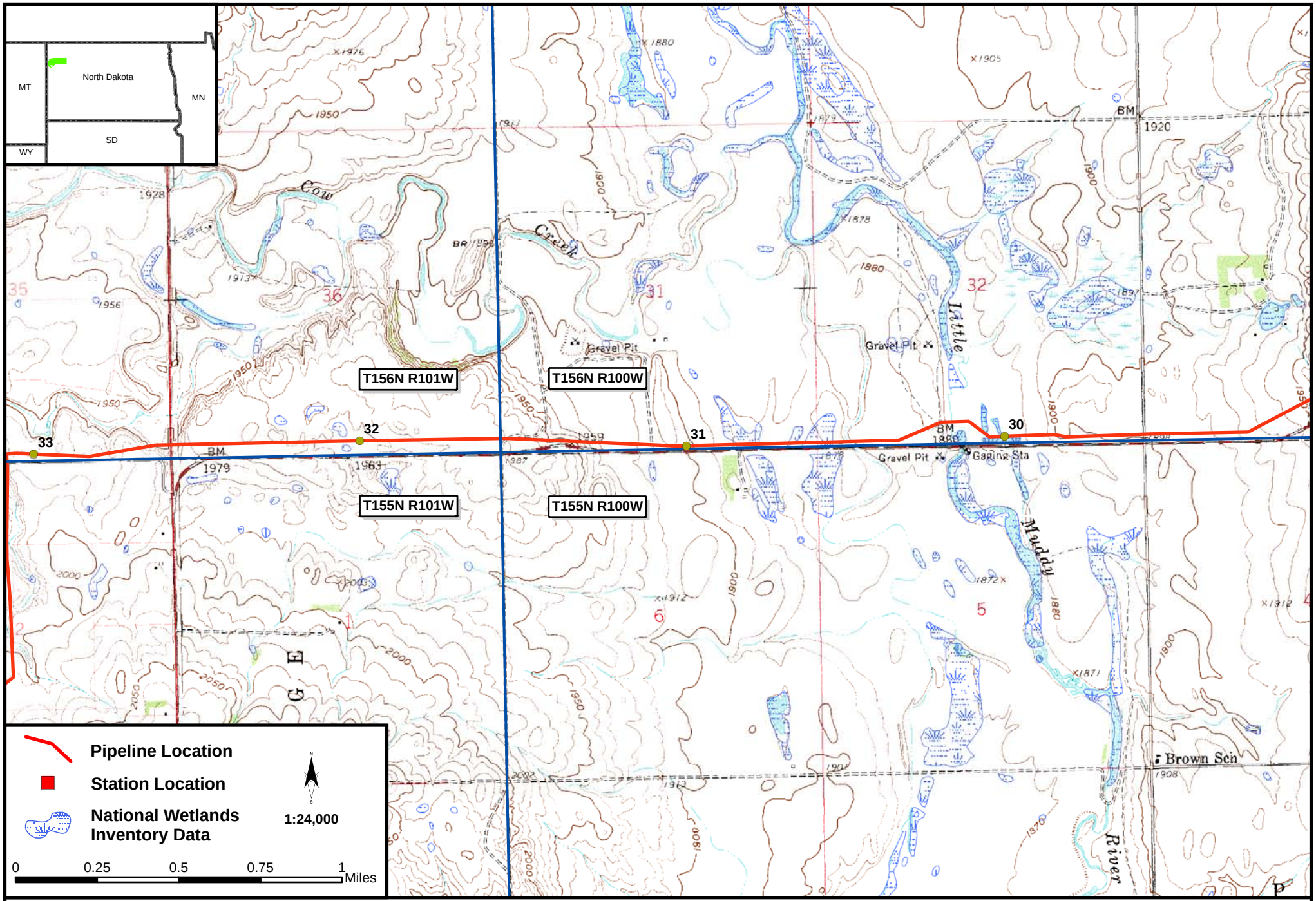
Location Map - Sheet 7 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

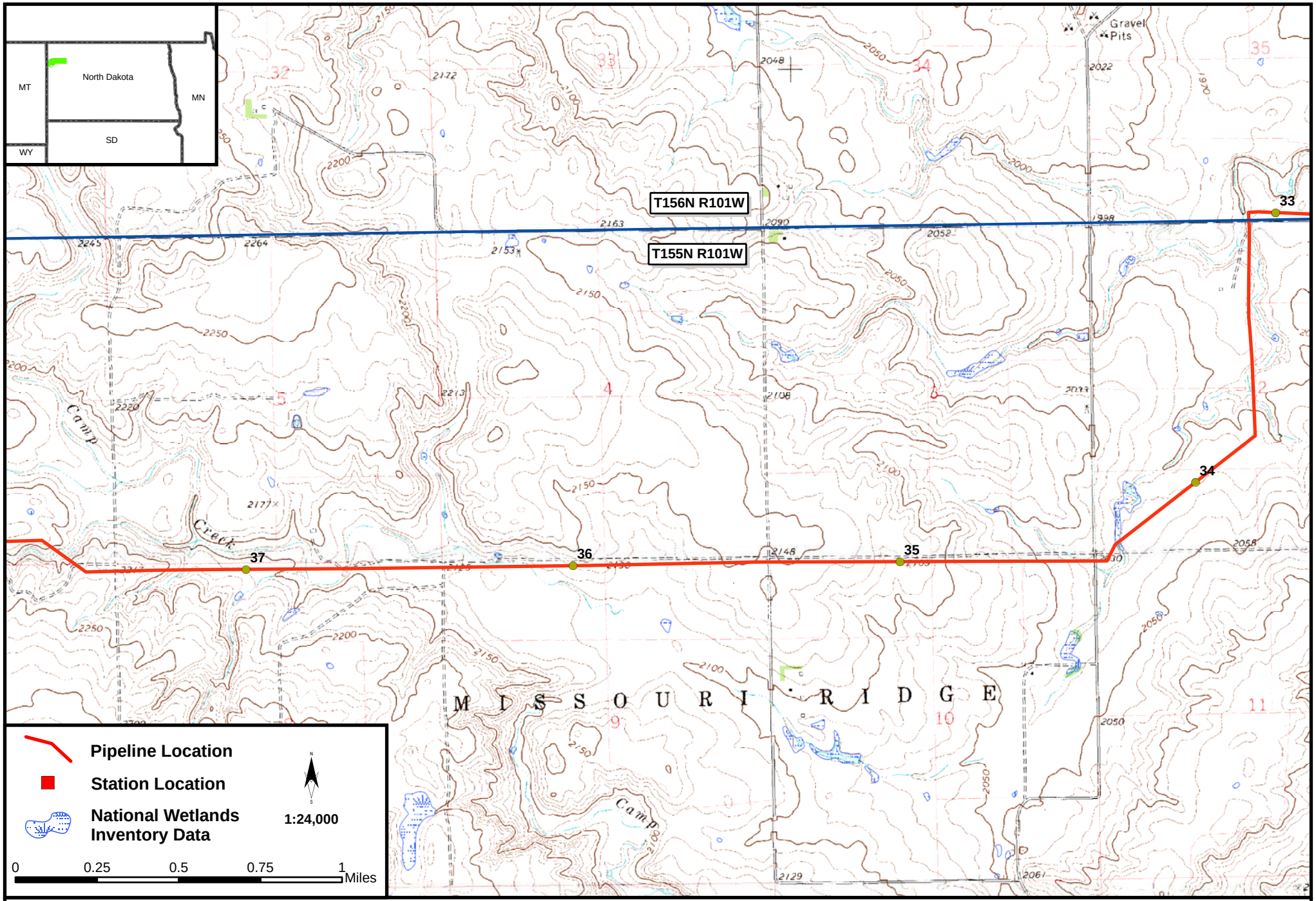
Location Map - Sheet 8 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

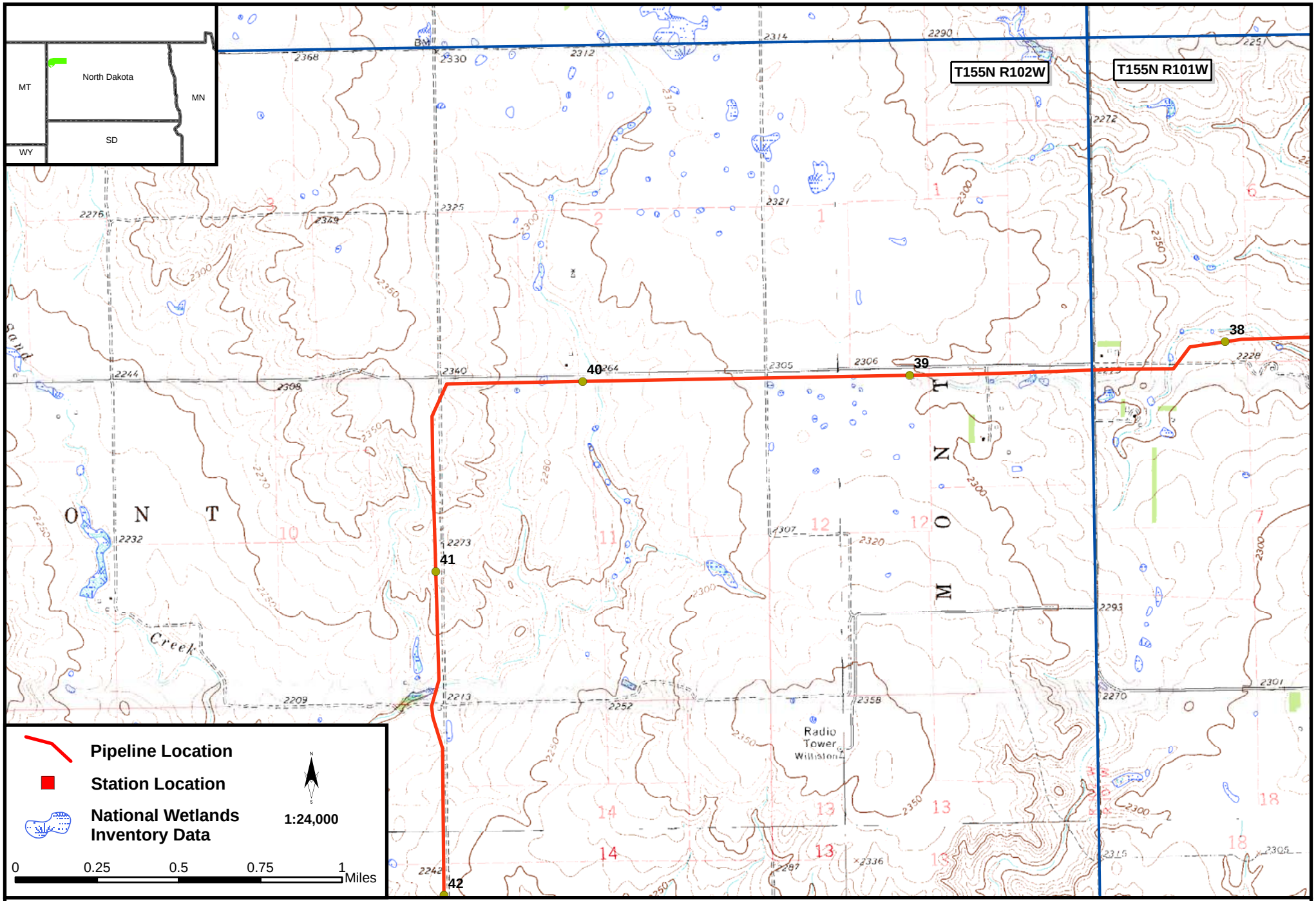
Location Map - Sheet 9 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

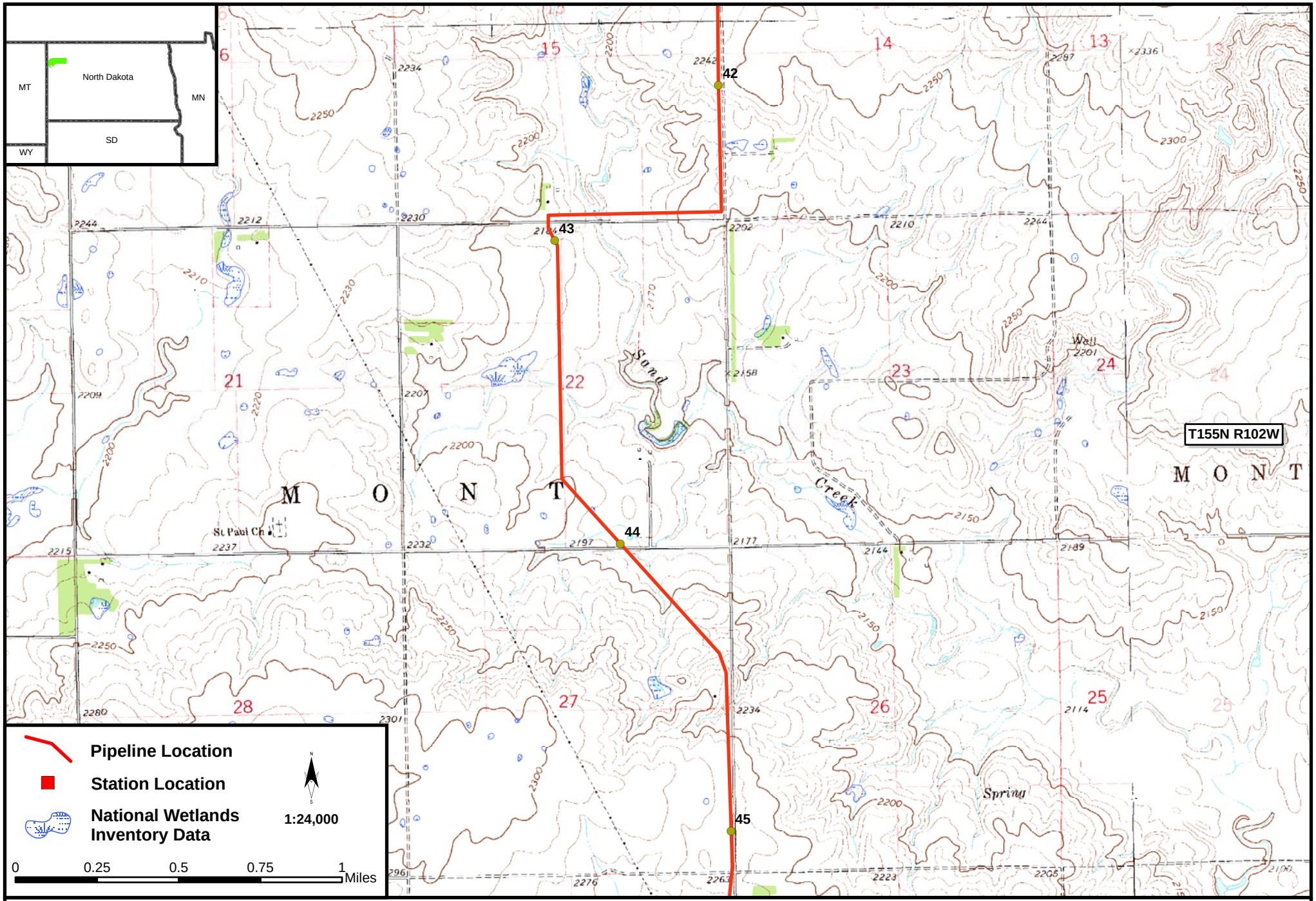
Location Map - Sheet 10 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

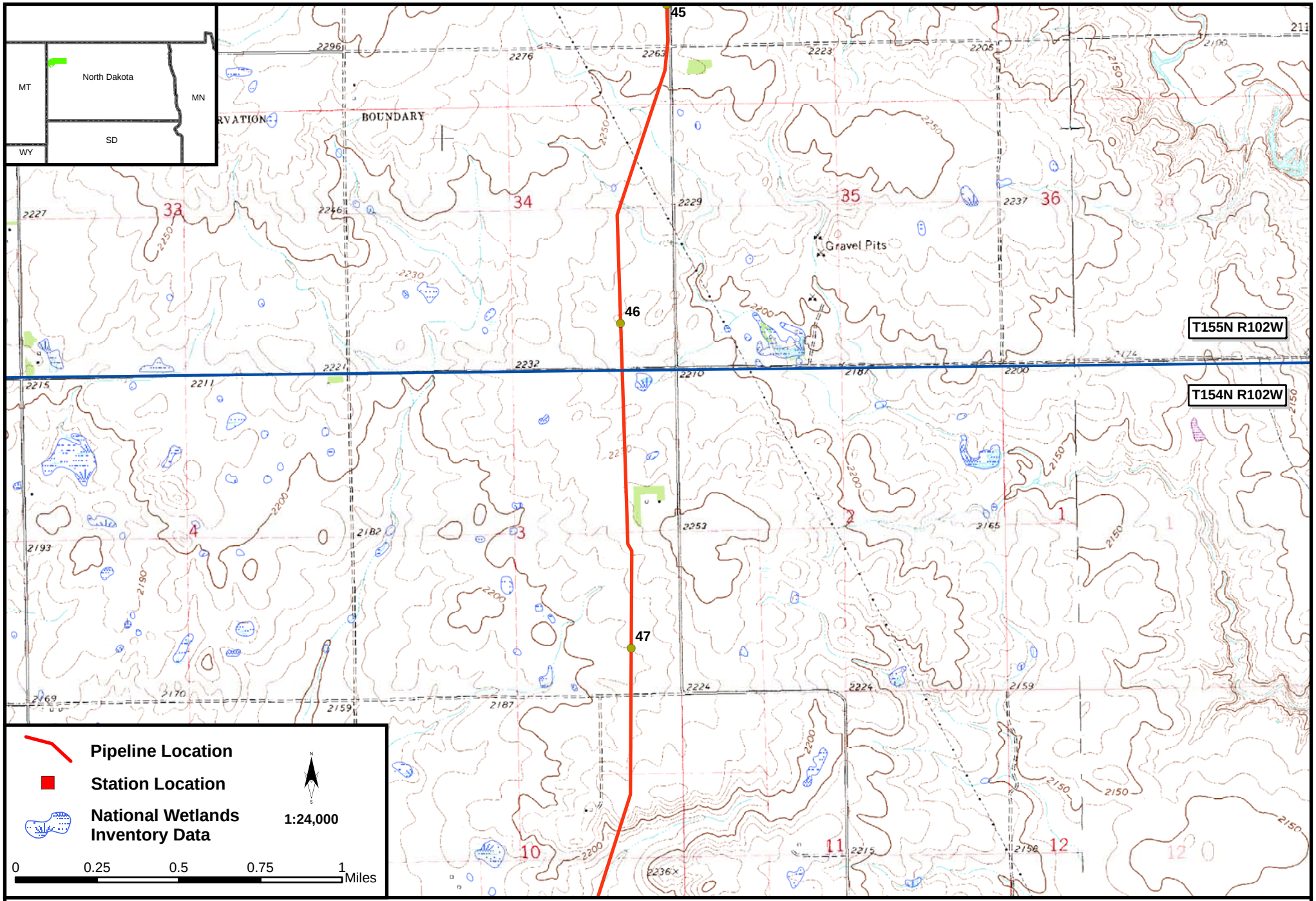
Location Map - Sheet 11 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

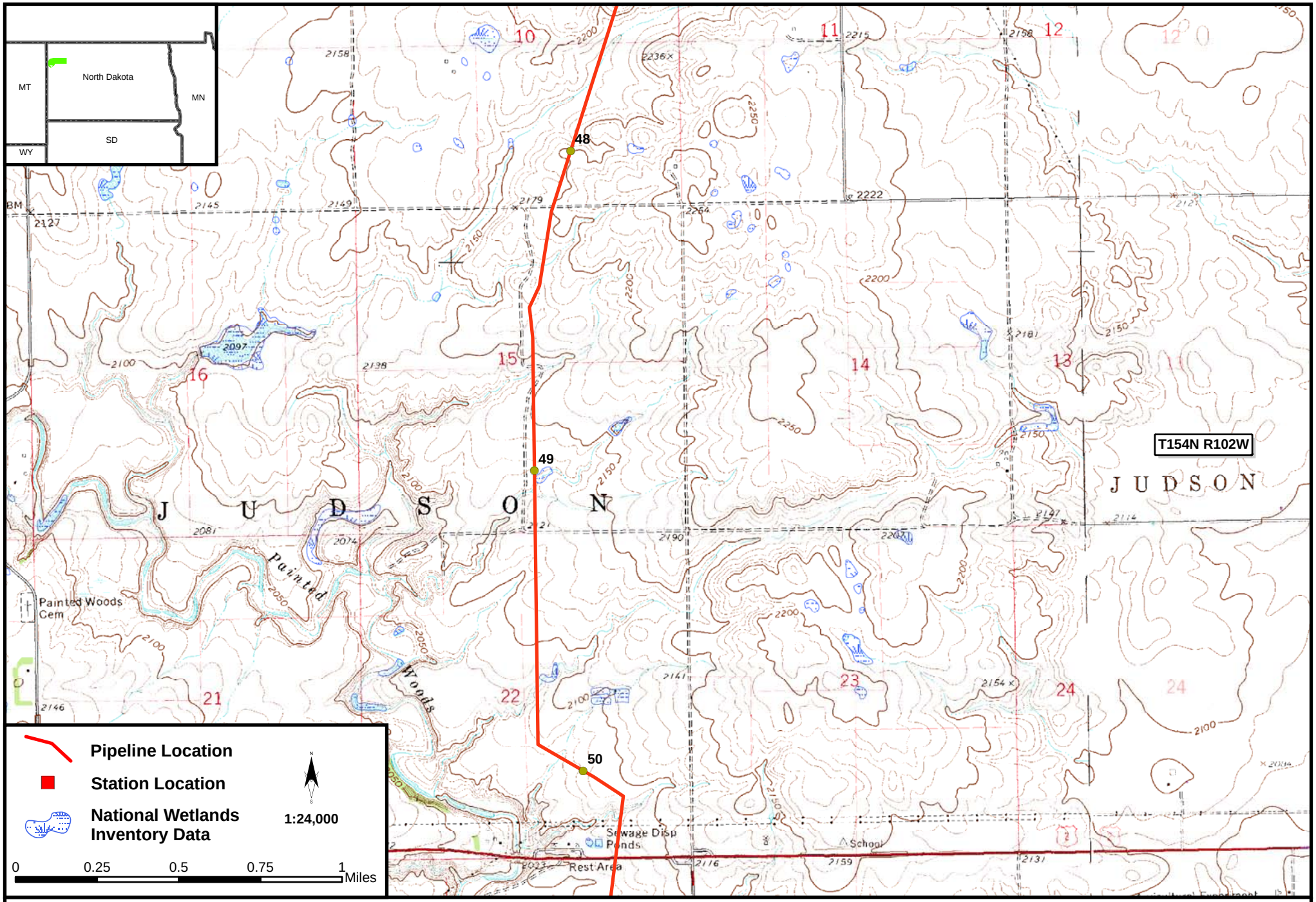
Location Map - Sheet 12 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

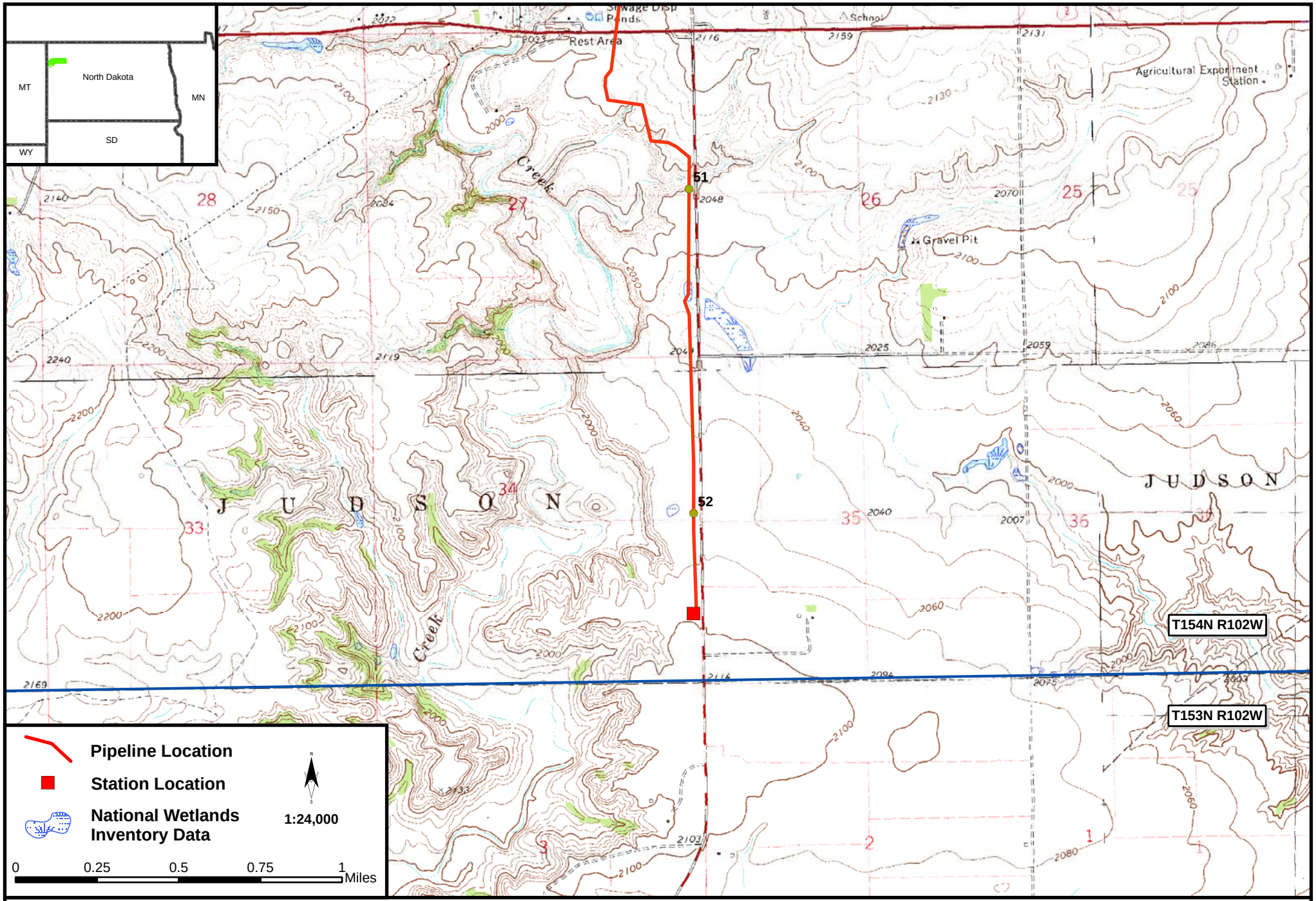
Location Map - Sheet 13 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 14 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 15 of 15

U.S. Department of Interior, Bureau of Reclamation

Potential Impacts to Buford-Trenton Project Irrigation System

United States Department of the Interior

BUREAU OF RECLAMATION
Dakotas Area Office
P.O. Box 1017
Bismarck, North Dakota 58502

TAKE PRIDE IN AMERICA

DK-600

JUN 13 2006

Kris Benson, CHMM
Environmental Analyst II
Enbridge Pipelines (Lakehead) L.L.C.
119 North 25th Street East
Superior, WI 54880

Subject: Enbridge Pieplines (North Dakota) LLC – North Dakota Pipeline Expansion Project
Potential Impacts to Burford-Trenton Irrigation Project Facilities

Dear Mr. Benson:

Bureau of Reclamation's Facilities Management, the municipal, rural, and industrial (MRI) water supply staff, and the Area Office archaeologist of the Dakota's Area Office, Bismarck, North Dakota, have examined the proposed route of the pipeline expansion provided to our office. Based on our examination of same, we did not detect any conflicts or potential crossings of Reclamation irrigation or MRI facilities.

Unless the alignment is altered, there are no permissions necessary from Reclamation. However, should the alignment be altered or the nature of the project change in a substantive manner in the future, Reclamation would appreciate the opportunity to review the alignment at that time.

Thank you for allowing us to review your project alignment for potential effects to Reclamation facilities. We wish you well with your undertaking.

Should you have questions or require further information or coordination, please contact Kelly McPhillips at 701-250-4242 extension 3606 or KMcPhillips@gp.usbr.gov.

Sincerely,

Joseph E. Hall, Chief
Resource Management

cc: Mr. Daniel E. Cimarosti
Regulatory Program Manager
U.S. Army Corps of Engineers
1513 South 12th Street
Bismarck, ND 58504

Enbridge Pipelines (Lakehead) L.L.C.
119 N. 25th Street East
Superior, WI 54880
Tel 715 394 1400
Fax 715 394 1570
www.enbridgepartners.com

Scott W. Lounsbury Supervisor, Environment
Kris H. Benson Environmental Analyst II
Paul R. Meneghini Sr. Environmental Analyst
Rachael A. Shetka Environmental Analyst
David M. Hoffman Sr. Environmental Analyst
Joseph P. Peterson Environmental Analyst II

June 6, 2006

Mr. Kelly McPhillips
U.S. Department of the Interior, Bureau of Reclamation
Dakotas Area Office
304 East Broadway Ave.
P.O. Box 1017
Bismarck, ND 58502-1017

RE: Enbridge Pipelines (North Dakota) LLC - North Dakota Pipeline Expansion Project
Potential impacts to Buford-Trenton Project irrigation system

Dear Mr. McPhillips,

Enbridge Pipelines (North Dakota) LLC ("Enbridge") is presently evaluating a project to expand a portion of its North Dakota pipeline system. The proposed expansion would involve constructing a new underground pipeline adjacent to a portion of its existing underground pipeline, and potentially modifying aboveground facilities along the project route. Enbridge anticipates the proposed pipeline will be co-located in the same corridor as its existing pipeline and will extend approximately 53 miles between its Beaver Lodge Pump Station (about 7 miles south of Tioga) and Trenton Pump Station (about 6 miles southwest of Williston). USGS topographic maps are enclosed that depict the anticipated pipeline route. Construction will require approximately 3-5 months to complete, with a tentative start date of August 2006.

Enbridge requests the Bureau of Reclamation review the anticipated project area to determine if the pipeline route will cross or potentially affect the Buford-Trenton Project irrigation system, or other similarly regulated facilities. To account for potential route variations, Enbridge requests your review include lands within ¼ mile buffer of the currently proposed pipeline. If your review indicates the project route crosses or might affect irrigation facilities, please indicate in your response what further steps Enbridge must complete (e.g. submit a permit application) to obtain authorization to construct the pipeline.

If you have questions or require further information regarding this project, please contact Tom Hess of Merjent, Inc., Enbridge's environmental consultant, at (612) 746-3667, or me at (715) 394-1572.

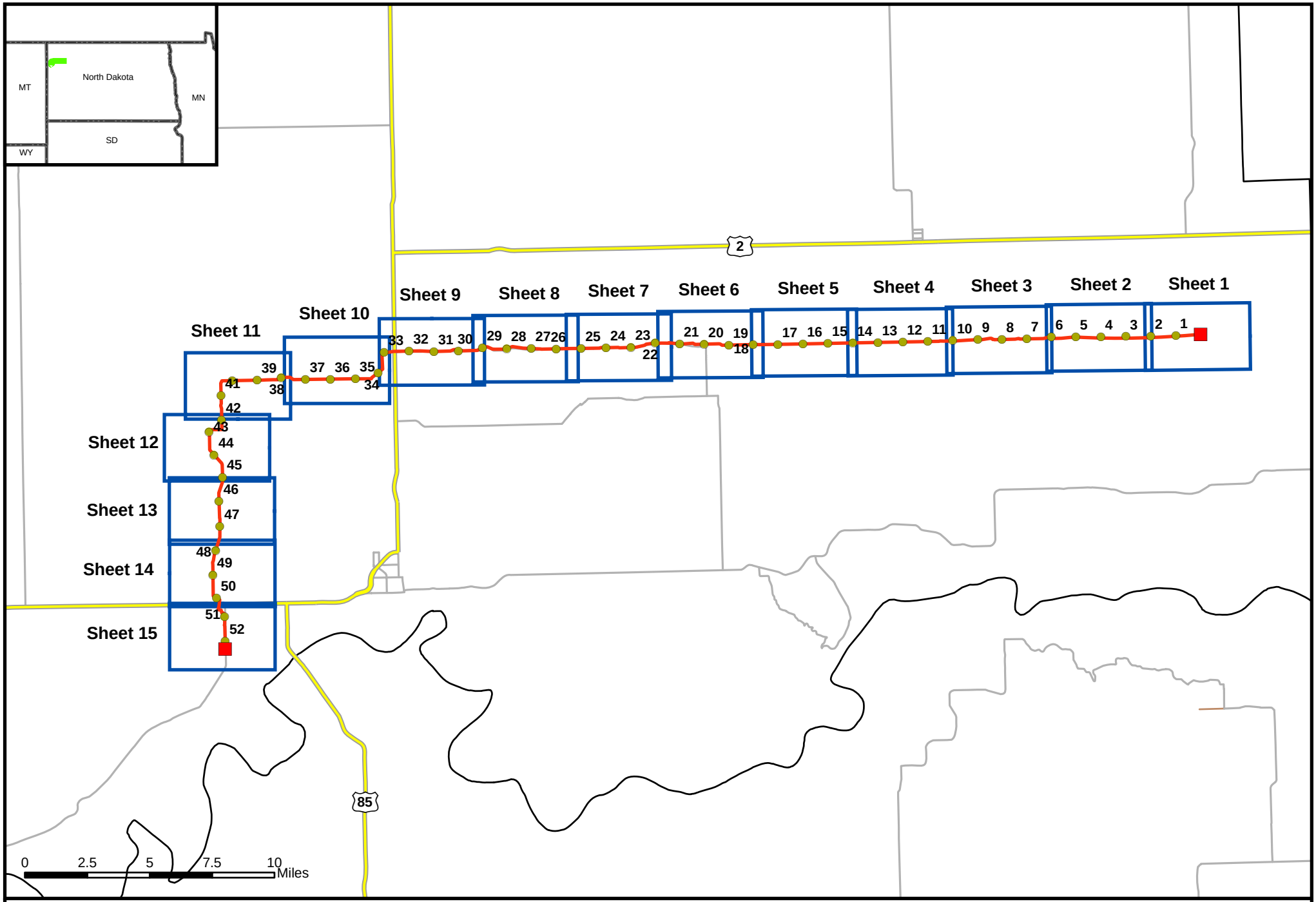
Sincerely,

Kris Benson

Kris Benson, CHMM
Environmental Analyst II
Enbridge Pipelines (North Dakota) LLC

Enclosures: Project location maps

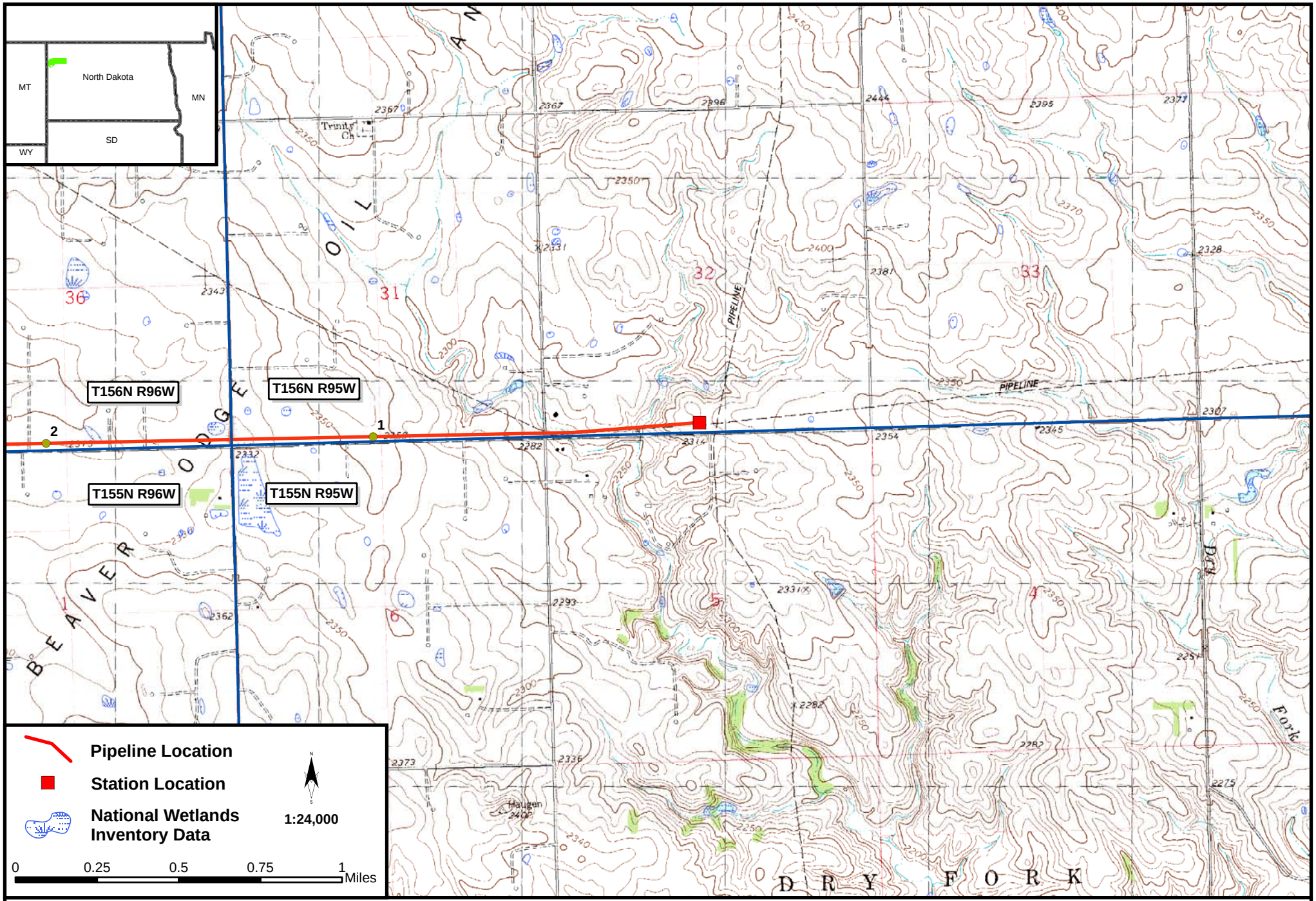
cc: Tom Hess, Merjent, Inc.



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

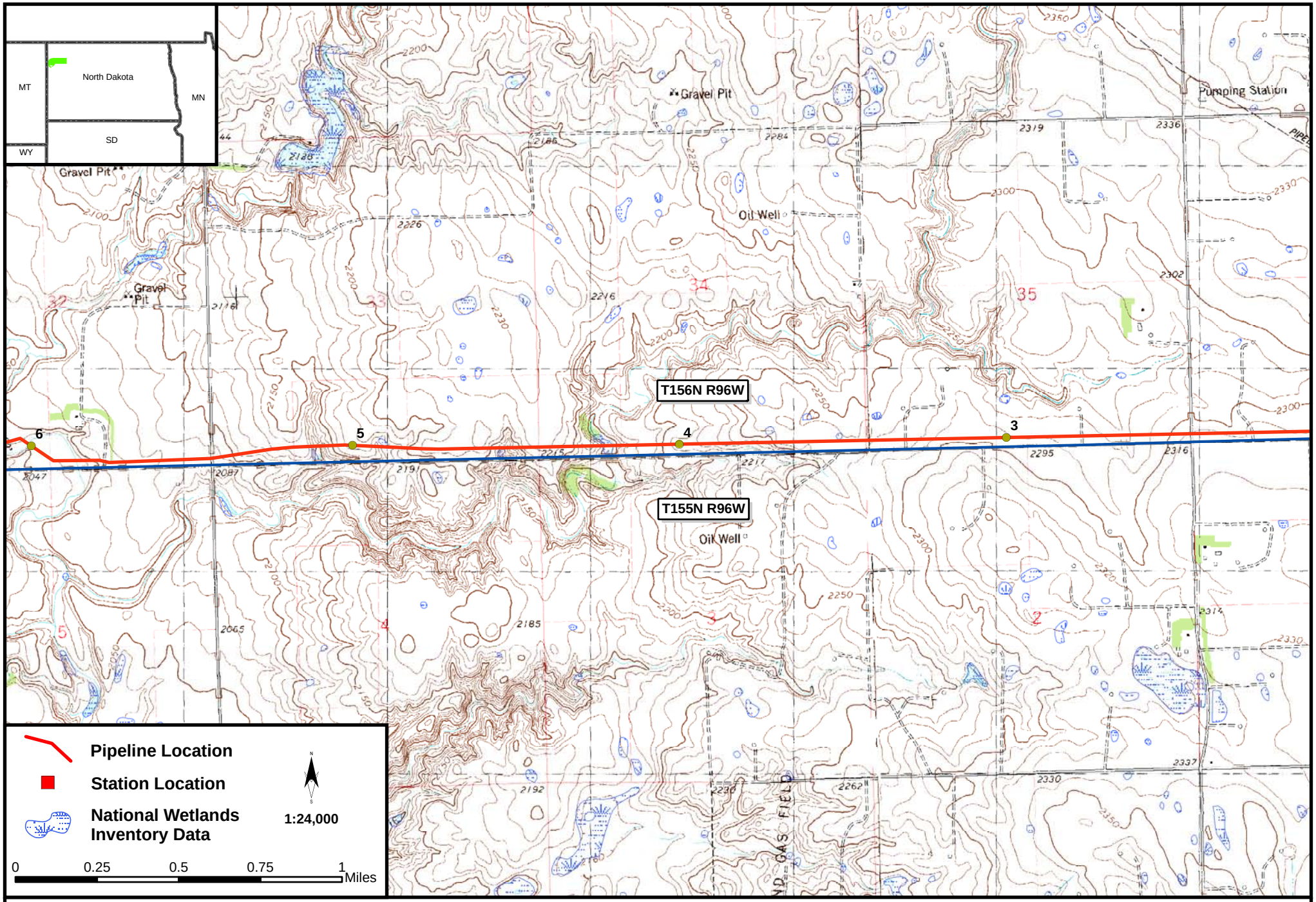
Location Map - Index



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

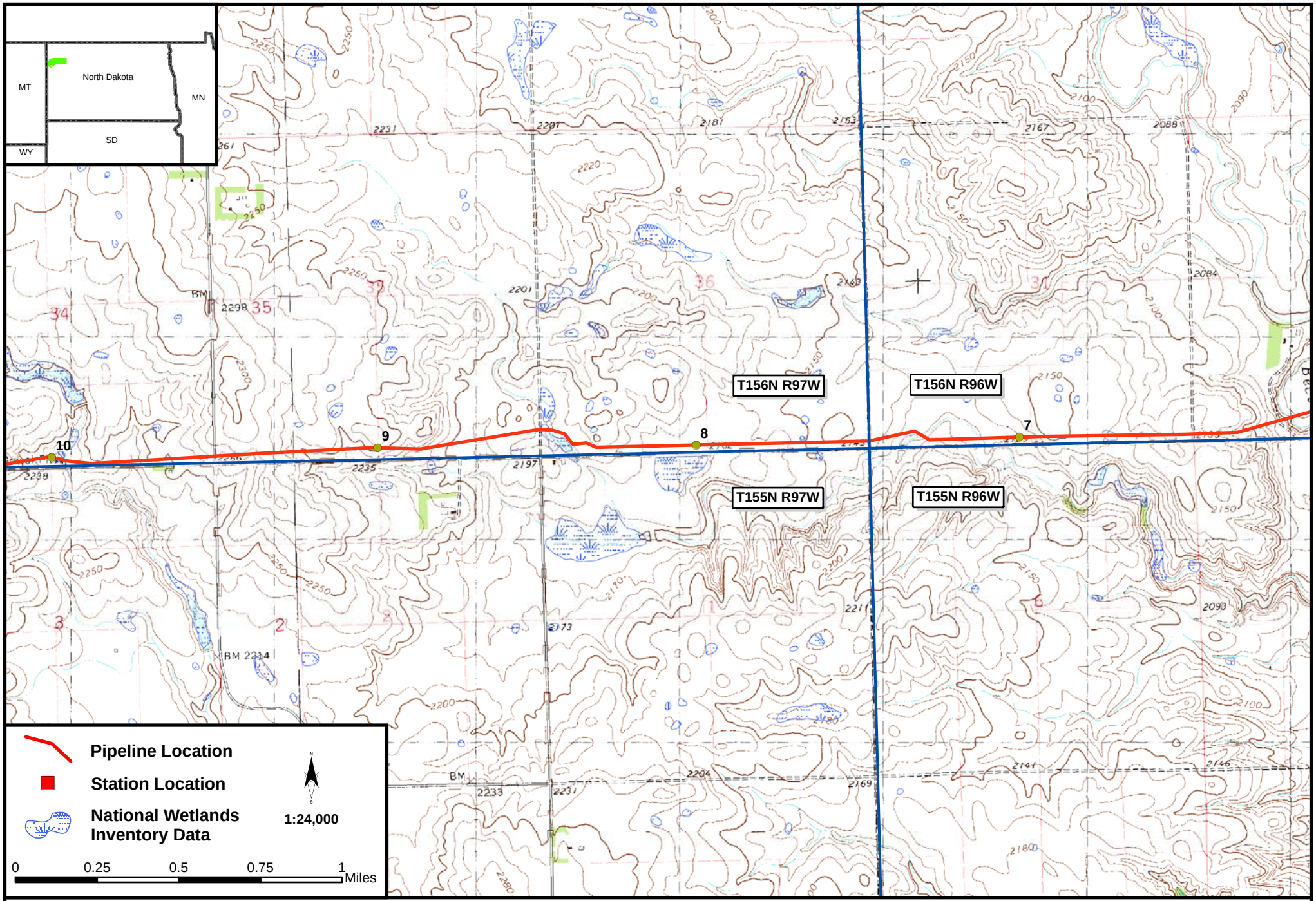
Location Map - Sheet 1 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

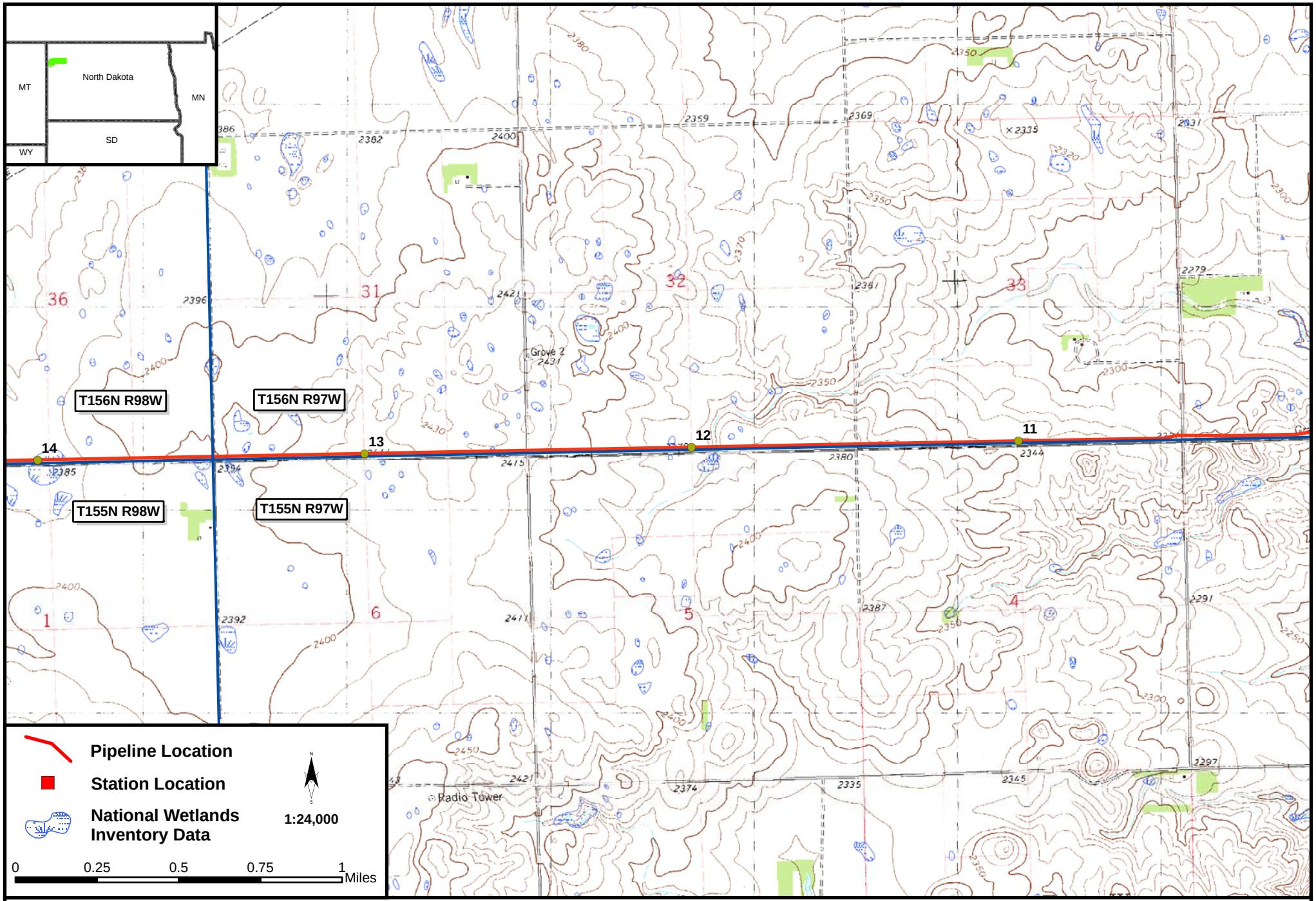
Location Map - Sheet 2 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

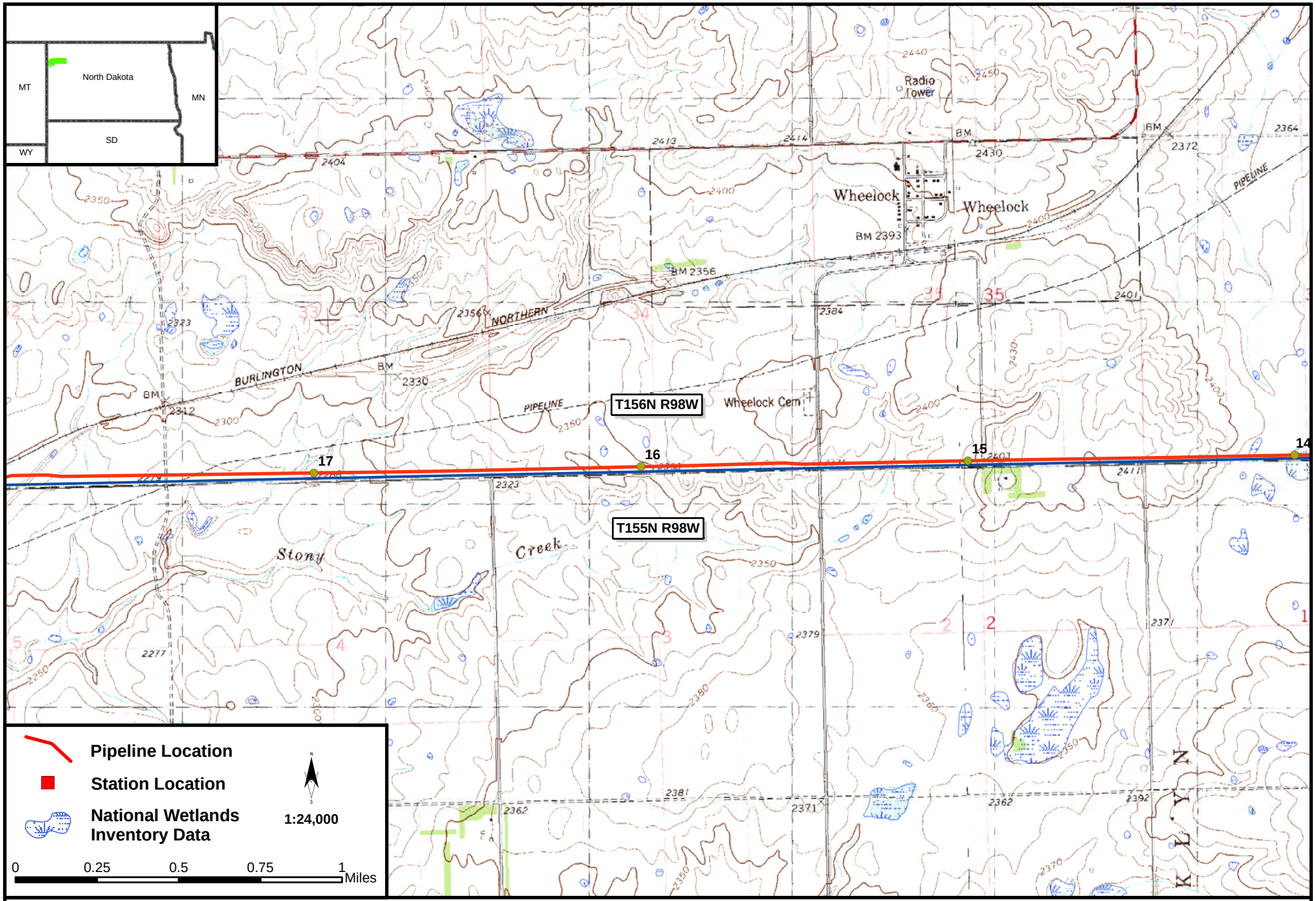
Location Map - Sheet 3 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

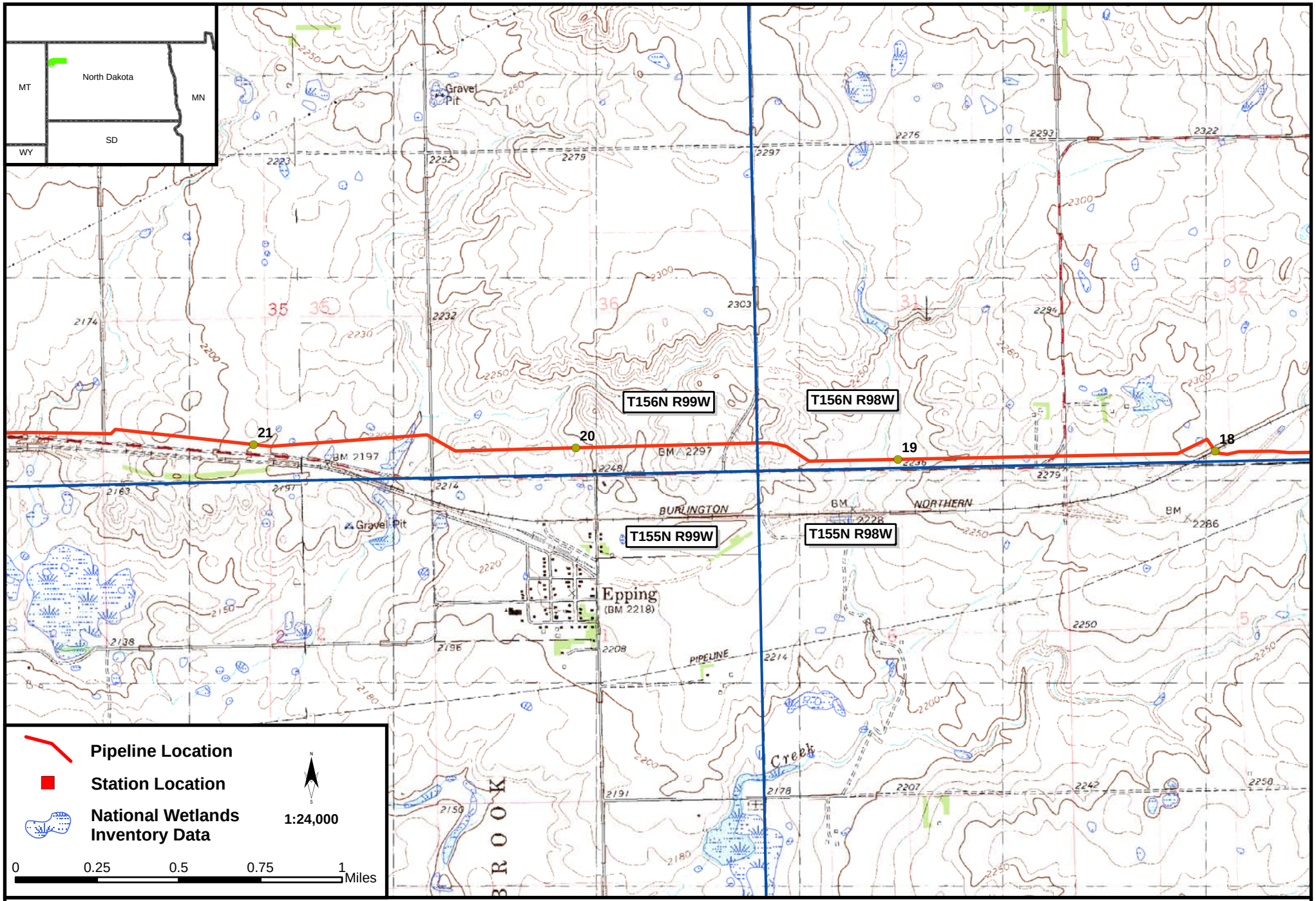
Location Map - Sheet 4 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

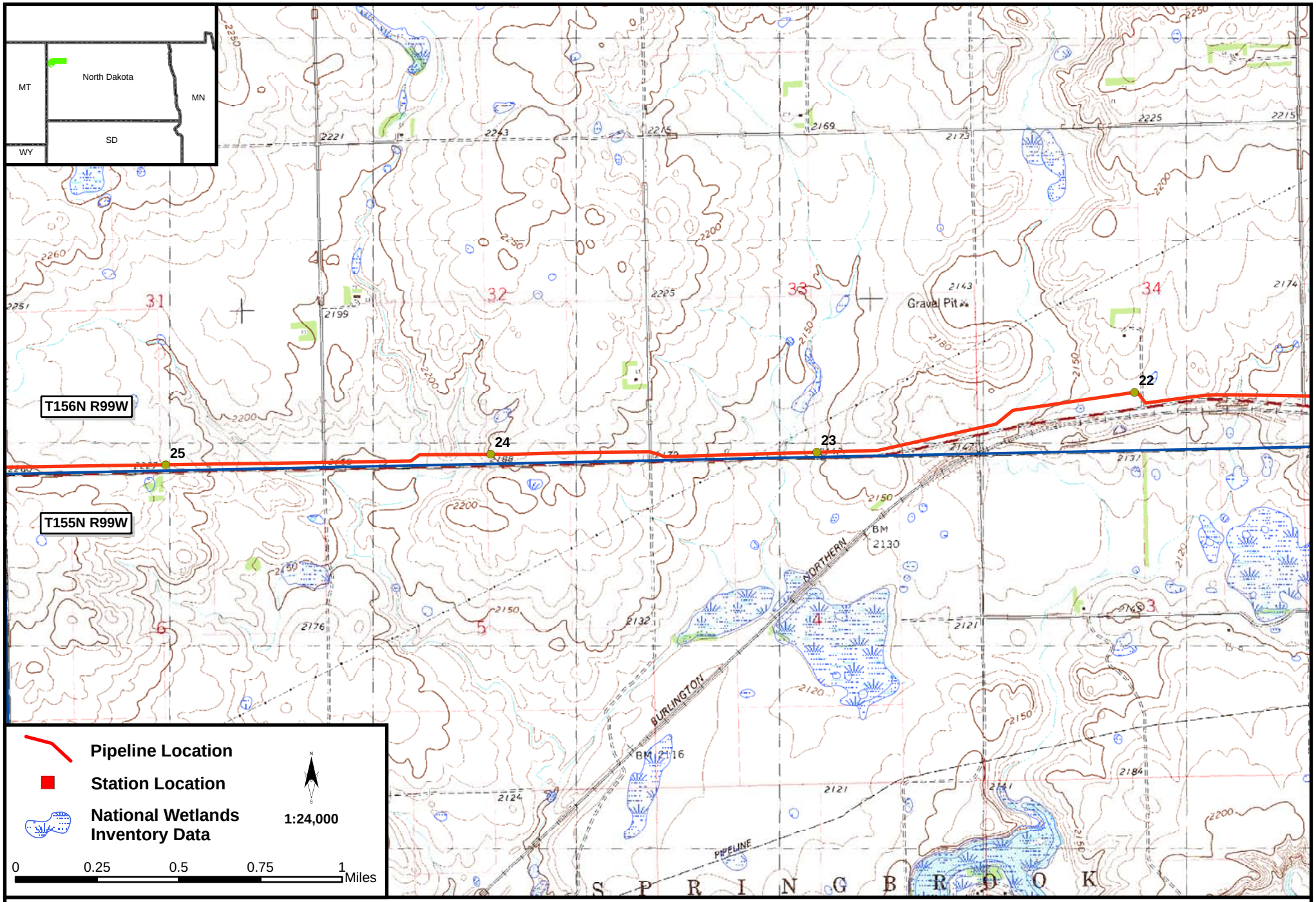
Location Map - Sheet 5 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

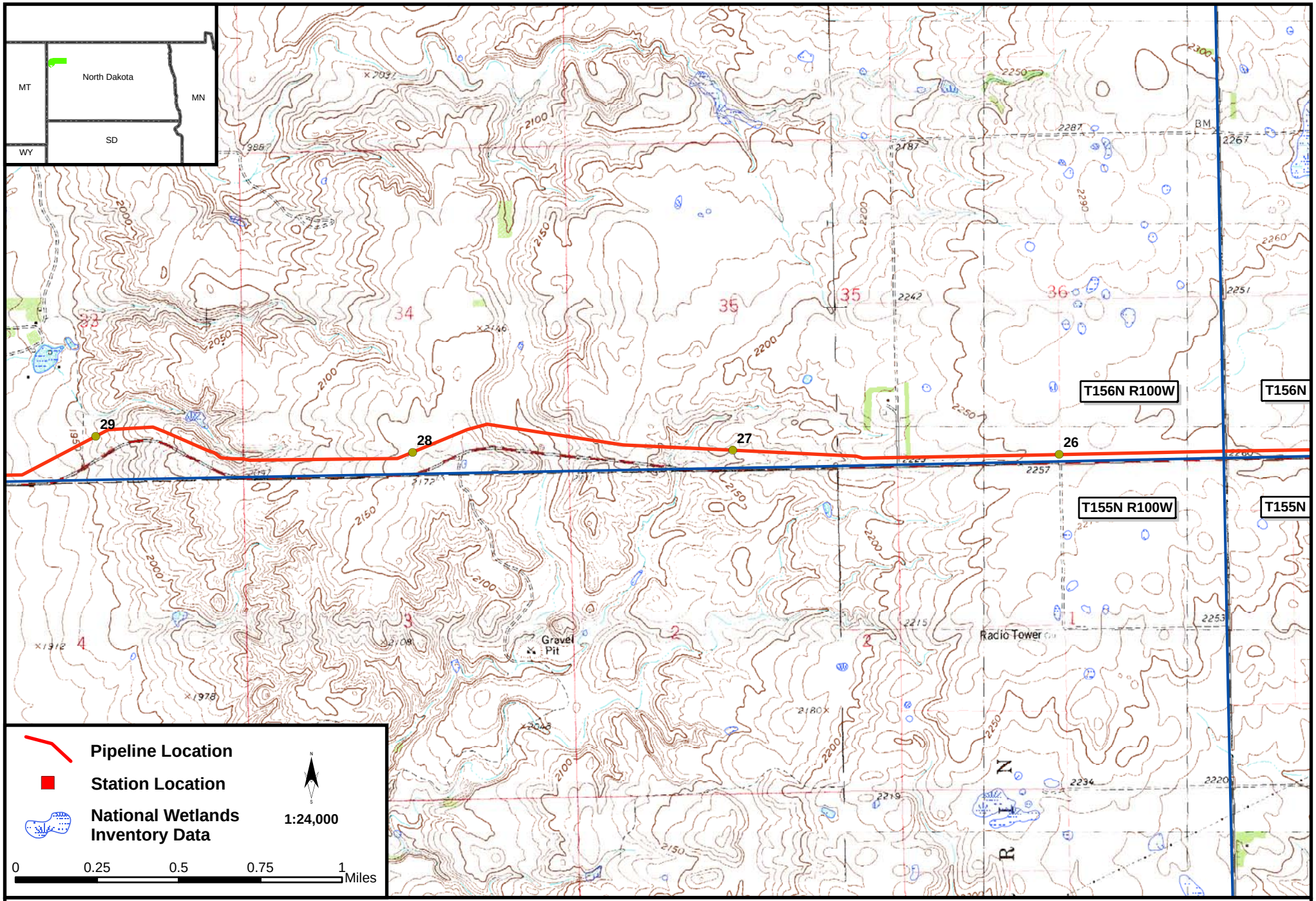
Location Map - Sheet 6 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 7 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

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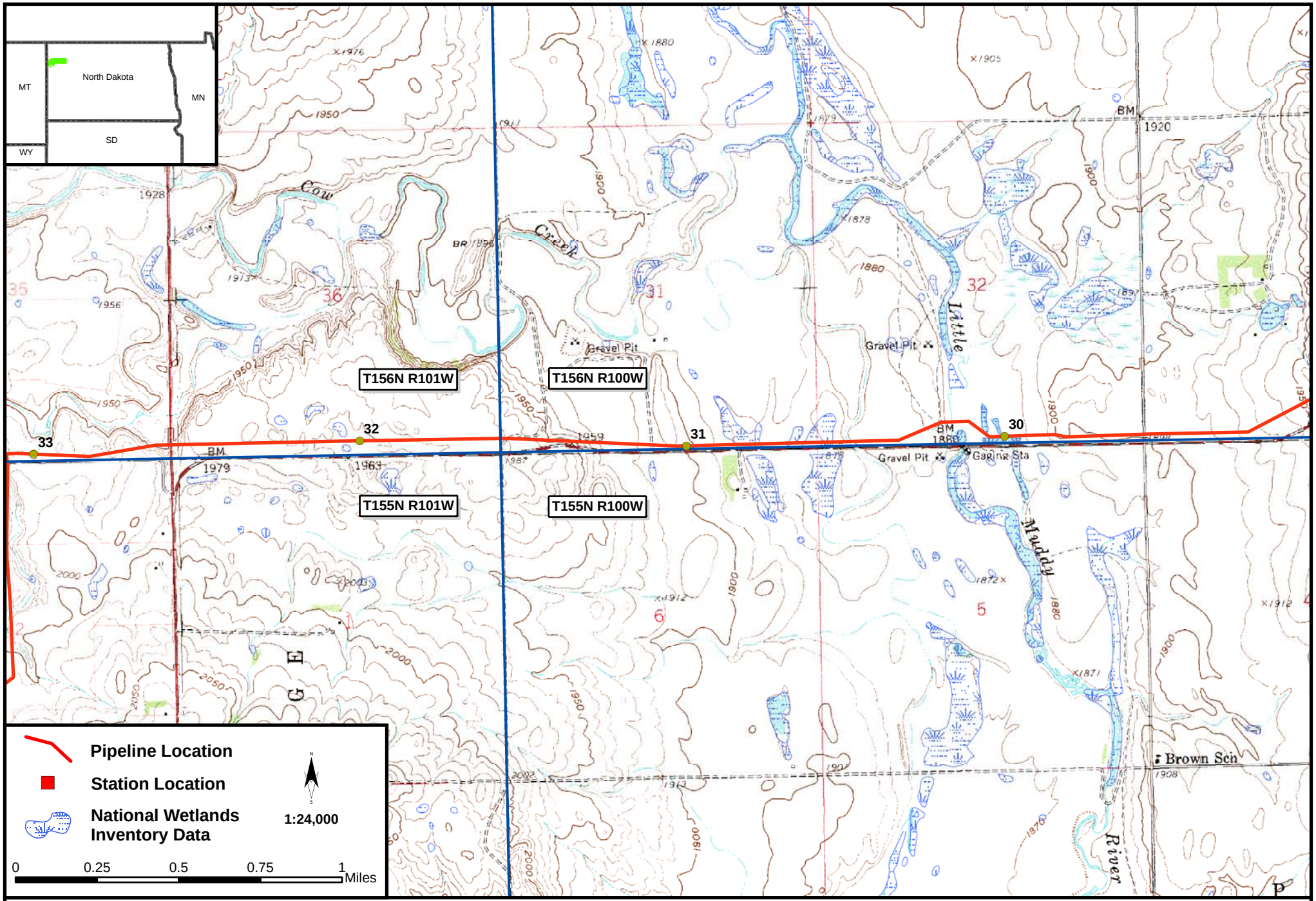
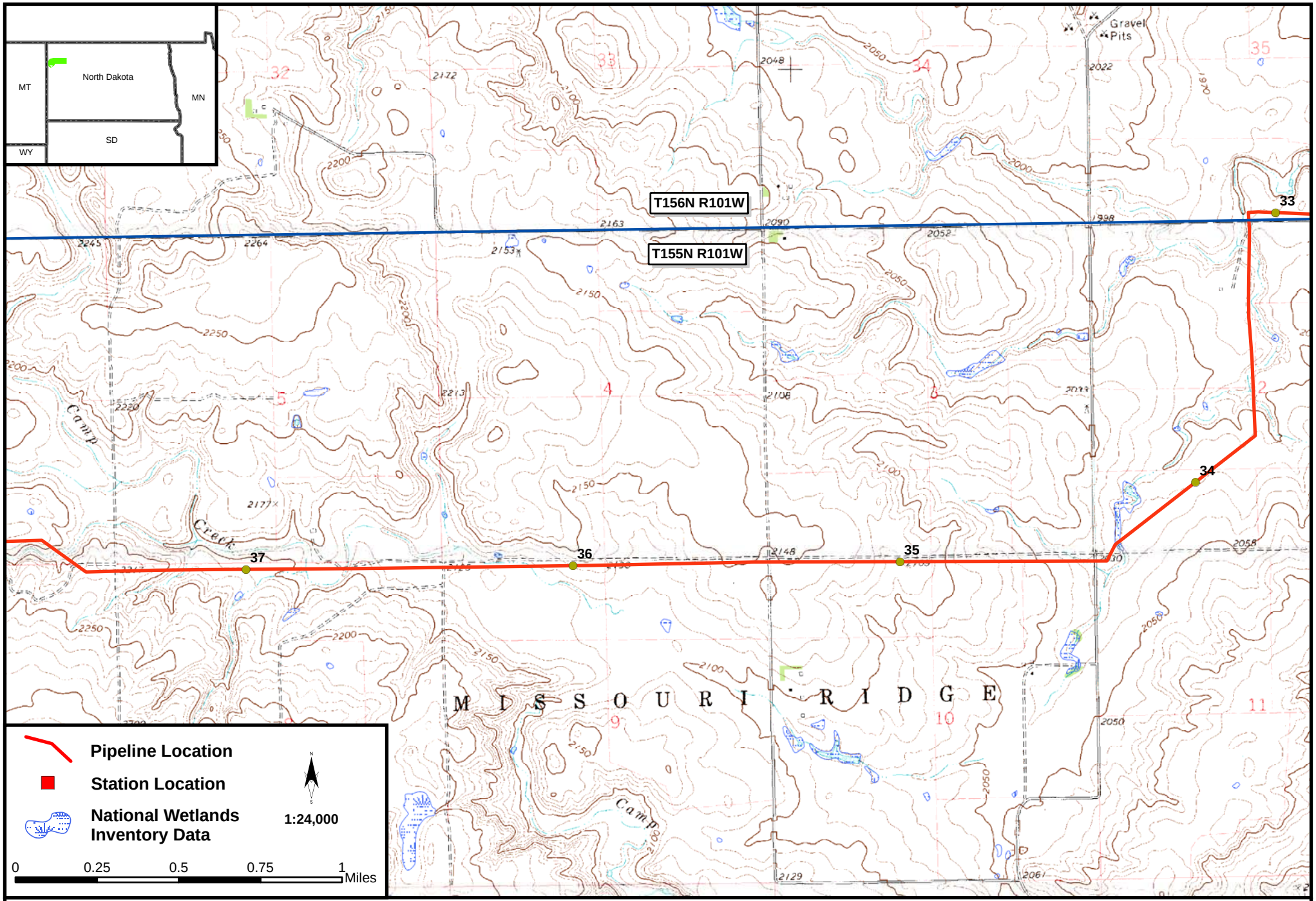


Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

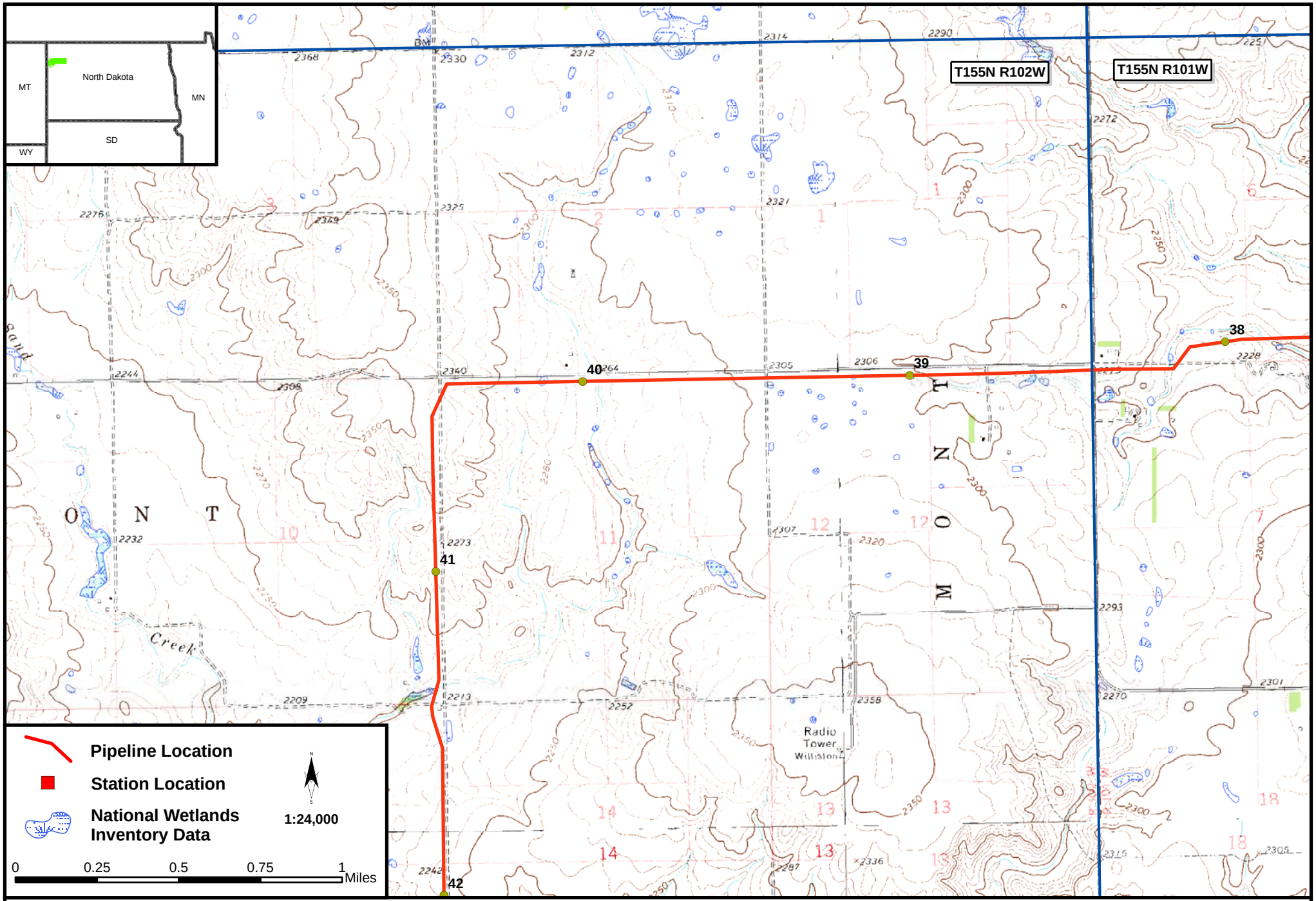
Location Map - Sheet 9 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

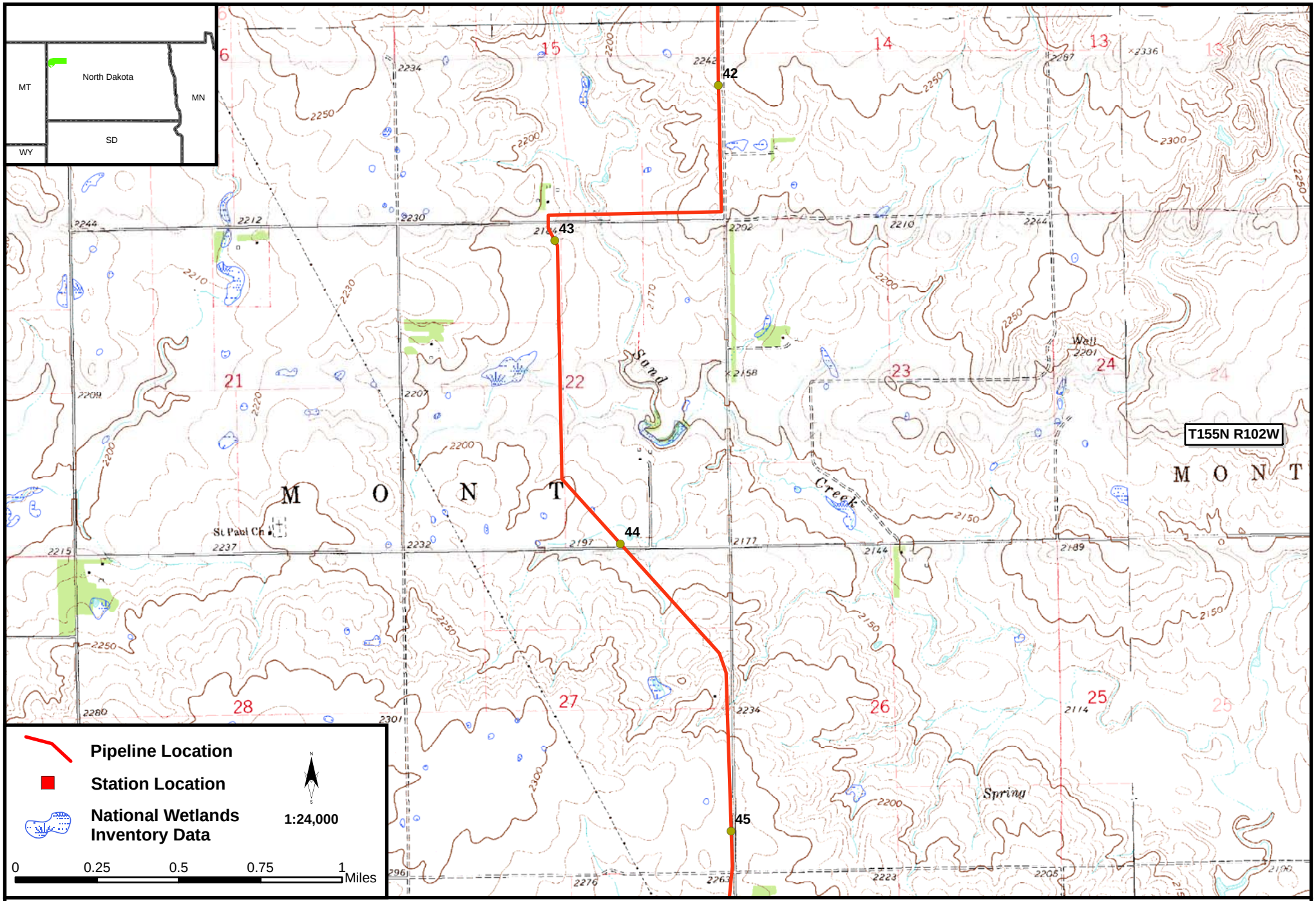
Location Map - Sheet 10 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

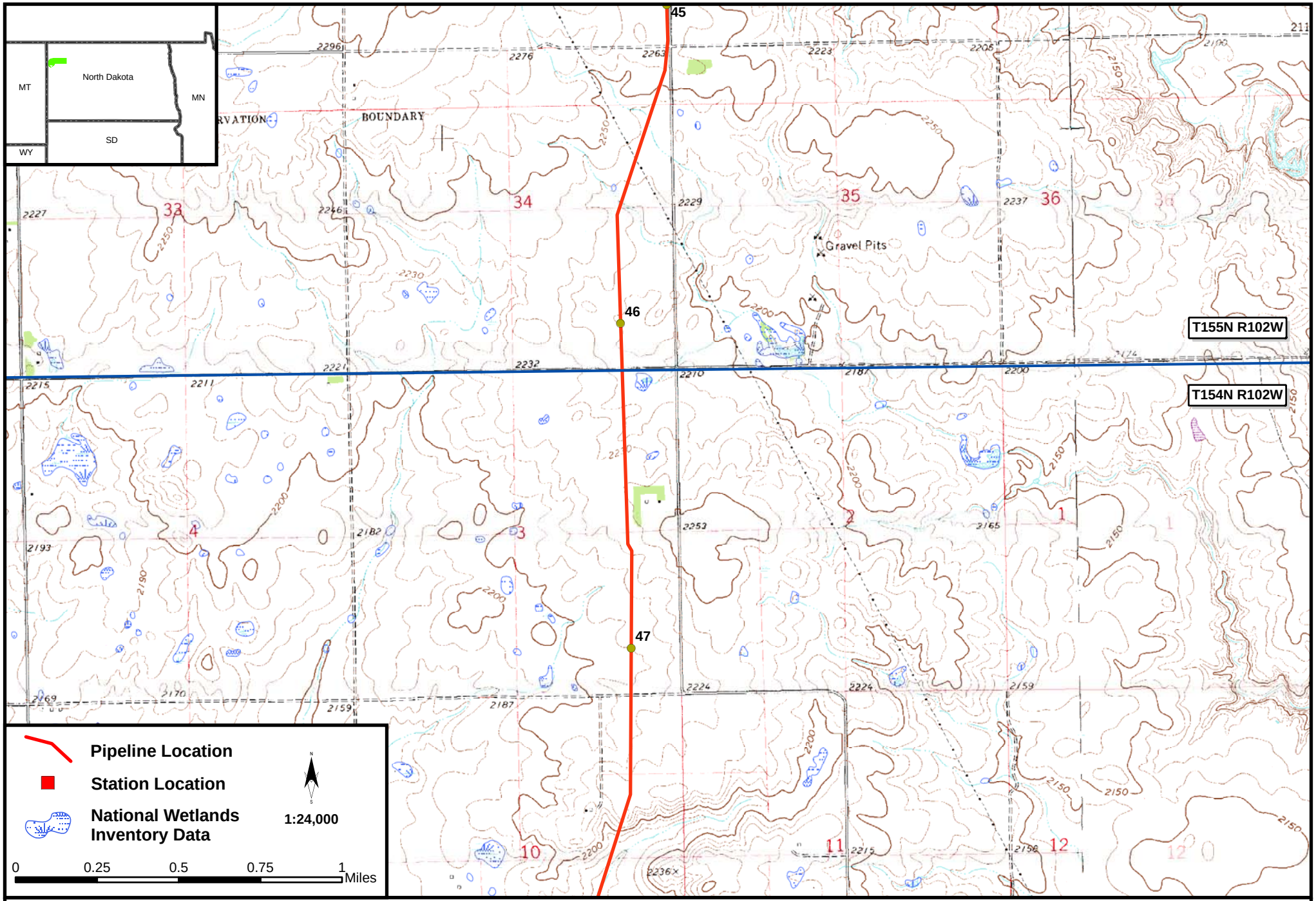
Location Map - Sheet 11 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

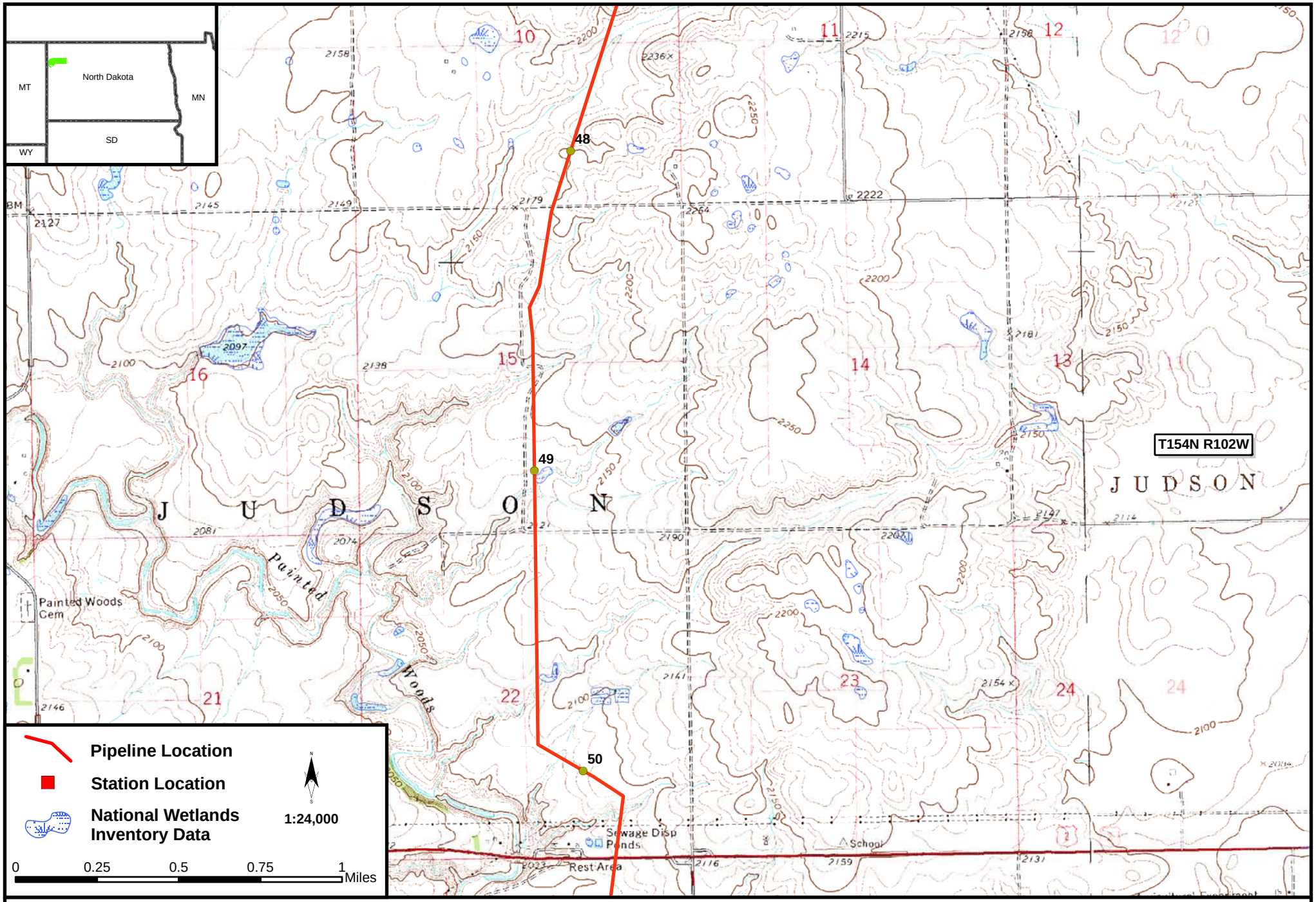
Location Map - Sheet 12 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

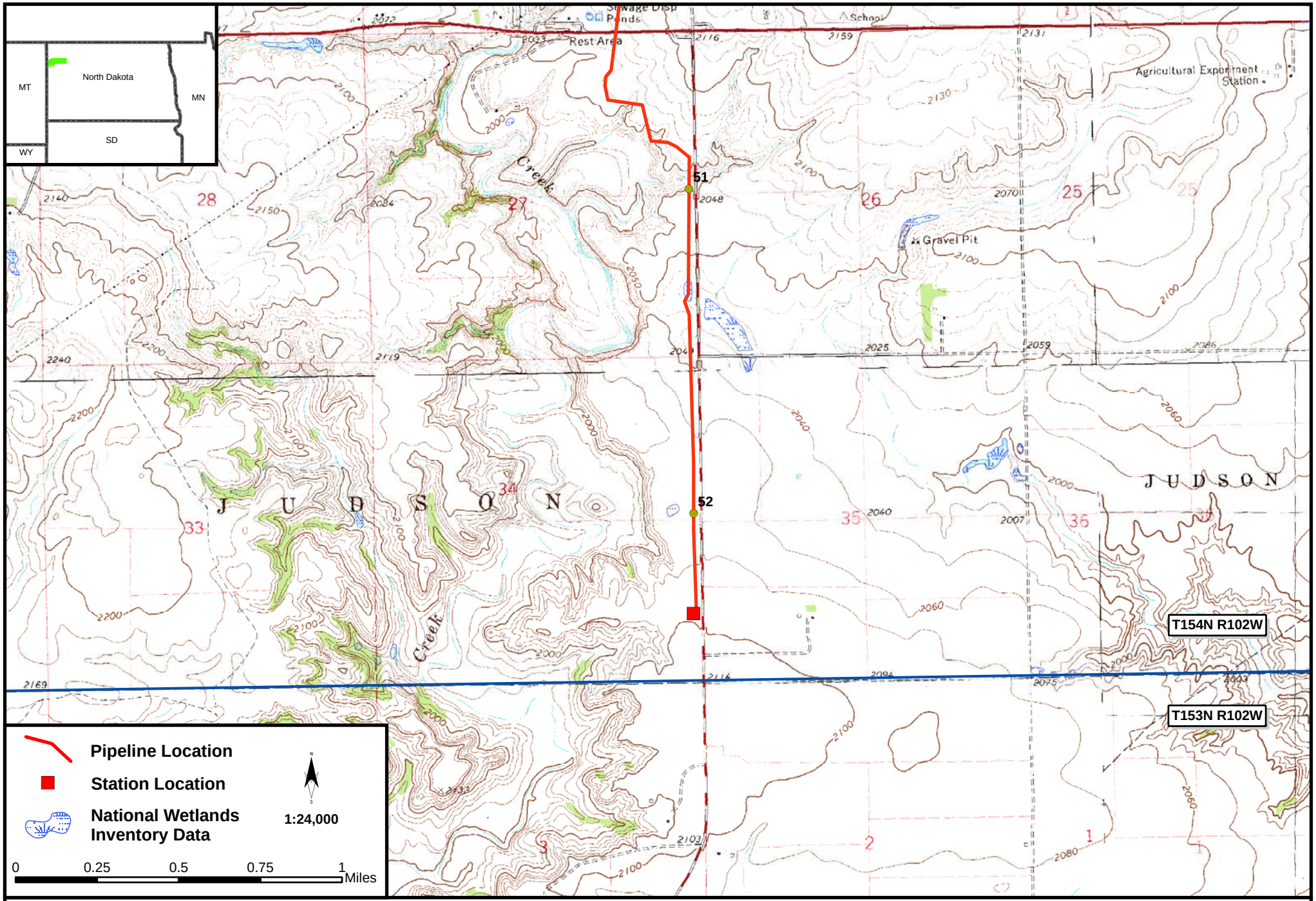
Location Map - Sheet 13 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 14 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 15 of 15

U.S. Department of Agriculture, Natural Resource Conservation Service

Potential Impacts to NRCS Reserve Program Lands

merjent

Contact Report

Date:
June 26, 2006

To:
David Schmidt

Company:
USDA – NRCS

Phone Number:
701-572-9651

From:
Jeff Mackenthun

Company:
Merjent, Inc.

Phone Number:
612-746-3668

Subject:
Revision to June 7 Consultation Letter

Mr. Mackenthun received a call from David Schmidt regarding an e-mail Mackenthun had sent him on June 21 (see attached). Mr. Schmidt informed Mackenthun that the Farm Service Agency and the NRCS was no longer allowed to release information to the public regarding the location of any lands managed by either department. Mr. Schmidt indicated that Enbridge should contact landowners that may be impacted by the proposed pipeline project to inquire whether reserve lands are located on their properties. Mr. Schmidt did indicate Conservation Reserve Program lands would be the only reserve lands located within the project area. No other NRCS or FSA managed lands would be located within the project area. Mackenthun thanked him for his assistance with this project.

Attachment

Jeff Mackenthun

From: Jeff Mackenthun [jmackenthun@merjent.com]

Sent: Wednesday, June 21, 2006 1:17 PM

To: 'david.schmidt@nd.usda.gov'

Subject: Enbridge Pipeline ND Expansion Project - Revision to June 7 Consultation Letter

David,
On June 7th, Enbridge sent you a consultation letter which requested the NRCS review Enbridge's proposed North Dakota Pipeline Expansion Project for Conservation Reserve Program lands, Wetland Reserve Program lands, Grassland Reserve Program lands, or other similar program lands administered by the NRCS. The original letter requested you review an area one quarter mile on either side of the proposed pipeline route. Since the original submittal request, Enbridge has expanded its review corridor to a half mile on either side of the proposed route. Thus, please include a half mile buffer in your review of the aforementioned project.

Please let me know if this e-mail is a sufficient means in providing this request, or if you would like a more formal request (i.e., new consultation letter). Thanks for your help!

Merjent

Banks Building
615 - 1st Avenue NE
Suite 425
Minneapolis, MN 55413

Jeff Mackenthun

612-746-3668 direct
612-810-4795 cell
612-746-3660 main
612-746-3679 fax

Enbridge Pipelines (Lakehead) L.L.C.
119 N. 25th Street East
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Scott W. Lounsbury Supervisor, Environment
Kris H. Benson Environmental Analyst II
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Rachael A. Shetka Environmental Analyst
David M. Hoffman Sr. Environmental Analyst
Joseph P. Peterson Environmental Analyst II

June 9, 2006

Mr. David Schmidt
Natural Resources Conservation Service
Williston Field Office
1106 West 2nd Street
Williston, ND 58801-5804

RE: Enbridge Pipelines (North Dakota) LLC - North Dakota Pipeline Expansion Project
Potential Impacts to NRCS Reserve Program Lands

Dear Mr. Schmidt,

Enbridge Pipelines (North Dakota) LLC ("Enbridge") is presently evaluating a project to expand a portion of its North Dakota pipeline system. The proposed expansion involves the construction of a new pipeline that is anticipated to be co-located within the same corridor as its existing pipeline extending approximately 53 miles between Enbridge's Beaver Lodge Pump Station (approximately seven miles south of Tioga) and Trenton Pump Station (approximately six miles southwest of Williston). USGS topographic maps are enclosed that depict the current pipeline route. Construction is anticipated to require three to five months to complete, with a tentative start date of August 2006. In addition, Enbridge may perform modifications at its existing aboveground facilities along the project route.

Enbridge requests the Natural Resources Conservation Service (NRCS) review the anticipated project area to determine if the pipeline route will cross Conservation Reserve Program lands, Wetland Reserve Program lands, Grassland Reserve Program lands, or other similar program lands administered by the NRCS. To account for potential route variations, Enbridge requests your review include lands within a quarter mile buffer of the currently proposed pipeline. If your review indicates the project route crosses NRCS Program lands, please provide the location of affected lands, an NRCS-approved seed mix for use in revegetation, and any further steps Enbridge must complete (*e.g.*, work with NRCS and landowners to amend program contracts) to obtain authorization to construct the pipeline.

If you have questions or require further information regarding this project, please contact Tom Hess of Merjent, Inc., Enbridge's environmental consultant, at (612) 746-3667, or me at (715) 394-1572.

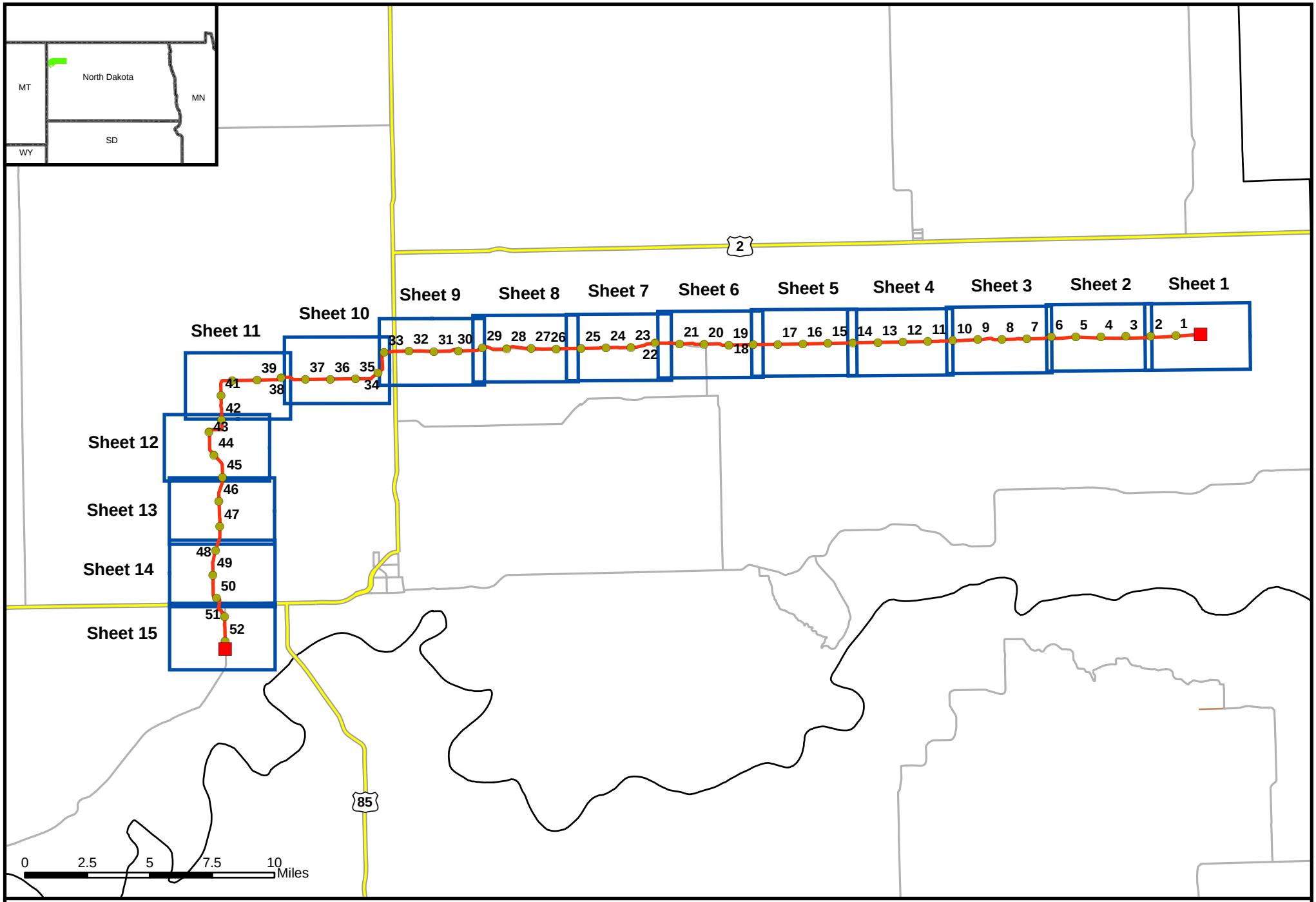
Sincerely,
Enbridge Pipelines (North Dakota) LLC

Kris Benson

Kris Benson, CHMM
Environmental Analyst II

Enclosures: Project location maps

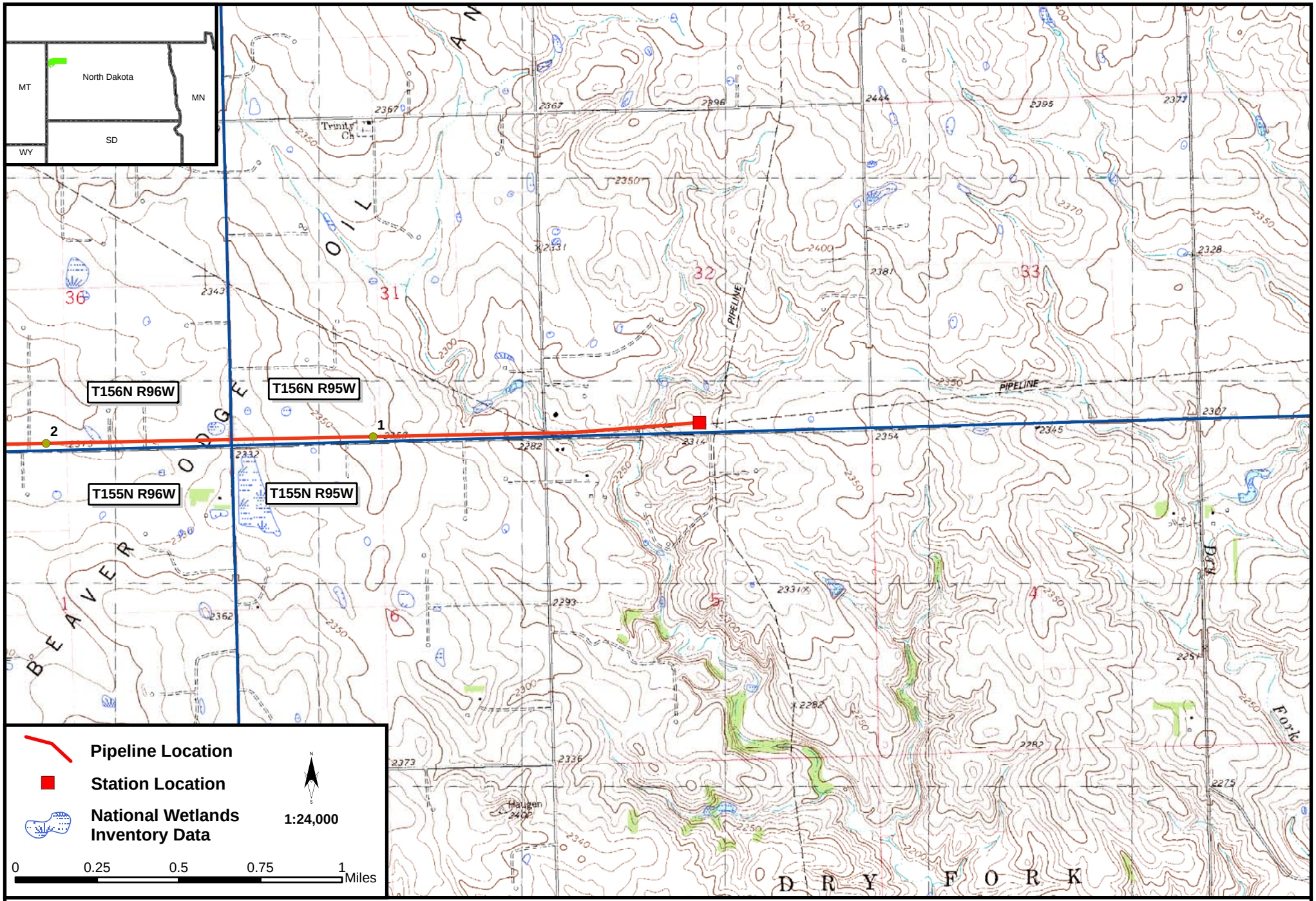
cc: Tom Hess, Merjent, Inc.



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

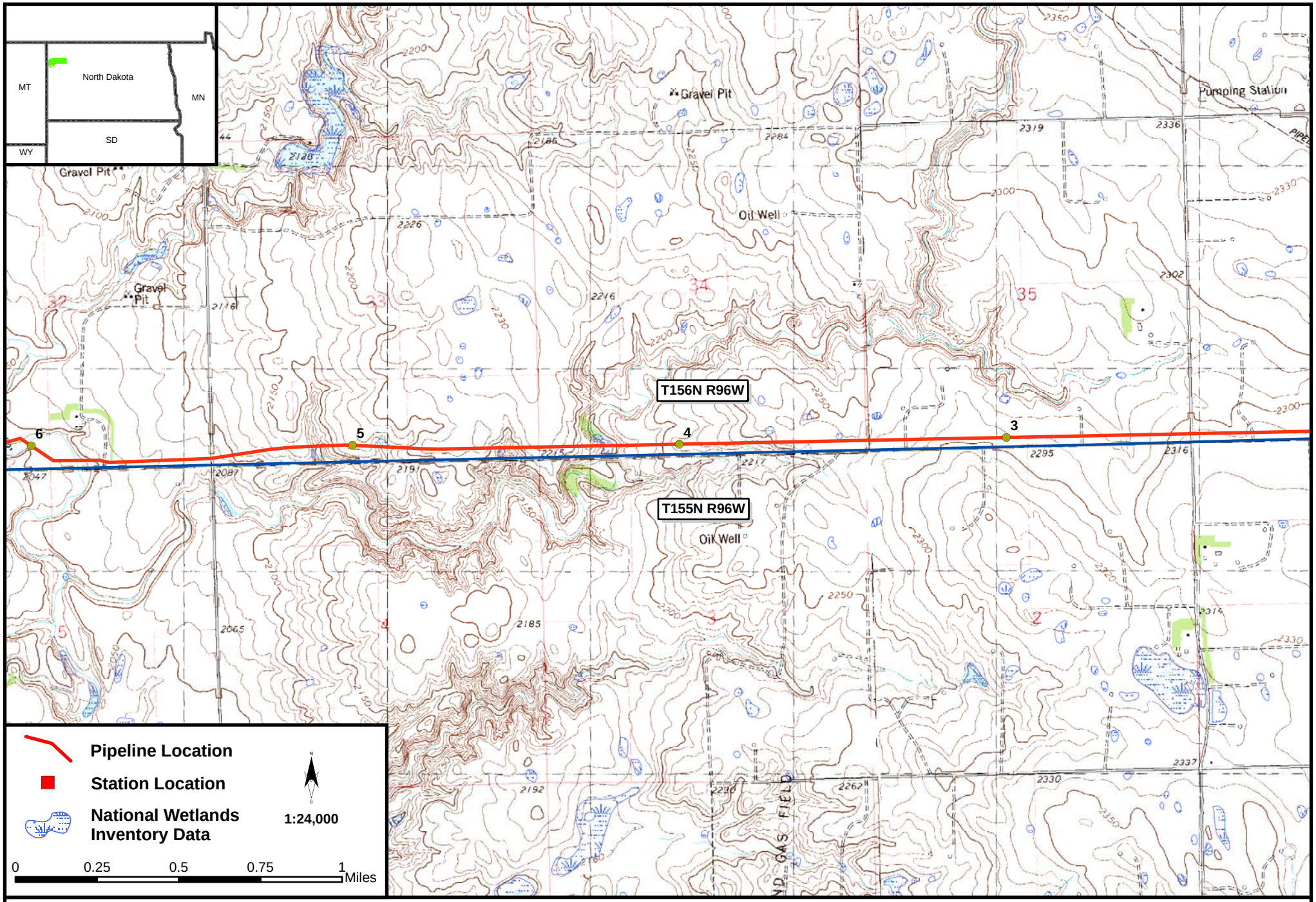
Location Map - Index



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

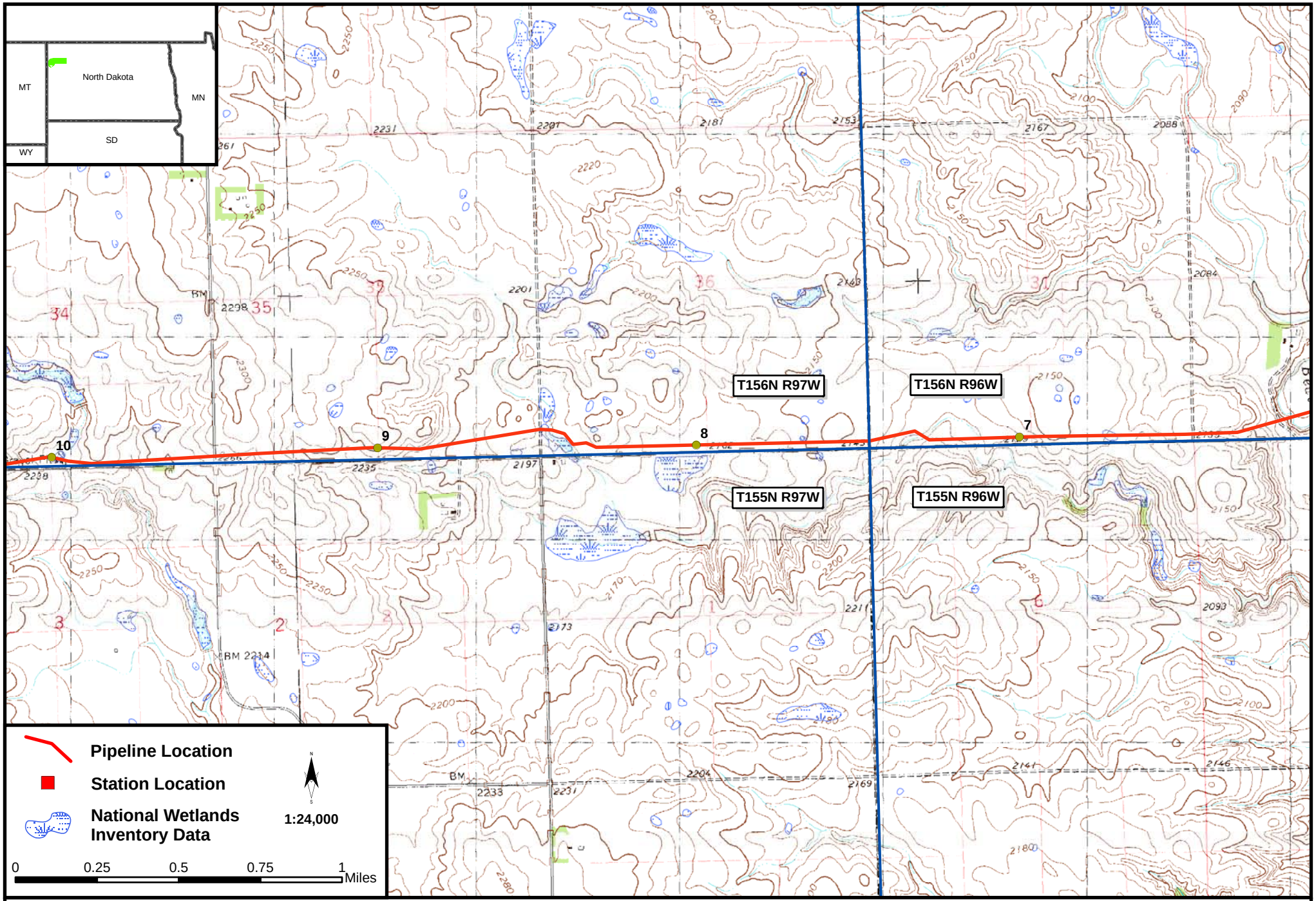
Location Map - Sheet 1 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

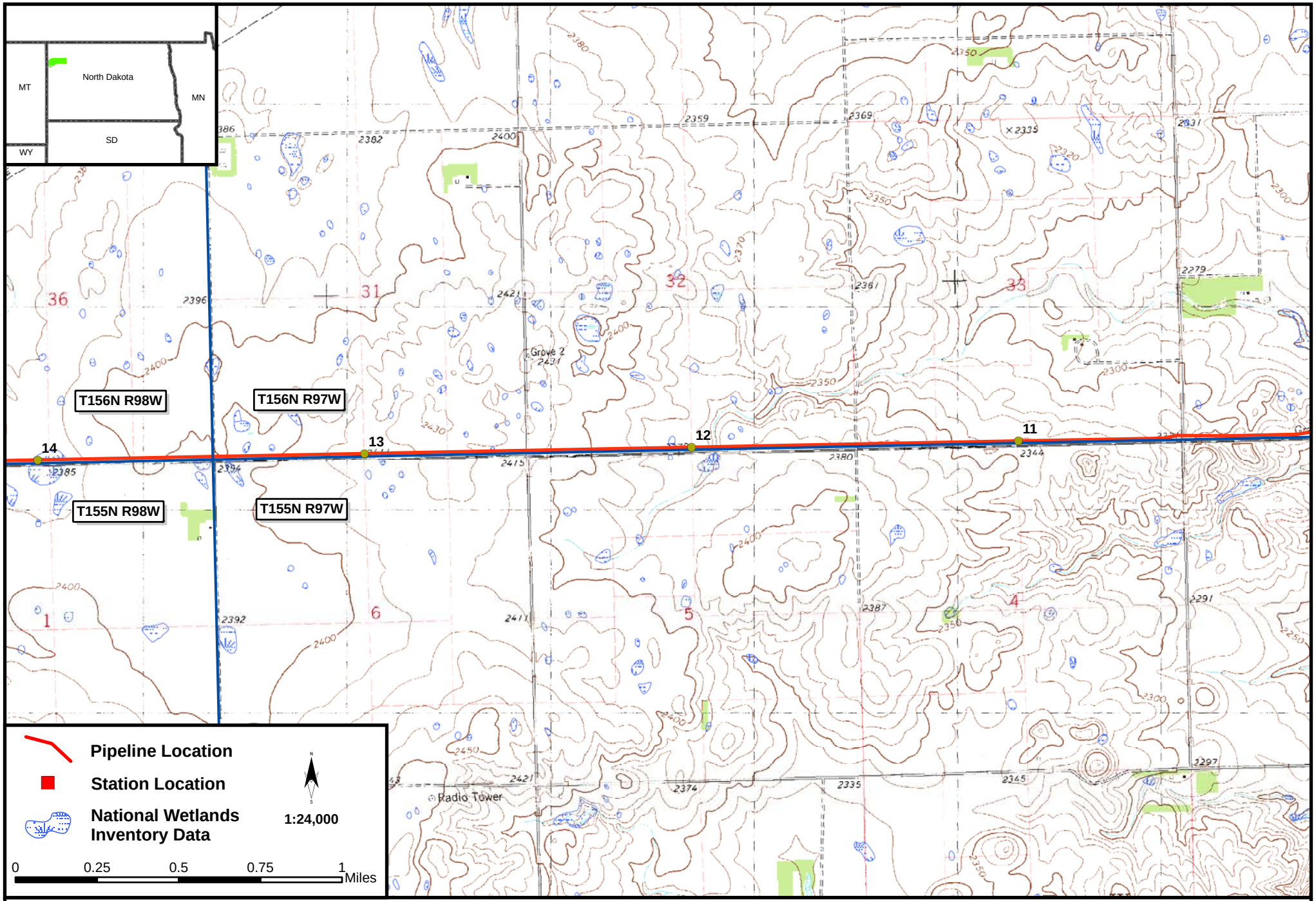
Location Map - Sheet 2 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

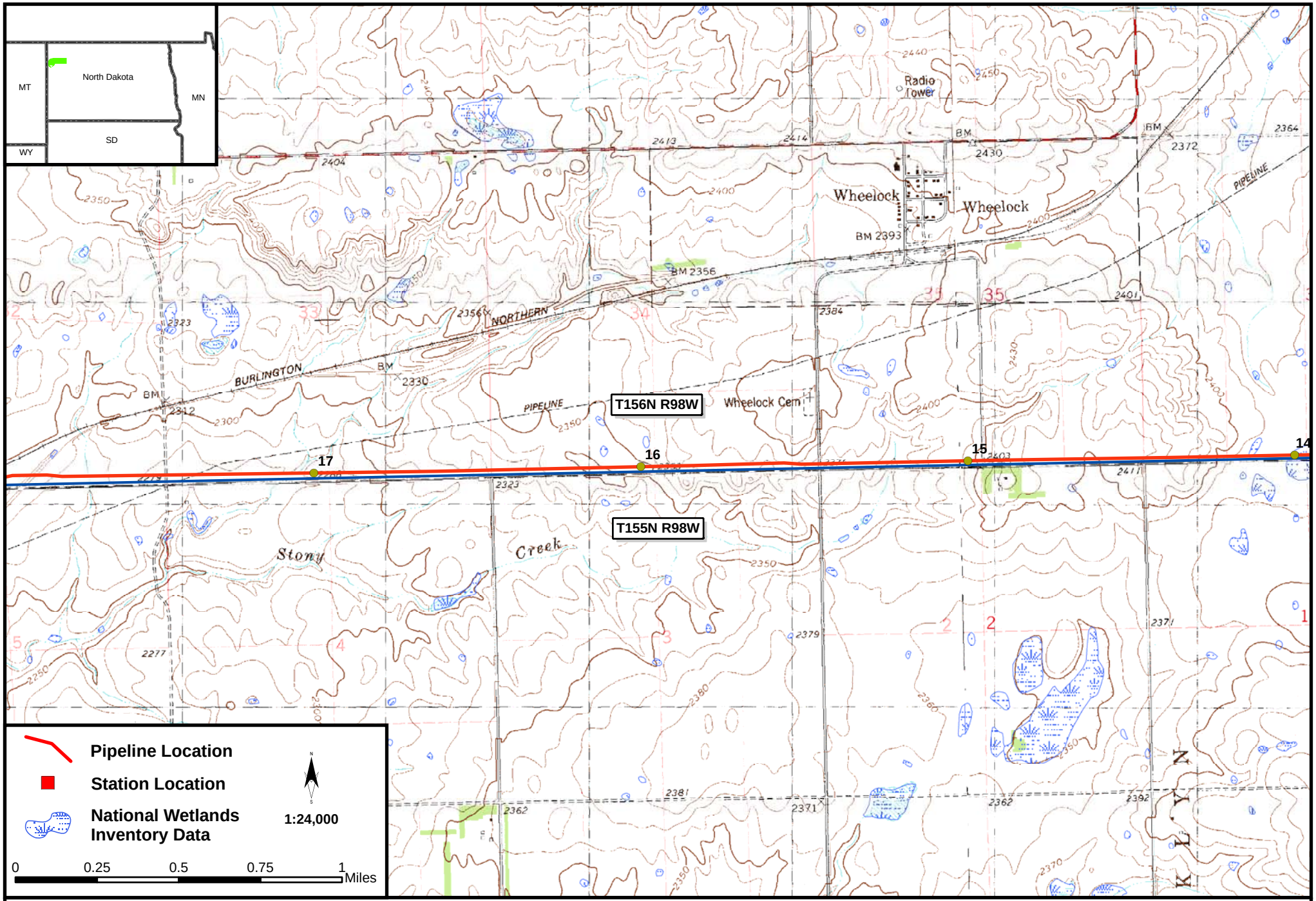
Location Map - Sheet 3 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

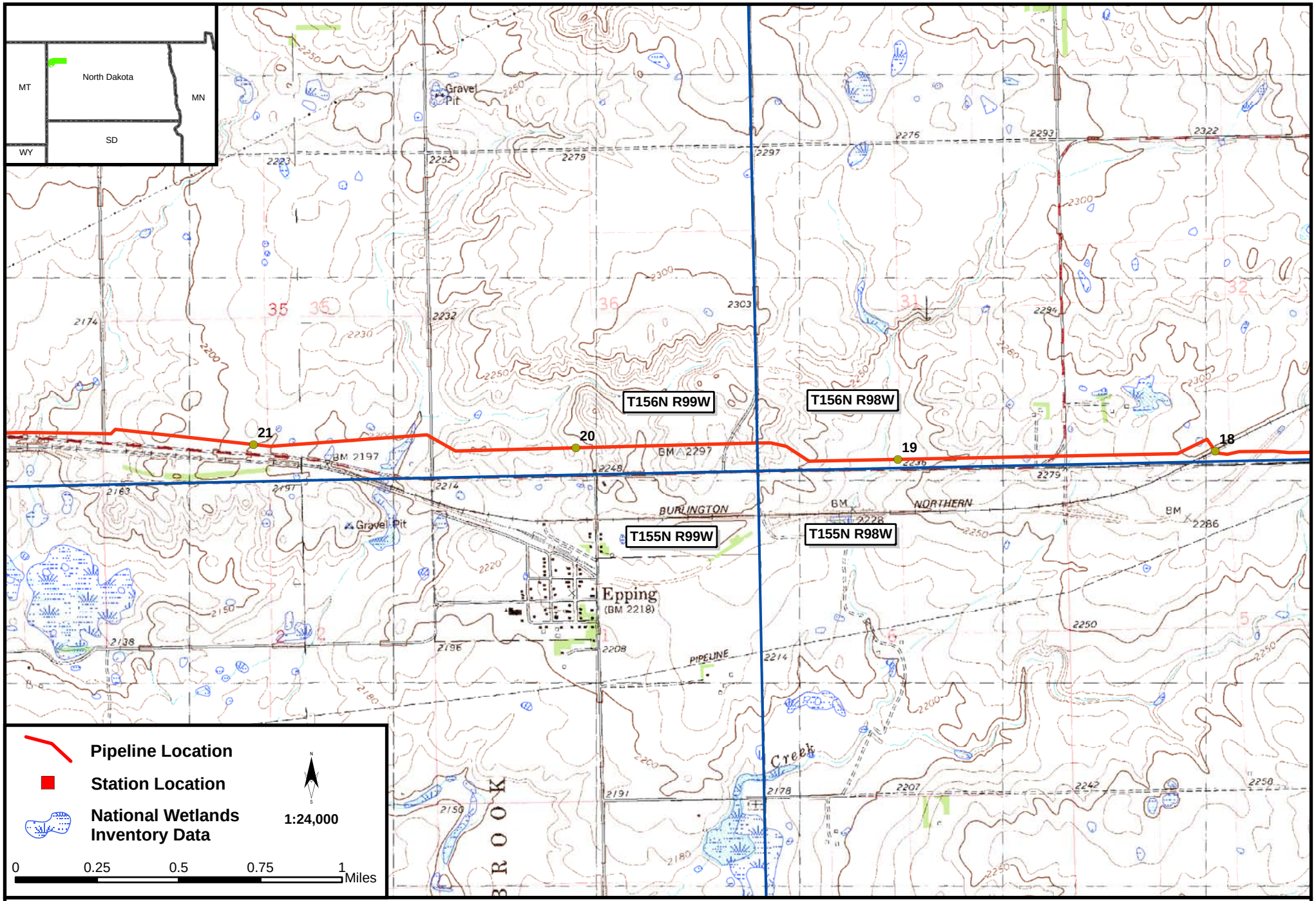
Location Map - Sheet 4 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

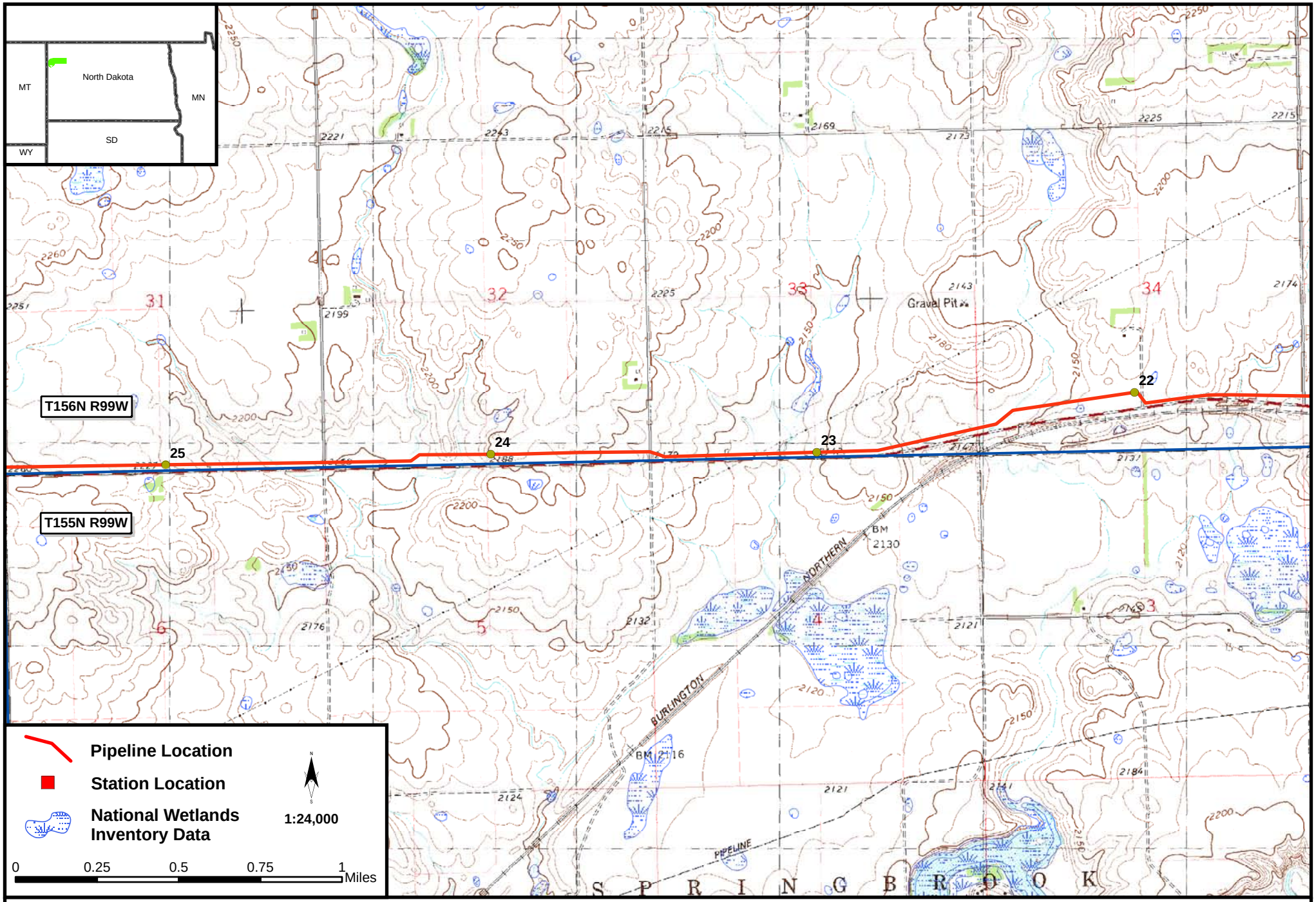
Location Map - Sheet 5 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

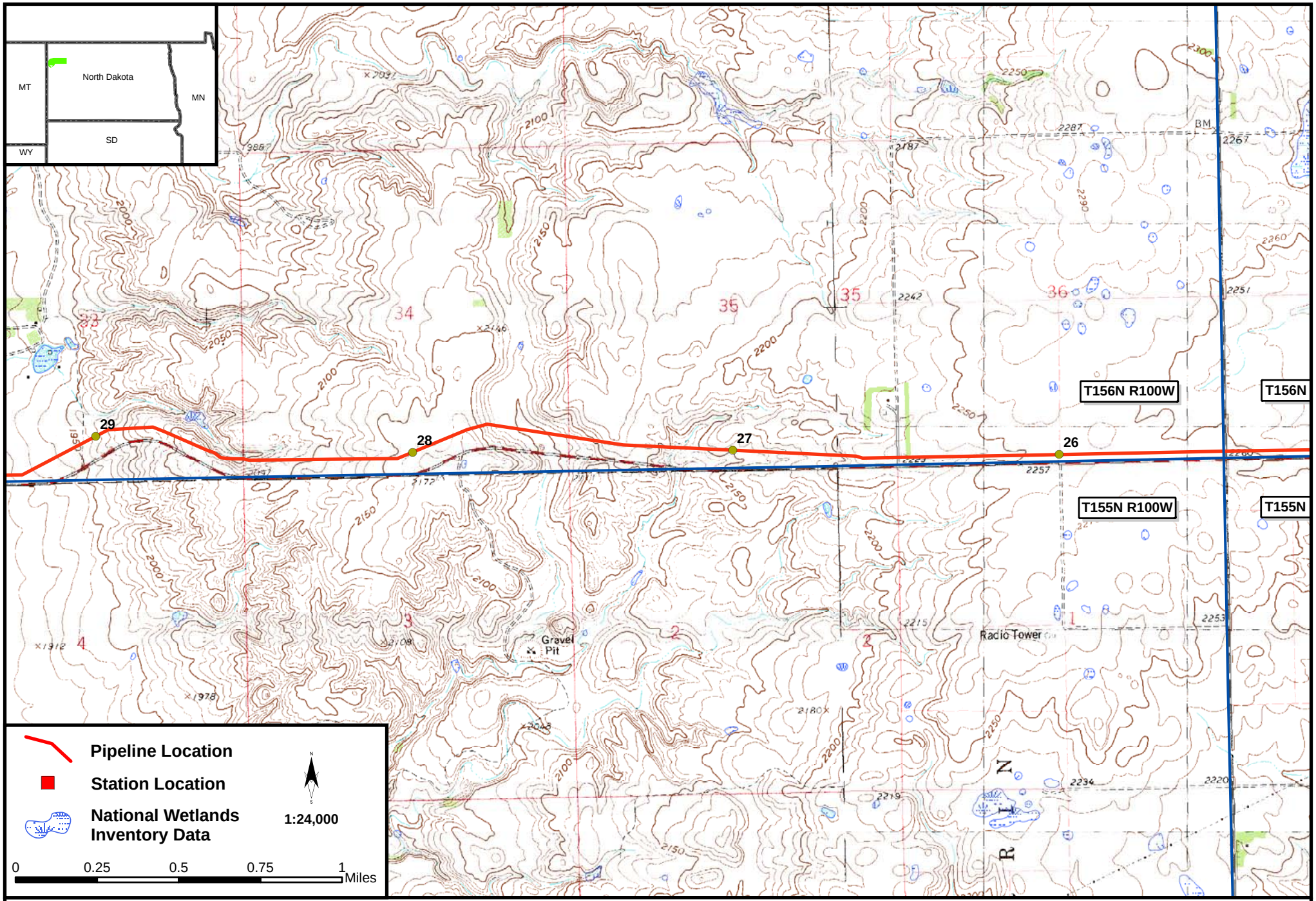
Location Map - Sheet 6 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

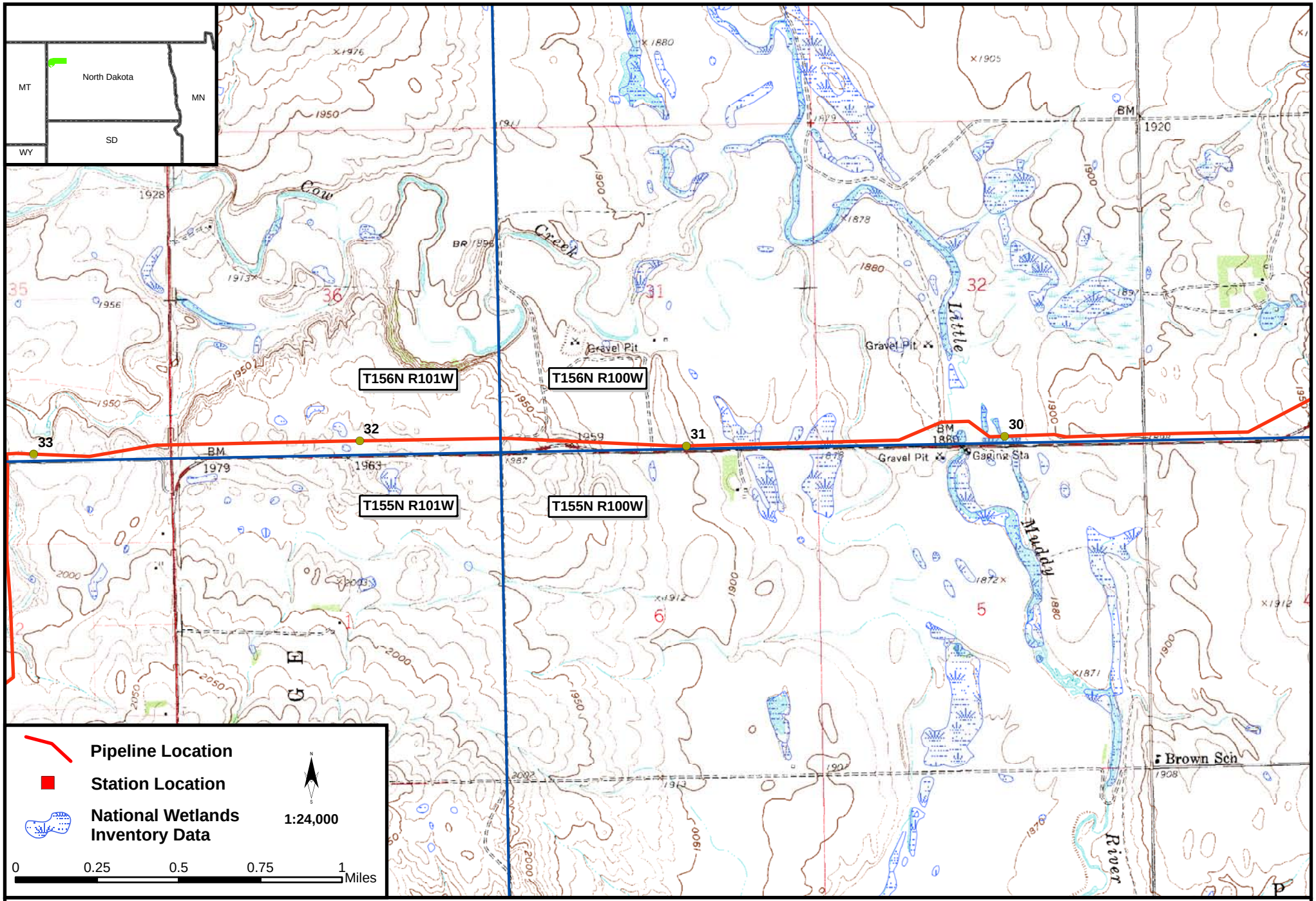
Location Map - Sheet 7 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

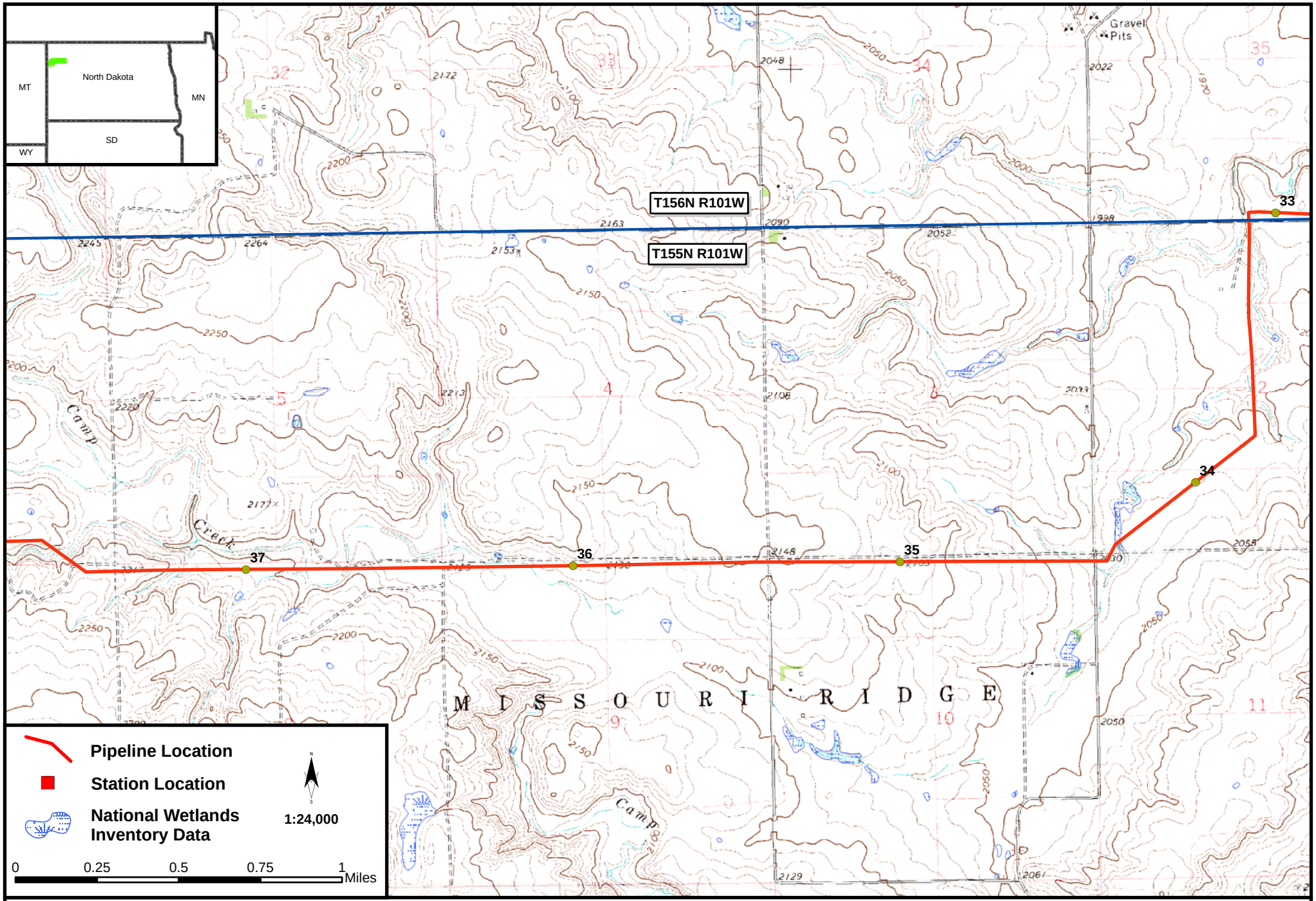
Location Map - Sheet 8 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

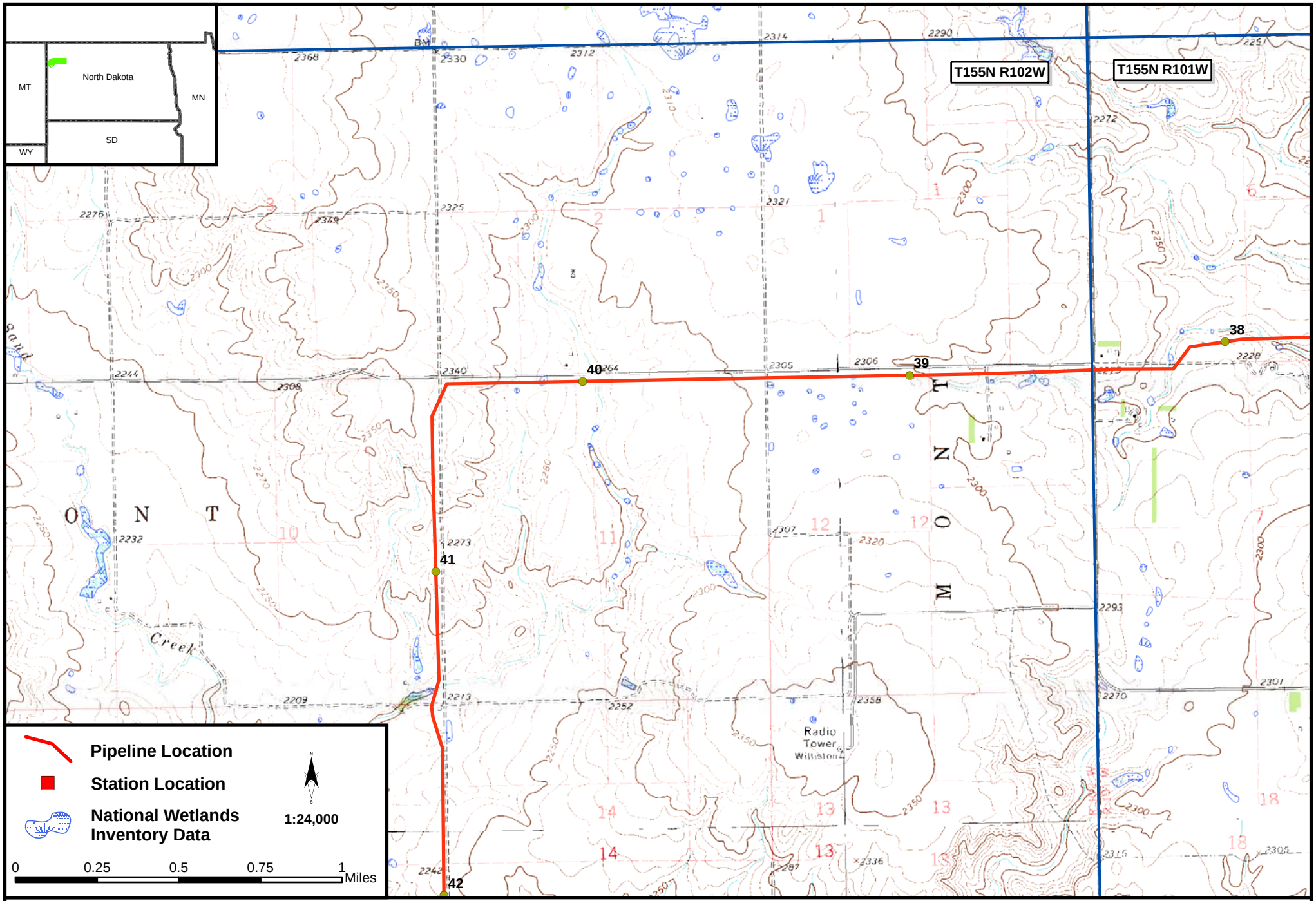
Location Map - Sheet 9 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

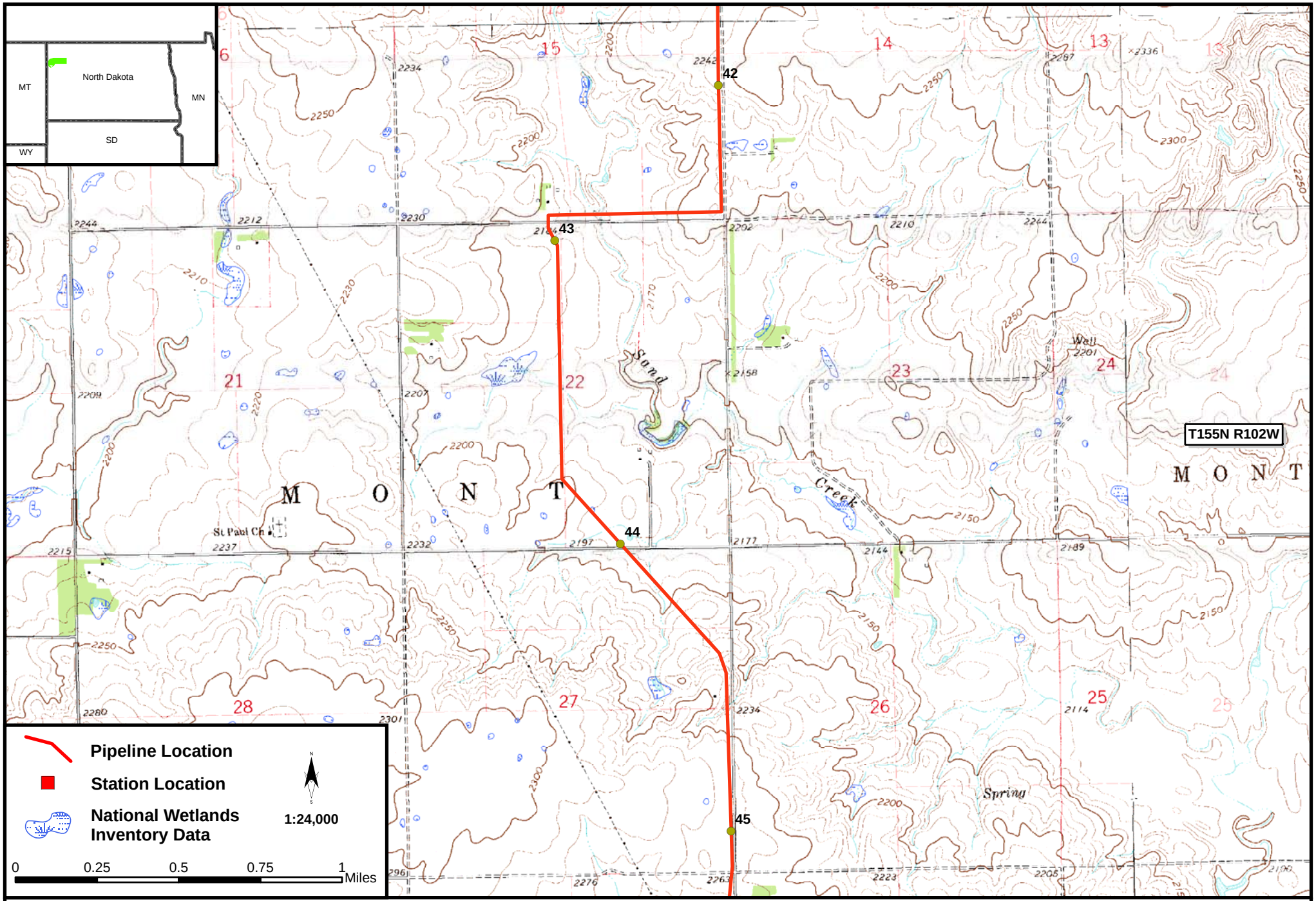
Location Map - Sheet 10 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

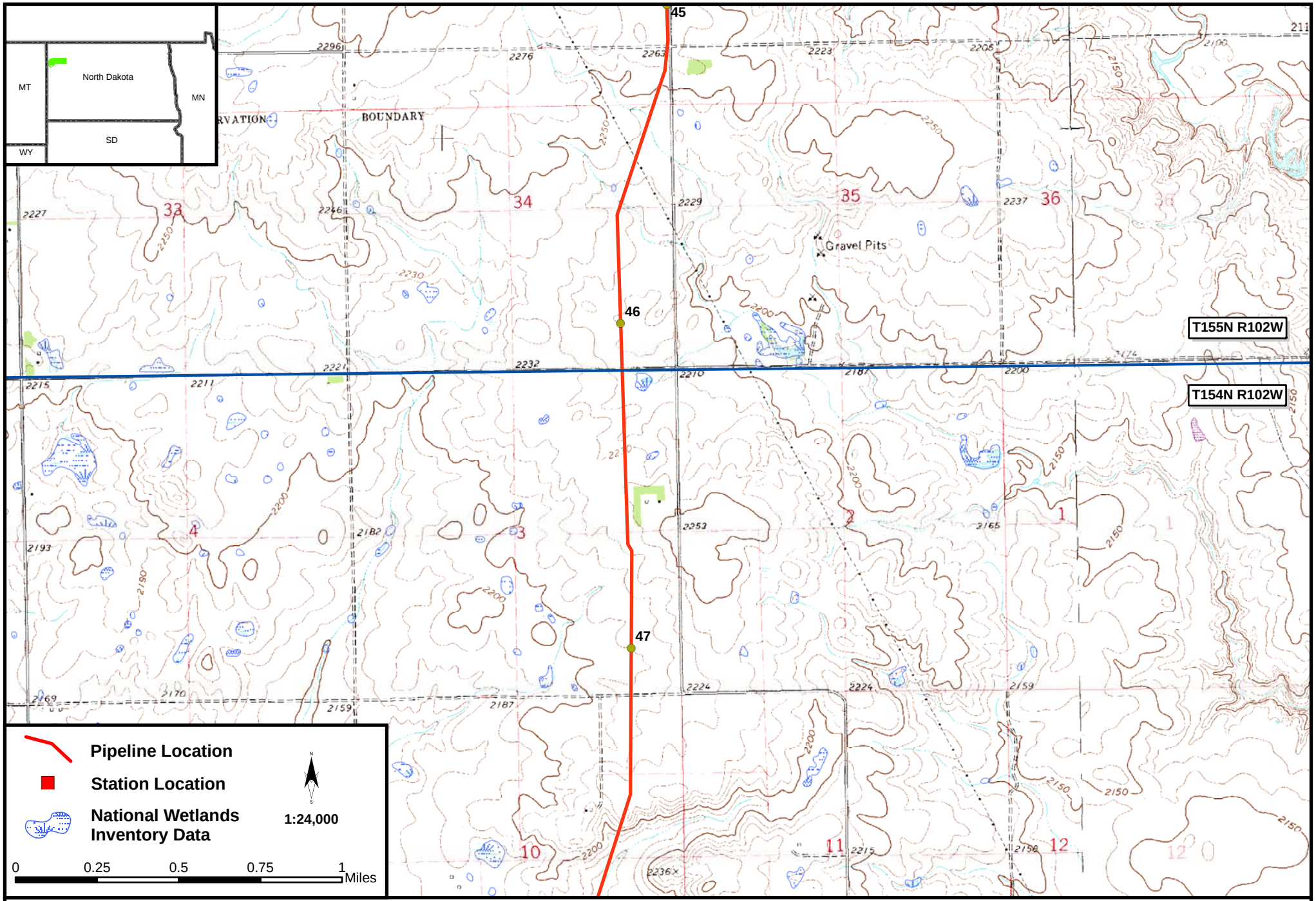
Location Map - Sheet 11 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 12 of 15



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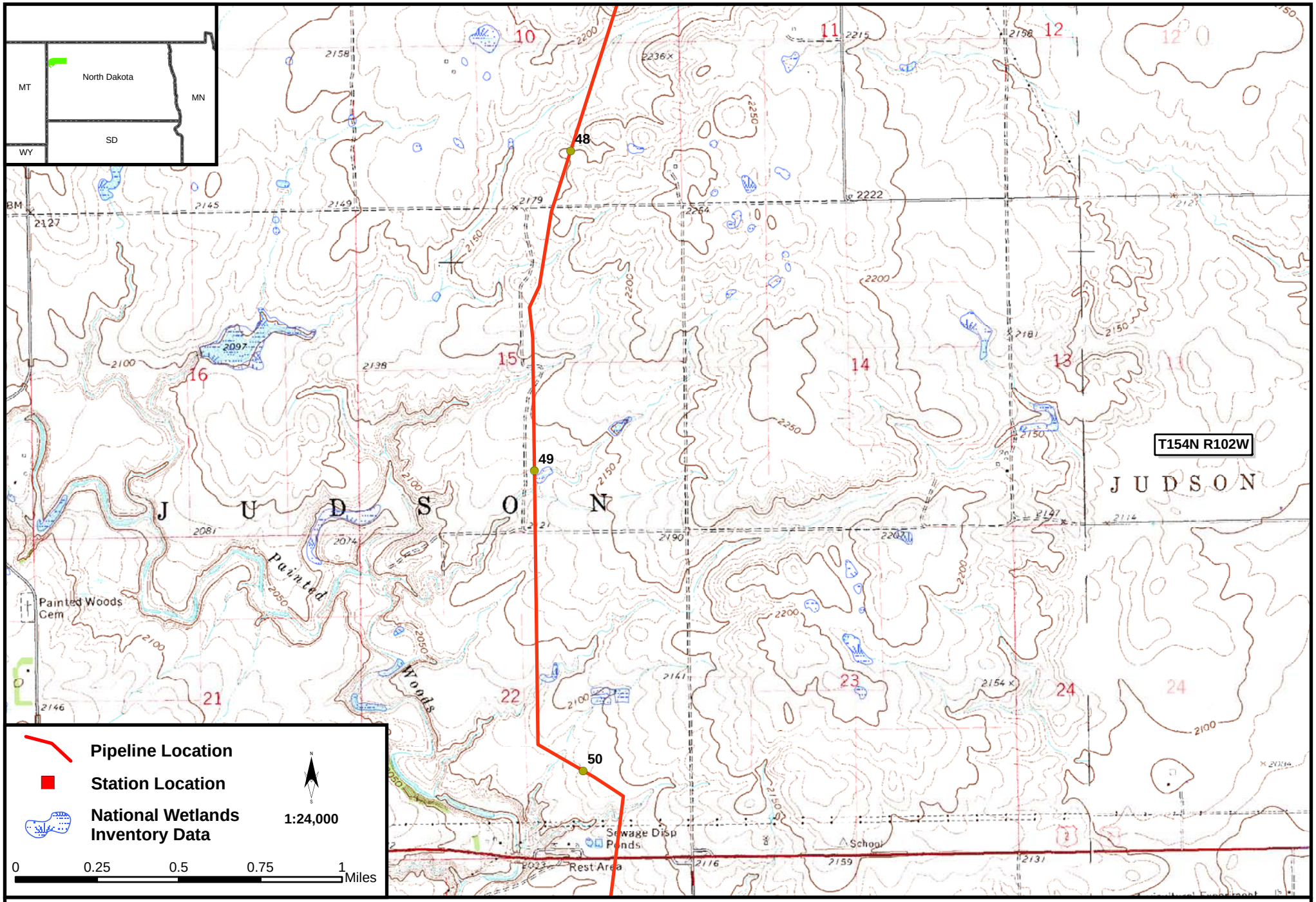
North Dakota Pipeline Expansion Project

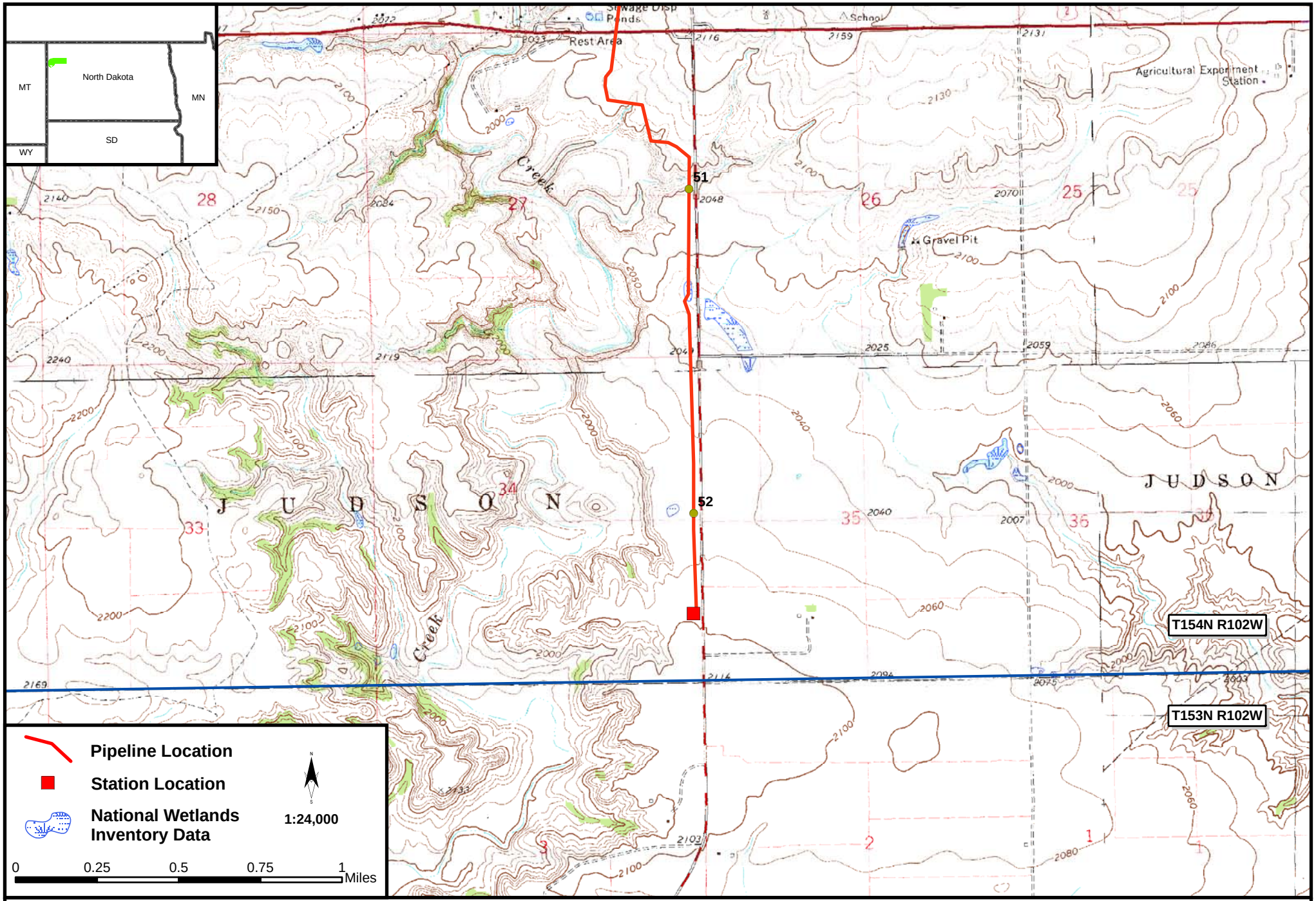
Location Map - Sheet 13 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 14 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 15 of 15

North Dakota Department of Health

Section 401 Certification

Tom Hess

From: Tom Hess [thess@merjent.com]

Sent: Thursday, July 20, 2006 10:19 AM

To: 'Kristen.Benson@enbridge.com'; 'Rachael.Shetka@enbridge.com'

Cc: 'John Muehlhausen'

Subject: Phase 5 pipeline, 401 Certification

Background

As we determined early in the scoping process for the North Dakota Expansion project, 401 Certification is automatic under the Corps of Engineers' Nationwide Permit #12 provided several criteria are met, including the project will not affect Class 1 or Class 1A streams. North Dakota lists the Little Muddy Creek as a Class 2 stream (see page 21 of the attached document). Therefore 401 Certification should be automatic through the NWP #12 permitting process.

Update

The North Dakota Game and Fish Department, in its consultation-response letter to Enbridge dated 6/30/06, refers to the Little Muddy Creek as a Class 1 fishery resource. I called Bruce Kreft and Mike McKenna, ND Game & Fish, this morning. Both are out of the office for the next week+. I left a voicemail message with Kreft, asking that he call me to clarify the fishery designation of Little Muddy Creek. I also called Mike Sauer of the ND Department of Health – the agency that administers Section 401 of the Clean Water Act in North Dakota. Sauer confirmed Little Muddy Creek is classified as a Class 2 stream under North Dakota's water quality standards. These are the standards that apply when determining waterbody classification relative to 401 Certification. Sauer explained that the Game and Fish Department has a separate and independent rating system for classifying waterbodies relative to fishery standards. A Class 1 fishery is not the same as a Class 1 stream. Enbridge's ND Expansion Project should receive automatic 401 Certification as part of the Corps of Engineers' NWP #12 permitting process.

merjent

615 First Avenue NE, Suite 425
Minneapolis, Minnesota 55413-2680

Tom Hess
thess@merjent.com

612-746-3667 direct
612-746-3660 main
612-746-3679 fax
612-802-5962 cell

North Dakota Game and Fish Department

Formal Solicitation of State Species and Habitat Concerns

Enbridge Pipelines (North Dakota) LLC
119 N. 25th Street East
Superior, WI 54880
Tel 715 394 1400
Fax 715 394 1570
www.enbridgepartners.com

Scott W. Lounsbury Supervisor, Environment
Kris H. Benson Environmental Analyst II
Paul R. Meneghini Sr. Environmental Analyst
Rachael A. Shetka Environmental Analyst
David M. Hoffman Sr. Environmental Analyst
Joseph P. Peterson Environmental Analyst II

July 12, 2006

Mr. Michael McKenna
North Dakota Game and Fish Department
100 N. Bismarck Expressway
Bismarck, North Dakota 58501-5095

RE: Enbridge Pipelines (North Dakota) LLC - North Dakota Pipeline Expansion Project
Amendment to May 25, 2006 State Species and Habitat Concerns Consultation

Dear Mr. McKenna,

On May 25, 2006, Enbridge Pipelines (North Dakota) LLC ("Enbridge") submitted a consultation letter requesting North Dakota Game and Fish Department review the North Dakota Pipeline Expansion Project for concerns related to North Dakota conservation priority species that could be affected by project activities. The consultation letter included USGS topographic maps and a legal description table of quarter sections that would be crossed by the proposed pipeline route. Since submitting our request, the North Dakota Public Service Commission (PSC) requested Enbridge review a mile-wide "evaluation corridor" along the proposed pipeline route for resources that could be affected by the proposed project.

Enbridge requests North Dakota Game and Fish Department review the evaluation corridor for concerns related to North Dakota conservation priority species. USGS topographic maps are enclosed that depict the anticipated pipeline route and the one-mile-wide evaluation corridor. The townships, ranges, sections, and quarter sections of the evaluation corridor are listed on the enclosed legal description table. Highlighted text in the table indicates locations that were not submitted as part Enbridge's initial May 25, 2006 consultation letter.

As explained in Enbridge's first consultation letter, the proposed expansion would involve constructing a new 53-mile-long underground pipeline adjacent to its existing underground pipeline, and modifying aboveground facilities along the project route between its Beaver Lodge Pump Station (about seven miles south of Tioga) and Trenton Pump Station (about six miles southwest of Williston). Construction is anticipated to require approximately three to five months to complete, with a tentative start date of August 2006. Due to the tight project schedule, Enbridge would appreciate your reply by July 26, 2006 if possible.

Enbridge is also consulting with the U.S. Fish and Wildlife Service regarding federally listed species. If you have questions or require further information regarding this project, please contact Tom Hess of Merjent, Inc., Enbridge's environmental consultant, at (612) 746-3667, or me at (715) 394-1572. Thank you for your continued assistance on this project.

Sincerely,
Enbridge Pipelines (North Dakota) LLC

Kris Benson
Environmental Analyst II, CHMM

Enclosures: Legal description table
Project location maps

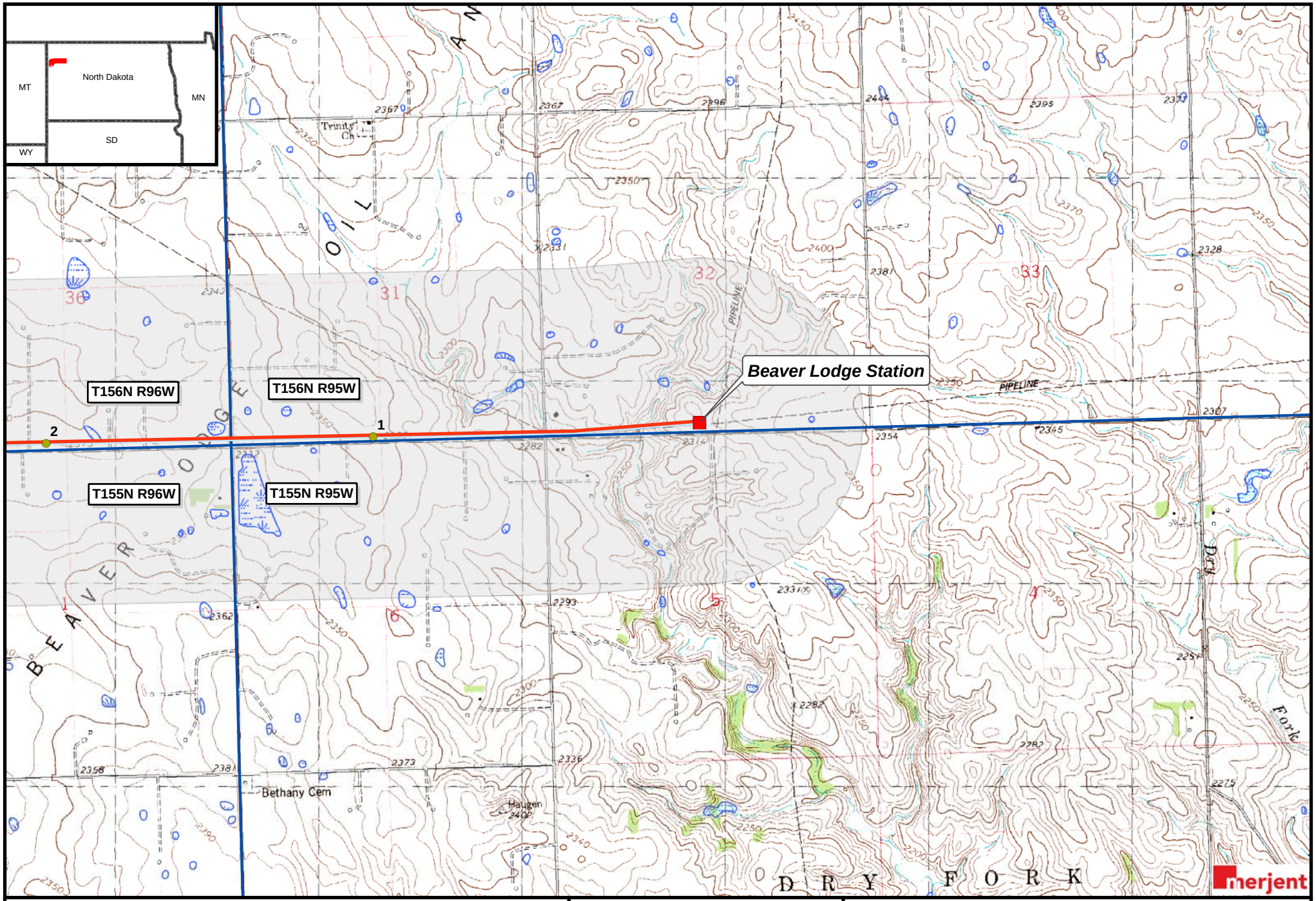
cc: Tom Hess, Merjent, Inc.

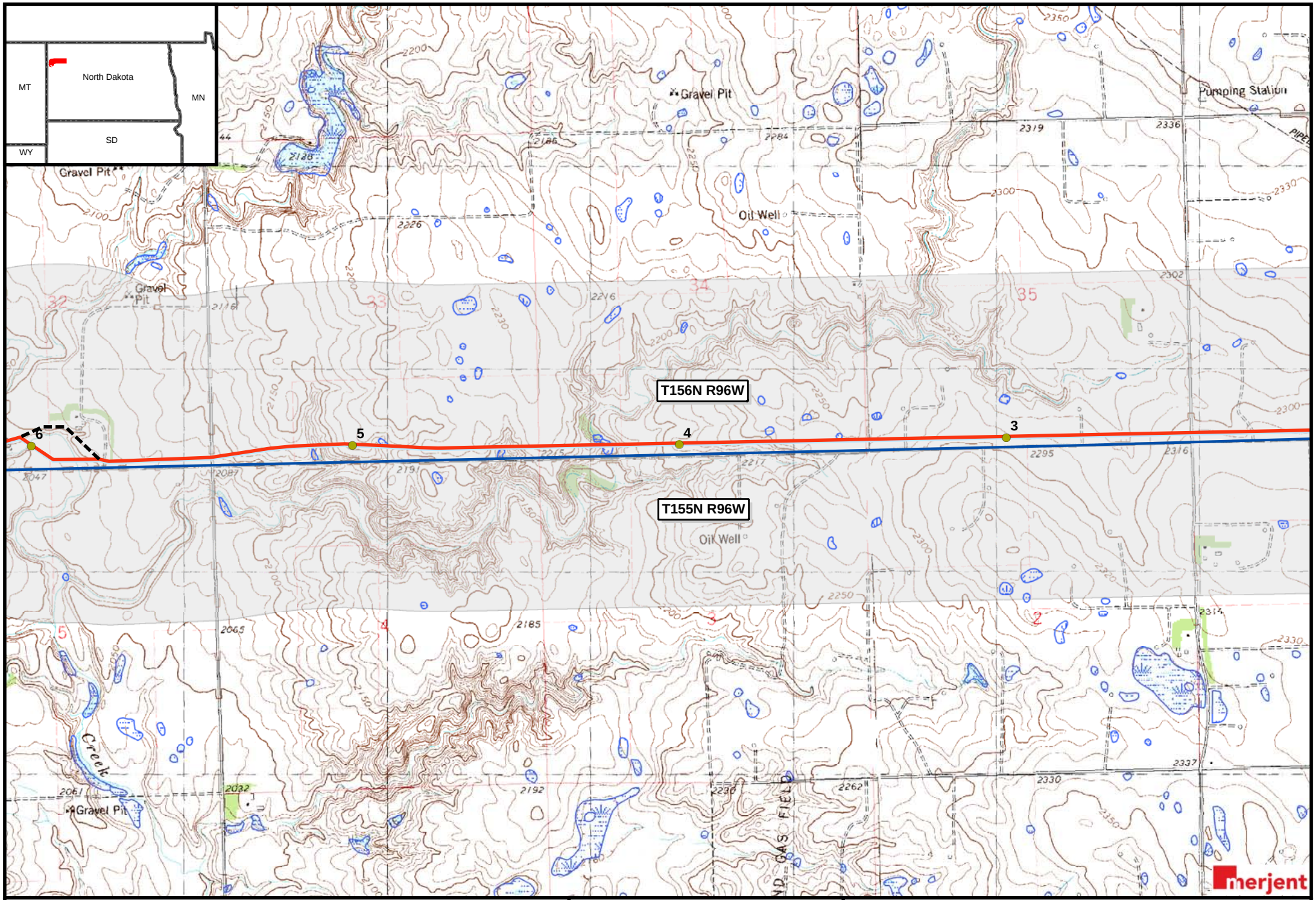
Enbridge Pipelines (North Dakota) LLC - North Dakota Pipeline Expansion Project
Legal Description Table

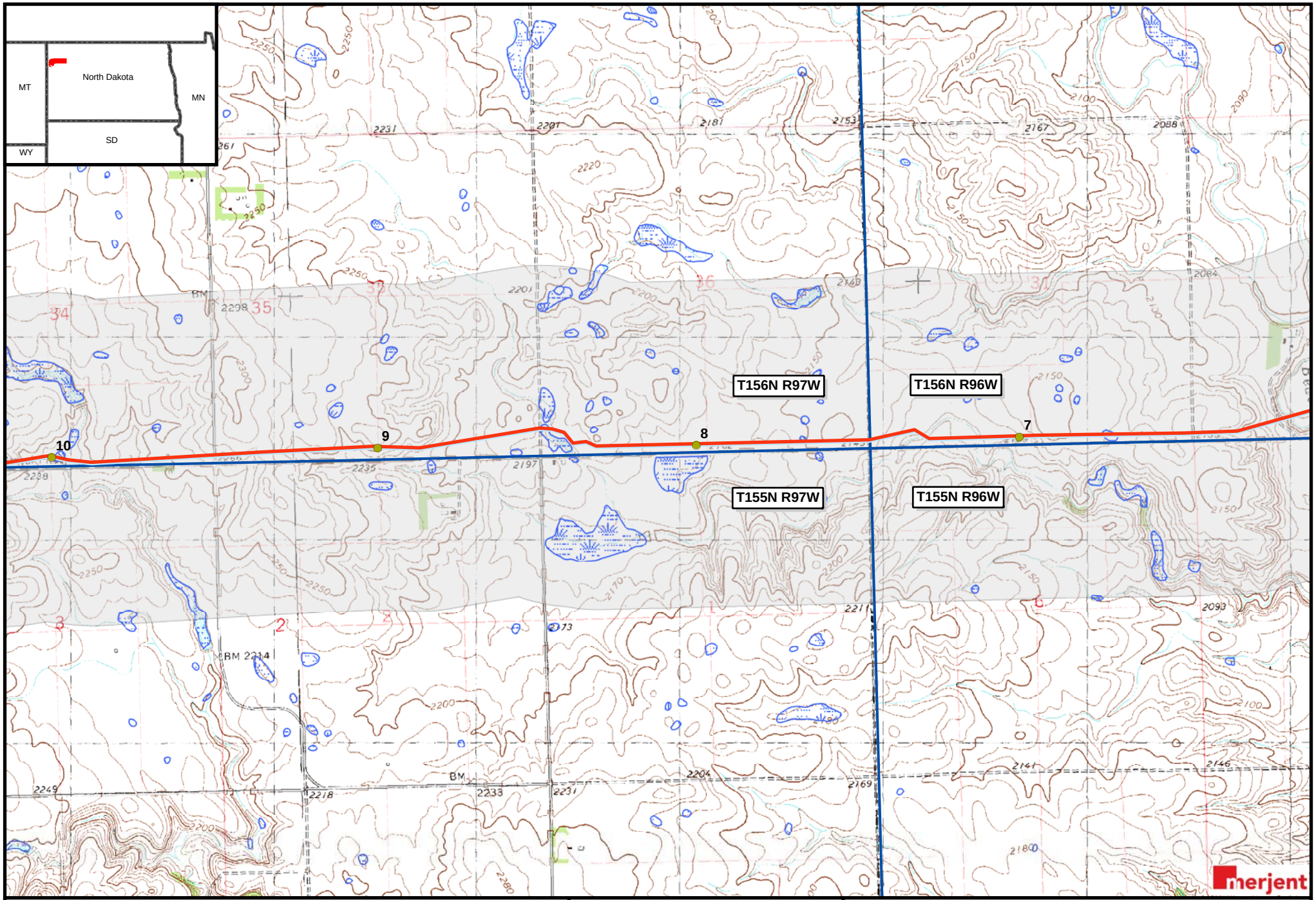
Township	Range	Section	Quarter Section [1]	Approximate Milepost
156N	95W	31 32	SW, SE SW, SE	0.0 – 1.5
155N	95W	5 6	NW, NE NW, NE	0.0 – 1.5
156N	96W	31 32 33 34 35 36	SW, SE NW, NE, SW, SE SW, SE SW, SE SW, SE SW, SE	1.5 – 7.5
155N	96W	1 2 3 4 5 6	NW, NE NW, NE NW, NE NW, NE NW, NE NW, NE	1.5 – 7.5
156N	97W	31 32 33 34 35 36	SW, SE SW, SE SW, SE SW, SE NE, SW, SE NW, SW, SE	7.5 – 13.5
155N	97W	1 2 3 4 5 6	NW, NE NW, NE NW, NE NW, NE NW, NE NW, NE	7.5 – 13.5
156N	98W	31 32 33 34 35 36	NW, SW, SE SW, SE SW, SE SW, SE SW, SE SW, SE	13.5 – 19.5
155N	98W	1 2 3 4 5 6	NW, NE NW, NE NW, NE NW, NE NW, NE NW, NE	13.5 – 19.5
156N	99W	31 32 33 34 35 36	SW, SE SW, SE NE SW, SE NW, NE SW, SE NW, NE SW, SE NW, NE, SW, SE	19.5 – 25.6
155N	99W	1 2 3 4 5 6	NW, NE NW, NE NW, NE NW, NE NW, NE NW, NE	19.5 – 25.6
156N	100W	31 32 33 34 35 36	NW, SW, SE SW, SE NW, NE SW, SE NW, NE SW, SE NW, NE SW, SE SW, SE	25.6 – 31.6

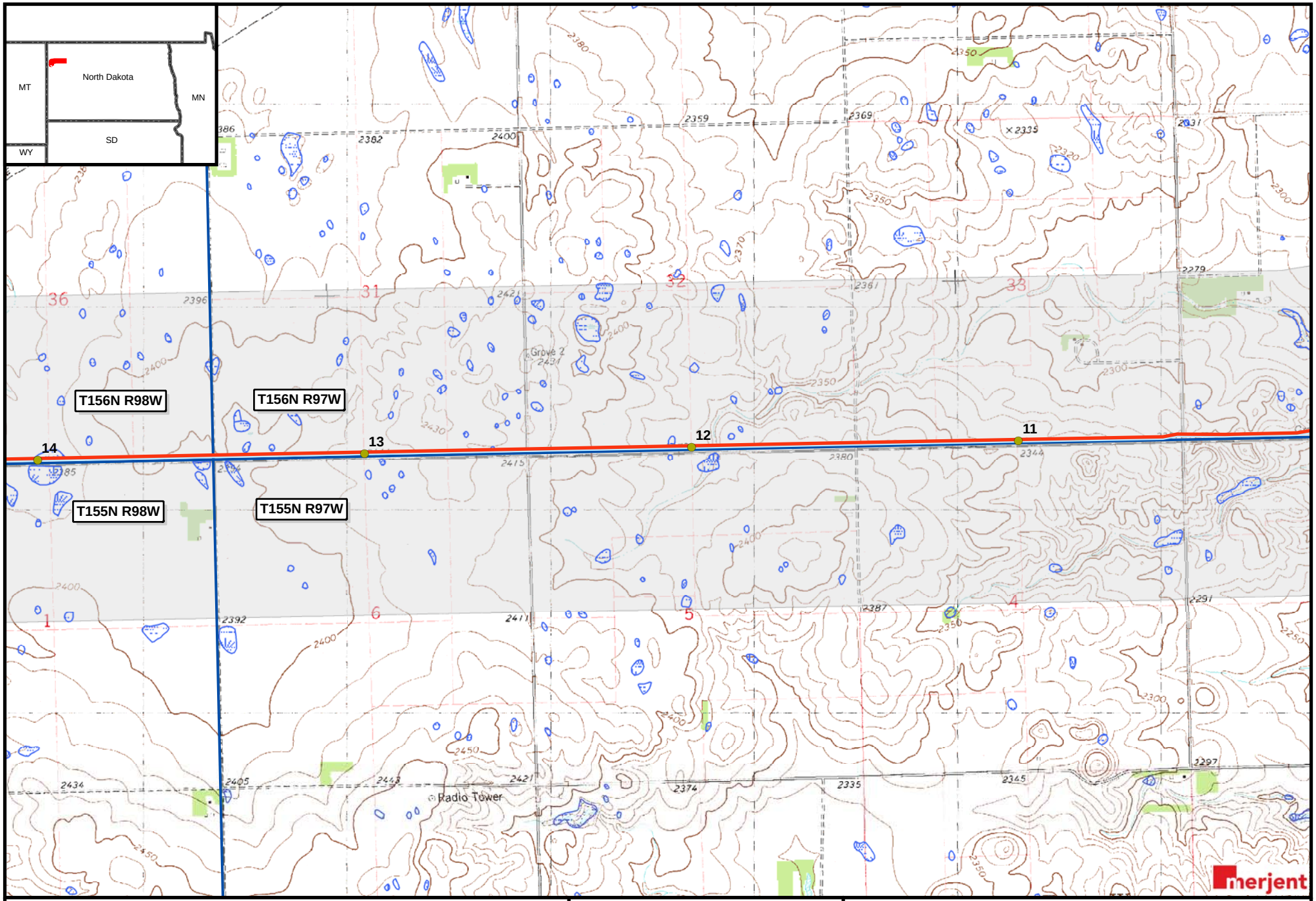
Township	Range	Section	Quarter Section [1]	Approximate Milepost
155N	100W	1 2 3 4 5 6	NW, NE NW, NE NW, NE NW, NE NW, NE NW, NE	25.6 – 31.6
156N	101W	35 36	SW, SE NW, NE SW, SE	31.6 – 33.1
155N	101W	1 2 3 4 5 6 7 8 9 10 11	NW, NE NW, NE, SW, SE SW, SE SW, SE SW, SE NW, NE SW, SE NW, NE NW, NE NW, NE NW, NE NW, NE	33.1 – 38.4
155N	102W	1 2 3 10 11 12 14 15 22 23 26 27 34 35	SW, SE SW, SE SE NE, SE NW, NE, SW NW, NE NW, SW NE, SW, SE NW, NE, SW, SE NW, SW NW, SW NW, NE, SE NW, NE, SW, SE NW, SW	38.4 – 46.2
154N	102W	2 3 10 11 14 15 22 23 26 27 34 35	NW, SW NW, NE, SW, SE NW, NE, SW, SE NW, SW NW NW, NE, SW, SE NW, NE, SW, SE SW NW, SW NW, NE, SE NE, SE NW, SW	46.2 – 52.5
153N	102W	2 3	NW, NE NW, NE	52.5

[1] Highlighted locations were not submitted as part Enbridge's initial May 25, 2006 consultation letter.


MT
North Dakota
MN
SD
WY
Beaver Lodge Station
T156N R96W
T156N R95W
T155N R96W
T155N R95W
PIPELINE
Bethany Cem
Haugen
DRY FORK
Existing Pipeline
Proposed Pipeline
Possible Reroutes
One Mile Evaluation Corridor
National Wetlands Inventory Data
ENBRIDGE
0 1,000 2,000 Feet
0 0.25 0.5 Miles
1:24,000
Enbridge Pipelines (North Dakota) LLC
North Dakota Pipeline Expansion Project
Location Map - Sheet 1 of 15
merjent


MT
North Dakota
MN
SD
WY
Gravel Pit
Pumping Station
Oil Well
T156N R96W
T155N R96W
6
5
4
3
Existing Pipeline
Proposed Pipeline
Possible Reroutes
One Mile Evaluation Corridor
National Wetlands Inventory Data
ENBRIDGE
0 1,000 2,000 Feet
0 0.25 0.5 Miles
1:24,000
Enbridge Pipelines (North Dakota) LLC
North Dakota Pipeline Expansion Project
Location Map - Sheet 2 of 15
merjent

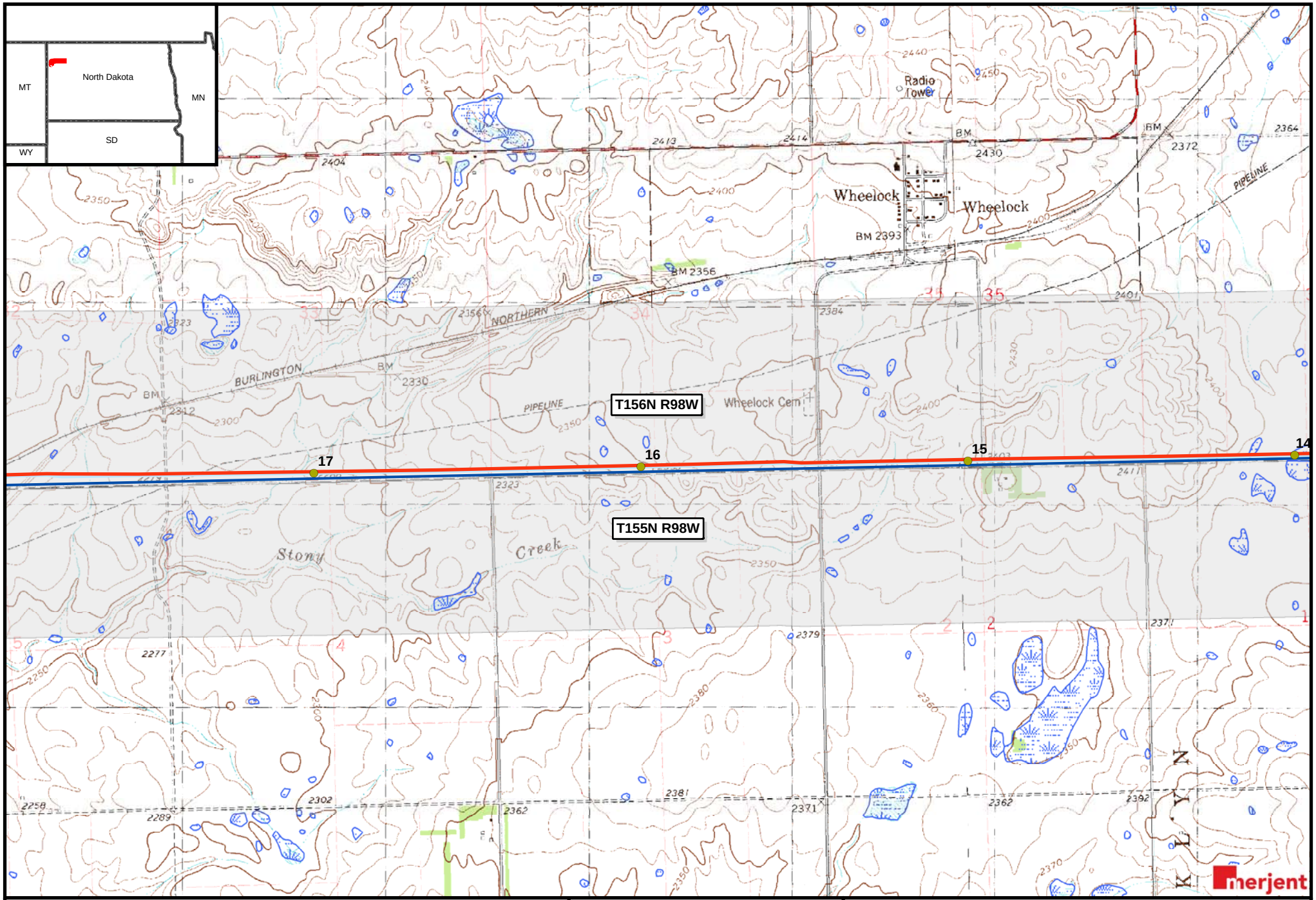

MT
North Dakota
MN
SD
WY
T156N R97W
T156N R96W
T155N R97W
T155N R96W
10
9
8
7
BM 2214
BM 2233
Existing Pipeline
Proposed Pipeline
Possible Reroutes
One Mile Evaluation Corridor
National Wetlands Inventory Data
ENBRIDGE
0 1,000 2,000 Feet
0 0.25 0.5 Miles
1:24,000
Enbridge Pipelines (North Dakota) LLC
North Dakota Pipeline Expansion Project
Location Map - Sheet 3 of 15
merjent



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 4 of 15



Existing Pipeline
Proposed Pipeline
Possible Reroutes

One Mile Evaluation Corridor
National Wetlands Inventory Data

ENBRIDGE

0 1,000 2,000 Feet

0 0.25 0.5 Miles

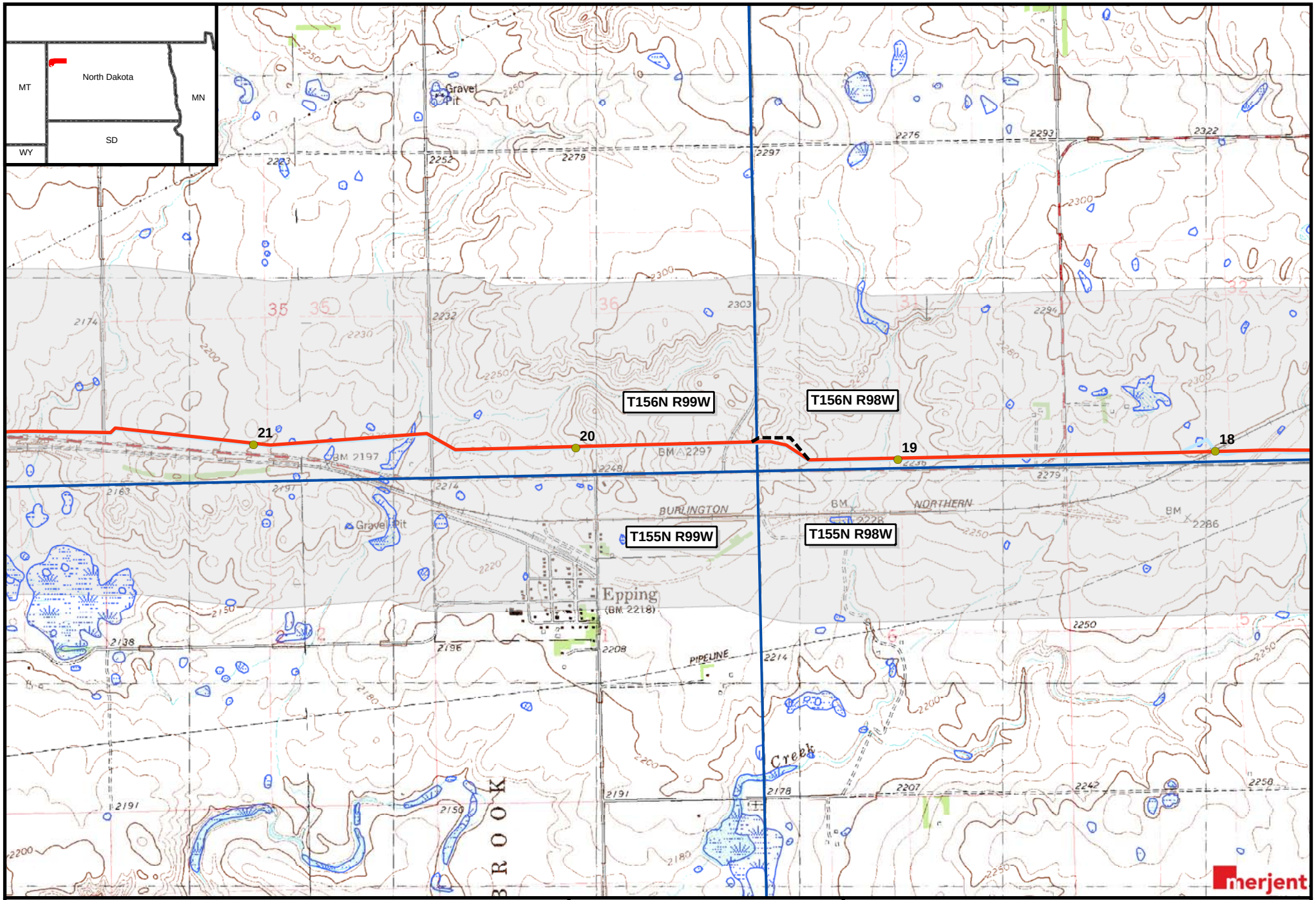
1:24,000

Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 5 of 15

merjent



Existing Pipeline

Proposed Pipeline

Possible Reroutes

One Mile Evaluation Corridor

National Wetlands Inventory Data

ENBRIDGE

0 1,000 2,000 Feet

0 0.25 0.5 Miles

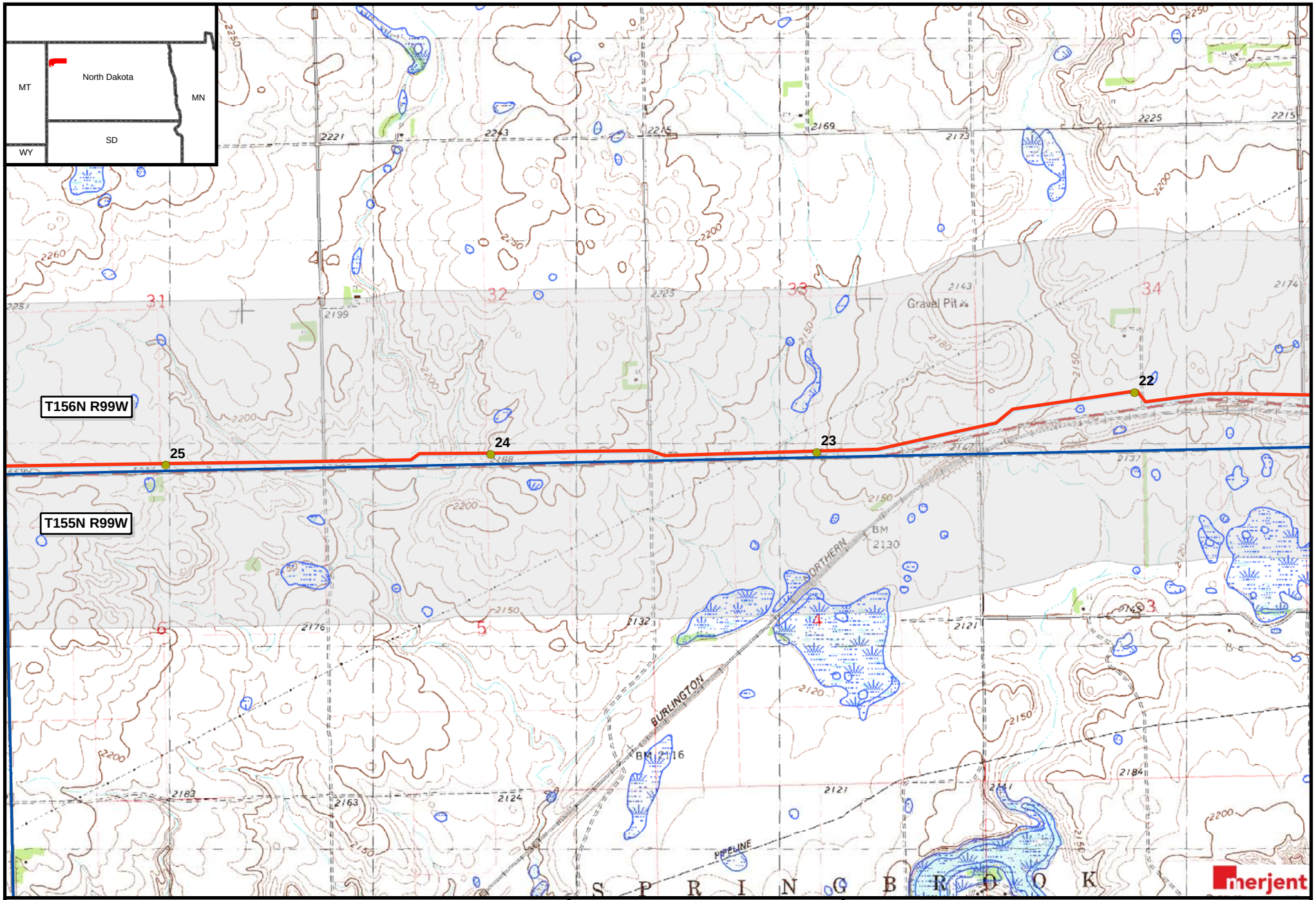
1:24,000

Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 6 of 15

merjent



Existing Pipeline
Proposed Pipeline
Possible Reroutes

One Mile Evaluation Corridor
National Wetlands Inventory Data

ENBRIDGE

0 1,000 2,000 Feet

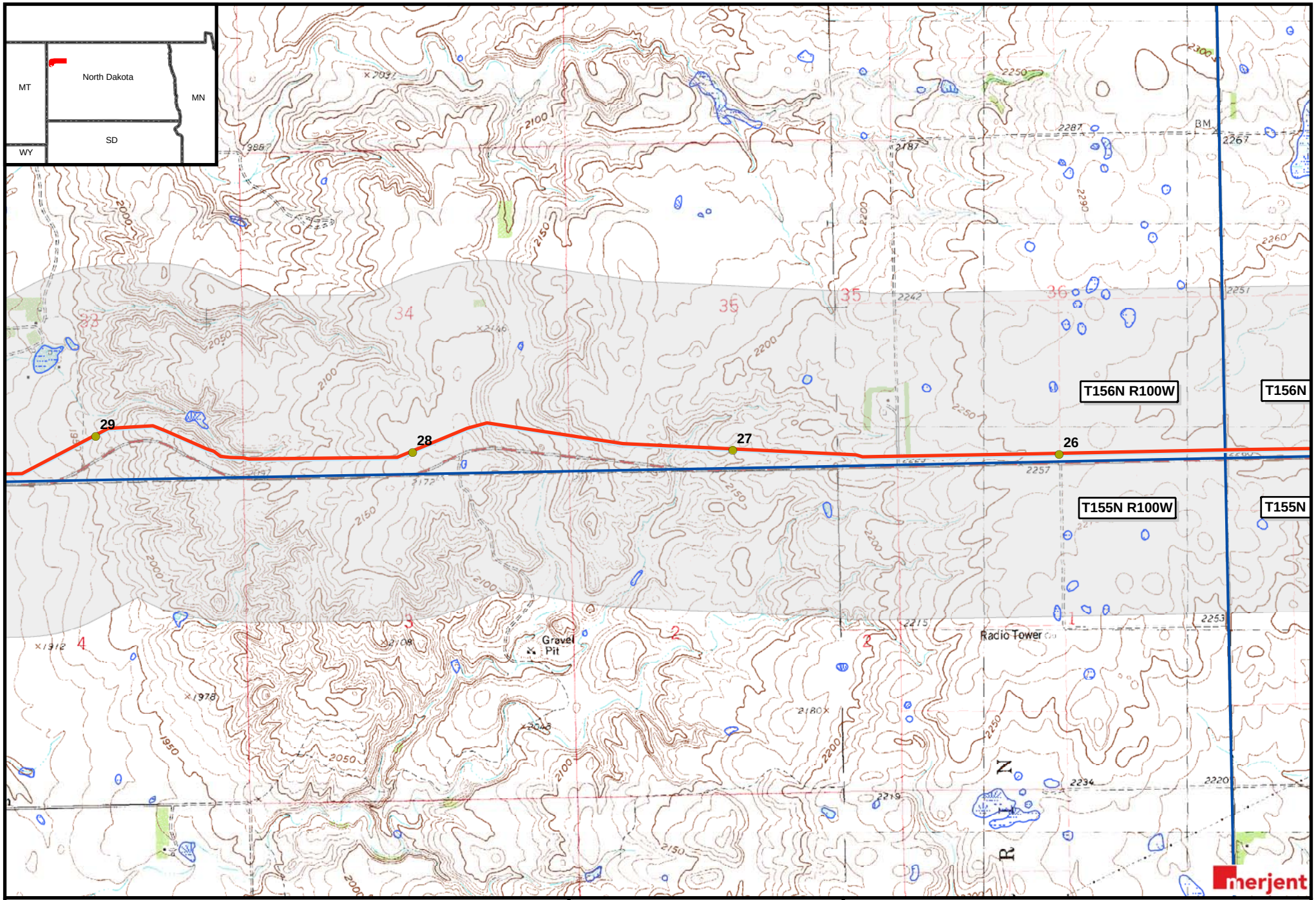
0 0.25 0.5 Miles

1:24,000

Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 7 of 15



Existing Pipeline
Proposed Pipeline
Possible Reroutes

One Mile Evaluation Corridor
National Wetlands Inventory Data

ENBRIDGE

0 1,000 2,000 Feet

0 0.25 0.5 Miles

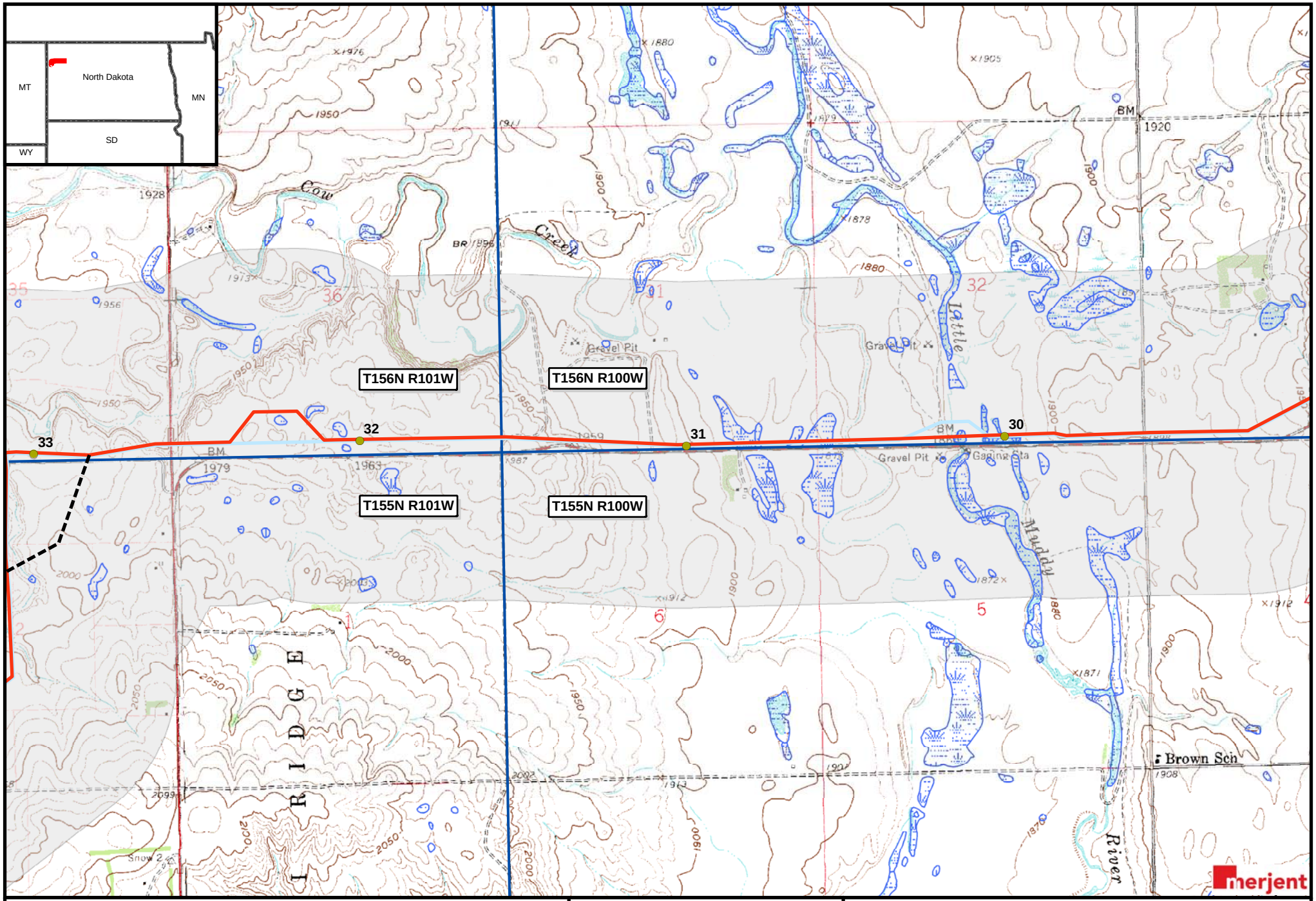
1:24,000

Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 8 of 15

merjent



Existing Pipeline
Proposed Pipeline
Possible Reroutes

One Mile Evaluation Corridor
National Wetlands Inventory Data

ENBRIDGE

0 1,000 2,000 Feet

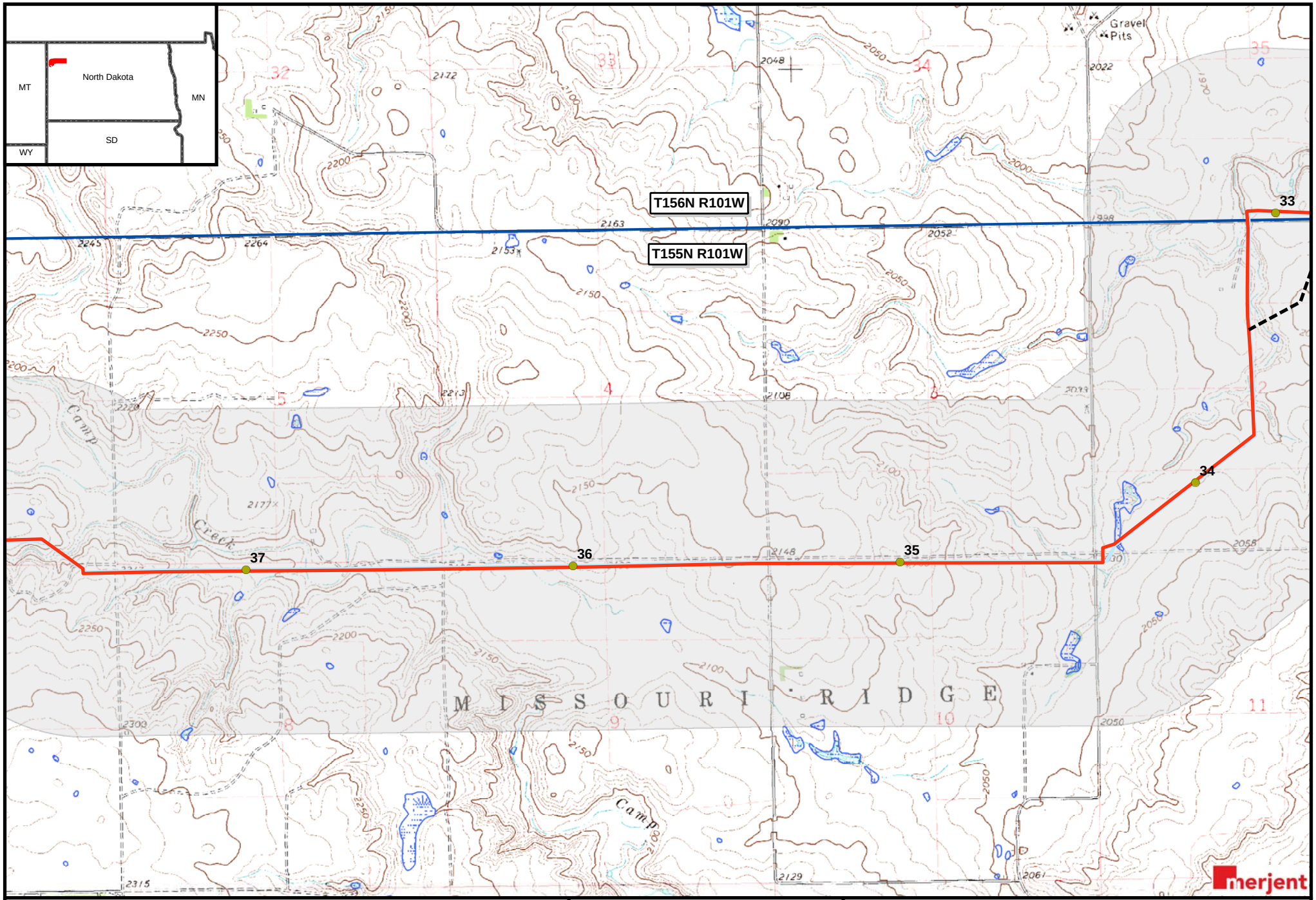
0 0.25 0.5 Miles

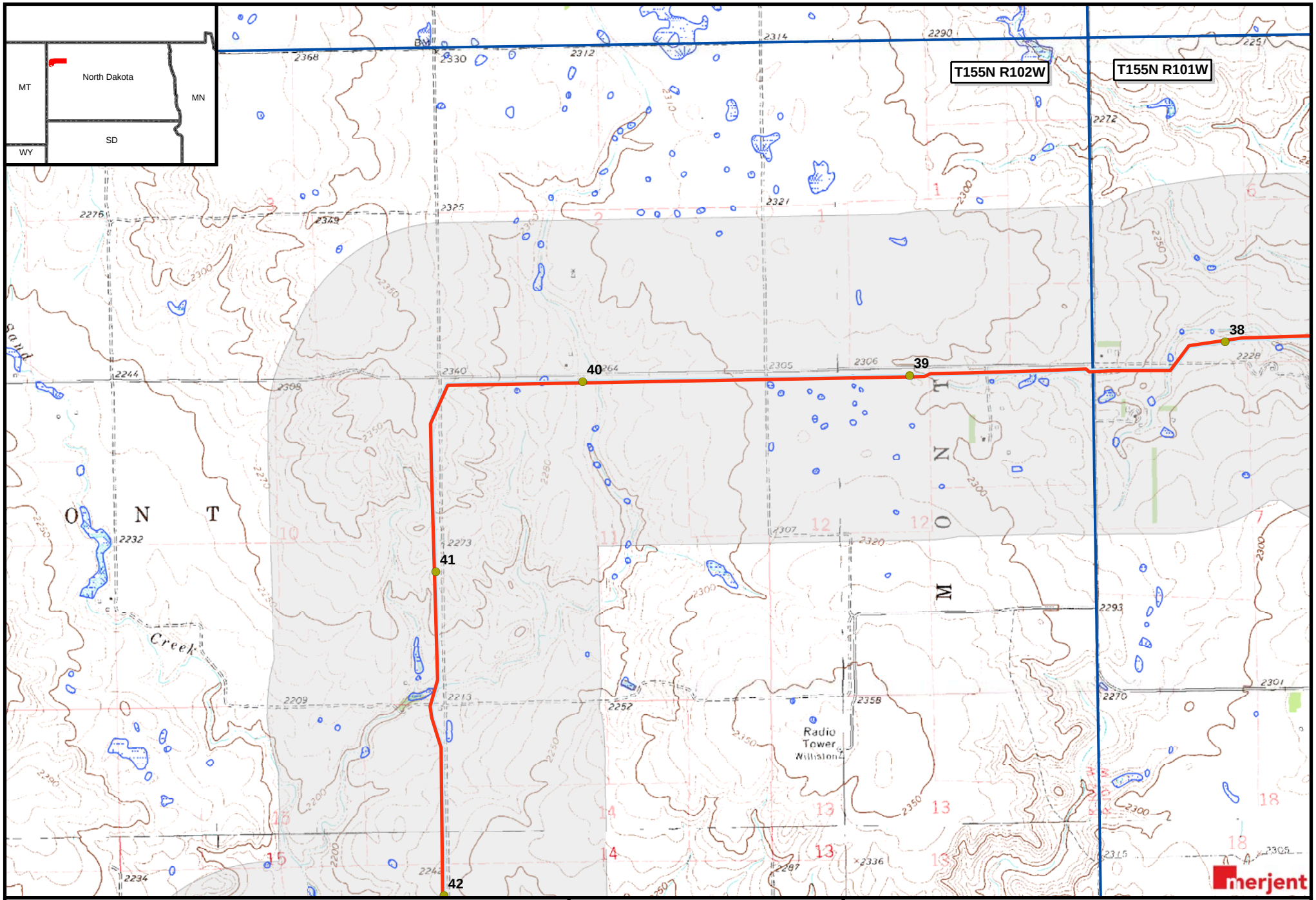
1:24,000

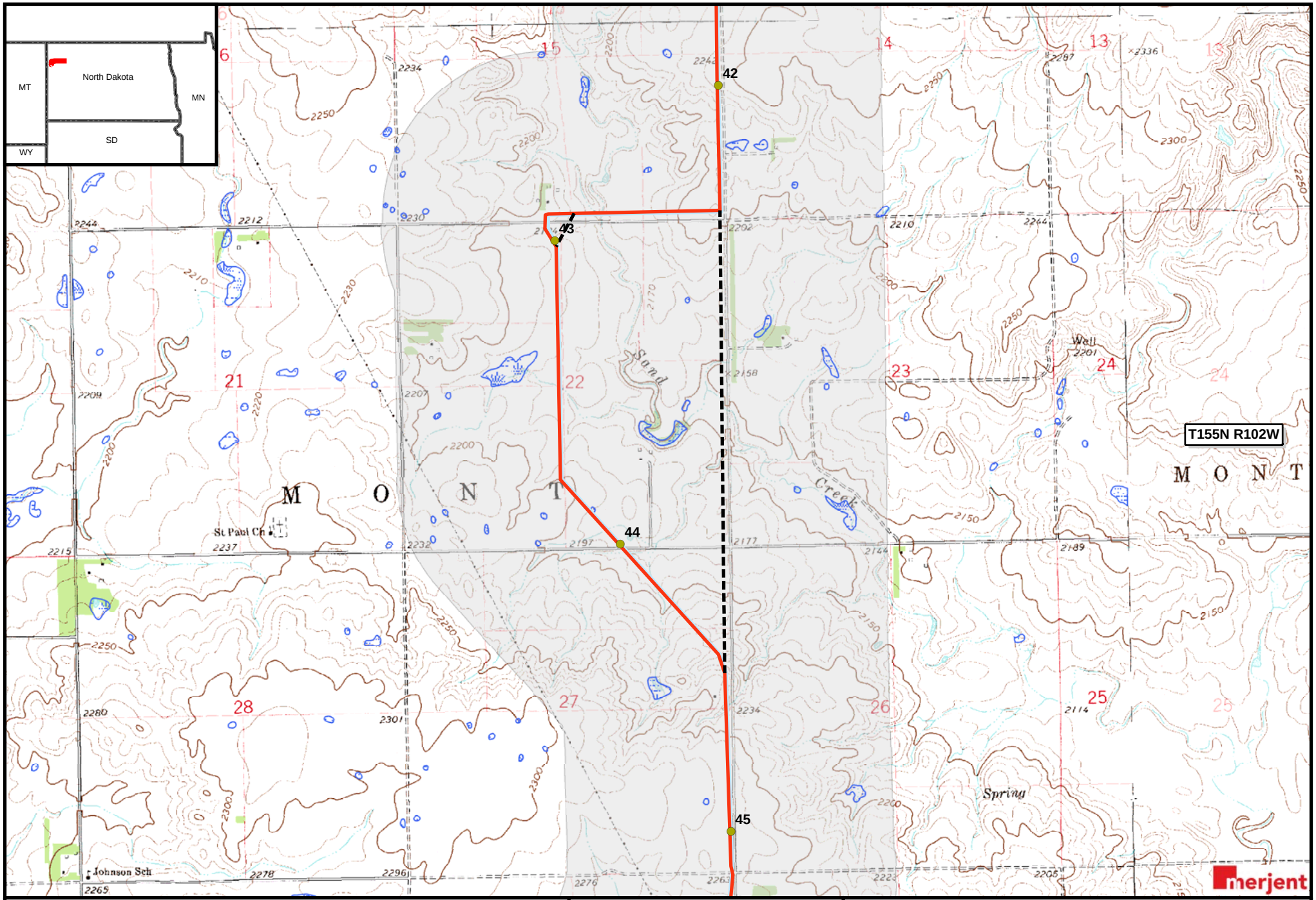
Enbridge Pipelines (North Dakota) LLC

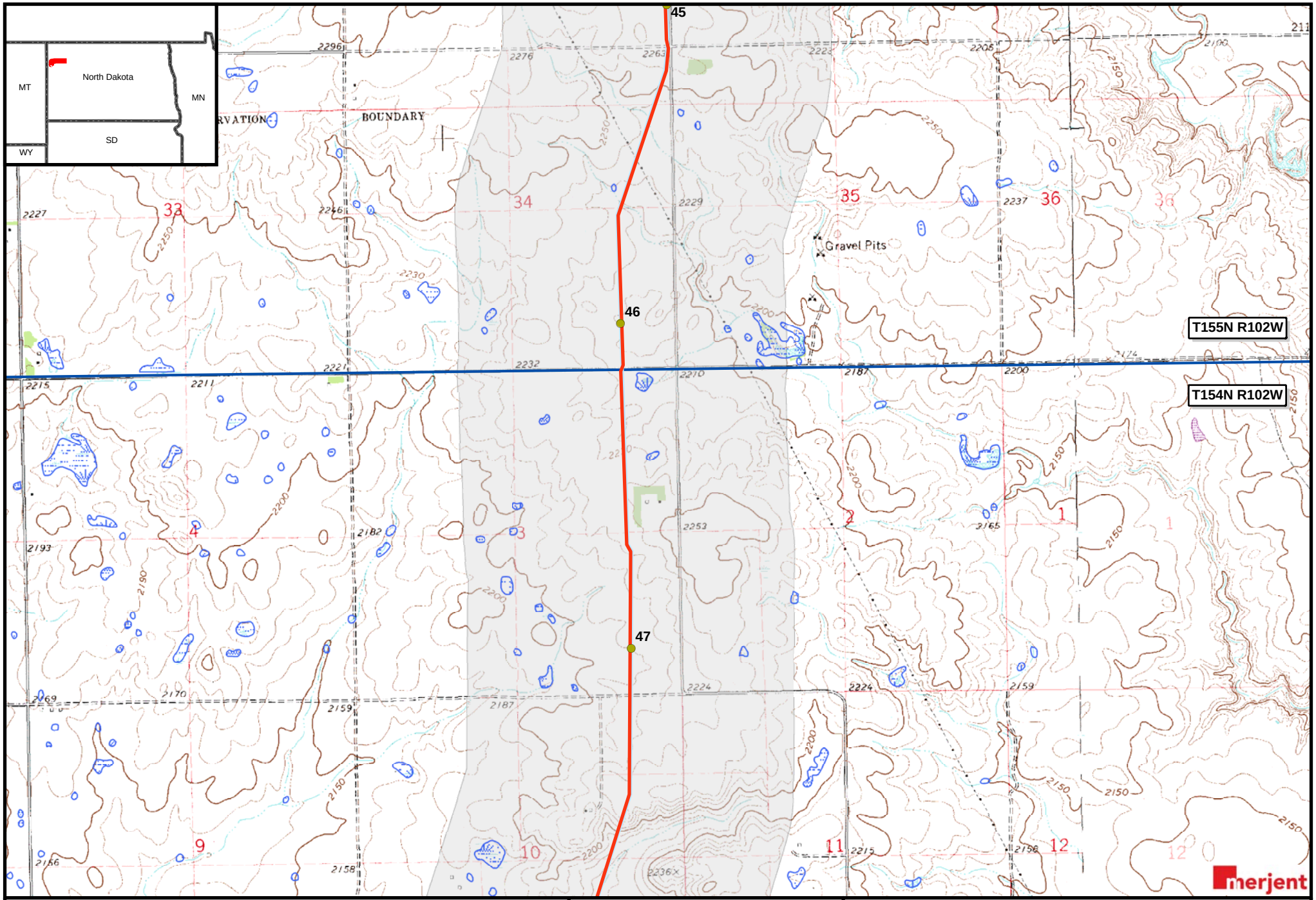
North Dakota Pipeline Expansion Project

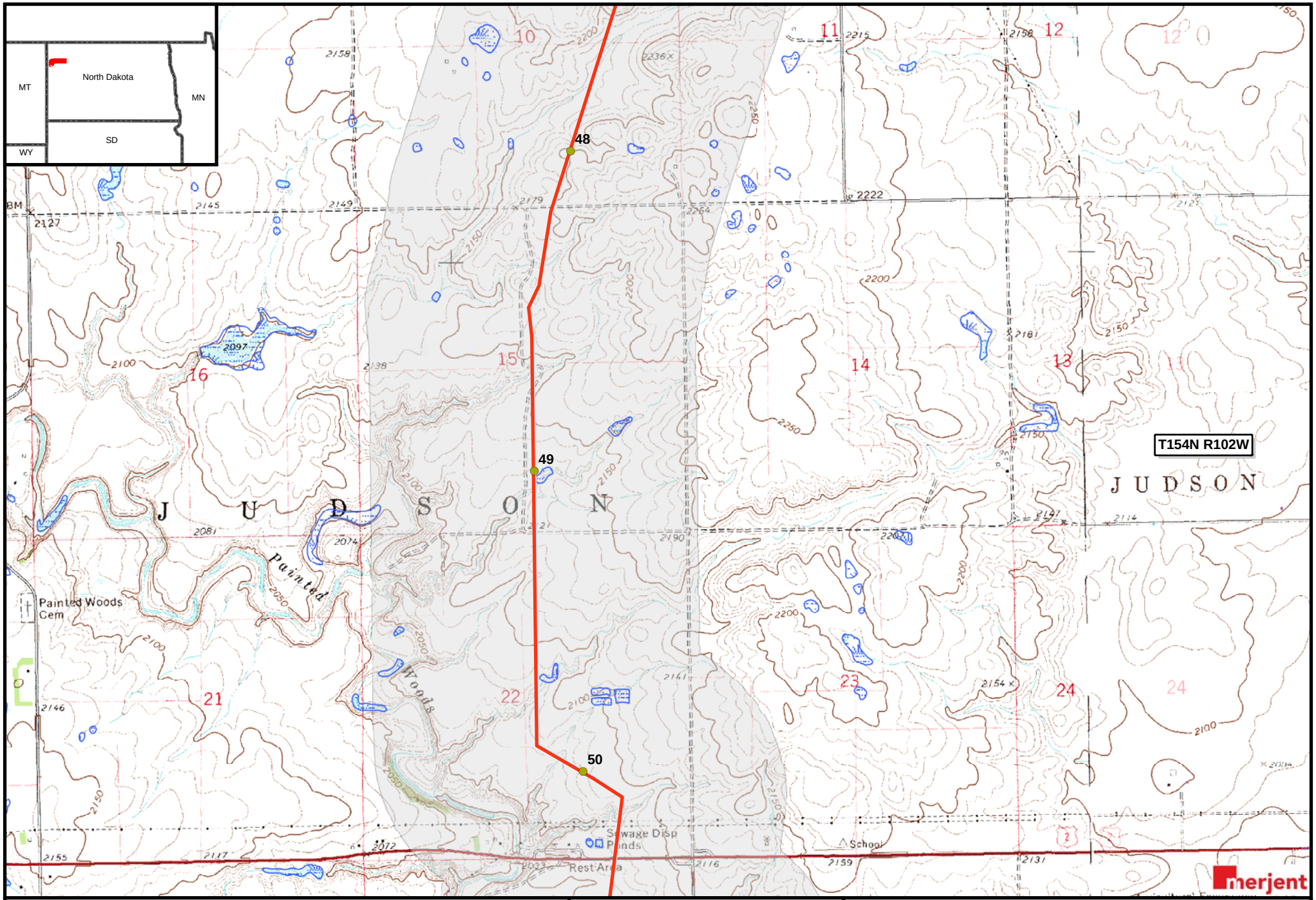
Location Map - Sheet 9 of 15


MT
North Dakota
MN
SD
WY
T156N R101W
T155N R101W
33
34
35
36
37
Gravel Pits
MISSOURI RIDGE
Camp Creek
Existing Pipeline
Proposed Pipeline
Possible Reroutes
One Mile Evaluation Corridor
National Wetlands Inventory Data
ENBRIDGE
0 1,000 2,000 Feet
0 0.25 0.5 Miles
1:24,000
Enbridge Pipelines (North Dakota) LLC
North Dakota Pipeline Expansion Project
Location Map - Sheet 10 of 15
merjent


MT
North Dakota
MN
SD
WY
T155N R102W
T155N R101W
38
39
40
41
42
Radio Tower
Williston
Creek
Existing Pipeline
Proposed Pipeline
Possible Reroutes
One Mile Evaluation Corridor
National Wetlands Inventory Data
ENBRIDGE
0 1,000 2,000 Feet
0 0.25 0.5 Miles
1:24,000
Enbridge Pipelines (North Dakota) LLC
North Dakota Pipeline Expansion Project
Location Map - Sheet 11 of 15
merjent


MT
North Dakota
MN
SD
WY
42
43
44
45
T155N R102W
M O N T
St Paul Ch
Johnson Sch
Sand Creek
Spring
Well
Existing Pipeline
Proposed Pipeline
Possible Reroutes
One Mile Evaluation Corridor
National Wetlands Inventory Data
ENBRIDGE
0 1,000 2,000 Feet
0 0.25 0.5 Miles
1:24,000
Enbridge Pipelines (North Dakota) LLC
North Dakota Pipeline Expansion Project
Location Map - Sheet 12 of 15
merjent


MT
North Dakota
MN
SD
WY
45
46
47
T155N R102W
T154N R102W
Gravel Pits
BOUNDARY
Existing Pipeline
Proposed Pipeline
Possible Reroutes
One Mile Evaluation Corridor
National Wetlands Inventory Data
ENBRIDGE
0 1,000 2,000 Feet
0 0.25 0.5 Miles
1:24,000
Enbridge Pipelines (North Dakota) LLC
North Dakota Pipeline Expansion Project
Location Map - Sheet 13 of 15
merjent



Existing Pipeline
Proposed Pipeline
Possible Reroutes

One Mile Evaluation Corridor
National Wetlands Inventory Data

ENBRIDGE

0 1,000 2,000 Feet

0 0.25 0.5 Miles

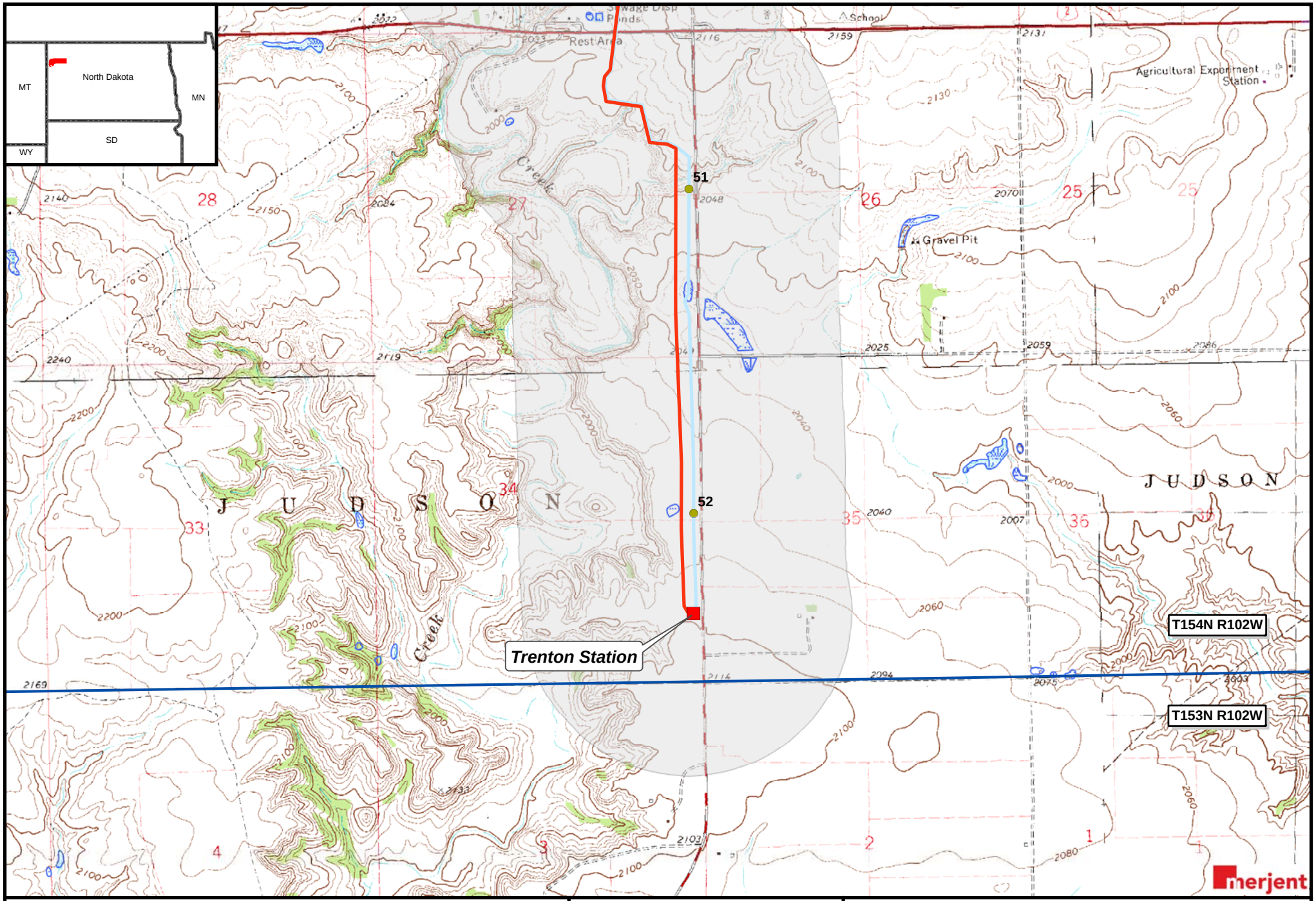
1:24,000

Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 14 of 15

merjent


MT
North Dakota
MN
SD
WY
51
52
Trenton Station
T154N R102W
T153N R102W
Gravel Pit
Agricultural Experiment Station
Rest Area
School
J U D S O N
Creek
Existing Pipeline
Proposed Pipeline
Possible Reroutes
One Mile Evaluation Corridor
National Wetlands Inventory Data
ENBRIDGE
0 1,000 2,000 Feet
0 0.25 0.5 Miles
1:24,000
Enbridge Pipelines (North Dakota) LLC
North Dakota Pipeline Expansion Project
Location Map - Sheet 15 of 15
merjent

"VARIETY IN HUNTING AND FISHING"

NORTH DAKOTA GAME AND FISH DEPARTMENT

100 NORTH BISMARCK EXPRESSWAY BISMARCK, NORTH DAKOTA 58501-5095 PHONE 701-328-6300 FAX 701-328-6352

June 30, 2006

Kris Benson
Environmental Analyst II
Enbridge Pipelines LLC
119 N 25th Street East
Superior, WI 54880

Dear Ms. Benson:

RE: Enbridge Energy Company - North Dakota Expansion Project

The North Dakota Game and Fish Department has reviewed this project for wildlife concerns. We do not believe it will have any significant adverse effects on wildlife or wildlife habitat, including rare or priority species, provided best management practices are implemented.

The National Wetland Inventory maps indicate numerous wetlands within the proposed project corridor. We recommend that steps be taken to protect any wetlands that cannot be avoided, above-ground appurtenances not be placed in wetland areas, and no alterations be made to existing drainage patterns. We also ask that every effort be made to prevent destruction of woody vegetation and any loss of trees and shrubs be replaced on a 2:1 basis.

The pipeline will cross Little Muddy Creek, a Class I fishery resource. We recommend this stream be crossed by directional boring if possible. If this method is not feasible, construction should not take place within the waterway between April 15 and June 1, and controls should be implemented to minimize erosion and sedimentation. We suggest the US Army Corps of Engineers' North Dakota Regulatory Office be contacted for permit requirements under Section 404 of the Clean Water Act.

Sincerely,

Michael G. McKenna
Chief
Conservation & Communication Division

js

Enbridge Pipelines (Lakehead) L.L.C.
119 N. 25th Street East
Superior, WI 54880
Tel 715 394 1400
Fax 715 394 1570
www.enbridgepartners.com

Scott W. Lounsbury Supervisor, Environment
Kris H. Benson Environmental Analyst II
Paul R. Meneghini Sr. Environmental Analyst
Rachael A. Shetka Environmental Analyst
David M. Hoffman Sr. Environmental Analyst
Joseph P. Peterson Environmental Analyst II

May 25, 2006

Mr. Michael McKenna
North Dakota Game and Fish Department
100 N. Bismarck Expressway
Bismarck, North Dakota 58501-5095

RE: Enbridge Energy Company - North Dakota Expansion Project
Formal Solicitation of State Species and Habitat Concerns

Dear Mr. McKenna,

Enbridge Pipelines (North Dakota) LLC ("Enbridge") is presently evaluating a project to expand a portion of its North Dakota pipeline system. The proposed expansion would involve constructing a new underground pipeline adjacent to a portion of its existing underground pipeline, and potentially modifying aboveground facilities along the project route. Enbridge anticipates the proposed pipeline will be collocated in the same corridor as its existing pipeline and will extend approximately 53 miles between its Beaver Lodge Pump Station (about 7 miles south of Tioga) and Trenton Pump Station (about 6 miles southwest of Williston). USGS topographic maps are enclosed that depict the anticipated pipeline route. Construction will require approximately 3-5 months to complete during a yet to be scheduled time period between August 2006 and July 2007.

Enbridge requests North Dakota Game and Fish Department review the anticipated project area for concerns related to North Dakota conservation priority species that could be affected by project activities. The townships, ranges, sections, and quarter sections crossed by the anticipated workspace areas are listed on the enclosed legal description table.

Enbridge is also consulting with the U.S. Fish and Wildlife Service regarding federally listed species. If you have questions or require further information regarding this project, please contact Tom Hess of Merjent, Inc., Enbridge's environmental consultant, at (612) 746-3667, or me at (715) 394-1572. Thank you.

Sincerely,
Enbridge Pipelines (North Dakota) LLC

Kris Benson
Environmental Analyst II, CHMM

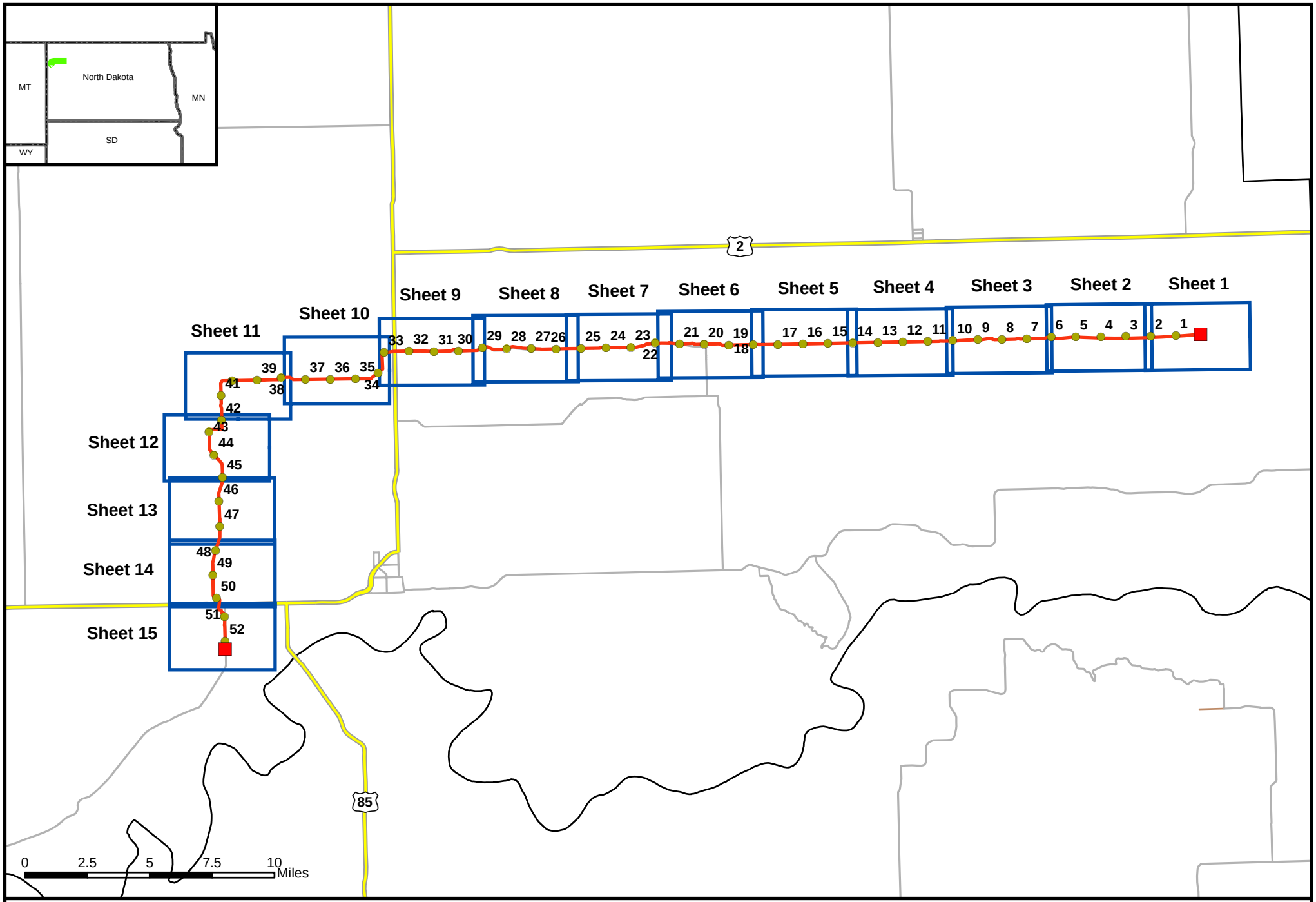
Enclosures: Legal description table
Project location maps

cc: Tom Hess, Merjent, Inc.

Enbridge Pipelines (North Dakota) LLC - North Dakota Pipeline Expansion Project
Legal Description Table

Township	Range	Section	Quarter Section	Approximate Milepost [1]
156N	95W	31 32	SW, SE SW, SE	0.0 – 1.5
156N	96W	31 32 33 34 35 36	SW, SE SW, SE SW, SE SW, SE SW, SE SW, SE	1.5 – 7.5
156N	97W	31 32 33 34 35 36	SW, SE SW, SE SW, SE SW, SE SW, SE SW, SE	7.5 – 13.5
156N	98W	31 32 33 34 35 36	SW, SE SW, SE SW, SE SW, SE SW, SE SW, SE	13.5 – 19.5
156N	99W	31 32 33 34 35 36	SW, SE SW, SE SW, SE SW, SE SW, SE SW, SE	19.5 – 25.6
156N	100W	31 32 33 34 35 36	SW, SE SW, SE SW, SE SW, SE SW, SE SW, SE	25.6 – 31.6
156N	101W	35 36	SW, SE SW, SE	31.6 – 33.1
155N	101W	2 3 6 7 8 9 10 11	NW, NE, SW, SE SE SW, SE NW, NE NW, NE NW, NE NW, NE NW	33.1 – 38.4
155N	102W	1 2 3 10 11 12 15 22 27 34	SW, SE SW, SE SE NE, SE NW, NE NW, NE NE, SW, SE NW, NE, SW, SE NE, SE NE, SE	38.4 – 46.2
154N	102W	3 10 15 22 27 34	NE, SE NE, SW, SE NW, NE, SW, SE NW, NE, SW, SE NE, SE NE, SE	46.2 – 52.5

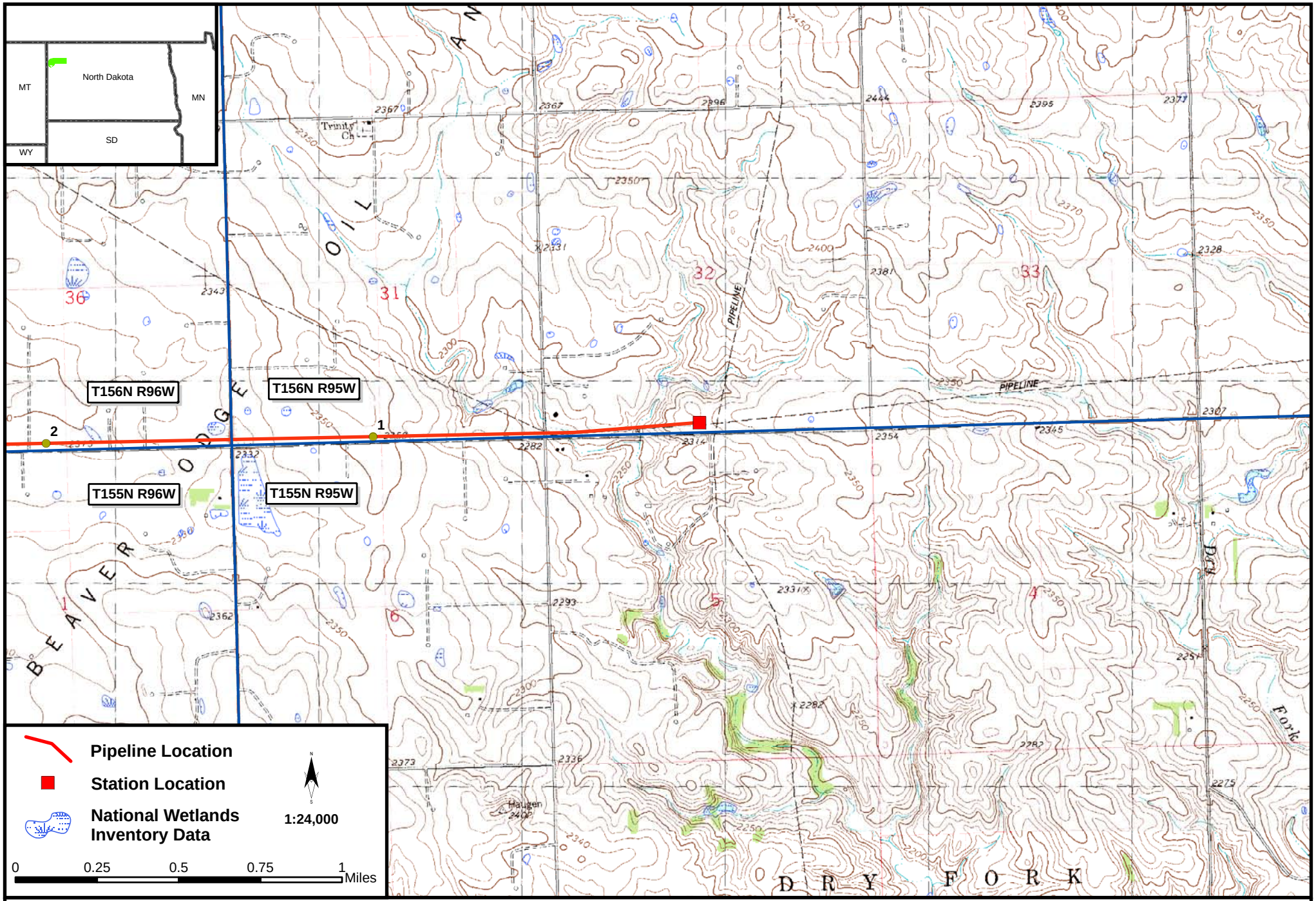
[1] The approximate milepost designations should be considered preliminary and only used for environmental review purposes as numeric identifiers of the proposed pipeline route. The final milepost designations will be determined by Enbridge just prior to construction and may vary from those provided in this table.



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

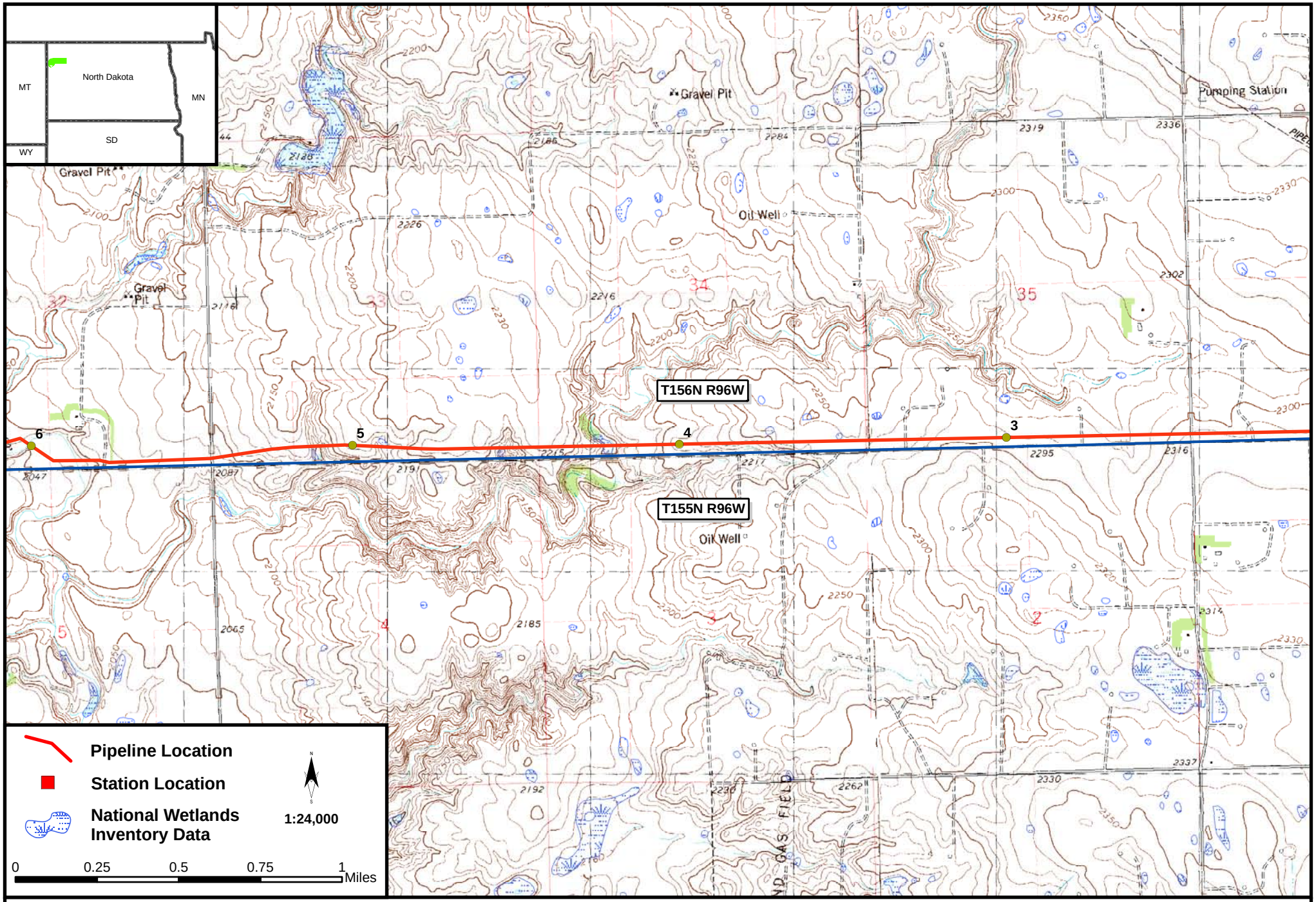
Location Map - Index



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

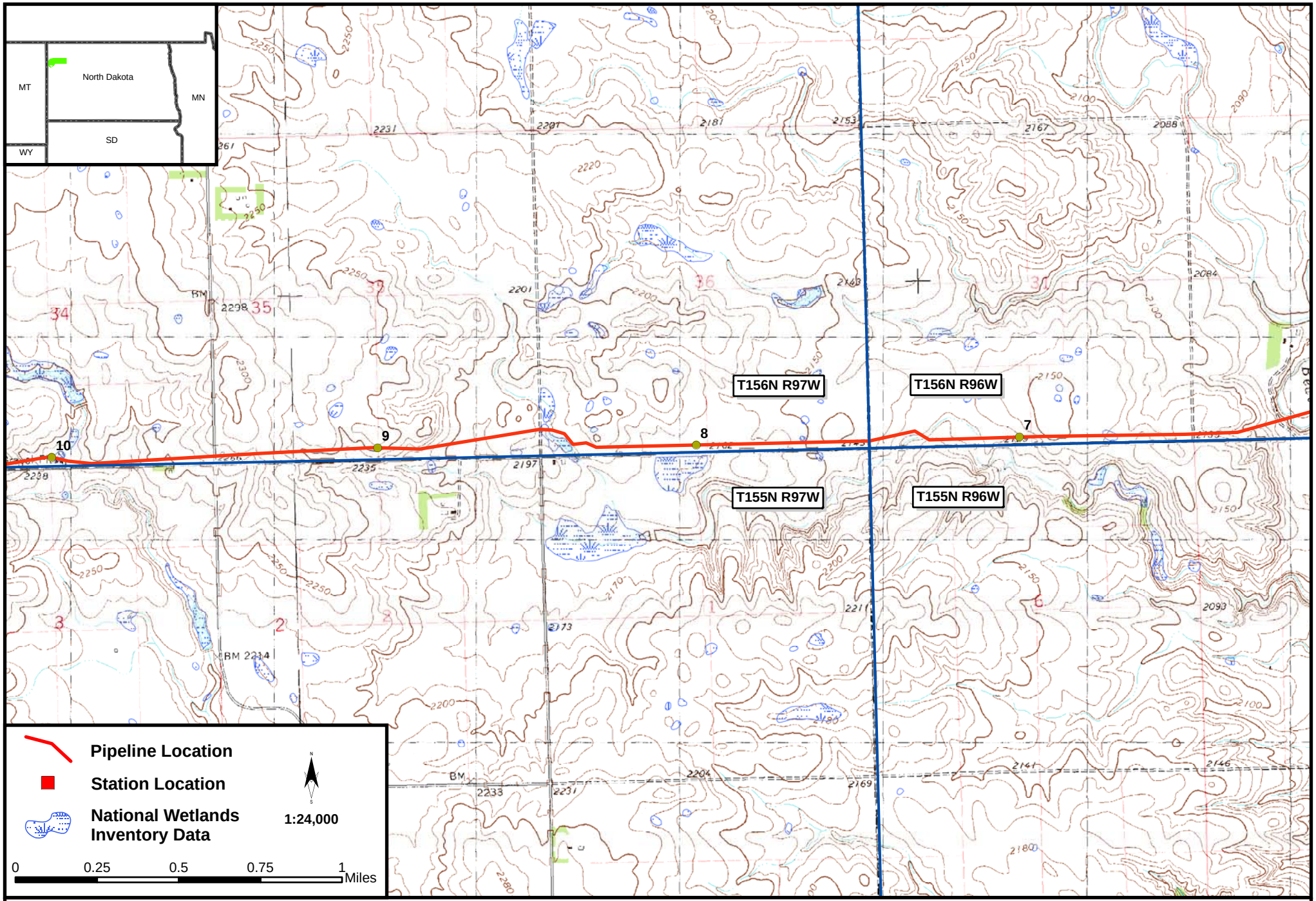
Location Map - Sheet 1 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

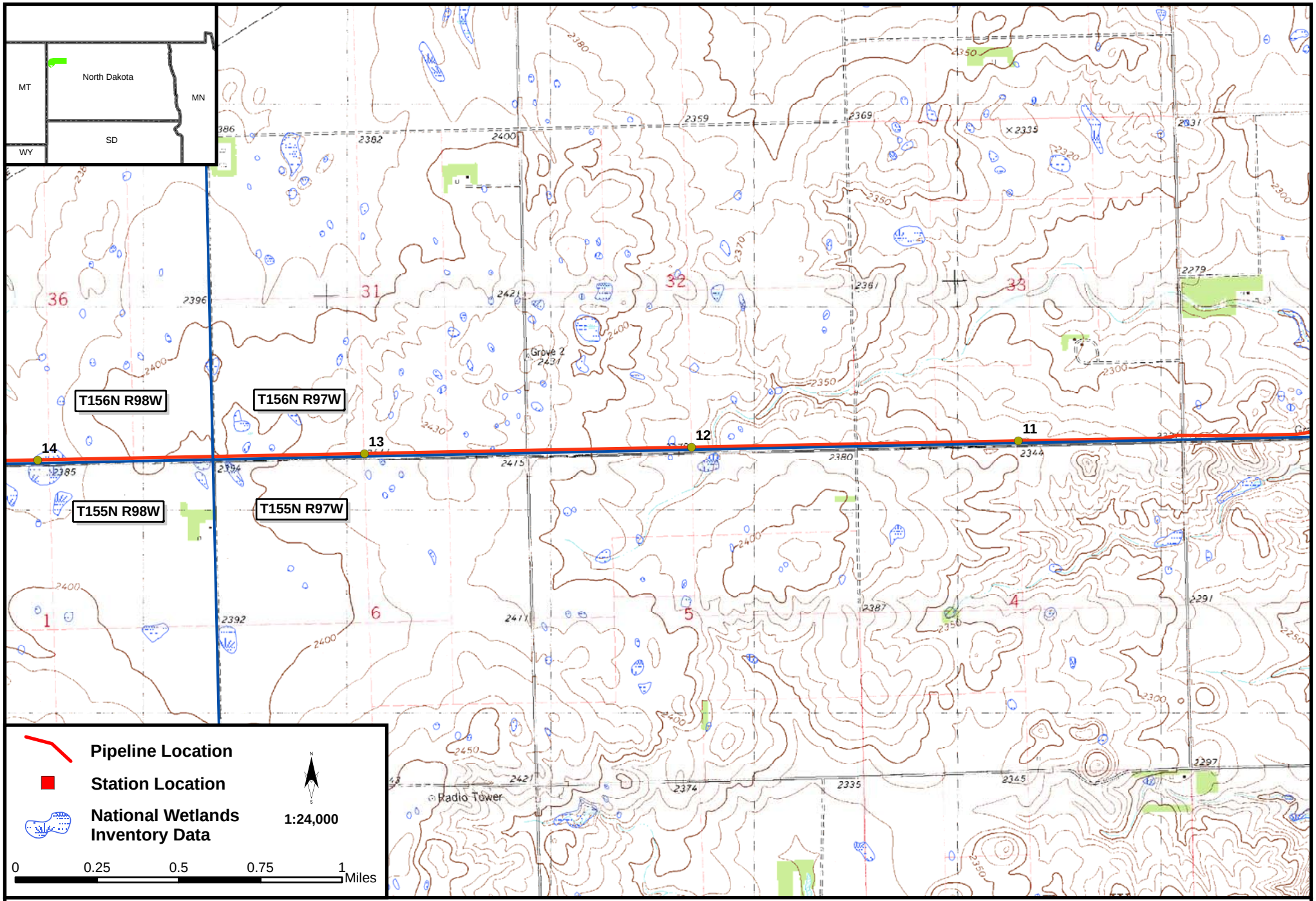
Location Map - Sheet 2 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

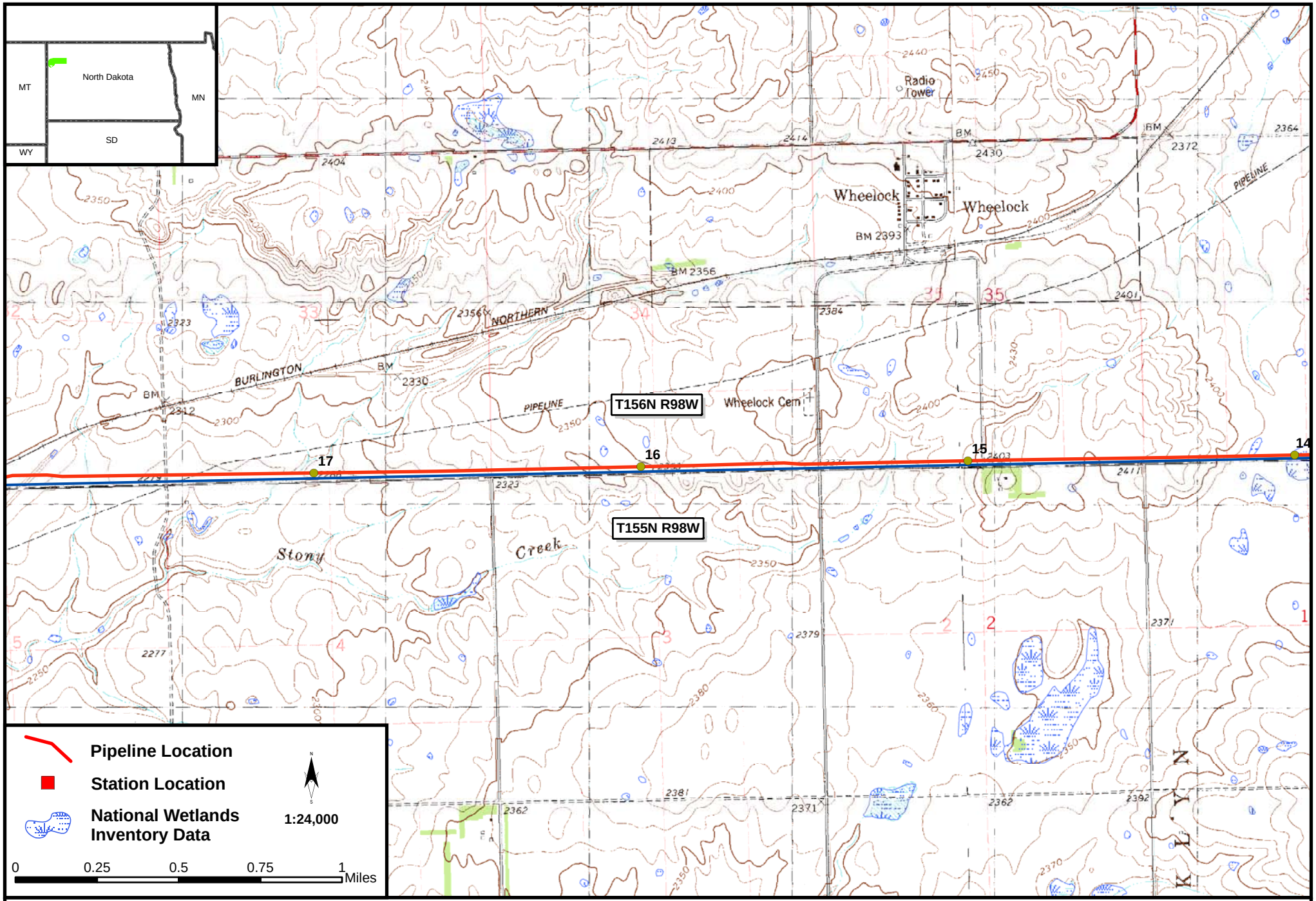
Location Map - Sheet 3 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

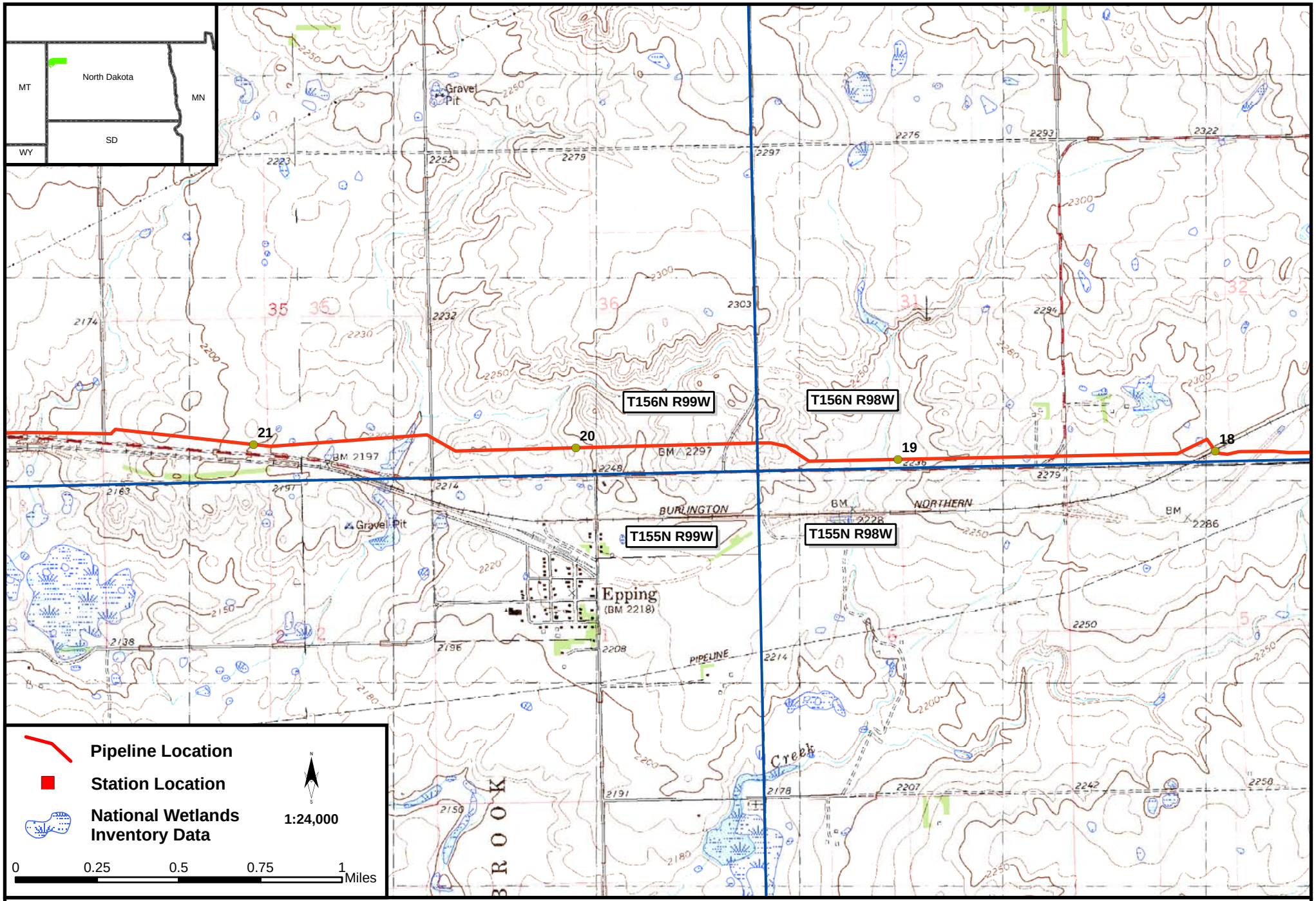
Location Map - Sheet 4 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

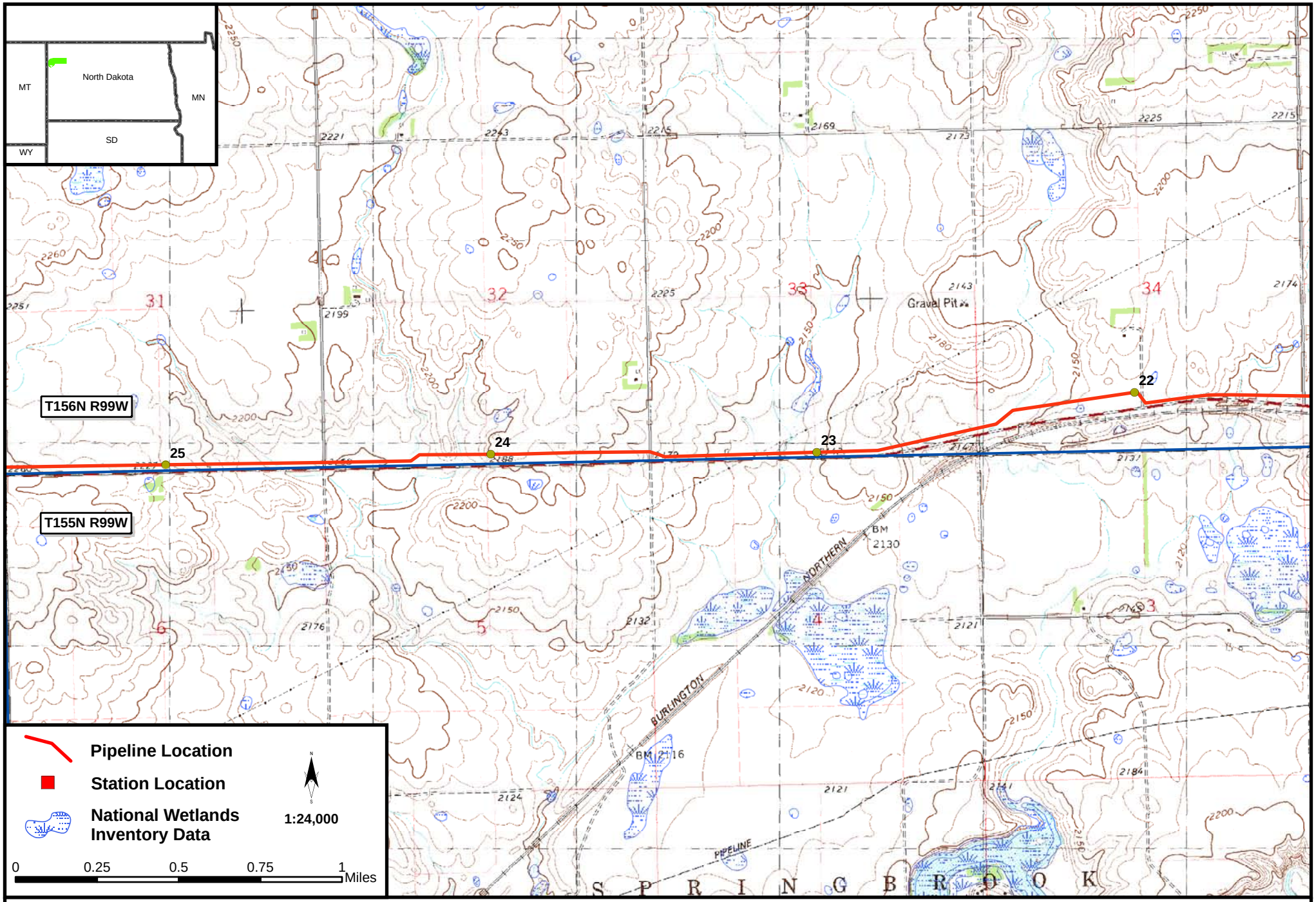
Location Map - Sheet 5 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

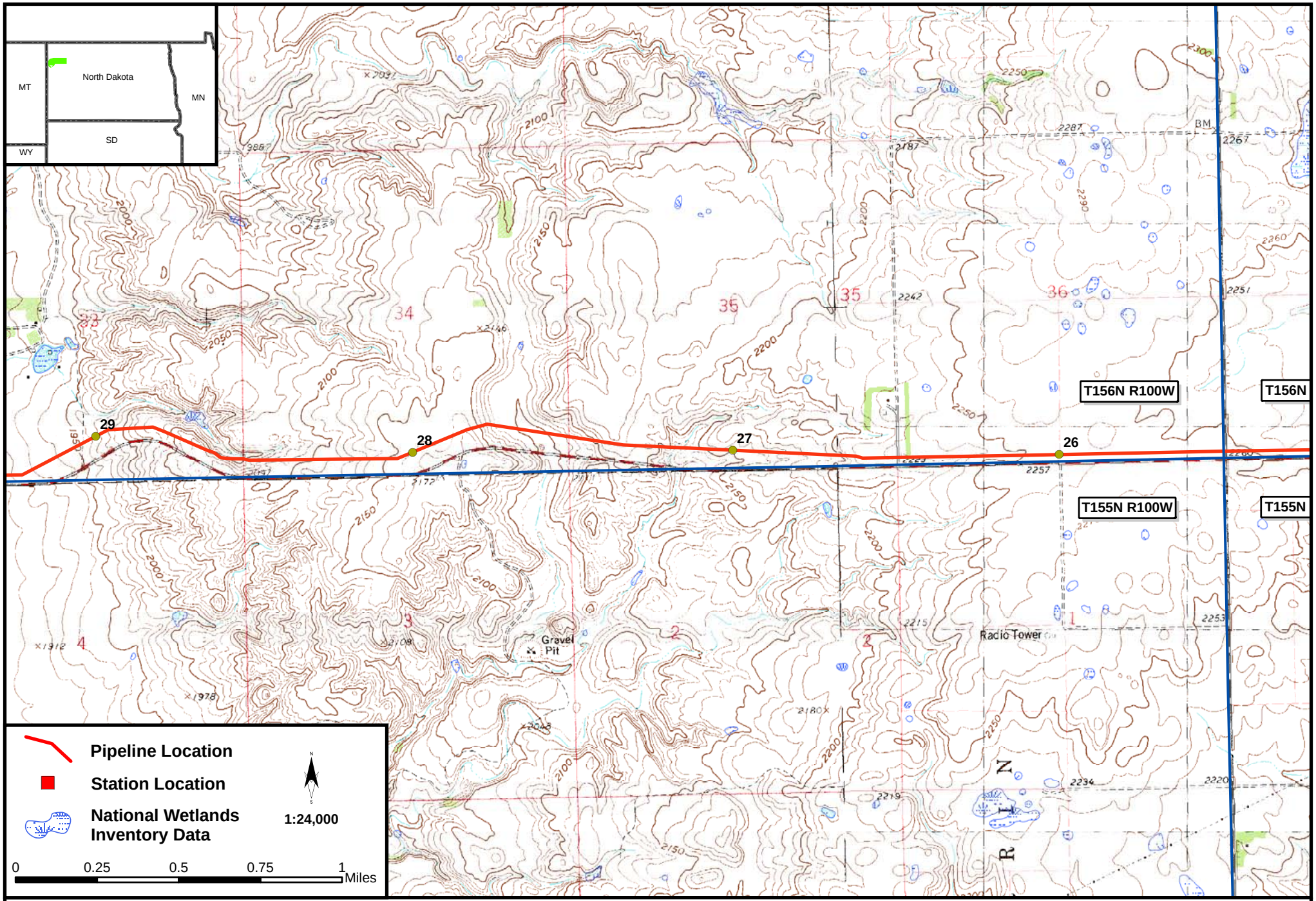
Location Map - Sheet 6 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

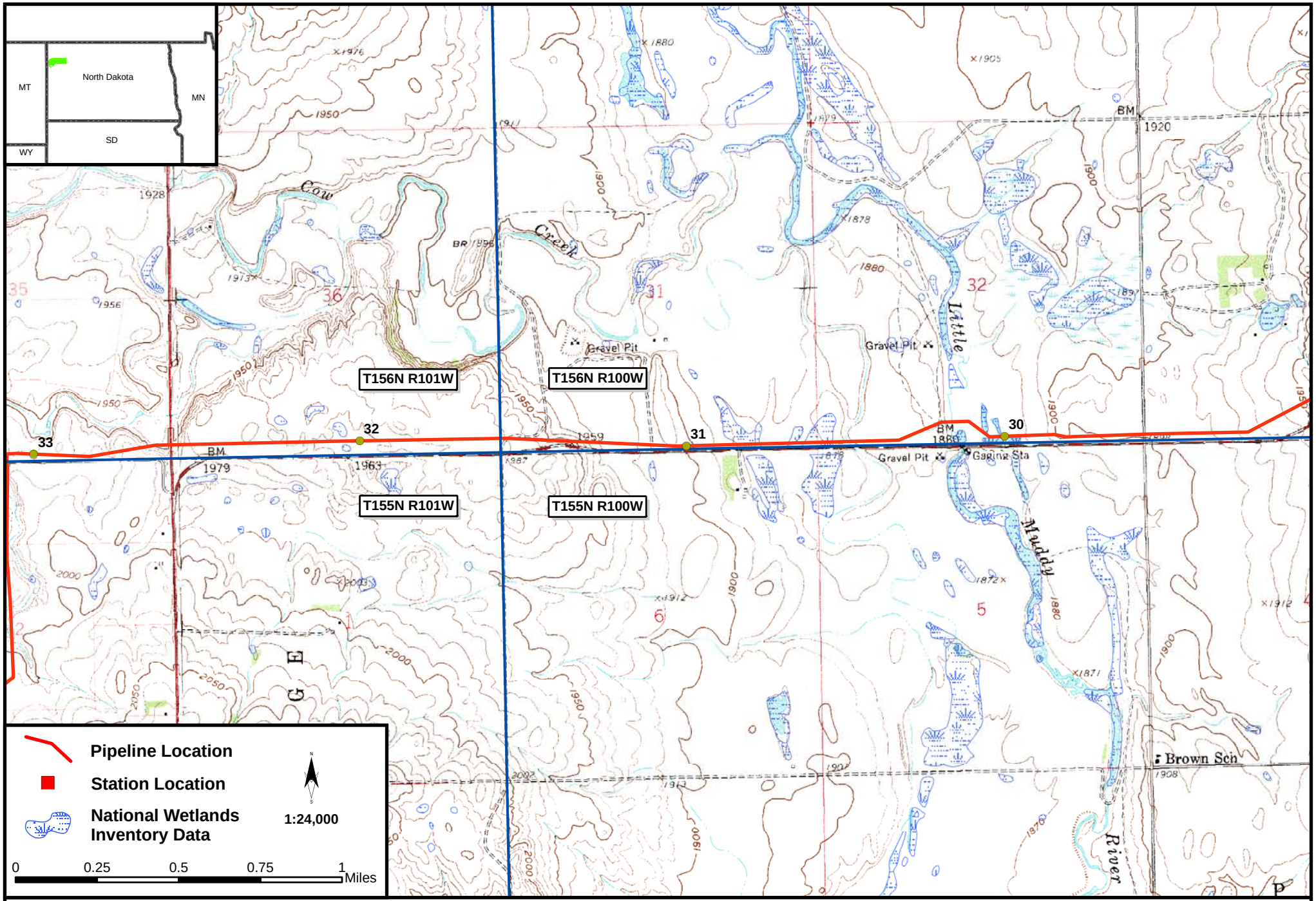
Location Map - Sheet 7 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

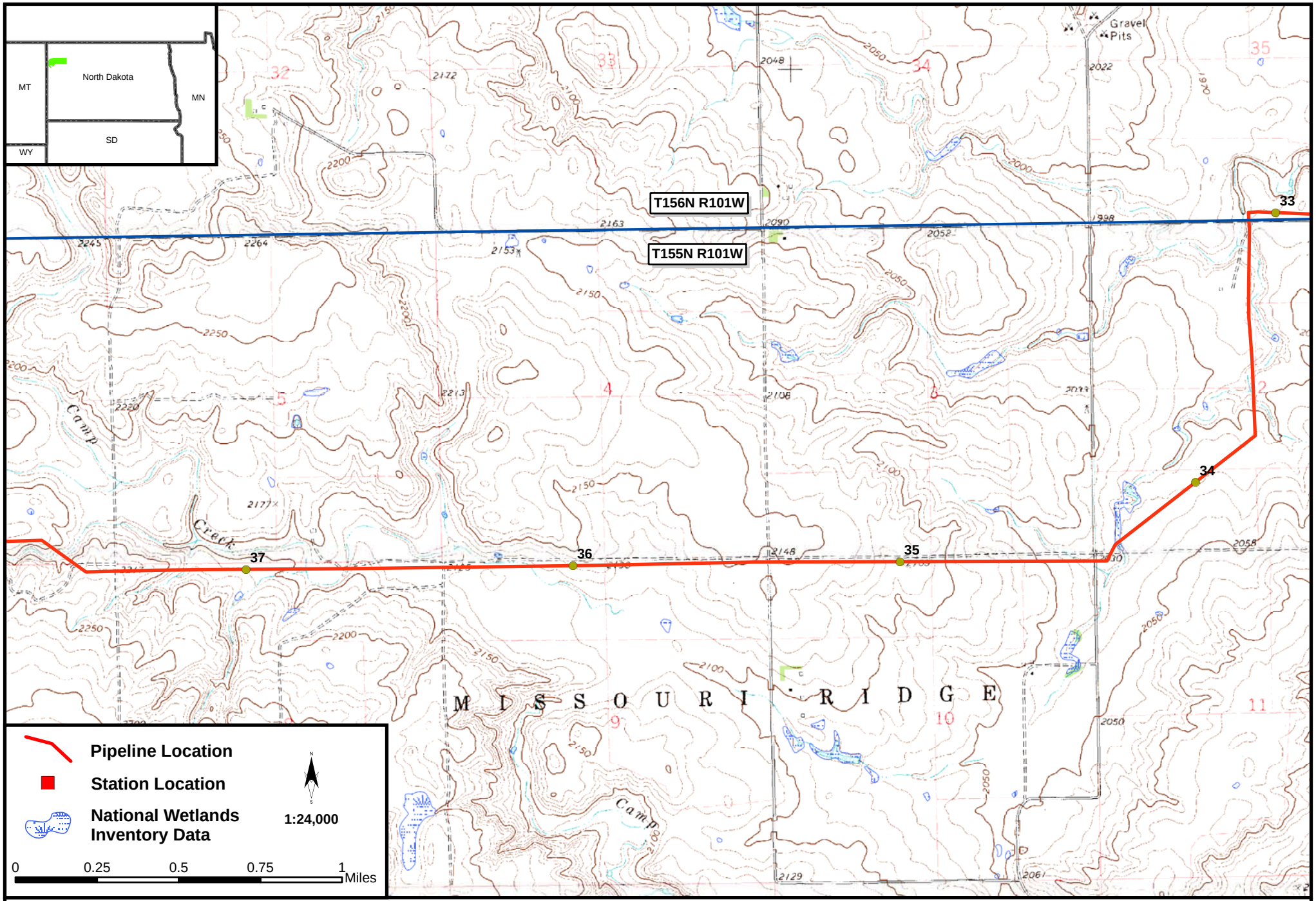
Location Map - Sheet 8 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

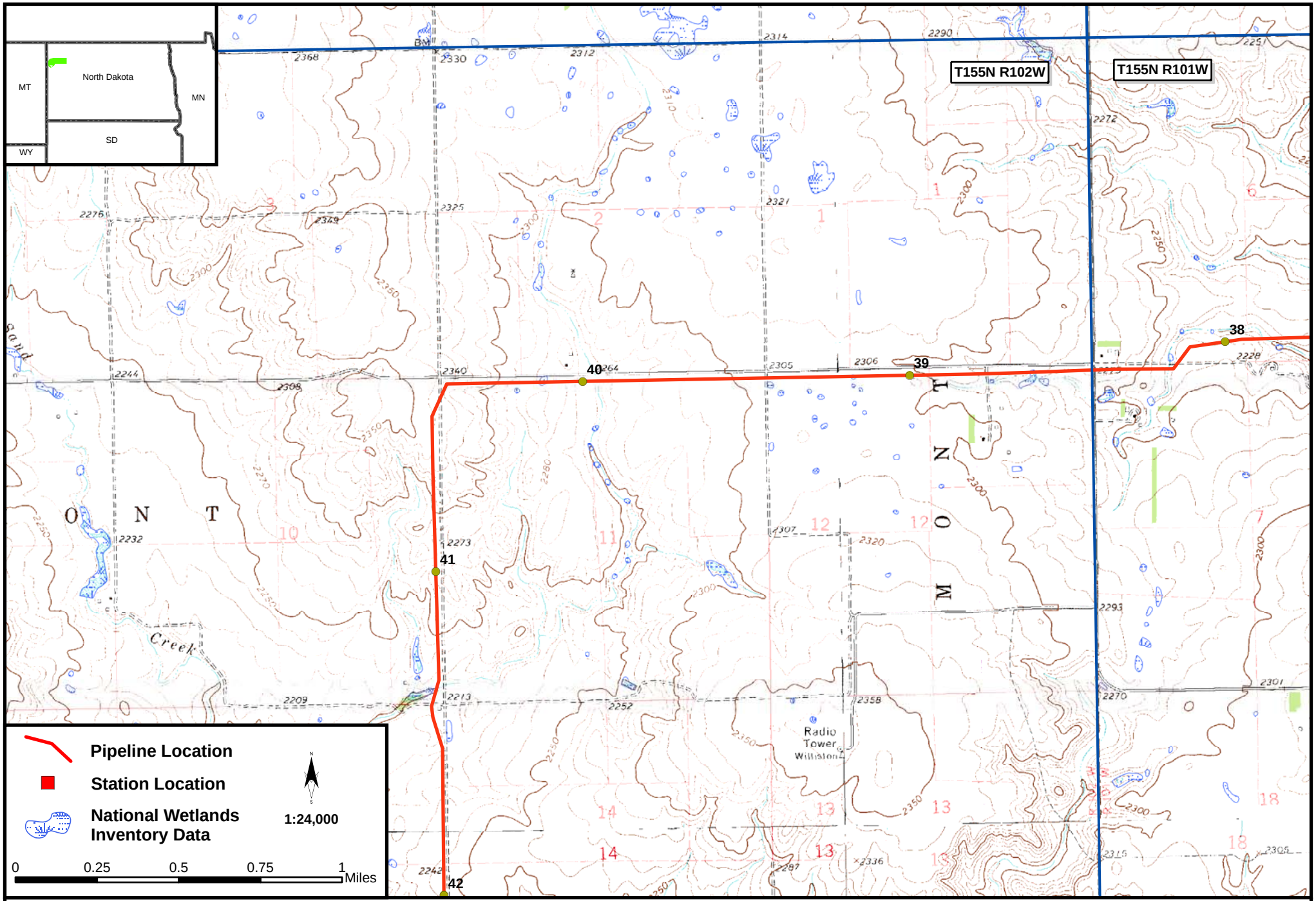
Location Map - Sheet 9 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

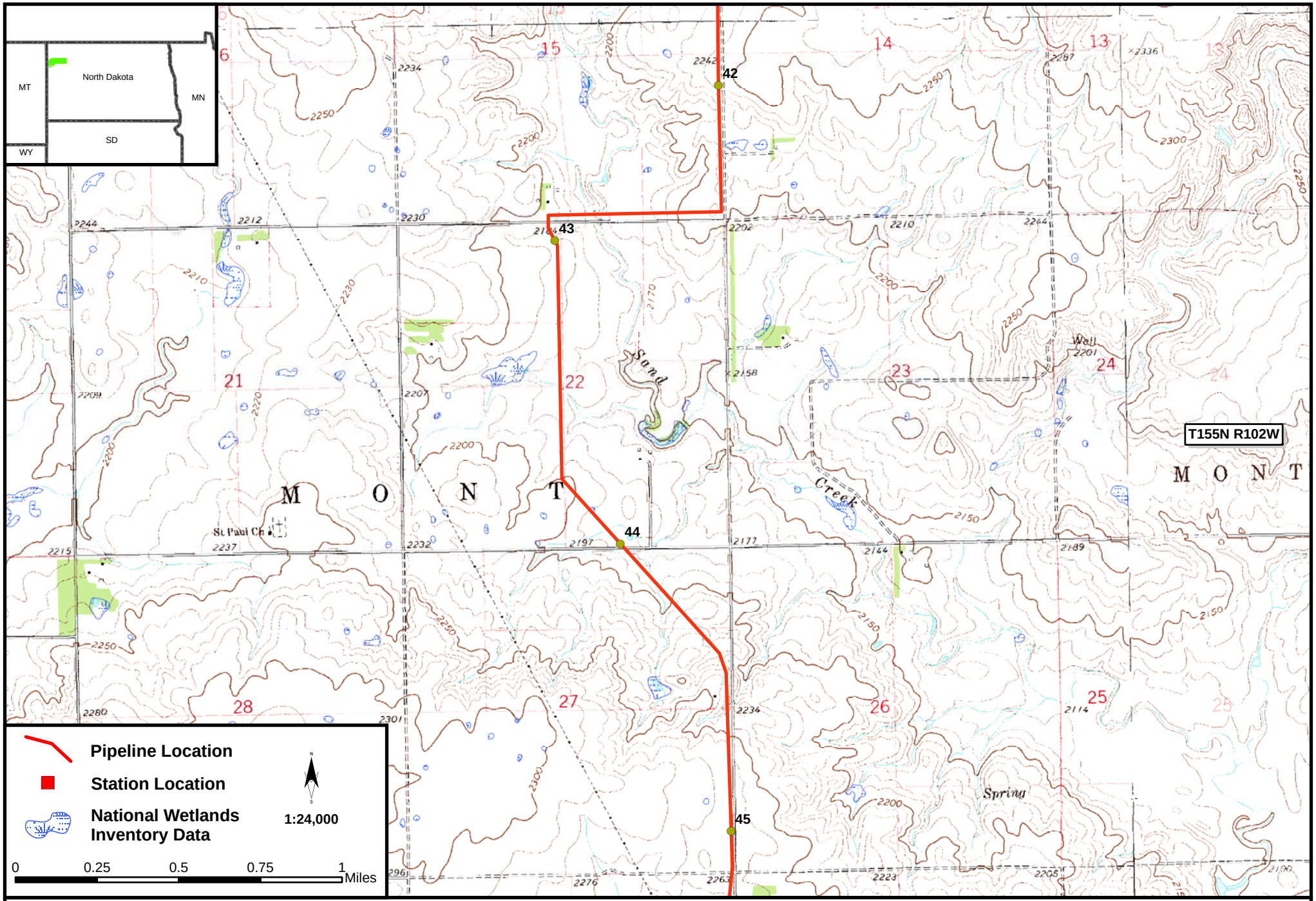
Location Map - Sheet 10 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

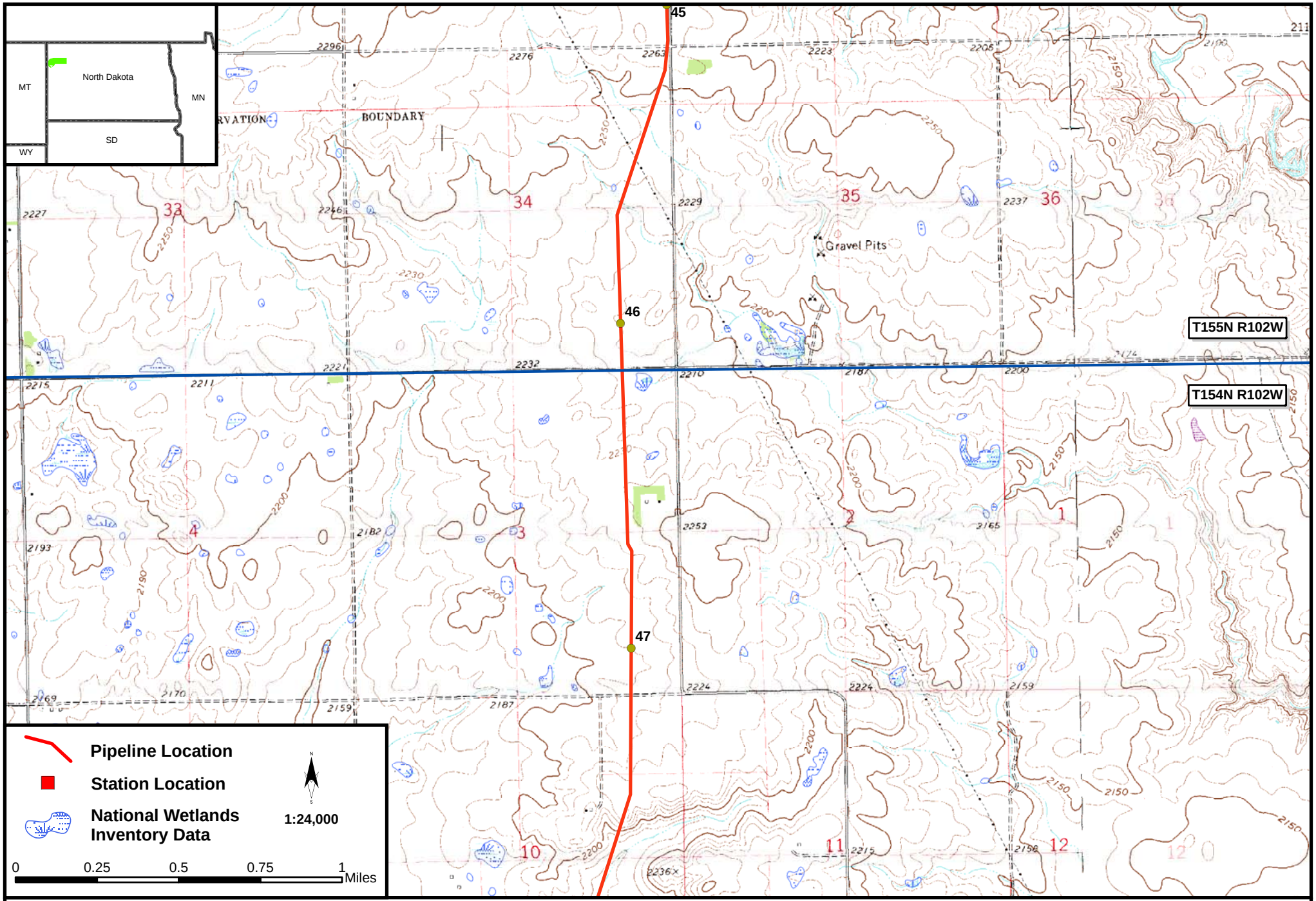
Location Map - Sheet 11 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

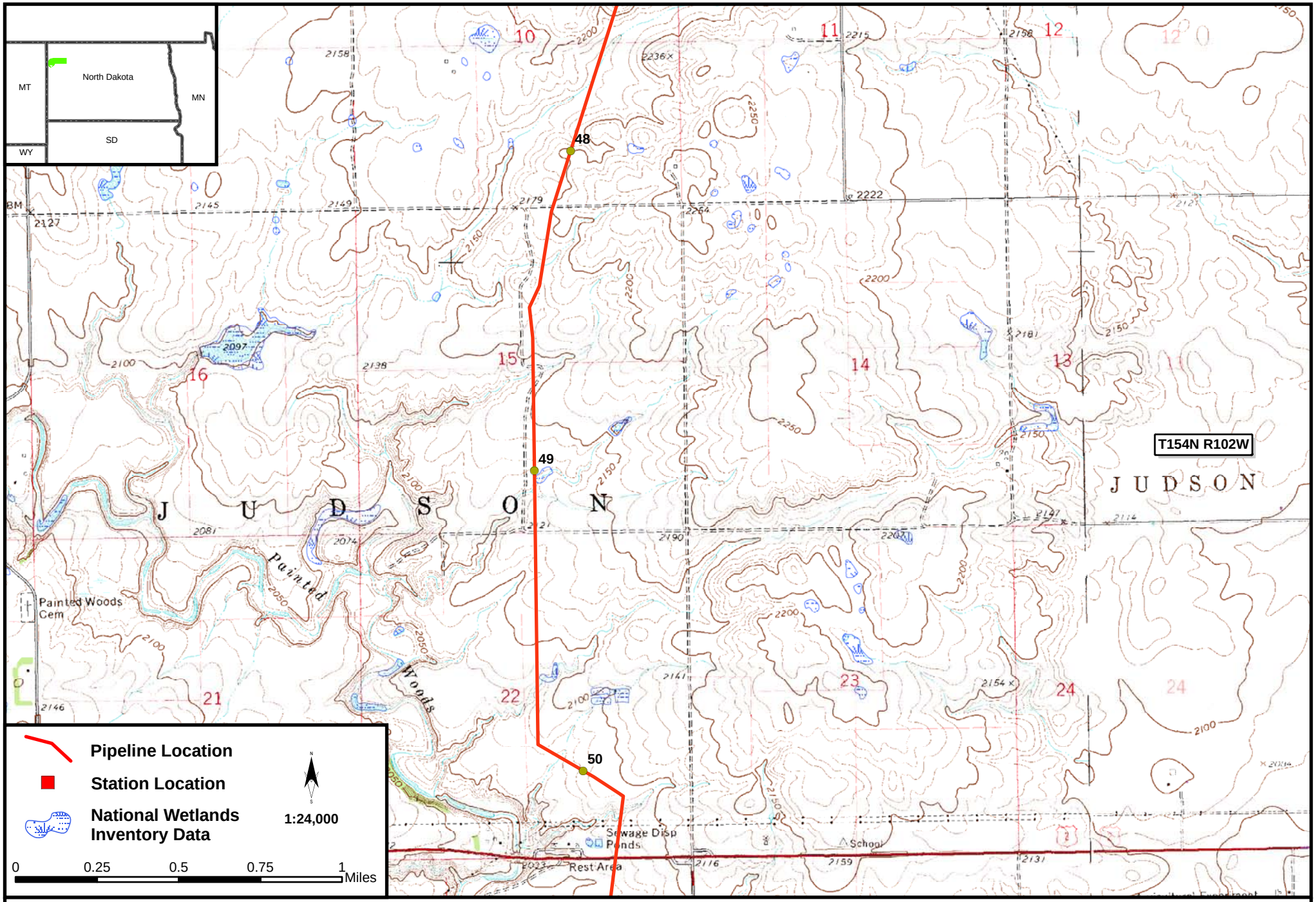
Location Map - Sheet 12 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

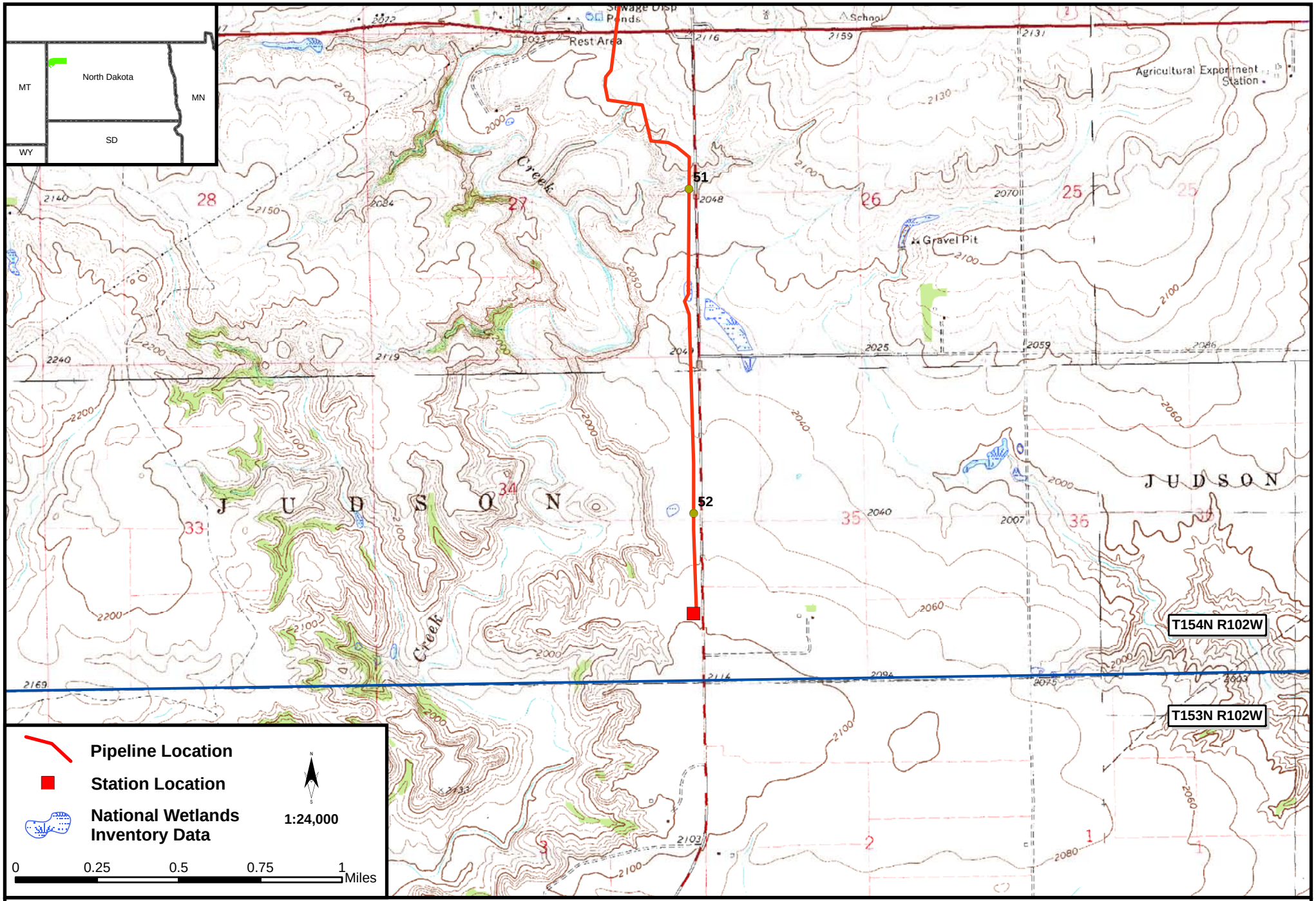
Location Map - Sheet 13 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 14 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 15 of 15

North Dakota Public Service Commission

Zoning and Planning

John Muehlhausen

From: Roberta Groening [rgroening@merjent.com]
Sent: Tuesday, July 18, 2006 8:20 AM
To: 'John Muehlhausen'
Subject: RE: Zoning and Planning for Williams County ND

Williams county equalization had no applications on file at the time of my call pertaining to developments within a ½ mile on either side of Enbridge's existing pipeline.

From: John Muehlhausen [mailto:jmuehlhausen@merjent.com]
Sent: Tuesday, July 18, 2006 8:17 AM
To: 'Roberta Groening'
Subject: FW: Zoning and Planning for Williams County ND

Roberta,

What was the outcome of proposed development within the project corridor?

From: Roberta Groening [mailto:rgroening@merjent.com]
Sent: Tuesday, July 11, 2006 11:49 AM
To: 'John Muehlhausen'
Subject: Zoning and Planning for Williams County ND

7/11/06 – Spoke with Doug L. at the Williams County Equalization office regarding proposed development within ½ mile on either side of Enbridge' existing pipeline on county road 8. I sent him a copy of the county map with the site of the existing pipeline. He will research and provide me information regarding any known development applications. I also asked Doug regarding any active or inactive salt, gravel, scona, lignite or abandoned mines. Doug indicated that the information that the county had was dated, but he would indicate any known mines on the map and also suggested that I call the North Dakota state office and inquire with them.

7/11/06 – Spoke with Bill Dodd at the Public Service Commission Division of abandoned mines, and he indicated that the state had not updated their information for Williams County since 1980/1981. He is going to send me a copy of the maps and reports regarding mines (coal) in Williams County that the state has in its collections.

Merjent

The Banks Building
615 - 1st Avenue NE
Suite 425
Minneapolis, MN 55413

Roberta Groening

612-746-3669 direct
612-746-3660 main
612-746-3679 fax

Public Service Commission
State of North Dakota

COMMISSIONERS

Tony Clark, President
Susan E. Wefald
Kevin Cramer

Executive Secretary
Illona A. Jeffcoat-Sacco

600 E. Boulevard Ave. Dept 408
Bismarck, North Dakota 58505-0480
web: www.psc.state.nd.us
e-mail: ndpsc@nd.gov
TDD 800-366-6888
Fax 701-328-2410
Phone 701-328-2400

July 11, 2006

Roberta Groeming
Merjent
615 1st. Avenue NE
Suite 425
Minneapolis, MN 55413

Dear Ms. Groeming:

Thank you for your phone call on July 11, 2006 concerning abandoned coal mines in Williams County, North Dakota. Enclosed for your files is a copy of mine specific information that we have available for Williams County. Additionally, I've included a copy of the 1918 State Engineer Biennial Report listing additional mines in Williams County. We know that these listings of abandoned coal mines are not complete and that there are probably more abandoned mines than what is indicated in this information.

Also enclosed is a copy of our "Ask before you build" brochure with some information on abandoned coal mines in North Dakota.

If you have any other questions or require additional information, please feel free to call the Abandoned Mine Lands Division (AML) at (701) 328-4096.

Sincerely,

Bruce Beechie, AML Division
North Dakota Public Service Commission

WILLIAMS COUNTY

Planning Unit 092: AML Printout #492: T155N, R100W, Section 4, NE

Additional Legal Location: None

Name:	Owner:
No data	No data

Category: No data

Type: No data

Overburden:	Coal Seam:	Thickness Mined:	Source:
No data	No data	No data	Not applicable

Cultural Resource Site Number: Not formally recorded

Basic Data (excerpted from primary sources):

None

Descriptive information pertaining to this mine is included in:

[source:year(pages)]

Not applicable

Notes:

None

Sources (primary and secondary):

None

MEETING NOTES

(written by Tom Hess)

Date: Monday 6/26/06 2:00-2:55pm (Central time)

Participants: see below

Subject: Enbridge North Dakota Pipeline Expansion Project
North Dakota PSC Teleconference

Participants

Kris Benson	Enbridge Environmental
Bill Binek	PSC attorney
Brian Bjella	Fleck, Mather & Strutz (Enbridge outside counsel – PSC applications)
Tom Hess	Merjent (environmental consultant – pipeline PSC application)
Brent Horton	Enbridge Operations
Patrick Fahn	PSC Staffer
Brian Johnson	Enbridge Operations
Joel Kanvik	Enbridge Legal
John Muehlhausen	Merjent (environmental consultant – pipeline PSC application)
Bill Regan	Merjent (environmental consultant – pipeline PSC application)
Rachael Shetka	Enbridge Environmental
Jennifer Turnbow	Kadrmas, Lee and Jackson (environmental consultant – station PSC application)

1.0 Project Description

Enbridge is planning to submit two projects for PSC approval: a pipeline project, and a stations project. Each project is discrete and will be completed independent of the other, on separate schedules and under separate capital budget items. The pipeline project involves constructing 52 miles of 10-inch-diameter pipe adjacent to Enbridge's existing pipeline, with some minor route deviations (i.e. less than ¼ mile from existing pipeline). The new pipeline will be built within Enbridge's existing PSC-certificated Corridor, and within its existing easements where possible. The project is entirely within Williams County.

The stations project involves constructing four new pump stations along the exiting pipeline route, and building two new tanks within the fenced area of two existing stations – one at Alexander and one at Trenton. Enbridge is planning to submit application materials for station work before submitting application materials for the pipeline. PSC permitting is the critical path for both projects.

2.0 PSC Permitting Process

2.1 Letter of Intent – The PSC requested Enbridge submit a Letter of Intent prior to submitting its application. Once the LOI is filed, the PSC will assign the project a docket number and open a file. This will allow the PSC to more effectively manage agency correspondence it receives prior to the application. Enbridge agreed to submit a Letter of Intent.

2.2 Wait period – Enbridge will request PSC waive the 12 month wait period.

2.3 Certificate of Corridor Compatibility – One of the purposes of the corridor study is to support the route location, and to support potential applicant- or PSC-requested route deviations. Constraint mapping, and evaluation of exclusion and avoidance areas helps determine and justify route selection. Rule 69-06-04, section.02, subsection 1b specifies the corridor width is 10% of the project length, but no less than one mile wide or more than six miles wide. Enbridge may apply for a Corridor Certificate that is less than 5.2 miles wide, but the PSC staffer discouraged it. If the PSC recommends a route deviation that is outside the study area, the route would not be approved. But the route of the new pipeline is generally already established – adjacent to the existing pipeline, with some minor deviations. It seems unnecessary to study a 5.2-mile-wide corridor if the pipeline route is essentially already known, and it seems unlikely the PSC would recommend a wide route deviation. The 1983 corridor application cannot simply be updated for this

project. Endangered species move around, land use changes, structures along the route might now be old enough to be considered historic. The whole corridor needs to be reevaluated from scratch and the corridor application needs to be rewritten. Discussion of the purpose and need of the project is part of the Corridor Certificate guidelines. Enbridge needs to answer this question, but the PSC does not evaluate need.

2.4 Route Permit – Enbridge is planning to submit the Route Permit application with its Corridor Certificate application. Enbridge may not submit its 200- to 600-foot-wide environmental study footprint as its proposed Route, with the condition the pipeline would be constructed within the footprint. The Route is the centerline of the pipeline. It has zero width. PSC advised Enbridge to submit both routes for each of its two proposed landowner-requested reroutes. The PSC staffer did not know how the Commission would respond to the request.

2.5 Route Deviations – The Route will likely need to be changed after it is established – to accommodate landowner requests, to avoid unanticipated archaeological resources, to avoid exposing the adjacent pipeline in areas with unstable soil, etc. The PSC is familiar with these circumstances, and has established protocol for addressing route deviations in Rule 69-06-05, section 02, subsection 2. Deviations are permitted provided they meet certain criteria, including avoid exclusion and avoidance areas. Enbridge will need to submit deviation requests to the PSC with justification. Although not defined as such in the rules, the PSC can evaluate minor deviations quickly (e.g. to accommodate construction), but major deviations might require additional public notice. The Route Enbridge submits in its Route Application must be as accurate as possible.

3.0 Schedule

Enbridge is planning to submit its pipeline Corridor and Route application on 7/26/06 – in time for the 8/9/06 Commission meeting. PSC would like to informally review a draft of the application before it is submitted – so they can provide upfront feedback regarding completeness.

Distribution:

Kris Benson, Enbridge
Brian Bjella, Fleck, Mather & Strutz
Tom Hess, Merjent
Brent Horton, Enbridge
Joel Kanvik, Enbridge
John Muehlhausen, Merjent
Rachael Shetka, Enbridge

North Dakota State Lands Department

North Dakota School Trust Lands

Jeff Mackenthun

From: Haupt, Michael L. [mhaupt@nd.gov]
Sent: Wednesday, June 28, 2006 8:36 AM
To: Jeff Mackenthun
Subject: RE: Enbridge Pipeline ND Expansion Project - Revision to June 9 Consultation Letter

Jeff,

Good morning! We have enough information and have been in the field with Enbridge personnel to look at the proposed route across ND School Trust Lands. Thanks

Michael L. Haupt
Rangeland & Reclamation Specialist
North Dakota State Land Dept
PO Box 5523
Bismarck, ND 58506-5523
701-328-2800
mhaupt@nd.gov

-----Original Message-----
From: Jeff Mackenthun [mailto:jmackenthun@merjent.com]
Sent: Wednesday, June 21, 2006 1:25 PM
To: Haupt, Michael L.
Subject: Enbridge Pipeline ND Expansion Project - Revision to June 9 Consultation Letter

Mike,
On June 9th, Enbridge sent you a consultation letter which requested the North Dakota State Land Department review Enbridge's proposed North Dakota Pipeline Expansion Project for impacts to school trust lands. The original letter requested you review an area one quarter mile on either side of the proposed pipeline route. Since the original submittal request, Enbridge has expanded its review corridor to a half mile on either side of the proposed route. Thus, please include a half mile buffer in your review of the aforementioned project. Additionally, if there are any other lands administered by your office that may be of concern to you, please include them in your review and response. Thanks!

Please let me know if this e-mail is a sufficient means in providing this request, or if you would like a more formal request (i.e., new consultation letter). Thanks for your help!

Merjent

Banks Building
615 - 1st Avenue NE
Suite 425
Minneapolis, MN 55413

Jeff Mackenthun

612-746-3668 direct
612-810-4795 cell
612-746-3660 main
612-746-3679 fax

Enbridge Pipelines (Lakehead) L.L.C.
119 N. 25th Street East
Superior, WI 54880
Tel 715 394 1400
Fax 715 394 1570
www.enbridgepartners.com

Scott W. Lounsbury Supervisor, Environment
Kris H. Benson Environmental Analyst II
Paul R. Meneghini Sr. Environmental Analyst
Rachael A. Shetka Environmental Analyst
David M. Hoffman Sr. Environmental Analyst
Joseph P. Peterson Environmental Analyst II

June 9, 2006

Mr. Michael Haupt
North Dakota State Land Department
1707 North 9th Street
P.O. Box 5523
Bismarck, ND 58506-5523

RE: Enbridge Pipelines (North Dakota) LLC - North Dakota Pipeline Expansion Project
North Dakota School Trust Lands

Dear Mr. Haupt,

Enbridge Pipelines (North Dakota) LLC ("Enbridge") is presently evaluating a project to expand a portion of its North Dakota pipeline system. The proposed expansion involves the construction of a new pipeline that is anticipated to be co-located within the same corridor as its existing pipeline extending approximately 53 miles between Enbridge's Beaver Lodge Pump Station (approximately seven miles south of Tioga) and Trenton Pump Station (approximately six miles southwest of Williston). USGS topographic maps are enclosed that depict the current pipeline route. Construction is anticipated to require three to five months to complete, with a tentative start date of August 2006. In addition, Enbridge may perform modifications at its existing aboveground facilities along the project route.

Enbridge requests the North Dakota State Land Department review the anticipated project area to determine if the pipeline route will cross School Trust Lands. To account for potential route variations, Enbridge requests your review include lands within a quarter mile buffer of the currently proposed pipeline. If your review indicates the project route crosses School Trust Lands, please indicate in your response: where the parcels are located, if there are any construction or mitigation requirements (*e.g.*, sow a certain seed mix), and whether Enbridge must complete further steps (*e.g.*, submit a permit application) to obtain authorization to construct the pipeline.

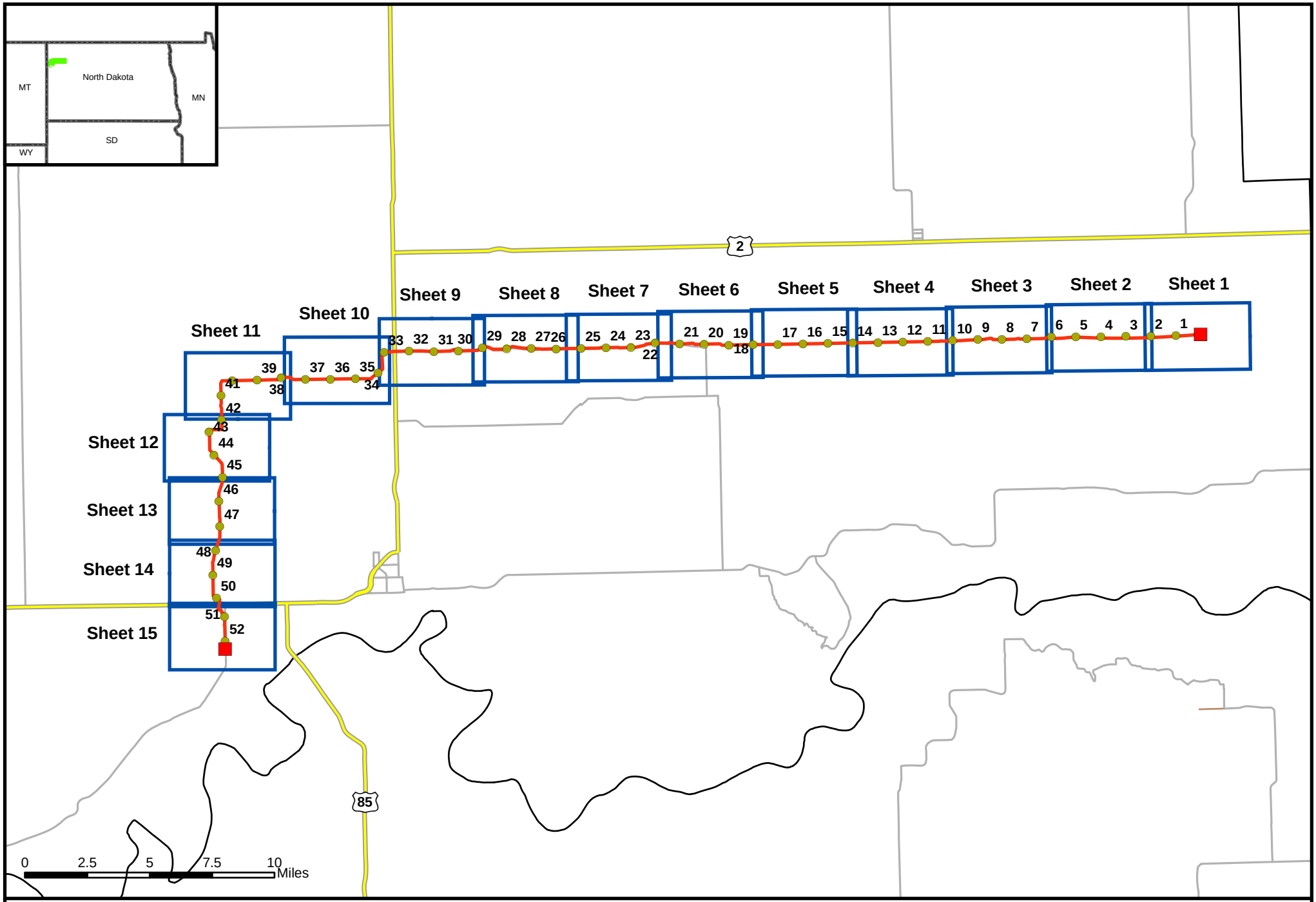
If you have questions or require further information regarding this project, please contact Tom Hess of Merjent, Inc., Enbridge's environmental consultant, at (612) 746-3667, or me at (715) 394-1572.

Sincerely,
Enbridge Pipelines (North Dakota) LLC

Kris Benson, CHMM
Environmental Analyst II

Enclosures: Project location maps

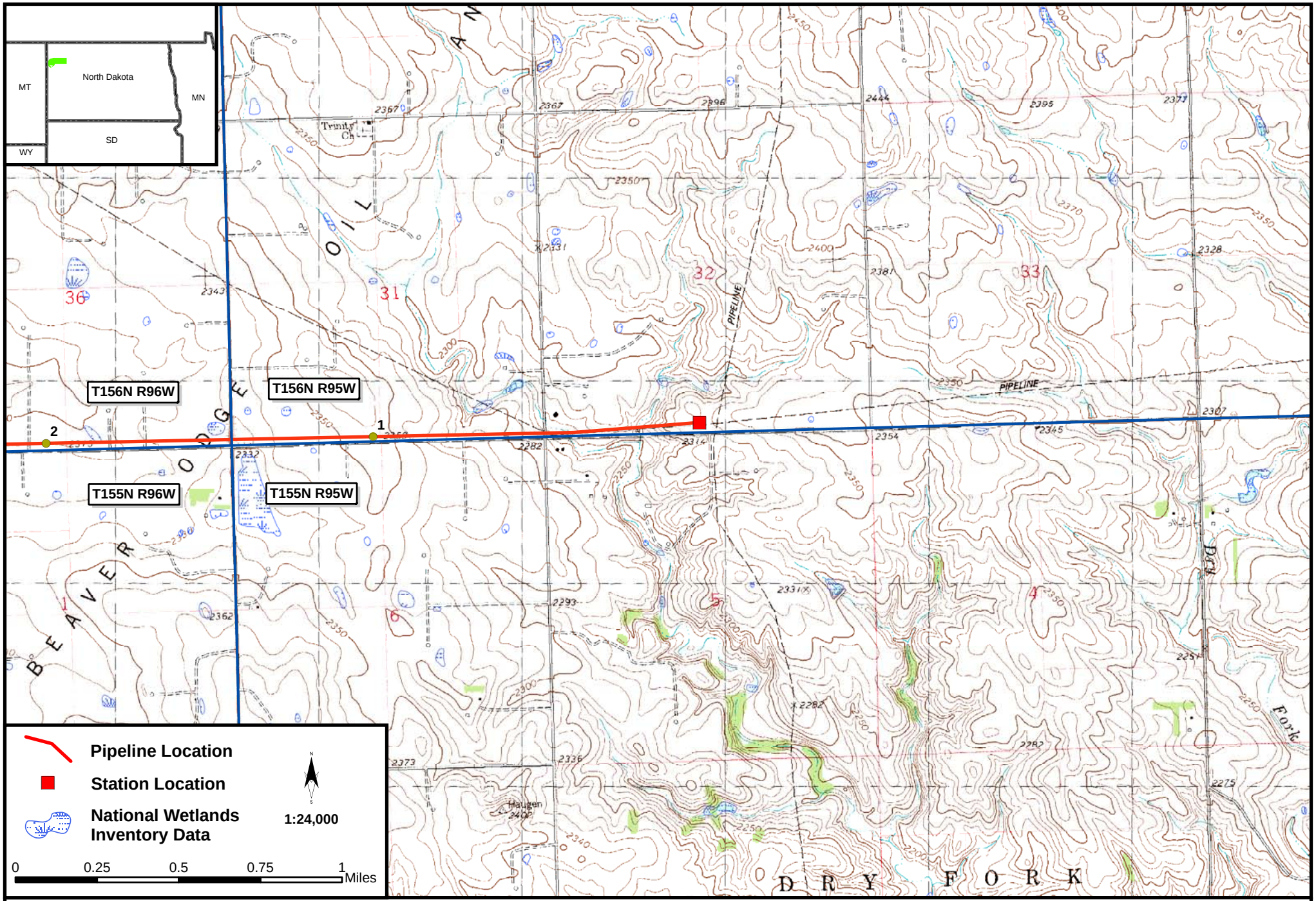
cc: Tom Hess, Merjent, Inc.



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

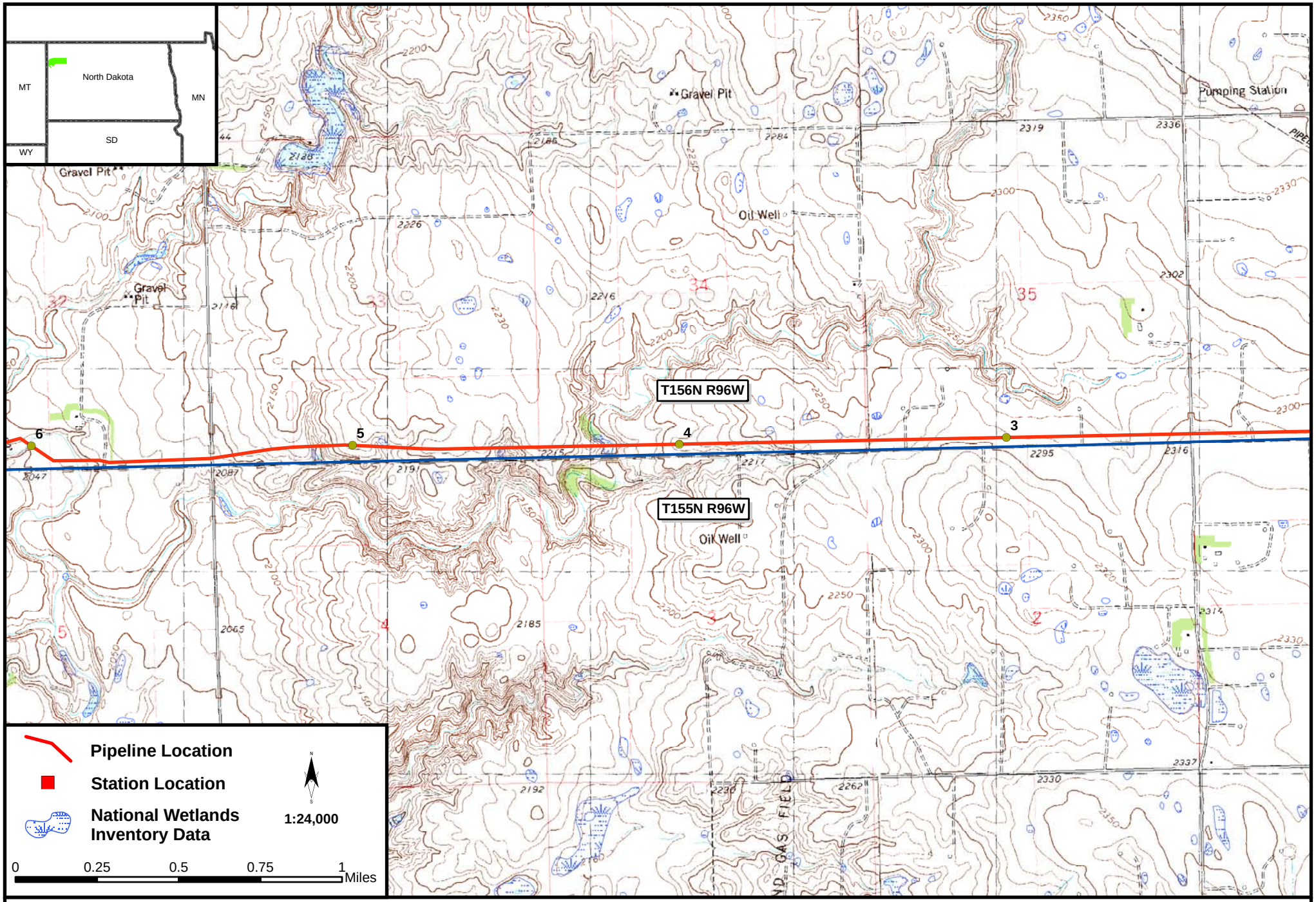
Location Map - Index



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

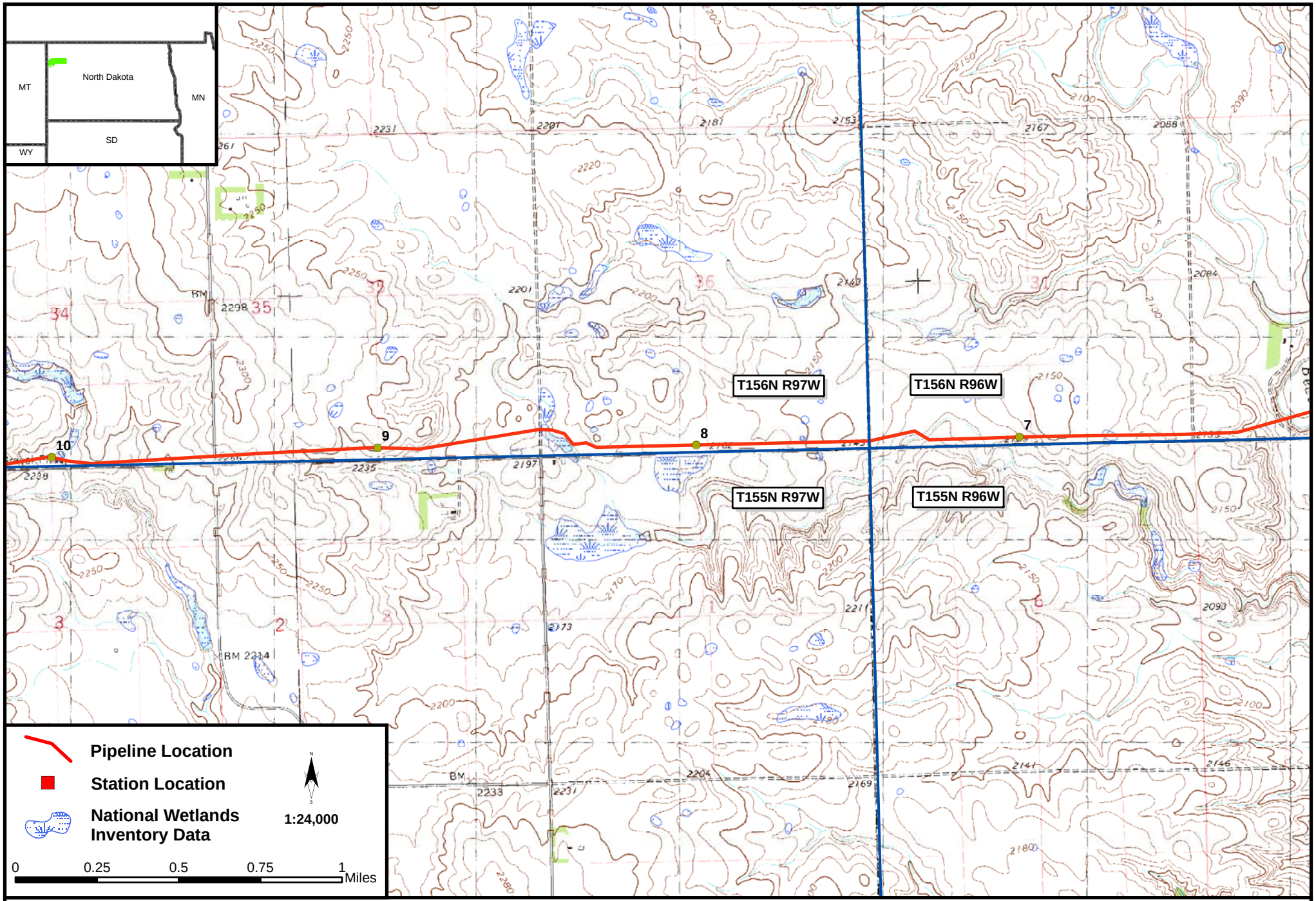
Location Map - Sheet 1 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

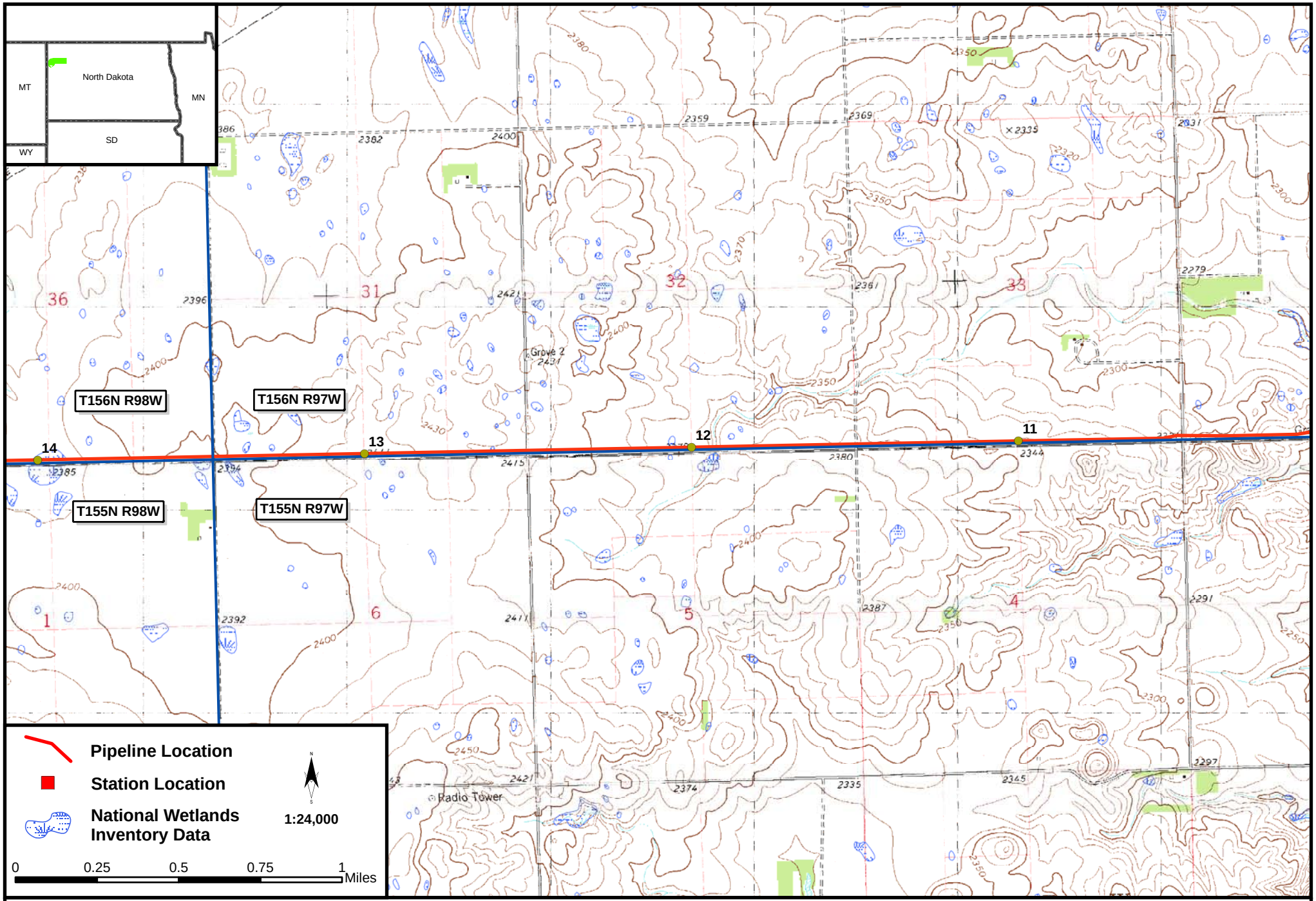
Location Map - Sheet 2 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

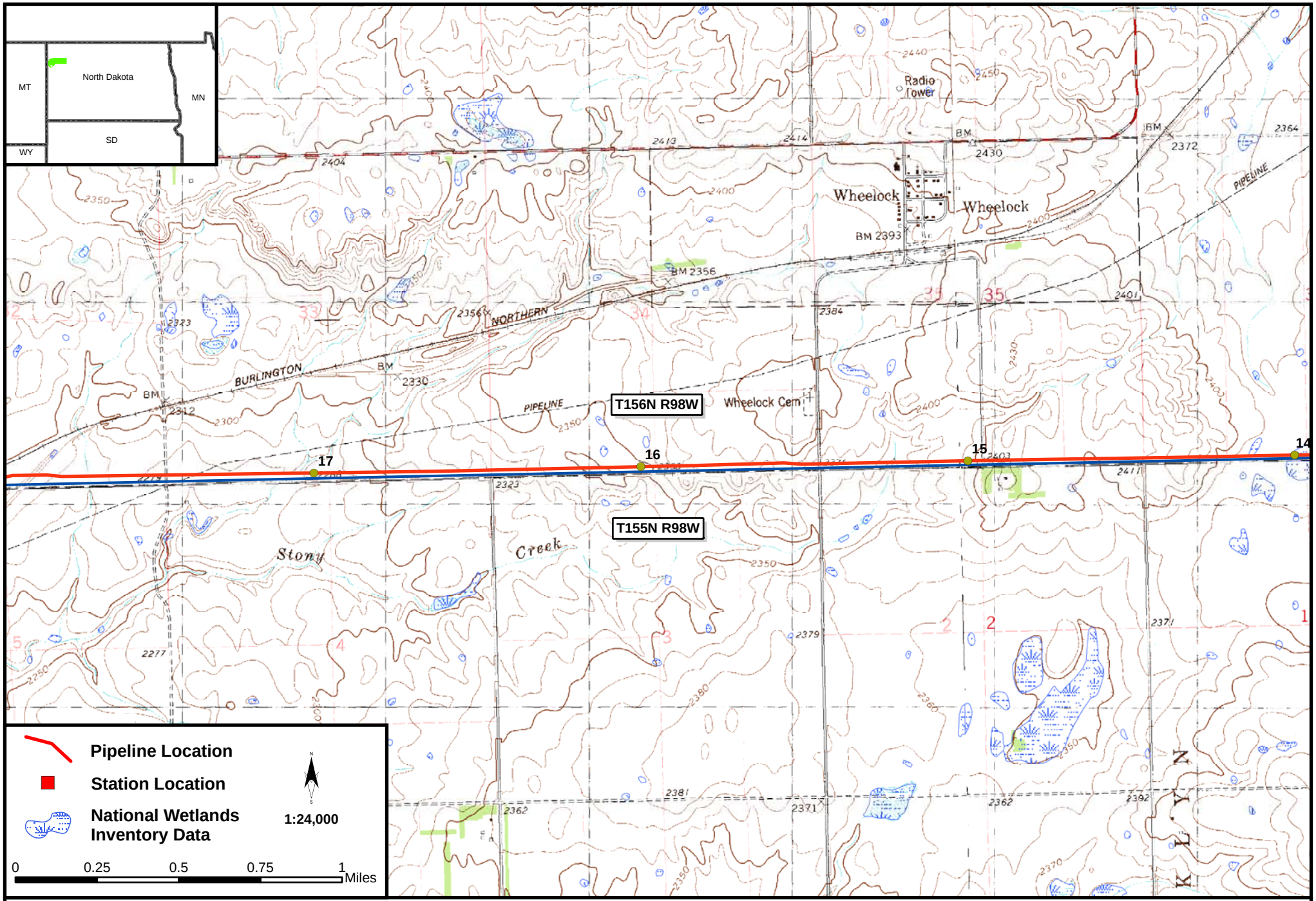
Location Map - Sheet 3 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

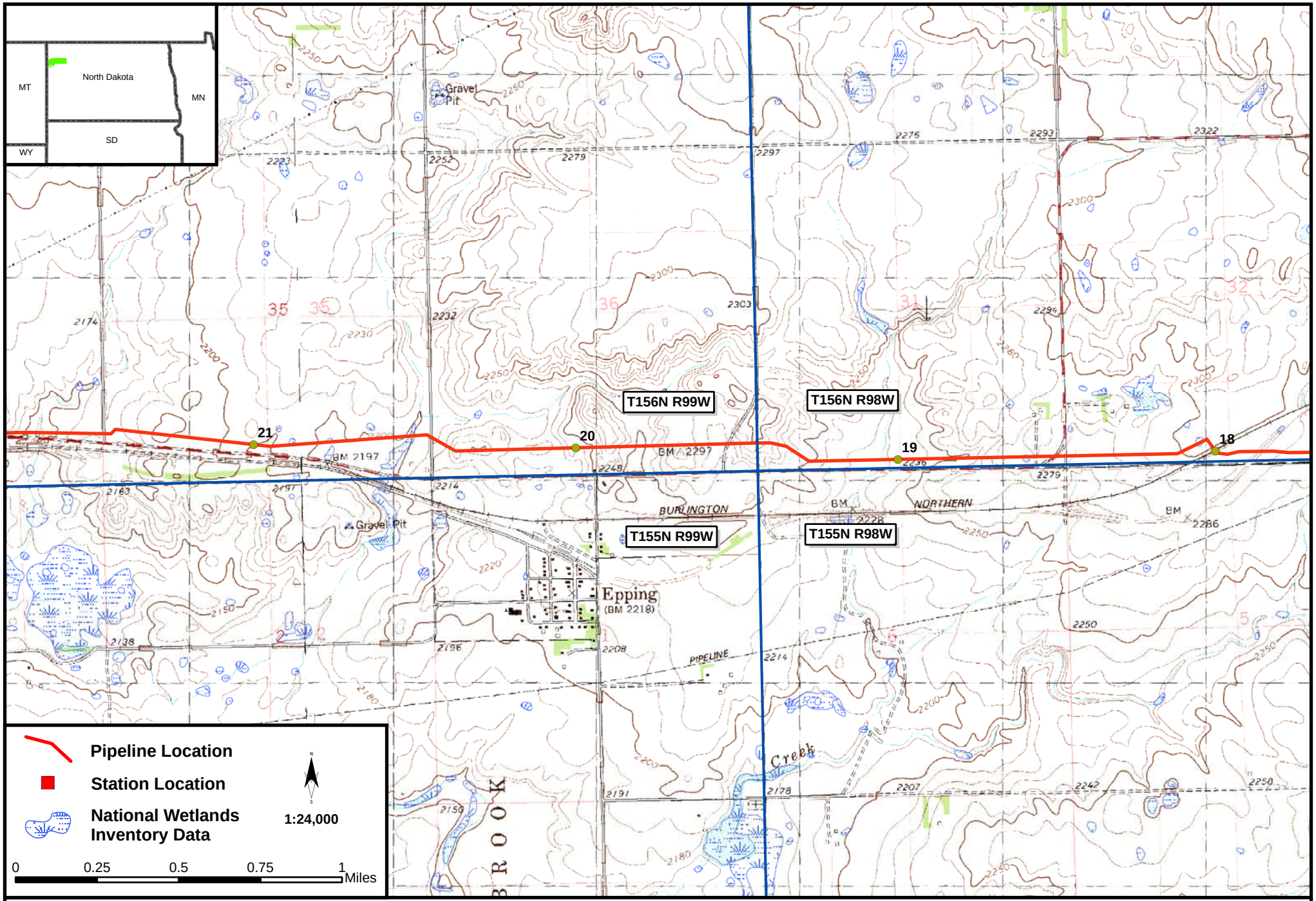
Location Map - Sheet 4 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

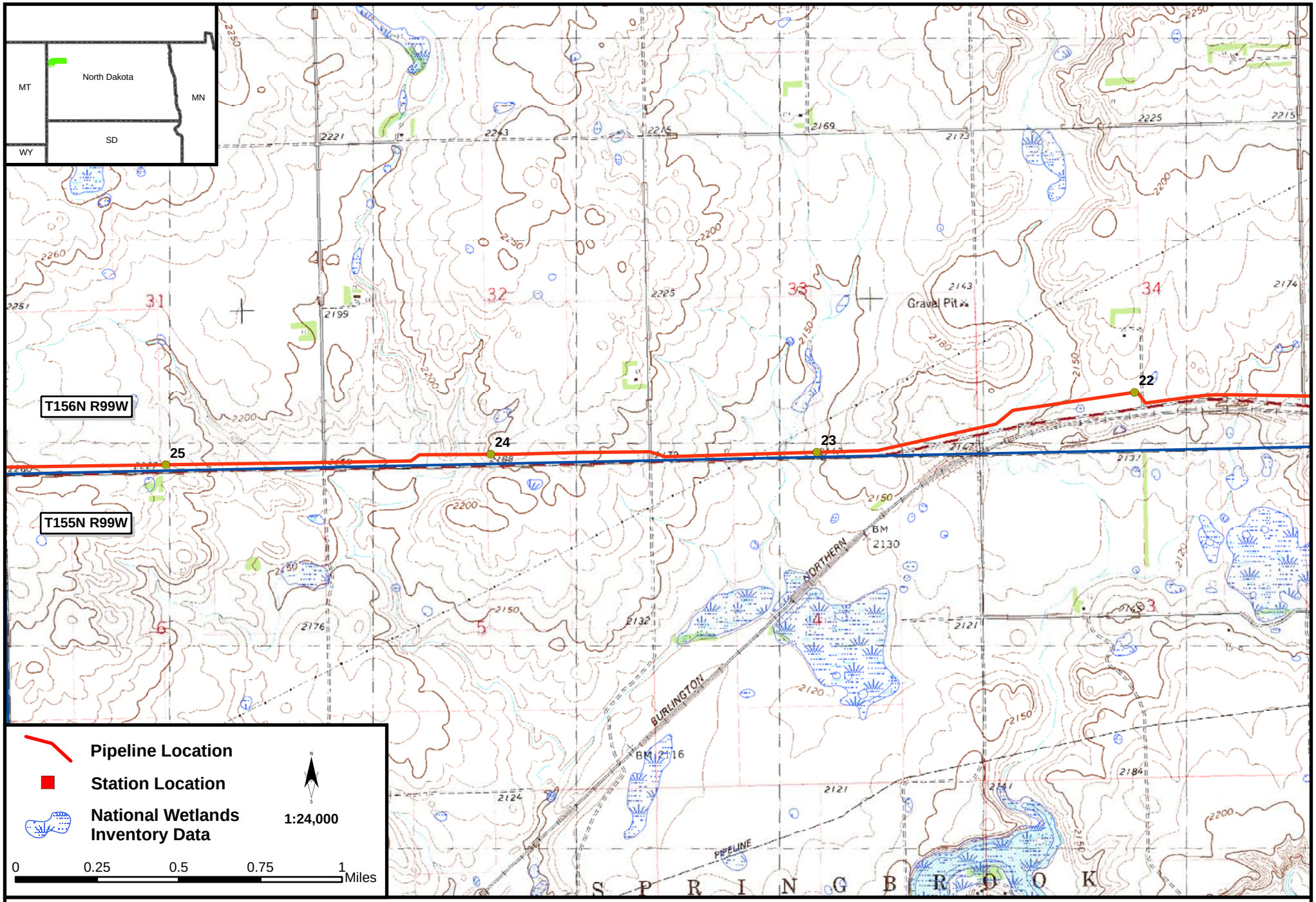
Location Map - Sheet 5 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

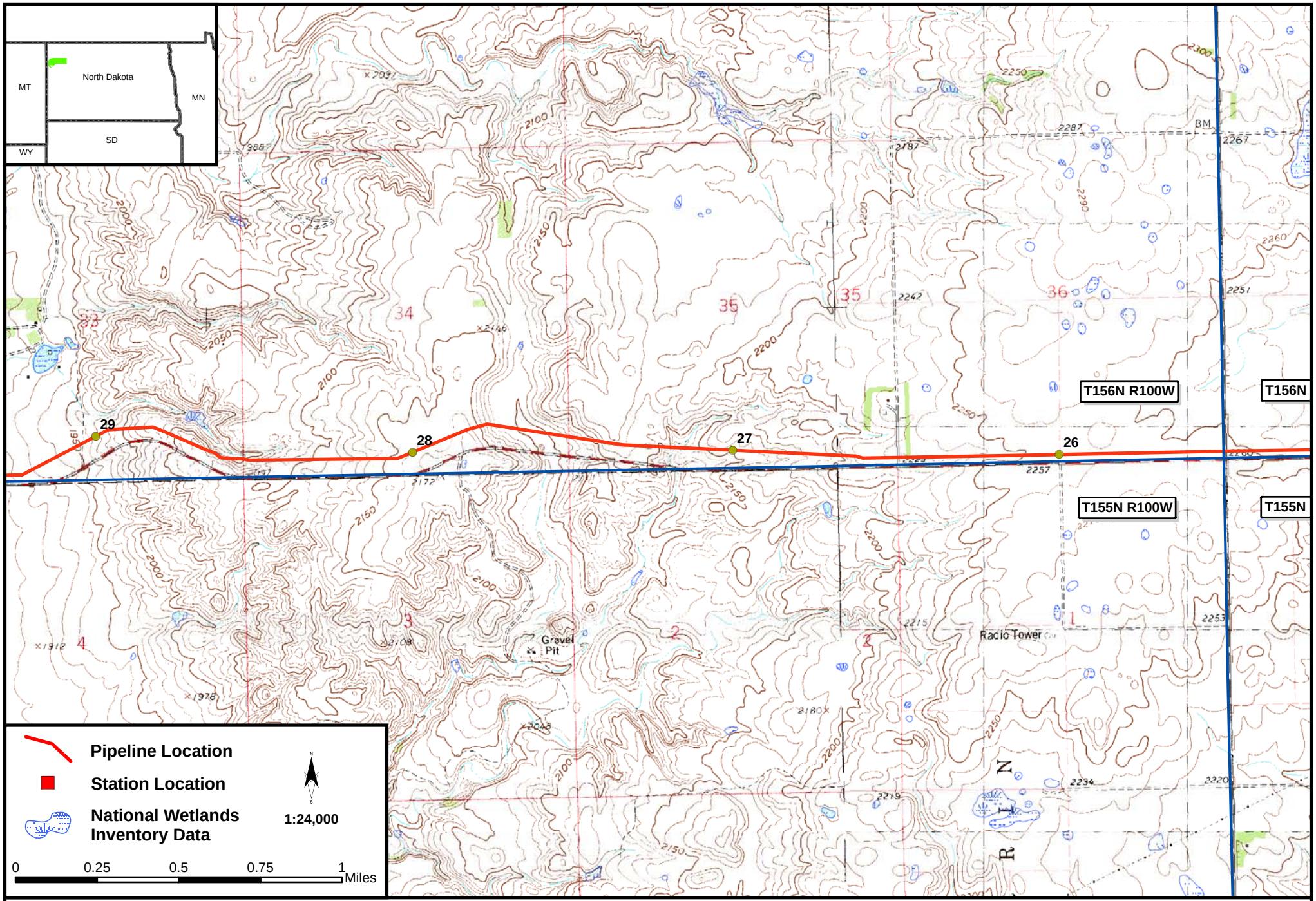
Location Map - Sheet 6 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 7 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

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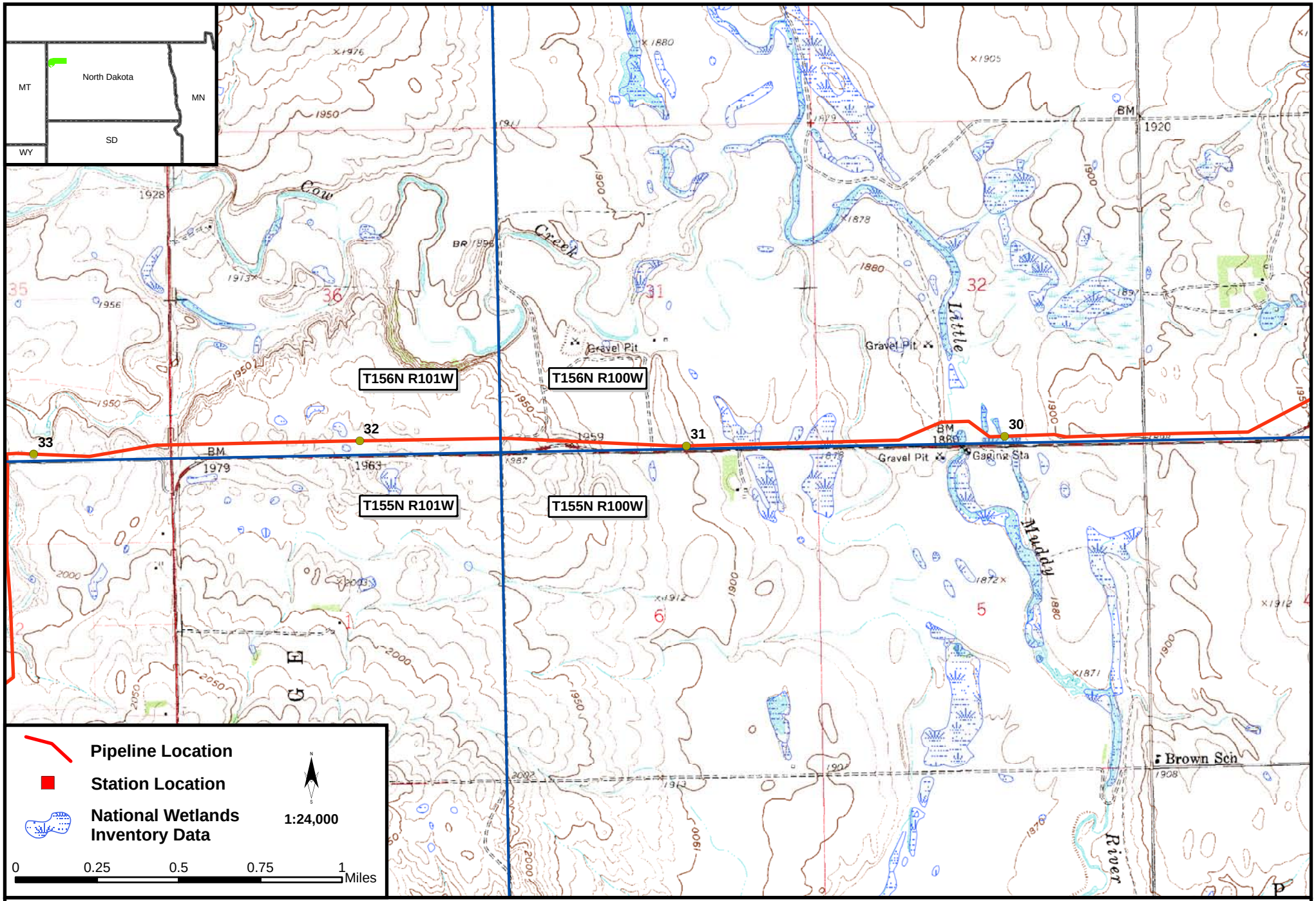
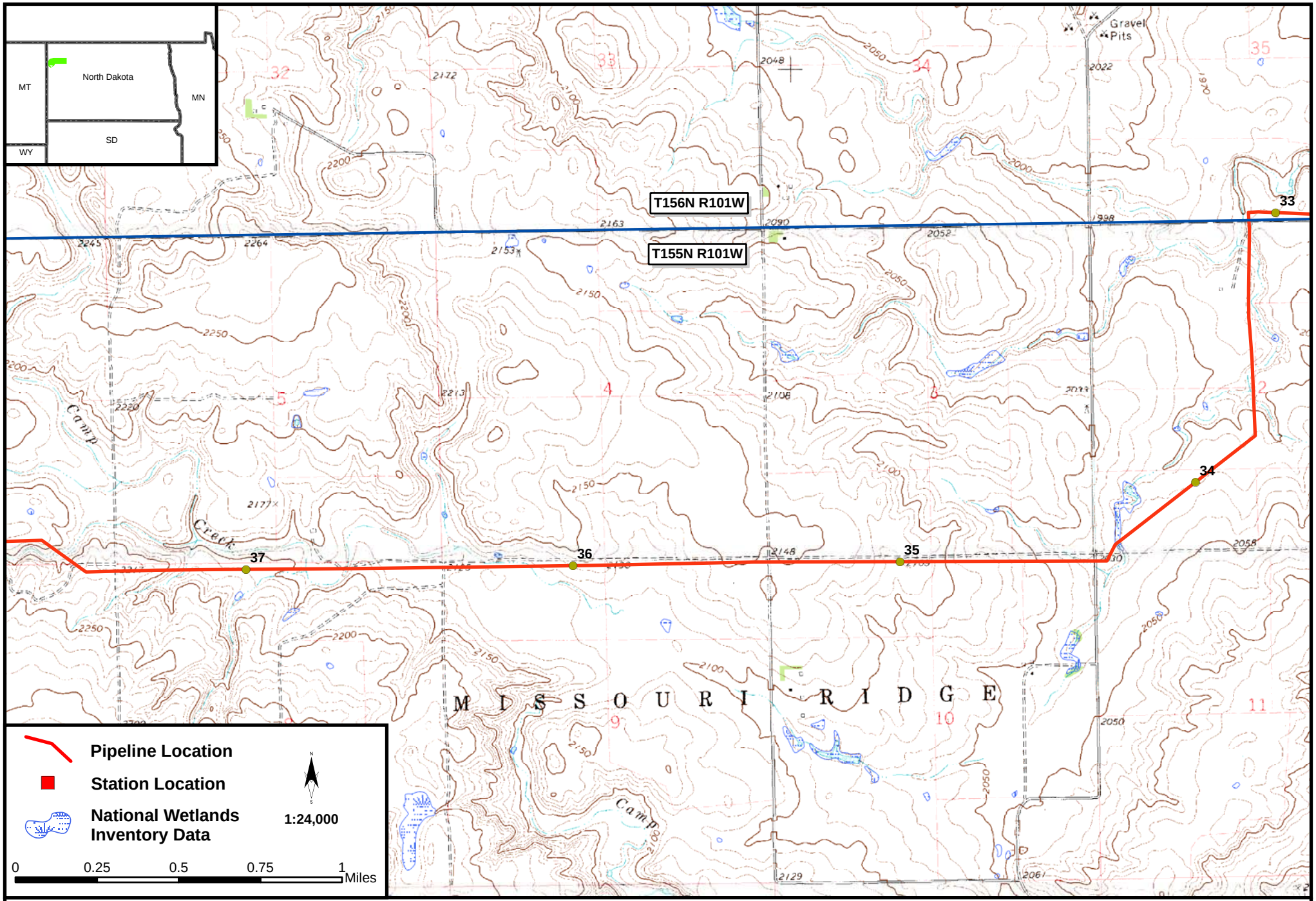


Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

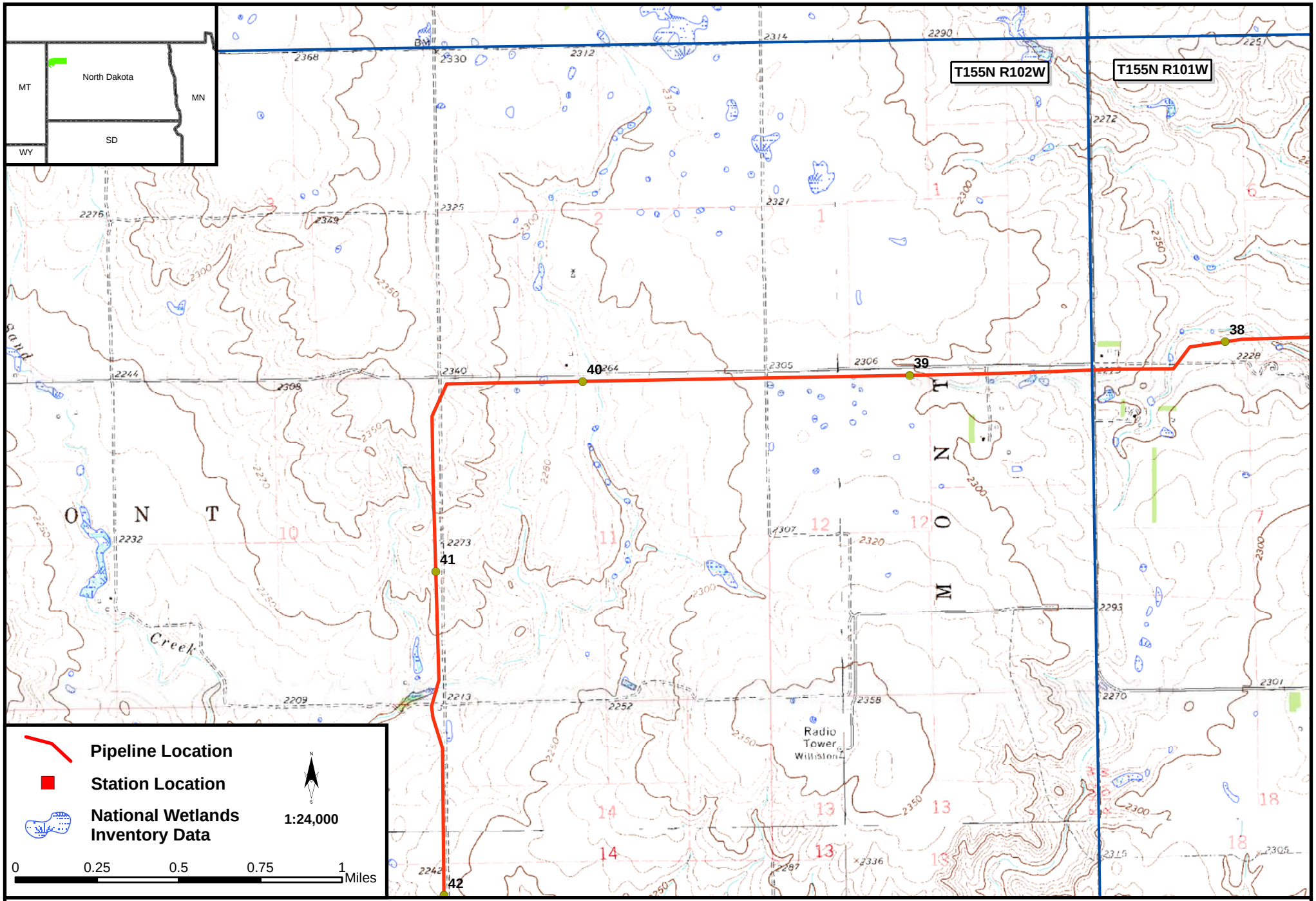
Location Map - Sheet 9 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 10 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

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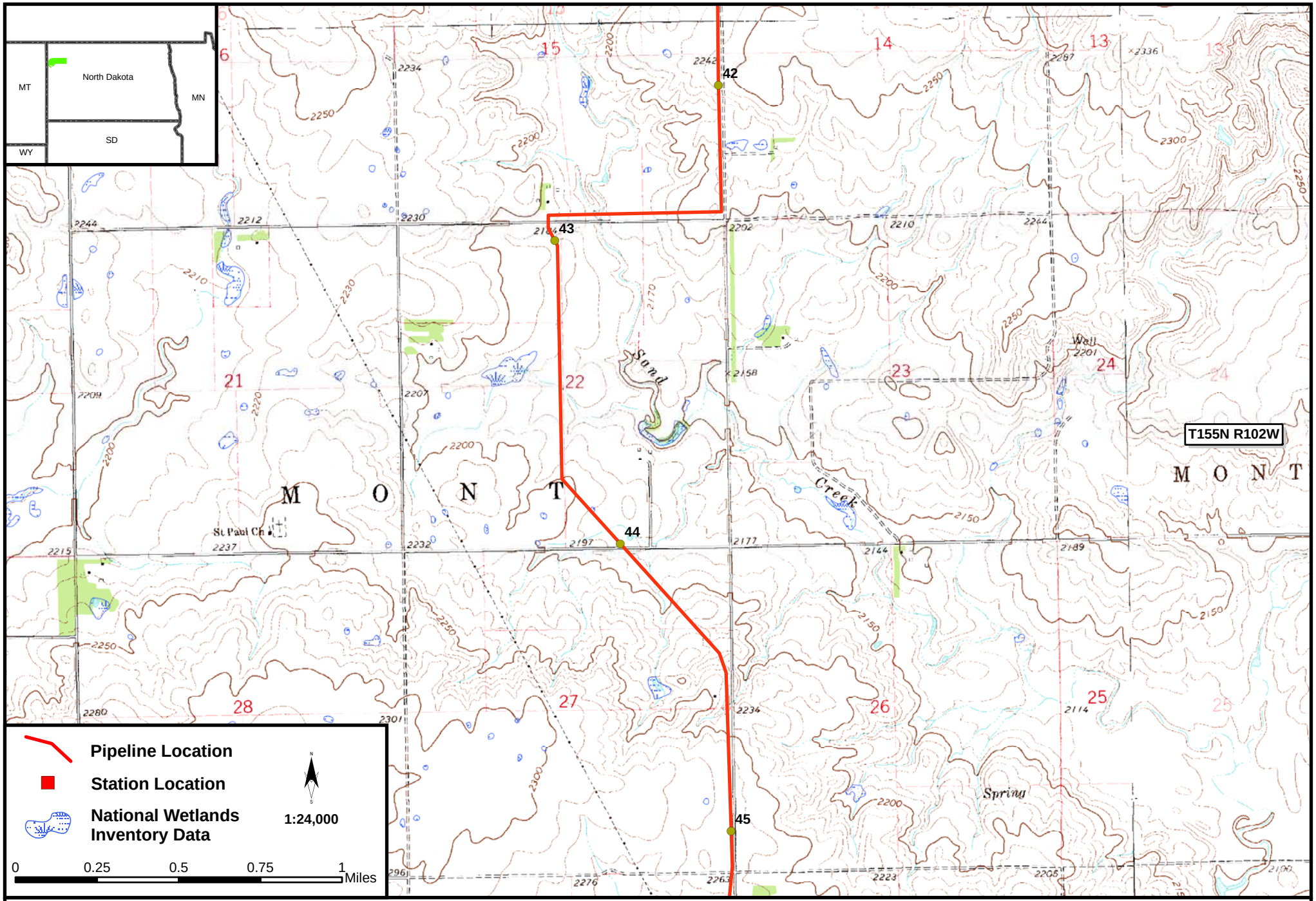
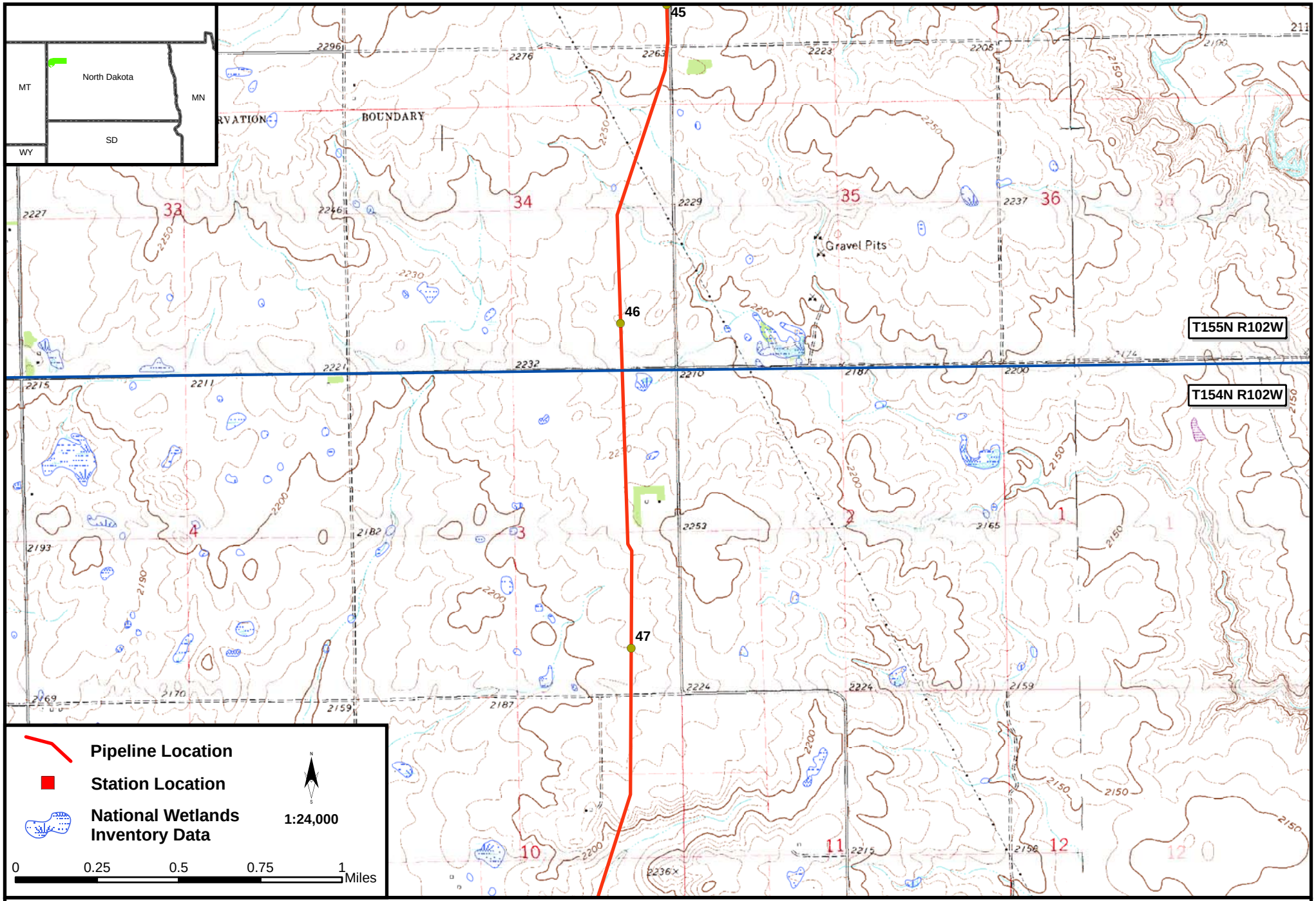


Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

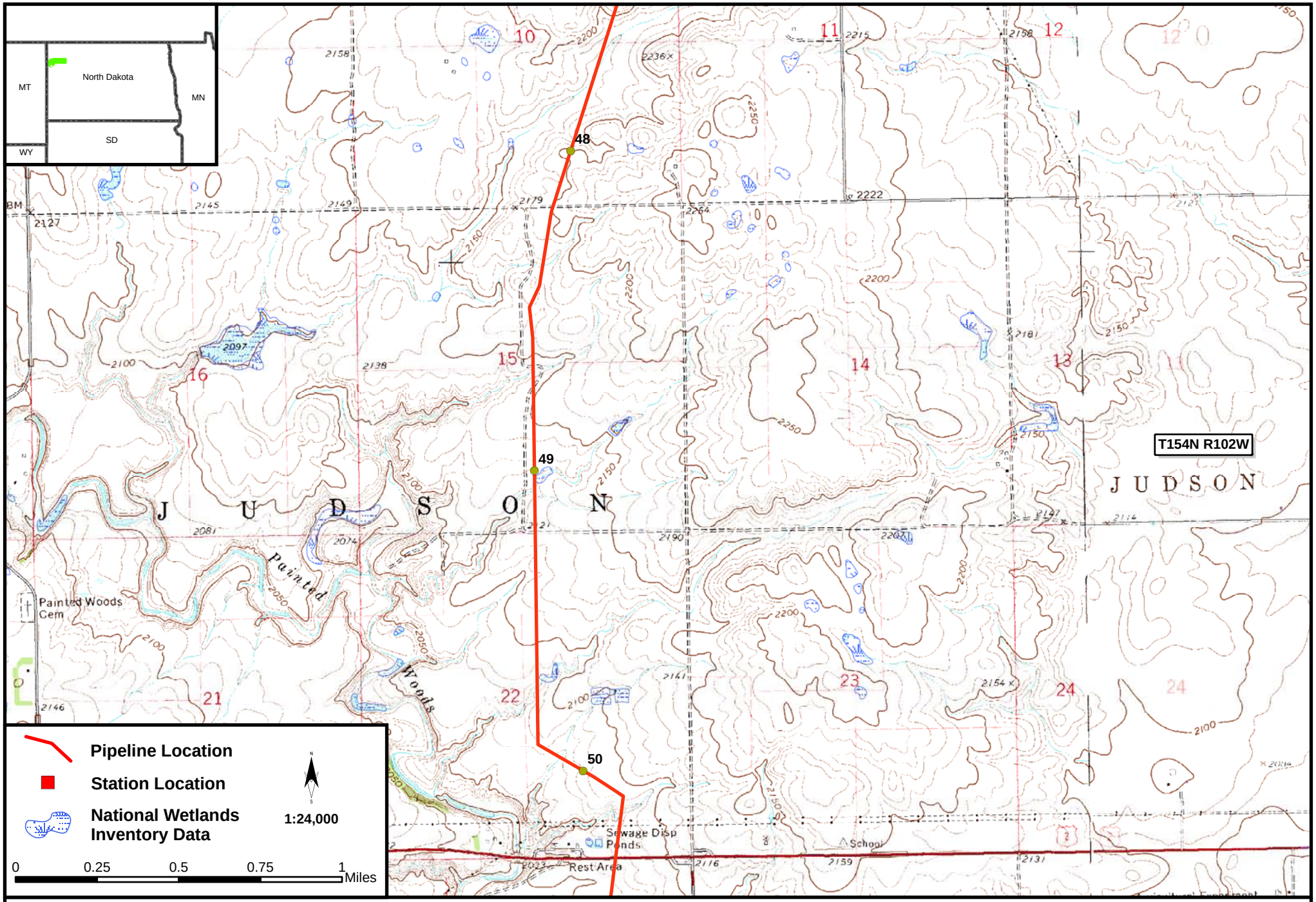
Location Map - Sheet 12 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

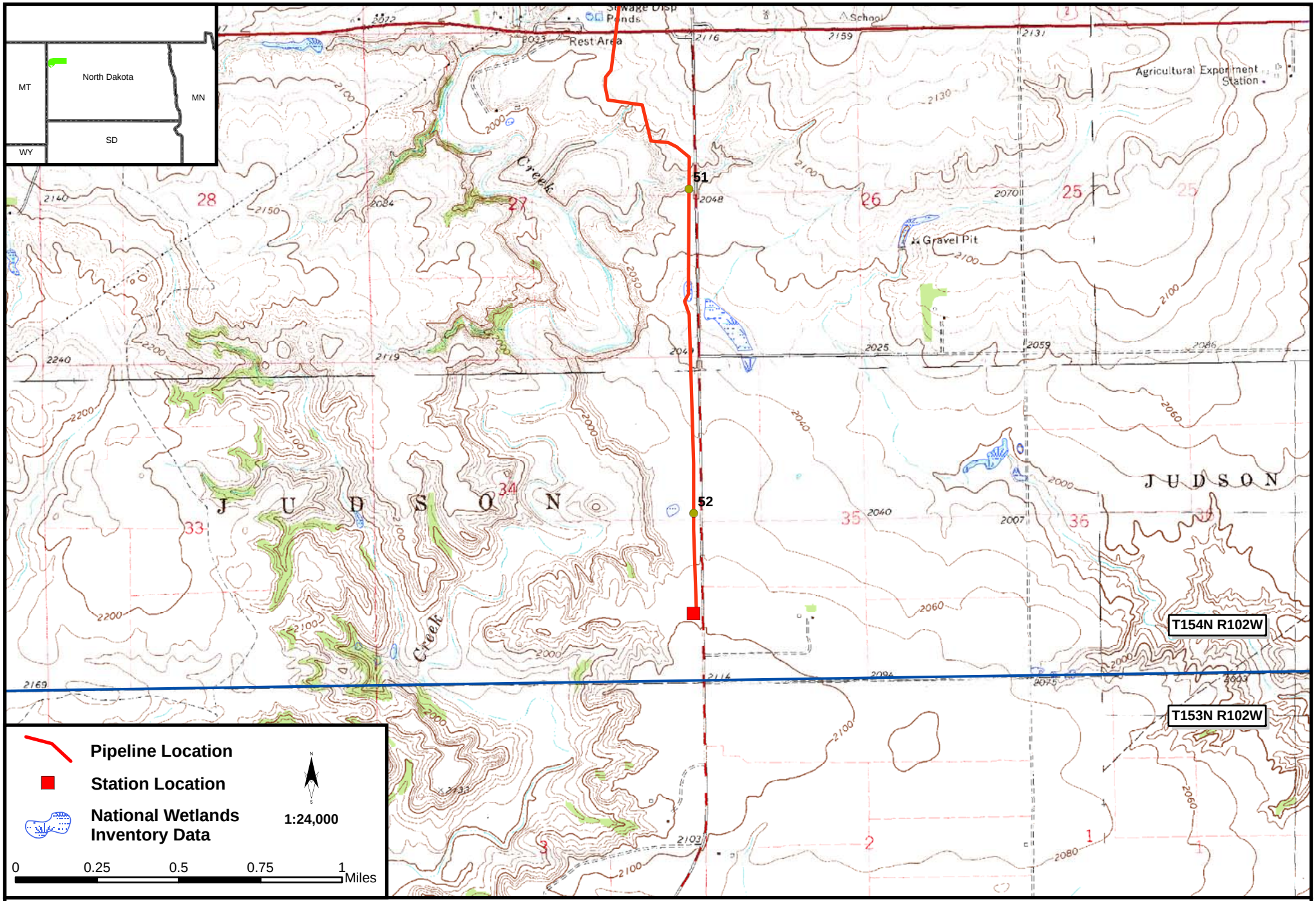
Location Map - Sheet 13 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 14 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 15 of 15

North Dakota State Water Commission

Sovereign Lands, Solicitation of View

Enbridge Pipelines (Lakehead) L.L.C.
119 N. 25th Street East
Superior, WI 54880
Tel 715 394 1400
Fax 715 394 1570
www.enbridgepartners.com

Scott W. Lounsbury Supervisor, Environment
Kris H. Benson Environmental Analyst II
Paul R. Meneghini Sr. Environmental Analyst
Rachael A. Shetka Environmental Analyst
David M. Hoffman Sr. Environmental Analyst
Joseph P. Peterson Environmental Analyst II

June 6, 2006

Mr. Jim Lindseth
North Dakota State Water Commission
900 East Boulevard
Bismarck, ND 58505-0850

RE: Enbridge Pipelines (North Dakota) LLC - North Dakota Pipeline Expansion Project
Sovereign Lands, Solicitation of View

Dear Mr. Lindseth,

Enbridge Pipelines (North Dakota) LLC ("Enbridge") is presently evaluating a project to expand a portion of its North Dakota pipeline system. The proposed expansion would involve constructing a new underground pipeline adjacent to a portion of its existing underground pipeline, and potentially modifying aboveground facilities along the project route. Enbridge anticipates the proposed pipeline will be co-located in the same corridor as its existing pipeline and will extend approximately 53 miles between its Beaver Lodge Pump Station (about 7 miles south of Tioga) and Trenton Pump Station (about 6 miles southwest of Williston). USGS topographic maps are enclosed that depict the anticipated pipeline route. Construction will require approximately 3-5 months to complete, with a tentative start date of August 2006.

Enbridge requests the North Dakota State Water Commission review the anticipated project area for Sovereign Lands, as defined in NDCC 61-33, which could be affected by project activities. If Sovereign Lands are identified, Enbridge will submit an *Application for Authorization to Construct a Project within Islands and Beds of Navigable Streams and Waters*. To account for potential route variations, Enbridge requests your review include lands within ¼ mile buffer of the currently proposed pipeline.

If you have questions or require further information regarding this project, please contact Tom Hess of Merjent, Inc., Enbridge's environmental consultant, at (612) 746-3667, or me at (715) 394-1572.

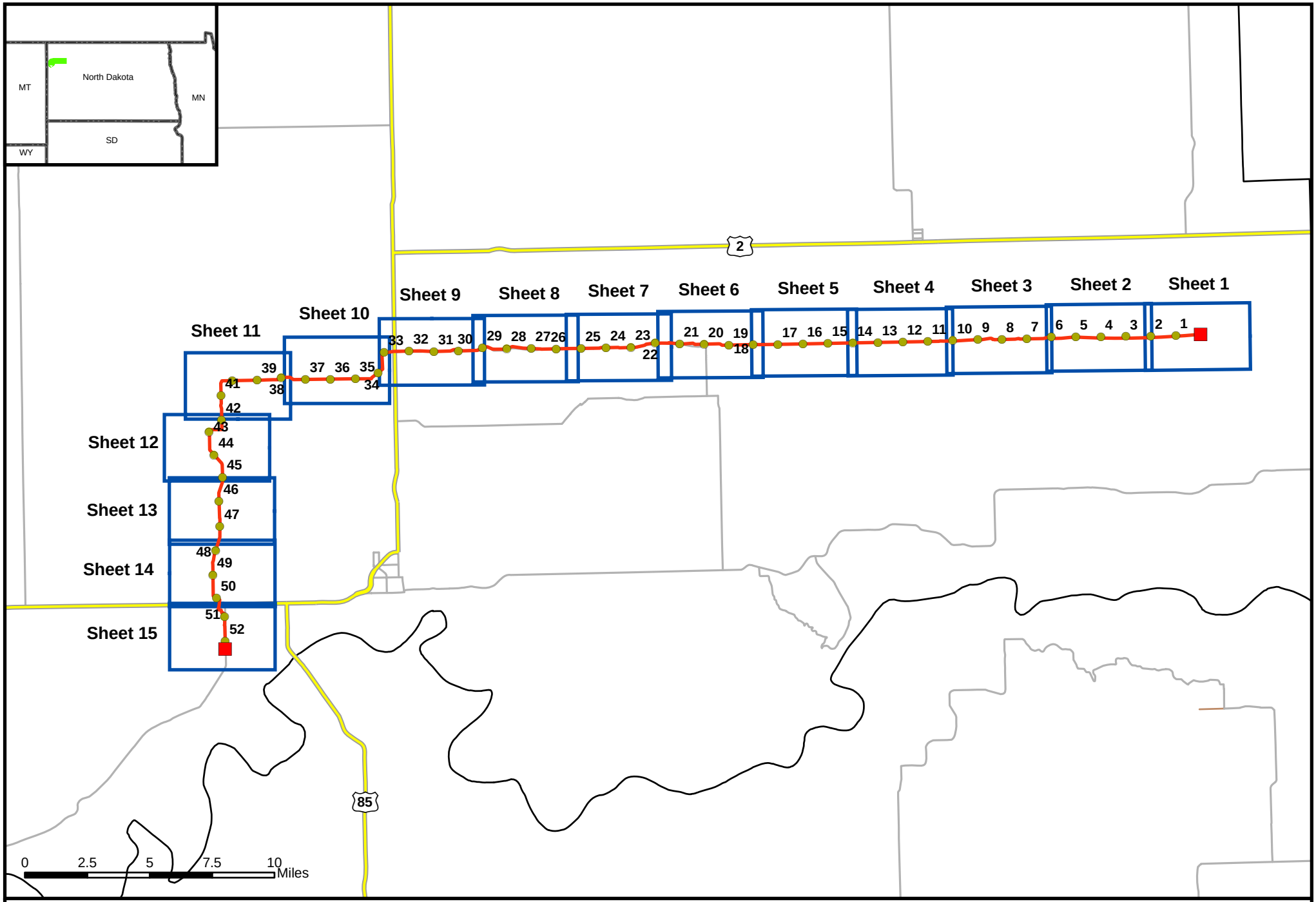
Sincerely,

Kris Benson

Kris Benson, CHMM
Environmental Analyst II
Enbridge Pipelines (North Dakota) LLC

Enclosures: Project location maps

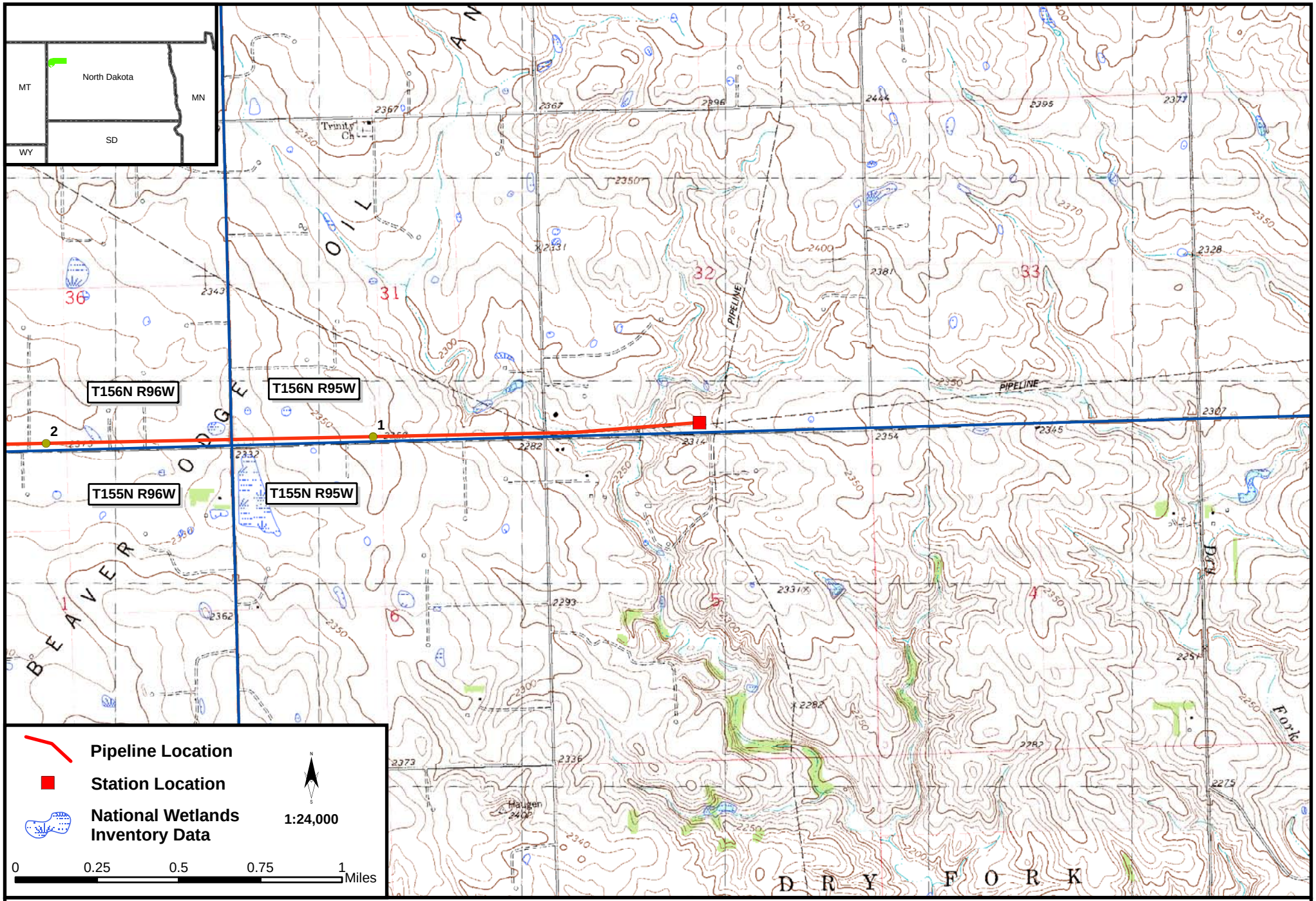
cc: Tom Hess, Merjent, Inc.



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

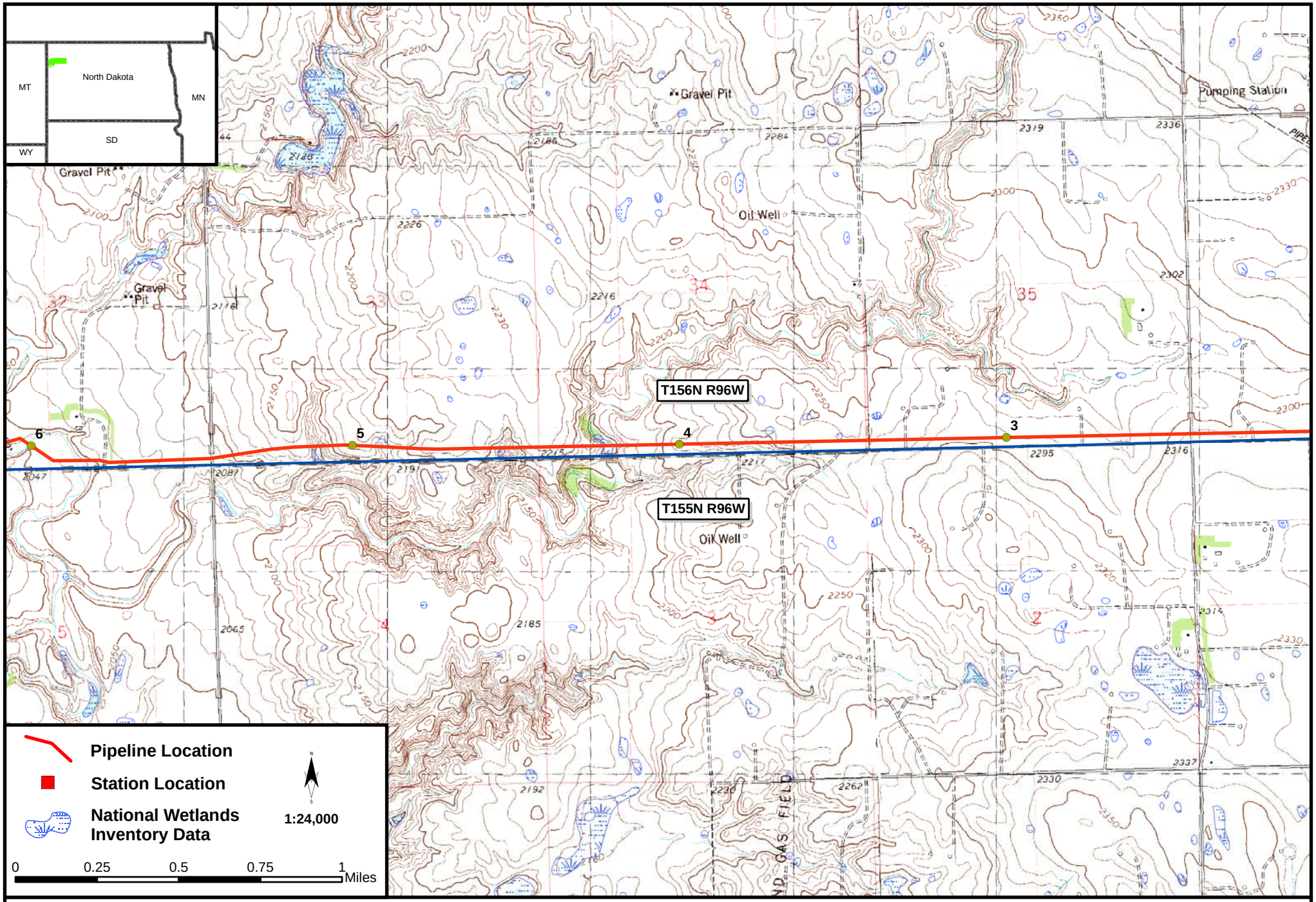
Location Map - Index



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

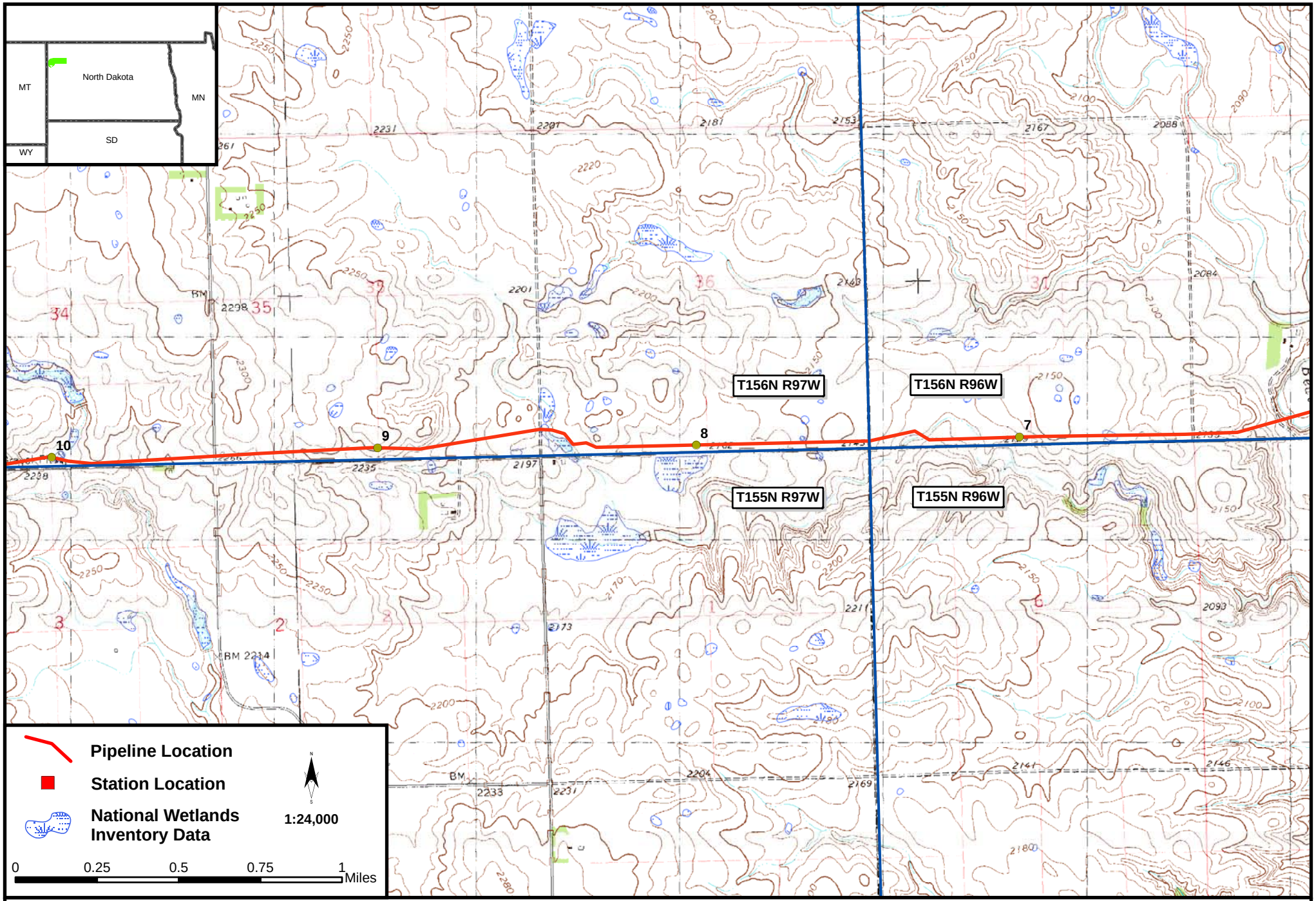
Location Map - Sheet 1 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

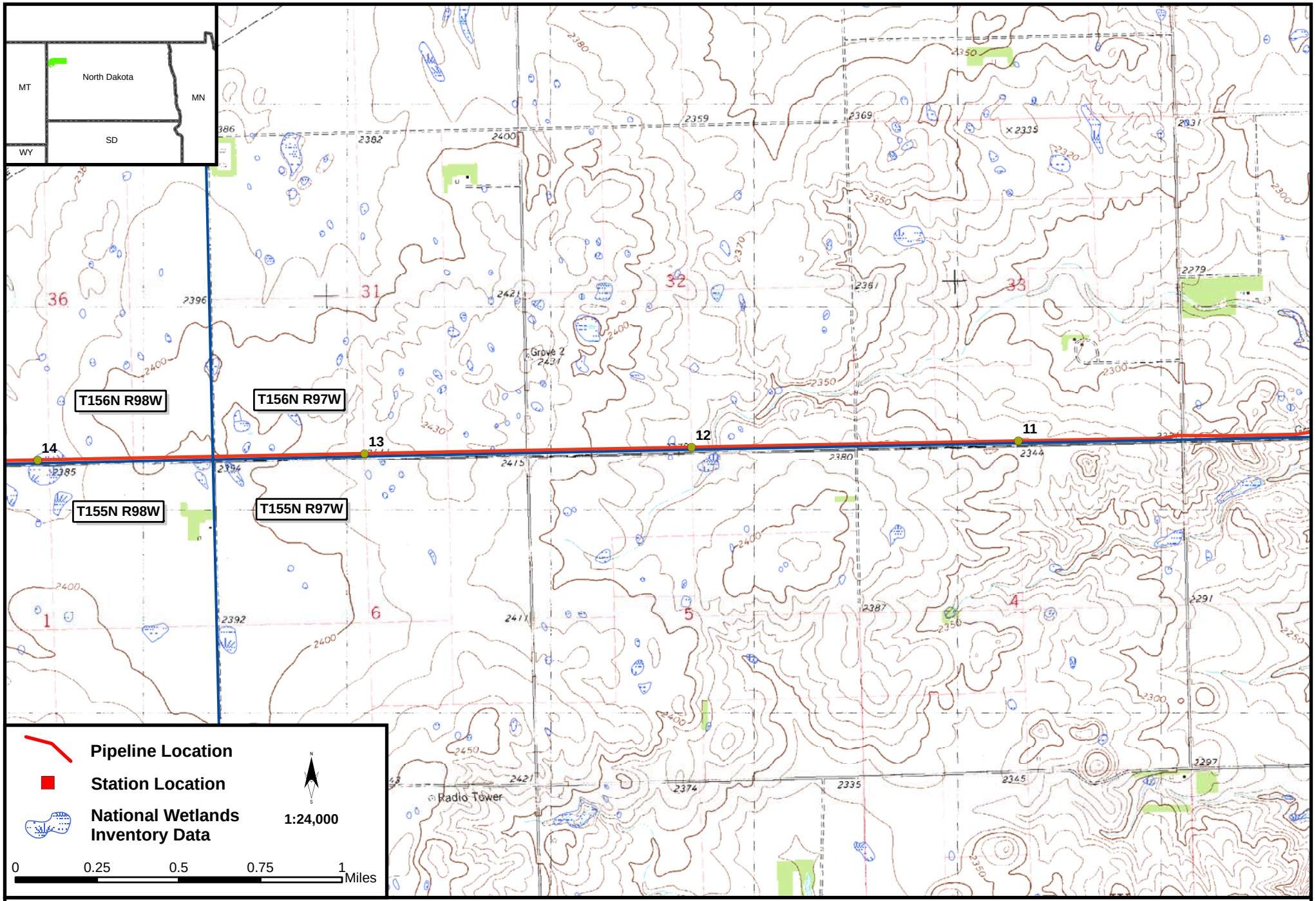
Location Map - Sheet 2 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

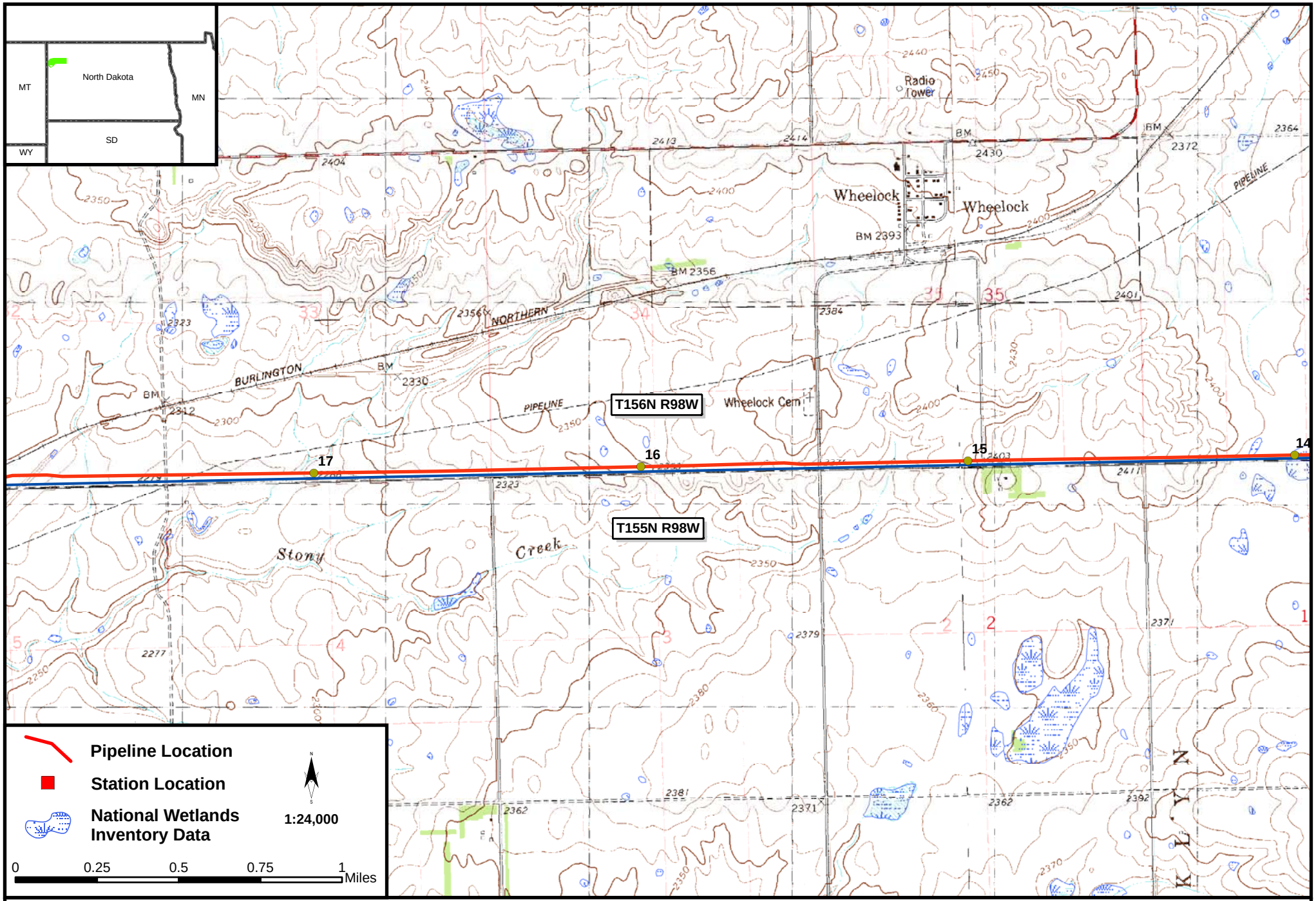
Location Map - Sheet 3 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

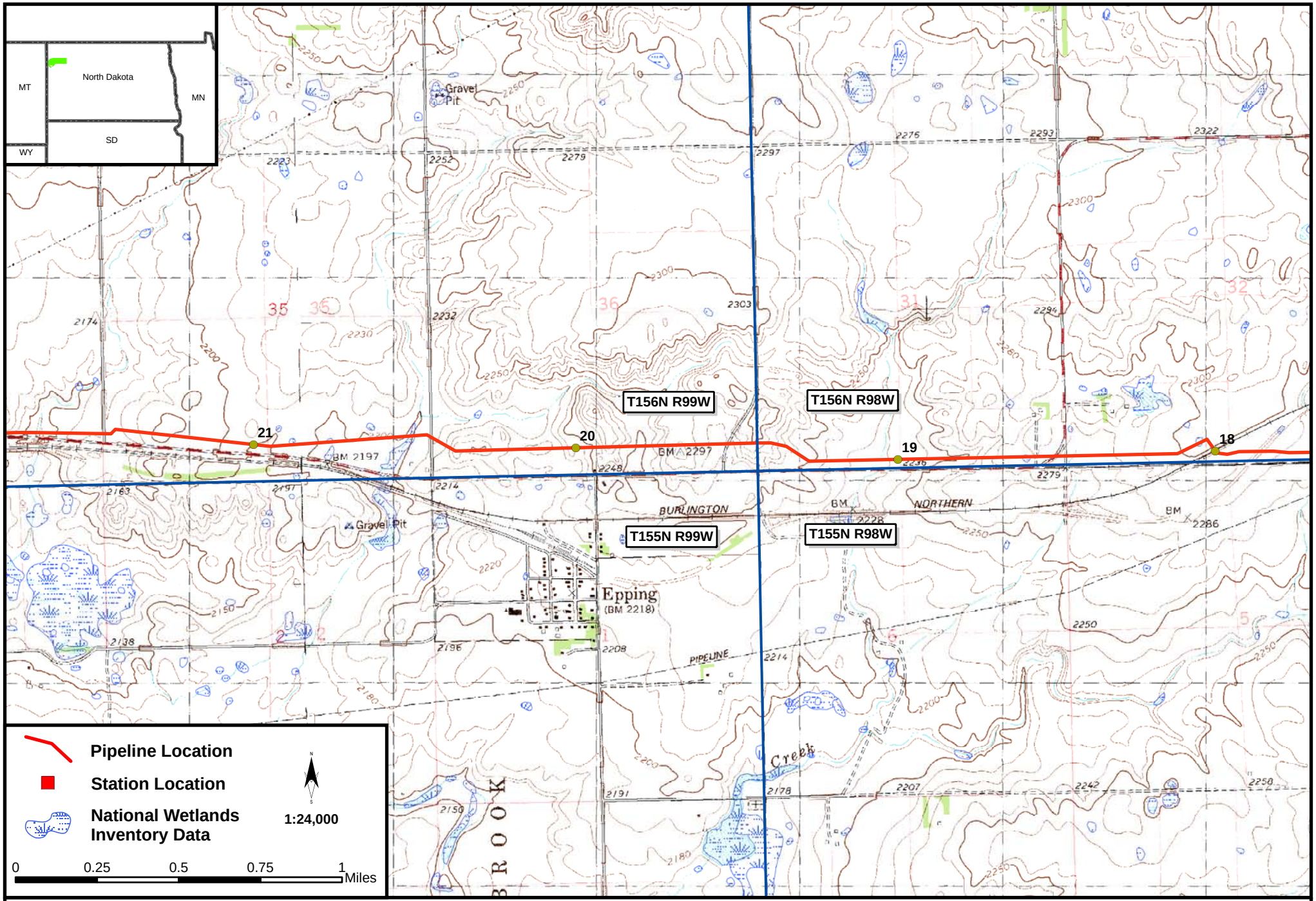
Location Map - Sheet 4 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

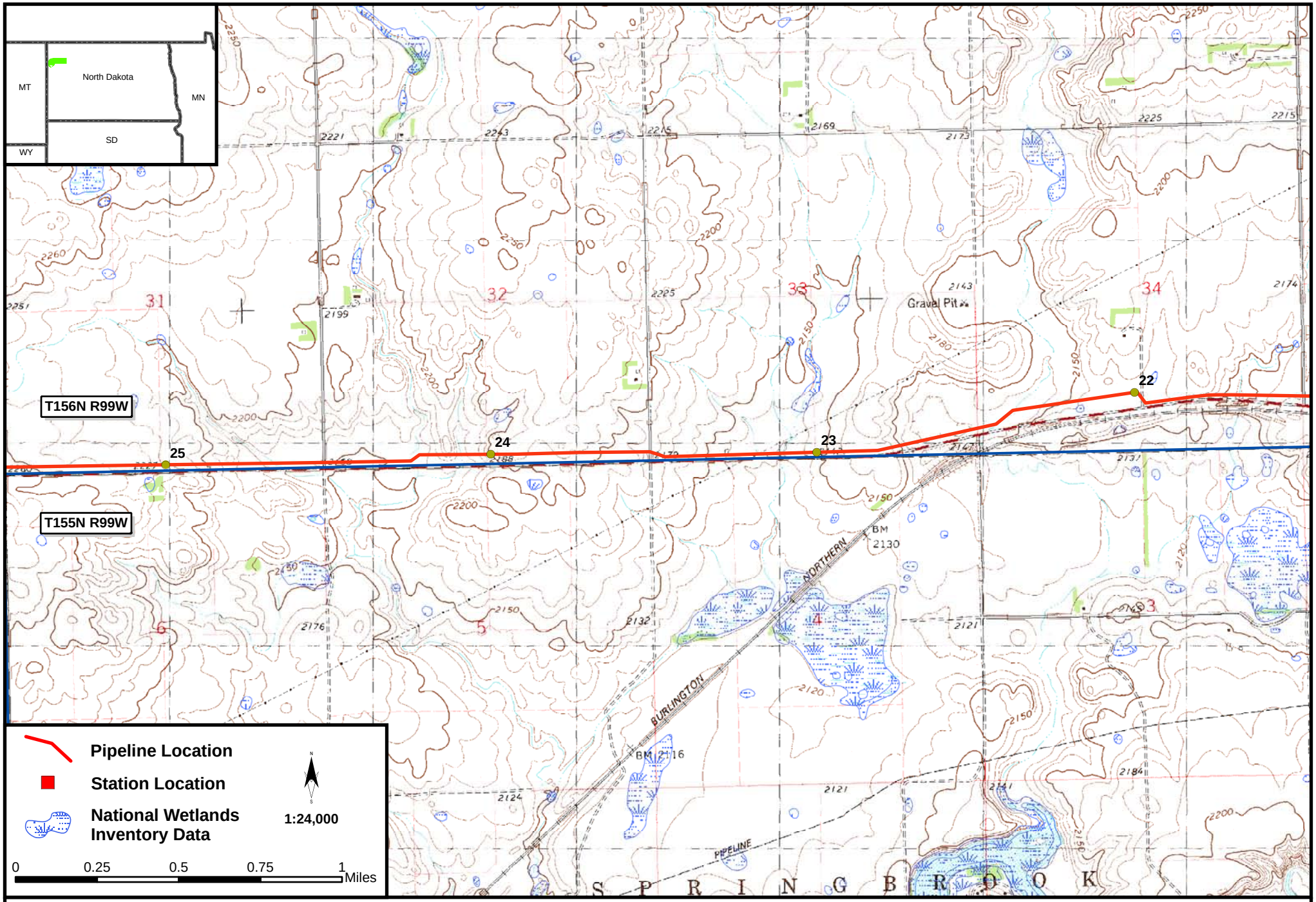
Location Map - Sheet 5 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

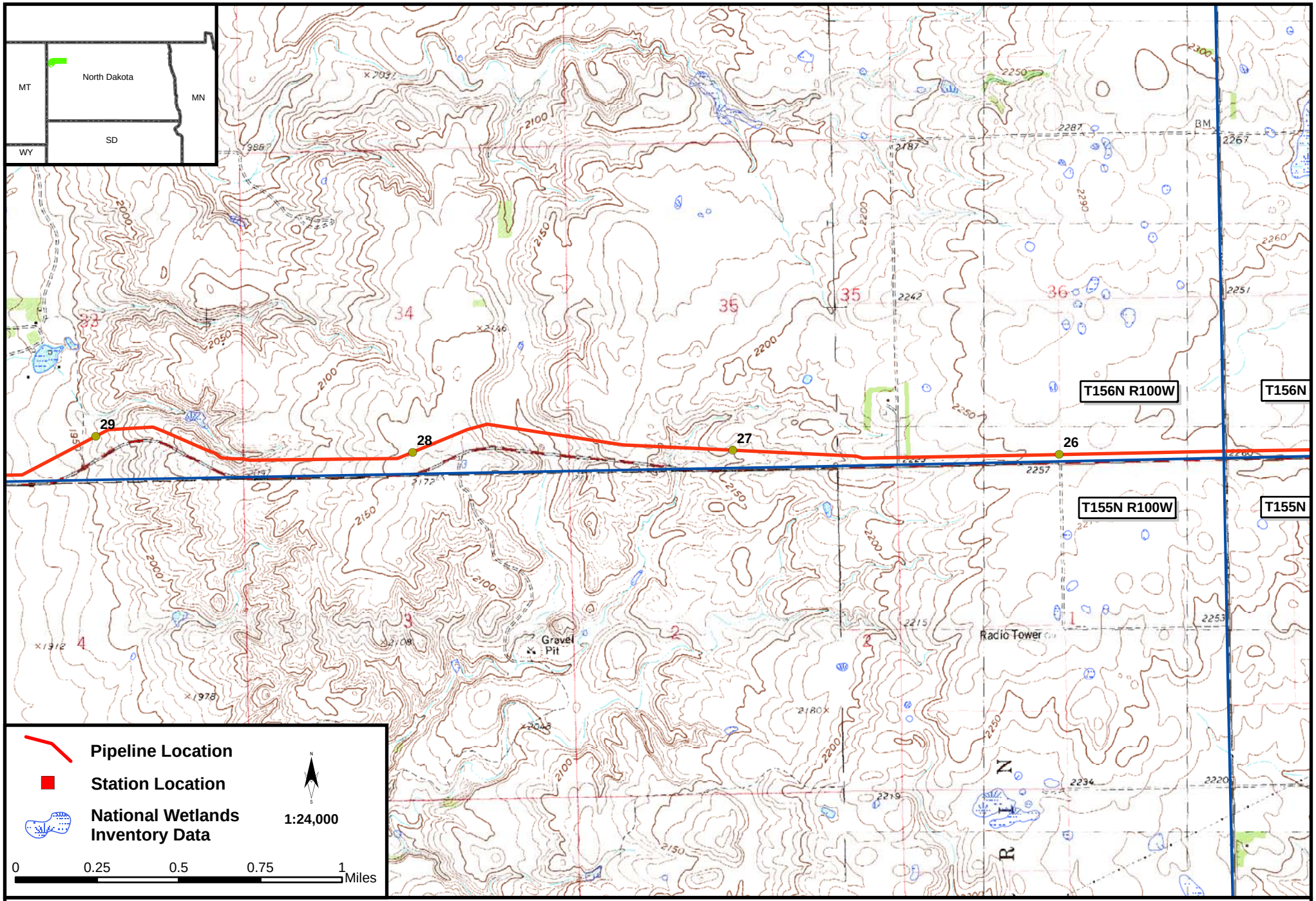
Location Map - Sheet 6 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

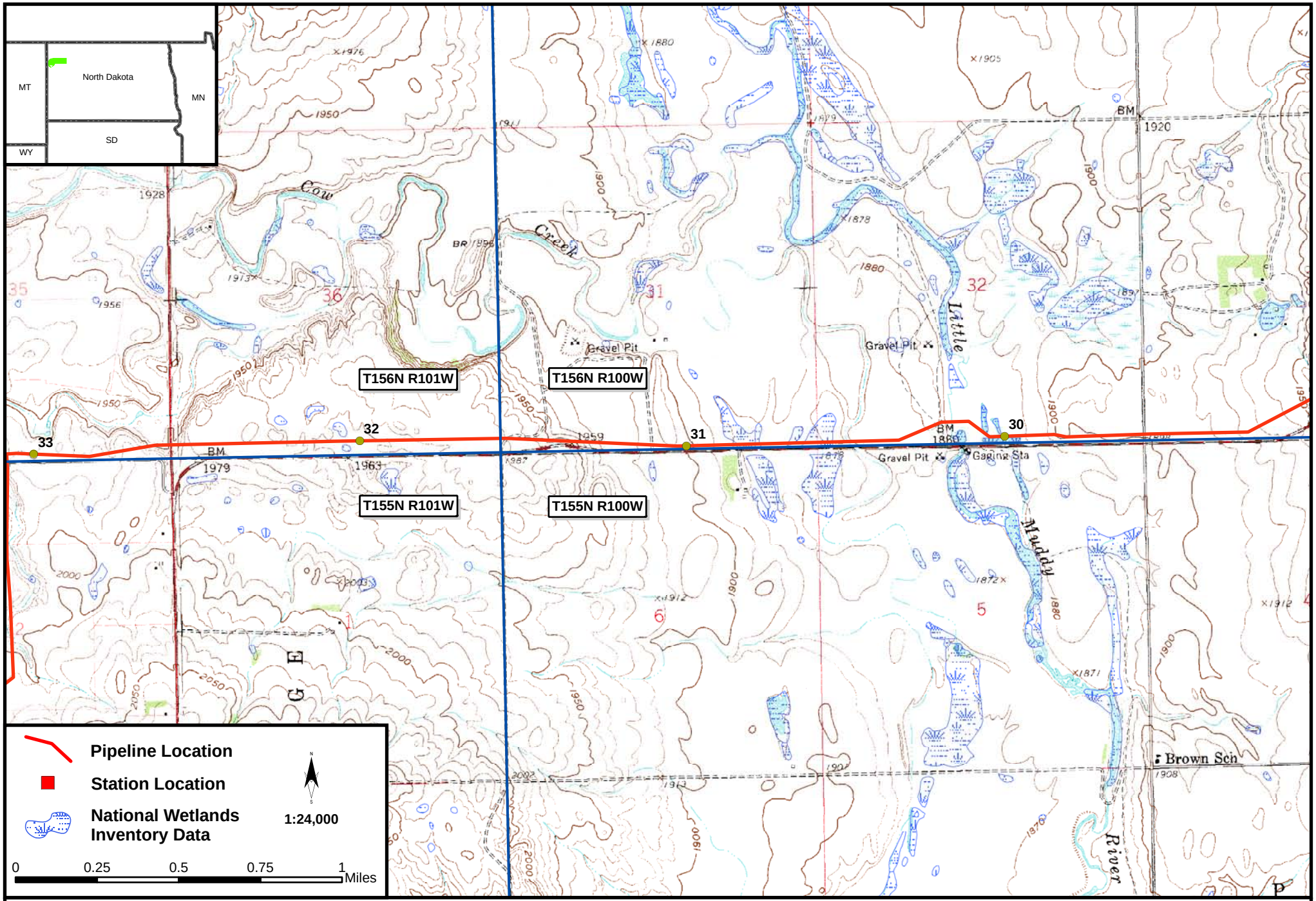
Location Map - Sheet 7 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

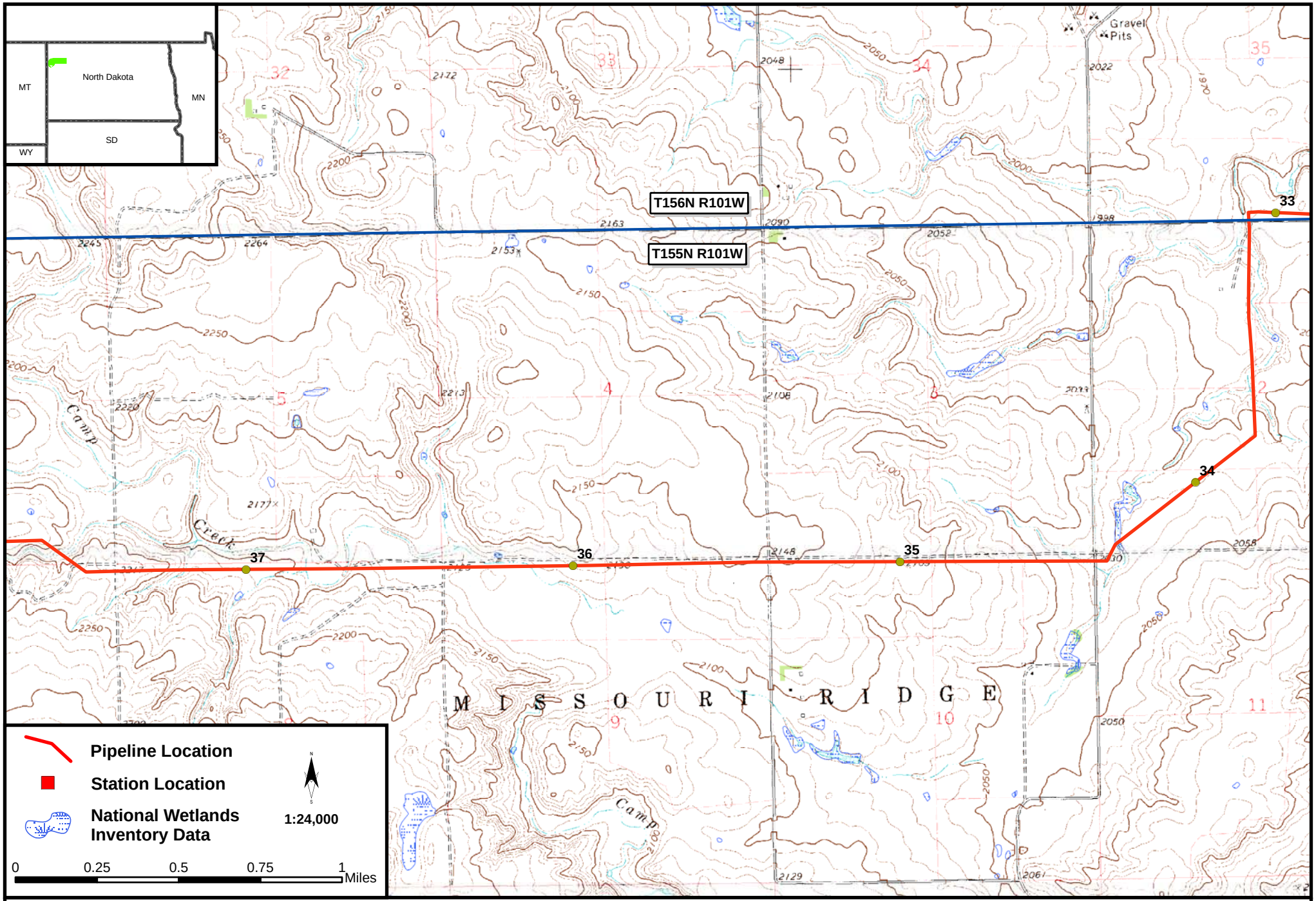
Location Map - Sheet 8 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

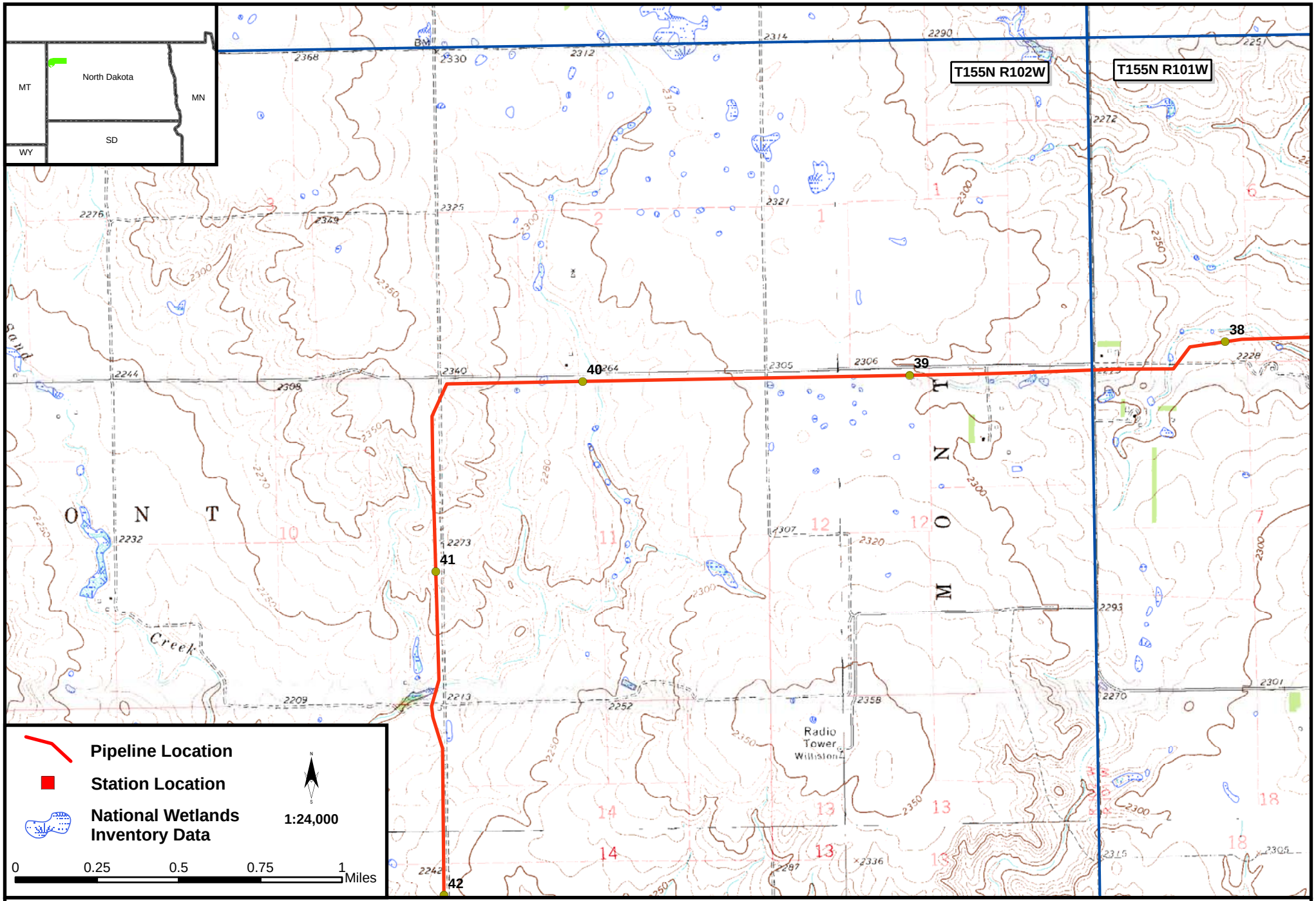
Location Map - Sheet 9 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

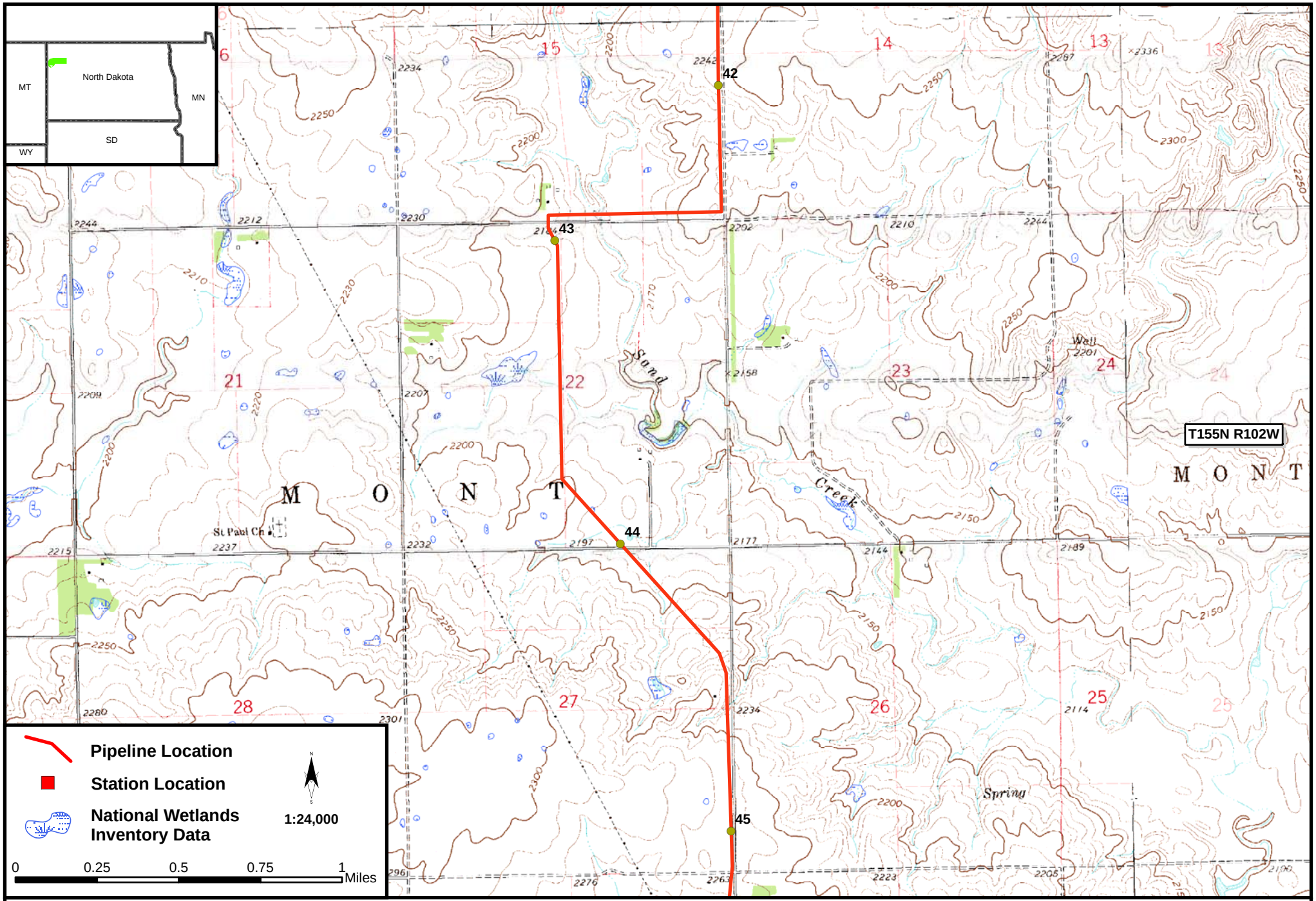
Location Map - Sheet 10 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

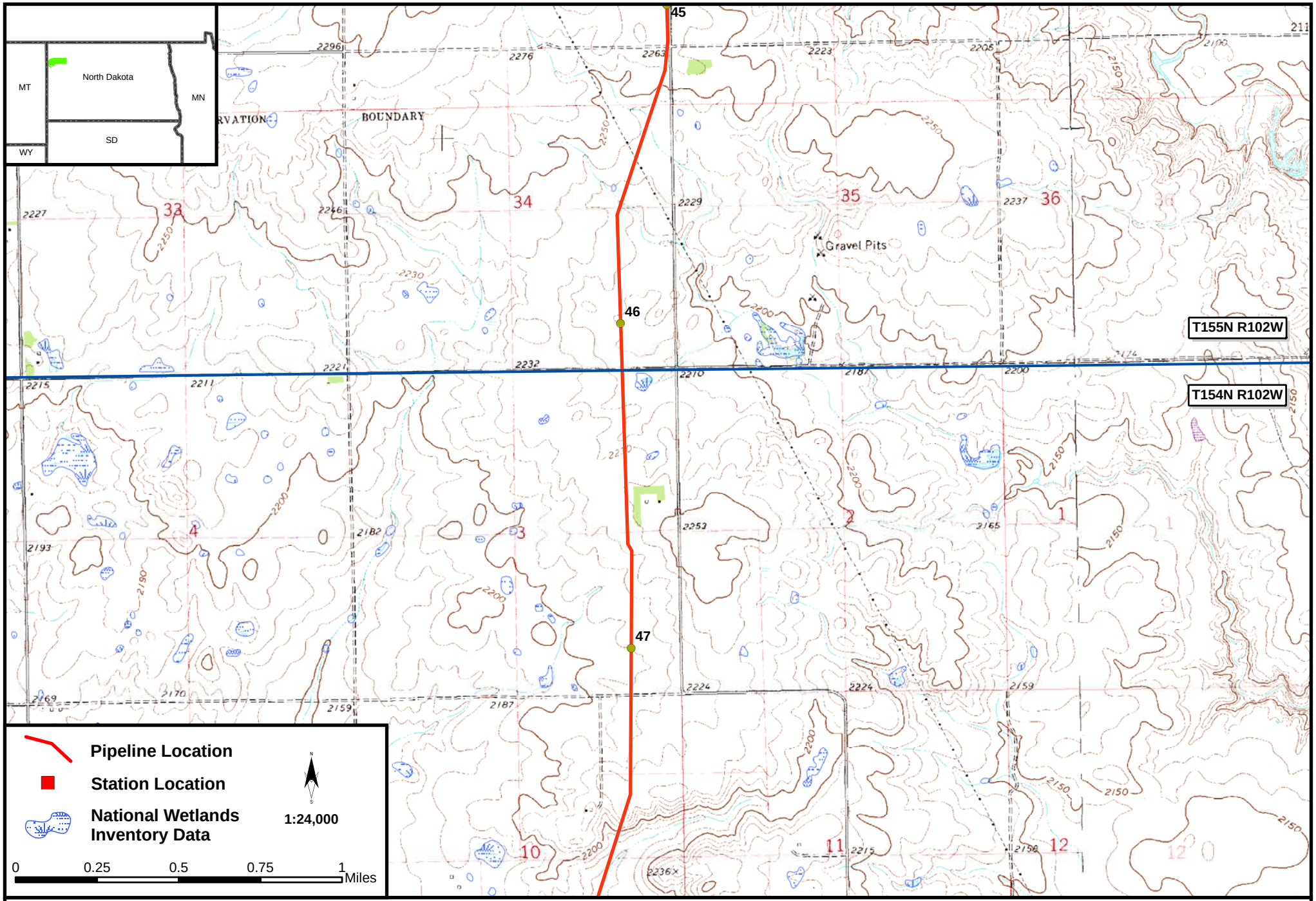
Location Map - Sheet 11 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

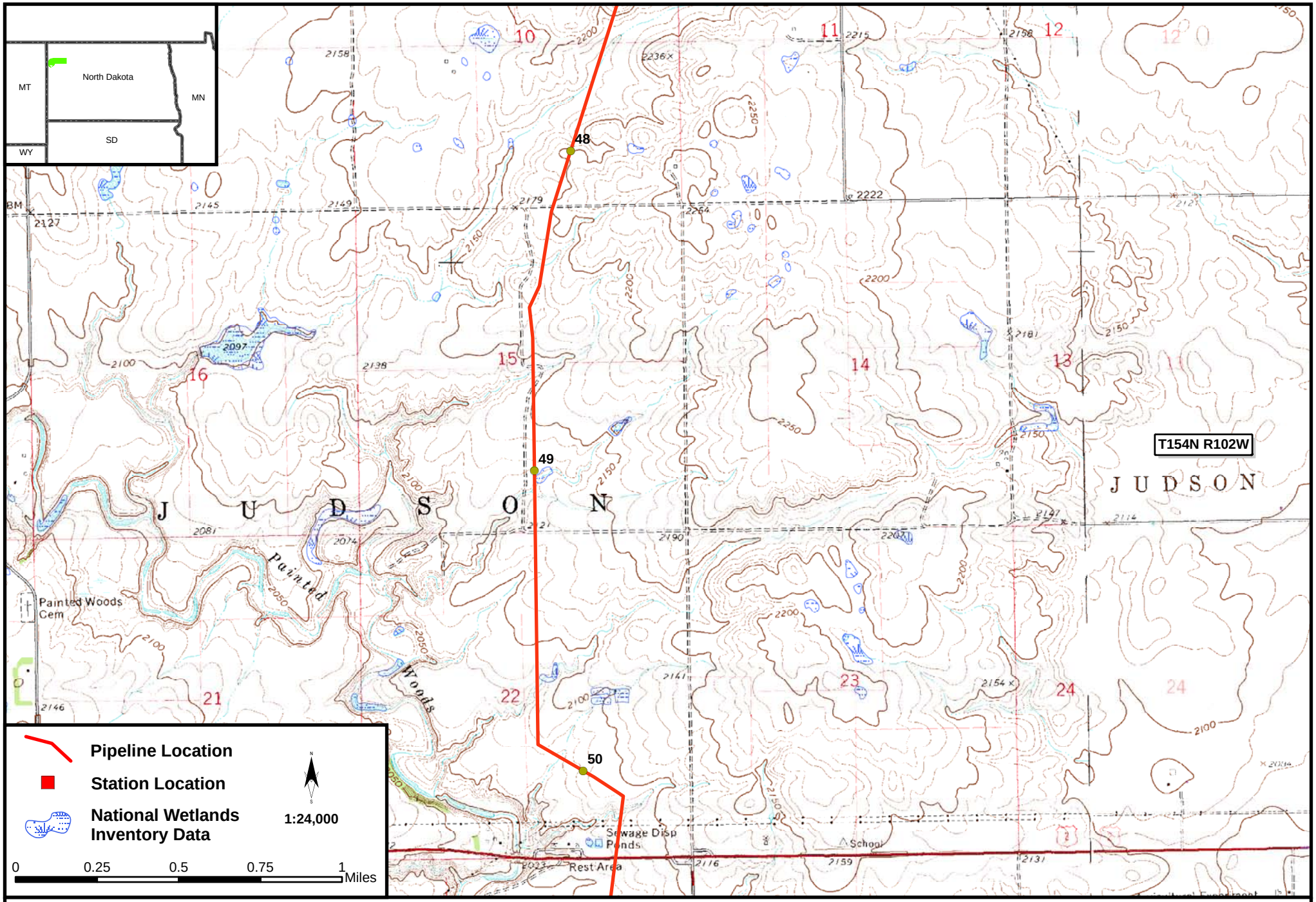
Location Map - Sheet 12 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

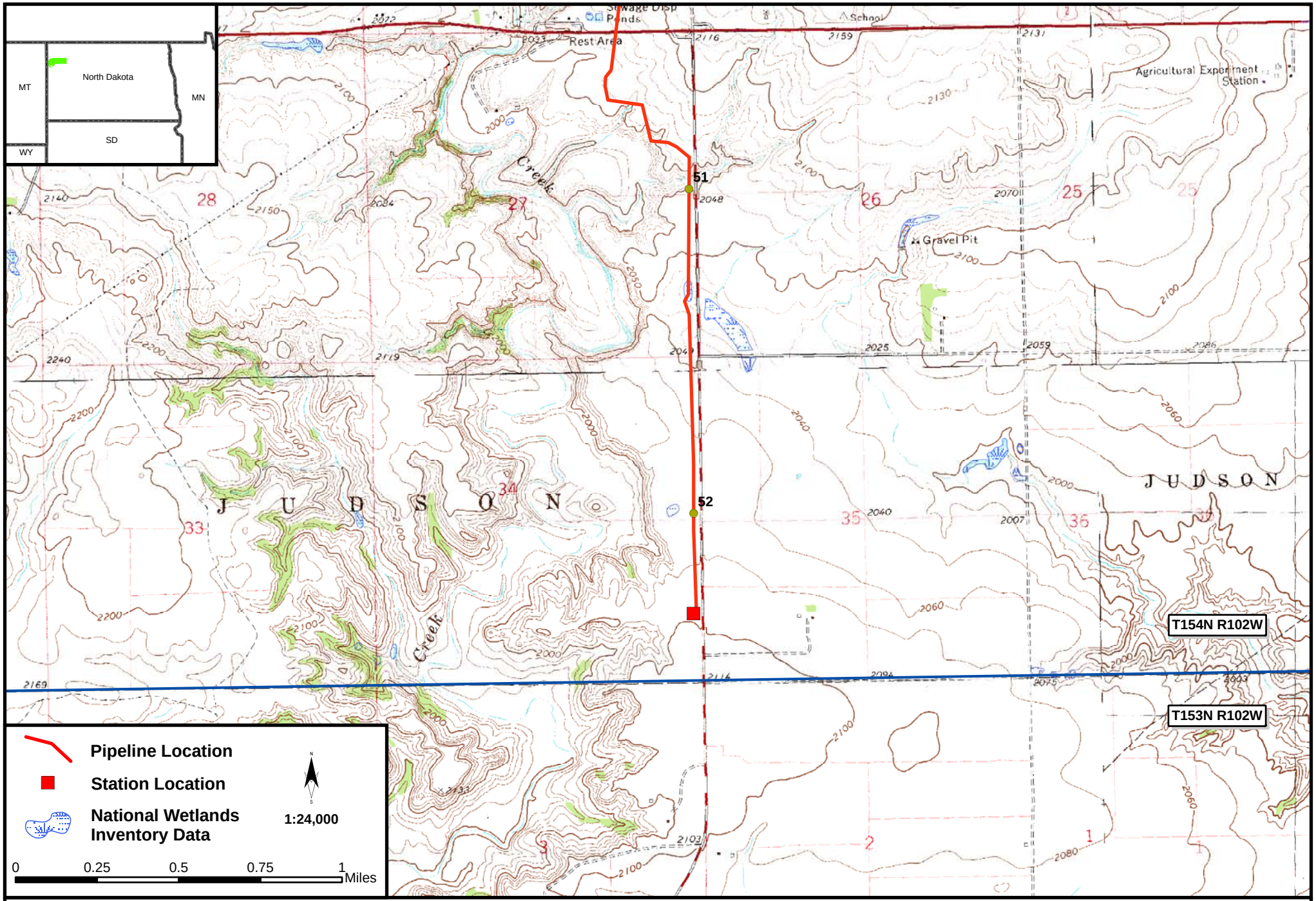
Location Map - Sheet 13 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 14 of 15



Enbridge Pipelines (North Dakota) LLC

North Dakota Pipeline Expansion Project

Location Map - Sheet 15 of 15

State Historical Society of North Dakota (State Historic Preservation Office)

National Historic Preservation Act Consultation

STATE HISTORICAL SOCIETY OF NORTH DAKOTA

John Hoeven
Governor of North Dakota

North Dakota
State Historical Board

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Director
Parks and Recreation Department

David A. Sprynczynatyk
Director
Department of Transportation

Merlan E. Paaverud, Jr.
Director

June 21, 2006

Mr. Patrick Fahn
Public Utility Analyst
Public Service Commission
600 East Boulevard Avenue, Dept. 408
Bismarck, ND 58505-0480

ND SHPO REF.:06-0776 Corps of Engineers, KJL/Earthworks PSC; Enbridge Pipeline Expansion, Class I CRI and Class III CRI Recommendations

Dear Mr. Fahn,

Enclosed is a copy of our letter to the Corps of Engineers sent yesterday regarding the cultural resource survey for the Enbridge Pipeline Expansion. We are recommending a Class III (pedestrian survey) for moderate-high potential priority areas listed and identified in Earthwork's "Archaeological Survey Plan for Enbridge Pipelines (North Dakota) LLC, North Dakota Expansion Project," by Duane Klinner and John Morrison.

Please include the ND SHPO Reference number listed above in any correspondence for this specific project. If you have any questions please contact Susan Quinnell at (701) 328-3576 or squinnell@nd.gov

Sincerely,

Merlan E. Paaverud, Jr.
State Historic Preservation Officer
(North Dakota) and
Director
State Historical Society of North Dakota

Accredited by the American Association of Museums

STATE HISTORICAL SOCIETY OF NORTH DAKOTA

COPY

John Hoeven
Governor of North Dakota

North Dakota
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Chester E. Nelson, Jr.
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Sara Otte Coleman
Director
Tourism Division

Kelly Schmidt
State Treasurer

Alvin A. Jaeger
Secretary of State

Douglass Prchal
Director
Parks and Recreation Department

David A. Sprynczynatyk
Director
Department of Transportation

Merlan E. Paaverud, Jr.
Director

Accredited by the American Association of Museums

June 20, 2006

Ms. Toni R. Erhardt
Program Manager
US Army Corps of Engineers
1513 South 12th Street
Bismarck, ND 58504

Ms. Kris Benson
Environmental Analyst II
Enbridge Pipelines LLC
119 N. 25th Street East
Superior, WI 54880

NDSHPO REF. : 06-0776 COE, KLJ/Earthworks; Enbridge Pipeline Expansion, Class I CRI and Class III CRI Recommendations.

Dear Toni and Kris :

We have reviewed project: **06-0776:** "Archaeological Survey Plan for Enbridge Pipelines (North Dakota) LLC, North Dakota Expansion Project," by Duane Klinner and John Morrison (Earthworks, June 2006), and find the Class I CRI (file search) acceptable. We concur with the proposed program for identification and investigation efforts for cultural resources that has been successfully applied on other pipeline projects. There is potential for unrecorded and recorded properties in a variety of physiographic settings in the overall study area. We recommend that a qualified and permitted cultural resource contractor: (1) conduct Class III (pedestrian survey) for those moderate-high potential priority areas listed and identified in the document and (2)re-examine other moderate-high potential areas and conduct Class III CRI based on professional judgment, as part of the Environmental Assessment. A well grounded identification program demonstrates a good faith effort and decreases the possibility of and potential for unanticipated discoveries at a later date. Finally, we look forward to reviewing the report(s) covering the investigations.

Thank you for the opportunity to review and we look forward to further consultation on the project. If you have questions please contact either Paul Picha at (701) 328-3574 or Susan Quinnell at (701) 328-3576.

Sincerely,

for Merlan E. Paaverud, Jr.
State Historic Preservation Officer (North Dakota)
and
Director, State Historical Society of North Dakota
c: John G. Morrison, Earthworks

Williams County Auditor

6-23-06

John:

Here is the information that you requested. I have not enclosed anything on Little Eygpt since that is located on Corps of Engineer's land, but it is along the river in Hofflund Township.

Should you have any further questions, please call.

Sincerely,

Jim Ryen
Deputy Auditor
701-577-4504

MIDLAND ATLAS CO. INC. MILBANK, SOUTH DAKOTA

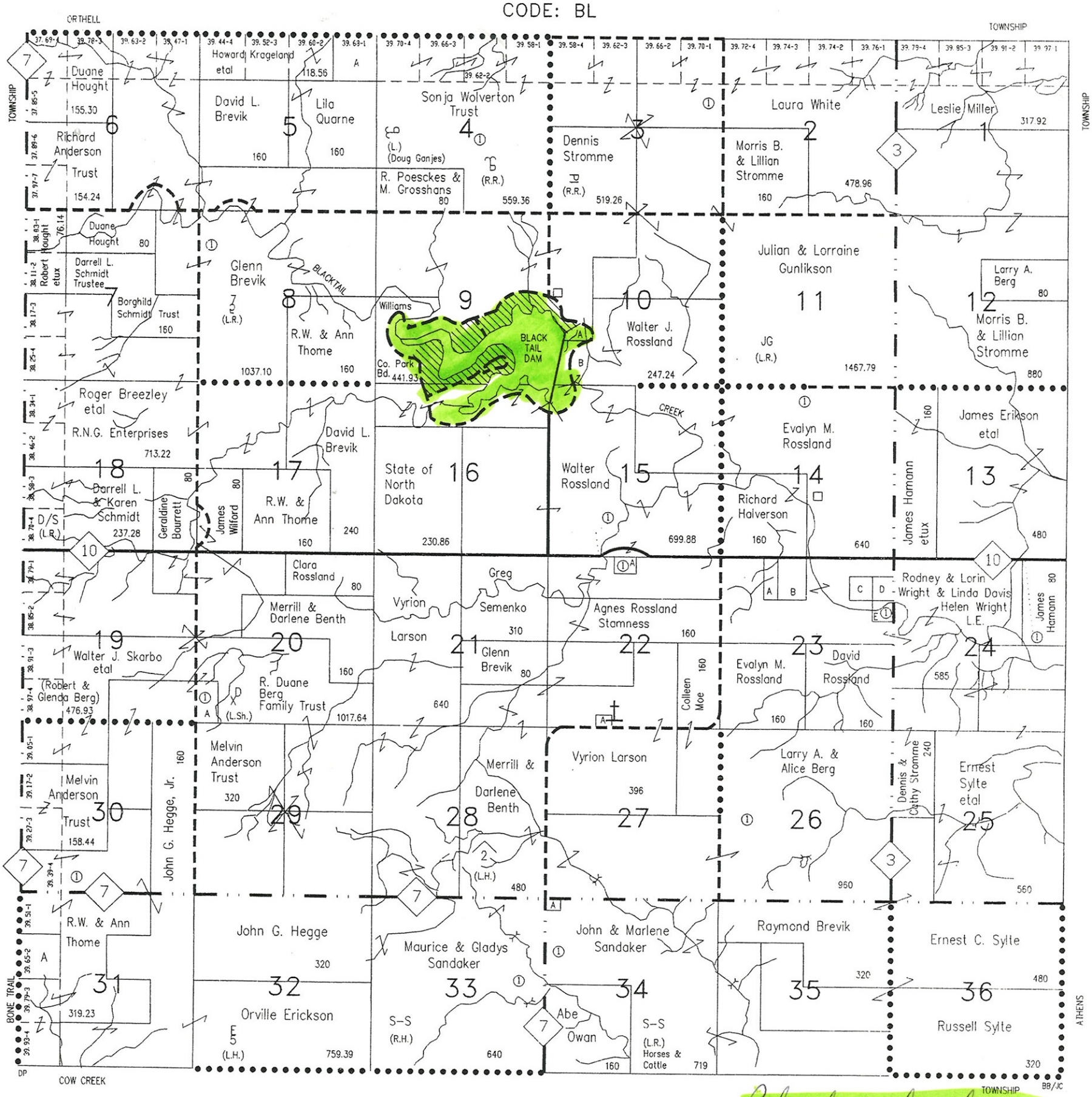
MAP OF BLACK TAIL

MIDLAND ATLAS CO. INC. COPYRIGHT 1997

TOWNSHIP: 157 N

RANGE: 101 W

CODE: BL



SEE SMALL TRACT OWNERS FOLLOWING TOWNSHIP MAPS

Blacktail dam

NORTHWEST ABSTRACT & TITLE, INC.

ABSTRACTS - TITLE INS. - OIL & GAS TITLE

Jerry M. Grev

President

717 East Broadway
P.O. Box 1265
Williston, ND 58802

Williams & Dunn Counties
701-774-8829
1-800-798-6723
Fax 701-774-9004

NEFF CRESAP RATHERT EIKEN & IRIGOIN P.C.

Attorneys at Law

Williston Office
(701)572-3794

Sidney Office
(406)482-1607

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MAP OF VIEW

MIDLAND ATLAS CO. INC.
MILBANK, SOUTH DAKOTA

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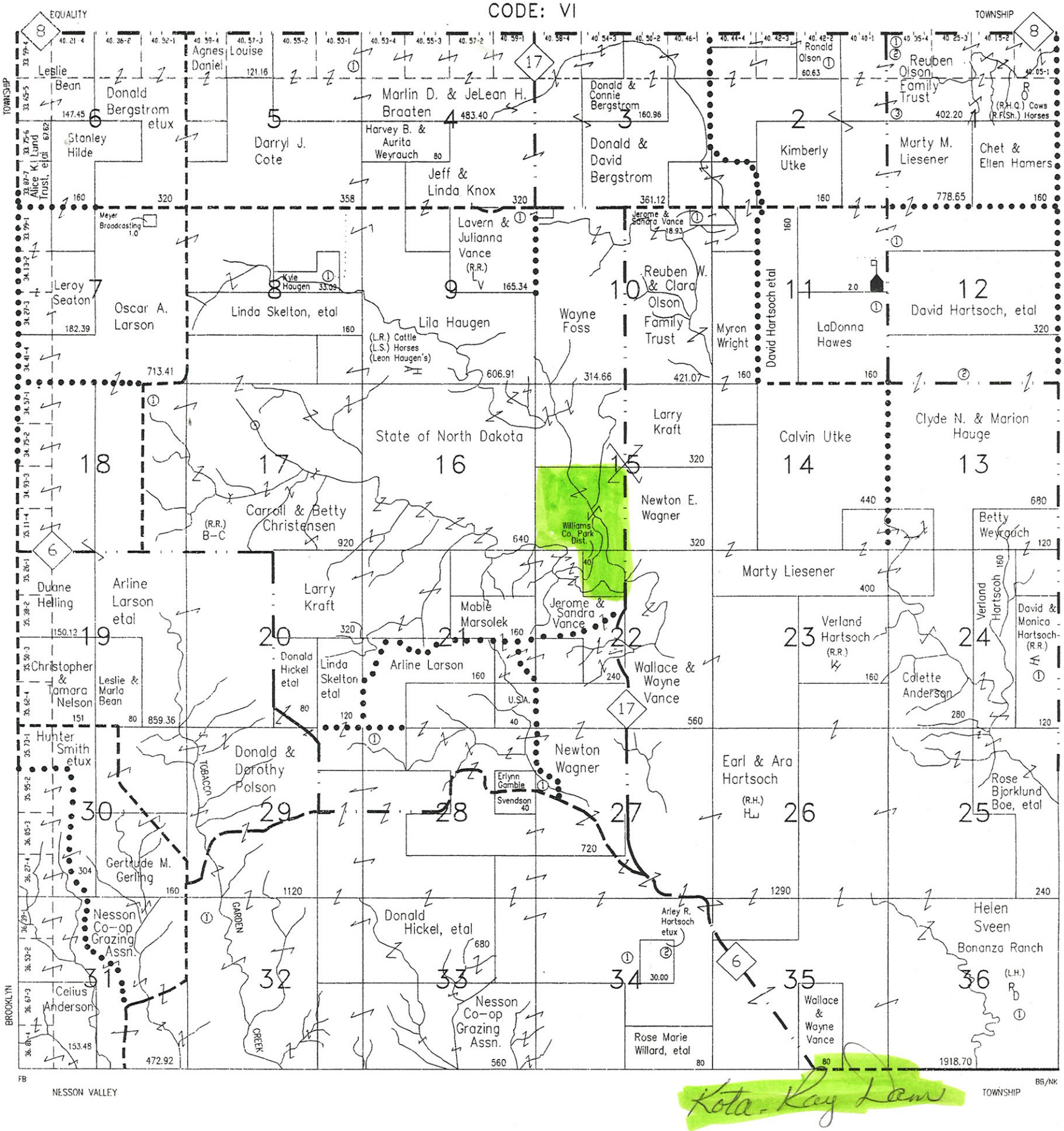
TOWNSHIP: 155 N

RANGE: 97 W

CODE: VI



Kota-Kay Land

NORTHWEST ABSTRACT & TITLE, INC.
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Jerry M. Grew
President
717 East Broadway
P.O. Box 1265
Williston, ND 58802
Williams & Dunn Counties
701-774-8829
1-800-798-6723
Fax 701-774-9004

NEFF CRESAP RATHERT EIKEN & IRIGOIN P.C.
Attorneys at Law
Williston Office
(701)572-3794
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MAP OF SPRINGBROOK

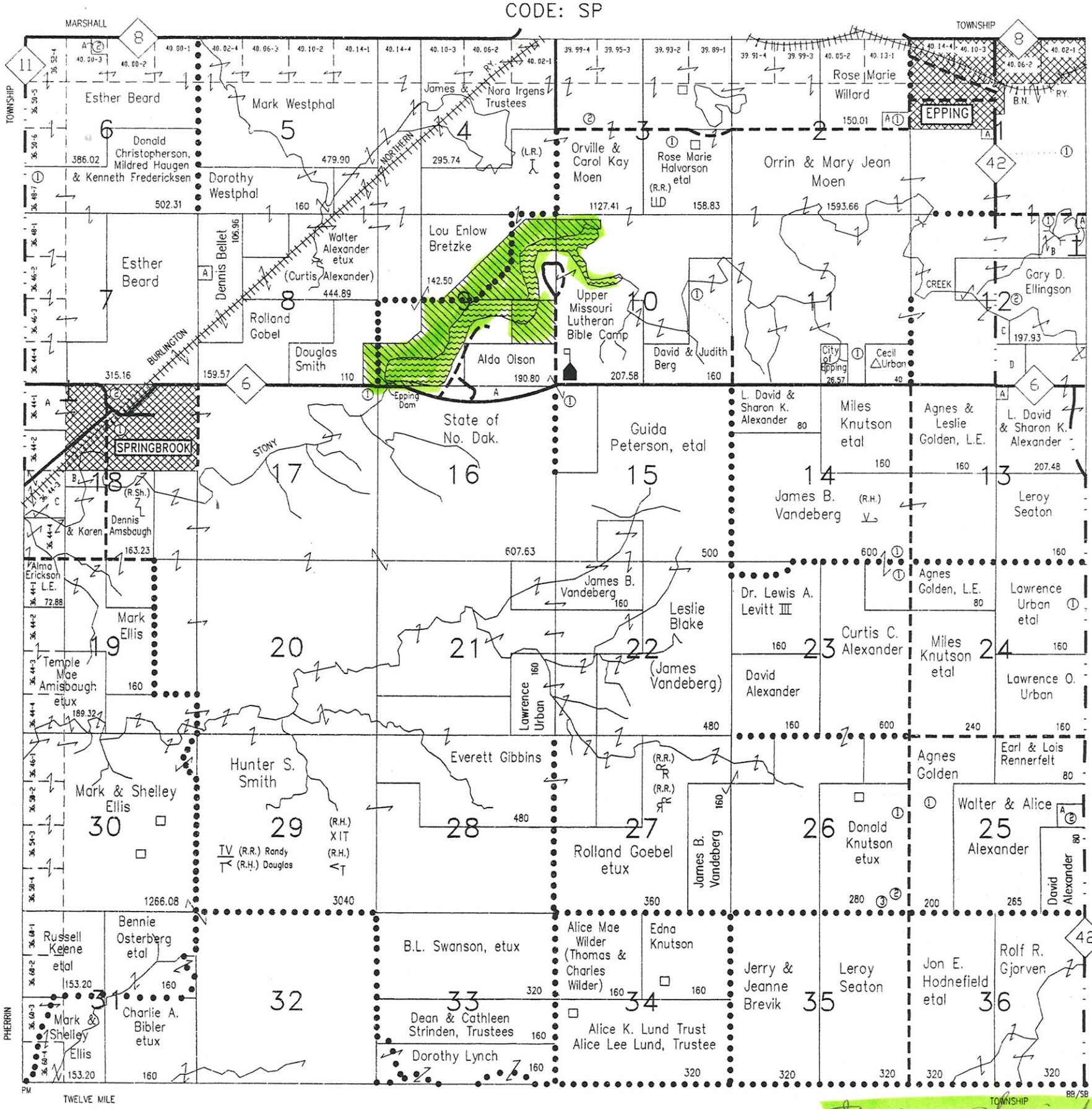
MIDLAND ATLAS CO. INC.
MILBANK, SOUTH DAKOTA

TOWNSHIP: 155 N

MIDLAND ATLAS CO. INC. COPYRIGHT 1997

RANGE: 99 W

CODE: SP



SEE SMALL TRACT OWNERS FOLLOWING TOWNSHIP MAPS

Epping - Springbrook dam

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ABSTRACTS - TITLE INS. - OIL & GAS TITLE
Jerry M. Grev
President
717 East Broadway
P.O. Box 1265
Williston, ND 58802
Williams & Dunn Counties
701-774-8829
1-800-798-6723
Fax 701-774-9004

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Attorneys at Law
Williston Office
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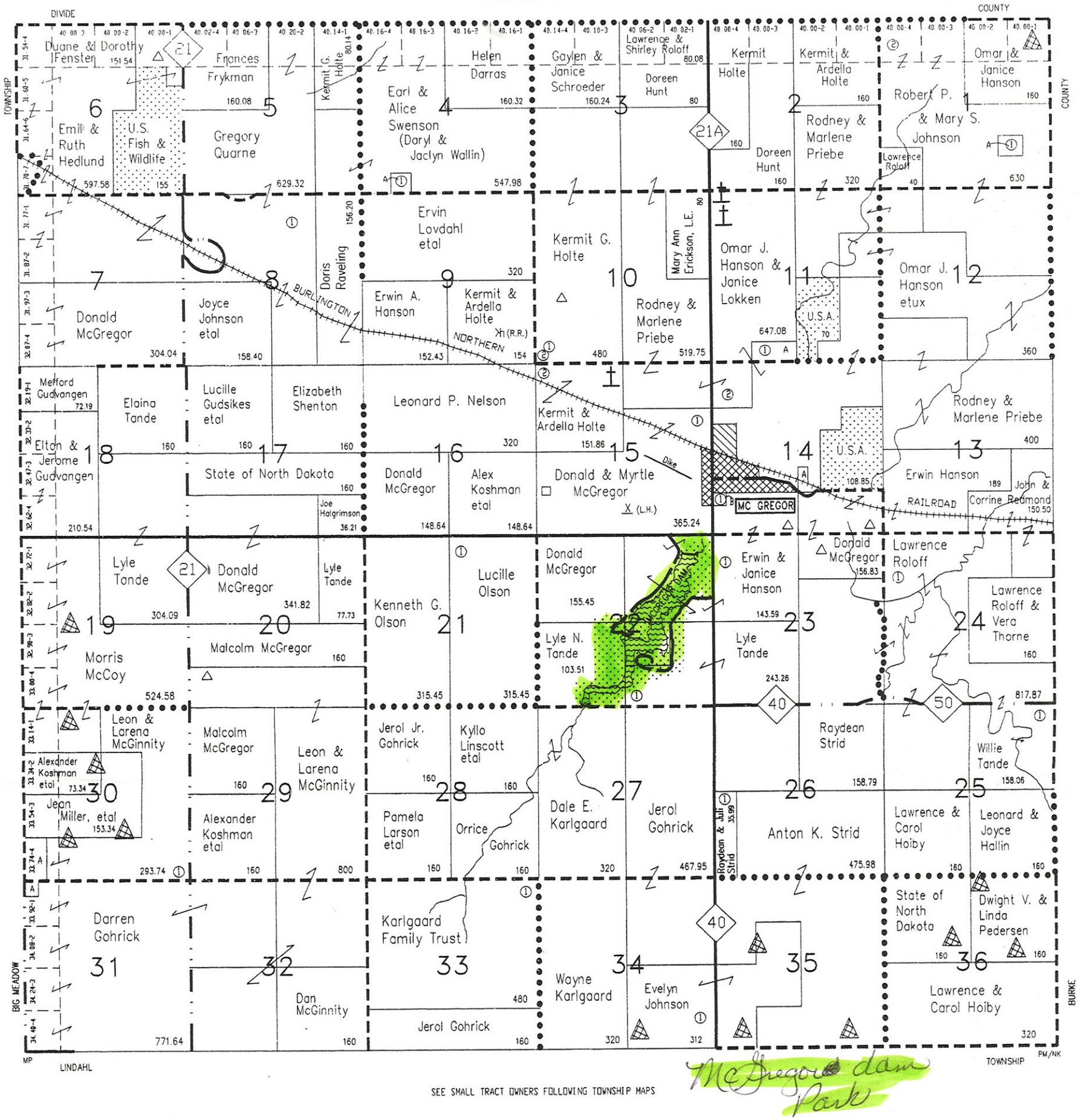
MAP OF
SAUK VALLEY

MIDLAND ATLAS CO. INC. COPYRIGHT 1997

TOWNSHIP: 159 N

RANGE: 95 W

CODE: SV



SEE SMALL TRACT OWNERS FOLLOWING TOWNSHIP MAPS

McGregor dam Park

NORTHWEST ABSTRACT & TITLE , INC.

ABSTRACTS - TITLE INS. - OIL & GAS TITLE

Jerry M. Grev

President

717 East Broadway
P.O. Box 1265
Williston, ND 58802

Williams & Dunn Counties
701-774-8829
1-800-798-6723
Fax 701-774-9004

NEFF CRESAP RATHERT EIKEN & IRIGOIN P.C.

Attorneys at Law

Williston Office
(701)572-3794

Sidney Office
(406)482-1607

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Williams County Department of Equalization

Zoning and Planning

John Muehlhausen

From: Roberta Groening [rgroening@merjent.com]
Sent: Tuesday, July 18, 2006 8:20 AM
To: 'John Muehlhausen'
Subject: RE: Zoning and Planning for Williams County ND

Williams county equalization had no applications on file at the time of my call pertaining to developments within a ½ mile on either side of Enbridge's existing pipeline.

From: John Muehlhausen [mailto:jmuehlhausen@merjent.com]
Sent: Tuesday, July 18, 2006 8:17 AM
To: 'Roberta Groening'
Subject: FW: Zoning and Planning for Williams County ND

Roberta,

What was the outcome of proposed development within the project corridor?

From: Roberta Groening [mailto:rgroening@merjent.com]
Sent: Tuesday, July 11, 2006 11:49 AM
To: 'John Muehlhausen'
Subject: Zoning and Planning for Williams County ND

7/11/06 – Spoke with Doug L. at the Williams County Equalization office regarding proposed development within ½ mile on either side of Enbridge' existing pipeline on county road 8. I sent him a copy of the county map with the site of the existing pipeline. He will research and provide me information regarding any known development applications. I also asked Doug regarding any active or inactive salt, gravel, scona, lignite or abandoned mines. Doug indicated that the information that the county had was dated, but he would indicate any known mines on the map and also suggested that I call the North Dakota state office and inquire with them.

7/11/06 – Spoke with Bill Dodd at the Public Service Commission Division of abandoned mines, and he indicated that the state had not updated their information for Williams County since 1980/1981. He is going to send me a copy of the maps and reports regarding mines (coal) in Williams County that the state has in its collections.

merjent

The Banks Building
615 - 1st Avenue NE
Suite 425
Minneapolis, MN 55413

Roberta Groening

612-746-3669 direct
612-746-3660 main
612-746-3679 fax

APPENDIX D

EARTHWORKS
ARCHAEOLOGY & ENVIRONMENTAL INVESTIGATIVE SERVICES

ARCHAEOLOGICAL SURVEY PLAN FOR ENBRIDGE PIPELINES (NORTH DAKOTA) LLC, NORTH DAKOTA PIPELINE EXPANSION PROJECT:

OVERVIEW OF KNOWN CULTURAL RESOURCES AND POTENTIAL FOR DISCOVERY OF UNDOCUMENTED CULTURAL RESOURCES IN WILLIAMS COUNTY, NORTH DAKOTA

Prepared For:
Merjent, Inc.
Minneapolis, Minnesota

Principal Investigator:
John G. Morrison

Prepared By:
Duane Klinner
and John G. Morrison
EARTHWORKS, Inc.
Bismarck, North Dakota

Report of Investigation: 391 **June 2006**

MANUSCRIPT DATA RECORD FORM

1. Manuscript Number:

2. SHPO Reference #:

3. Author(s): Duane Klinner and John G. Morrison

4. Title: Archaeological Survey Plan: Enbridge Pipelines (North Dakota) LLC, North Dakota Pipeline Expansion Project: Overview of Known Cultural Resources and Potential for Discovery of Undocumented Cultural Resources in Williams County, North Dakota

5. Report Date: June 2006

6. Number of Pages: 32

7. Type I, T, E, O: O

8. Acres: N/A

9. Legal Location(s) with Historic Context Study Unit(s):

County	Township	Range	Section(s)	Study Unit
Williams	T. 156 N.	R. 95 W.	31, 32, and 33	GA
	T. 156 N.	R. 96 W.	31, 32, 33, 34, 35, and 36	GA
	T. 156 N.	R. 97 W.	31, 32, 33, 34, 35, and 36	GA
	T. 156 N.	R. 98 W.	31, 32, 33, 34, 35, and 36	GA
	T. 156 N.	R. 99 W.	31, 32, 33, 34, 35, and 36	GA
	T. 156 N.	R. 100 W.	31, 32, 33, 34, 35, and 36	GA
	T. 156 N.	R. 101 W.	34, 35, and 36	GA
	T. 155 N.	R. 95 W.	4, 5, and 6	GA
	T. 155 N.	R. 96 W.	1, 2, 3, 4, 5, and 6	GA
	T. 155 N.	R. 97 W.	1, 2, 3, 4, 5, and 6	GA
	T. 155 N.	R. 98 W.	1, 2, 3, 4, 5, and 6	GA
	T. 155 N.	R. 99 W.	1, 2, 3, 4, 5, and 6	GA
	T. 155 N.	R. 100 W.	1, 2, 3, 4, 5, and 6	GA
	T. 155 N.	R. 101 W.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12	GA
	T. 155 N.	R. 102 W.	1, 2, 3, 10, 11, 12, 14, 15, 16, 21, 22, 23, 26, 27, 28, 33, 34, and 35	GA
	T. 154 N.	R. 102 W.	2, 3, 4, 9, 10, 11, 14, 15, 16, 21, 22, 23, 26, 27, 28, 34, and 35	GA

ARCHAEOLOGICAL SURVEY PLAN FOR ENBRIDGE PIPELINES (NORTH DAKOTA) LLC, NORTH DAKOTA PIPELINE EXPANSION PROJECT:

OVERVIEW OF KNOWN CULTURAL RESOURCES AND POTENTIAL FOR DISCOVERY OF UNDOCUMENTED CULTURAL RESOURCES IN WILLIAMS COUNTY, NORTH DAKOTA

Prepared for:
Merjent, Inc.
Minneapolis, Minnesota

Prepared by:
Duane Klinner
and John G. Morrison
EARTHWORKS, Inc.
Bismarck, North Dakota

Report of Investigation: 391

June 2006

ABSTRACT

EARTHWORKS, Inc., of Bismarck, North Dakota, completed a Class I Literature Review of 116 legal sections in Williams County, North Dakota. The literature review information was augmented by a field examination of the project route and examination of soil, geomorphic, past climatic, vegetative, and wildlife data for the area. This Class I Investigation was completed at the request of Merjent, Inc., for the proposed Enbridge Pipelines (North Dakota) LLC's North Dakota Pipeline Expansion Project in Williams County, North Dakota. The results are to be used to aid in establishing the levels of cultural resource inventory that will be needed for specific portions of the pipeline route. The principal objective of this investigation is to provide Enbridge with the mapped locations of all relevant recorded cultural resources, all relevant previous inventories directly adjacent to or within the project corridor, and a sensitivity model for identifying locations within the project area where cultural resources may be undiscovered. From this information, impacts to significant cultural resources can be minimized and previously inventoried areas, determined to be free of cultural resources, can be used without redundant investigations.

The North Dakota state site files contain records of 152 cultural resources (sites, site leads, and isolated finds) within the legal sections encompassing the project area. The cultural resources consist of 34 prehistoric sites, five historic sites, two sites with both historic and prehistoric components, three sites with both historic and architectural components, 86 architectural sites, and 22 site leads and isolated finds. Of these 152 cultural resources, 14 lie within or in close proximity to the proposed pipeline route. In addition to the cultural resources, a summary of the 19 previously conducted cultural resource investigations was compiled.

After considering the results of the Literature Review, EARTHWORKS recommends that the landscapes of the proposed project corridor be classified into three levels of probability/potential for encountering cultural resources, and accordingly, the recommended level of effort for cultural resource inventories reflects this probability/potential. Determination of the probability criteria and the appropriate levels of inventory should be accomplished in consultation with the Corps of Engineers and the North Dakota State Historic Preservation Office, and can be drawn from data provided by EARTHWORKS contained in this report and on the provided maps.

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1.0 INTRODUCTION

Enbridge Pipelines (North Dakota) LLC (Enbridge) is presently evaluating a project to expand a portion of its pipeline system in Williams County, North Dakota. The proposed expansion involves the construction of a new pipeline that is anticipated to be co-located within the same corridor as its existing pipeline extending approximately 53 miles between Enbridge's Beaver Lodge Pump Station (approximately seven miles south of Tioga) and Trenton Pump Station (approximately six miles southwest of Williston).

EARTHWORKS, Inc., was contracted by Merjent, Inc., on behalf of Enbridge to develop an archaeological survey plan for the project. EARTHWORKS evaluated 116 sections encompassing the project area as defined in Table 1 (below) and as depicted on the project maps (Appendix B).

Table 1: Legal Locations of the Project Corridor

County	Township	Range	Section(s)
Williams	T. 156 N.	R. 95 W.	31, 32, and 33
	T. 156 N.	R. 96 W.	31, 32, 33, 34, 35, and 36
	T. 156 N.	R. 97 W.	31, 32, 33, 34, 35, and 36
	T. 156 N.	R. 98 W.	31, 32, 33, 34, 35, and 36
	T. 156 N.	R. 99 W.	31, 32, 33, 34, 35, and 36
	T. 156 N.	R. 100 W.	31, 32, 33, 34, 35, and 36
	T. 156 N.	R. 101 W.	34, 35, and 36
	T. 155 N.	R. 95 W.	4, 5, and 6
	T. 155 N.	R. 96 W.	1, 2, 3, 4, 5, and 6
	T. 155 N.	R. 97 W.	1, 2, 3, 4, 5, and 6
	T. 155 N.	R. 98 W.	1, 2, 3, 4, 5, and 6
	T. 155 N.	R. 99 W.	1, 2, 3, 4, 5, and 6
	T. 155 N.	R. 100 W.	1, 2, 3, 4, 5, and 6
	T. 155 N.	R. 101 W.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12
	T. 155 N.	R. 102 W.	1, 2, 3, 10, 11, 12, 14, 15, 16, 21, 22, 23, 26, 27, 28, 33, 34, and 35
	T. 154 N.	R. 102 W.	2, 3, 4, 9, 10, 11, 14, 15, 16, 21, 22, 23, 26, 27, 28, 34, and 35

To develop this survey plan, EARTHWORKS evaluated the environmental setting, completed a Class I Literature Review, and conducted a visual review of the project route. The results and recommendations of this investigation are included at the back of this report.

The study is meant to aid in design and placement of the pipeline route as well as to establish the appropriate amount of pedestrian inventory needed for specific portions of those areas. EARTHWORKS recommends the landforms of the proposed project corridor be classified into three classes of probability/potential for encountering cultural resources (i.e., low potential, moderate potential, and high potential), and accordingly, the recommended level of effort for inventory should reflect this probability/potential. Determination of the probability criteria and the appropriate levels of inventory should be accomplished in consultation with the Corps of Engineers (COE) and the North Dakota State Historic Preservation Office (NDSHPO), and can be drawn from data provided by EARTHWORKS contained in this report and on the project maps.

2.0 ENVIRONMENTAL SETTING

The project area is located in the Garrison Study Unit (#6), as described in the *North Dakota Comprehensive Plan for Historic Preservation: Archaeological Component* (SHSND 1990). The SHSND (1990) document provides a generalized overview of the physiography and previous research in the study unit.

2.1 Topography

The topography of the Garrison Study Unit is described by the SHSND (1990) as consisting of glaciated uplands, breaks terrain, rolling prairie, valley wall side-slopes and foot-slopes, draws, alluvial terraces, and floodplains. The area was glaciated during the late Wisconsin advance and is now characterized by rolling hills, hilly plains, badlands, buttes, steep escarpments, and shallow pothole lakes. The physical setting is dominated by intermittent drainages and the Missouri River and its tributaries.

The project corridor is characterized by rolling uplands bisected by numerous drainages. Larger named drainages which cross the project area include the Little Muddy River, Beaver Creek, Camp Creek, and Sand Creek. The southern portion of the project area also parallels Painted Wood Creek.

2.2 Prevailing Weather Patterns

Climate in the area is generally of a semiarid, northern continental type, with extremes in temperature between the summer and winter. Winters are generally dry, long, and cold, lasting into April and beginning as early as November. Mean annual precipitation is approximately 16 inches, with the majority of the precipitation occurring in the form of rain during the spring and summer months. Prevailing winds are from the west-northwest and average approximately 13 mph (SHSND 1990).

2.3 Flora

The project corridor lies predominantly (85%) within agricultural fields. Areas that are unsuitable for agriculture are being used for pasture. In the past, the vegetation of the corridor would have consisted of mixed grassland vegetation on the rolling prairie, and riparian vegetation along and within the water systems. The present-day biota does not necessarily reflect that of the past. The pasturelands present today are dominated by needle grass, blue gamma grass, and western wheatgrass. The vegetation communities of the wooded water systems include bur oak, green ash, and juniper, with chokecherry, Juneberry, gooseberries found within the wooded areas and in the transitional zones between the prairie and the wooded water systems.

2.4 Fauna

It can also be said that the types and distributions of faunal species present in the project area today do not necessarily reflect those of the past. While the following list is not exhaustive of the fauna present, it represents the species most likely to have been encountered during historic or prehistoric times. The region would have been habitat for diverse large and small mammals, as well

as some birds, amphibians, and reptiles. In the past, people would have commonly encountered bison, elk, pronghorn antelope, bighorn sheep, and mule and white-tailed deer. In addition, wolf, coyote, mountain lion, jack rabbits, badger, beaver, ground squirrel, and prairie dogs would have been present, as well as raptors, songbirds, and game birds.

The major water systems and their tributaries would have provided habitat for various species of fish (northern pike, perch, and suckers), different types of waterfowl (ducks, geese, etc.,), amphibians, and reptiles. These water bodies would have also served as major sources of water for the area, drawing in and concentrating the faunal resources.

2.5 Lithic Resources

Lithic resources available to prehistoric populations in the general project area include knappable stones for making chipped stone tools, and granitic raw materials used for producing ground stone tools. Available lithic resources found in glacial till and stream gravel include Tongue River silicified sediment (TRSS), Knife River flint (KRF), Yellowstone agate, porcellanite, basalt, jasper, and chert (SHSND 1990).

3.0 CLASS I LITERATURE REVIEW

The state site files contain records of 152 cultural resources (sites, site leads, and isolated finds) identified within one mile of the legal sections encompassing the project corridor. The cultural resources consist of 34 prehistoric sites, five historic sites, two sites with both historic and prehistoric components, three sites with both historic and architectural components, 86 architectural sites, and 22 site leads and isolated finds (summarized in Table 2). A complete table of the compiled data of the known cultural resources is provided in Appendix A. The Appendix A table includes detailed information about the location (township, range, and sections), SITS #, brief descriptions of the type of sites, recorders, and the associated manuscript numbers for each sections.

Table 2: Previously Recorded Cultural Resources By Type

Archaeological Sites	34
Historic Sites	5
Historic/Archaeological Sites	2
Historic/Architectural Sites	3
Architectural Sites	86
Total Sites	130
Site Leads/Isolated Finds	22
Total Cultural Resources	152

3.1 Research Goals for Class I Literature Review

The purpose of this document is to facilitate planning for the proposed pipeline expansion project. The compiled data will be used to avoid cultural resources. Another goal of this study is to identify areas which will require intensive pedestrian inventory, and those areas that will not require further cultural resource work. The stated goals and strategies of this Class I Literature Review and predictive analysis also strive to be sensitive to the general research goals and information provided in the SHSND (1990) defined study units.

3.2 Methods for Class I Literature Review

On June 1, 2006, EARTHWORKS archaeologist Price B. Heiner and Research and Support Staff member Sommer Hunke conducted a search of the site records and manuscript files of the State Historical Society of North Dakota. The files search centered on the North Dakota Cultural Resources Survey master site data files and manuscript files for previous investigations in the vicinity of the proposed undertaking. The locations of previously mapped historic sites, archaeological sites, site leads, and isolated finds were plotted on USGS 1:24,000 scale quadrangle maps. The locations of cultural resource inventories conducted since 1982 were also plotted on these maps when possible, with the exception of architectural sites located in urban areas. Generally, cultural resource investigations conducted prior to 1982 were not included on the maps because cultural resource work conducted prior to that time may not have conformed to uniform standards, and many would not be considered adequate by current standards. Also, some of the investigations conducted since 1982 contained maps that were not detailed enough or the production quality was too low to allow for confident transfer of the data to standard scale maps. These investigations were also not included on the project maps.

Because the eligibility recommendations and status of nominations to the State and National Registers of Historic Places are not kept current in the site files, the files search also included the North Dakota Comprehensive Plan (SHSND 1990), the North Dakota Historical Society list of National Register Sites, and the NDSHPO Consensus database to obtain information on site eligibility. However, sites that have not had NDSHPO concurrence or formal determinations of eligibility by a federal agency or the Keeper of the National Register cannot be considered ineligible. Most sites in the vicinity of the project have had, at best, only preliminary field recommendations of eligibility.

In addition to previous cultural resource investigations that have addressed areas encompassing or adjacent to the project area, large block surveys and other Class I investigations concentrating on nearby and comparable areas were also consulted. The latter studies were used to aid in evaluating the levels of site potential/probability, particularly in areas where few previous investigations have been conducted.

3.3 Evaluation of Research

The data gathered for this project has a fundamental bias toward the areas of the greatest development, (i.e., along roadways, waterlines, pipelines, and areas of energy development). The

previously conducted cultural resource inventories vary greatly in scope ranging from small gravel pit inventories to large scale linear surveys.

As mentioned, the methods and accuracy of records compiled prior to 1982 vary in quality. This is especially true in regard to site locational data. Some of the cultural resources (data) associated with this study are unmapped or too poorly mapped to be useful. This is due to factors including: non-standard maps used to plot resources; inconsistent, vague, or contradictory data for the legal locations; and written descriptions of resource locations based on local landmarks that may or may not still exist (and no maps). The methods of recording cultural resources have also changed over time. In the past, small lithic scatters and similar types of sites were ignored or only minimally recorded because they were not valued (understood scientifically) as they are today. These sites may not have been considered worthy of recording, or the recording efforts focused only on portions of the overall artifact assemblage (i.e., noting only diagnostic artifacts and stone tools while discarding debitage or heat altered rock).

Of the 19 previously conducted cultural resource investigations, three (15%) were conducted prior to 1982, six (32%) were conducted between 1983 and 1989, four (21%) were conducted between 1990 and 1999, and six (32%) were conducted after 2000. This indicates that approximately one-half of the work within the project area occurred over 17 years ago. The implications of this are that many of the past cultural resource projects have not been inventoried using modern, consistent methodology.

Of these, one manuscript, *Archaeological Investigations Along the Portal Beaver Lodge to Alexander Pipeline Williams and McKenzie Counties, North Dakota,* (Manuscript No. 3251) details the results of a Class III Cultural Resource Inventory for the pipeline that the current project parallels (Kuehn and Borchert, 1984). The inventory was conducted in 1983 using a 100 foot wide corridor along the centerline of the then proposed pipeline. The inventory resulted in the recording of 21 sites. Nineteen of the 21 sites were avoided by rerouting the pipeline. Two of the sites, 32WI91 and 32WI92, were tested and recommended *not eligible* for the NRHP and pipeline construction was allowed to proceed through the sites.

The other 18 previously conducted cultural resource investigations concentrated mostly on other large linear projects which would be crossed by the proposed undertaking at right angles. Those other inventories did not cover a significant amount of the currently proposed undertaking (less than 1,000 linear feet of the overall corridor, or less than 1%). The older methods employed for those investigations will have little to no affect on this undertaking because of the limited extent of coverage (less than 1%).

3.4 Eligibility of Cultural Resources

Rather than discuss the eligibility statements for each of the 152 cultural resources identified during the files search, a generalized discussion of eligibility is presented. For a cultural resource to be eligible for the National Register, the resource must retain one or more essential aspects of physical and spatial integrity and meet one or more of the criteria for eligibility (36 CFR§ 60.4).

Segment 20

Previous Location and Updated Boundary of 32WI85

Segment 21

Segment 22

0 1,000 2,000 Feet

EARTHWORKS

Legend - Map 16
Enbridge Pipelines (North Dakota) LLC,
North Dakota Pipeline Expansion Project:
Class II and III Cultural Resource Inventory Results

- Isolated Find
- Existing Pipeline
- Newly Recorded Site
- Exclusion Zone
- Survey Corridor
- Previously Recorded Site
- Inventory Segment

ERT-MPP-04

ERT-MPP-03

Segment 23

ERT-MPP-02

ERT-MPP-01

0 1,000 2,000 Feet

EARTHWORKS

Legend - Map 17
Enbridge Pipelines (North Dakota) LLC,
North Dakota Pipeline Expansion Project:
Class II and III Cultural Resource Inventory Results

- Isolated Find
- Existing Pipeline
- Newly Recorded Site
- Exclusion Zone
- Survey Corridor
- Previously Recorded Site
- Inventory Segment

APPLICATION

to the

NORTH DAKOTA PUBLIC SERVICE COMMISSION

for a

CERTIFICATE OF CORRIDOR COMPATIBILITY

and a

ROUTE PERMIT

for the

TRENTON TO BEAVER LODGE LINE LOOP

by

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

on

JULY 26, 2006

ENBRIDGE™

VOLUME 2 OF 2

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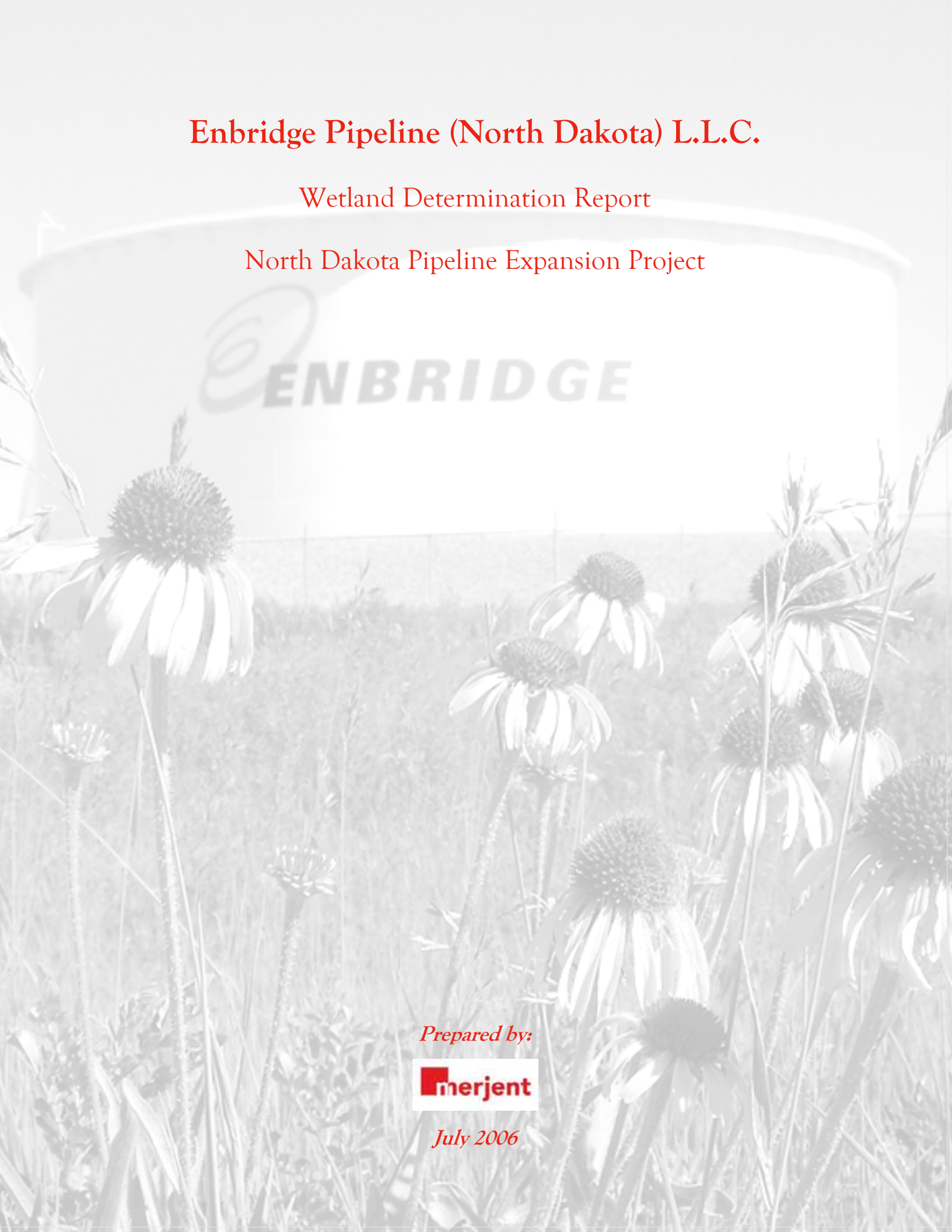
APPENDIX F

Enbridge Pipeline (North Dakota) L.L.C.

Wetland Determination Report

North Dakota Pipeline Expansion Project



Prepared by:

merjent

July 2006

WETLAND DETERMINATION REPORT

North Dakota Pipeline Expansion Project

Enbridge Pipeline (North Dakota) L.L.C.

INTRODUCTION

Enbridge Pipelines (North Dakota) LLC ("Enbridge") is presently evaluating a project to expand a portion of its North Dakota pipeline system. The proposed expansion would involve constructing a new underground pipeline adjacent to a portion of its existing underground pipeline, and potentially modifying aboveground facilities along the project route. Most of the proposed pipeline will be collocated in the same corridor as its existing pipeline and will extend approximately 53 miles between its Beaver Lodge Pump Station (about 7 miles south of Tioga) and Trenton Pump Station (about 6 miles southwest of Williston). USGS topographic maps depicting the proposed project area are enclosed.

Merjent, Inc., on behalf of Enbridge, conducted an on-site routine wetland determination to identify and classify wetlands located within the survey area. Waterbodies within the survey area were also reviewed and photographed. The survey area consisted of a varied width corridor centered along the proposed pipeline route. Survey width dimensions are depicted on the attached wetland location maps. The centerline of the proposed pipeline was marked in the field by civil survey engineers and was used to accurately review the required survey corridor. The routine wetland determination and waterbody investigation was completed July 7 - 11, 2006. A summary of the wetland determination and waterbody investigation are provided below.

METHODOLOGY

A routine onsite wetland determination was performed to identify wetlands within the survey area. This method of wetland identification is outlined in the *U.S. Army Corps of Engineers Wetlands Delineation Manual (1987 Manual)*. According to the 1987 Manual, routine wetland determinations are based on the presence of hydrophytic vegetation, wetland hydrology and hydric soils, referred to as the "three parameter approach". Wetlands present were classified according to methodologies identified in *Wetlands and Deepwater Habitats of the United States* (FWS/OBS Publication 79/31; Cowardin *et al*. 1979).

Data Sources

National Wetlands Inventory data, 7.5 minute USGS quadrangle maps, 2003 1-meter resolution aerial photography, and Williams County SSURGO data was reviewed prior to conducting the onsite wetland determination. Rainfall totals for Williston, North Dakota were 0.21 inches above average between April 1 and July 16, 2006. However, the month of June received 1.05 inches of precipitation which is 1.23 inches below the monthly average.

Hydrophytic Vegetation

Plant species nomenclature and indicator status were assigned according to the *National List of Plant Species that Occur in Wetlands: North Plains (Region 4)* (May, 1988). The hydrophytic plant criterion (FAC-neutral test) was met when 50 percent or more of the dominant species within the vegetative strata were assigned an obligate (OBL), facultative wet (FACW) and/or facultative (FAC) wetland status. Where vegetation may be absent or unidentifiable (*i.e.* agricultural land or heavily grazed pasture), atypical methodology was used to make a wetland determination.

Wetland Hydrology

Sufficient hydrology indicators must be present in order to satisfy the "three parameter approach" methodology. At least one or more primary indicators or two or more secondary indicators must be observed in order to satisfy the hydrology criteria. The presence of current wetland hydrology was determined through direct observation of surrounding environment and if necessary, direct observation of free water, saturated soil conditions, and soil redoximorphic features in excavated soil pits.

Hydric Soils

Hydric soils were assumed present if all dominant vegetative species have an obligate indicator status or all dominant species and an obligate or facultative wet indicator status and the wetland boundary is abrupt. Where necessary, random soil pits were excavated to determine the presence of hydric soils. Soil color, texture, and presence or absence of redoximorphic indicators (*e.g.*; mottles, gley, oxidized rhizospheres, etc.) were then evaluated at each soil pit.

RESULTS

Wetlands

Forty-seven wetlands were identified and delineated within the survey area. Wetland boundaries were recorded using a GPS unit rated for 1 meter accuracy. The locations of the delineated wetlands are presented on the attached 1:12,000 scale aerial photograph based maps (see Appendix B). National Wetlands Inventory data and Williams County SSURGO data are presented on the attached 1:24,000 scale USGS topographic maps (see Appendix A). Photographs of the delineated wetlands are presented in Appendix D. A wetland information summary table is provided on the following page and determination information for each wetland is recorded in the attached Data Sheets (see Appendix C).

Waterbodies

The proposed pipeline will cross two perennial waterbodies, the Little Muddy River and Beaver Creek. Beaver Creek is crossed at pipeline milepost 6.0. There was minimal water flow at the time of survey. Creek banks varied widely with heights from two to twenty feet. The creek bottom had a sandy to gravelly substrate. Photos of the river are attached in Appendix E.

The Little Muddy River is crossed at pipeline milepost 30.2. There was no observable water flow at the time of the survey. Within the survey corridor, the river has banks approximately 2 to 4 feet in height and is typically 50 to 60 feet wide; however, where the existing pipeline crosses the river, a larger oxbow/pond is present. Vegetation growing to the water surface was present throughout the waterbody. The river bottom contained a muddy to sandy substrate. Numerous carp were observed in the river. Photos of the river are attached in Appendix E.

As indicated on the USGS topographic maps, approximately 58 intermittent waterbodies are crossed by the proposed project. Each waterbody was reviewed during the field survey. All of intermittent waterbodies indicated on the USGS maps were dry during the survey. The only inundated areas along the waterbody courses were deep scour pools or excavated livestock ponds. Few of the waterbodies had a defined channel. The typical intermittent waterbodies consisted of grassy or cropped swales approximately 50 to 100 feet wide. Photos of waterbodies crossed by the proposed project are presented in Appendix E.

WETLAND SUMMARY TABLE			
Wetland ID	**Cowardin Classification**	**NWI Inventory Status**	**Jurisdictional Status**
W4B	PEM1A/PFO1A	PEMC	Non-isolated
W4A	PEMA	PEMC	Isolated
W5B	PEMA	PEMAd	Isolated
W5A	PEMA/C	PEMA/Bf	Isolated
W6A	PEMA	Not Inventoried as Wetland	Non-isolated
W7C	PEMA/PSS1C	Not Inventoried as Wetland	Non-isolated
W7B	PEMC	Not Inventoried as Wetland	Non-isolated
W7A	PEMA	PEMC	Isolated
W8A	PEMA/PUBGx	PABFh	Non-isolated
W9A	PEMA	PEMC	Non-isolated
W12C	PEMAf	PEMA/Bf	Isolated
W12B	PEMAf	Not Inventoried as Wetland	Isolated
W12A	PEMAf	Not Inventoried as Wetland	Isolated
W20B	PEMB/C	PEMA	Non-isolated
W20A	PEMA	PEMC	Isolated
W21A	PEMA	Not Inventoried as Wetland	Isolated
W22A	PEMA	Not Inventoried as Wetland	Non-isolated
W23A	PEMA	Not Inventoried as Wetland	Non-isolated
W29A	PEMCx	PEMFx	Isolated
W30C	PEMA	PEMA	Non-isolated
W30B	PEMA	PEMC	Isolated
W30A	PEMA	PEMA	Isolated
W32B	PEMA	PEMC	Isolated
W32A	PEM1A	Not Inventoried as Wetland	Non-isolated
W33E	PEMA	Not Inventoried as Wetland	Non-isolated
W33D	PEMA	Not Inventoried as Wetland	Non-isolated
W33C	PEMA/PUBGx	PABFh	Non-isolated
W33B	PEMA	Not Inventoried as Wetland	Non-isolated
W33A	PEMA/C	Not Inventoried as Wetland	Non-isolated
W34A	PEMA	PABFh	Non-isolated
W36A	PEMA/C	Not Inventoried as Wetland	Non-isolated
W37B	PEMA/C	Not Inventoried as Wetland	Non-isolated
W37A	PEMA	PEMC	Non-isolated
W38E	PEMA	PEMC	Non-isolated
W38D	PEMA	PEMC	Non-isolated
W38C	PEMA	Not Inventoried as Wetland	Non-isolated
W38B	PEMA	PABFh	Non-isolated
W38A	PEMA	PABFh	Non-isolated
W41A	PEMA/C	PEMC	Non-isolated
W42Br	PEMA/B	Not Inventoried as Wetland	Non-isolated
W42A	PEMA	Not Inventoried as Wetland	Non-isolated
W45A	PEMA	PEMA	Isolated
W47A	PUBGx	Not Inventoried as Wetland	Isolated
W48A	PEMA	Not Inventoried as Wetland	Non-isolated
W49A	PEMA	PABFh	Non-isolated
W50A	PEMAx	PABFx	Isolated
W52A	PEMA	PEMA	Isolated

The information contained herein represents my findings during the wetland delineation activities conducted on July 7 - 11, 2006, at the aforementioned project site.

Merjent, Inc.

Jeff Mackenthun
Professional Wetland Scientist No. 001414
MN Certified Wetland Delineator No. 1086

Date

Enclosures

Appendix A

Project Location Maps

1:24,000 7.5 Minute USGS Topographic Maps

Survey Configuration
Road to 600' N of Road

Survey Configuration
125' N x 75' S

T156N R96W

T156N R95W

T155N R96W

T155N R95W

60th St NW

106th Ave NW

105th Ave NW

104th Ave NW

Pumping Station

Trinity Ch

Bethany Cem

Radio Tower

PIPELINE

OIL AND GAS FIELD

BEAVER

FARMVALE

DRY FORK

NOTE: Survey configuration is based on the existing piepline.

EXISTING PIPELINE
ESTIMATED MILEPOST
SURVEY CORRIDOR
NATIONAL WETLANDS INVENTORY DATA

1 INCH = 2,000 FT
SCALE = 1:24,000

merjent

0 0.25 0.5 0.75 1 Miles
0 1,000 2,000 4,000 6,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC
NORTH DAKOTA PIPELINE EXPANSION PROJECT
Survey Corridor Maps - Sheet 1 of 11

REV. NO.	DESCRIPTION	DATE
	ORIGINAL	07/21/06

ENBRIDGE

Survey Configuration
700' N x 75' S

Survey Configuration
500' N x 75' S

Survey Configuration
500' N x 75' S

Survey Configuration
125' N x 75' S

Survey Configuration
125' N x 75' S

T156N R97W

T156N R96W

T155N R97W

T155N R96W

112th Ave NW

111th Ave NW

110th Ave NW

109th Ave NW

Gravel Pit

Oil Well

Creek

OIL AND GAS FIELD

FARMVALE

VIEW

Townhall

BM

Rau

NOTE: Survey configuration is based on the existing piepline.

EXISTING PIPELINE
ESTIMATED MILEPOST
SURVEY CORRIDOR
NATIONAL WETLANDS INVENTORY DATA

1 INCH = 2,000 FT
SCALE = 1:24,000

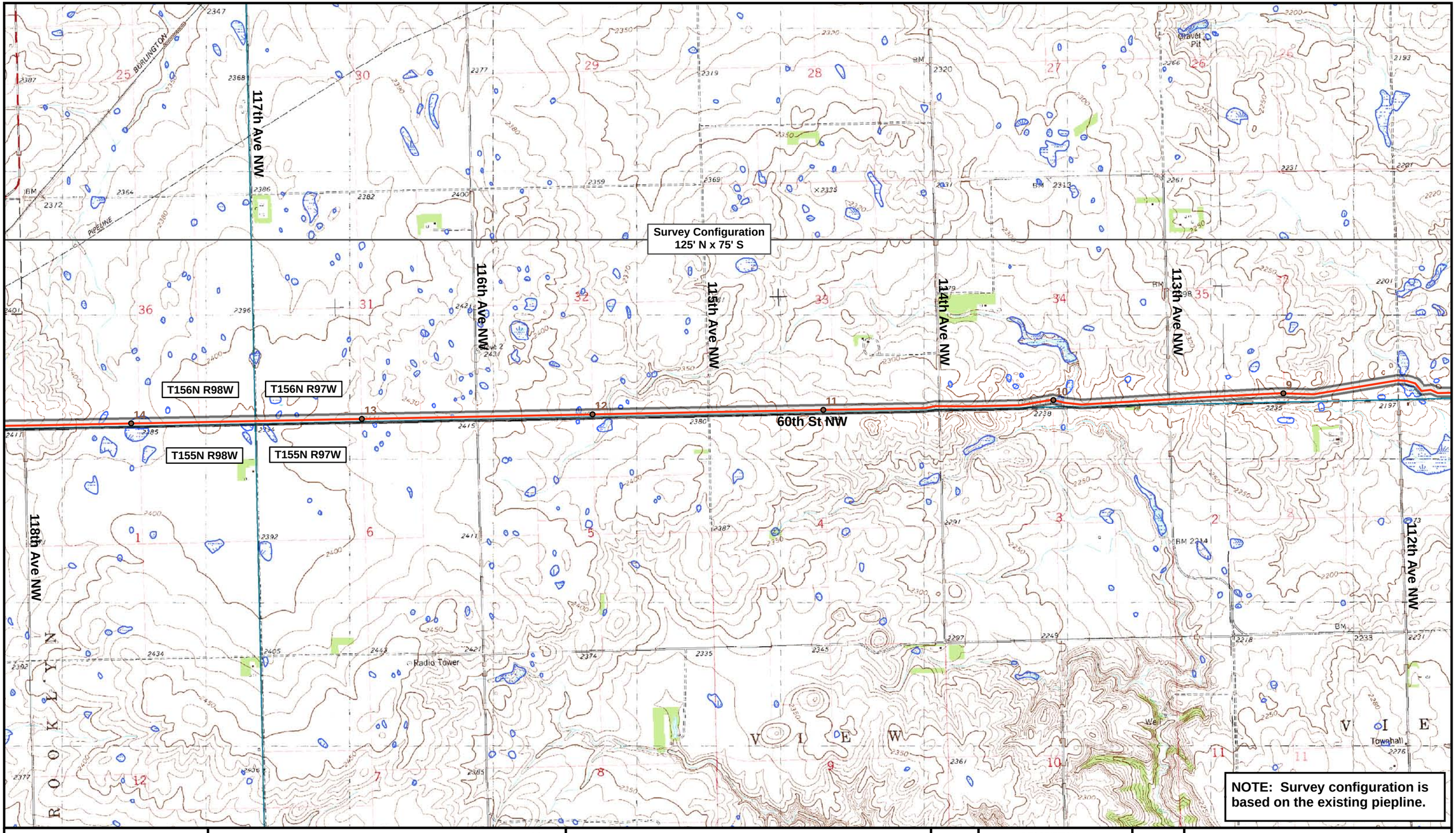
0 0.25 0.5 0.75 1 Miles
0 1,000 2,000 4,000 6,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC
NORTH DAKOTA PIPELINE EXPANSION PROJECT
Survey Corridor Maps - Sheet 2 of 11

REV. NO.	DESCRIPTION	DATE
	ORIGINAL	07/21/06

ENBRIDGE



EXISTING PIPELINE
ESTIMATED MILEPOST
SURVEY CORRIDOR
NATIONAL WETLANDS INVENTORY DATA

1 INCH = 2,000 FT
SCALE = 1:24,000

merjent

0 0.25 0.5 0.75 1 Miles
0 1,000 2,000 4,000 6,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC
NORTH DAKOTA PIPELINE EXPANSION PROJECT
Survey Corridor Maps - Sheet 3 of 11

REV. NO.	DESCRIPTION	DATE
	ORIGINAL	07/21/06

ENBRIDGE

Survey Configuration
Approx. 300' N x 75' S

Survey Configuration
125' N x 75' S

Survey Configuration
Road to 600' N of Pipeline

Survey Configuration
125' N x 75' S

123rd Ave NW

122nd Ave NW

Co. Rd. 5

121st Ave NW

120th Ave NW

119th Ave NW

118th Ave NW

T156N R99W

T156N R98W

T155N R99W

T155N R98W

Wheelock

Epping
(BM 2218)

Wheelock Cem

Radio Tower

BURLINGTON NORTHERN

PIPELINE

Stony Creek

B R O O K L Y N

NOTE: Survey configuration is based on the existing piepline.

EXISTING PIPELINE
ESTIMATED MILEPOST
SURVEY CORRIDOR
NATIONAL WETLANDS INVENTORY DATA

1 INCH = 2,000 FT
SCALE = 1:24,000

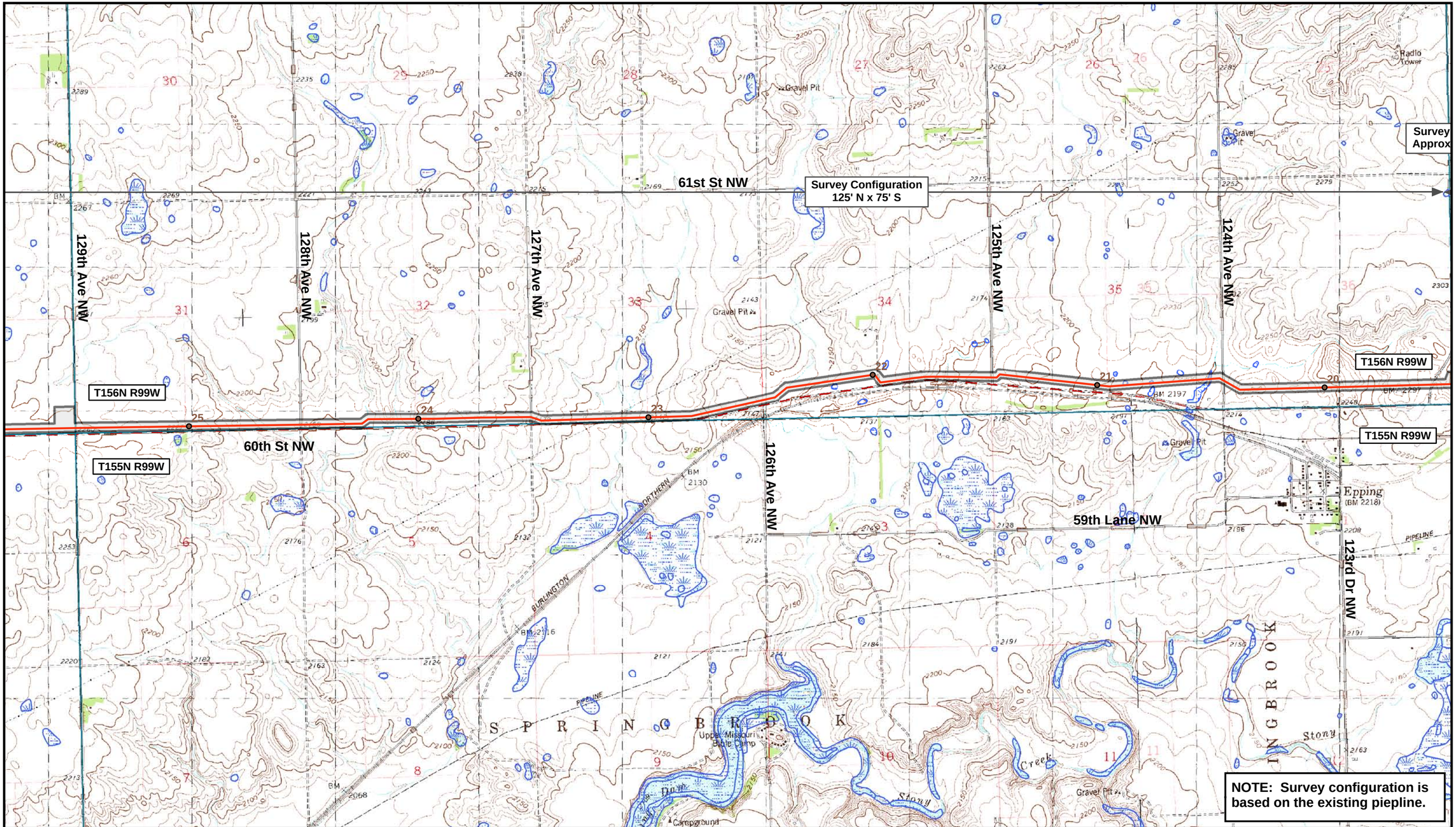
0 0.25 0.5 0.75 1 Miles
0 1,000 2,000 4,000 6,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC
NORTH DAKOTA PIPELINE EXPANSION PROJECT
Survey Corridor Maps - Sheet 4 of 11

REV. NO.	DESCRIPTION	DATE
	ORIGINAL	07/21/06

ENBRIDGE



EXISTING PIPELINE
ESTIMATED MILEPOST
SURVEY CORRIDOR
NATIONAL WETLANDS INVENTORY DATA

1 INCH = 2,000 FT
SCALE = 1:24,000

merjent

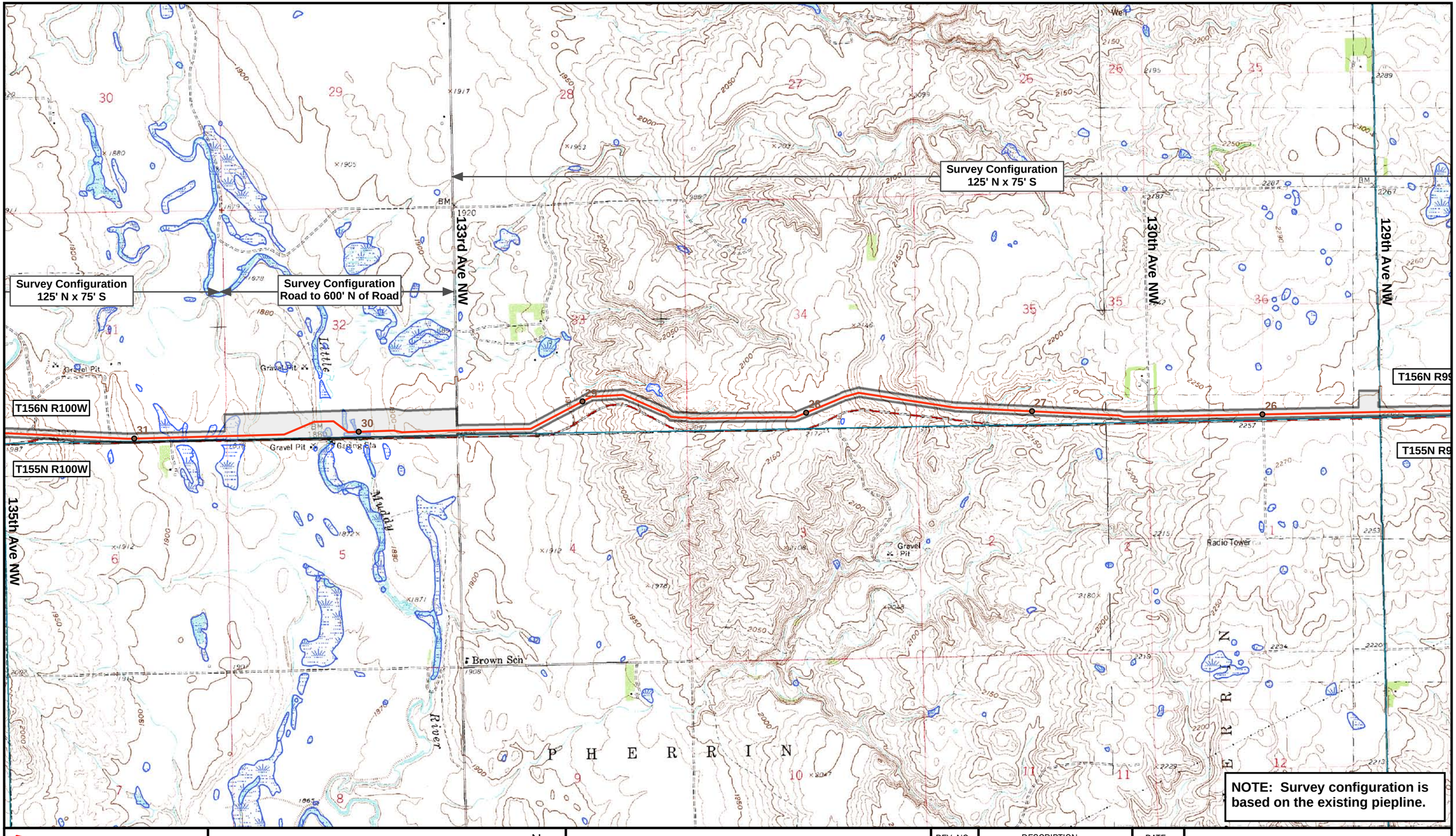
0 0.25 0.5 0.75 1 Miles
0 1,000 2,000 4,000 6,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC
NORTH DAKOTA PIPELINE EXPANSION PROJECT
Survey Corridor Maps - Sheet 5 of 11

REV. NO.	DESCRIPTION	DATE
	ORIGINAL	07/21/06

ENBRIDGE



EXISTING PIPELINE
ESTIMATED MILEPOST
SURVEY CORRIDOR
NATIONAL WETLANDS INVENTORY DATA

1 INCH = 2,000 FT
SCALE = 1:24,000

merjent

0 0.25 0.5 0.75 1 Miles
0 1,000 2,000 4,000 6,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC
NORTH DAKOTA PIPELINE EXPANSION PROJECT
Survey Corridor Maps - Sheet 6 of 11

REV. NO.	DESCRIPTION	DATE
	ORIGINAL	07/21/06

ENBRIDGE

Survey Configuration
Road to 1100' N of Pipeline

Survey Configuration
125' N/W

Survey Configuration
125' N x 75' S

137th Ave NW

60th St NW

T156N R101W

T156N R100W

T155N R101W

T155N R100W

138th Ave NW

Survey Configuration
125' N x 125' S

135th Ave NW

Survey Configuration
125' S

Survey Configuration
75' N x 125' S

59th St NW

US Highway 2

140th Ave NW

139th Ave NW

58th St NW

NOTE: Survey configuration is based on the existing piepline.

EXISTING PIPELINE
ESTIMATED MILEPOST
SURVEY CORRIDOR
NATIONAL WETLANDS INVENTORY DATA

1 INCH = 2,000 FT
SCALE = 1:24,000

0 0.25 0.5 0.75 1 Miles
0 1,000 2,000 4,000 6,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC
NORTH DAKOTA PIPELINE EXPANSION PROJECT
Survey Corridor Maps - Sheet 7 of 11

REV. NO.	DESCRIPTION	DATE
	ORIGINAL	07/21/06

ENBRIDGE

T156N R102W

T156N R101W

T155N R102W

T155N R101W

143rd Ave NW

Survey Configuration
75' N x 125' S

Survey Configuration
800' N of Road by
125' S of Pipeline

Survey Configuration
125' N x 125' S

59th St NW

Survey Configuration
Approx. 200' W x 125' E

142nd Ave NW

141st Ave NW

140th Ave NW

38

39

40

41

42

43

58th St NW

Survey Configuration
125' W/N x 75' E/S

57th St NW

Survey Configuration
125' W x 500' E

NOTE: Survey configuration is based on the existing piepline.

EXISTING PIPELINE
ESTIMATED MILEPOST
SURVEY CORRIDOR
NATIONAL WETLANDS INVENTORY DATA

1 INCH = 2,000 FT

SCALE = 1:24,000

merjent

0 0.25 0.5 0.75 1 Miles

0 1,000 2,000 4,000 6,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

Survey Corridor Maps - Sheet 8 of 11

REV. NO.	DESCRIPTION	DATE
	ORIGINAL	07/21/06

ENBRIDGE

Survey Configuration
125' W x 500' E

Survey Configuration
125' W x 125' E

Survey Configuration
125' W x 75' E

Survey Configuration
125' W x125' E

Survey Configuration
75' W x 125' E

Survey Configuration
125' W x 75' E

57th St NW

56th St NW

55th St NW

54th St NW

143rd Ave NW

T155N R102W

T155N R101W

T154N R102W

T154N R101W

NOTE: Survey configuration is based on the existing piepline.

EXISTING PIPELINE
ESTIMATED MILEPOST
SURVEY CORRIDOR
NATIONAL WETLANDS INVENTORY DATA

1 INCH = 2,000 FT
SCALE = 1:24,000

0 0.25 0.5 0.75 1 Miles
0 1,000 2,000 4,000 6,000 Feet

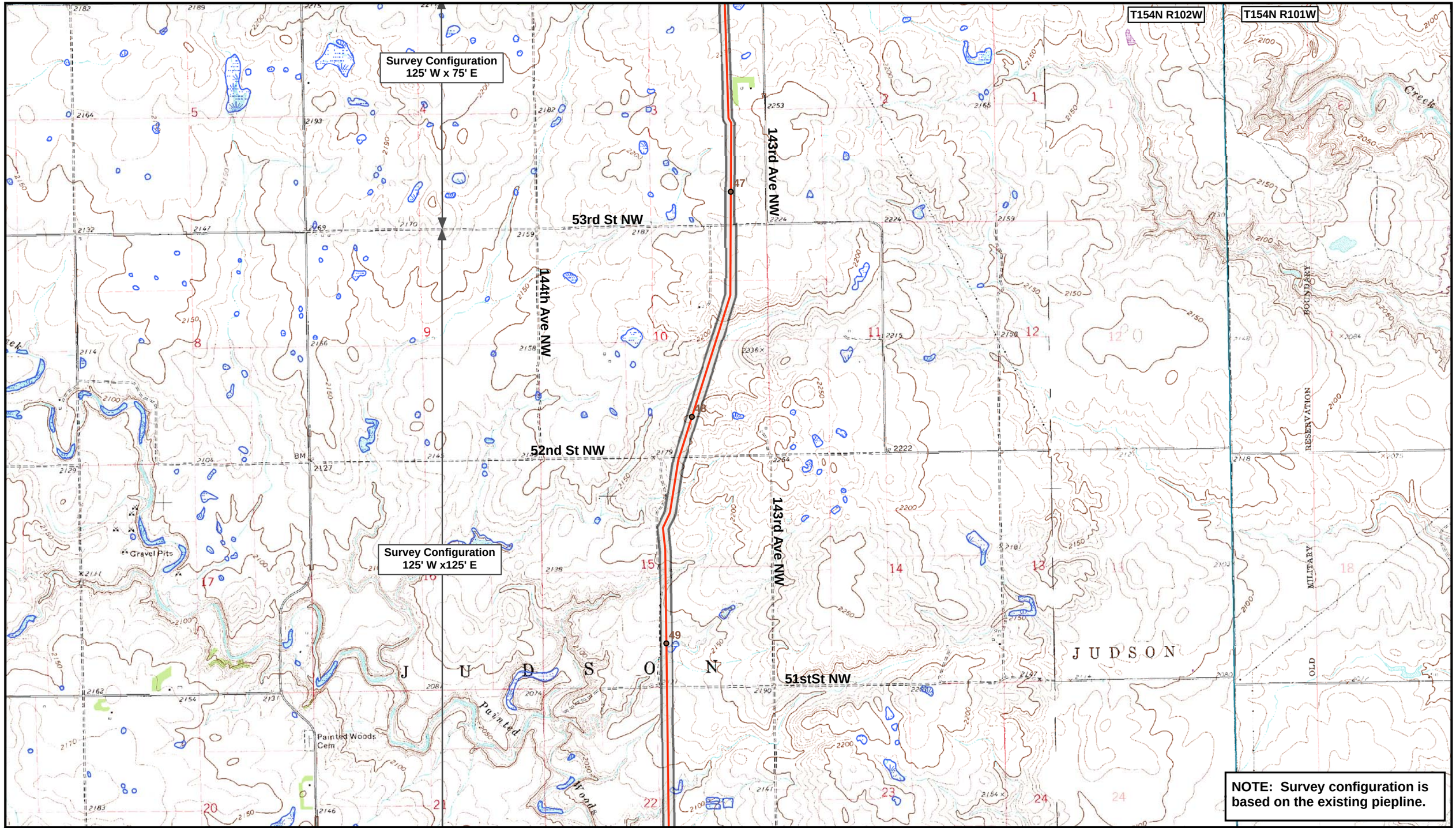
N

merjent

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC
NORTH DAKOTA PIPELINE EXPANSION PROJECT
Survey Corridor Maps - Sheet 9 of 11

REV. NO.	DESCRIPTION	DATE
	ORIGINAL	07/21/06

ENBRIDGE



EXISTING PIPELINE
ESTIMATED MILEPOST
SURVEY CORRIDOR
NATIONAL WETLANDS INVENTORY DATA

1 INCH = 2,000 FT
SCALE = 1:24,000

merjent

0 0.25 0.5 0.75 1 Miles
0 1,000 2,000 4,000 6,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC
NORTH DAKOTA PIPELINE EXPANSION PROJECT
Survey Corridor Maps - Sheet 10 of 11

REV. NO.	DESCRIPTION	DATE
	ORIGINAL	07/21/06

ENBRIDGE

Survey Configuration
125' W x 125' E

Survey Configuration
400' W x 125' E

Survey Configuration
125' W x 125' E

Survey Configuration
300' W x 75' E

Survey Configuration
1200' N of 48th St and
1000' W of 143rd Ave.

US Highway 2

143rd Ave NW

49th St NW

48th St NW

50

51

52

JUDSON

T154N R102W

T154N R101W

T153N R102W

T153N R101W

Gravel Pits

Gravel Pit

Substation

Agricultural Experiment Station

Rest Area

Sewage Disp Ponds

Radio Towers (KEZY)

Woods

Creek

Bods

PIPELINE

OLD MIS. RES BDY

NORTHERN PACIFIC RAILROAD

MISSOURI

NOTE: Survey configuration is based on the existing piepline.

EXISTING PIPELINE
ESTIMATED MILEPOST
SURVEY CORRIDOR
NATIONAL WETLANDS INVENTORY DATA

1 INCH = 2,000 FT
SCALE = 1:24,000

merjent

0 0.25 0.5 0.75 1 Miles
0 1,000 2,000 4,000 6,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC
NORTH DAKOTA PIPELINE EXPANSION PROJECT
Survey Corridor Maps - Sheet 11 of 11

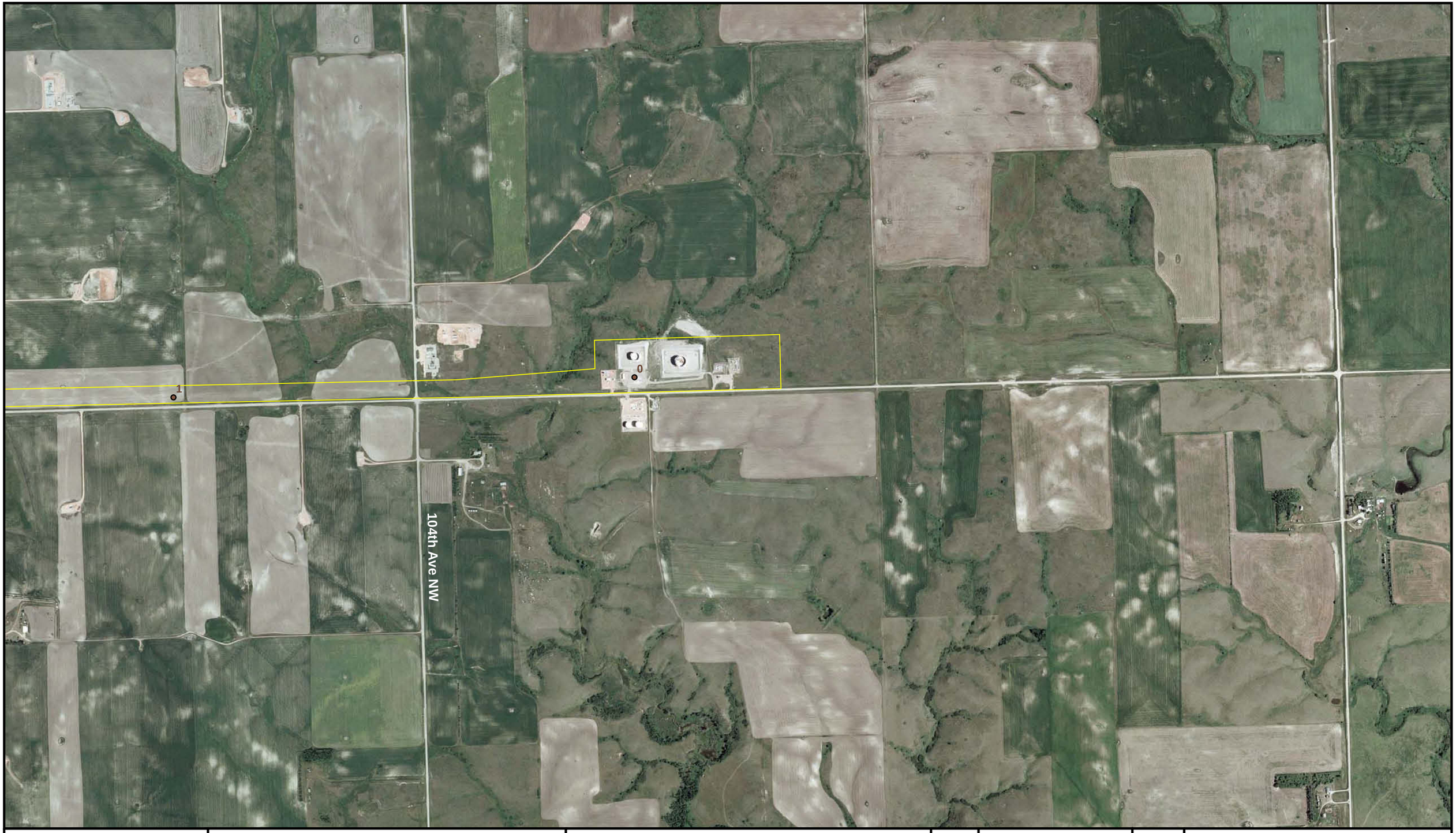
REV. NO.	DESCRIPTION	DATE
	ORIGINAL	07/21/06

ENBRIDGE

Appendix B

Wetland Location Maps

1:12,000 2003 Aerial Photography



ESTIMATED MILEPOST
WETLAND BOUNDARIES
SURVEY CORRIDOR

1 INCH = 1,000 FT
SCALE = 1:12,000

merjent

0 0.125 0.25 0.375 0.5 Miles
0 500 1,000 2,000 3,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

LOCATION MAP - SHEET 1 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

ENBRIDGE™

ESTIMATED MILEPOST
WETLAND BOUNDARIES
SURVEY CORRIDOR

1 INCH = 1,000 FT
SCALE = 1:12,000

merjent

0 0.125 0.25 0.375 0.5 Miles
0 500 1,000 2,000 3,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

LOCATION MAP - SHEET 2 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

ENBRIDGE™

- ESTIMATED MILEPOST
- WETLAND BOUNDARIES
- SURVEY CORRIDOR

1 INCH = 1,000 FT

SCALE = 1:12,000

0 0.125 0.25 0.375 0.5 Miles

0 500 1,000 2,000 3,000 Feet

N

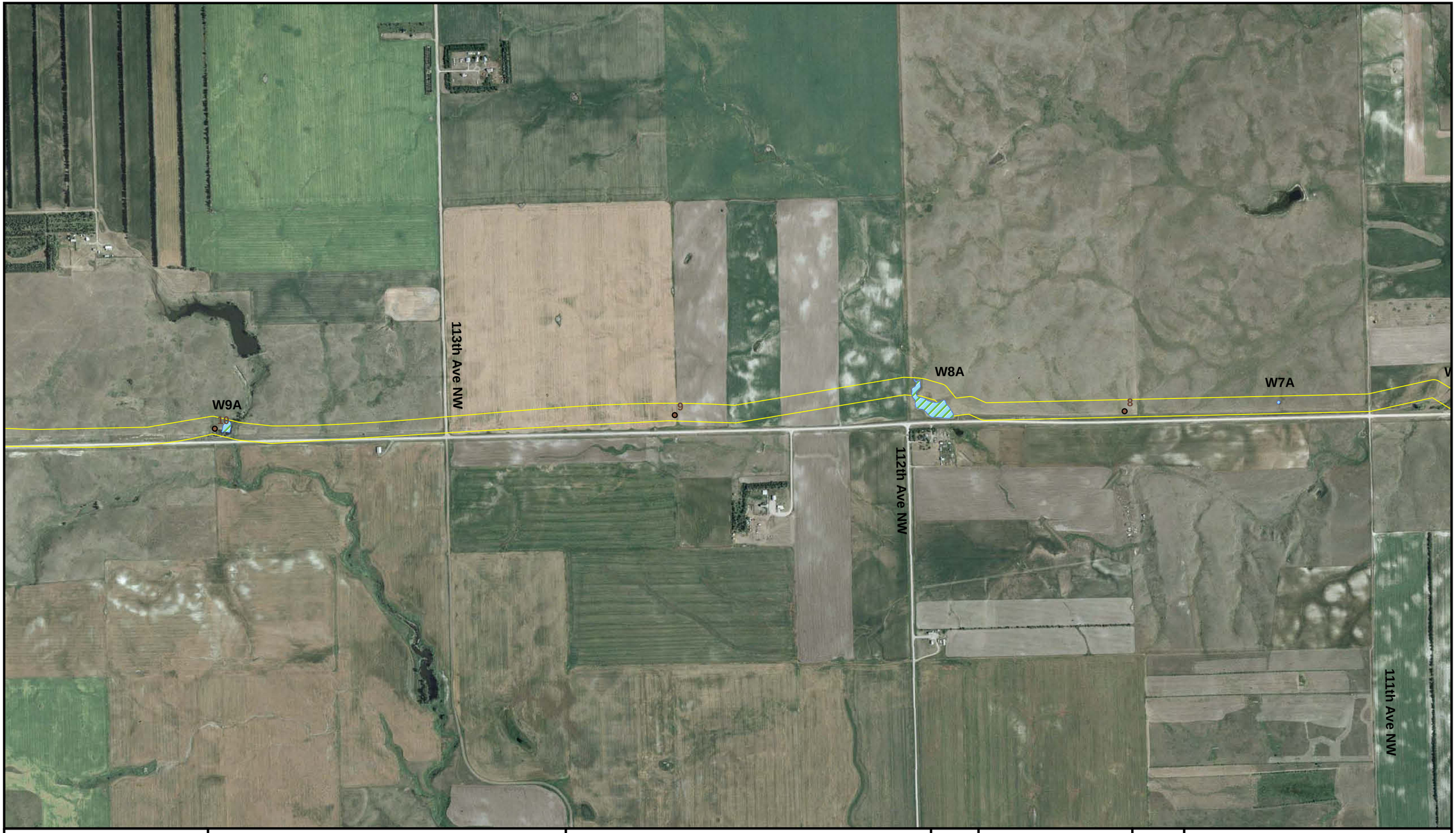
ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

LOCATION MAP - SHEET 3 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

ENBRIDGE™



ESTIMATED MILEPOST
WETLAND BOUNDARIES
SURVEY CORRIDOR

1 INCH = 1,000 FT
SCALE = 1:12,000

merjent

0 0.125 0.25 0.375 0.5 Miles
0 500 1,000 2,000 3,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

LOCATION MAP - SHEET 4 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

ENBRIDGE™

ESTIMATED MILEPOST
WETLAND BOUNDARIES
SURVEY CORRIDOR

1 INCH = 1,000 FT
SCALE = 1:12,000

merjent

0 0.125 0.25 0.375 0.5 Miles
0 500 1,000 2,000 3,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

LOCATION MAP - SHEET 5 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

ENBRIDGE™

ESTIMATED MILEPOST
WETLAND BOUNDARIES
SURVEY CORRIDOR

1 INCH = 1,000 FT
SCALE = 1:12,000

merjent

0 0.125 0.25 0.375 0.5 Miles
0 500 1,000 2,000 3,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

LOCATION MAP - SHEET 6 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

ENBRIDGE™

ESTIMATED MILEPOST
WETLAND BOUNDARIES
SURVEY CORRIDOR

1 INCH = 1,000 FT
SCALE = 1:12,000

merjent

0 0.125 0.25 0.375 0.5 Miles
0 500 1,000 2,000 3,000 Feet

N

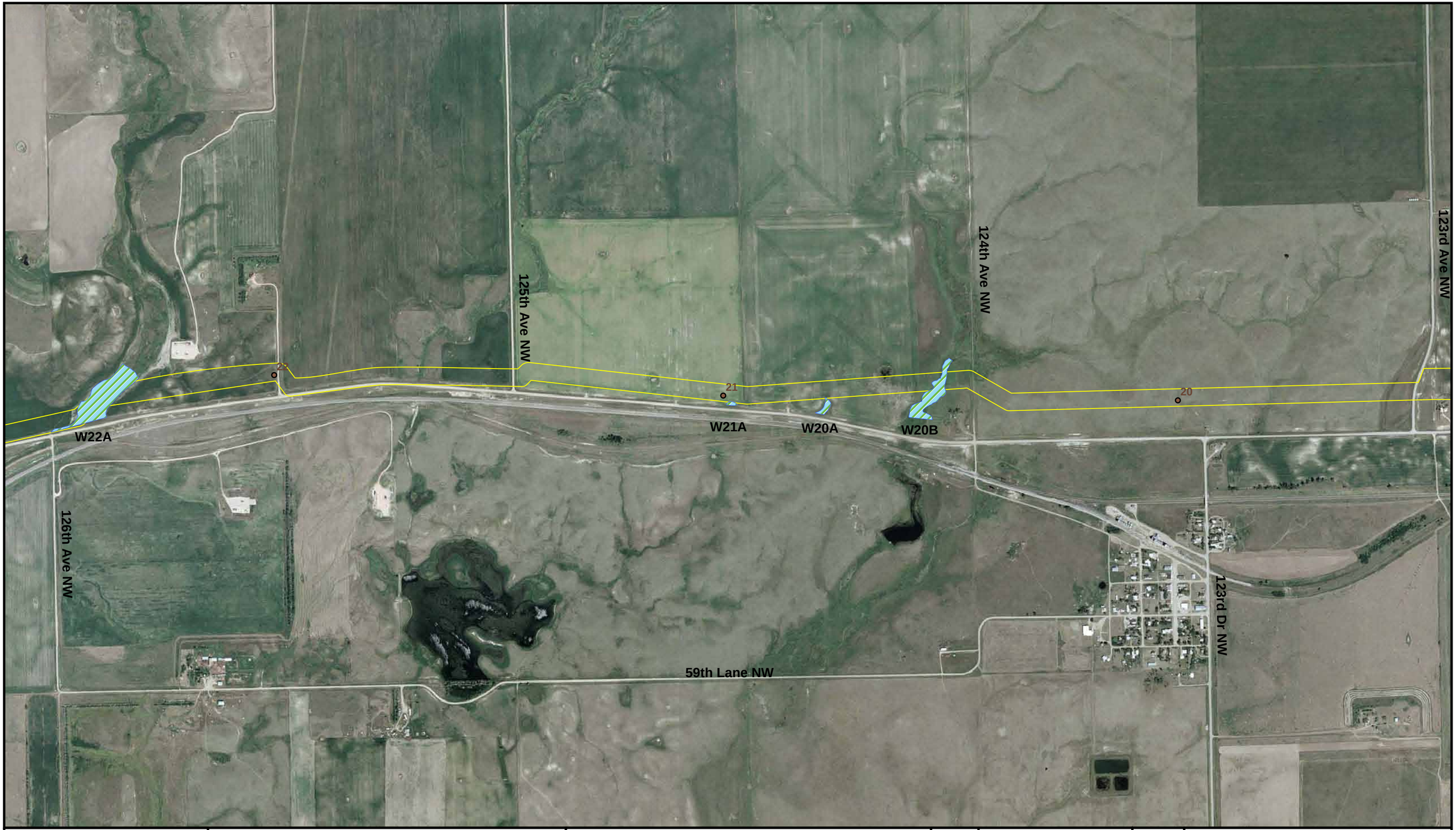
ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

LOCATION MAP - SHEET 7 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

ENBRIDGE™



- ESTIMATED MILEPOST
- WETLAND BOUNDARIES
- SURVEY CORRIDOR

1 INCH = 1,000 FT

SCALE = 1:12,000

0 0.125 0.25 0.375 0.5 Miles

0 500 1,000 2,000 3,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

LOCATION MAP - SHEET 8 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

- ESTIMATED MILEPOST
- WETLAND BOUNDARIES
- SURVEY CORRIDOR

1 INCH = 1,000 FT

SCALE = 1:12,000

merjent

0 0.125 0.25 0.375 0.5 Miles

0 500 1,000 2,000 3,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

LOCATION MAP - SHEET 9 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

ENBRIDGE™

ESTIMATED MILEPOST
WETLAND BOUNDARIES
SURVEY CORRIDOR

1 INCH = 1,000 FT
SCALE = 1:12,000

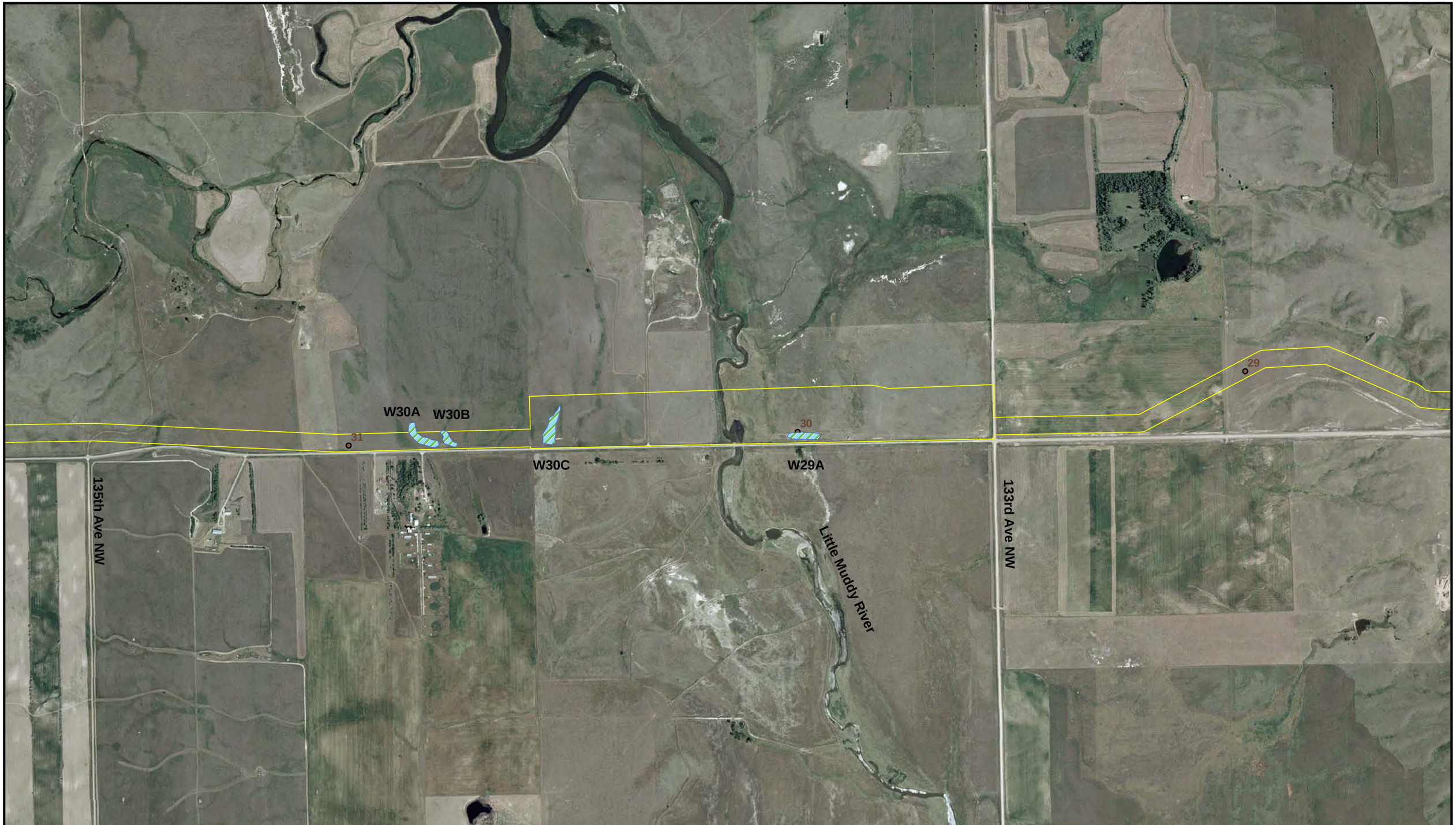
0 0.125 0.25 0.375 0.5 Miles
0 500 1,000 2,000 3,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC
NORTH DAKOTA PIPELINE EXPANSION PROJECT
LOCATION MAP - SHEET 10 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

ENBRIDGE



- ESTIMATED MILEPOST
- WETLAND BOUNDARIES
- SURVEY CORRIDOR

1 INCH = 1,000 FT

SCALE = 1:12,000

merjent

0 0.125 0.25 0.375 0.5 Miles

0 500 1,000 2,000 3,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

LOCATION MAP - SHEET 11 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

ENBRIDGE™

ESTIMATED MILEPOST
WETLAND BOUNDARIES
SURVEY CORRIDOR

1 INCH = 1,000 FT
SCALE = 1:12,000

merjent

0 0.125 0.25 0.375 0.5 Miles
0 500 1,000 2,000 3,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

LOCATION MAP - SHEET 12 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

ENBRIDGE™

- ESTIMATED MILEPOST
- WETLAND BOUNDARIES
- SURVEY CORRIDOR

1 INCH = 1,000 FT

SCALE = 1:12,000

merjent

0 0.125 0.25 0.375 0.5 Miles

0 500 1,000 2,000 3,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

LOCATION MAP - SHEET 13 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

ENBRIDGE™

W38D
W38E
W38A
W38B
W38C
W37A
W37B
W36A
142nd Ave NW
141st Ave NW
140th Ave NW

- ESTIMATED MILEPOST
- WETLAND BOUNDARIES
- SURVEY CORRIDOR

1 INCH = 1,000 FT

SCALE = 1:12,000

0 0.125 0.25 0.375 0.5 Miles

0 500 1,000 2,000 3,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

LOCATION MAP - SHEET 14 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

ENBRIDGE™

ESTIMATED MILEPOST
WETLAND BOUNDARIES
SURVEY CORRIDOR

1 INCH = 1,000 FT
SCALE = 1:12,000

merjent

0 0.125 0.25 0.375 0.5 Miles
0 500 1,000 2,000 3,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

LOCATION MAP - SHEET 15 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

ENBRIDGE™

58th St NW

W41A

42

W42A

57th St NW

41

W42Br

143rd Ave NW

ESTIMATED MILEPOST

WETLAND BOUNDARIES

SURVEY CORRIDOR

1 INCH = 1,000 FT

SCALE = 1:12,000

merjent

0 0.125 0.25 0.375 0.5 Miles

0 500 1,000 2,000 3,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

LOCATION MAP - SHEET 16 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

ENBRIDGE

- ESTIMATED MILEPOST
- WETLAND BOUNDARIES
- SURVEY CORRIDOR

1 INCH = 1,000 FT

SCALE = 1:12,000

merjent

0 0.125 0.25 0.375 0.5 Miles

0 500 1,000 2,000 3,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

LOCATION MAP - SHEET 17 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

ENBRIDGE™

ESTIMATED MILEPOST
WETLAND BOUNDARIES
SURVEY CORRIDOR

1 INCH = 1,000 FT
SCALE = 1:12,000

merjent

0 0.125 0.25 0.375 0.5 Miles
0 500 1,000 2,000 3,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

LOCATION MAP - SHEET 18 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

ENBRIDGE™

ESTIMATED MILEPOST
WETLAND BOUNDARIES
SURVEY CORRIDOR

1 INCH = 1,000 FT
SCALE = 1:12,000

0 0.125 0.25 0.375 0.5 Miles
0 500 1,000 2,000 3,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC
NORTH DAKOTA PIPELINE EXPANSION PROJECT
LOCATION MAP - SHEET 19 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

ENBRIDGE

- ESTIMATED MILEPOST
- WETLAND BOUNDARIES
- SURVEY CORRIDOR

1 INCH = 1,000 FT

SCALE = 1:12,000

merjent

0 0.125 0.25 0.375 0.5 Miles

0 500 1,000 2,000 3,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

LOCATION MAP - SHEET 20 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

ENBRIDGE™

ESTIMATED MILEPOST
WETLAND BOUNDARIES
SURVEY CORRIDOR

1 INCH = 1,000 FT
SCALE = 1:12,000

merjent

0 0.125 0.25 0.375 0.5 Miles
0 500 1,000 2,000 3,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC
NORTH DAKOTA PIPELINE EXPANSION PROJECT
LOCATION MAP - SHEET 21 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

ENBRIDGE™

ESTIMATED MILEPOST
WETLAND BOUNDARIES
SURVEY CORRIDOR

1 INCH = 1,000 FT
SCALE = 1:12,000

0 0.125 0.25 0.375 0.5 Miles
0 500 1,000 2,000 3,000 Feet

N

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

LOCATION MAP - SHEET 22 OF 22

REV. NO.	DESCRIPTION	DATE
1	ORIGINAL	07/21/06

ENBRIDGE™

Appendix C

Routine Determination Data Sheets

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project	**Date:** July 11, 2006
Company/Project: Enbridge Pipeline (North Dakota) L.L.C.	**County:** Williams Co.
Investigator(s): Jeff Mackenthun, Tom Janssen	**State:** North Dakota
Do normal circumstances exist on the site? Yes	**Wetland:** W4B
Is the site significantly disturbed (atypical situation)? No	**Transect/Community:**
Is the area a potential problem area? No	Herbaceous

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
American sloughgrass	*Beckmannia syzigachne*	Herb	25	OBL
Barley Fox-tail	*Hordeum jubatim*	Herb	15	FACW
Curly Dock	*Rumex crispus*	Herb	5	FACW
Rough cockle-bur	*Xanthium strumarium*	Herb	10	FAC
Sedge	*Carex spp.*	Herb	30	-
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area. There is a forested component of wetland W4B that is described on the following data sheet.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	X Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	X Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list. The intermittent waterbody was dry but exhibited drown out conditions with deeply cracked soils (see photo).

SOILS

Map Unit Name: 2176 – Zahl-Williams loams, 15 to 60% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**___ No**
Wetland Hydrology Present?	**X Yes**	**___ No**
Hydric Soils Present?	**X Yes**	**___ No**
Is the sampling point within a wetland?	**X Yes**	**___ No**

Remarks: Classified as a PEM1A.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project	**Date:** July 11, 2006
Company/Project: Enbridge Pipeline (North Dakota) L.L.C.	**County:** Williams Co.
Investigator(s): Jeff Mackenthun, Tom Janssen	**State:** North Dakota
Do normal circumstances exist on the site? Yes	**Wetland:** W4B
Is the site significantly disturbed (atypical situation)? No	**Transect/Community:**
Is the area a potential problem area? No	Forested

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Green ash	*Fraxinus pennsylvanica*	Tree	90	FAC
Uptight sedge	*Carex stricta*	Herb	10	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area. Ash was approximately 25 – 30 feet in height.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	X Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	X Water-Stained Leaves
	X Local Soil Survey Data
	_____ FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2176 – Zahl-Williams loams, 15 to 60% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on the fact the surrounding community around the forested portion of the wetland contained OBL and FACW species.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**____ No**
Wetland Hydrology Present?	**X Yes**	**____ No**
Hydric Soils Present?	**X Yes**	**____ No**
Is the sampling point within a wetland?	**X Yes**	**____ No**

Remarks: Classified as a PFO1A.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 11, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W4A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Fowl bluegrass	*Poa palustris*	Herb	15	FACW
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: The majority of the wetland area lacked identifiable vegetation (dead vegetation from the prior year).

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	_____ Local Soil Survey Data
	X FAC-Neutral Test
	X Other (Explain in remarks)

Remarks: Drownout conditions prevented the development of wetland vegetation this year.

SOILS

Map Unit Name: 2342 – Cabba-Amor-Zahl loams, 25-60% slopes. **Drainage Class:**
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure
0-6	A1	10YR 3/2	7.5YR 3/3	Common, distinct	Fine sandy loam
6-14	A2	10YR 3/1	7.5YR 3/3	Common, distinct	Fine sandy loam
14-18	B	10YR 4/1			

Hydric Soil Indicators:

____	Histols	____	Concretions
____	Histic Epipedon	____	High organic Content in Surface Layer
____	Sulfidic Odor	____	Organic Streaking in Sandy Soils
____	Aquic Moisture Regime	____	Listed on Local Hydric Soils List
____	Reducing Conditions	____	Listed on National Hydric Soils
X	Gleyed or Low-Chroma Colors	____	Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	X	**Yes**	____	**No**
Wetland Hydrology Present?	X	**Yes**	____	**No**
Hydric Soils Present?	X	**Yes**	____	**No**
Is the sampling point within a wetland?	X	**Yes**	____	**No**

Remarks: This is a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 11, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W5B **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Water smartweed	*Polygonum amphibium*	Herb	45	OBL
Curly Dock	*Rumex crispus*	Herb	45	FACW
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks:

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2176 – Zahl-Williams loams, 15 to 60% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**_____ No**
Wetland Hydrology Present?	**X Yes**	**_____ No**
Hydric Soils Present?	**X Yes**	**_____ No**
Is the sampling point within a wetland?	**X Yes**	**_____ No**

Remarks: This is a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 11, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W5A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Uptight sedge	*Carex stricta*	Herb	10	OBL
Broadleaf cattail	*Typha latifolia*	Herb	50	OBL
Inland rush	*Juncus interior*	Herb	10	FACW
Soft-stem bulrush	*Scirpus validus*	Herb	15	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	X Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2176 – Zahl-Williams loams, 15 to 60% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**_____ No**
Wetland Hydrology Present?	**X Yes**	**_____ No**
Hydric Soils Present?	**X Yes**	**_____ No**
Is the sampling point within a wetland?	**X Yes**	**_____ No**

Remarks: This is a PEMA/C wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 11, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W6A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Uptight sedge	*Carex stricta*	Herb	30	OBL
Broadleaf cattail	*Typha latifolia*	Herb	5	OBL
Inland rush	*Juncus interior*	Herb	5	FACW
Soft-stem bulrush	*Scirpus validus*	Herb	15	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area. Riparian area along river contained hydrophytic vegetation.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	X Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Wetland is the riparian area along Beaver Creek. Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2348 Korchea-Divide loams, channeled 0-3%slopes and 2362 Wabek sandy loam, 6-25% slopes. **Drainage Class:** Well drained and Excessively drained, respectfully.

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**_____ No**
Wetland Hydrology Present?	**X Yes**	**_____ No**
Hydric Soils Present?	**X Yes**	**_____ No**
Is the sampling point within a wetland?	**X Yes**	**_____ No**

Remarks: This is a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project	**Date:** July 11, 2006
Company/Project: Enbridge Pipeline (North Dakota) L.L.C.	**County:** Williams Co.
Investigator(s): Jeff Mackenthun, Tom Janssen	**State:** North Dakota
Do normal circumstances exist on the site? Yes	**Wetland:** W7C
Is the site significantly disturbed (atypical situation)? No	**Transect/Community:**
Is the area a potential problem area? No	Scrub-Shrub

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Sedge	*Carex spp.*	Herb	5	-
Sandbar willow	*Salix exigua*	Shrub	90	FACW+
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area. This portion of the wetland, located at is southern extent, is classified as scrub-shrub.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2348 Korchea-Divide loams, channeled 0-3%slopes. **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**_____ No**
Wetland Hydrology Present?	**X Yes**	**_____ No**
Hydric Soils Present?	**X Yes**	**_____ No**
Is the sampling point within a wetland?	**X Yes**	**_____ No**

Remarks: This portion of the wetland is classified as PSS1A.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project	**Date:** July 11, 2006
Company/Project: Enbridge Pipeline (North Dakota) L.L.C.	**County:** Williams Co.
Investigator(s): Jeff Mackenthun, Tom Janssen	**State:** North Dakota
Do normal circumstances exist on the site? Yes	**Wetland:** W7C
Is the site significantly disturbed (atypical situation)? No	**Transect/Community:**
Is the area a potential problem area? No	Herbaceous

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Inland rush	*Juncus interior*	Herb	25	FACW
Soft-stem bulrush	*Scirpus validus*	Herb	10	OBL
Uptight sedge	*Carex stricta*	Herb	25	OBL
Clasping-leaf dogbane	*Apocynum cannabinum*	Forb/Herb	25	FAC
Reed canary grass	*Phalaris arundinacea*	Herb	<5	FACW+
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	X Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2348 Korchea-Divide loams, channeled 0-3%slopes. **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

____	Histols	____	Concretions
____	Histic Epipedon	____	High organic Content in Surface Layer
____	Sulfidic Odor	____	Organic Streaking in Sandy Soils
____	Aquic Moisture Regime	____	Listed on Local Hydric Soils List
x	Reducing Conditions	____	Listed on National Hydric Soils
____	Gleyed or Low-Chroma Colors	____	Other (Explain in Remarks)

Remarks: Soil pit indicated reducing conditions. Soil profile was not documented.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	X	**Yes**	____	**No**
Wetland Hydrology Present?	X	**Yes**	____	**No**
Hydric Soils Present?	X	**Yes**	____	**No**
Is the sampling point within a wetland?	X	**Yes**	____	**No**

Remarks: This portion of the wetland is classified as PEMA.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 11, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W7B **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Inland rush	*Juncus interior*	Herb	25	FACW
Uptight sedge	*Carex stricta*	Herb	25	OBL
Water plantain	*Alisma subcordatum*	Herb	10	OBL
Lesser duckweed	*Lemna minor*	Herb	5	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	X Inundated
_____ Other	X Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2348 Korchea-Divide loams, channeled 0-3%slopes. **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X**	**Yes**	_____	**No**
Wetland Hydrology Present?	**X**	**Yes**	_____	**No**
Hydric Soils Present?	**X**	**Yes**	_____	**No**
Is the sampling point within a wetland?	**X**	**Yes**	_____	**No**

Remarks: Classified as a PEMC. This is a deep depression in an USGS intermittent stream channel. Outside of this wetland area, there are no indications of channalized flow. It is likely this deep depression is the result of pipeline construction since it is located within what would have been the construction workspace for the existing pipeline.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 10, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W7A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Inland rush	*Juncus interior*	Herb	30	FACW
Fowl bluegrass	*Poa palustris*	Herb	50	FACW
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2032 – Zahl-Williams loams, 6-9% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**___ No**
Wetland Hydrology Present?	**X Yes**	**___ No**
Hydric Soils Present?	**X Yes**	**___ No**
Is the sampling point within a wetland?	**X Yes**	**___ No**

Remarks: This wetland is classified as a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 10, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W8A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Water smartweed	*Polygonum amphibium*	Herb	5	OBL
Barley Fox-tail	*Hordeum jubatim*	Herb	70	FACW
Curly Dock	*Rumex crispus*	Herb	5	FACW
American sloughgrass	*Beckmannia syzigachne*	Herb	10	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: This data point represents the northwest portion of the wetland. The southeastern portion of the wetland consists of an excavated stock pond with no peripheral vegetation (see photos).

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	X Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 53 – Arnegard loam, 0-3% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**___ No**
Wetland Hydrology Present?	**X Yes**	**___ No**
Hydric Soils Present?	**X Yes**	**___ No**
Is the sampling point within a wetland?	**X Yes**	**___ No**

Remarks: This is a PEMA/PUBGx wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 10, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W9A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Drown out			95	
Barley Fox-tail	*Hordeum jubatim*	Herb	5	FACW
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): NA				

Remarks: This wetland is drown out, but has a small periphery of barley foxtail.

HYDROLOGY

Recorded Data (Describe in Remarks)

_____ Stream, Lake, or Tide Gauge
_____ Aerial Photographs
_____ Other
_____ No Recorded Data Available

Field Observations:

Depth of Surface Water: _____
Depth of Free Water in Pit: _____
Depth to Saturated Soil: _____

Wetland Hydrology Indicators

Primary Indicators:

_____ Inundated
_____ Saturated in Upper 12 Inches
_____ Water Marks
_____ Drift Lines
_____ Sediment Deposits
_____ Drainage Patterns

Secondary Indicators (2 or more required):

_____ Oxidized Roots Channels in Upper 12”
_____ Water-Stained Leaves
_____ Local Soil Survey Data
_____ FAC-Neutral Test
X Other (Explain in remarks)

Remarks: Drown out conditions. Area was saturated or inundated for a period sufficient during the growing season to restrict vegetative growth.

SOILS

Map Unit Name: 2350 – Lehr-Williams loams, 0-6% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on drown out conditions of wetland.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**_____ No**
Wetland Hydrology Present?	**X Yes**	**_____ No**
Hydric Soils Present?	**X Yes**	**_____ No**
Is the sampling point within a wetland?	**X Yes**	**_____ No**

Remarks: This is a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 10, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W12C **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Field grass		Herb	80	-
Wheat	*Triticum spp.*	Herb	20	-
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): --%				

Remarks: A grassy depression within a wheat field. This area may have been recently sprayed with herbicide. The grass leaves where turning red and curling.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	_____ FAC-Neutral Test
	X Other (Explain in remarks)

Remarks: Although sufficient hydrology indicators are not present, this depressional basin is likely saturated for a sufficient period during the growing season to greatly reduce wheat growth and produce redoximorphic features in the upper eight inches of the soil profile. Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2014 – Bowbells-Williams loams, 0-3% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure
0-14	A	10YR3/2	7.5YR 4/3	Common, prominent	Fine sandy clay loam
14-17	B	2.5YR3/1	7.5YR 4/3	Common, prominent	Fine sandy loam

Hydric Soil Indicators:

____	Histols	____	Concretions
____	Histic Epipedon	____	High organic Content in Surface Layer
____	Sulfidic Odor	____	Organic Streaking in Sandy Soils
____	Aquic Moisture Regime	____	Listed on Local Hydric Soils List
____	Reducing Conditions	____	Listed on National Hydric Soils
X	Gleyed or Low-Chroma Colors	____	Other (Explain in Remarks)

Remarks: Mottles started at 8 inches.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	X	**Yes**	____	**No**
Wetland Hydrology Present?	X	**Yes**	____	**No**
Hydric Soils Present?	X	**Yes**	____	**No**
Is the sampling point within a wetland?	X	**Yes**	____	**No**

Remarks: Classified as a PEMAf.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 10, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W12B **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Field grass		Herb	60	-
Wheat	*Triticum spp.*	Herb	40	-
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): --%				

Remarks: A grassy depression within a wheat field.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	_____ FAC-Neutral Test
	X Other (Explain in remarks)

Remarks: Although sufficient hydrology indicators are not present, this depressional basin is likely saturated for a sufficient period during the growing season to greatly reduce wheat growth and produce redoximorphic features in the upper eight inches of the soil profile. Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2014 – Bowbells-Williams loams, 0-3% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure
0-14	A	10YR3/2	7.5YR 4/3	Common, prominent	Fine sandy clay loam
14-17	B	2.5YR3/1	7.5YR 4/3	Common, prominent	Fine sandy loam

Hydric Soil Indicators:

____	Histols	____	Concretions
____	Histic Epipedon	____	High organic Content in Surface Layer
____	Sulfidic Odor	____	Organic Streaking in Sandy Soils
____	Aquic Moisture Regime	____	Listed on Local Hydric Soils List
____	Reducing Conditions	____	Listed on National Hydric Soils
X	Gleyed or Low-Chroma Colors	____	Other (Explain in Remarks)

Remarks: Mottles started at 8 inches.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	X	**Yes**	____	**No**
Wetland Hydrology Present?	X	**Yes**	____	**No**
Hydric Soils Present?	X	**Yes**	____	**No**
Is the sampling point within a wetland?	X	**Yes**	____	**No**

Remarks: Classified as a PEMAf.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 10, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W12A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Field grass		Herb	50	-
Wheat	*Triticum spp.*	Herb	50	-
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): --%				

Remarks: A grassy depression within a wheat field.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	_____ FAC-Neutral Test
	X Other (Explain in remarks)

Remarks: Although sufficient hydrology indicators are not present, this depressional basin is likely saturated for a sufficient period during the growing season to greatly reduce wheat growth and produce redoximorphic features in the upper eight inches of the soil profile. Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2031 – Zahl-Williams loams, 3-6% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure
0-14	A	10YR3/2	7.5YR 4/3	Common, prominent	Fine sandy clay loam
14-17	B	2.5YR3/1	7.5YR 4/3	Common, prominent	Fine sandy loam

Hydric Soil Indicators:

____	Histols	____	Concretions
____	Histic Epipedon	____	High organic Content in Surface Layer
____	Sulfidic Odor	____	Organic Streaking in Sandy Soils
____	Aquic Moisture Regime	____	Listed on Local Hydric Soils List
____	Reducing Conditions	____	Listed on National Hydric Soils
X	Gleyed or Low-Chroma Colors	____	Other (Explain in Remarks)

Remarks: Mottles started at 8 inches.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	X	**Yes**	____	**No**
Wetland Hydrology Present?	X	**Yes**	____	**No**
Hydric Soils Present?	X	**Yes**	____	**No**
Is the sampling point within a wetland?	X	**Yes**	____	**No**

Remarks: Classified as a PEMAf.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 10, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W20B **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Broad-leaf cattail	*Typha latifolia*	Herb	30	OBL
Inland rush	*Juncus interior*	Herb	25	FACW
Uptight sedge	*Carex stricta*	Herb	20	OBL
Common reed grass	*Phragmites australis*	Herb	<5	FACW
Prairie Cordgrass	*Spartina pectinata*	Herb	<5	FACW
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area. There was a small area of trees directly over the existing pipeline, but beavers have cut all the trees down. Beavers seem to have left the area.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	X Inundated
_____ Other	X Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	X Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2270 – Harriet and Stirum soils, 0-3% slopes **Drainage Class:** Poorly drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**_____ No**
Wetland Hydrology Present?	**X Yes**	**_____ No**
Hydric Soils Present?	**X Yes**	**_____ No**
Is the sampling point within a wetland?	**X Yes**	**_____ No**

Remarks: Classified as a PEMB/C. Cattail, cordgrass and reed grass where limited to the drainageway. Juncus and sedge dominated a wet meadow on the southeast portion of the wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 10, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W20A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Water smartweed	*Polygonum amphibium*	Herb	65	OBL
Narrow-leaf cattail	*Typha angustifolia*	Herb	30	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks:

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2031 – Zahl-Williams loams, 3-6% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X**	**Yes**	_____	**No**
Wetland Hydrology Present?	**X**	**Yes**	_____	**No**
Hydric Soils Present?	**X**	**Yes**	_____	**No**
Is the sampling point within a wetland?	**X**	**Yes**	_____	**No**

Remarks: This wetland is classified as a PEMA wetland. This wetland was not planted through during spring planting. Wheat planting rows clearly indicate the farmer planted around the wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 10, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W21A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Water smartweed	*Polygonum amphibium*	Herb	50	OBL
Field grass		Herb	40	-
Uptight sedge	*Carex stricta*	Herb	<5	OBL
Creeping spikerush	*Eleocharis palustris*	Herb	5	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): --%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area. The field grass was not identified.

HYDROLOGY

Recorded Data (Describe in Remarks)

_____ Stream, Lake, or Tide Gauge
_____ Aerial Photographs
_____ Other
_____ No Recorded Data Available

Field Observations:

Depth of Surface Water: _____
Depth of Free Water in Pit: _____
Depth to Saturated Soil: _____

Wetland Hydrology Indicators

Primary Indicators:

_____ Inundated
_____ Saturated in Upper 12 Inches
_____ Water Marks
_____ Drift Lines
_____ Sediment Deposits
_____ Drainage Patterns

Secondary Indicators (2 or more required):

_____ Oxidized Roots Channels in Upper 12”
_____ Water-Stained Leaves
X Local Soil Survey Data
X FAC-Neutral Test
_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2031 – Zahl-Williams loams, 6-9% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**___ No**
Wetland Hydrology Present?	**X Yes**	**___ No**
Hydric Soils Present?	**X Yes**	**___ No**
Is the sampling point within a wetland?	**X Yes**	**___ No**

Remarks: This wetland is classified as a PEMA wetland. This wetland was not planted through during spring planting. Wheat planting rows clearly indicate the farmer planted around the wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 10, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W22A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Meadow foxtail	*Alopecurus pratensis*	Herb	70	FACW
Uptight sedge	*Carex stricta*	Herb	5	OBL
Creeping spikerush	*Eleocharis palustris*	Herb	5	OBL
Soft-stem bulrush	*Scirpus validus*	Herb	5	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	X Water-Stained Leaves
	_____ Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks:

SOILS

Map Unit Name: 669 – Farland silt loam, 1-6% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**_____ No**
Wetland Hydrology Present?	**X Yes**	**_____ No**
Hydric Soils Present?	**X Yes**	**_____ No**
Is the sampling point within a wetland?	**X Yes**	**_____ No**

Remarks: This is classified as a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 9, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W23A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Reed canary grass	*Phalaris arundinacea*	Herb	90	FACW+
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks:

HYDROLOGY

Recorded Data (Describe in Remarks)

_____ Stream, Lake, or Tide Gauge
_____ Aerial Photographs
_____ Other
_____ No Recorded Data Available

Field Observations:

Depth of Surface Water: _____
Depth of Free Water in Pit: _____
Depth to Saturated Soil: _____

Wetland Hydrology Indicators

Primary Indicators:

_____ Inundated
_____ Saturated in Upper 12 Inches
_____ Water Marks
_____ Drift Lines
_____ Sediment Deposits
X Drainage Patterns

Secondary Indicators (2 or more required):

_____ Oxidized Roots Channels in Upper 12”
_____ Water-Stained Leaves
X Local Soil Survey Data
X FAC-Neutral Test
_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 53 – Arnegard loam, 0-3% slopes **Drainage Class:** Well to moderately well
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**___ No**
Wetland Hydrology Present?	**X Yes**	**___ No**
Hydric Soils Present?	**X Yes**	**___ No**
Is the sampling point within a wetland?	**X Yes**	**___ No**

Remarks: This is classified as a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 9, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W29A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Barley Fox-tail	*Hordeum jubatim*	Herb	10	FACW
Prairie Cordgrass	*Spartina pectinata*	Herb	5	FACW
Uptight sedge	*Carex stricta*	Herb	10	OBL
Narrow-leaf cattail	*Typha angustifolia*	Herb	5	OBL
Soft-stem bulrush	*Scirpus validus*	Herb	60	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	X Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2270 – Harriet and Stirum soils, 0-3% slopes **Drainage Class:** Poorly drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**_____ No**
Wetland Hydrology Present?	**X Yes**	**_____ No**
Hydric Soils Present?	**X Yes**	**_____ No**
Is the sampling point within a wetland?	**X Yes**	**_____ No**

Remarks: This is classified as a PEMCx. The wetland is an excavated stock pond.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 9, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W30C **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Fowl bluegrass	*Poa palustris*	Herb	40	FACW
Barley Fox-tail	*Hordeum jubatim*	Herb	15	FACW
Curly Dock	*Rumex crispus*	Herb	10	FACW
American sloughgrass	*Beckmannia syzigachne*	Herb	20	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	X Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2270 – Harriet and Stirum soils, 0-3% slopes **Drainage Class:** Poorly drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**_____ No**
Wetland Hydrology Present?	**X Yes**	**_____ No**
Hydric Soils Present?	**X Yes**	**_____ No**
Is the sampling point within a wetland?	**X Yes**	**_____ No**

Remarks: This is a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 9, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W30B **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Fowl bluegrass	*Poa palustris*	Herb	20	FACW
Barley Fox-tail	*Hordeum jubatim*	Herb	50	FACW
Curly Dock	*Rumex crispus*	Herb	5	FACW
American sloughgrass	*Beckmannia syzigachne*	Herb	15	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	X Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2270 – Harriet and Stirum soils, 0-3% slopes **Drainage Class:** Poorly drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**_____ No**
Wetland Hydrology Present?	**X Yes**	**_____ No**
Hydric Soils Present?	**X Yes**	**_____ No**
Is the sampling point within a wetland?	**X Yes**	**_____ No**

Remarks: This is a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 9, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W30A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Fowl bluegrass	*Poa palustris*	Herb	40	FACW
Barley Fox-tail	*Hordeum jubatim*	Herb	10	FACW
Curly Dock	*Rumex crispus*	Herb	25	FACW
American sloughgrass	*Beckmannia syzigachne*	Herb	5	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	X Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2270 – Harriet and Stirum soils, 0-3% slopes **Drainage Class:** Poorly drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**_____ No**
Wetland Hydrology Present?	**X Yes**	**_____ No**
Hydric Soils Present?	**X Yes**	**_____ No**
Is the sampling point within a wetland?	**X Yes**	**_____ No**

Remarks: This is a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 9, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W32B **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
American sloughgrass	*Beckmannia syzigachne*	Herb	5	OBL
Barley Fox-tail	*Hordeum jubatim*	Herb	15	FACW
Curly Dock	*Rumex crispus*	Herb	10	FACW
Uptight sedge	*Carex stricta*	Herb	20	OBL
Fowl bluegrass	*Poa palustris*	Herb	15	FACW
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2032 – Zahl-Williams loams, 6-9% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**___ No**
Wetland Hydrology Present?	**X Yes**	**___ No**
Hydric Soils Present?	**X Yes**	**___ No**
Is the sampling point within a wetland?	**X Yes**	**___ No**

Remarks: This is a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 9, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W32A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Three square bulrush	*Scirpus pungens*	Herb	15	OBL
Uptight sedge	*Carex stricta*	Herb	35	OBL
Soft-stem bulrush	*Scirpus validus*	Herb	20	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	X Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	_____ Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Channalized water flow and scour pools on the eastern portion of the wetland. Listed on

SOILS

Map Unit Name: 1664 – Shambo loam, 0-2% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**_____ No**
Wetland Hydrology Present?	**X Yes**	**_____ No**
Hydric Soils Present?	**X Yes**	**_____ No**
Is the sampling point within a wetland?	**X Yes**	**_____ No**

Remarks: This is a PEM1A wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 9, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W33E **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Uptight sedge	*Carex stricta*	Herb	30	OBL
Creeping spikerush	*Eleocharis palustris*	Herb	40	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Drown out area near culvert and along intermittent waterbody channel.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	X Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	_____ Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks:

SOILS

Map Unit Name: 2362 - Wabek sandy loam, 6-25% slopes **Drainage Class:** Excessively drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure
0-8	A	10YR 3/2			Sandy clay loam
8-12	B	2.5Y 4/1			Sand loam

Hydric Soil Indicators:

____	Histols	____	Concretions
____	Histic Epipedon	____	High organic Content in Surface Layer
____	Sulfidic Odor	____	Organic Streaking in Sandy Soils
____	Aquic Moisture Regime	____	Listed on Local Hydric Soils List
____	Reducing Conditions	____	Listed on National Hydric Soils
X	Gleyed or Low-Chroma Colors	____	Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	X	**Yes**	____	**No**
Wetland Hydrology Present?	X	**Yes**	____	**No**
Hydric Soils Present?	X	**Yes**	____	**No**
Is the sampling point within a wetland?	X	**Yes**	____	**No**

Remarks: This is classified as a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 9, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W33D **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Giant ragweed	*Ambrosia trifida*	Herb	40	FAC
Uptight sedge	*Carex stricta*	Herb	30	OBL
Stinging nettle	*Urtica dioica*	Herb	10	FACW
Clasping-leaf dogbane	*Apocynum cannabinum*	Forb/Herb	15	FAC
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Photos from May 24th, 2006 show some water within the intermittent stream (see photos). Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2176 – Zahl-Williams loams, 15 to 60% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soils were assumed.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**____ No**
Wetland Hydrology Present?	**X Yes**	**____ No**
Hydric Soils Present?	**X Yes**	**____ No**
Is the sampling point within a wetland?	**X Yes**	**____ No**

Remarks: This is a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 9, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W33C **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Meadow foxtail	*Alopecurus pratensis*	Herb	40	FACW
Fowl bluegrass	*Poa palustris*	Herb	25	FACW
Uptight sedge	*Carex stricta*	Herb	10	OBL
Barley Fox-tail	*Hordeum jubatim*	Herb	15	FACW
Water plantain	*Alisma subcordatum*	Herb	5	OBL
Creeping spikerush	*Eleocharis palustris*	Herb	5	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area. This is an excavated stock pond with a associated wetland along the intermittent stream channel.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	X Inundated
_____ Other	X Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	X Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2176 – Zahl-Williams loams, 15 to 60% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**___ No**
Wetland Hydrology Present?	**X Yes**	**___ No**
Hydric Soils Present?	**X Yes**	**___ No**
Is the sampling point within a wetland?	**X Yes**	**___ No**

Remarks: This is a PUBGx/PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 9, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W33B **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Stinging nettle	*Urtica dioica*	Herb	5	FACW
Water smartweed	*Polygonum amphibium*	Herb	60	OBL
Uptight sedge	*Carex stricta*	Herb	25	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	X Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	_____ Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Channelized flow in eastern portion of wetland.

SOILS

Map Unit Name: 2362 - Wabek sandy loam, 6-25% slopes **Drainage Class:** Excessively drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**_____ No**
Wetland Hydrology Present?	**X Yes**	**_____ No**
Hydric Soils Present?	**X Yes**	**_____ No**
Is the sampling point within a wetland?	**X Yes**	**_____ No**

Remarks: This is a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 9, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W33A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Narrow-leaf cattail	*Typha angustifolia*	Herb	10	OBL
Water smartweed	*Polygonum amphibium*	Herb	10	OBL
Uptight sedge	*Carex stricta*	Herb	20	OBL
Soft-stem bulrush	*Scirpus validus*	Herb	30	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	X Inundated
_____ Other	X Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	X Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	_____ Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Inundated portions of the wetland near the culvert by 60th Street.

SOILS

Map Unit Name: 2362 - Wabek sandy loam, 6-25% slopes **Drainage Class:** Excessively drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**___ No**
Wetland Hydrology Present?	**X Yes**	**___ No**
Hydric Soils Present?	**X Yes**	**___ No**
Is the sampling point within a wetland?	**X Yes**	**___ No**

Remarks: This is a PEMA/C wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 8, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W34A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Uptight sedge	*Carex stricta*	Herb	30	OBL
Barley Fox-tail	*Hordeum jubatim*	Herb	15	FACW
Curly Dock	*Rumex crispus*	Herb	10	FACW
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2176 – Zahl-Williams loams, 15 to 60% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**_____ No**
Wetland Hydrology Present?	**X Yes**	**_____ No**
Hydric Soils Present?	**X Yes**	**_____ No**
Is the sampling point within a wetland?	**X Yes**	**_____ No**

Remarks: This is a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 8, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W36A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Uptight sedge	*Carex stricta*	Herb	30	OBL
Water smartweed	*Polygonum amphibium*	Herb	5	OBL
Narrow-leaf cattail	*Typha angustifolia*	Herb	60	OBL
Sedge	*Carex spp.*	Herb	5	--
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	X Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	X Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12"
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2176 – Zahl-Williams loams, 15 to 60% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**_____ No**
Wetland Hydrology Present?	**X Yes**	**_____ No**
Hydric Soils Present?	**X Yes**	**_____ No**
Is the sampling point within a wetland?	**X Yes**	**_____ No**

Remarks: This is a PEMA/C wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 8, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W37B **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Uptight sedge	*Carex stricta*	Herb	50	OBL
Soft-stem bulrush	*Scirpus validus*	Herb	20	OBL
Narrow-leaf cattail	*Typha angustifolia*	Herb	20	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks:

HYDROLOGY

Recorded Data (Describe in Remarks)

_____ Stream, Lake, or Tide Gauge
_____ Aerial Photographs
_____ Other
_____ No Recorded Data Available

Field Observations:

Depth of Surface Water: _____
Depth of Free Water in Pit: _____
Depth to Saturated Soil: _____

Wetland Hydrology Indicators

Primary Indicators:

_____ Inundated
_____ Saturated in Upper 12 Inches
_____ Water Marks
_____ Drift Lines
_____ Sediment Deposits
X Drainage Patterns

Secondary Indicators (2 or more required):

_____ Oxidized Roots Channels in Upper 12”
_____ Water-Stained Leaves
X Local Soil Survey Data
X FAC-Neutral Test
_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2176 – Zahl-Williams loams, 15 to 60% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**___ No**
Wetland Hydrology Present?	**X Yes**	**___ No**
Hydric Soils Present?	**X Yes**	**___ No**
Is the sampling point within a wetland?	**X Yes**	**___ No**

Remarks: This is a PEMA/C wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 8, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W37A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Uptight sedge	*Carex stricta*	Herb	5	OBL
Water smartweed	*Polygonum amphibium*	Herb	80	OBL
Curly Dock	*Rumex crispus*	Herb	5	FACW
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks:

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2176 – Zahl-Williams loams, 15 to 60% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**___ No**
Wetland Hydrology Present?	**X Yes**	**___ No**
Hydric Soils Present?	**X Yes**	**___ No**
Is the sampling point within a wetland?	**X Yes**	**___ No**

Remarks: This is a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 8, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W38E **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Water plantain	*Alisma subcordatum*	Herb	15	OBL
Water smartweed	*Polygonum amphibium*	Herb	15	OBL
Curly Dock	*Rumex crispus*	Herb	15	FACW
Rough cockle-bur	*Xanthium strumarium*	Herb	10	FAC
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Approximately 40 percent of the wetland is drown out.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	X Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2032 – Zahl-Williams loams, 6-9% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**___ No**
Wetland Hydrology Present?	**X Yes**	**___ No**
Hydric Soils Present?	**X Yes**	**___ No**
Is the sampling point within a wetland?	**X Yes**	**___ No**

Remarks: This is a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 8, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W38D **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Uptight sedge	*Carex stricta*	Herb	25	OBL
Water smartweed	*Polygonum amphibium*	Herb	25	OBL
Curly Dock	*Rumex crispus*	Herb	25	FACW
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Approximately 25 % of the wetland is drown out.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2176 – Zahl-Williams loams, 15 to 60% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**___ No**
Wetland Hydrology Present?	**X Yes**	**___ No**
Hydric Soils Present?	**X Yes**	**___ No**
Is the sampling point within a wetland?	**X Yes**	**___ No**

Remarks: This is a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 8, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W38C **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Creeping spikerush	*Eleocharis palustris*	Herb	40	OBL
Curly Dock	*Rumex crispus*	Herb	25	FACW
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Approximately 50 percent of the wetland is drown out.

HYDROLOGY

Recorded Data (Describe in Remarks)

_____ Stream, Lake, or Tide Gauge
_____ Aerial Photographs
_____ Other
_____ No Recorded Data Available

Field Observations:

Depth of Surface Water: _____
Depth of Free Water in Pit: _____
Depth to Saturated Soil: _____

Wetland Hydrology Indicators

Primary Indicators:

X Inundated
X Saturated in Upper 12 Inches
_____ Water Marks
_____ Drift Lines
_____ Sediment Deposits
_____ Drainage Patterns

Secondary Indicators (2 or more required):

_____ Oxidized Roots Channels in Upper 12”
_____ Water-Stained Leaves
X Local Soil Survey Data
X FAC-Neutral Test
_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2032 – Zahl-Williams loams, 6-9% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**___ No**
Wetland Hydrology Present?	**X Yes**	**___ No**
Hydric Soils Present?	**X Yes**	**___ No**
Is the sampling point within a wetland?	**X Yes**	**___ No**

Remarks: This is a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 8, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W38B **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Creeping spikerush	*Eleocharis palustris*	Herb	10	OBL
Water smartweed	*Polygonum amphibium*	Herb	50	OBL
Water plantain	*Alisma subcordatum*	Herb	5	OBL
Soft-stem bulrush	*Scirpus validus*	Herb	10	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Approximately 30 percent of the wetland is drown out.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2032 – Zahl-Williams loams, 6-9% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**___ No**
Wetland Hydrology Present?	**X Yes**	**___ No**
Hydric Soils Present?	**X Yes**	**___ No**
Is the sampling point within a wetland?	**X Yes**	**___ No**

Remarks: This is a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 8, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W38A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Creeping spikerush	*Eleocharis palustris*	Herb	10	OBL
Water smartweed	*Polygonum amphibium*	Herb	45	OBL
Water plantain	*Alisma subcordatum*	Herb	15	OBL
Broad-leaf cattail	*Typha latifolia*	Herb	10	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area.

HYDROLOGY

Recorded Data (Describe in Remarks)

_____ Stream, Lake, or Tide Gauge
_____ Aerial Photographs
_____ Other
_____ No Recorded Data Available

Field Observations:

Depth of Surface Water: _____
Depth of Free Water in Pit: _____
Depth to Saturated Soil: _____

Wetland Hydrology Indicators

Primary Indicators:

_____ Inundated
_____ Saturated in Upper 12 Inches
_____ Water Marks
_____ Drift Lines
_____ Sediment Deposits
_____ Drainage Patterns

Secondary Indicators (2 or more required):

_____ Oxidized Roots Channels in Upper 12”
_____ Water-Stained Leaves
X Local Soil Survey Data
X FAC-Neutral Test
_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2032 – Zahl-Williams loams, 6-9% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**___ No**
Wetland Hydrology Present?	**X Yes**	**___ No**
Hydric Soils Present?	**X Yes**	**___ No**
Is the sampling point within a wetland?	**X Yes**	**___ No**

Remarks: This is a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project	**Date:** July 8, 2006
Company/Project: Enbridge Pipeline (North Dakota) L.L.C.	**County:** Williams Co.
Investigator(s): Jeff Mackenthun, Tom Janssen	**State:** North Dakota
Do normal circumstances exist on the site? Yes	**Wetland:** W41A
Is the site significantly disturbed (atypical situation)? No	**Transect/Community:**
Is the area a potential problem area? No	

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Creeping spikerush	*Eleocharis palustris*	Herb	70	OBL
Sedge	*Carex spp.*	Herb	10	--
Water plantain	*Alisma subcordatum*	Herb	20	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area. This wetland area is heavily grazed.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	X Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2176 – Zahl-Williams loams, 15-60% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**_____ No**
Wetland Hydrology Present?	**X Yes**	**_____ No**
Hydric Soils Present?	**X Yes**	**_____ No**
Is the sampling point within a wetland?	**X Yes**	**_____ No**

Remarks: This is a PEMA/C wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 8, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W42Br **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Creeping spikerush	*Eleocharis palustris*	Herb	10	OBL
Sedge	*Carex spp.*	Herb	10	--
Water plantain	*Alisma subcordatum*	Herb	20	OBL
Reed canary grass	*Phalaris arundinacea*	Herb	20	FACW+
Fowl bluegrass	*Poa palustris*	Herb	15	FACW
Inland rush	*Juncus interior*	Herb	5	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area. This wetland area is heavily grazed.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	X Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2350 – Lehr-Williams loams, 0-6% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X**	**Yes**	_____	**No**
Wetland Hydrology Present?	**X**	**Yes**	_____	**No**
Hydric Soils Present?	**X**	**Yes**	_____	**No**
Is the sampling point within a wetland?	**X**	**Yes**	_____	**No**

Remarks: This is a PEMA/B wetland located along a potential reroute of the proposed pipeline route. There is a small excavated portion of the wetland that is likely used as a stock pond (20' x 30').

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project	**Date:** July 8, 2006
Company/Project: Enbridge Pipeline (North Dakota) L.L.C.	**County:** Williams Co.
Investigator(s): Jeff Mackenthun, Tom Janssen	**State:** North Dakota
Do normal circumstances exist on the site? Yes	**Wetland:** W42A
Is the site significantly disturbed (atypical situation)? No	**Transect/Community:**
Is the area a potential problem area? No	

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Creeping spikerush	*Eleocharis palustris*	Herb	15	OBL
Sedge	*Carex spp.*	Herb	10	--
Barley Fox-tail	*Hordeum jubatim*	Herb	10	FACW
Curly Dock	*Rumex crispus*	Herb	5	FACW
Fowl bluegrass	*Poa palustris*	Herb	20	FACW
Inland rush	*Juncus interior*	Herb	10	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area. This wetland area is partially grazed.

HYDROLOGY

Recorded Data (Describe in Remarks)

_____ Stream, Lake, or Tide Gauge
_____ Aerial Photographs
_____ Other
_____ No Recorded Data Available

Field Observations:

Depth of Surface Water: _____
Depth of Free Water in Pit: _____
Depth to Saturated Soil: _____

Wetland Hydrology Indicators

Primary Indicators:

X Inundated
_____ Saturated in Upper 12 Inches
_____ Water Marks
_____ Drift Lines
_____ Sediment Deposits
_____ Drainage Patterns

Secondary Indicators (2 or more required):

_____ Oxidized Roots Channels in Upper 12”
_____ Water-Stained Leaves
_____ Local Soil Survey Data
X FAC-Neutral Test
_____ Other (Explain in remarks)

Remarks:

SOILS

Map Unit Name: 281 – Bowdle loam, 0-3% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**___ No**
Wetland Hydrology Present?	**X Yes**	**___ No**
Hydric Soils Present?	**X Yes**	**___ No**
Is the sampling point within a wetland?	**X Yes**	**___ No**

Remarks: This is a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 8, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W45A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Ryegrass	*Lolium spp.*	Herb	85	--
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): --%				

Remarks: Stinging nettle around periphery.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	_____ FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 53 – Arnegard loam, 0-3% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure
0-10	A	2.5Y 4/2	7.5YR 3/4	Common, Prominent	Fine sandy clay loam

Hydric Soil Indicators:

_____ Histols
_____ Histic Epipedon
_____ Sulfidic Odor
_____ Aquic Moisture Regime
_____ Reducing Conditions
_____ Gleyed or Low-Chroma Colors

_____ Concretions
_____ High organic Content in Surface Layer
_____ Organic Streaking in Sandy Soils
_____ Listed on Local Hydric Soils List
_____ Listed on National Hydric Soils
_____ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	X	**Yes**	____	**No**
Wetland Hydrology Present?	X	**Yes**	____	**No**
Hydric Soils Present?	X	**Yes**	____	**No**
Is the sampling point within a wetland?	X	**Yes**	____	**No**

Remarks: This is a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 8, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W47A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Creeping spikerush	*Eleocharis palustris*	Herb	30	OBL
Barley Fox-tail	*Hordeum jubatim*	Herb	10	FACW
Narrow-leaf cattail	*Typha angustifolia*	Herb	5	OBL
Soft-stem bulrush	*Scirpus validus*	Herb	5	OBL
Common reed grass	*Phragmites australis*	Herb	10	FACW
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	X Inundated
_____ Other	X Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: This is an excavated wetland basin. Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2081 – Zahl-Williams loams, 9-15% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**___ No**
Wetland Hydrology Present?	**X Yes**	**___ No**
Hydric Soils Present?	**X Yes**	**___ No**
Is the sampling point within a wetland?	**X Yes**	**___ No**

Remarks: This is a PUBGx wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 7, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W48A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Uptight sedge	*Carex stricta*	Herb	40	OBL
Barley Fox-tail	*Hordeum jubatim*	Herb	20	FACW
Annual ragweed	*Ambrosia artemisiifolia*	Herb	20	FACU
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 66%				

Remarks:

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2176 – Zahl-Williams loams, 15-60% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil were assumed.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**_____ No**
Wetland Hydrology Present?	**X Yes**	**_____ No**
Hydric Soils Present?	**X Yes**	**_____ No**
Is the sampling point within a wetland?	**X Yes**	**_____ No**

Remarks: This is a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 7, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W49A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Uptight sedge	*Carex stricta*	Herb	40	OBL
Barley Fox-tail	*Hordeum jubatim*	Herb	15	FACW
Curly Dock	*Rumex crispus*	Herb	5	FACW
Water smartweed	*Polygonum amphibium*	Herb	15	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks: Dominants are provided, along with other significant vegetation within the sample area.

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2032 – Zahl-Williams loams, 6-9% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**___ No**
Wetland Hydrology Present?	**X Yes**	**___ No**
Hydric Soils Present?	**X Yes**	**___ No**
Is the sampling point within a wetland?	**X Yes**	**___ No**

Remarks: This is a PEMA wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 7, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W50A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Uptight sedge	*Carex stricta*	Herb	30	OBL
Creeping spikerush	*Eleocharis palustris*	Herb	25	OBL
Water smartweed	*Polygonum amphibium*	Herb	30	OBL
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks:

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: This is an excavated pond. Listed on Williams County hydric soils list.

SOILS

Map Unit Name: 2015 – Bowbells-Williams loams, 3-6% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**_____ No**
Wetland Hydrology Present?	**X Yes**	**_____ No**
Hydric Soils Present?	**X Yes**	**_____ No**
Is the sampling point within a wetland?	**X Yes**	**_____ No**

Remarks: This is a PEMAx wetland.

ROUTINE WETLAND DETERMINATION
DATA FORM

Project/Site: North Dakota Pipeline Expansion Project **Company/Project:** Enbridge Pipeline (North Dakota) L.L.C. **Investigator(s):** Jeff Mackenthun, Tom Janssen	**Date:** July 7, 2006 **County:** Williams Co. **State:** North Dakota
Do normal circumstances exist on the site? Yes **Is the site significantly disturbed (atypical situation)?** No **Is the area a potential problem area?** No	**Wetland:** W52A **Transect/Community:**

VEGETATION

Dominant Plant Species		Stratum	Percent Coverage	Indicator Status
Common Name	**Scientific Name**			
Barley Fox-tail	*Hordeum jubatim*	Herb	20	FACW
Curly Dock	*Rumex crispus*	Herb	10	FACW
Fowl bluegrass	*Poa palustris*	Herb	40	FACW
Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-): 100%				

Remarks:

HYDROLOGY

Recorded Data (Describe in Remarks)	**Wetland Hydrology Indicators**
_____ Stream, Lake, or Tide Gauge	**Primary Indicators:**
_____ Aerial Photographs	_____ Inundated
_____ Other	_____ Saturated in Upper 12 Inches
_____ No Recorded Data Available	_____ Water Marks
	_____ Drift Lines
	_____ Sediment Deposits
Field Observations:	_____ Drainage Patterns
Depth of Surface Water: _____	
Depth of Free Water in Pit: _____	**Secondary Indicators (2 or more required):**
Depth to Saturated Soil: _____	_____ Oxidized Roots Channels in Upper 12”
	_____ Water-Stained Leaves
	X Local Soil Survey Data
	X FAC-Neutral Test
	_____ Other (Explain in remarks)

Remarks: A small depressional wetland in a pasture. Listed on Williams County hydric soils list. Sunken hoof prints indicate former saturation conditions.

SOILS

Map Unit Name: 2015 – Bowbells-Williams loams, 3-6% slopes **Drainage Class:** Well drained
Subgroup:

Profile Description:

Depth	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structure

Hydric Soil Indicators:

_____ Histols	_____ Concretions
_____ Histic Epipedon	_____ High organic Content in Surface Layer
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List
_____ Reducing Conditions	_____ Listed on National Hydric Soils
_____ Gleyed or Low-Chroma Colors	_____ Other (Explain in Remarks)

Remarks: Hydric soil was assumed based on all dominant species having an indicator status of OBL, or all dominants having an indicator status of OBL or FACW and the wetland boundary is abrupt.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**X Yes**	**_____ No**
Wetland Hydrology Present?	**X Yes**	**_____ No**
Hydric Soils Present?	**X Yes**	**_____ No**
Is the sampling point within a wetland?	**X Yes**	**_____ No**

Remarks: This is a PEMA wetland.

Appendix D

Wetland Photographs

WETLAND – W4B

WETLAND – W4B

WETLAND – W4A

WETLAND – W5B

APPENDIX D
WETLAND PHOTOGRAPHS

WETLAND – W5A

WETLAND – W6A

WETLAND – W6A

WETLAND – W7C

APPENDIX D
WETLAND PHOTOGRAPHS

WETLAND – W7B

NOT AVAILABLE

WETLAND – W7A

WETLAND – W8A

WETLAND – W8A

APPENDIX D
WETLAND PHOTOGRAPHS

WETLAND – W9A

WETLAND – W12C

WETLAND – W12B

NOT AVAILABLE

20WETLAND – W2A

APPENDIX D
WETLAND PHOTOGRAPHS

WETLAND – W20B

WETLAND – W20A

WETLAND – W21A

WETLAND – W22A

APPENDIX D
WETLAND PHOTOGRAPHS

NOT AVAILABLE

WETLAND – W23A

WETLAND – W29A

WETLAND – W30C

WETLAND – W30B

APPENDIX D
WETLAND PHOTOGRAPHS

WETLAND – W30A

WETLAND – W32B

WETLAND – W32A

WETLAND – W33A

APPENDIX D
WETLAND PHOTOGRAPHS

WETLAND – W33A

WETLAND – W33B

WETLAND – W33C

WETLAND – W33D

APPENDIX D
WETLAND PHOTOGRAPHS

WETLAND – W34A

WETLAND – W36A

WETLAND – W36A

WETLAND – W37B

APPENDIX D
WETLAND PHOTOGRAPHS

WETLAND – W37B

WETLAND – W37A

WETLAND – W38D

WETLAND – W38E

APPENDIX D
WETLAND PHOTOGRAPHS

WETLAND – W38C

WETLAND – W38B

WETLAND – W38A

WETLAND – W41A

APPENDIX D
WETLAND PHOTOGRAPHS

WETLAND – W42A

WETLAND – W42Br

WETLAND – W45A

WETLAND – W47A

APPENDIX D
WETLAND PHOTOGRAPHS

WETLAND – W48A

WETLAND – W49A

WETLAND – W50A

WETLAND – W52A

APPENDIX D
WETLAND PHOTOGRAPHS

Appendix E

Waterbody Photographs

WATERBODY – MP 0.15

WATERBODY – MP 0.30

WATERBODY – MP 4.3

WATERBODY – MP 5.9

APPENDIX E
WATERBODY CROSSING PHOTOGRAPHS

WATERBODY – MP 6.1 (July 2006)

WATERBODY – MP 6.1 (May 2006)

WATERBODY – MP 7.2

WATERBODY – MP 7.4

APPENDIX E
WATERBODY CROSSING PHOTOGRAPHS

WATERBODY – MP 8.5

WATERBODY – MP 10.0

WATERBODY – MP 11.9

WATERBODY – MP 17.4

APPENDIX E
WATERBODY CROSSING PHOTOGRAPHS

WATERBODY – MP 19.1

WATERBODY – MP 20.5

WATERBODY – MP 21.8

WATERBODY – MP 22.5

APPENDIX E
WATERBODY CROSSING PHOTOGRAPHS

WATERBODY – MP 24.3

WATERBODY – MP 24.7

WATERBODY – MP 27.2

WATERBODY – MP 30.2

APPENDIX E
WATERBODY CROSSING PHOTOGRAPHS

WATERBODY – MP 30.2

WATERBODY – MP 30.5

WATERBODY – MP 33.1

WATERBODY – MP 33.2

APPENDIX E
WATERBODY CROSSING PHOTOGRAPHS

WATERBODY – MP 33.1 (May 2006)

WATERBODY – MP 33.4

WATERBODY – MP 33.6

WATERBODY – MP 34.4

APPENDIX E
WATERBODY CROSSING PHOTOGRAPHS

WATERBODY – MP 34.6 (south side of road)

WATERBODY – MP 34.6 (north side of road)

WATERBODY – MP 36.2

WATERBODY – MP 36.7

APPENDIX E
WATERBODY CROSSING PHOTOGRAPHS

WATERBODY – MP 36.8

WATERBODY – MP 37.2

WATERBODY – MP 37.9

WATERBODY – MP 38.1 as waterbody turns to the east

APPENDIX E
WATERBODY CROSSING PHOTOGRAPHS

WATERBODY – MP 38.1 on north side of 59th Street

WATERBODY – MP 38.1 on south side of 59th Street

WATERBODY – MP 38.8 on east side of private drive

WATERBODY – MP 38.8 on west side of private drive

APPENDIX E
WATERBODY CROSSING PHOTOGRAPHS

WATERBODY – MP 40.0

WATERBODY – MP 41.4

WATERBODY – MP 42.8

WATERBODY – MP 43.5

APPENDIX E
WATERBODY CROSSING PHOTOGRAPHS

WATERBODY – MP 43 reroute along 143rd Ave (Sand Creek)

WATERBODY – MP 43 reroute along 143rd Ave (south of Sand Creek)

WATERBODY – MP 48.6

WATERBODY – MP 49.0

APPENDIX E
WATERBODY CROSSING PHOTOGRAPHS

WATERBODY – MP 49.7

WATERBODY – MP 49.9

WATERBODY – MP 50.2

WATERBODY – MP 50.6

APPENDIX E
WATERBODY CROSSING PHOTOGRAPHS

WATERBODY – MP 51.0

APPENDIX E
WATERBODY CROSSING PHOTOGRAPHS

APPENDIX G

ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

TEN YEAR PLAN

NORTH DAKOTA

JUNE 30, 2005

Enbridge Pipelines (North Dakota) LLC
Ten Year Plan
North Dakota

JUNE 30, 2005

SCHEDULE A: Existing Energy Conversion Facilities

This schedule does not apply to Enbridge Pipelines (North Dakota) LLC

Ten Year Plan
North Dakota

JUNE 30, 2005

SCHEDULE B: Energy Conversion Facilities Under Construction

This schedule does not apply to Enbridge Pipelines (North Dakota) LLC

Ten Year Plan
North Dakota

JUNE 30, 2005

SCHEDULE C: Proposed Energy Conversion Facilities on Which Construction is Intended Within the Ensuing Five Years

This schedule does not apply to Enbridge Pipelines (North Dakota) LLC

Ten Year Plan
North Dakota

JUNE 30, 2005

SCHEDULE D: Proposed Energy Conversion Facilities During the Next Ten Year Time Period

This schedule does not apply to Enbridge Pipelines (North Dakota) LLC

Ten Year Plan
North Dakota

JUNE 30, 2005

SCHEDULE E: Existing Transmission Facilities (Electric)

This schedule does not apply to Enbridge Pipelines (North Dakota) LLC

Enbridge Pipelines (North Dakota) LLC
Ten Year Plan
North Dakota

JUNE 30, 2005

SCHEDULE F: Existing Transmission Facilities (Pipeline)

1) Enclosed is a System Map designated as Exhibit "A".

2) The pipeline consists of:

   a) Product type – crude petroleum
   b) Length of facility

      i) 514.86 miles in service

   c) Pipe size

      i) 6-5/8" O.D.
      ii) 8-5/8" O.D.
      iii) 10-3/4" O.D.
      iv) 12-3/4" O.D.
      v) 16" O.D.

   d) Maximum design operating pressure

      i) 1440 psig for 6-5/8"
      ii) 1440 psig for 8-5/8"
      iii) 1440 psig for 10-3/4"
      iv) 1440 psig for 12-3/4"
      v) 1440 psig for 16"

   e) Maximum design flow rate

      i) Grenora to Beaver Lodge – 25, 000 BPD (Barrels Per Day)
      ii) Alexander to Beaver Lodge – 20,000 BPD
      iii) Canadian Border to Berthold – 45,000 BPD
      iv) Beaver Lodge to Minot – 80, 000 BPD
      v) Sherwood to Maxbass – 7, 000 BPD
      vi) Newburg to Maxbass – 4,800 BPD
      vii) Maxbass to Minot – 16,000 BPD
      viii) Minot to Clearbrook, Minnesota – 110, 000 BPD

f) Pump Stations

i) Number (North Dakota) 13
ii) Station horsepower
(1) Total installed horsepower – 10, 315 Hp
(2) 2 – 1500 horsepower diesel engines (back-up)
iii) Discharge pressure – 1440 psig
iv) Capacity – 4,800-110,000 BPD

g) Minimum cover over pipe – 36 inches

3) Facilities "in service" dates

a) Grenora to Beaver Lodge – 1964
b) Alexander to Beaver Lodge – 1983
c) Canadian Border to Berthold – 1996
d) Beaver Lodge to Berthold – 1964
e) Sherwood to Maxbass – 1962
f) Newburg to Maxbass – 1960
g) Maxbass to Minot – 1960
h) Minot to Clearbrook Station, Minnesota – 1962
i) Berthold to Minot - 1962

Enbridge Pipelines (North Dakota) LLC
Ten Year Plan
North Dakota

JUNE 30, 2005

SCHEDULE G: Proposed Transmissions Facilities on Which Construction is Intended Within the Ensuing Five Years (Electric)

This schedule does not apply to Enbridge Pipelines (North Dakota) LLC

Enbridge Pipelines (North Dakota) LLC
Ten Year Plan
North Dakota

JUNE 30, 2005

SCHEDULE H: Proposed Transmission Facility on Which Construction is Intended Within the Ensuing Five Years (Pipeline)

Planned upgrades to the EPND pipeline system in 2005 are as follows:

Alexander to Beaver Lodge

1. Increase pumping capacity at 2 station facilities.
2. Construct 1 additional pumping station facility.

Enbridge Pipelines (North Dakota) LLC
Ten Year Plan
North Dakota

JUNE 30, 2005

SCHEDULE I: Proposed Transmission Facilities During the Next Ten-Years Time Period (Electric and Pipeline)

There are no definite plans to construct additional facilities during the next ten-year time frame.

Enbridge Pipelines (North Dakota) LLC
Ten Year Plan
North Dakota

JUNE 30, 2005

SCHEDULE J: Regional Coordination

Enbridge Pipelines (North Dakota) LLC is not attempting to coordinate our plans with other utilities serving the area. However, as expansion plans develop, affected utilities have and will be contacted.

Enbridge Pipelines (North Dakota) LLC
Ten Year Plan
North Dakota

JUNE 30, 2005

SCHEDULE K: Environmental Information

See attached policy.

Enbridge Pipelines (North Dakota) LLC
Ten Year Plan
North Dakota

JUNE 30, 2005

SCHEDULE L: Projected Demand for Service

Crude oil gathered into the Enbridge System is batched in Minot for transporting through Enbridge's mainline pipeline to Clearbrook, Minnesota. In 2005, Enbridge's mainline projection is 70,000 BPD. Enbridge's volume of business is directly related to production in the Williston basin, which is dependent on the extent of exploration being undertaken and crude oil usage, by others.

APPENDIX H

PROPOSED PIPELINE
EXISTING PIPELINE
ESTIMATED MILEPOST
SCHOOLS
MUNICIPAL PARK
RESIDENCE
BUSINESS
GEOLOGIC HAZARD - LAND SLIDE
UNEVALUATED ARCHAEOLOGICAL SITES
GEOLOGIC HAZARD - ABANDONED MINE
PLOTS
SCHOOL TRUST LAND
EVALUATION CORRIDOR

1 INCH = 2,000 FT
SCALE = 1:24,000

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0 0.25 0.5 Miles
0 1,000 2,000 4,000 Feet

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ENBRIDGE PIPELINES (NORTH DAKOTA) LLC
NORTH DAKOTA PIPELINE EXPANSION PROJECT
Exclusion and Avoidance Area Maps - Sheet 1 of 11

ENBRIDGE™

9
8
7
6
5
4
3
112th Ave NW
111th Ave NW
110th Ave NW
109th Ave NW

PROPOSED PIPELINE
EXISTING PIPELINE
ESTIMATED MILEPOST
SCHOOLS
MUNICIPAL PARK
RESIDENCE
BUSINESS
GEOLOGIC HAZARD - LAND SLIDE
UNEVALUATED ARCHAEOLOGICAL SITES
GEOLOGIC HAZARD - ABANDONED MINE
PLOTS
SCHOOL TRUST LAND
EVALUATION CORRIDOR

1 INCH = 2,000 FT
SCALE = 1:24,000
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ENBRIDGE PIPELINES (NORTH DAKOTA) LLC
NORTH DAKOTA PIPELINE EXPANSION PROJECT
Exclusion and Avoidance Area Maps - Sheet 2 of 11

ENBRIDGE

PROPOSED PIPELINE
EXISTING PIPELINE
ESTIMATED MILEPOST
SCHOOLS
MUNICIPAL PARK
RESIDENCE
BUSINESS
GEOLOGIC HAZARD - LAND SLIDE
UNEVALUATED ARCHAEOLOGICAL SITES
GEOLOGIC HAZARD - ABANDONED MINE
PLOTS
SCHOOL TRUST LAND
EVALUATION CORRIDOR

1 INCH = 2,000 FT
SCALE = 1:24,000
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ENBRIDGE PIPELINES (NORTH DAKOTA) LLC
NORTH DAKOTA PIPELINE EXPANSION PROJECT
Exclusion and Avoidance Area Maps - Sheet 3 of 11

ENBRIDGE™

PROPOSED PIPELINE
EXISTING PIPELINE
ESTIMATED MILEPOST
SCHOOLS
MUNICIPAL PARK
RESIDENCE
BUSINESS
GEOLOGIC HAZARD - LAND SLIDE
UNEVALUATED ARCHAEOLOGICAL SITES
GEOLOGIC HAZARD - ABANDONED MINE
PLOTS
SCHOOL TRUST LAND
EVALUATION CORRIDOR

1 INCH = 2,000 FT
SCALE = 1:24,000
0 0.25 0.5 Miles
0 1,000 2,000 4,000 Feet
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ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

Exclusion and Avoidance Area Maps - Sheet 4 of 11

ENBRIDGE™

PROPOSED PIPELINE
EXISTING PIPELINE
ESTIMATED MILEPOST
SCHOOLS
MUNICIPAL PARK
RESIDENCE
BUSINESS
GEOLOGIC HAZARD - LAND SLIDE
UNEVALUATED ARCHAEOLOGICAL SITES
GEOLOGIC HAZARD - ABANDONED MINE
PLOTS
SCHOOL TRUST LAND
EVALUATION CORRIDOR

1 INCH = 2,000 FT
SCALE = 1:24,000

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0 0.25 0.5 Miles
0 1,000 2,000 4,000 Feet

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ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

Exclusion and Avoidance Area Maps - Sheet 5 of 11

ENBRIDGE™

133rd Ave NW

135th Ave NW

129th Ave NW

31

30

29

28

27

26

PROPOSED PIPELINE
EXISTING PIPELINE
ESTIMATED MILEPOST
SCHOOLS
MUNICIPAL PARK
RESIDENCE
BUSINESS
GEOLOGIC HAZARD - LAND SLIDE
UNEVALUATED ARCHAEOLOGICAL SITES
GEOLOGIC HAZARD - ABANDONED MINE
PLOTS
SCHOOL TRUST LAND
EVALUATION CORRIDOR

1 INCH = 2,000 FT
SCALE = 1:24,000

0 0.25 0.5 Miles
0 1,000 2,000 4,000 Feet

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ENBRIDGE PIPELINES (NORTH DAKOTA) LLC
NORTH DAKOTA PIPELINE EXPANSION PROJECT
Exclusion and Avoidance Area Maps - Sheet 6 of 11

ENBRIDGE™

PROPOSED PIPELINE
EXISTING PIPELINE
ESTIMATED MILEPOST
SCHOOLS
MUNICIPAL PARK
RESIDENCE
BUSINESS
GEOLOGIC HAZARD - LAND SLIDE
UNEVALUATED ARCHAEOLOGICAL SITES
GEOLOGIC HAZARD - ABANDONED MINE
PLOTS
SCHOOL TRUST LAND
EVALUATION CORRIDOR

1 INCH = 2,000 FT
SCALE = 1:24,000
0 0.25 0.5 Miles
0 1,000 2,000 4,000 Feet
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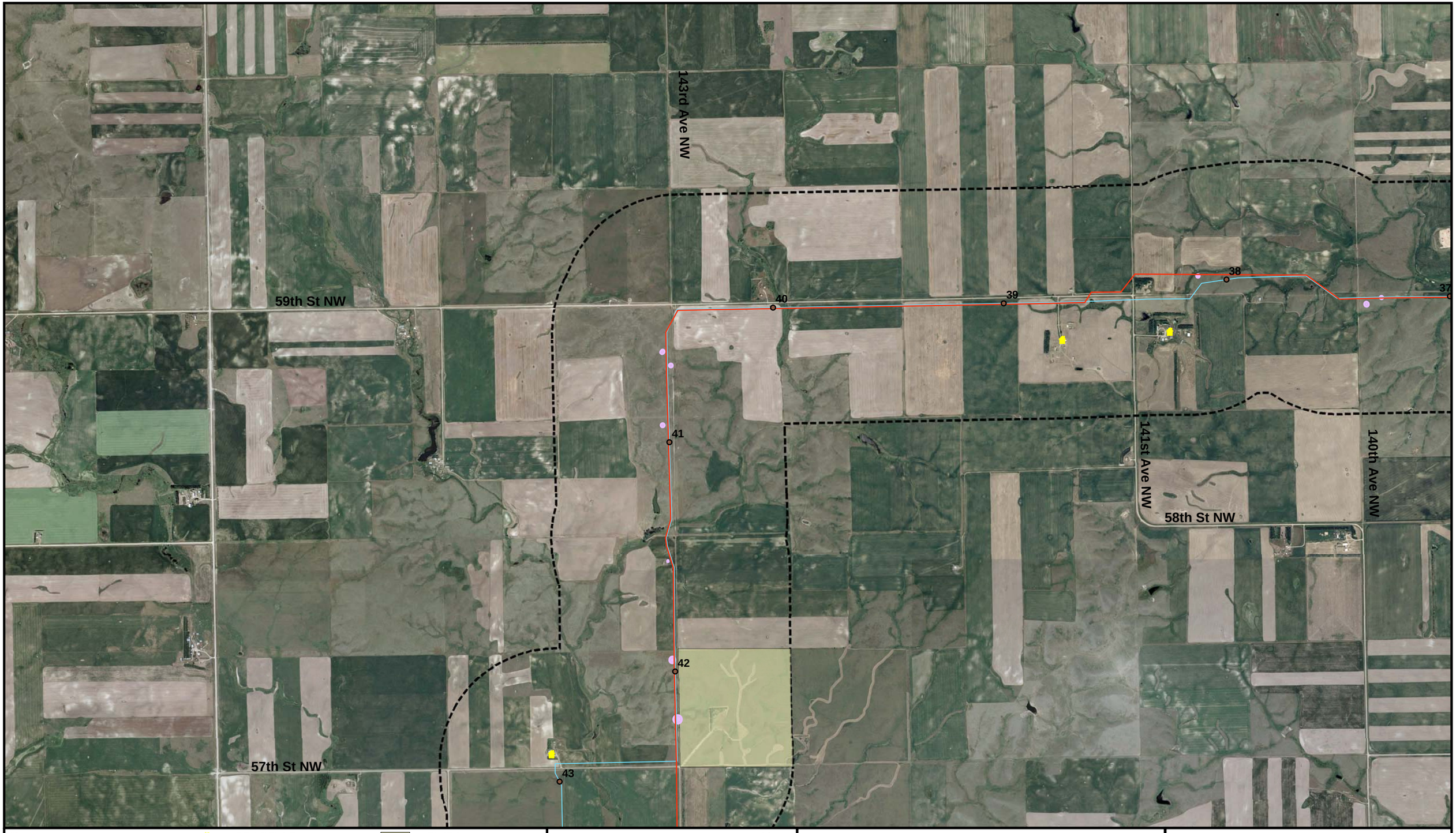
ENBRIDGE PIPELINES (NORTH DAKOTA) LLC
NORTH DAKOTA PIPELINE EXPANSION PROJECT
Exclusion and Avoidance Area Maps - Sheet 7 of 11

ENBRIDGE™



PROPOSED PIPELINE
EXISTING PIPELINE
ESTIMATED MILEPOST
SCHOOLS
MUNICIPAL PARK
RESIDENCE
BUSINESS
GEOLOGIC HAZARD - LAND SLIDE
UNEVALUATED ARCHAEOLOGICAL SITES
GEOLOGIC HAZARD - ABANDONED MINE
PLOTS
SCHOOL TRUST LAND
EVALUATION CORRIDOR

1 INCH = 2,000 FT
SCALE = 1:24,000

0 0.25 0.5 Miles
0 1,000 2,000 4,000 Feet

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ENBRIDGE PIPELINES (NORTH DAKOTA) LLC
NORTH DAKOTA PIPELINE EXPANSION PROJECT
Exclusion and Avoidance Area Maps - Sheet 8 of 11

ENBRIDGE

57th St NW

56th St NW

54th St NW

55th St NW

143rd Ave NW

43

44

45

46

PROPOSED PIPELINE
EXISTING PIPELINE
ESTIMATED MILEPOST
SCHOOLS
MUNICIPAL PARK

RESIDENCE
BUSINESS
GEOLOGIC HAZARD - LAND SLIDE
UNEVALUATED ARCHAEOLOGICAL SITES
GEOLOGIC HAZARD - ABANDONED MINE

PLOTS
SCHOOL TRUST LAND
EVALUATION CORRIDOR

1 INCH = 2,000 FT
SCALE = 1:24,000

0 0.25 0.5 Miles

0 1,000 2,000 4,000 Feet

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ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

Exclusion and Avoidance Area Maps - Sheet 9 of 11

ENBRIDGE

PROPOSED PIPELINE
EXISTING PIPELINE
ESTIMATED MILEPOST
SCHOOLS
MUNICIPAL PARK
RESIDENCE
BUSINESS
GEOLOGIC HAZARD - LAND SLIDE
UNEVALUATED ARCHAEOLOGICAL SITES
GEOLOGIC HAZARD - ABANDONED MINE
PLOTS
SCHOOL TRUST LAND
EVALUATION CORRIDOR

1 INCH = 2,000 FT
SCALE = 1:24,000
0 0.25 0.5 Miles
0 1,000 2,000 4,000 Feet
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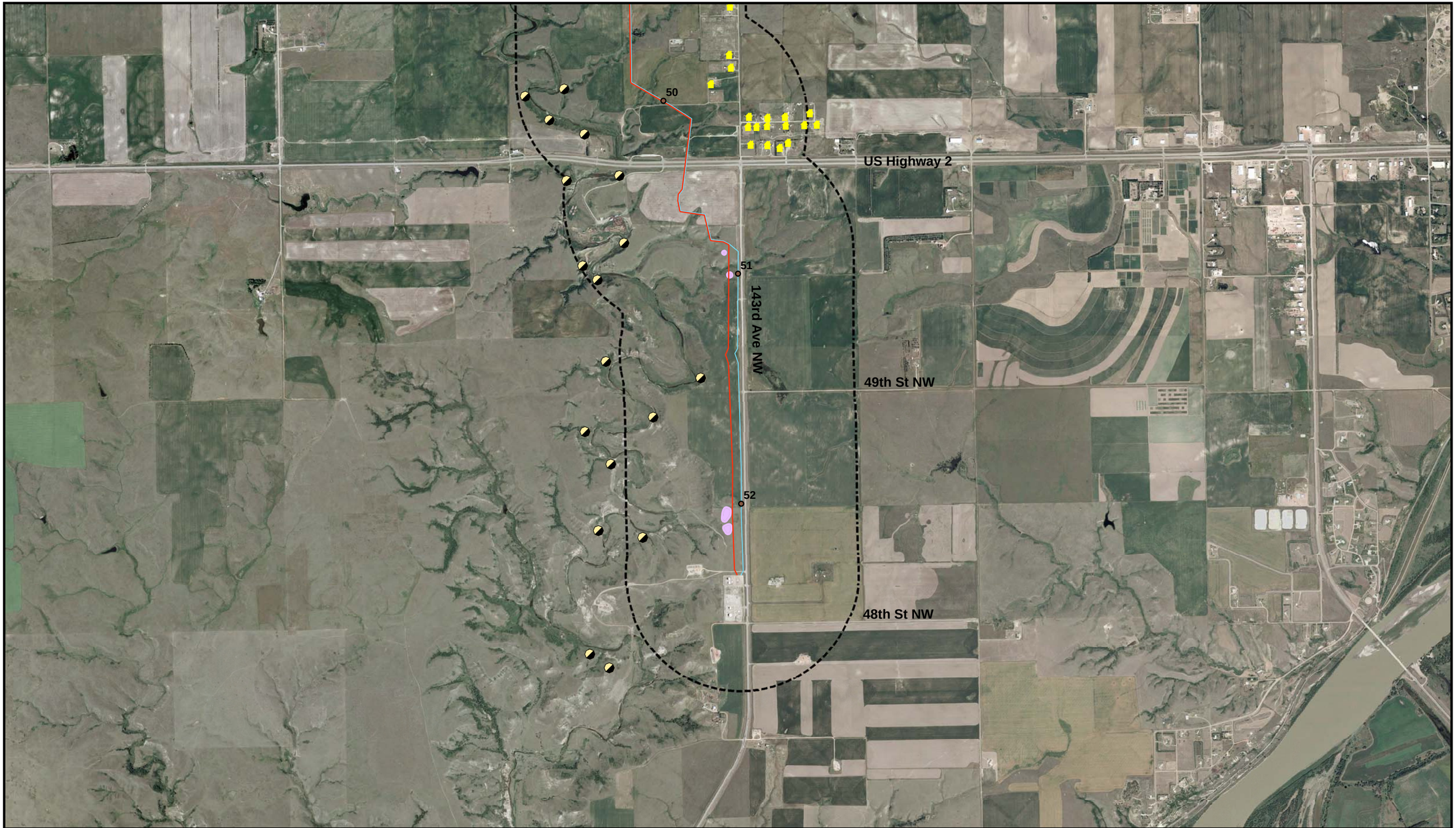
ENBRIDGE PIPELINES (NORTH DAKOTA) LLC
NORTH DAKOTA PIPELINE EXPANSION PROJECT
Exclusion and Avoidance Area Maps - Sheet 10 of 11

ENBRIDGE™



PROPOSED PIPELINE
EXISTING PIPELINE
ESTIMATED MILEPOST
SCHOOLS
MUNICIPAL PARK
RESIDENCE
BUSINESS
GEOLOGIC HAZARD - LAND SLIDE
UNEVALUATED ARCHAEOLOGICAL SITES
GEOLOGIC HAZARD - ABANDONED MINE
PLOTS
SCHOOL TRUST LAND
EVALUATION CORRIDOR

1 INCH = 2,000 FT
SCALE = 1:24,000

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0 0.25 0.5 Miles
0 1,000 2,000 4,000 Feet

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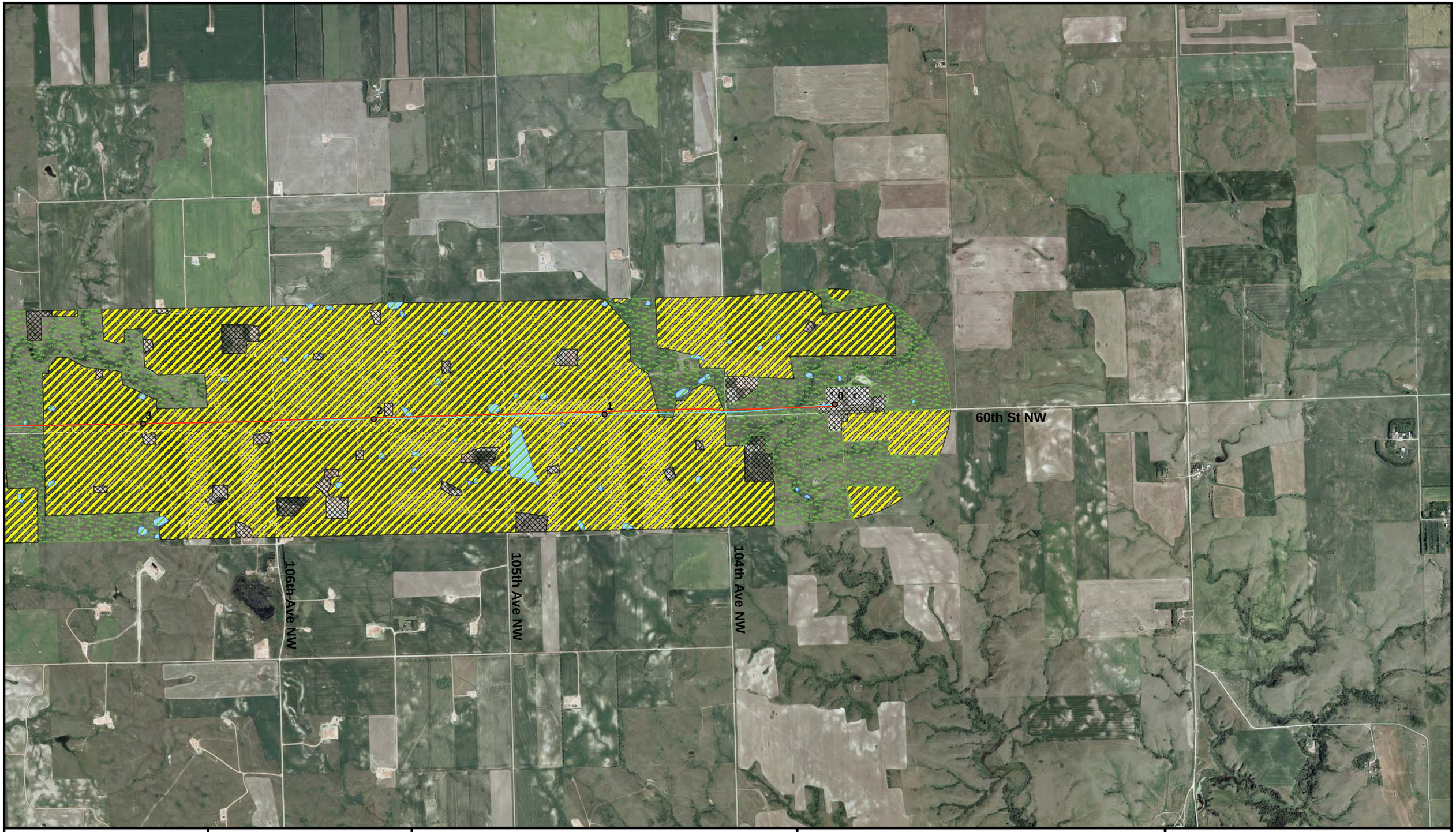
ENBRIDGE PIPELINES (NORTH DAKOTA) LLC

NORTH DAKOTA PIPELINE EXPANSION PROJECT

Exclusion and Avoidance Area Maps - Sheet 11 of 11

ENBRIDGE

APPENDIX I



PROPOSED PIPELINE
EXISTING PIPELINE
ESTIMATED MILEPOST

AGRICULTURAL LAND
GRASSLAND
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NORTH DAKOTA PIPELINE EXPANSION PROJECT
Selection Criteria Maps (Land Use) - Sheet 1 of 11

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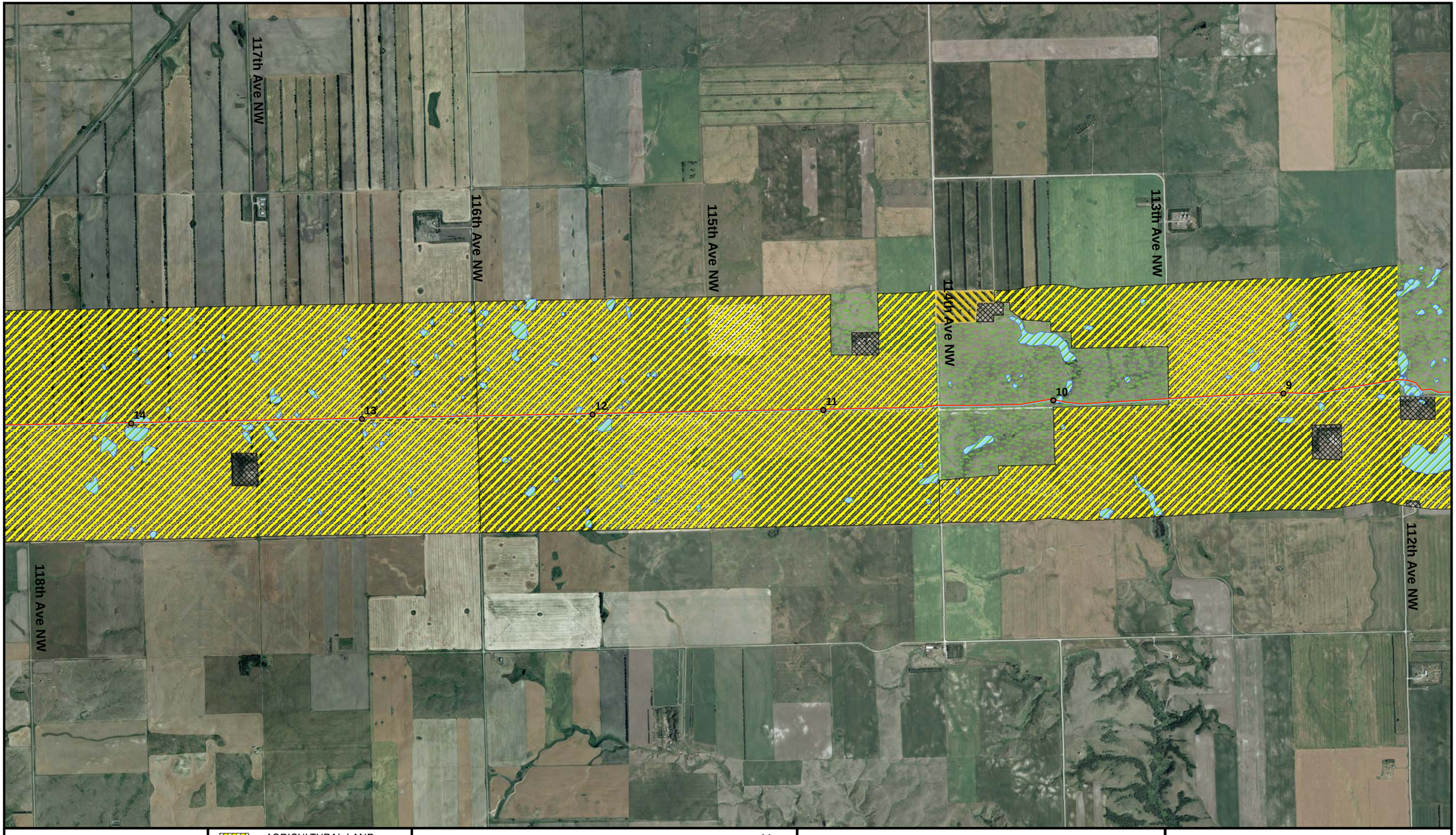

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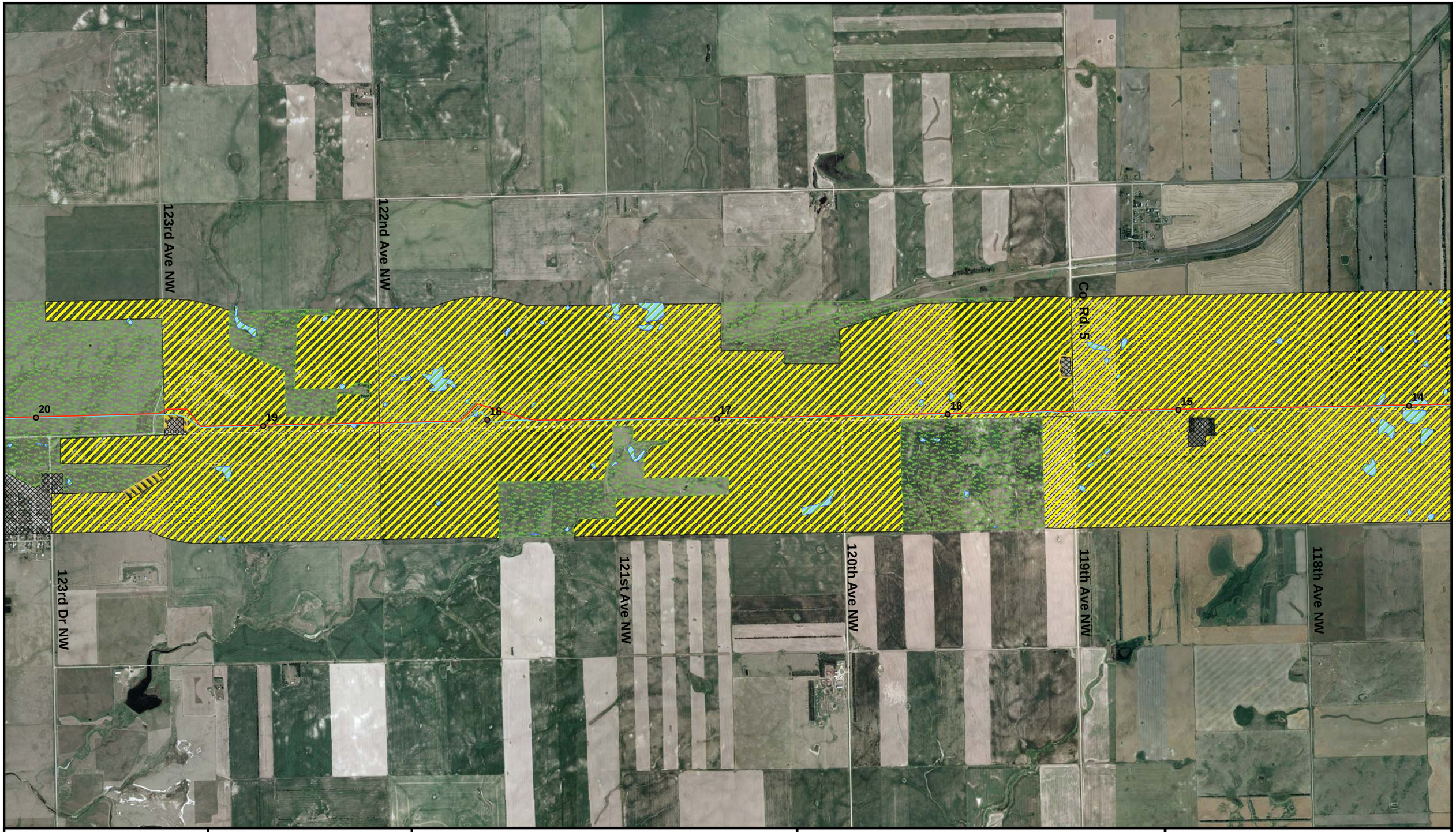

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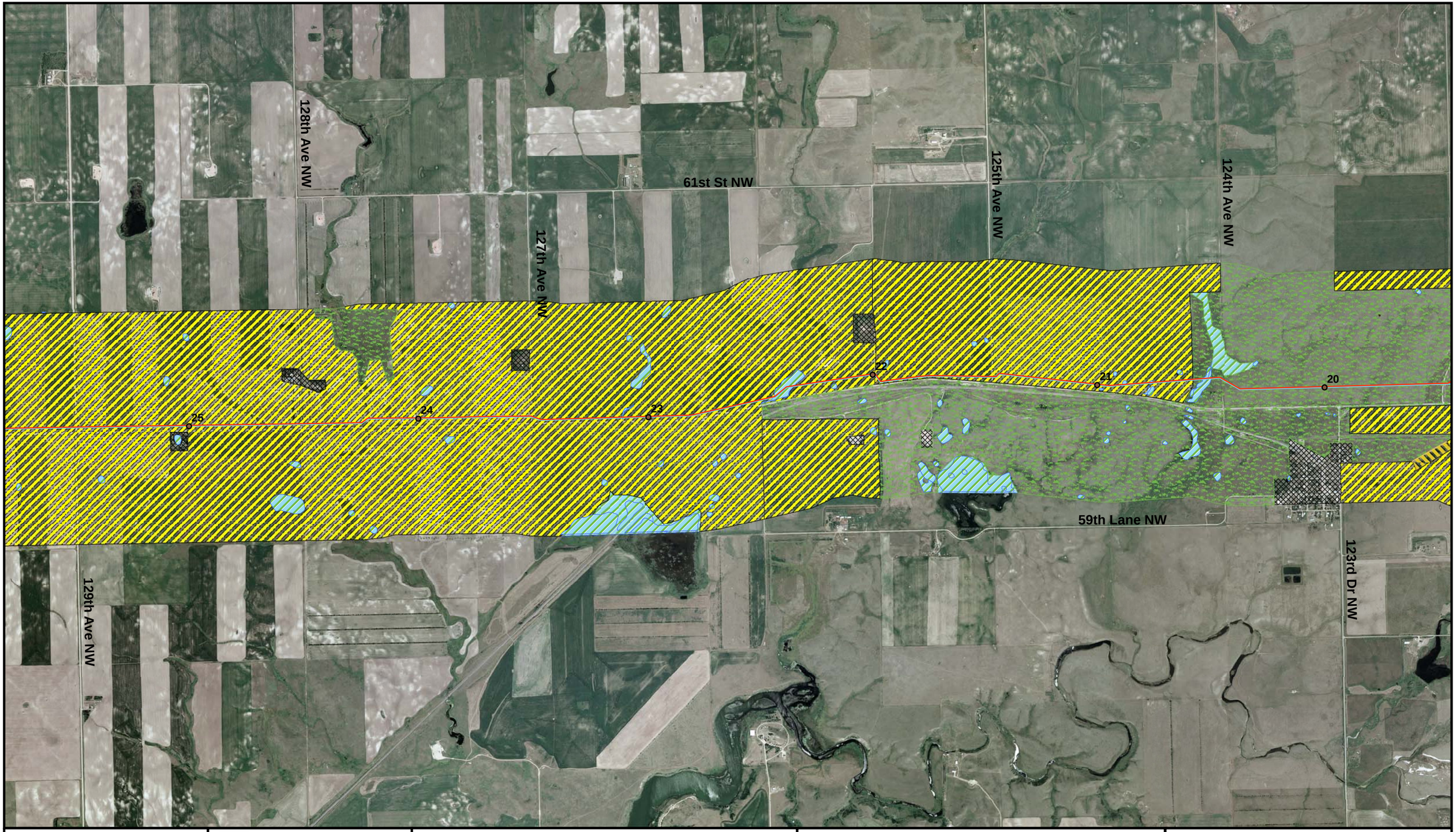

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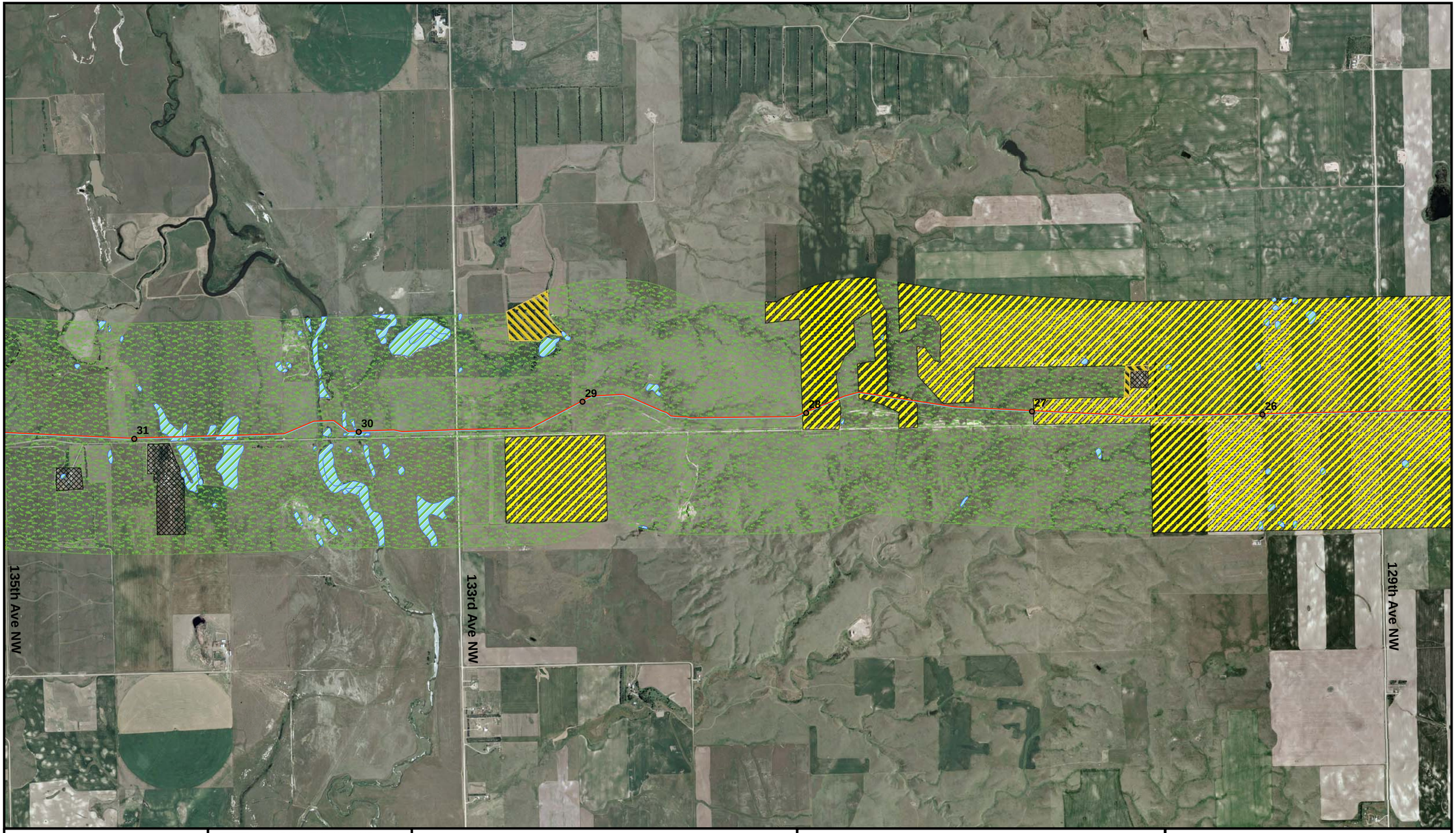

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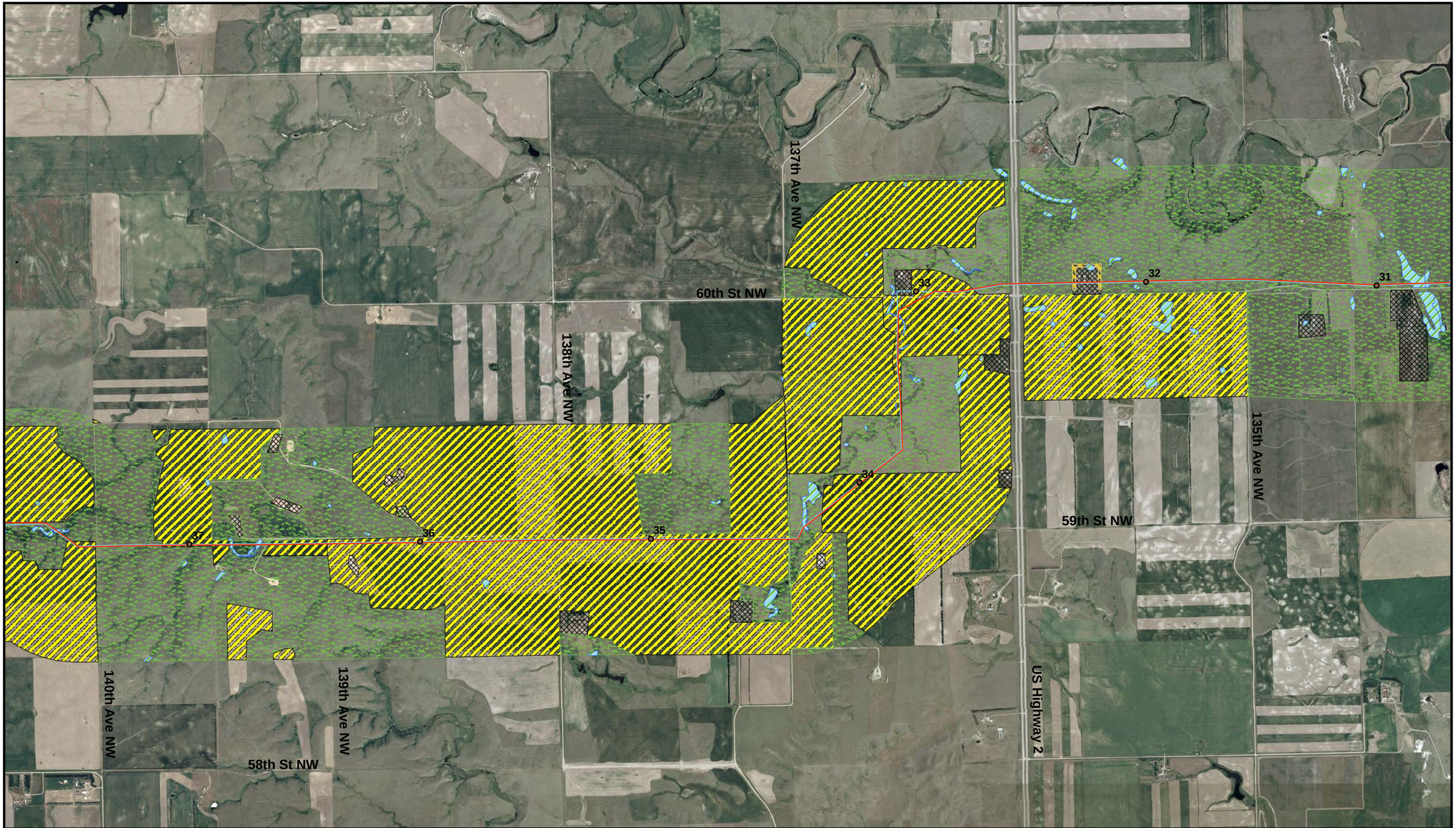

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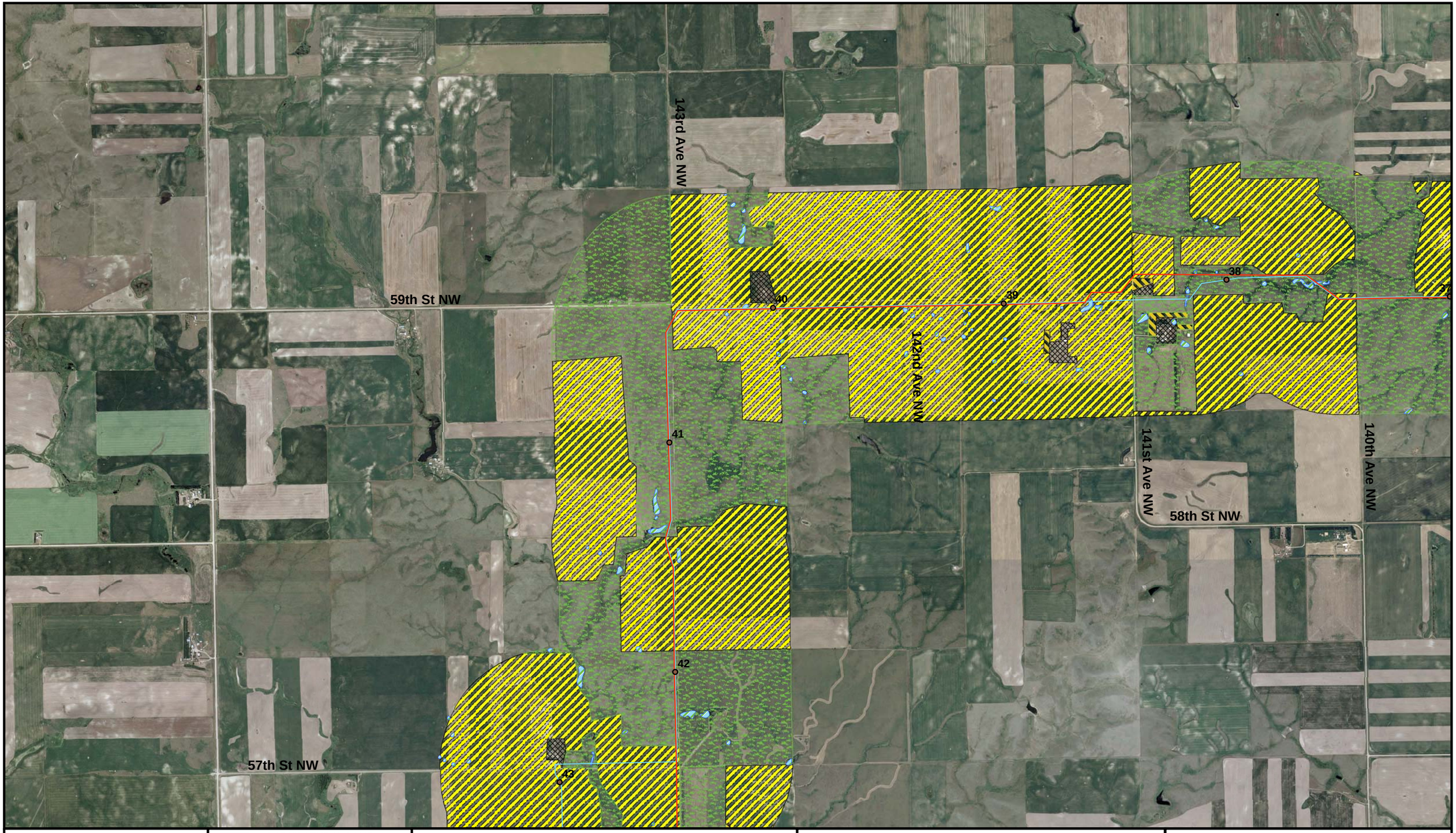

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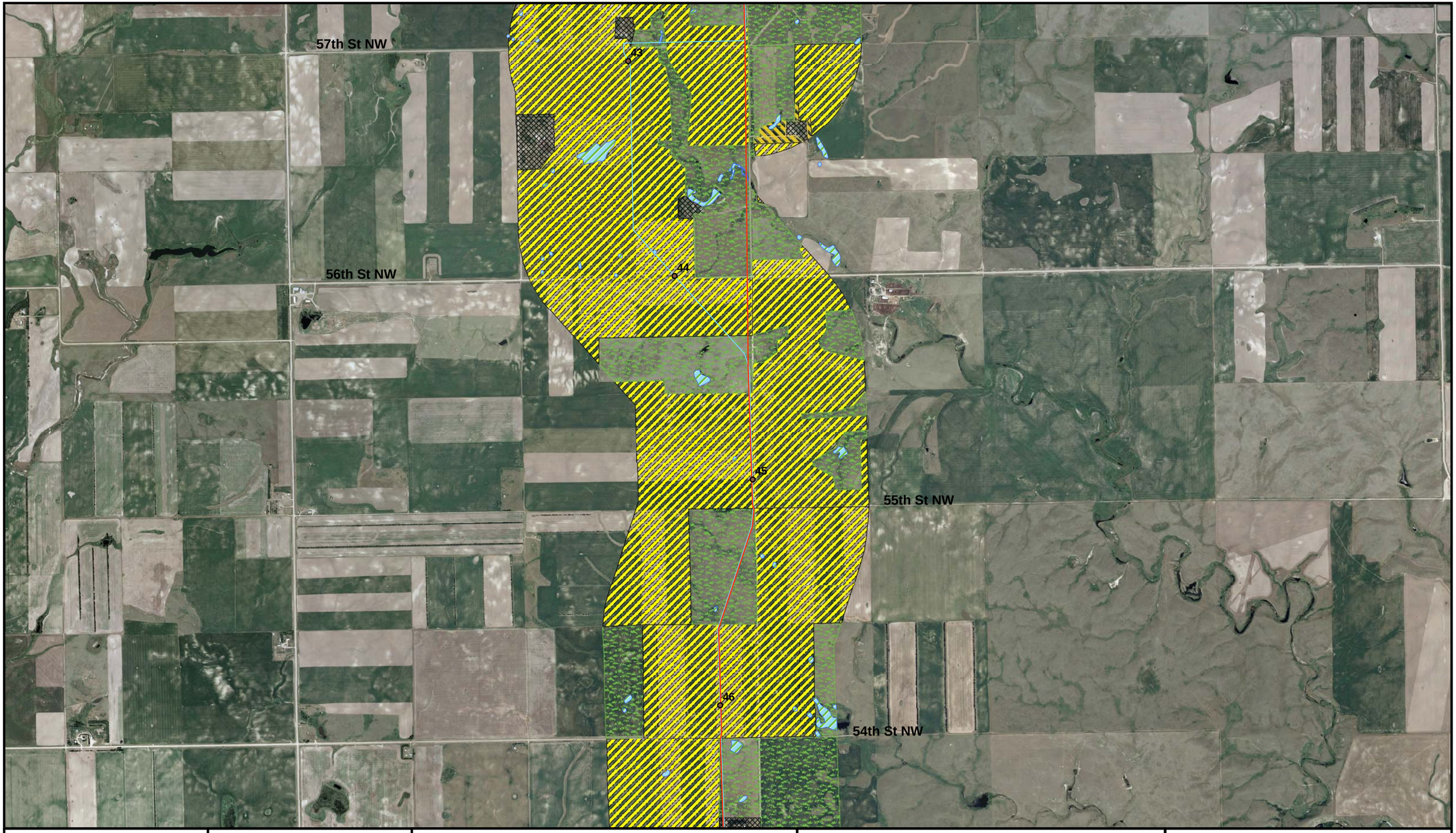

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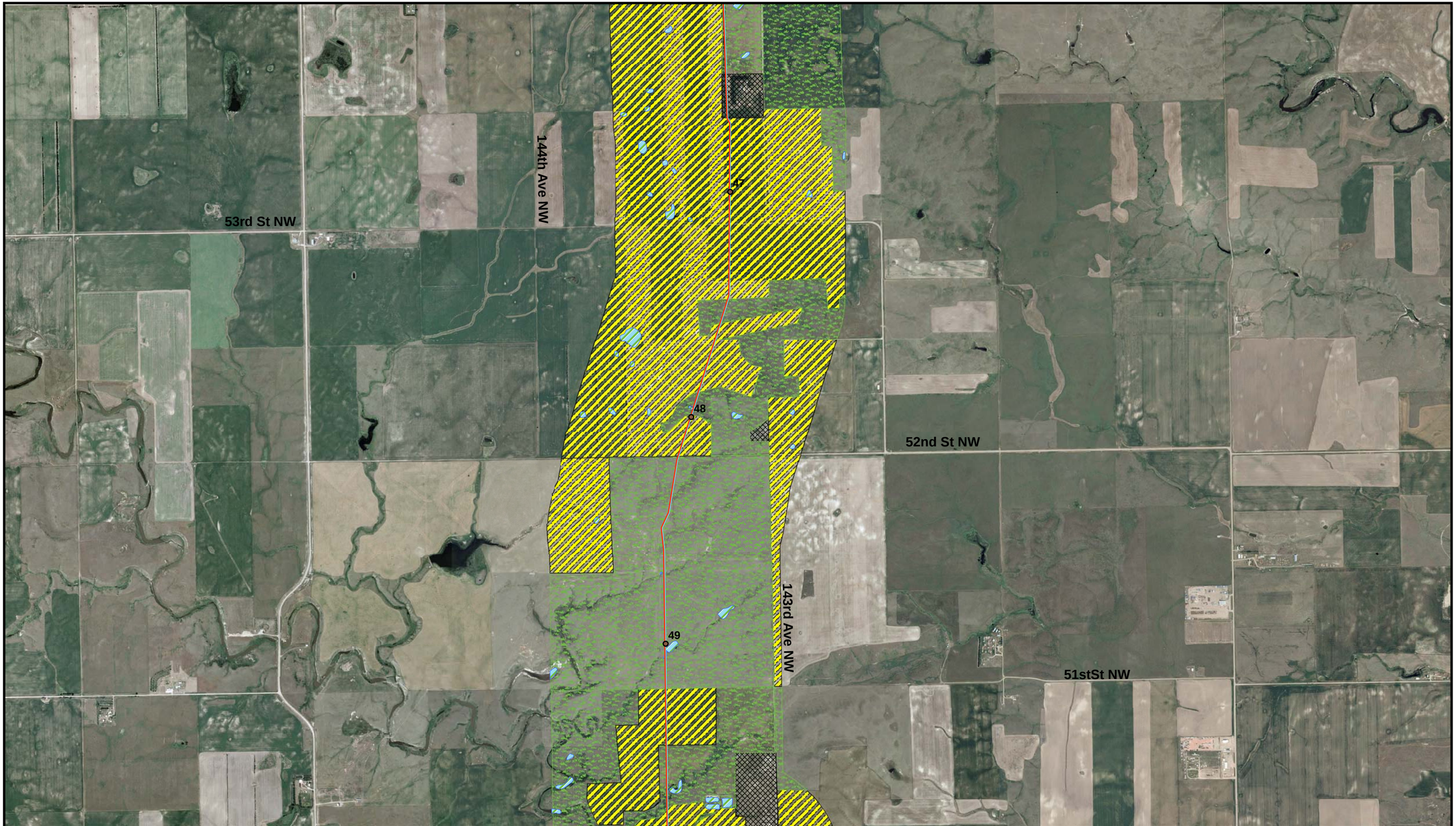

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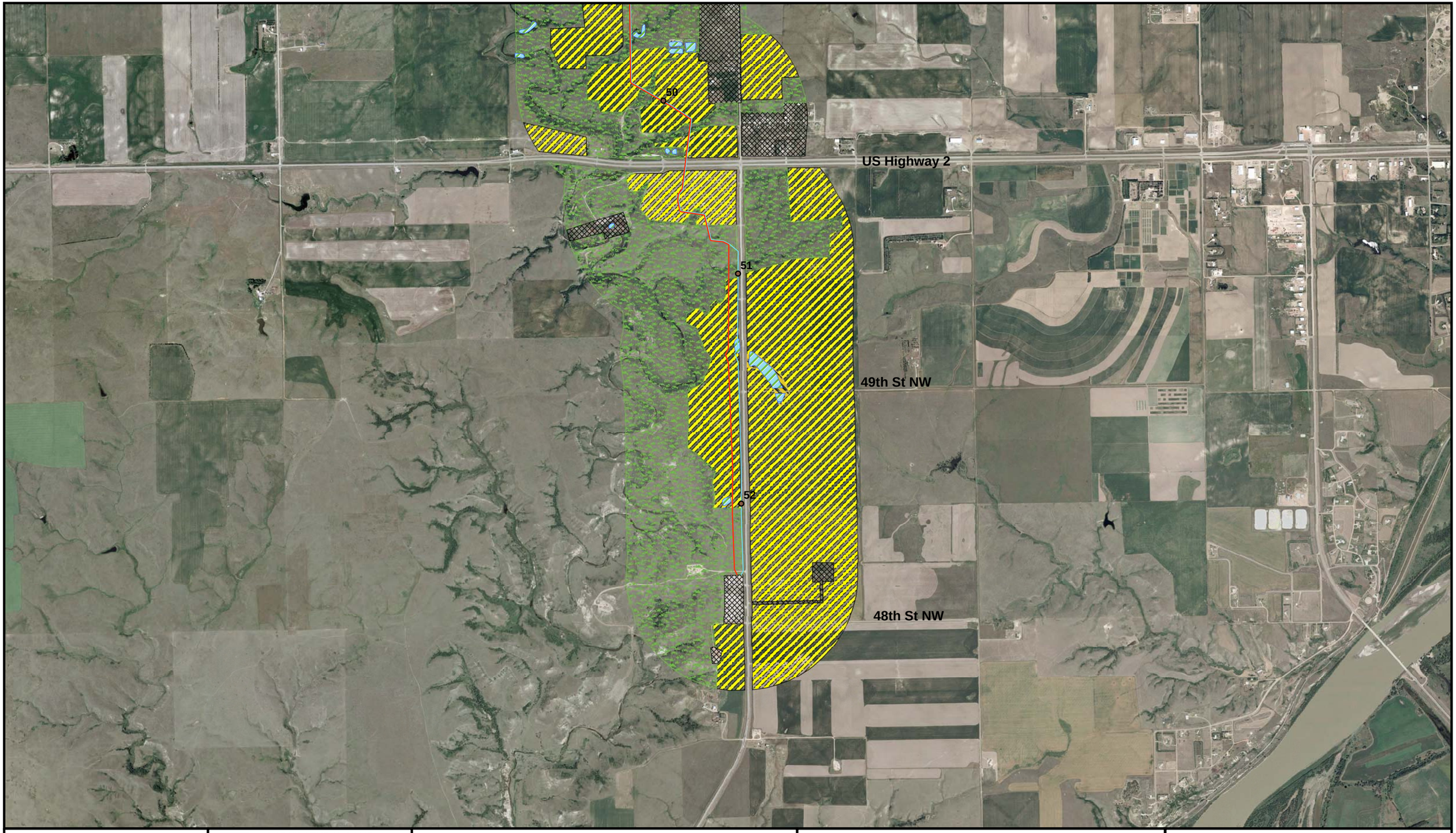

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NORTH DAKOTA PIPELINE EXPANSION PROJECT
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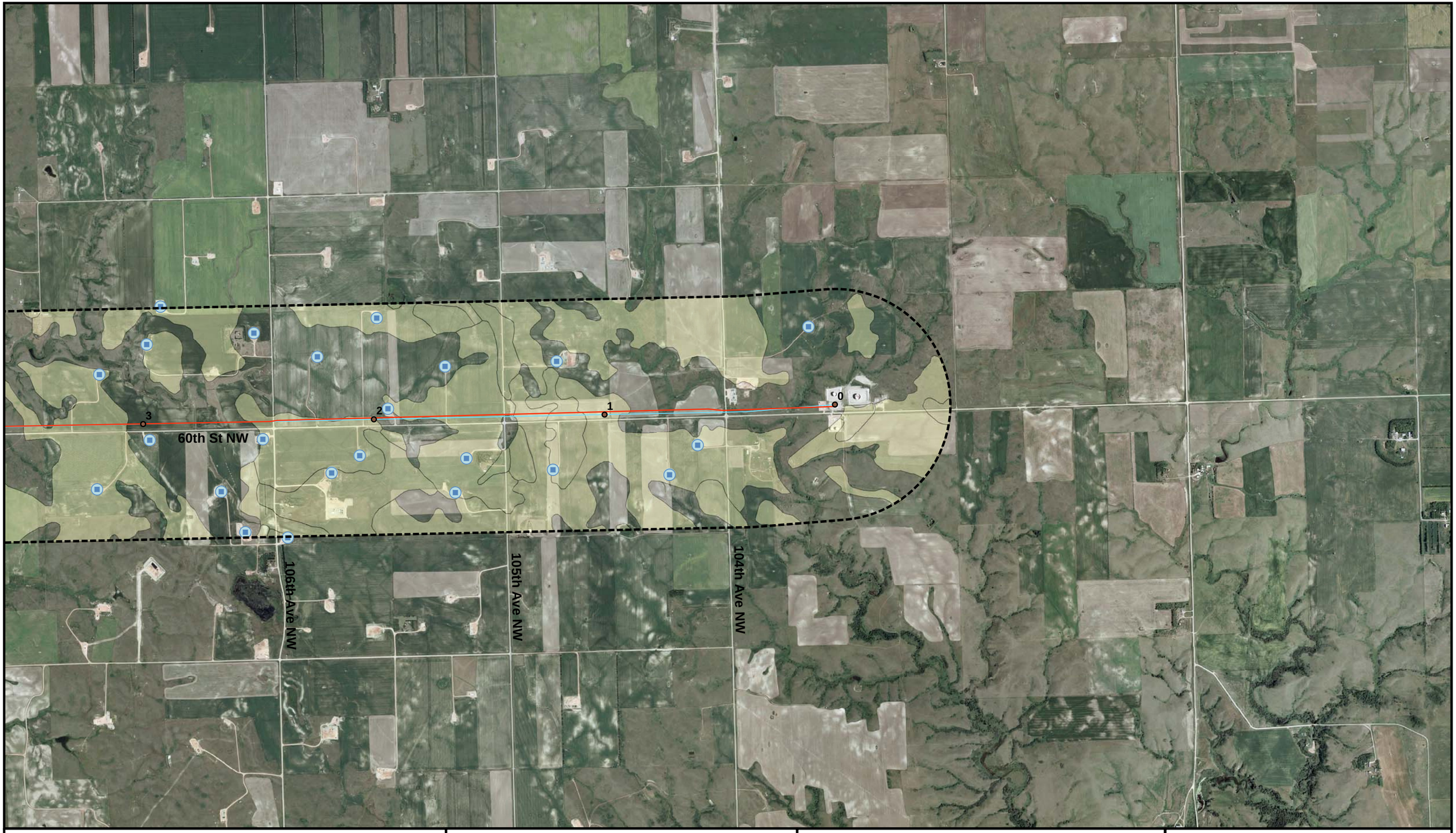
APPENDIX J



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NORTH DAKOTA PIPELINE EXPANSION PROJECT
Selection Criteria Maps (Other) - Sheet 1 of 11

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PROPOSED PIPELINE

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NORTH DAKOTA PIPELINE EXPANSION PROJECT

Selection Criteria Maps (Other) - Sheet 2 of 11

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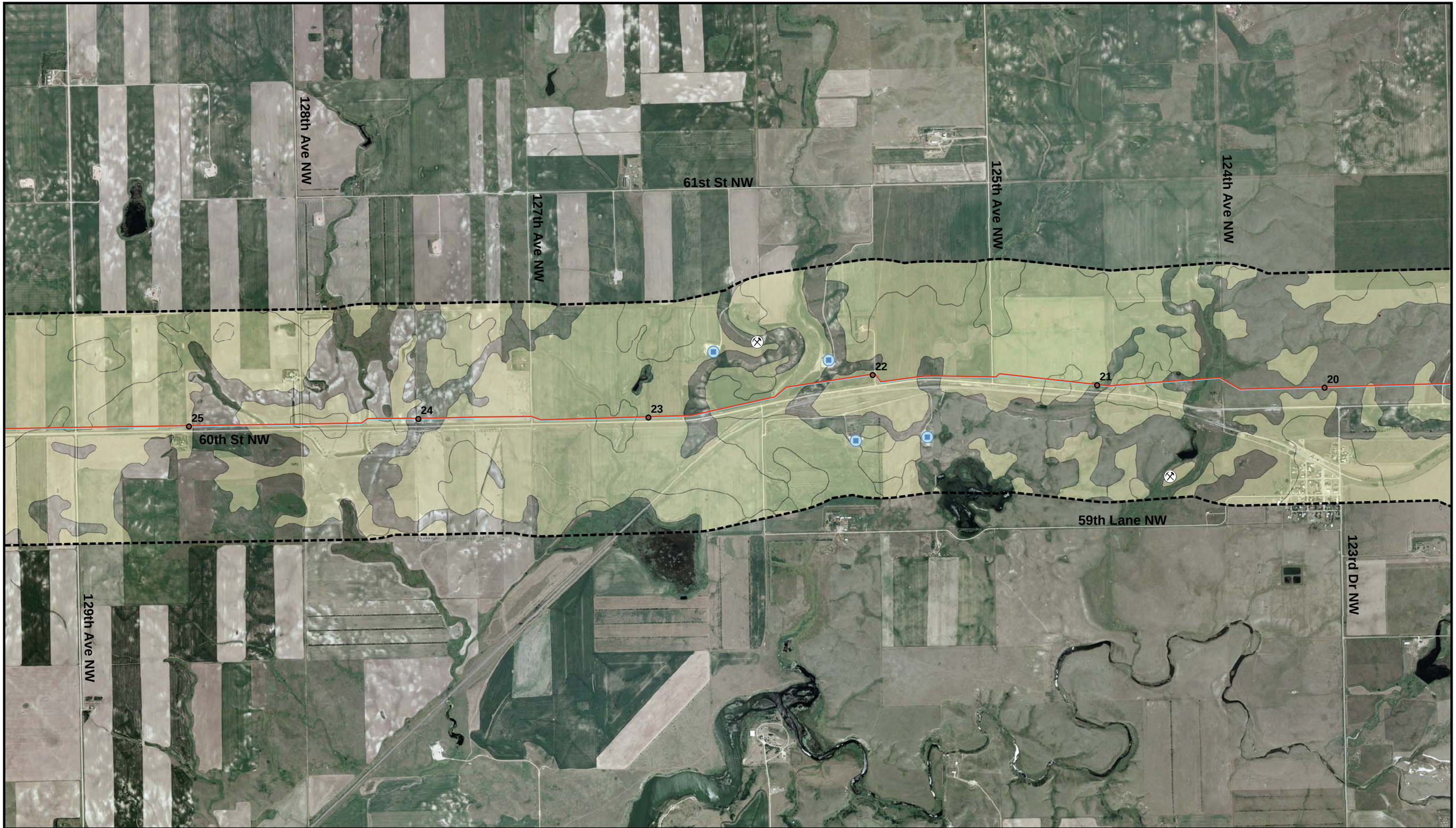

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NORTH DAKOTA PIPELINE EXPANSION PROJECT
Selection Criteria Maps (Other) - Sheet 5 of 11

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LITTLE MUDDY AQUIFER

135th Ave NW

129th Ave NW

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PROPOSED PIPELINE
EXISTING PIPELINE
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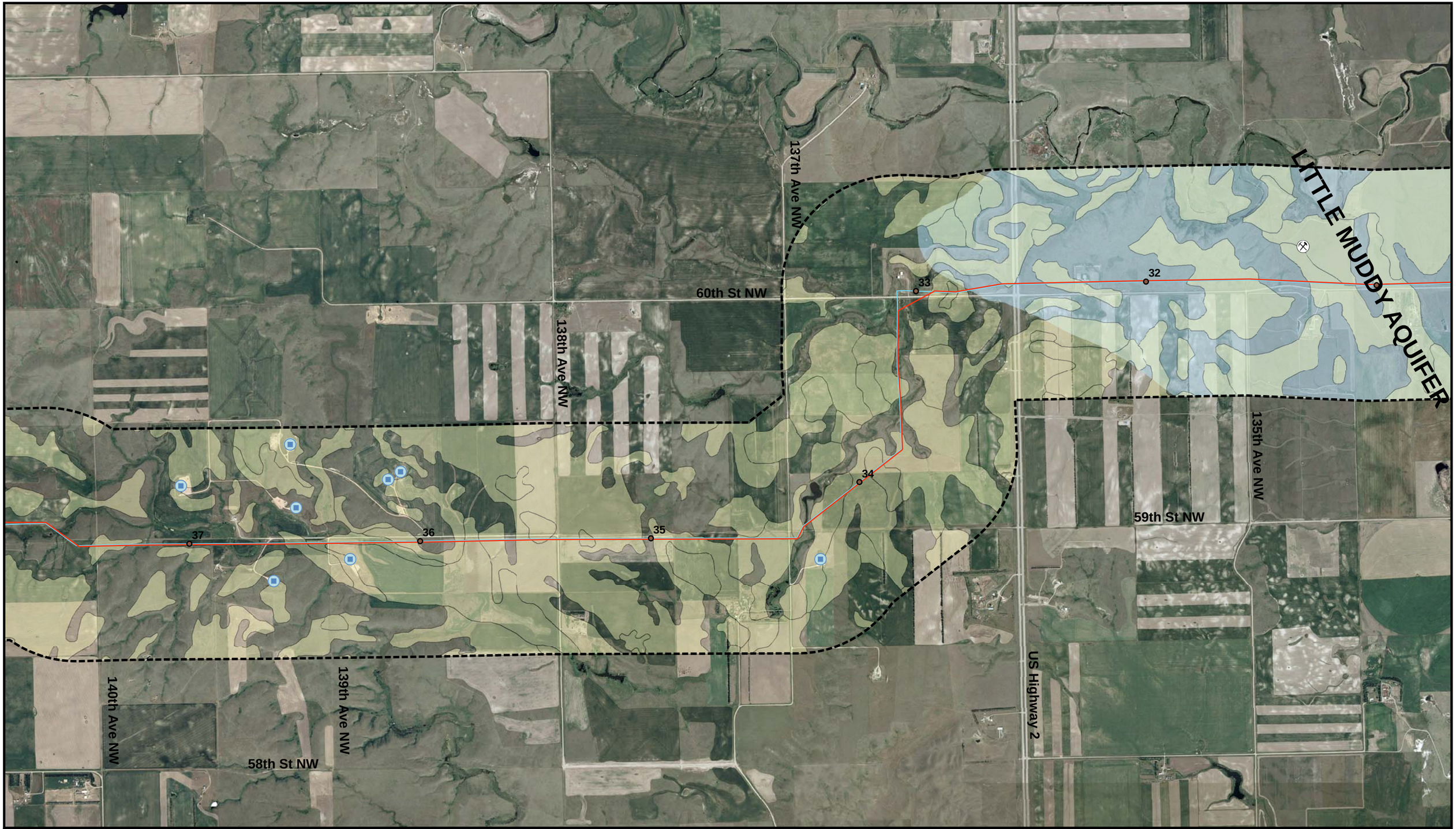

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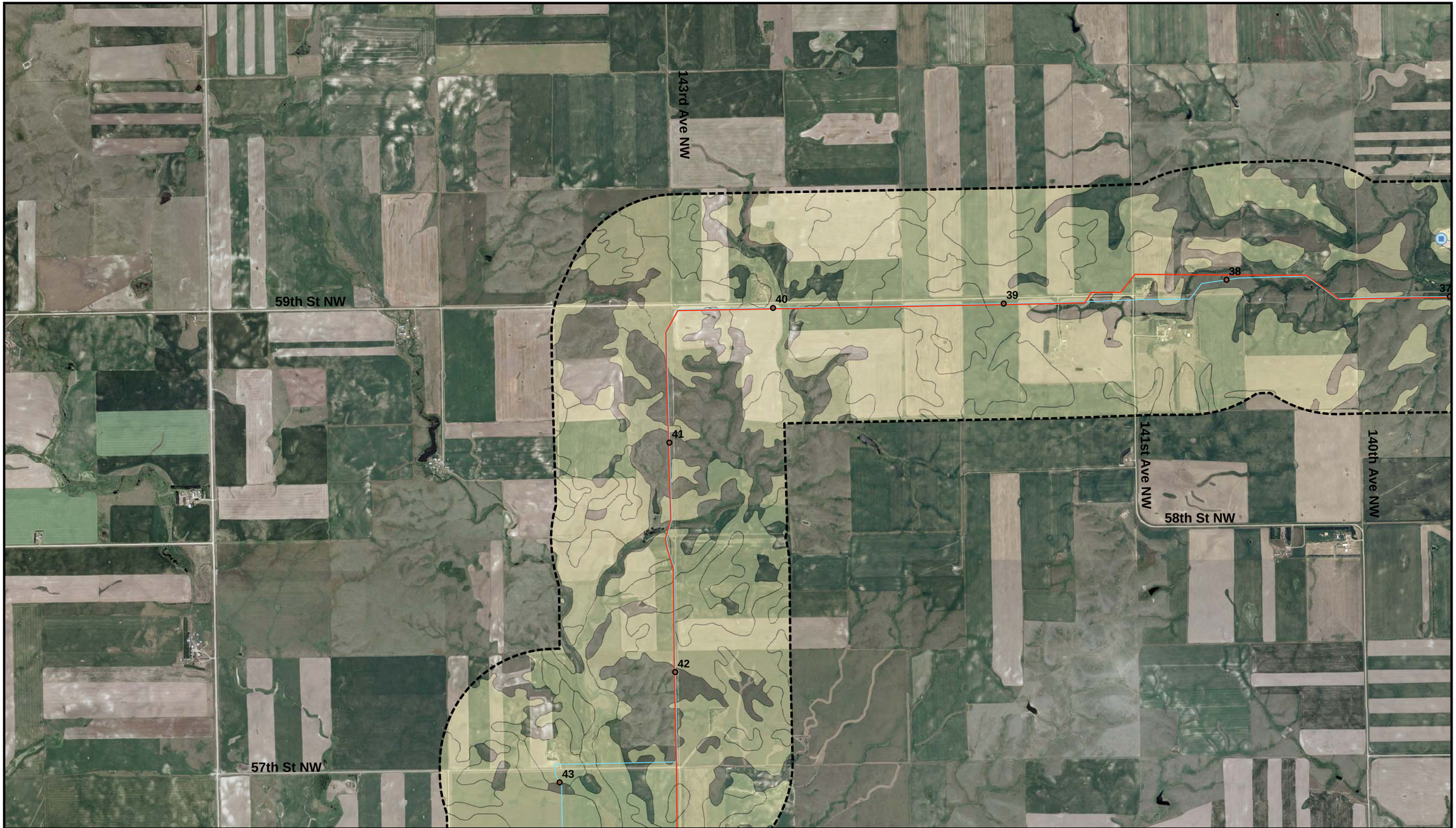

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Selection Criteria Maps (Other) - Sheet 9 of 11

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PROPOSED PIPELINE
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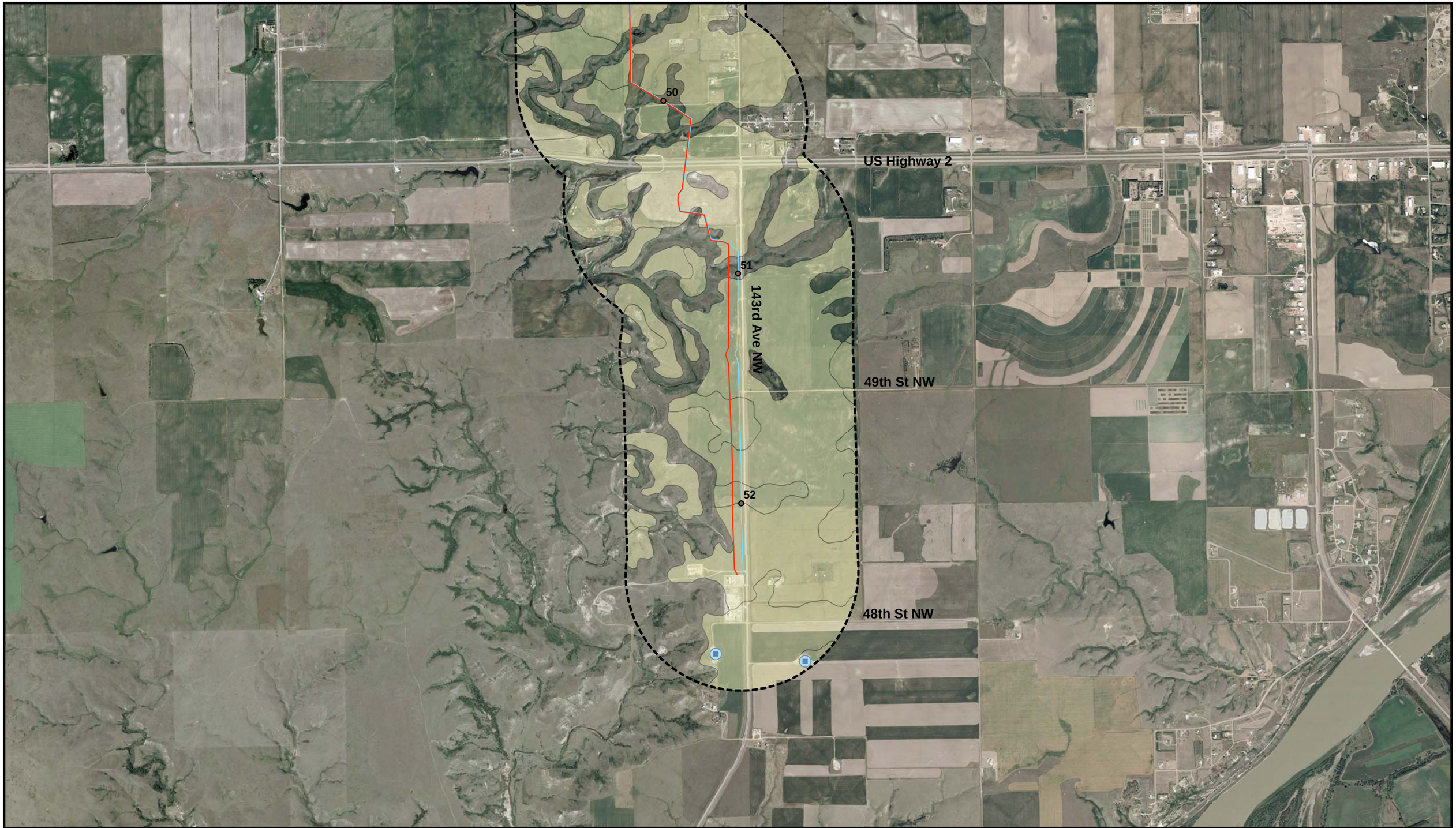

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APPENDIX K

ENBRIDGE

Environmental Guidelines
for
Construction

December 2003

ENBRIDGE

Environmental Guidelines
for
Construction

December 2003

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INTRODUCTION

Scope

This manual provides environmental guidelines and mitigation measures when planning and constructing new pipelines and facilities. It was developed based on the company's experience implementing best management practices during construction. In addition to the guidelines in this manual, site-specific project circumstances must be considered.

Who Should Use this Manual

This manual is primarily intended for Engineering and Operations employees and their contractors during planning and construction of new pipelines and facilities in Canada and the United States.

Locating Information

To locate information quickly, refer to the table of contents, which provides a cover-to-cover overview of the manual contents.

Manual Custodian

Safety & Environment, Enbridge Pipelines Inc., is the custodian of *Environmental Guidelines for Construction*.

Relationship to Other Manuals

This manual is maintained independent from the series of O&MP manuals. For a copy of this manual, contact Enbridge Pipelines Inc., Safety & Environment, at [780] 420-8436.

Review and Revision

This manual is reviewed and revised as necessary by new or different operating conditions and regulatory requirements.

GLOSSARY

aquifer	A natural underground geological formation, structure or layer (rock, sand or gravel) containing water. Are sources of groundwater for wells and springs.
aquifer recharge area	An area that allows water to enter an acquitter.
bentonite	A colloidal clay, expansible when moist, commonly used to provide a tight seal around a well casing.
clearing	The removal of all trees, brush, underbrush, vegetative growth, logs, deadwood, debris, rubbish and other objectionable matter.
construction ROW	A temporary right-of-way (ROW) acquired to accommodate construction, usually adjacent to and including a part of the permanent ROW.
control point	A location downstream of a spill site on a stream or river where containment and recovery operations can occur.
emergency	An unforeseen combination of circumstances or a disruption of normal operating conditions that poses a potential threat to human life, health, property and/or the environment if not contained, controlled or eliminated immediately.
environmental sensitivity maps	Maps that identify sensitive wildlife areas, waterfowl nesting areas, important fishing areas, irrigated lands, parks and water users along the pipeline system.
erosion	The wearing away of land surface by wind or water.
extra work space	Rectangular area adjacent to the right-of-way that, through an agreement with the landowner, is available for use during the construction period.
grubbing	The mechanical removal and disposal of surface organic debris, including stumps, roots and partially embedded rocks or boulders.
hazardous material	A material that, because of its quantity, concentration and physical or chemical characteristics, either individually or in combination with other substances is, or poses a threat to, the environment, humans or other living organisms.
heavy silt-laden	In general terms, when settling of sediment can be seen after a few minutes in a glass jar.
incident	An event affecting company operations that may be defined as an emergency or crisis.

mulch	A layer of material (e.g., wood chips, straw, leaves) placed around plants to hold moisture, prevent weed growth, and enrich or sterilize the soil.
riparian habitat	Areas adjacent to a water supply such as a rivers, lakes or ponds with a different density, diversity, and productivity of plant and animal species relative to nearby uplands
sedimentation	The settling out of soil particles which are transported by water. Sedimentation occurs when water carrying soil particles slows for a sufficient amount of time to allow the particles to settle out.
soil erosion	The removal and loss of soil by the action of wind and water.
stumping	The mechanical removal and disposal of subsurface organic debris, including stumps, roots, rocks or boulders
topography	The size and slope of a site.
watercourse	The bed and shore of a river, stream, lake, creek, lagoon, swamp, marsh or other natural body of water, or a canal, ditch, or other man-made surface feature, whether it contains or conveys water continuously or intermittently.
well point	A hollow vertical tube, rod or pipe terminating in a perforated pointed shoe and fitted with a fine- mesh screen.
wetlands	An area that is saturated by surface or ground water with vegetation adapted for life under those soil conditions, as swamps, bogs, fens, marshes, and estuaries.

Abbreviations

COSH	Canadian Occupational Safety and Health
CSA	Canadian Standards Association
DOL	Department of Labor
EPA	Environmental Protection Agency
MSDS	Material Safety Data Sheet
NEB	National Energy Board
NERC	National Emergency Response Center
NGL	natural gas liquids
OPA	Oil Pollution Act
OSHA	Occupational Safety and Health Administration
PLM	pipeline maintenance
WHMIS	Workplace Hazardous Materials Information System

OVERVIEW of PRECONSTRUCTION 01–1

Purpose

Protecting the environment, compliance with regulatory requirements and maintaining good landowner relations is of primary importance to the company. Careful and effective planning ensures compliance with environmental regulations, public and landowner concerns are addressed and potential long-range impacts are identified.

Responsibilities

The project manager is responsible for ensuring workers clearly understand and follow the company policies and procedures in this manual throughout all phases of construction.

Legislation

CAN

Canada

National Energy Board (NEB):

- Onshore Pipeline Regulations, latest edition

Land Use Regulations

USA

United States

Department of Transportation (DOT), Pipeline Safety Regulations:

- Part 195, Transportation of Hazardous Liquids by Pipeline

Area contingency plan/regional contingency plan
Clean Air Act
Clean Water Act
Comprehensive Environmental Response Cleanup and Liability Act (CERCLA)
Emergency Planning and Community Right to Know Act (EPCRA)
Federal, state and local environmental agency regulations
National Environmental Policy Act (NEPA)
Oil Pollution Act (OPA)
Safe Drinking Water Act

PLANNING and PREPARATION 01–2

Purpose

Project planning is an essential part of pipeline construction. Work activities are assessed to determine associated environmental issues and restrictions (e.g., wastes, water management). In addition, construction within environmentally sensitive areas must be planned on a site specific basis and special mitigative measures taken to minimize potential impacts.

Requirements

Permits/Licenses/Approvals

Apply for necessary licenses, permits and approvals well in advance of construction activities. Consult with the environment department to determine lead times for permits.

Typical situations that require environmental permits and/or regulatory approvals include:

- crossing environmentally sensitive areas, (e.g., watercourses, wetlands, cultural resources, endangered species, parks, nesting/denning areas)
- disturbing soil or vegetation
- hazardous waste generation, storage and disposal
- intrusive work in or adjacent to environmentally sensitive areas
- water appropriation (withdrawals) for hydrotests/dewatering
- discharging stormwater, hydrotest water or other waste water
- air emissions

NOTE: If permit requirements are more stringent than the requirements in this manual, the more restrictive requirements apply.

ENB (NW) Before entering any land with regional land claims, obtain any necessary quarry and access permits.

Notifications

Government Agencies

Notify government agencies of pipeline work as specified in the conditions of approval, or as required by legislation, e.g., fish and wildlife authorities, downstream water users.

NOTE: Contact the environment department for a complete list of government agencies.

Notify public agencies before using public access routes, especially ditches and vegetated access-ways or dirt bed roadways that are subject to rutting. Take photos before construction begins to document the as-found condition of all access routes.

Landowners

A company representative must contact landowners in advance to advise them of the scope of work and to discuss any special concerns. Determine lead time for notifications based on the nature and scope of the job and previous experience. Larger projects require longer lead time as landowner concerns and special approvals may need to be addressed.

Trappers

Before entering their trapping areas, notify registered trappers of the right-of-way (ROW) location and planned activities.

Forestry and Logging

Before clearing timber or beginning salvage operations, notify forestry or logging companies holding agreements, licenses or quotas.

Before construction, coordinate with local operators to haul merchantable timber.

Fish and Wildlife

Notify fish and wildlife authorities:

- if construction activities will damage beaver ponds, dams and lodges, muskrat pushups, raptor nests, mineral licks, etc.
- before implementing habitat enhancement techniques

Water Users

Notify downstream water users within the potential impact zone before instream activity at watercourse crossings, or before water withdrawal or discharge of hydrostatic test water.

Crossings

Notify road, rail, utility and other pipeline owners to obtain crossing and road use agreements.

Pre-Job Meeting

Before beginning construction, the project manager, or designate, must hold a pre-job meeting with engineering, safety and environment employees; inspectors; contractors; and government personnel to review:

- environmental concerns, mitigation measures, methods and regulations specific to the work
- the company's Environmental Policy
- contingency plans
- specific conditions on associated permits and regulatory approvals (e.g., public lands such as nation forest lands, wildlife areas, etc., and Indian lands)

Records

Line List

Before construction begins, contractors must be provided with a Construction Line List that describes special requirements requested by landowners, e.g., timber salvage, topsoil segregation, restoration measures, fencing requirements.

Permits

Permits typically require the company to submit compliance reports at specified intervals during the project and upon project completion, to submit permit termination notices. These records should be retained with other appropriate project documentation in Engineering files.

PROJECT SCHEDULING 01–3

Purpose

The project schedule identifies the start and finish of construction, including the timing of individual activities. Poor scheduling can impact soil, fish and wildlife resources, and land uses such as agriculture, forestry and outdoor recreation.

Guidelines

Spring Breakup

Avoid construction during spring breakups to minimize surface disturbance and impacts on aquatic habitats and agricultural land. The cost of moving equipment also may be prohibitive, since most jurisdictions severely restrict loads allowed on roadways.

Schedule Changes

When projects are large or have serious impacts on stakeholders, notify environmental inspectors, landowners and government agencies if field conditions or work progress requires a change in the project schedule.

Wet Areas

For wet areas, consider scheduling work activities during frozen conditions (see Table 1).

Table 1
Frost Depths for Wet Areas

Terrain	Minimum Frost Depth	
	cm	in.
loam soils	15	6
saturated silts or clays	30	12
muskeg	45	18
swamp, sloughs and shallow water	90	35

Weather

Where possible, schedule work during periods of low precipitation and runoff.

Fish and Wildlife Resources

Cross wildlife habitats during periods of low sensitivity, or as defined by government agencies.

Investigate the potential for the presence of endangered species

Contact the environment department to establish timing constraints for construction activities. Schedule activities before or after periods of concern, within reason. For example, when planning clearing operations consider timing restraints, e.g., migratory bird nesting from May 15–Aug 15.

Agricultural Activities

Coordinate work to minimize interference with agricultural operations and other activities such as spraying and fertilizing. Avoid construction during the irrigation season.

Burning

Burn tree and shrub debris during low fire hazard season. This applies in forested areas, native prairies or other areas prone to wild fire, or as directed by government agencies.

Recreational Areas

In recreational areas, schedule work during periods of low use if practical.

Near parks or campsites, schedule noisy activities between 0700–2000 hours, or as dictated by municipal bylaws.

Urban Areas

In urban areas, coordinate activities that might affect the public with:

- landowners
- community associations
- municipal governments

Schedule noisy activities between 0700–2000 hours, or as dictated by municipal bylaws.

SELECTING FACILITY SITES 01–4

Purpose

Selecting the site for a new facility is primarily determined by existing company facilities. Where practical, new facilities are located within existing facility sites; however, where no company facilities exist, a new site must be selected. Poor site selection may result in regulatory constraints, construction difficulties, geotechnical concerns and landowner disturbance. Use these guidelines to evaluate new sites for facilities and sites on existing undisturbed company property.

Guidelines

Alternative Sites

When evaluating alternative facility site locations, consider the following factors:

- Ensure sites are adjacent to the proposed or existing company right-of-way (ROW), in a high and dry location.
- Minimize the requirements for access road and infrastructure (e.g., power) development.
- Minimize disrupting agricultural practices. Avoid locating sites near sensitive agriculture operations (e.g., in the middle of agricultural lands or near feedlots, dairy operations and chicken/turkey farms).
- Minimize disrupting wildlife habitat and avoid locations with site-specific critical wildlife habitat.
- Avoid sites where groundwater can become contaminated.
- Avoid wetlands and other areas where drainage could be a problem.

NOTE: In the USA, government agencies will authorize filling wetlands only in extreme cases.

- Avoid sites on native prairie where practical.
- Avoid sites near surface drainage channels (e.g., watercourses, ravines).
- Avoid sites that would require significant grading.
- Ensure subsurface soil conditions will provide adequate support for facility foundations.
- Minimize tree clearing.
- Ensure noise levels from the facility are below the maximum acceptable limits at the nearest residence.

- Maximize the distance of the facility from existing and proposed residences.
- Minimize the number of residences with unobstructed and partially obstructed lines of sight to the facility.
- Avoid locations where air emissions could become an issue.

Procedure

1. Identify optimum and alternative facility site locations based on acceptable engineering and operational criteria (e.g., hydraulics, power considerations).
2. Gather and review environmental information for the potential facility sites from, for example:

- existing public data (e.g., wetland inventory maps, topographic maps)
- company records
- previous environmental assessments
- monitoring programs
- commissioned studies

3. Contact government agencies, local authorities, company representatives and landowners to identify concerns in the area of the potential facility sites.
4. Identify environmental concerns near the potential facility sites (see Table 1, Environmental Concerns, in 01-5, Selecting Routes).
5. Evaluate potential facility site locations.

SELECTING ROUTES 01–5

Purpose

Minimizing the adverse environmental effects of pipeline construction requires careful route selection. Poor route selection may result in regulatory constraints, construction difficulties, geotechnical concerns and potential land use conflicts. The preferred routing for a new pipeline is to utilize an existing right-of-way (ROW). However, where projects are not near an existing pipeline or where environmental sensitivities or land use prevent parallel routing, a new route must be selected. Use these guidelines to help select preferred and alternative routes for a new ROW and for routes that parallel an existing ROW.

Guidelines

Environmentally Sensitive Areas

Plant Species

Assess any plant or community identified in supporting studies (e.g., rare plant species survey) and/or regulatory agency consultations as having special conservation status using the following criteria:

- position of the plant or community on the ROW
- relative rarity and local abundance of the plant or community
- growth habit, propagation strategy and habitat preferences of the plant or community

Wildlife

Identify species, preferred types of cover and boundaries of significant wildlife habitat(s).

Assess any wildlife species identified as having special conservation status or site-specific habitat using the following criteria:

- location of wildlife or habitat features on or near the ROW
- presence of topography features or vegetation to effectively separate the wildlife or habitat features from construction activities, e.g., assess nesting setbacks
- timing of construction versus the timing constraints for the species, e.g., nesting season
- potential to alter construction activities to minimize or avoid sensory disturbances

Fish Habitats

Assess any sensitive fish habitat identified in supporting studies using the following criteria:

- position of the fish habitat features with respect to a proposed crossing
- timing of construction versus the timing constraints for the fish species, e.g., spawning season
- potential to alter construction activities to minimize habitat disturbance

Cultural Resources

Assess archaeological, historical or paleontological resources identified in supporting studies using the following criteria:

- significance and depth of the resource site
- location of the resources with respect to the proposed route
- feasibility of alternate routes or sites that avoid the resource

Evaluating Routes

When identifying and evaluating routes within a corridor, consider the following factors:

- Minimize pipeline length in order to minimize potential disturbance and cost.
- Minimize the amount of steep terrain, sidehill and unstable terrain.
- Parallel existing pipelines, use existing rights-of-way or other linear developments, e.g., roads, cutlines, abandoned railroad.
- Avoid country residential subdivisions, industrial subdivisions and urban areas where practical.
- Minimize the number of watercourse crossings.
- Minimize crossings of native prairie.
- Minimize crossing high-quality woodlots.
- Cross watercourses as close as possible to right angles and where approach slopes are stable.
- Avoid, where possible, environmentally sensitive areas such as critical wildlife areas, natural areas, parks, archaeological or historical sites.

- Avoid, where practical, special land use areas, e.g., golf courses, research farms.
- Minimize crossings of muskegs, wetlands, lakes and sloughs.
- Avoid, where practical, farm buildings, farmsteads, well sites, aquifer recharge areas and shelterbelts.
- As much as possible, cross windbreaks and shelterbelts at right angles to minimize the width of the ROW to that necessary for the trench line and vehicle traffic.
- Cross roads and rail lines at or near right angles.
- Contact all affected government agencies, landowners and other concerned parties. Where appropriate, hold an open house(s) to inform these groups of the proposed project, route alternatives and associated environmental mitigation.
- When practical, modify the route to accommodate input from landowners, the public and regulatory agencies.

Procedure

1. Identify the approximate corridor within which a number of possible routing alternatives for the proposed project may fall.
2. Gather and review environmental information for the proposed corridor from, for example:

- existing public data
- company records
- report and monitoring programs
- commissioned studies

3. Contact government agencies, local authorities, company representatives and landowners to identify general concerns within the corridor.
4. Identify environmental concerns within the corridor (see Table 1).
5. Identify and evaluate alternative routes within the corridor.
6. Select a preferred route from the alternatives.
7. Perform environmental assessment of preferred route.
8. Prepare formal applications and permits to jurisdictional/regulatory agencies for approval.

Table 1
Environmental Concerns

Environmental Components	Considerations
geology	• depth of bedrock • stability of bedrock • stability of surficial deposits
topography	• landform (e.g., dunes, wetlands, hills and hummocks). • slope stability • topographic features (e.g., slopes, ravines, slides, slumps, fault zones)
soils	• classification • texture • previous chemical contamination and physical damage • agricultural capability • erodibility • suitability for reclamation • profile characteristics
hydrology	• water table • surface and subsurface drainage • groundwater resources
vegetation	• dominant species • rare and endangered species • weeds • specialty crops • native prairie or other native vegetation • relative crop productivity • extent of vegetation cover • timber merchantability
wildlife	• dominant species • species with special conservation status • critical habitats • sensitive periods
watercourses	• named, unnamed and intermittent drainage courses • irrigation and drainage canals • bank and substrate composition • bank height and stability • riparian habitat • previous stream bed disturbance and construction • fish spawning, incubation, migration periods • navigable use • presence of contaminated substrate • location of municipal water intakes • licensed water uses • commercial or native fishing areas

Table 1—*continued*
Environmental Concerns

Environmental Components	Considerations
land uses/socio-economic	• urban area • rural areas • country residential • industrial development • existing ROW • compensation and land value • drainage tile • irrigated areas, equipment needs • ecological, wildlife or preservation parks, designated natural areas and reserves • landfills, quarries or mines • specialized farming operations • designated campgrounds and recreation sites • First Nations • aesthetics • historical, archaeological, paleontological or other unique site designations

DETERMINING WORK SPACE 01–6

Purpose

Right-of-way (ROW) width is a factor in the size of the pipeline installed and the appropriate equipment and construction methods used. An undersized ROW width can result in topsoil mixing with subsoils, slow work activities, and lead to damage off the ROW. Excessive ROW width results in unnecessary surface disturbance and greater restoration requirements.

Responsibilities

The project manager is responsible for defining appropriate widths for the construction right-of-way and extra work space, to ensure there is sufficient space for project activities and to confine disturbance to defined areas.

Requirements

All work must be carried out within the company's ROW and acquired extra work space. Any work beyond these limits requires landowner approval, work space agreements and/or special easements or permits.

Guidelines

Construction ROW Width

ROW width for construction activities involving large-diameter pipe (≥20 NPS) generally ranges from 26 m (85 ft) to 38 m (125 ft), depending on pipe size and construction environment (see Figure 1,Typical Construction of ROW).

Where a new pipeline will share an existing ROW with an operating pipeline, temporary ROW may be required to accommodate construction.

Environmentally Sensitive Areas

In environmentally sensitive areas, restrict ROW width to the minimum required and design the project activity to conform to this width.

Extra Work Space

Extra work space outside the boundary of the construction ROW may be necessary for:

- bends and line crossings
- steep slopes and staging areas
- watercourses, wetlands and road crossings

- safety reasons
- assembling sections of pipe
- storing spoil material, topsoil or equipment

Extra work space must be acquired from the landowner under an agreement negotiated by the company or designate.

NOTE: Use of unauthorized work space is prohibited without written approval from the company and landowner.

In all cases, the size of extra work space must be kept to the minimum necessary to safely conduct work.

Watercourses

Locate extra work spaces a minimum of 16 m (50 ft) away from the water's edge if practical, depending on topographic or other physical conditions such as stream channel meanders (see Figure 2, Typical Extra Workspace Waterbody or Wetland Crossing <50 ft Wide). Any deviations in size or location required by the contractor's crossing plan is subject to site-specific approval from the environment department or its field representative.

Vegetation between an extra work space and a watercourse must remain undisturbed.

Wetlands

USA

Locate extra work spaces a minimum of 16 m (50 ft) away from wetland boundaries if possible, depending on topographic conditions (see Figure 3, Typical Extra Workspace Waterbody or Wetland Crossing >50 ft Wide). If conditions do not allow for a 16 m (50-ft) setback, locate extra work spaces as far away from the wetland as practicable with approval from the environment department.

CAN

Establish wetland boundaries, buffer areas or setbacks in consultation with the environment department and regulatory agencies.

Road and Rail Crossings

Additional extra work spaces similar to watercourses and wetlands are often necessary adjacent to road and railway crossings (see Figures 4, Typical Extra Workspace Bored Road or Railroad Crossing and Figure 5, Typical Extra Workspace Open-Cut Road Crossing).

Procedure

1. Determine the area required for spoil piles and topsoil piles considering the following factors:

- ground cover
- topsoil depth and stripping width
- bulking factor
- trench shape
- trench wall stability
- trenching method
- trench depth and width (spoil)
- storage pile separation
- equipment track width

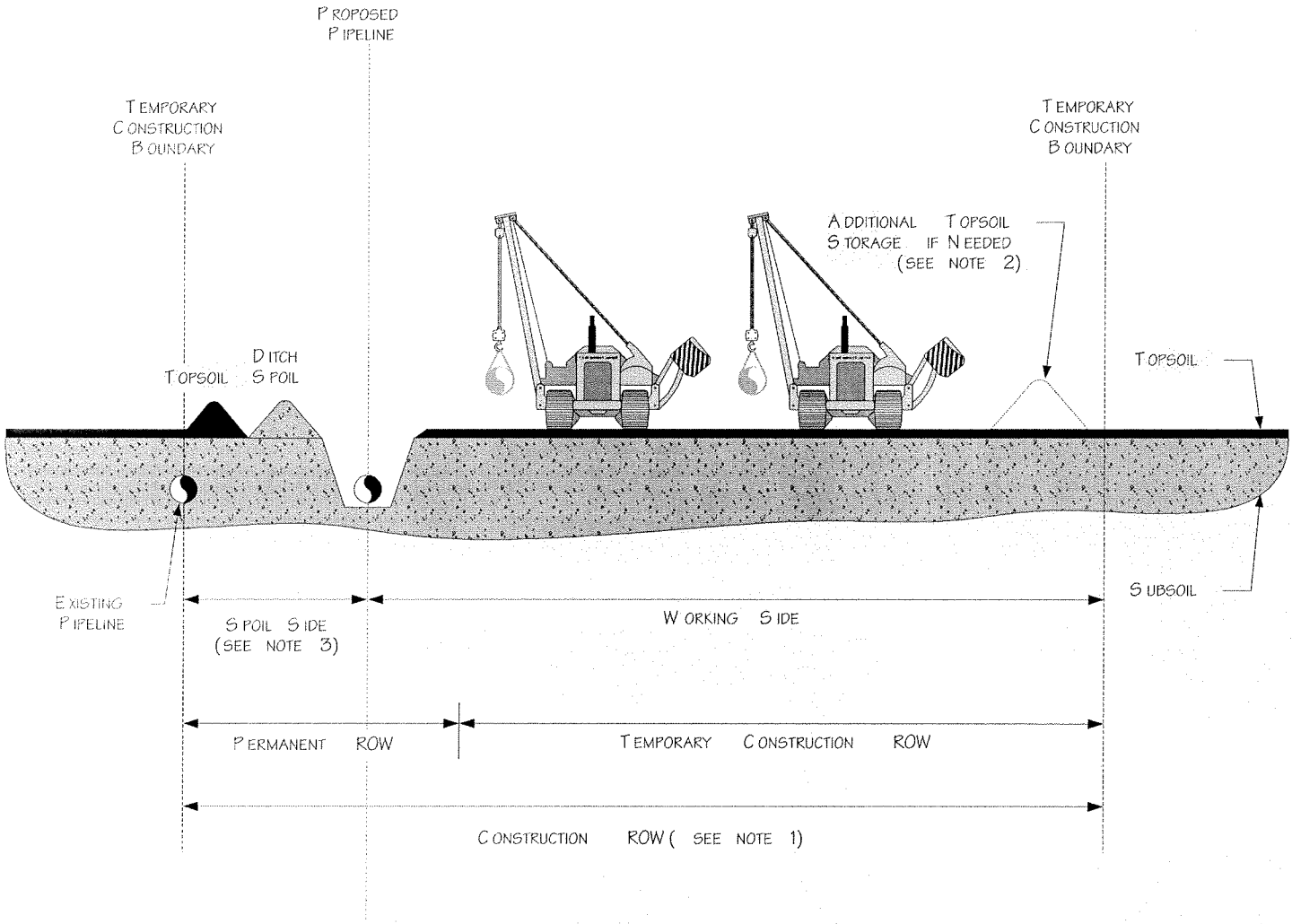
2. Determine space requirements for setup areas, working lane and passing lane (see Figure 6, Right of Way Widths).

3. Determine the standard construction ROW width and any locations requiring extra work space or where special work activities require extra storage space for the use of larger equipment.

NOTE: Table 1 shows the factors to consider when determining ROW width.

Table 1
Right-Of-Way Width Factors

ROW Factors	Less ROW	More ROW
number of pipelines • multiple		X
pipe diameter • small • large	X	 X
working space • crossings • expansion loops • passing land		 X X X
slash disposal • burning • rollback, mulch, chip	X	 X
topsoil stripping • depth 10 cm (4 in.) min 30 cm (12 in.) max • lift 2 lift 3 lift	 X X	 X X
grading • none • extensive	X	 X
trench material • clay • sand	X	 X
depth of cover • 1 m (3 ft) • 3 m (10 ft)	X	 X
water table • low • high	X	 X



PROFILE

NOTES :

1. THIS DRAWING REFLECTS "DITCH PLUS SPOIL SIDE" TOPSOIL STRIPPING PROCEDURE .
2. STOCKPILE TOPSOIL SEPARATELY FROM DITCH SPOIL AS SHOWN OR IN OTHER CONFIGURATIONS APPROVED BY THE COMPANY .
3. THE OFFSET FROM NORTHERNMOST OR SOUTHERNMOST EXISTING PIPELINE , WHERE APPLICABLE , WILL BE 20' FOR MOST LOCATIONS BUT MAY BE INCREASED OR DECREASED DEPENDING ON THE SITE SPECIFIC CONSTRUCTION REQUIREMENTS .

ENBRIDGE

Figure 1

Typical Construction Right-of-Way

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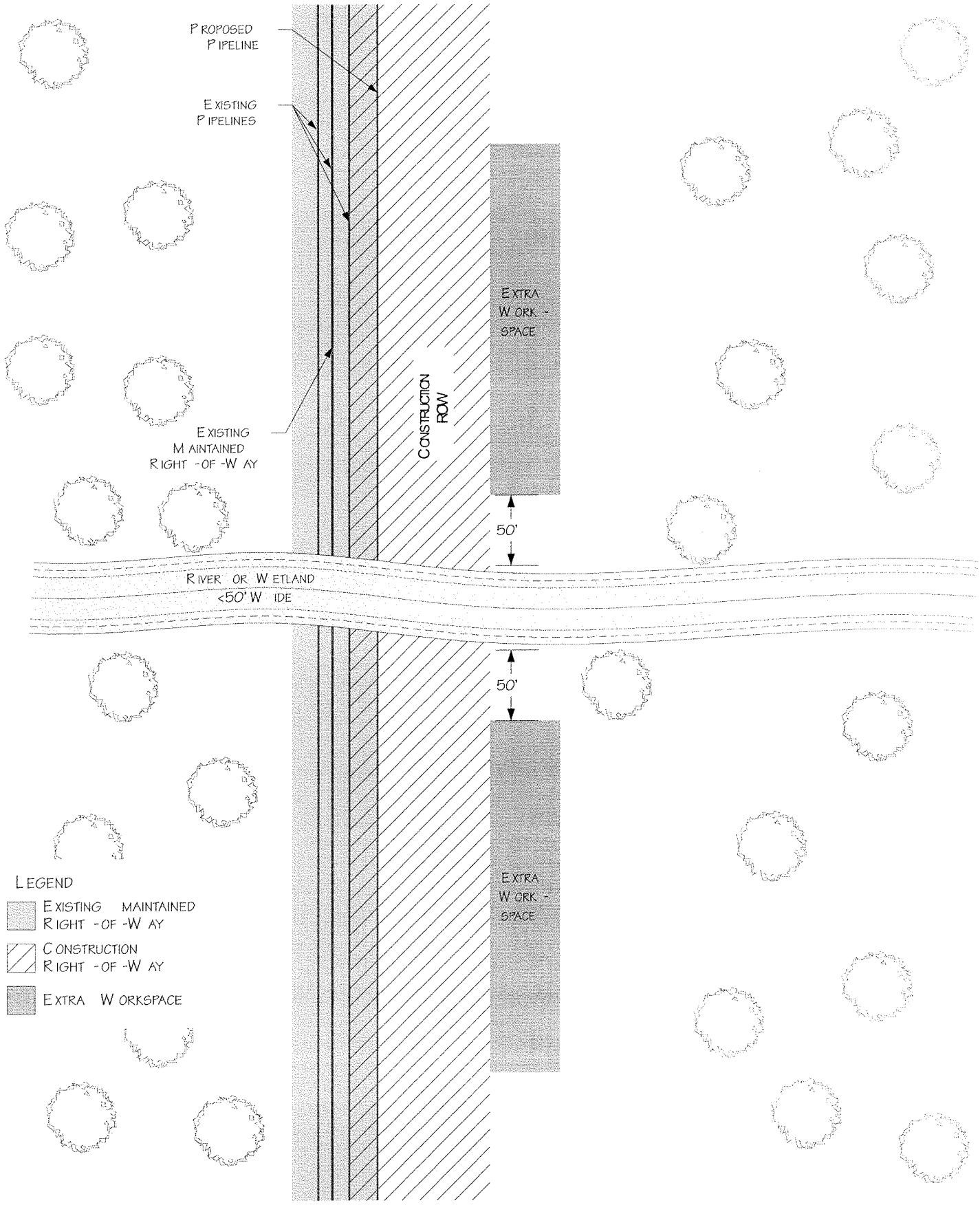

For environmental review purposes only.

ENBRIDGE

Figure 2

Typical Extra Workspace Waterbody or Wetland Crossing < 50 Feet Wide

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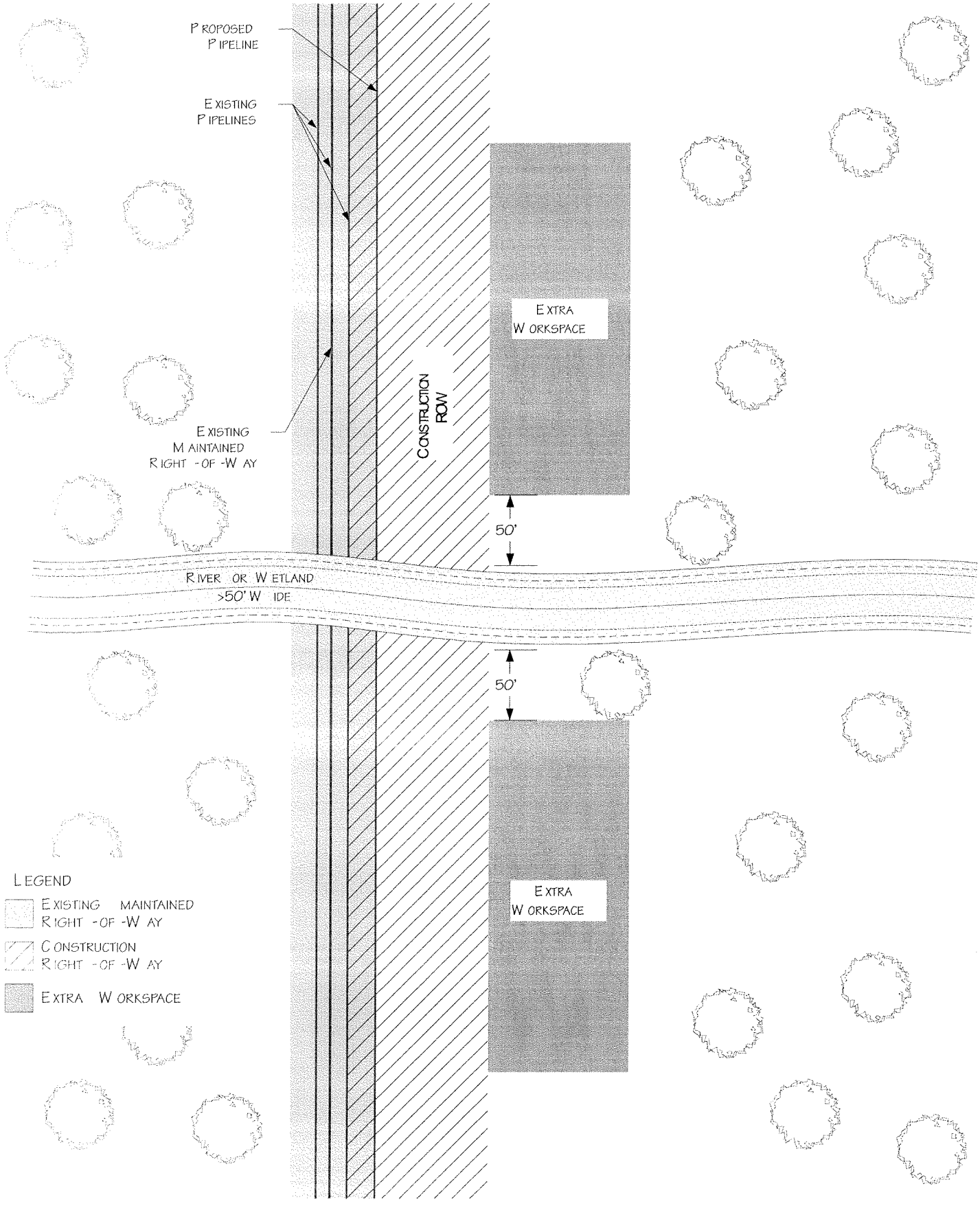

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ENBRIDGE

Figure 3

Typical Extra Workspace Waterbody or Wetland Crossing >50 Feet Wide

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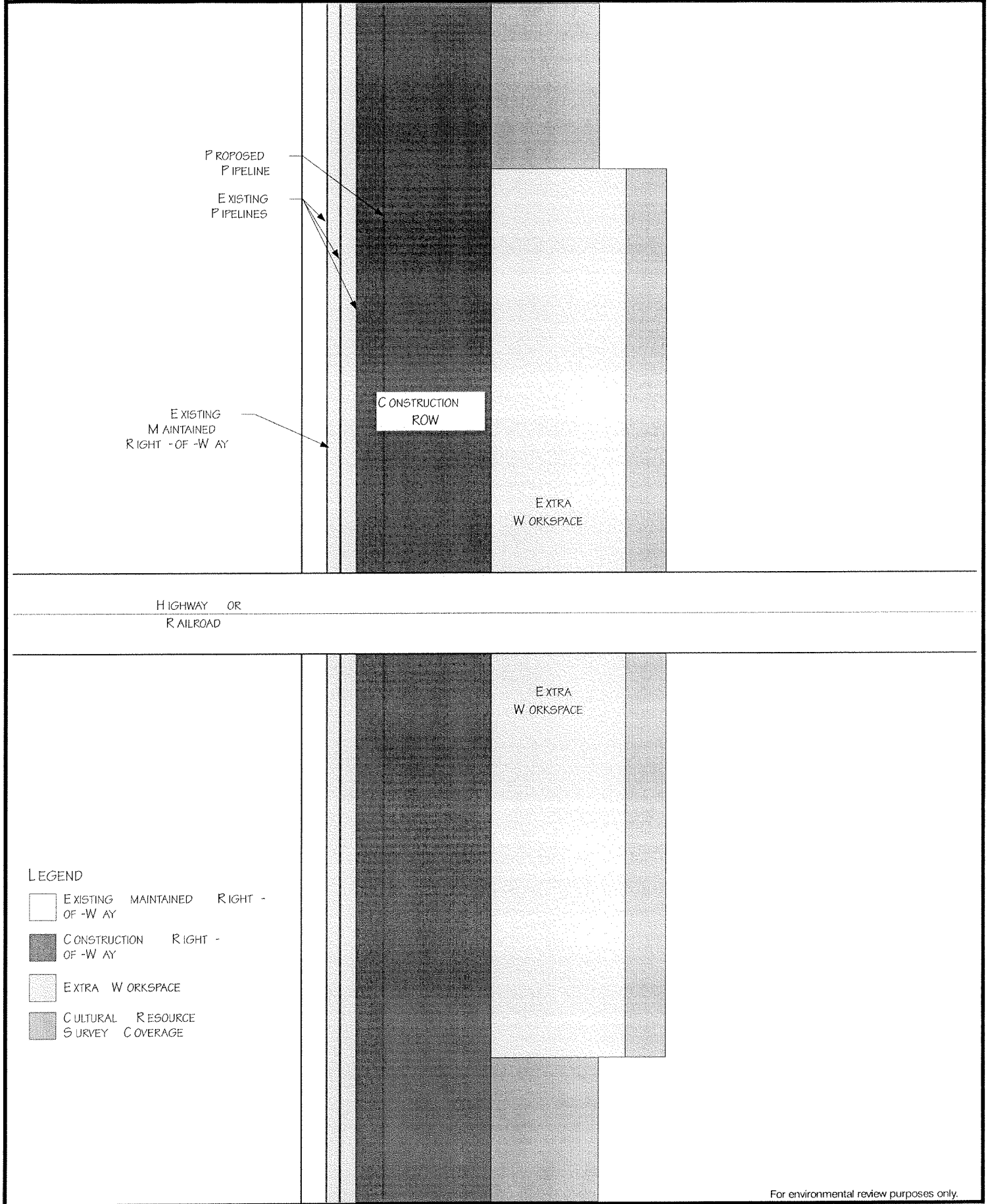

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ENBRIDGE

Figure 4

Typical Extra Workspace
Bored Road or Railroad Crossing

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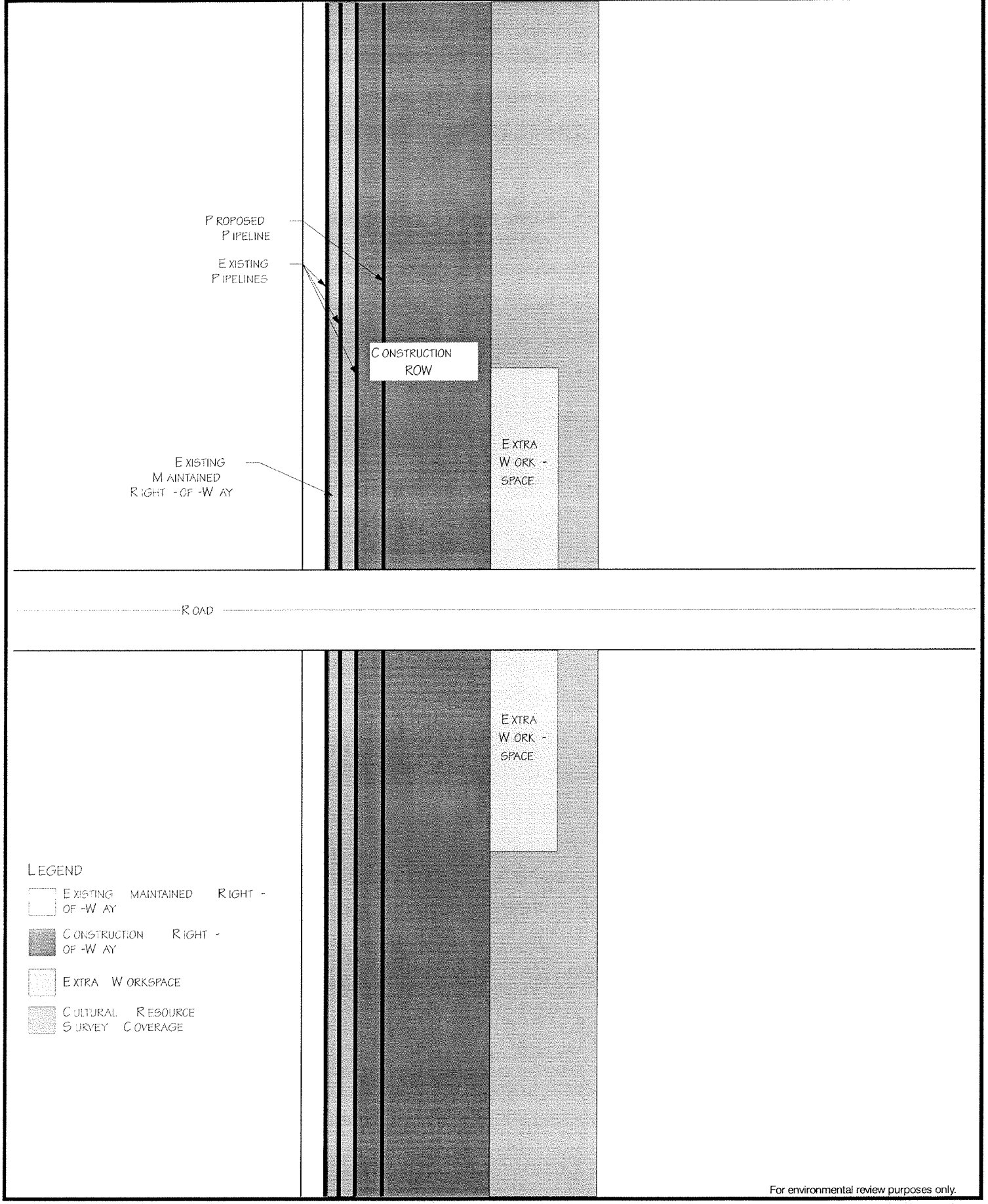

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Figure 5

Typical Extra Workspace
Open-Cut Road Crossing

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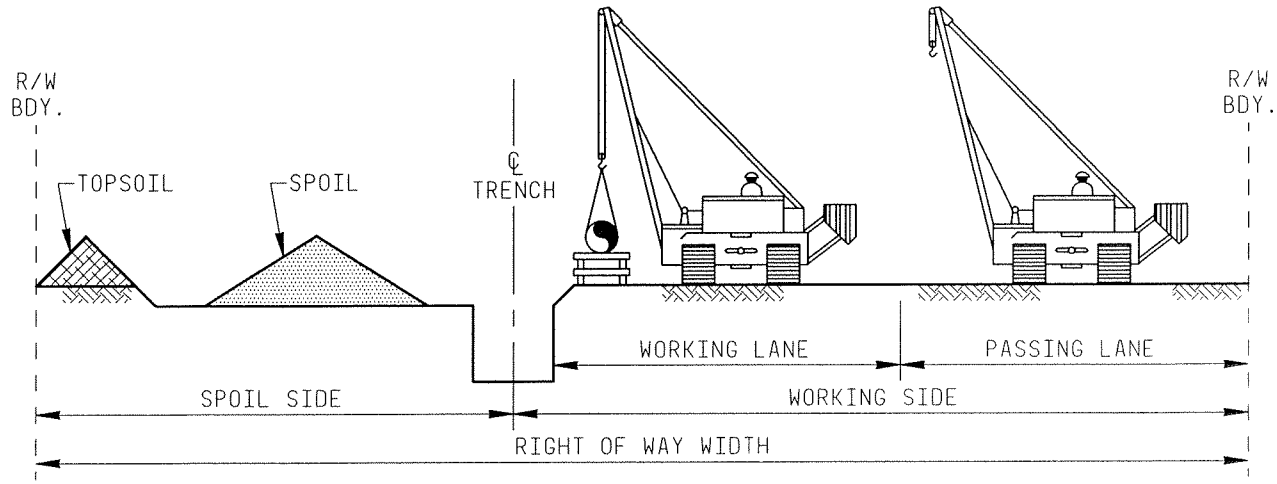


PROFILE

NOTES:

1. DETERMINE STANDARD RIGHT OF WAY WIDTH AND LOCATIONS REQUIRING ADDITIONAL TEMPORARY WORK SPACE PRIOR TO CONSTRUCTION. MERCHANTABLE TIMBER CAN THEN BE CLEARED AND SALVAGED, AND TOPSOIL CAN BE STRIPPED AND STOCKPILED SEPARATELY FROM SPOIL.

2. TWO LIFT SOIL HANDLING REFERS TO TOPSOIL SALVAGE FOLLOWED BY TRENCHING TO THE FULL DEPTH OF THE TRENCH.

3. THREE LIFT SOIL HANDLING REFERS TO TOPSOIL SALVAGE, FOLLOWED BY THE SALVAGE OF AN UPPER DESIRABLE LIFT OF SUBSOIL AND THEN THE LOWER UNDESIRABLE SUBSOIL. THE THREE LIFTS ARE PILED SEPERATELY AND ARE RETURNED TO THE TRENCH SEQUENTIALLY.

RIGHT OF WAY CONSIDERATIONS

	LESS R/W	MORE R/W
A) NO OF PIPELINES		
- SINGLE	X	
- MULTIPLE		X
B) PIPE DIAMETER		
- SMALL	X	
- LARGE		X
C) WORKING SPACE		
- CROSSINGS		X
- EXPANSION LOOPS		X
- PASSING LANE		X
D) SLASH DISPOSAL		
- BURNING	X	
- ROLLBACKS, MULCH, CHIP		X
E) TOPSOIL STRIPPING		
- WIDTH - NONE	X	
- FULL R/W		X
- DEPTH - 10cm (MIN)	X	
- 30cm (MAX)		X
- LIFT - 2 LIFT	X	
- 3 LIFT		X
F) GRADING		
- NONE	X	
- EXTENSIVE		X
G) TRENCH MATERIAL		
- CLAY	X	
- SAND		X
- ROCK (BLASTING)		X
H) DEPTH OF COVER		
- 1m	X	
- 3m		X
I) WATER TABLE		
- LOW	X	
- HIGH		X

For environmental review purposes only.

ENBRIDGE

Figure 6

Right-of-Way Widths

DETERMINING AREA for SOIL STORAGE 01–7

Purpose

Depths and widths of ditch and topsoil stripping must be established during the planning stage of construction to ensure adequate workspace is acquired for soil storage.

Requirements

Soil Survey

Base the depths of topsoil to be stripped on a soil survey (CAN), or soils maps (USA), since segregating soils solely by field observation could result in soil mixing and loss of agricultural capability.

NOTE: Lack of technical information related to stripping depths and widths, and consequently volumes, may result in the insufficient acquisition of right-of-way (ROW) or temporary working space.

Procedure

CAN

1. Commission a soil survey to establish topsoil depths, agricultural capability and locations with problem soils that require special handling.

NOTE: In Canada, for assistance in obtaining this information, contact Safety & Environment.

2. Identify all land uses along the proposed route by reviewing, for example, route sheets, topographical maps or aerial surveys.

3. Determine the amount of grading required.

4. Identify the preferred width of topsoil stripping based on:

- soil survey
- agricultural capability
- land uses
- season of construction
- regulatory requirements

5. Calculate the width of the spoil pile using the formula:

$$\text{Width of spoil pile base (W)} = \sqrt{6A}$$

Where:

A	=	(x-t) yb (cross-sectional area of spoil pile)
x	=	depth of trench
t	=	depth of topsoil
y	=	width of trench
b	=	bulking factor (1.2 for trenchers, 1.3 for backhoes)

e.g.,

Where:

x	=	*1.2 m (3.9 ft) depth of trench*
t	=	*15 cm (6 in) depth of topsoil*
y	=	*.91 m (3 ft) width of trench*
b	=	*1.3 (backhoe)*
A	=	*(1.2-.15) (.91) (1.3)*
	=	*1.24 m^2*

Then:

$$\textit{Width of spoil pile base (W)} = \sqrt{6A}$$

$$= \sqrt{6(1.24)}$$

$$= \sqrt{7.45}$$

$$= 2.73\ m$$

6. Determine the width of topsoil stripping (see 02-5,Topsoil Stripping and Segregation).

7. Calculate the width of the topsoil pile, using the formula:

$$\text{Width of topsoil pile base (W)} = 1.4\sqrt{6A}$$

Where:

A	=	ztb (cross-sectional area of topsoil pile)
z	=	width stripped of topsoil
t	=	depth of topsoil
b	=	bulking factor (1.1 for cultivated land, 1.2 for pasture)

NOTE: The width of a topsoil pile pushed by a dozer is 1.4 times the width of the same pile if deposited by a conveyor
e.g.,

Where:

z	=	*7 m (22.97 ft) width stripped of topsoil*
t	=	*15 cm (6 in) depth of topsoil*
b	=	*1.1 (cultivated land)*
A	=	*(7) (.15) (1.1)*
	=	*1.16 m^2*

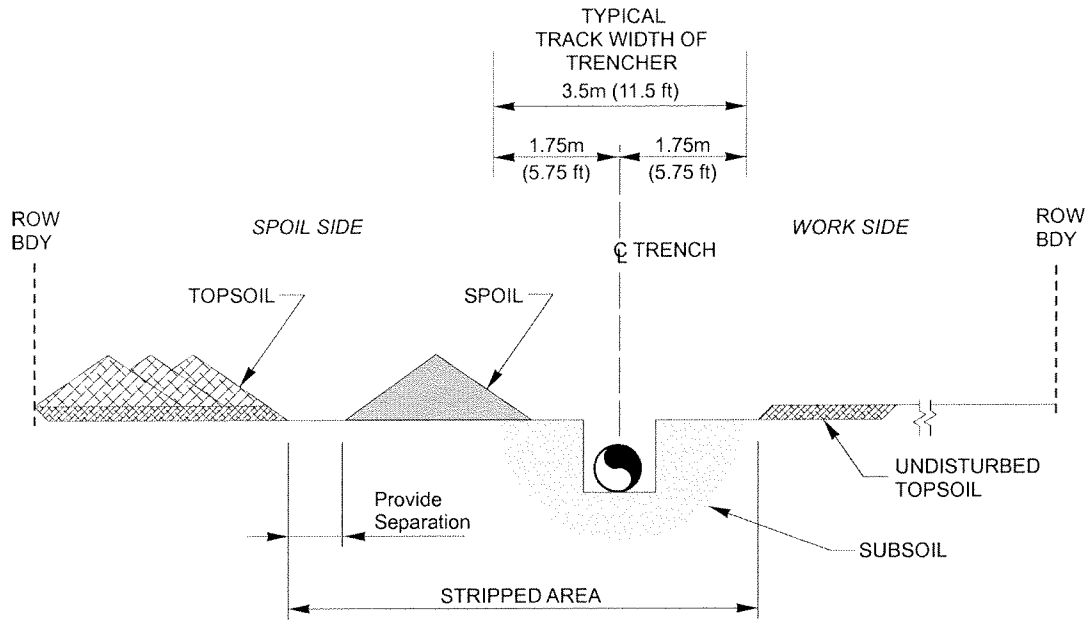
Then:

$$\text{Width of topspoil pile base } (W) = 1.4\sqrt{(6)1.6}$$
$$= 1.4\sqrt{6.93}$$
$$= (1.4)(2.64)$$
$$= 3.69 \text{ m}$$

8. Calculate the ROW and temporary workspace requirements (see 01-6, Determining Workspace).

9. Adjust calculations if:

- any of the assumptions cannot be made (see Figure 1)
- a stripping technique other than trench and spoil is used
- special subsoil handling procedures are required



PROFILE

NOTES

This drawing is based on trench and topsoil stripping and assumes:

- topsoil is stripped with a blade
- trench wall is excavated and spoil is stored with a wheel trencher
- trench walls are stable and can be cut vertically

Figure 1
Stripping and Storage Requirements

OVERVIEW of CONSTRUCTION 02–1

Purpose

This tab includes guidelines to ensure environmental protection and regulatory compliance during pipeline construction activities. In addition to the guidelines in this tab, site-specific project circumstances that necessitate alternate procedures must be considered.

Legislation

CAN

Canada

National Energy Board (NEB):

- Onshore Pipeline Regulations, latest edition

USA

United States

Department of Transportation (DOT), Pipeline Safety Regulations:

- Part 195, Transportation of Hazardous Liquids by Pipeline

Area contingency plan/regional contingency plan
Clean Air Act
Clean Water Act
Comprehensive Environmental Response Cleanup and Liability Act (CERCLA)
Emergency Planning and Community Right to Know Act (EPCRA)
Federal, state and local environmental agency regulations
National Environmental Policy Act (NEPA)
Oil Pollution Act (OPA)
Safe Drinking Water Act

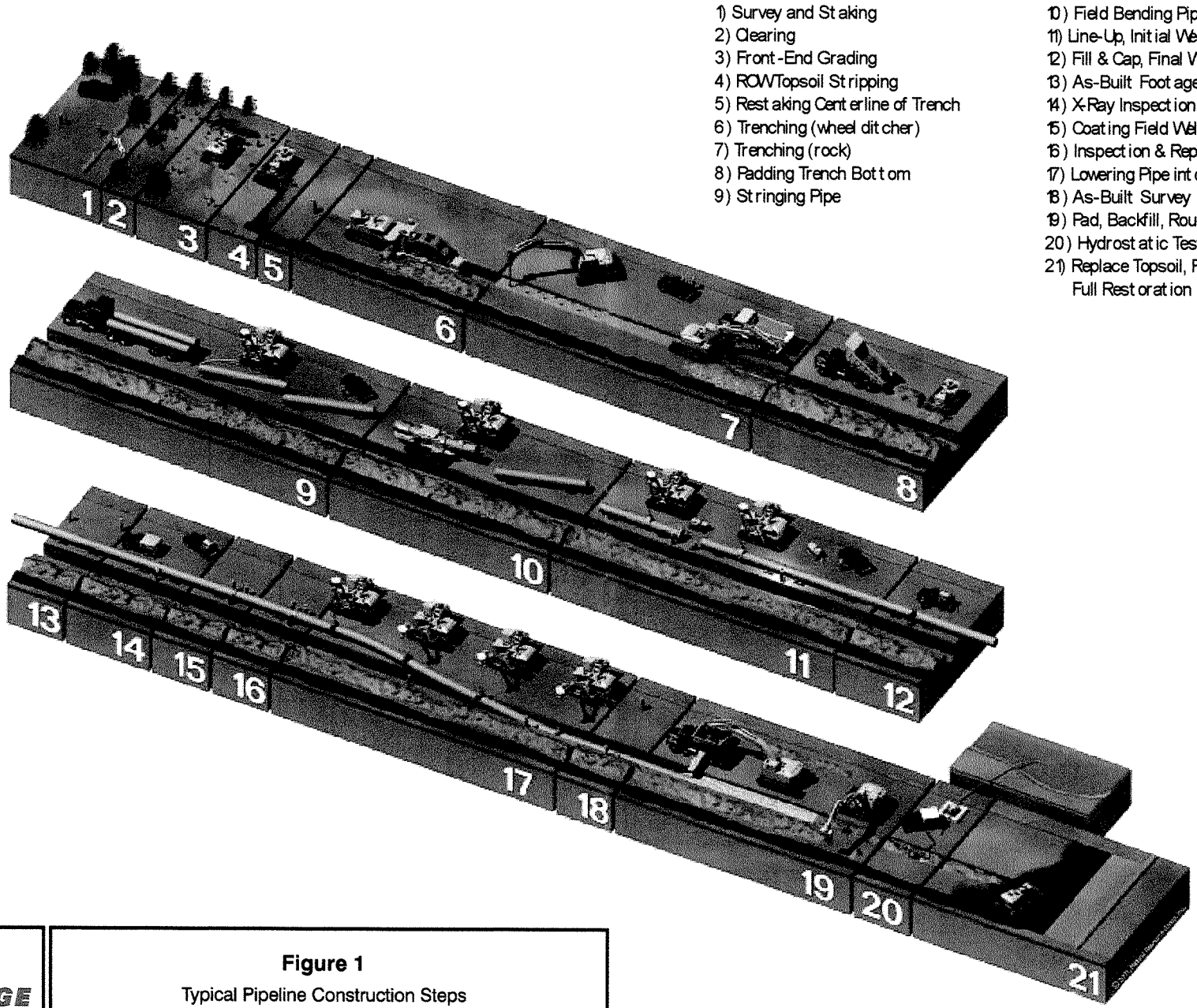


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Figure 1

Typical Pipeline Construction Steps

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GENERAL MITIGATION MEASURES 02–2

Purpose

Poor construction practices could result in short- or long-term environmental impacts. Further, these impacts could slow down construction, increase project costs, irritate landowners, or result in government agencies halting working or imposing fines that may jeopardize future approvals in the region.

This subject outlines general environmental mitigation measures that apply at all times throughout the construction project.

NOTE: For information on safety-related standards and procedures required throughout construction:

- for company employees, see Book 2: Safety
- for contractors, see the Contractor Safety Manual (CAN) or the Construction Safety Program (USA)

Guidelines

Planning and Preparation

Before beginning construction activities, the project manager, or designate, must ensure:

- workers clearly understand the environmental concerns, regulations and conditions specific to the work
- conditions on various permits are consistent
- applicable permits, licenses and approvals are filed or posted at the construction site

NOTE: For more information on project planning, see 01-2, Planning and Preparation.

Worksite Access

Confine all construction equipment and vehicles to the designated right-of-way (ROW), extra work space, existing public roads and approved temporary access roads.

Wetlands

Install a shoofly around wetlands or, in consultation with government agencies, construct a temporary access road along the working side of the construction ROW. Restrict access through wetlands to the shoofly or access road to the extent practical.

Watercourses

Locate temporary access roads as far from the watercourse as practical to minimize clearing and grading near the watercourse.

Traffic and Roads

Place appropriate protective materials (e.g., tires) when crossing roads, sidewalks and railways to minimize damage by tracked equipment. Install asphalt ramps on sidewalk curbs if required.

Noise and Dust Control

Ensure that noise abatement equipment on machinery is in good working order. If excessive noise becomes a nuisance to nearby residents, implement measures such as equipment alterations, erect noise barriers, or change the work schedule.

Take reasonable measures to control construction-related noise and dust near residential areas and other areas as directed by the company. Control measures for dust may include watering down the ROW, and suspending topsoil stripping and replacement during strong winds.

Highway and Road Crossings

Avoid open-cutting roads where other practical options exist. If an open cut is the best option, take photos before construction begins to document the as-found condition of the road.

NOTE: When weighing alternatives, consideration must be given to log hauling in forested areas and harvest operations in agricultural areas.

Install appropriately sized culverts where needed under access ramps in bar ditches.

Prevent tracking mud onto roadway crossings. After equipment crosses, shovel or sweep off any mud tracked onto a roadway and place within a sediment barrier as soon as possible, but no longer than 24 hrs after discovery.

NOTE: For more information on sediment barriers, see 02-14, Temporary Sediment Barriers.

Noxious Weeds

To minimize the risk of spreading undesirable weeds within the construction ROW:

- provide contractors and inspectors with information to help identify noxious weeds
- provide environmental inspectors with training to identify and prevent the spread of undesirable species
- flag areas containing noxious weeds during preconstruction walkovers
- before starting clearing/grading, use weed burners or herbicides to destroy infestations
- minimize the construction equipment used, and limit the number of passes the equipment makes through the infested areas
- place mats (i.e. construction mats, swamp mats) over infested areas to minimize construction equipment transporting weed or plant material. Ensure mats are free of soil, vegetation and debris prior to removing from site.
- ensure equipment is free of soil, vegetation and debris before arriving and leaving the site. If necessary set up cleaning stations to wash equipment.
- do not allow soil and water from cleaning the equipment to flow to uninfested areas
- during grading operations, strip the full ROW width and contain the spoil pile containing noxious weeds to prevent mixing with the surrounding soil during regrading and cleanup

Hazardous Materials

The project manager, in consultation with the Safety and Environment department, must consider the need for the contractor to develop response plans, e.g., spill response, emergency response, fire response.

NOTE: For more information on handling hazardous materials:

- for company employees, see Book 2: Safety, Tab 08, Hazardous Materials
- for contractors, see the Contractor Safety Manual (CAN) or the Construction Safety Program (USA)

Material Safety Data Sheets (MSDS) for all hazardous materials onsite must be readily available.

All hazardous materials onsite must be properly stored and labeled with, as a minimum, the:

- product contents
- hazard warning

Workers must be trained in the identification and safe handling of hazardous materials onsite.

If a fuel or hazardous material spill occurs, immediately notify the project manager (CAN) or implement the Spill Prevention, Containment and Control Plan (USA).

Transportation

Fuel trucks must not access any sections of the ROW where the risk of a fuel truck accident is high, e.g., steep slopes and difficult watercourse crossing approaches.

Vehicles transporting more than 200 L (CAN) or 119 gal (USA) of fuel or hazardous materials to unmanned pipeline locations and/or ROW work sites should be equipped with spill kits containing at a minimum:

- a shovel
- 30 m^2 (36 sq yd) of 6-ml polyethylene sheeting
- 25 kg (55 lb) of absorbent

Watercourses and Wetlands

Do not store hazardous materials, chemicals, fuels or lubricating oils or perform concrete coating activities within 30 m (100 ft) of watercourses or wetlands.

Cure concrete coating on the pipe for a minimum of 3 days before installation in a wetland, due to potential toxic effects on wildlife.

Refueling/Equipment Care

To minimize the risk of fuel spills:

- ensure containers for fuel or hazardous materials and any attached hoses and nozzles are free of leaks
- station equipment/fuel truck operators at both ends of a hose during fueling of equipment, unless the ends are visible and are readily accessible by one operator
- drain any fuel remaining in a hose into the storage container
- ensure the hose nozzle has an automatic shutoff

Watercourses and Wetlands

Do not wash equipment or machinery in or within 30 m (CAN) or 100 ft (USA) of watercourses or wetlands. Where this is not possible, adequate spill response equipment must be available.

Before using equipment near a watercourse, inspect hydraulic, fuel and lubrication systems to ensure they are in good condition and free of leaks.

Service and refuel mobile construction equipment on road allowances or on company property, maintaining a minimum of 30 m (CAN) or 100 ft (USA) from watercourses or wetlands. Stationary equipment within this zone must have an impervious means of secondary containment in place.

Fire Prevention

Maintain vehicle exhaust and engine systems in good repair, and park vehicles in a manner that minimizes the risk of igniting dried grass or other combustible material.

Immediately report accidental fires to the appropriate government authorities or landowners. All equipment and workers must be made available to control a fire.

When the fire hazard is rated high or extreme, the following are prohibited on the ROW:

- vehicles parking on tall grass or stubble
- fires
- dropping cigarette butts and used welding rods on the ground

Maintain water trucks on the ROW when the fire hazard is rated high or extreme.

NOTE: The stripping, welding, and coating operations may each need a water truck and delivery system.

Waste

Collect and dispose of all general waste and construction refuse daily at an approved facility. Waste containers must accompany each working unit. Do not dispose of waste in the trench.

Locate temporary toilets at convenient locations on/along the construction site.

At the end of each day, leave the construction site in a tidy and organized condition.

Environmentally Sensitive Areas

NOTE: The following environmental protection measures are guidelines only. The environment department will plan and prepare site-specific and detailed mitigative measures.

Watercourses and Wetlands

Where grading or spoil could block natural drainage and lead to ponding, install culverts at appropriate locations.

Wildlife

Do not harass or feed wildlife or livestock.

Do not allow pets on the ROW.

Report encounters or collisions with wildlife to Fish and Wildlife authorities or the local police department.

Where habitat degradation cannot be avoided, salvage and transplant vegetation or native seed of critical importance to the species.

Cultural Resources

If potential artifacts or fossils are discovered anytime during construction work activities:

- suspend the work activity
- immediately contact the project manager
- fence or flag off the area

Do not remove artifacts from the site.

Plant Species

If rare plant species with special conservation status is identified, consider implementing the following mitigative measures:

- fence or flag off the area
- temporarily cover the site with geotextile pads, fluxnet or swamp mats
- propagate plants or portions of the plant community via vegetative or reproductive means (e.g., harvesting seeds, collecting cuttings or transplanting plants)

Fish Habitats

If sensitive fish habitat is identified, consider implementing the following mitigative measure:

- alter the construction method to use isolated crossing techniques, e.g., partial bypass or trenchless crossing technique
- implement temporary and/or permanent erosion control measures to prevent increased sediment loading
- alter the equipment crossing to minimize disturbance, e.g., use existing bridges, or install temporary bridge

RIGHT-OF-WAY SURVEY 02–3

Purpose

Before construction activities begin, the right-of-way (ROW) boundaries are surveyed and clearly marked. In certain circumstances, surveyors make minor routing adjustments to avoid small problem areas. Extra work space to accommodate specific construction activities is also surveyed and marked.

Although surveyors generally cause minimal environmental impact, the primary concern is that they are given appropriate direction regarding standard ROW width, location of extra work space, and adjustments to navigate around environmentally sensitive areas. Potential impacts related to slopes and side hills, road and watercourse crossings, special areas of concern, and aesthetics can be overcome by route modifications and minor field adjustments.

Guidelines

Notification

Notify landowners and government authorities of intent to conduct a survey.

NOTE: For more information on requirements before surveying, see 01-2, Planning and Preparation.

Staking and Flagging

Surveyors are responsible to mark ROW boundaries and extra work spaces with stakes and flags. Increase the use of stakes, if appropriate, in environmentally sensitive areas.

Maintain stakes and flagging throughout construction activities.

Ensure the size and shape of the area surveyed is appropriate for construction, see 01-6, Determining Work Space. Advise the project manager of areas that are inadequate and that require additional temporary work space.

Wetlands

Stake, flag and/or fence limits of the ROW through all wetlands in a manner that (a) identifies start and end points and (b) prevents encroachment on the surrounding area.

Environmentally Sensitive Areas

Before beginning construction, identify, survey and fence, or flag off:

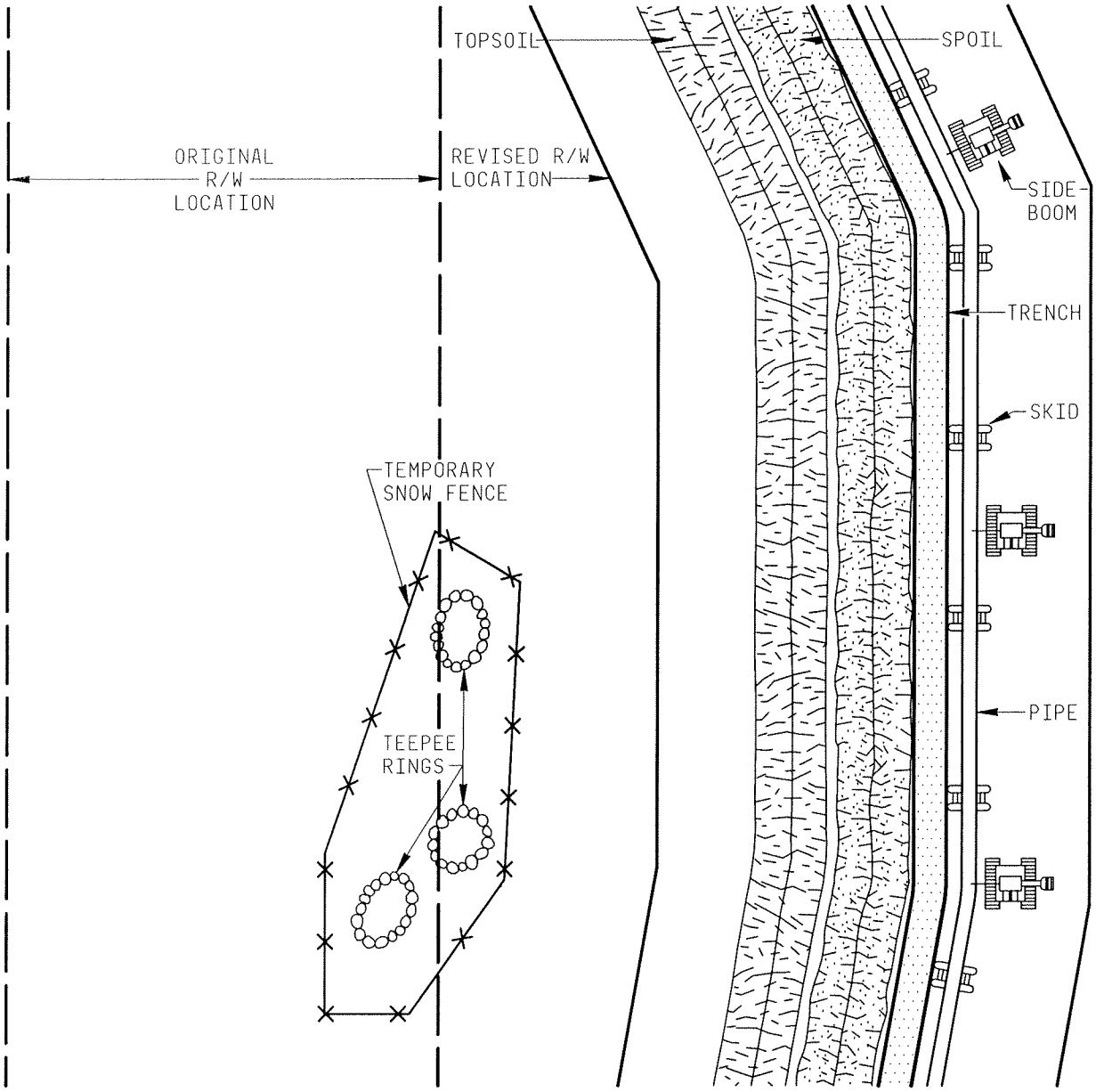
- archaeological, paleontological or historical sites (see Figure 1, Realignment for Environmentally Sensitive Areas)
- rare plant species and important wildlife habitat

Use short stakes to reduce cattle's attention where appropriate.

Route Adjustments

Surveyors should adjust the ROW survey to avoid sidehills, environmentally sensitive areas, poor watercourse crossing approaches, shelterbelts, buildings or other structures and significant features.

Verify any route adjustments with the project manager before leaving the field to ensure all company concerns are addressed.



PLAN VIEW

NOTES:

1. REALIGN RIGHT OF WAY OR TEMPORARY WORK SPACE TO AVOID SIGNIFICANT FEATURES.
2. OBTAIN PERMISSION FROM LANDOWNER AND/OR GOVERNMENT AUTHORITY TO RE-ROUTE AROUND SITE.
3. FENCE KNOWN ARCHAEOLOGICAL OR HISTORICAL SITES, SHELTERBELTS, SHADE TREES, DUGOUTS OR OTHER ENVIRONMENTALLY SENSITIVE AREAS TO BE PRESERVED.
4. SURVEY REALIGNMENT.

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Figure 1

Realignment for
Environmentally Sensitive Areas

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CLEARING and GRUBBING 02–4

Purpose

Clearing is the first major surface disturbance associated with pipeline construction. Clearing and grubbing involve removing trees, roots and stumps, brush and other vegetation from the right-of-way (ROW) ground surface. Poor clearing practices can damage the ROW, slow construction progress and complicate ROW restoration.

Guidelines

Clearance Width

Clear only the width needed for construction. Do not clear beyond marked ROW boundaries.

NOTE: For information on defining space required and acquiring temporary workspace, see 01-6, Determining Workspace.

Equipment

Clearing may be accomplished by:

- hand cutting
- bulldozers
- harvesting machinery

Use clearing equipment that minimizes surface disturbance, soil compaction and topsoil loss, e.g., equipment with low ground pressure tracks or tires, blade shoes and brush attachments.

To grub tree roots, use bulldozers equipped with brush rakes.

NOTE: Do not grub trees growing over an existing pipeline.

Winter Conditions

In winter, consider using bulldozers equipped with shearing blades to cut nonmerchantable timber flush to the ground.

NOTE: This minimizes the need for grubbing in areas other than the trench line if the root balls are frozen into the ground.

Fences and Gates

Before clearing the ROW, dismantle existing fences and livestock barriers in accordance with landowner agreements to allow access for construction equipment (see 02-9, Fences and Temporary Gates).

Install temporary gates and/or fences where necessary to maintain access restrictions.

Noxious Weeds

To prevent spreading undesirable plant species to the project area, construction equipment must be clean when it arrives at the site (see 02-2, General Mitigation Measures).

Trees and Shelterbelts

Fall trees parallel to the ROW. Fall bordering trees onto the cleared ROW to prevent damaging existing property, pipelines, adjacent trees and brush.

Save ornamental trees, wind breaks and shelterbelts on the ROW as much as possible or as per landowner agreements by boring underneath or transplanting.

Protect ornamental or other significant trees adjacent to the ROW from damage with flags, fencing or signs, or, if appropriate, by placing a minimum of 750 mm (30 in.) of topsoil over the roots within the dripline.

Slopes

On erosion-prone or steep slopes, consider:

- postponing clearing until immediately before pipe stringing
- leaving a temporary uncleared buffer zone extending back from the crest
- hand clearing or using slope harvesters, which leaves stumps and roots in place

Hand clear slopes leading to watercourses, going no closer than 16 m (50 ft) from the watercourse, except for timber salvage and if an equipment crossing is installed, an access trail. Leave this buffer strip of vegetation in place until crossing activities begin.

Watercourses and Wetlands

Minimize clearing next to watercourses and wetlands. Except for trees and brush hand cut close to the ground, leave a 16 m (50 ft) buffer of otherwise undisturbed vegetation between the area of disturbance and the watercourse or wetland.

If trees/shrubs must be preserved and fencing off is not practical, salvage live trees or shrubs from streambanks. Store salvaged trees and shrubs on the side of the ROW in a manner such that they don't dry out before replanting during restoration.

To minimize the potential for sedimentation in watercourses, cut vegetation and trees off at ground level, leaving root systems and organic matter undisturbed in areas that drain to the watercourse.

Fall trees away from watercourses to prevent damaging adjacent trees and aquatic habitat.

Immediately remove trees, debris or soil inadvertently deposited below the high watermark of watercourses to minimize disturbance to the streambed and banks.

Do not skid logs across watercourses or push logs into watercourses.

When clearing, limit the working space to the surveyed areas as much as possible.

If timber is needed for riprap or equipment mats, do not cut trees outside of the surveyed area within a wetland.

Merchantable Timber

Before construction on public lands, ensure salvage requirements are specified and agreed to by the company, clearing contractors, government agencies and commercial logging operator.

On private lands, salvage timber as specified by landowners; on public lands, salvage timber as specified by the government agency.

Do not bulldoze merchantable timber. If not needed by the owner of the timber rights, offer merchantable timber to the landowner. If the landowner does not want the timber, offer the timber to a commercial buyer. If a willing commercial buyer cannot be found, consider the timber nonmerchantable and dispose of it accordingly.

In upland areas, stack merchantable timber at a landing near the edge of the ROW in a manner that is accessible to hauling trucks (see Figure 1, Salvage of Merchantable Timber).

Nonmerchantable Timber

Consider saving nonmerchantable timber near watercourses for use in equipment crossing structures, slope stabilization or instream bank restoration.

In winter, cut nonmerchantable timber flush to the ground.

Disposal

Dispose of nonmerchantable timber and slash not needed for equipment crossing structures or bank restoration to the satisfaction of the landowner or regulatory authority. Disposal methods include:

- transportation to commercial disposal facilities
- burning
- chipping/grinding
- stockpiling (for firewood)

Do not dispose of nonmerchantable timber by placing it off the ROW, unless previously approved in writing by the landowner and the company.

NOTE: In forested areas, stumps and roots may be buried under 2 m of cover in natural clearings or low spots off the ROW, if the company can obtain permission in writing from the landowner or responsible forestry official.

Do not dispose of nonmerchantable timber, chips or any fill material in wetlands unless specifically approved by government agencies.

Rollback/Chip/ Mulch

Retain nonmerchantable timber and slash for use as chipping, rollback or corduroy.

ENB (NW)

Appropriate trees for chipping include spruce, alder and poplar.

If sufficient space is available, push slash into a windrow on the edge of the work side and store until cleanup; if space is limited, obtain temporary workspace in natural clearings adjacent to the ROW (see Figure 2, Slash Disposal-Rollback/Mulch/Chip).

Spread chips/mulch from clearing operations no thicker than 75 mm (3 in.). If practical, distribute clips/mulch across the ditch line and spoil area to encourage mixing during grading, backfill and cleanup, which eliminates a layer that can slow revegetation.

Burning

Burn nonmerchantable timber and slash if there is an excessive amount that may impede access for future maintenance activities.

Burning must be done under constant surveillance and in compliance with applicable permit requirements.

Before burning nonmerchantable timber and slash:

- develop a fire control plan
- obtain a burning permit
- designate a fire watch
- ensure adequate firefighting equipment is onsite

ENB (NW)

For minimum firefighting equipment requirements, refer to the applicable Land Use Permit or forestry regulation.

Push timber and slash into the center of the ROW, making windrows or piles no more than 60 m (196 ft) long. Separate the piles with firebreaks at least 8 m (25 ft) wide (see Figure 3, Slash Disposal-Burning).

Do not locate burn piles within 100 m (330 ft) of a watercourse or on organic soils.

Avoid locating burn piles on organic soil or on topsoil within agricultural lands. Burn piles on mineral soils or in a burning sloop.

Before leaving the site:

- extinguish burning embers
- spread ashes over the ROW
- dispose of all partially burnt stumps and logs to the satisfaction of landowners or government authorities

Equipment Crossings

A mat setting crew should install equipment crossings as a part of clearing operations, so that equipment does not ford any watercourse. (see 02-12, Equipment Crossings).

Grubbing

NOTE: Removing stumps and tree roots can cause topsoil and subsoil mixing, soil erosion, damage to standing trees and excessive surface disturbance.

Restrict grubbing to:

- the trench line
- areas requiring grading
- workside areas only where necessary to ensure safe equipment passage
- no closer than 2 m (6 ft) from standing trees to prevent damaging roots and to avoid creating bog holes in wetlands
- no closer than 10 m (CAN) or 50 ft (USA) from watercourses, except when absolutely necessary along the trench line and spoil pile area

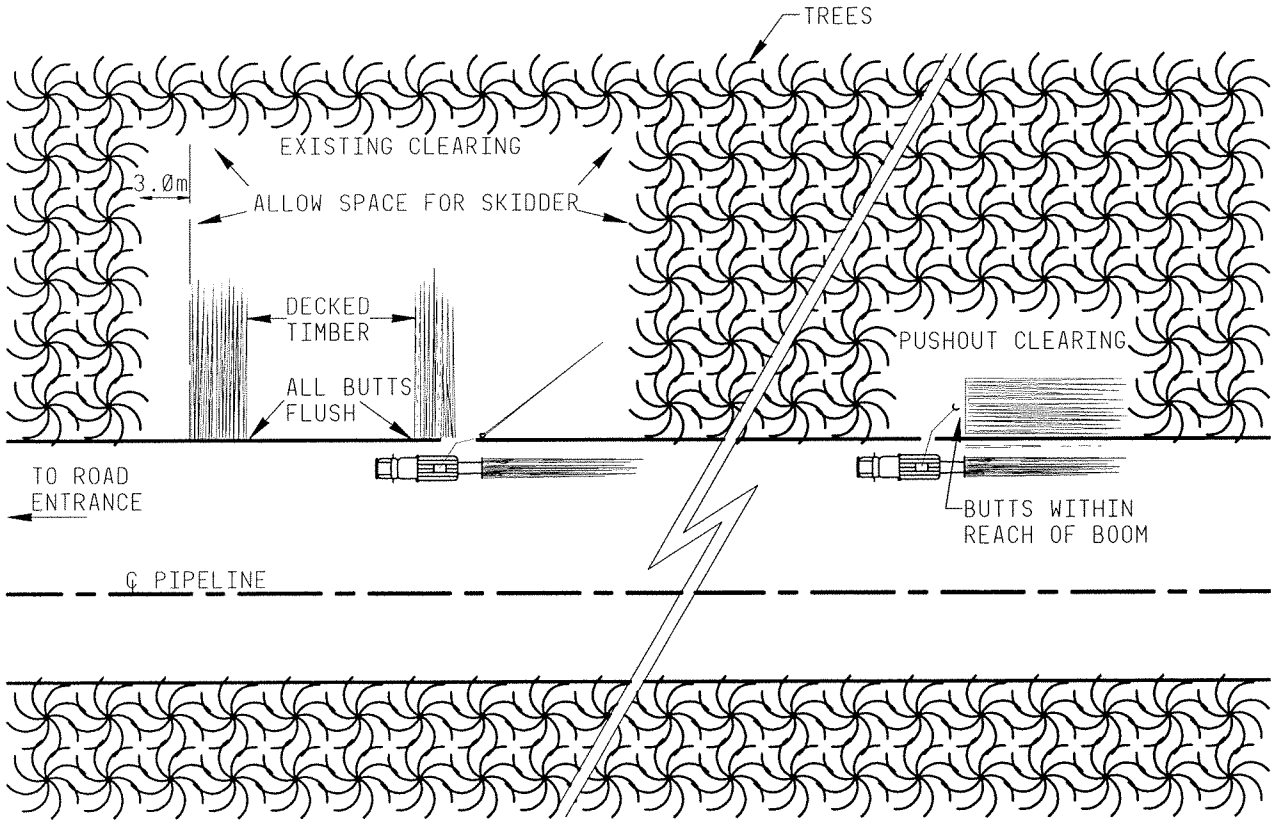
Grub spoil pile areas only if necessary.

Wildlife

If a tree to be cleared contains any large bird nests, or if any large ground nest, burrow or den is discovered during clearing:

- suspend the work activity
- immediately contact the project manager
- fence or flag off the area

NOTE: For more information on protecting wildlife, see 02-2, General Mitigation Measures.



PLAN VIEW

NOTES:

1. SALVAGE MERCHANTABLE TIMBER AS SPECIFIED BY LANDOWNER OR GOVERNMENT AUTHORITY AND COMPANY.

2. CUT TREES CLEAN; DO NOT BULLDOZE MERCHANTABLE TIMBER. REMOVE LIMBS AND TOPS. LOGS SHOULD NOT BE SKIDDED ACROSS OR DRIVEN INTO WATERCOURSES.

3. IN UPLAND AREAS, STACK MERCHANTABLE TIMBER AT A LANDING NEAR THE EDGE OF THE ROW IN A MANNER THAT IS ACCESSIBLE TO HAULING TRUCKS.

4. REQUEST LOGGING OPERATORS TO BEGIN HAULING TIMBER, PREFERABLY AFTER GRADING BUT BEFORE TRENCHING AND PIPE STRINGING.

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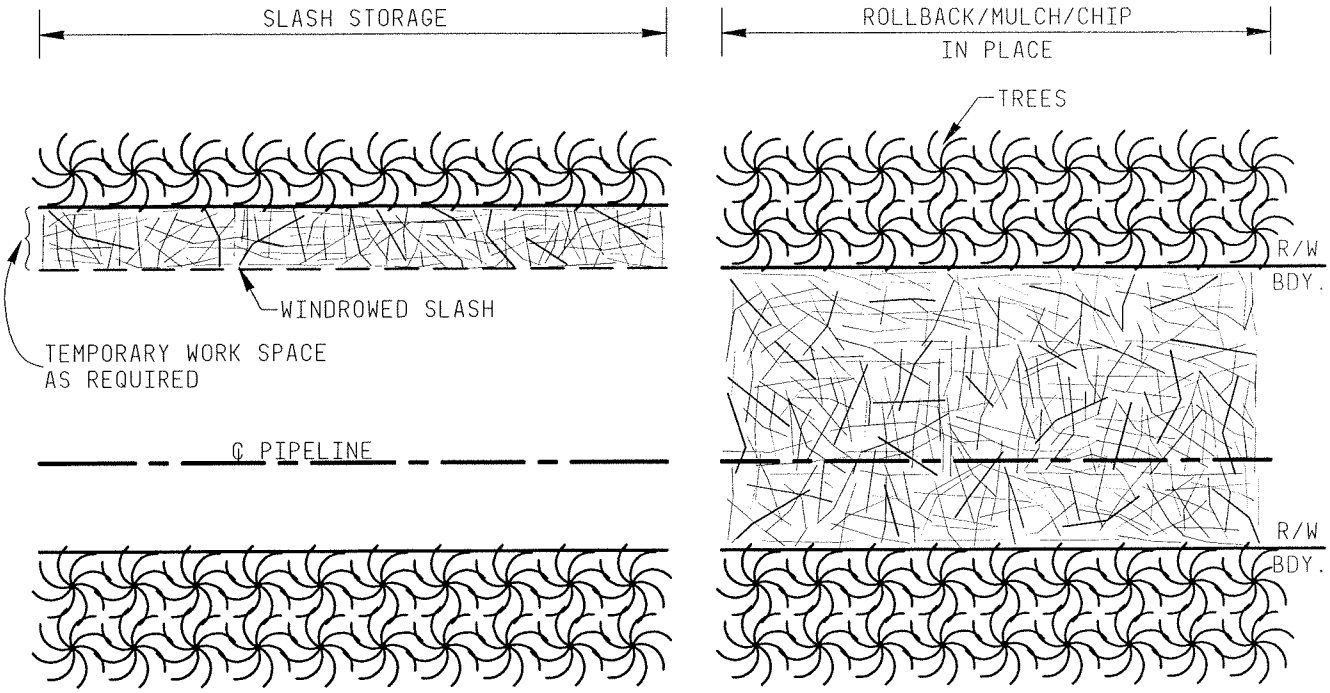
Figure 1

Salvage of Merchantable Timber



PLAN VIEW

NOTES:

1. RETAIN SLASH AND NON MERCHANTABLE TIMBER FOR USE AS CHIPPING, ROLLBACK OR CORDUROY.
2. WINDROW SLASH ON EDGE OF WORK SIDE AND STORE UNTIL CLEANUP. IF SPACE IS LIMITED, OBTAIN TEMPORARY WORKSPACE IN A NATURAL CLEARING ADJACENT TO ROW.
3. SPREAD CHIPS/MULCH FROM CLEARING OPERATIONS NO THICKER THAN 75MM (3IN.). IF PRACTICAL, DISTRIBUTE CHIPS/MULCH ACROSS THE DITCH LINE ON SPOIL AREA TO ENCOURAGE MIXING DURING GRADING, BACKFILL AND CLEANUP, WHICH ELIMINATES A LAYER THAT CAN SLOW VEGETATION.
4. WALK DOWN SLASH WITH BULLDOZER.
5. LEAVE AN ACCESS TRAIL CLEAR, IF REQUIRED.

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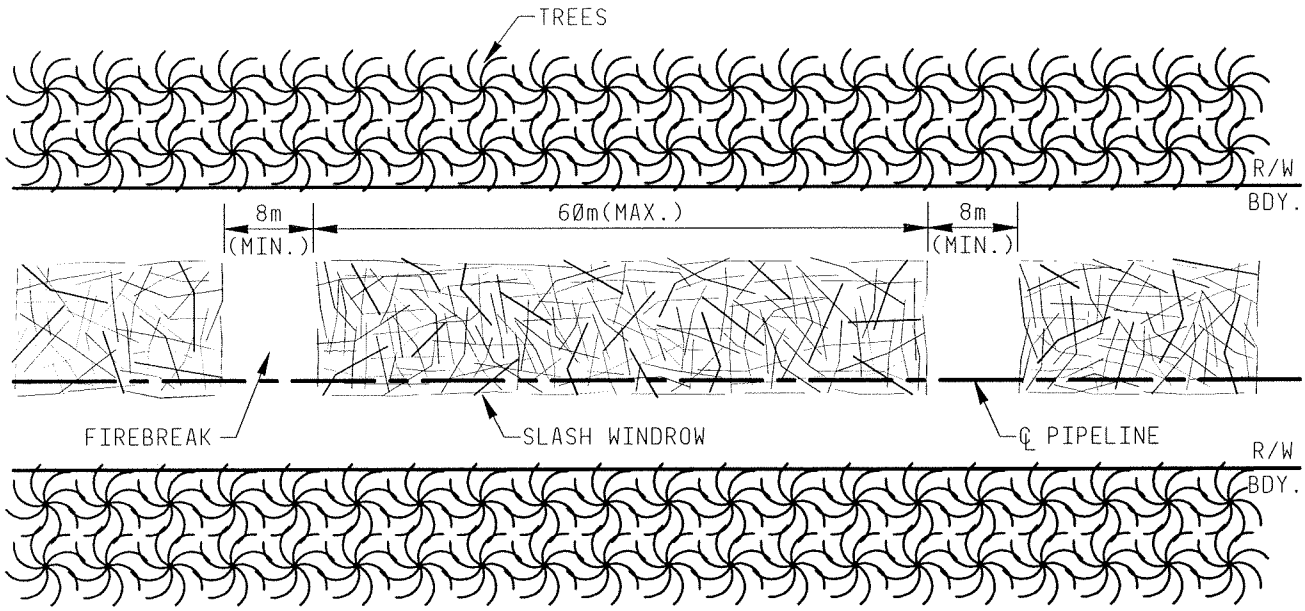
Figure 2

Slash Disposal -
Rollback/Mulch/Chip



PLAN VIEW

NOTES:

1. BURN NONMERCHANTABLE TIMBER AND SLASH IF THERE IS AN EXCESSIVE AMOUNT THAT MAY IMPEDE ACCESS FOR FUTURE MAINTENANCE ACTIVITIES.
2. BURNING MUST BE DONE UNDER CONSTANT SURVEILLANCE AND IN COMPLIANCE WITH APPLICABLE PERMIT REQUIREMENTS.
3. MAINTAIN FIRE FIGHTING EQUIPMENT ON SITE.
4. PUSH SLASH INTO WINDROWS OR PILES ALONG CENTRE OF RIGHT OF WAY AND SEPARATE BY FIREBREAKS. LOCATE BURN AREAS MORE THAN 100m FROM BODIES OF WATER AND AVOID LOCATING BURN SITES ON ORGANIC SOILS.
5. ATTEND FIRES AND PREVENT FROM SPREADING OFF RIGHT OF WAY. EXTINGUISH BURNING EMBERS BEFORE LEAVING SITE.
6. SPREAD ASHES OVER RIGHT OF WAY. DISPOSE OF ALL PARTIALLY BURNT STUMPS AND LOGS TO SATISFACTION OF LANDOWNERS OR GOVERNMENT AUTHORITIES.

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Figure 3

Slash Disposal - Burning

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TOPSOIL STRIPPING and SEGREGATION 02–5

Purpose

Topsoil is a valuable natural resource that is critical to agricultural capability and successful revegetation. Because subsoil properties are usually less favorable, mixing topsoil and subsoil can lower the overall productivity of soils. To prevent mixing soil during construction, every effort must be made to salvage topsoil in areas where soil productivity is an important consideration, e.g., cropland, pasture, golf courses, residential areas.

NOTE: For information on replacing topsoil, see 03-3, Cleanup.

Responsibilities

A company representative or an environmental inspector must oversee topsoil stripping in areas where:

- there is poor color change between topsoil and subsoil
- there are erodible soils
- the three-lift soils handling method is used
- there is uncertainty about the depth of stripping

Requirements

Stripping Depth

NOTE: In a typical soil profile, there is generally a visible change in color between topsoil and subsoil. Where color change is not evident, determine topsoil depth by texture and structure.

Maximum Depth

Where there is deep topsoil, such as on cultivated lands, strip topsoil to a maximum depth of 30 cm (12 in.) unless otherwise requested by the landowner

NOTE: If more than 30 cm (12 in.) of topsoil is stripped, additional space may be needed for spoil storage (see 01-7, Determining Area for Soil Storage).

Minimum Depth

Where there is less than 30 cm (12 in.) of topsoil, strip topsoil to color change, 15 cm (6 in.), or plough layer, whichever is deepest.

Variable Depth Topsoil

Strip topsoil so that the exposed surface has a mottled pattern composed of 50% topsoil and 50% subsoil where possible.

Use equipment with fine depth control, e.g., a grader or dozer, to strip variable depth topsoil.

Sandy Soils and Dunes

For sandy soils and dunes, strip the upper 5–10 cm (2–4 in.) of material where topsoil has not developed or is not apparent.

Stripping Width

Determine stripping width before beginning construction activities

NOTE: Strip topsoil from all areas that require grading.

Trench and Spoil Area

Strip topsoil from the trench and spoil area during dry and unfrozen conditions where there is greater than 10 cm (4 in.) of topsoil on (see Figure 1, Typical Storage Segregation Ditch Plus Spoil Side):

- cultivated land
- pasture and hay land with poorly established sod layer
- bush or woodland with agricultural potential
- deeply furrowed or rough-cultivated land

Store topsoil from the trench and spoil area on the spoil side of the trench, next to the stripped area and on adjacent undisturbed surface (see Figure 1, Typical Storage Segregation Ditch Plus Spoil Side).

Full Right-Of-Way

Strip topsoil from the full ROW during dry and unfrozen conditions on (see Figure 2, Typical Topsoil Segregation Full ROW):

- agricultural lands with localized weed infestations
- cultivated lands and lands with agricultural potential that are subject to compaction or soil mixing on the work side, e.g., where there is less than 10 cm (4 in.) of topsoil
- areas that will be graded or filled

Strip topsoil from the full ROW in wet or thawing soil conditions when project activities cannot be postponed.

NOTE: If soils are wet or thawed, use appropriate contingency measures or postpone work activities until soils dry out or freeze (see 02-16, Wet/Thawing Soils).

Trench Line Only

Strip topsoil from over the trench line only (see Figure 3, Typical Topsoil Segregation Trench Line Only):

- where topsoil is frozen solid
- in wetlands without standing water or saturated soils
- in areas with a fairly thick sod layer, e.g., golf courses, mature pastures, residential areas

Crossings

Strip topsoil from the full ROW width to allow for a wider and deeper trench, storage of larger volumes of spoil, and additional grading and temporary workspace.

Sandy Soils and Dunes

For sandy subsoils and dunes, strip an extra width of topsoil to allow for slumping of trench walls, or where trench walls are sloped.

NOTE: Minimize disturbance to surface vegetation on sandy soils or dunes wherever possible.

Stony Topsoil

For stony topsoil, minimize stripping the full width of the ROW to avoid bringing stones to the surface.

Use a backhoe to strip stony topsoil only if conventional methods, i.e., dozers and graders, are ineffective.

Unstable Trench Walls, Sidebends

Increase the width of stripped topsoil if (a) trench walls do not stand up and (b) a wider or deeper trench is otherwise needed, e.g., sidebend and tie-in locations (see Figure 4, Unstable Trench with Trench and Spoil Area Topsoil Stripping).

If possible, salvage topsoil from under the new spoil pile on the spoil side and relocate to the edge of the extra working space.

Storage

Always maintain separation between the base of a topsoil and the base of an adjacent subsoil pile.

When the three-lift soils handling method is used, maintain separation between topsoil and subsoil piles, and also between subsoil piles.

Urban Areas

In urban areas where storage space is limited, remove and store soils separately at a remote location; or alternately, flatten the topsoil pile, cover the pile with tarps, plywood or straw, and store the subsoil on top.

Winter Conditions

Maintain snow cover over the area to be stripped as long as possible. Remove snow just before stripping and windrow to the edges of the ROW.

Grade topsoil in the spoil area smooth to minimize mixing during backfilling.

To break up frozen topsoil, strip topsoil 1 m wider than the trench using a modified bucket wheel trencher, step blade or conventional equipment preceded by a ripper (see Figure 5, Topsoil Stripping and Trench Area Winter Construction).

Store topsoil on the working side of the trench, set back to allow the tracks of the trencher to operate on level ground. Leave breaks in topsoil at drainage courses.

Wooded Areas

In wooded areas where little or no topsoil has developed, stripping is not required unless requested by the authorities having jurisdiction.

Wetlands

Strip topsoil in unsaturated wetlands, giving extra attention to maintaining root stocks for replacement. Keep wetland soils separate from upland soils.

Organic Soils

Do not strip organic soils (peat).

Hay and Pasture Land

For mature sod layers on hay and pasture land, disc the area to be stripped.

Three-Lift Soils Handling

Strip topsoil using the three-lift soils handling technique during dry and unfrozen conditions where:

- a soil survey has indicated that lower subsoils are of significantly lower quality than upper subsoils
- conventional trenching could raise the undesirable lower subsoils within the soil profile.

Store topsoil on the spoil side of the trench next to the stripped area (see Figure 6, Three Lift Soil Handling Non-Frozen Conditions).

Store the first lift of trench subsoil on the spoil side, either next to the trench (Profile A), or back far enough to store the second lift (Profile B). Maintain a separation between the topsoil pile and the excavated spoil (see Figure 6, Three Lift Soil Handling).

Store the second lift of trench subsoil next to the trench, either on the work side (Profile A), or the spoil side (Profile B). Maintain a separation between the two excavated spoil piles, or between the second lift spoil pile and the undisturbed topsoil on the work side.

Erosion Control

High Winds

If drifting soils or topsoil loss is evident in areas prone to wind erosion, postpone topsoil stripping until 3 days before trenching. If this is not practical:

- limit the time between topsoil stripping and final cleanup
- suspend topsoil stripping and backfill operations during high winds
- apply a tackifier to the topsoil pile
- install wind barriers, e.g., slat fences, snow fences

Tackifier

Apply tackifier solution to topsoil piles at a minimum rate of 1.4 L/m^2. The solution should contain at least 0.5 L/m^2 of concentrated tackifier (ER-2000 or company approved alternative).

If directed, also apply tackifier solution to the unstripped work side at a minimum rate of 2.25 L/m^2 for the initial application. This solution should contain at least 1.1 L/m^2 of concentrated tackifier.

For subsequent applications to the work side, reduce the solution concentration to 0.5 L/m^2 of concentrated tackifier.

Adjacent Hot Lines

When stripping topsoil over adjacent hot lines, use (a) a grader with a basic operating weight not exceeding 40,500 lbs and a maximum axle loading of 18,000 lbs per axle, or (b) a company approved equivalent.

CAUTION: Do not strip topsoil over hot lines within a swamp or slough, or within 6 m of a protective sleeve.

Maintain a minimum of 0.76 m of cover over hot lines, reducing the depth of topsoil stripping if necessary. Where there is 0.83 m or less of cover over the existing pipeline before stripping, suspend stripping. Instead, place a protective covering over the topsoil in the spoil area to prevent mixing topsoil and subsoil (e.g., matting, sheeting).

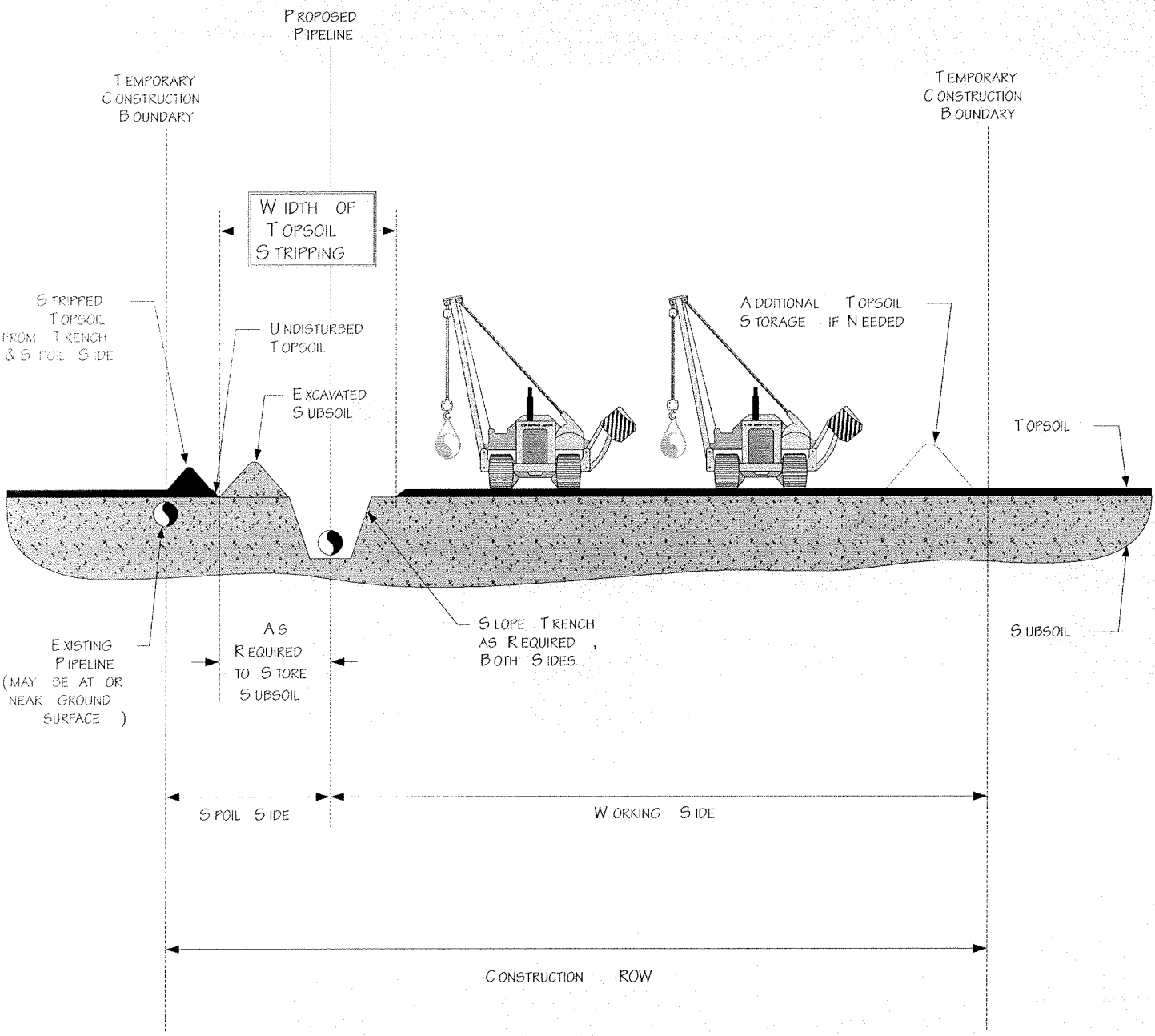

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Figure 1

Typical Topsoil Segregation
Ditch Plus Spoil Side

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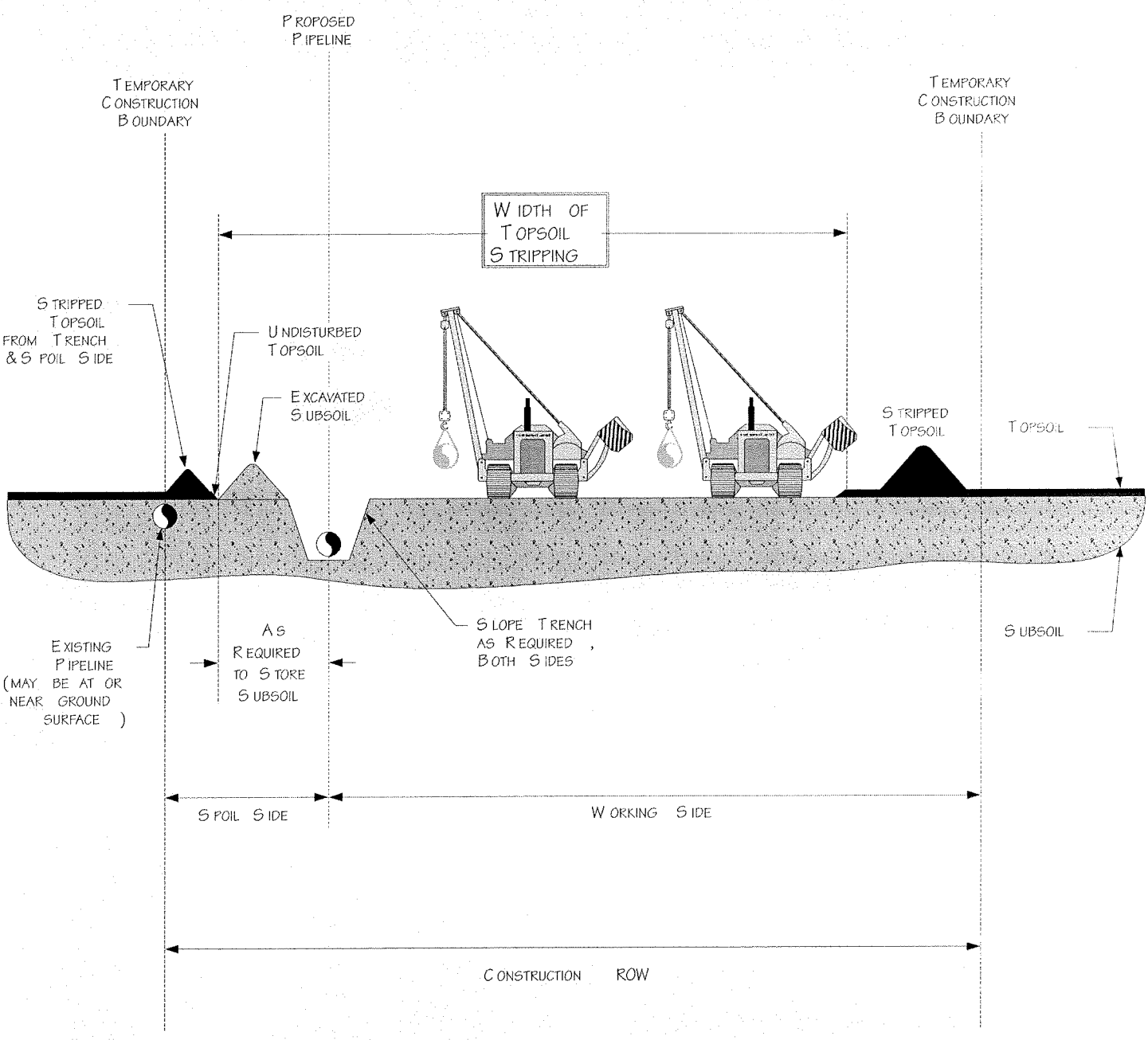

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Figure 2

Typical Topsoil Segregation
Full Right-of-Way

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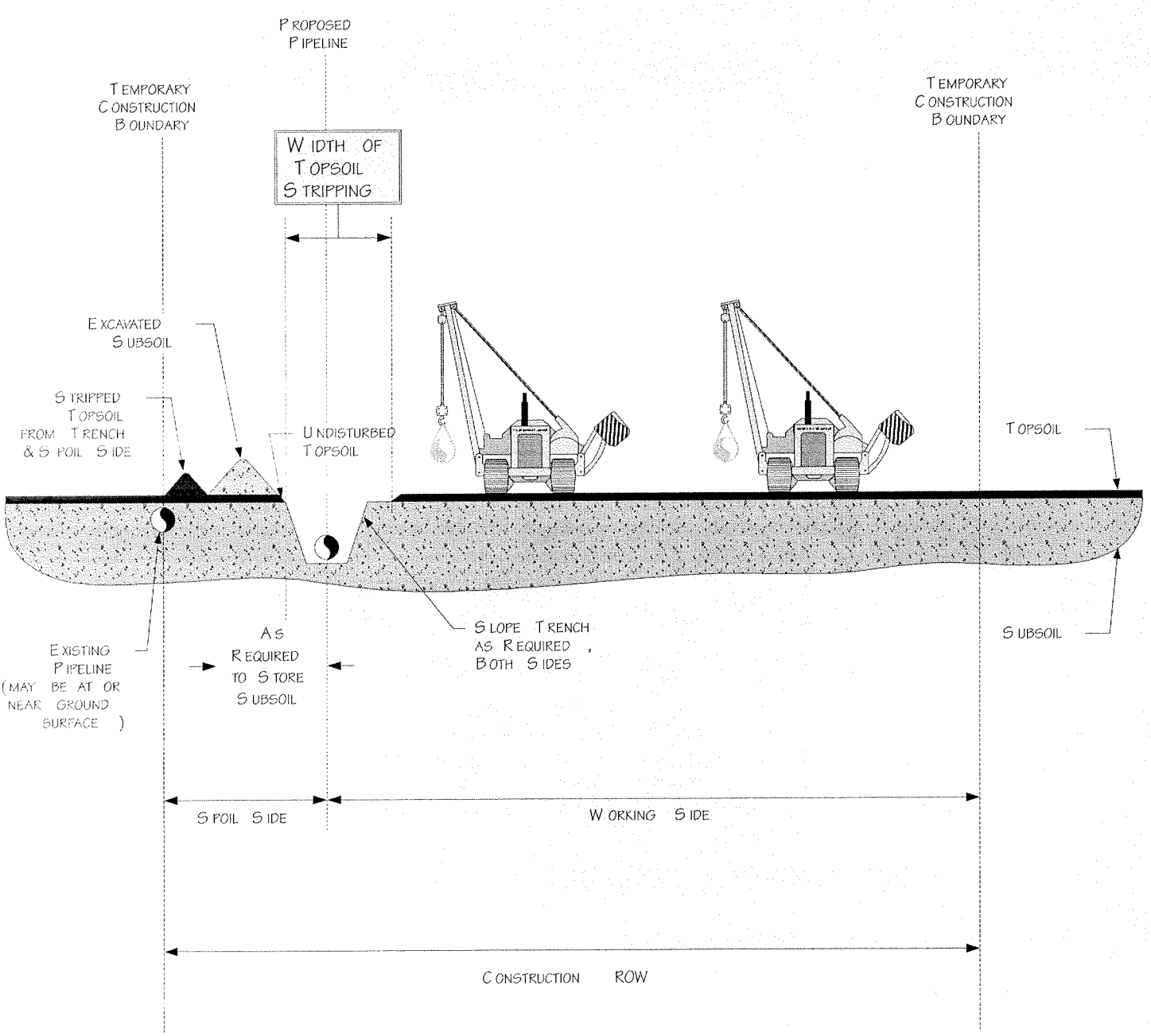

NOTES :

1. TRENCH LINE ONLY TOPSOIL SEGREGATION TYPICALLY EMPLOYED IN UNSATURATED WETLANDS, HAYLAND, PASTURES, AND RESIDENTIAL AREAS UNLESS OTHERWISE SPECIFIED BY THE LANDOWNER.

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Figure 3

Typical Topsoil Segregation
Trench Line Only

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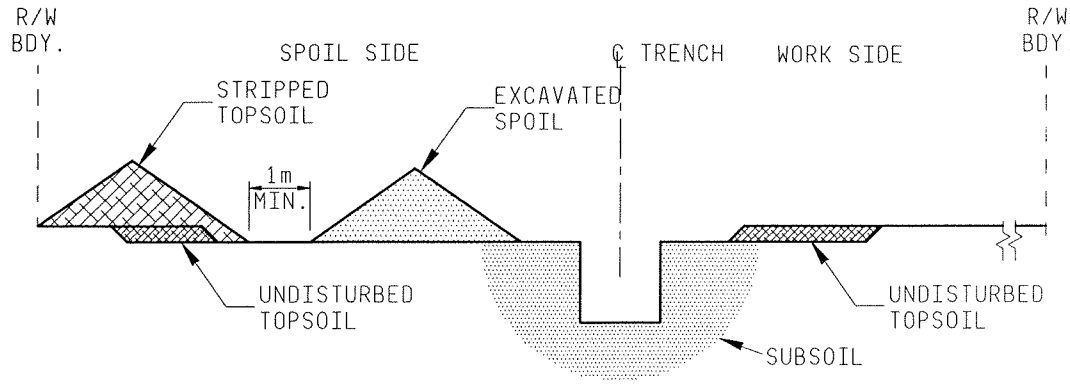
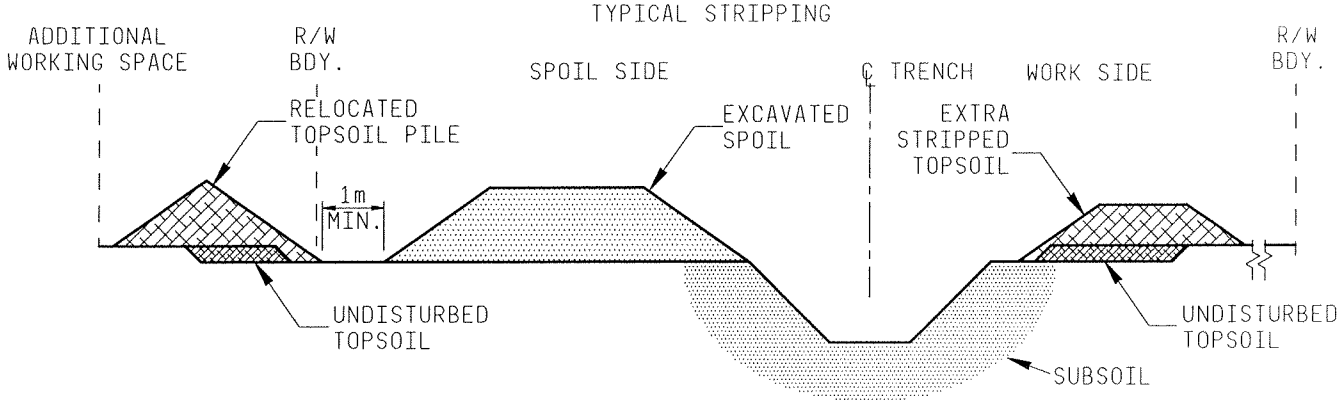


PROFILE
TYPICAL STRIPPING



PROFILE
EXTRA STRIPPING

NOTES:

1. SUSPEND TRENCHING IF UNSTABLE TRENCH IS ENCOUNTERED. WELD-UP PIPE PRIOR TO CONTINUING TRENCHING TO MINIMIZE TIME OF AN OPEN TRENCH.
2. STRIP EXTRA WIDTH IF TRENCH WALLS DO NOT STAND UP AND TOPSOIL AND SUBSOIL SLOUGH INTO TRENCH OR A WIDER OR DEEPER TRENCH IS OTHERWISE NEEDED.
3. OBTAIN EXTRA WORKING SPACE ON SPOIL SIDE.
4. SALVAGE TOPSOIL PILE ON THE SPOIL SIDE AND RELOCATE TO THE EDGE OF EXTRA WORKING SPACE.
5. STRIP EXTRA TOPSOIL ON WORK SIDE AND FLATTEN AS REQUIRED FOR PIPE SET-UP AREA.
6. EXCAVATE TRENCH TO ANGLE OF REPOSE OF SUBSOIL. STORE ON SPOIL SIDE.
7. MAINTAIN 1.0m SEPARATION BETWEEN SPOIL PILE AND TOPSOIL PILE.

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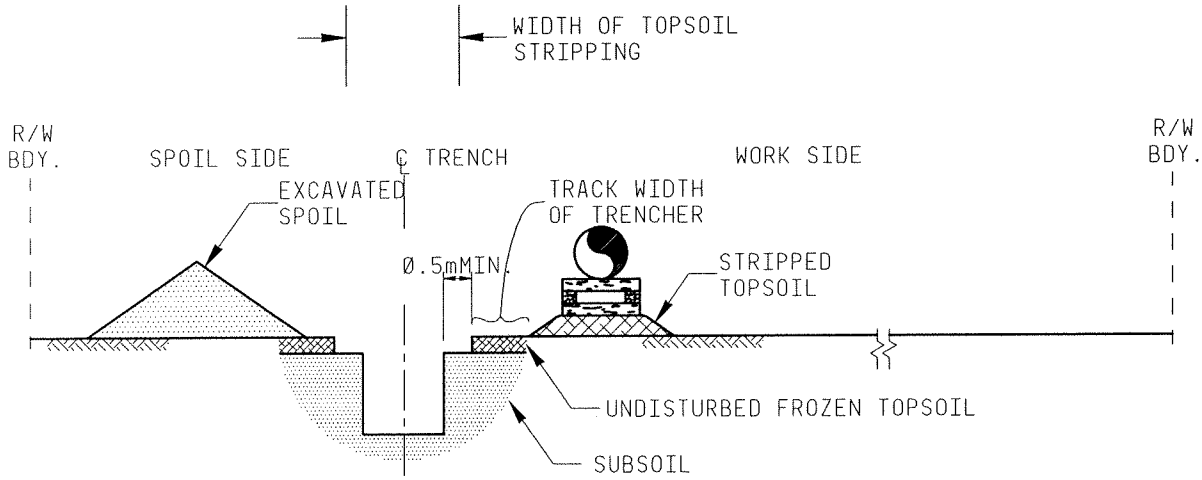
Figure 4

Unstable Trench with Trench and Spoil Area Topsoil Stripping



PROFILE

NOTES:

1. UTILIZE WINTER WIDTH STRIPPING ON SOLID FROZEN GROUND WHERE A SOD LAYER, A SNOW BARRIER OR GROUND SURFACE WILL PREVENT MIXING OF TOPSOIL AND SPOIL.
2. STRIP TOPSOIL WIDER THAN THE TRENCH USING A MODIFIED BUCKET WHEEL TRENCHER OR A STEP BLADE PRECEEDED BY A RIPPER. MULTIPLE PASSES WITH THE RIPPER ARE PREFERRED TO A SINGLE PASS TO THE FULL STRIPPING DEPTH.
3. STRIPPING WIDTH SHOULD BE 1m WIDER THAN AND CENTERED OVER THE TRENCH. STRIPPING DEPTH SHOULD BE 10cm MIN. TO THE COLOR CHANGE OR AS INDICATED ON THE AIRPHOTO MOSAIC OR LINE LIST.
4. STORE TOPSOIL ON WORKING SIDE OF THE TRENCH SET BACK TO ALLOW THE TRACKS OF THE TRENCHER TO OPERATE ON LEVEL GROUND. LEAVE BREAKS IN TOPSOIL AT DRAINAGE COURSES.
5. EXCAVATE TRENCH CENTERED WITHIN STRIPPED AREA AND STORE ON SPOIL SIDE.
6. COMPLETE STRINGING, WELDING AND LOWERING-IN ACTIVITIES
7. RETURN EXCAVATED SPOIL TO TRENCH AND LEAVE A HIGH CROWN CENTERED OVER THE TRENCH LINE. ALLOW BACKFILL MATERIAL TO THAW IN THE SPRING. COMPACT NONFROZEN MATERIAL IN PLACE. NO CROWN SHOULD BE EVIDENT.
8. RETURN TOPSOIL EVENLY OVER THE TRENCH LINE.
9. ALLEVIATE COMPACTION OF TOPSOIL OVER ENTIRE RIGHT OF WAY ON CULTIVATED LANDS. SEED DISTURBED AREA WITH A COMPATIBLE SEED MIX AND FERTILIZE ON PASTURE , HAY AND NONCULTIVATED LANDS.

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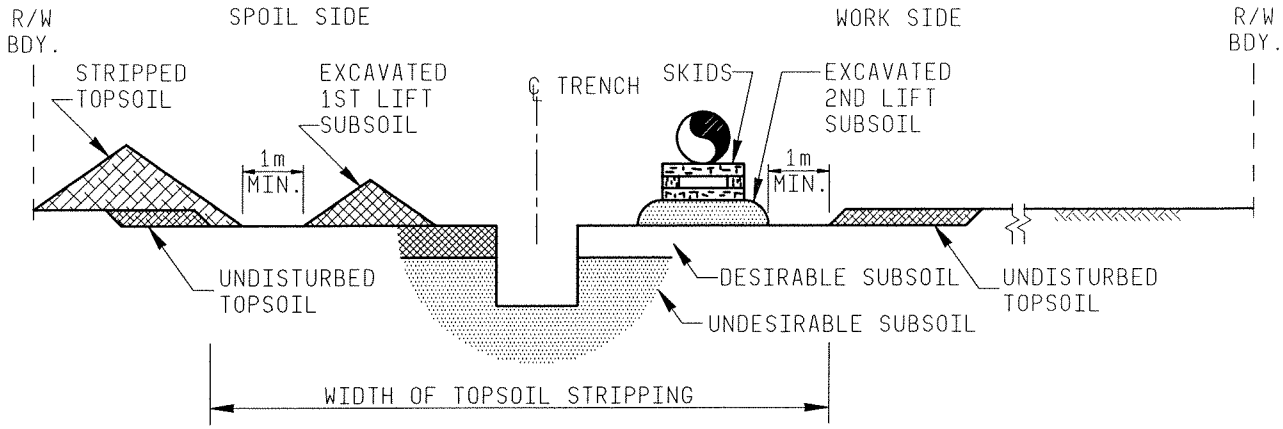
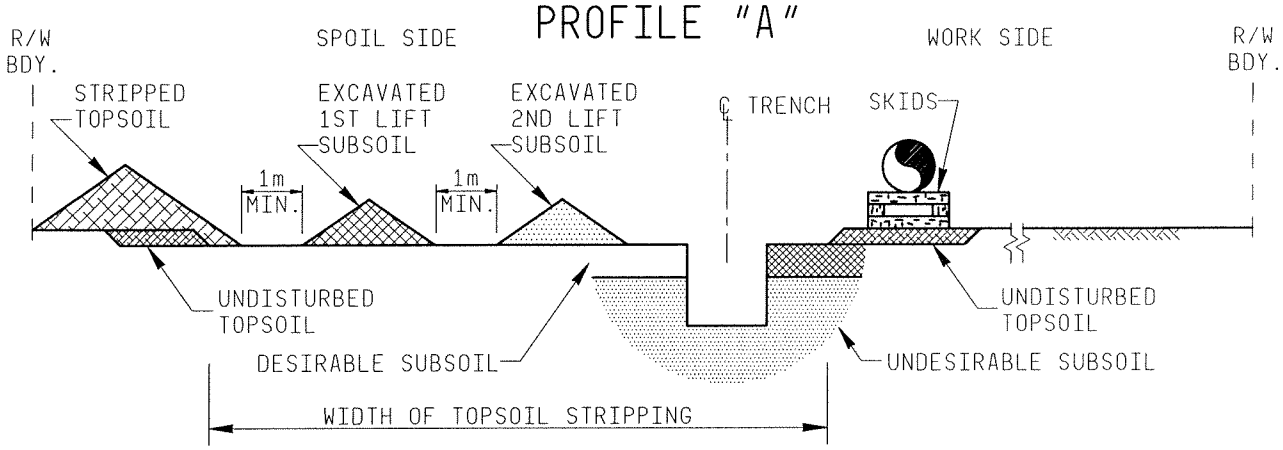
Figure 5

Topsoil Stripping - Trench Area
Winter Construction



PROFILE "A"



PROFILE "B"

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Figure 6

Three Lift Soil Handling
Non-Frozen Conditions

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TEMPORARY EROSION and SEDIMENTATION CONTROL 02–6

Purpose

Temporary erosion and sedimentation control measures include slope breakers, sediment barriers, trench breakers and mulch. The purpose of erosion and sedimentation control is to (a) contain excavated soils onsite and to (b) prevent construction-related sediment from entering streams, wetlands, lakes, drainage ditches (dry or flowing) or other watercourses.

NOTE: For information on specific temporary control measures, see the procedures in this tab.

Guidelines

Soil erosion is determined by four main factors:

- soil characteristics
- vegetative cover
- topography
- climate

Soil Characteristics

Analyze soil conditions at the site to help determine erosion control measures. The most erodible soils have a high content of silt and very fine sand. The least erodible soils have little or no silt, e.g., well-drained gravel and sand.

Although soils with a high content of clay are more resistant to erosion, these soils have poor infiltration and therefore runoff tends to increase resulting in erosion. In addition, clay soils are easily transported and do not settle out very quickly.

Vegetative Cover

Maintain existing vegetation on areas with high erosion potential whenever possible, e.g., slopes, drainage ways or next to streams and wetlands. Vegetative cover (e.g., grass, weeds, shrubs, crops) is important in controlling erosion because it:

- shields the soil surface
- slows runoff
- maintains the capacity of the soil to absorb water
- holds soil in place

Topography

Protect disturbed slopes from runoff and revegetate quickly. Where possible, leave steep slopes undisturbed. Topography is important in controlling erosion because as the slope length and gradient increases, the volume and velocity of runoff increases and the potential for erosion increases.

Climate

Climate affects the frequency, intensity and duration of rainfall. Where possible, schedule work during periods of low precipitation and runoff.

NOTE: For more information on scheduling projects, see 01-3, Project Scheduling.

Principles of Erosion and Sedimentation Control

Keep disturbed areas small and minimize the length of time they are disturbed.

Stabilize and protect disturbed areas as soon as possible.

Keep storm water runoff velocities low.

Protect disturbed areas from storm water runoff.

Retain sediment within the corridor or site area.

Temporary Control Measures

All temporary control measures must be:

- properly installed
- installed immediately after initial disturbance
- reinstalled where required, e.g., after backfill
- inspected and properly maintained (i.e., repaired, replaced or supplemented with functional materials) throughout construction until permanent erosion control is established or restoration is complete

GRADING 02–7

Purpose

Grading generally follows clearing and involves leveling and smoothing the construction right-of-way (ROW) to create an even working surface for equipment and vehicles. Grading can disturb the surface more than any pipeline activity. Cutting and replacing steep slopes may lead to long term instability and erosion, which may threaten integrity of the pipeline. In addition, grading and erosion near streams may damage riparian habitats and result in siltation of aquatic habitats. Finally, berming snow or organic matter over the trench line during winter construction can temporarily block the movement of wildlife and livestock.

Guidelines

Before grading, ensure erosion control measures are in place at watercourses.

Minimize grading and grade changes that require excessive cuts and fills. Grade only as necessary to provide an adequate surface for construction equipment, and to allow overbends and sag bends to be made within permissible bending limits.

Do not store or push graded materials into treed areas. Store graded spoil in discrete piles or windrows for replacement during cleanup (see Figure 1, Cut and Fill Grading).

Minimize grading on hay or improved pasture and native prairie to minimize disturbance to the sod.

Slopes

Minimize grading on steep slopes. Limit grading to allow access for tracked vehicles only. Rubber-tired traffic must use temporary access trails.

Do not place graded material on steep slopes or closer than 20 m (60 ft) from the crests of slopes. Cuts and fills should not exceed 1:3 slope (rise over run). Do not store graded spoil in low areas.

Ensure graded material does not spread off the ROW.

Do not mix topsoil and subsoil disturbed during grading with foreign material, e.g., stumps and brush.

Two-tone the ROW to limit the need for deep cuts and additional temporary work space on sidehills (see Figure 2, Two Toning Grading).

Watercourses and Wetlands

Minimize disturbance to natural drainage channels during grading; avoid blocking channels with graded material—install a culvert.

Restrict grading to the trench line and work area where possible. Minimize grading when constructing temporary bridges or fill crossings. Ice bridges and fords may require additional grading.

Direct grading away from watercourses to reduce the risk of material entering the watercourse. Do not place fill material in a watercourse during grading.

Grading equipment must not be operated directly in watercourses or must not directly cross watercourses.

Minimize grading within the 16 m (50 ft) buffer of undisturbed vegetation on each stream bank. If grading within the buffer, install temporary sediment barriers to prevent sediment from disturbed areas from flowing into the stream (see 02-14, Temporary Sediment Barriers).

Immediately after grading, install temporary slope breakers or silt fences at the base of slopes leading to streams or wetlands (see 02-13, Slope Breakers and 02-14, Temporary Sediment Barriers).

Snow

As soon as wetlands or muskegs are sufficiently frozen to support light construction equipment, remove snow from the working side of the proposed line to increase frost penetration.

Windrow snow over the trench line to prevent deep frost penetration along the trench line.

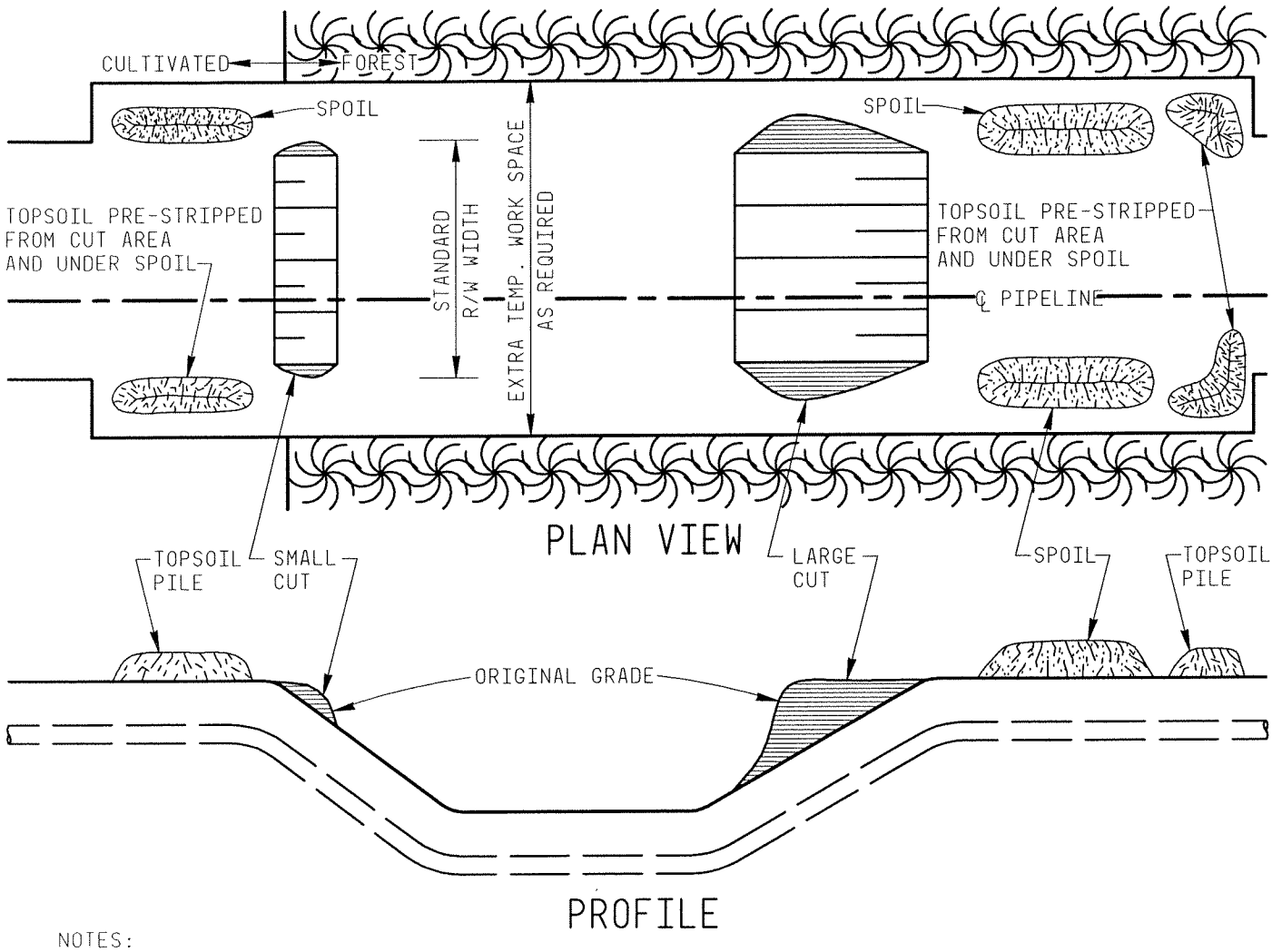
Remove large amounts of snow from the spoil storage area to facilitate removing spoil during backfilling and to avoid mixing snow with the backfill.

NOTE: With landowner permission, windrow snow off the ROW.

Immediately before ditching, windrow surplus snow and any snow bermed over the trench line to the closest side of the ROW.

If necessary to contain spoil during construction, use snow berms at the edge of the ROW. If snow berms are not feasible or could lead to mixing snow in the backfill material, install silt fence or hay bales.

Leave 3 m (10 ft) wide gaps at regular intervals (every 400 m or ¼ mi) in snow windrows greater than 0.75 m (30 in.) in height, to allow movement of wildlife and livestock.



NOTES:

1. GRADE EXCESSIVELY STEEP SLOPES TO PROVIDE A SUITABLE SURFACE FOR MOVEMENT OF CONSTRUCTION EQUIPMENT AND TO ALLOW OVERBENDS AND SAGBENDS TO BE MADE WITHIN PERMISSIBLE BENDING LIMITS. ON WINTER PROJECTS, USE SNOW TO SMOOTH OUT THE WORKING SIDE IF POSSIBLE.

2. IDENTIFY AREAS WHERE ADDITIONAL RIGHT OF WAY IS REQUIRED TO ACCOMMODATE CUTS AND FILLS. SALVAGE MERCHANTABLE TIMBER AND TOPSOIL. MAINTAIN A MINIMUM 1m SEPARATION BETWEEN TOPSOIL AND SPOIL PILES.

3. GRADE SLOPES SUFFICIENTLY TO MINIMIZE INSTABILITY AND RESULTANT EROSION AND PIPE INTEGRITY PROBLEMS.

4. STORE FILL UPHILL OF CUT WHERE IT CAN BE EASILY RECOVERED AND WHERE NATURAL DRAINAGE IS NOT BLOCKED.

5. STORE FILL ON LEVEL GROUND BACK FROM UPPER BREAK OF SLOPE TO AVOID OVERLOAD AND POTENTIAL FAILURE. OBTAIN ADVICE FROM A GEOTECHNICAL ENGINEER.

6. REPLACE CUTS AND RECONTOUR SLOPES DURING CLEAN-UP TO MAXIMUM 3:1 GRADE UNLESS OTHERWISE DIRECTED BY GEOTECHNICAL ENGINEER.

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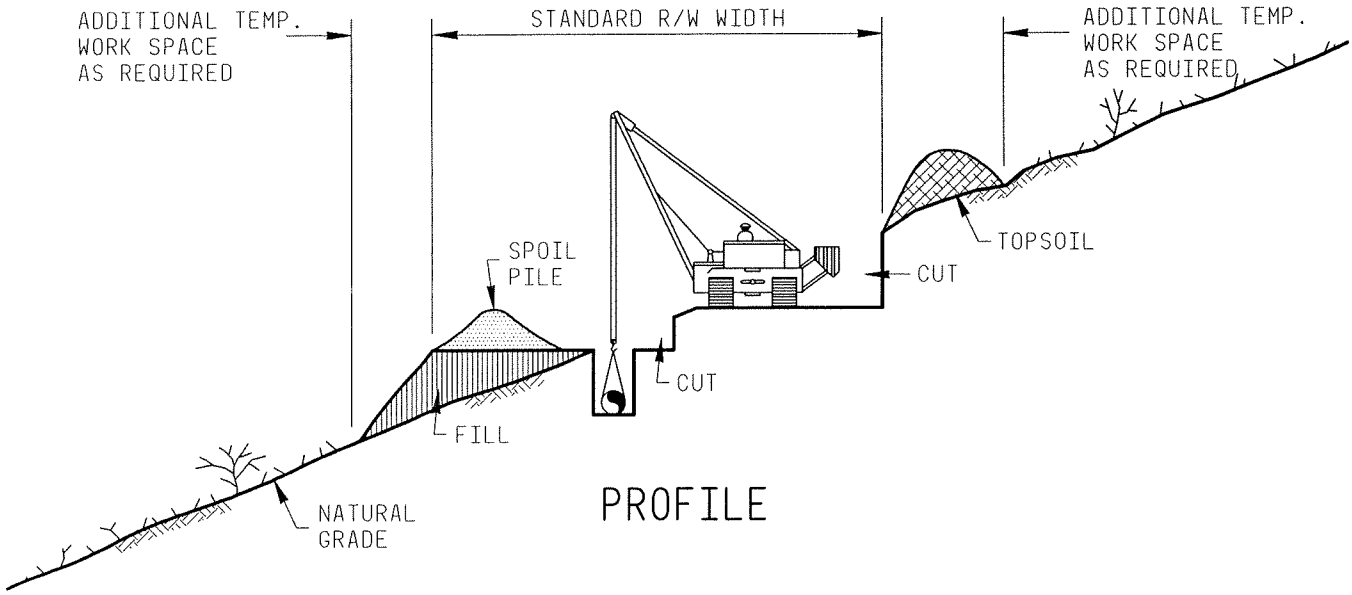
Figure 1

Cut and Fill Grading



PROFILE

NOTES:

1. TWO-TONE THE RIGHT OF WAY TO LIMIT THE NEED FOR EXCESSIVELY DEEP CUTS AND FILLS AND TO MINIMIZE THE NEED FOR ADDITIONAL TEMPORARY WORK SPACE ON SIDEHILLS.
2. CLEAR AND STAKE ADDITIONAL TEMPORARY WORK SPACE TO ALLOW FOR EXTRA SPOIL.
3. ENSURE SIDE BOOM TRACTORS ARE EQUIPPED WITH BOOM EXTENDERS AND COUNTERWEIGHTS IF REQUIRED.
4. USE BACKHOE TO ASSIST BULLDOZERS WITH REPLACING CUTS. RECONTOUR TO MAXIMUM 3:1 GRADE UNLESS OTHERWISE DIRECTED BY GEOTECHNICAL ENGINEER.
5. EXCESS FILL MAY BE PUSHED FORWARDS OR BACKWARDS TO RAMP APPROACH SLOPES OR DRAWS IN THE SIDE SLOPE.

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Figure 2

Two-Toning Grading

TRENCHING 02–8

Purpose

Trenching (pipe installation) involves stringing pipe, welding, ditching and lowering the pipe into the excavation. Excavating the trench for the pipeline is typically done using backhoes or a wheel ditching machine. Spoil (subsoil) from the trench is piled near the trench opposite the working side.

Pipe stringing involves unloading pipe from heavy trucks onto skids in preparation for welding. After pipe stringing is complete, the pipe is bent as necessary to conform to changes in ground contour and pipeline alignment. Pipe joints are then welded together and the welds are nondestructively tested. After the welds are coated with a material as protection from corrosion, pipe sections are lowered into the trench.

These activities have the potential to cause soil mixing and compaction, and can interfere with farming activities and wildlife.

Guidelines

Scheduling

During winter construction, ensure the frost is deep enough to proceed without causing excessive rutting and soil compaction.

If excessive rutting and compaction are expected, postpone heavy traffic until soils freeze or dry.

Coordinate with landowners to minimize disruption of access caused by trenching or pipe stringing.

NOTE: For more information on scheduling construction activities, see 01-3, Project Scheduling.

Minimize the length of time a trench is open to limit trench sloughing or frost penetration, and disruption to wildlife, agricultural activities and other land uses.

Pipe Stringing

Confine stringing trucks to the stripped portion of the ROW as much as practical.

Limit heavy equipment to machinery and vehicles equipped with low-ground pressure tires or wide tracks. If ground conditions are too soft to support stringing trucks, consider using specialized equipment such as tracked flat beds or Rolligons.

If low-ground pressure equipment is not used and ground conditions on the ROW are unstable, use geotextile or corduroy to improve the bearing capacity of soft ground.

NOTE: Do not use tree stumps, bush riprap, imported dirt or rock fill to stabilize the ROW for vehicle traffic.

Welding

Do not leave spent welding rods, filings/shavings from end preparation, or cut off pipe rings on the ground or in the trench.

Provide receptacles (e.g., garbage cans, steel drums) for disposal of welding rods and other refuse at strategic locations.

Shut down welding during high winds in high fire hazard areas.

If requested by the landowner or the regulatory agency, leave gaps in continuous welded sections every 500 m (1/3 mi) to allow passage of livestock, farm equipment and wildlife.

Ditching Equipment

To minimize spoil storage requirements:

- match the trench width to the pipe size and soil conditions during trenching
- maximize the use of wheel ditchers
- minimize the amount of backhoe work

Unstable Trench Walls

If trench walls or topsoil slough into the trench or there is a potential for mixing topsoil with subsoil, suspend trenching and increase the width of stripped topsoil.

NOTE: For more information, 02-5, Topsoil Stripping and Segregation

Delay trenching in areas with a high water table or where there is a risk of sloughing until just before lowering in the pipe.

NOTE: Before trenching, consider installing well points around the site to intercept groundwater before it enters the trench.

Gaps and Plugs

Leave gaps in the spoil pile at natural drainage channels to accommodate surface runoff.

If requested by the landowner, leave gaps in strung pipe and in topsoil and spoil piles, with corresponding plugs in the ditch to allow vehicle access or movement of livestock and wildlife across the ROW. Consult with landowner regarding the location of gaps (recommended minimum width of the plug and gap is 3 m (10 ft) (see Figure 1, Two-Toning Grading and Topsoil and Spoil Piles).

Ripping

Rip bedrock where encountered and where adequate equipment is available. Ripping is preferred over blasting.

Blasting

Follow explosive laws and regulations where blasting is necessary.

Use blasting mats to prevent damage from rock fragments. Immediately collect any displaced rock from the vicinity of residences, highways, utilities, structures, and cultivated or improved lands. Dispose of excess rock by windrowing, scattering, placing in discrete piles or as directed by landowners or regulatory agencies.

Collect and dispose of shot cord, caps, cones and other debris associated with blasting in accordance with the Waste Management Plan.

If blasting is required within 50 m of a fish-bearing watercourse, contact the environment department.

Drain Tiles

Excavate the trench so that the pipeline may be laid over or under the tile with a minimum clearance of 30 cm (12 in.).

If drain tiles are cut during trenching:

- identify the location of the damaged tile at the trench and at both sides of the construction ROW
- install a temporary flume if needed to maintain drainage
- cap the ends to prevent clogging drains with dirt or debris

NOTE: Keep plugs in place until the damaged tile is repaired (see 03-2, Backfilling).

Road and Rail Crossings

Where soil and topographic conditions permit, bore public road and rail crossings to prevent disturbing the crossing and disrupting service (see Figure 2, Road Crossing-Boring). As circumstances dictate, also consider boring for irrigation canals, selected watercourses, shelterbelts, roadside trees and foreign lines.

If boring a road is impeded by topography, rock, gravel or organic material, and if rerouting is impractical, obtain the consent of local authorities to open cut the road.

Minimize the time crossings are left open.

Notify road owners and users, and construct detours as necessary. Install safety barricades, fences, signs and flashers around open road crossings and bellholes adjacent to the road.

Watercourses and Wetlands

Since water crossings are usually handled by a separate crossing or tie-in-crew, stop trenching crew activities before the buffer zone at the watercourse banks.

Use backhoes or draglines operated from one or both stream banks or from bridges to excavate the trench. As much as possible, store instream spoil on the stream bank within a straw bale/silt fence containment area (see 02-6, Temporary Erosion and Sedimentation Control).

Locate crossing pipe tie-ins and any bends requiring tie-ins at least 10 m (35 ft) from stream banks to minimize disturbance from bell holes.

If excavating equipment must encroach into the stream, it must operate on a sled or clean construction mats.

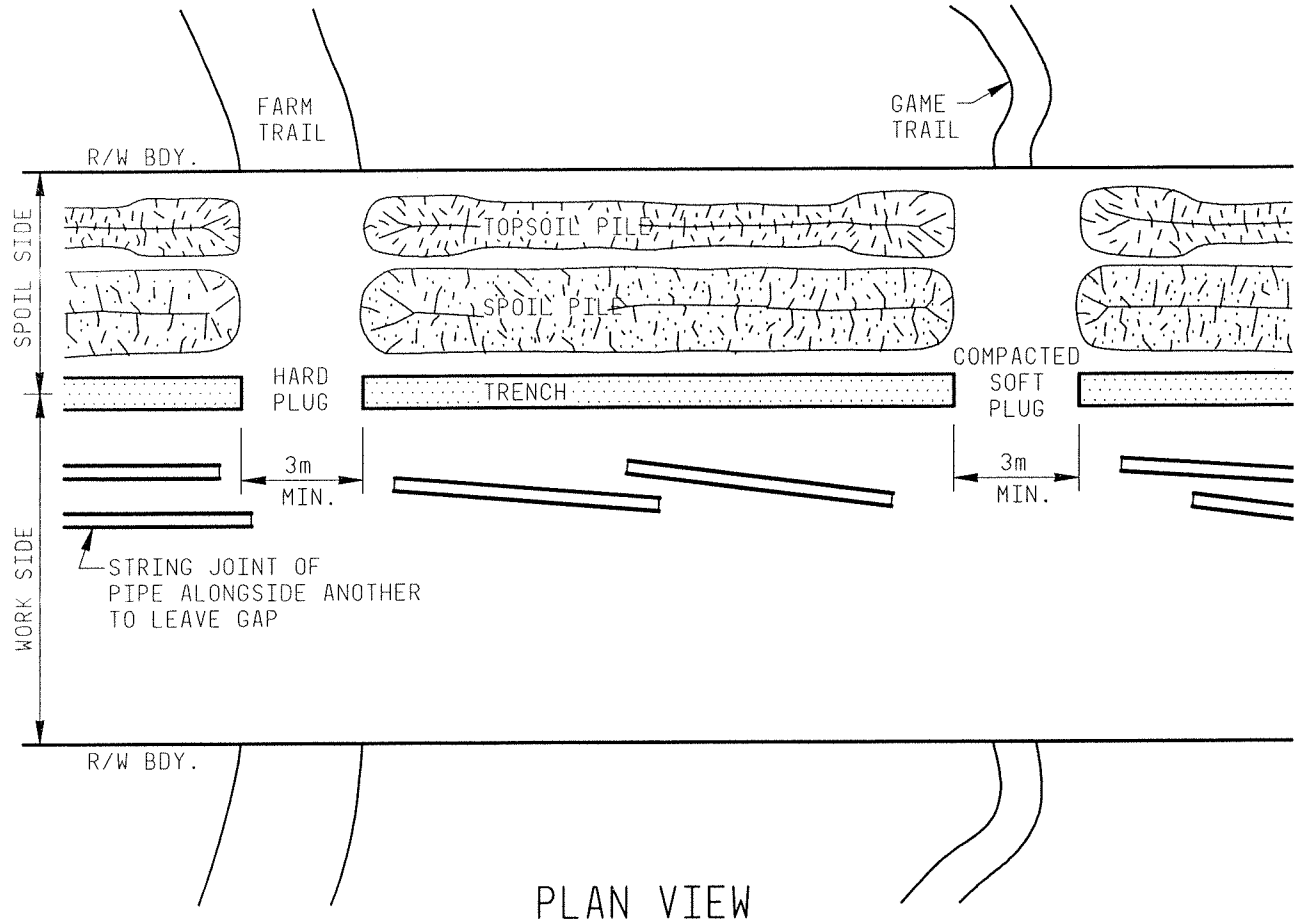
To facilitate trench excavation in saturated soils, timber mats may be placed over the ditch line to support the backhoe.

If the watercourse is wider than what can be trenched with a hoe entering the water, place insert spoil in discrete piles away from the areas of highest water velocity. Do not windrow soil across the stream channel or block more than two-thirds of the channel.

Install 3 m (10 ft) hard plugs in the ditchline to separate the crossing trench from the open trench on the stream banks. Before removing hard plugs, install soft plugs where necessary to prevent silty trench water from entering the watercourse. Dewater the trench onto stable, well-vegetated uplands (see 02-17, Dewatering).

Trench Breakers

Where the pipeline trench has the potential to partially drain a wetland, install trench breakers as necessary to maintain the original wetland hydrology (see 02-15, Trench Breakers).



PLAN VIEW

NOTES:

1. LEAVE GAPS IN STRUNG PIPE, TOPSOIL AND SPOIL PILES TO PERMIT VEHICULAR ACCESS OR MOVEMENT OF LIVESTOCK AND WILDLIFE ACROSS THE RIGHT OF WAY. CONSULT WITH LANDOWNER REGARDING LOCATION OF GAPS.

2. LEAVE GAPS AT DRAINAGE COURSES, WILDLIFE TRAILS AND IF REQUESTED, LIVESTOCK TRAILS.

3. GAPS IN STRUNG PIPE SHOULD COINCIDE WITH GAPS LEFT IN TOPSOIL, SPOIL PILES, AND WITH HARD PLUGS IN TRENCH.

4. INSTALL A COMPACTED SOFT PLUG WHERE TRENCHING HAS ALREADY BEEN COMPLETED.

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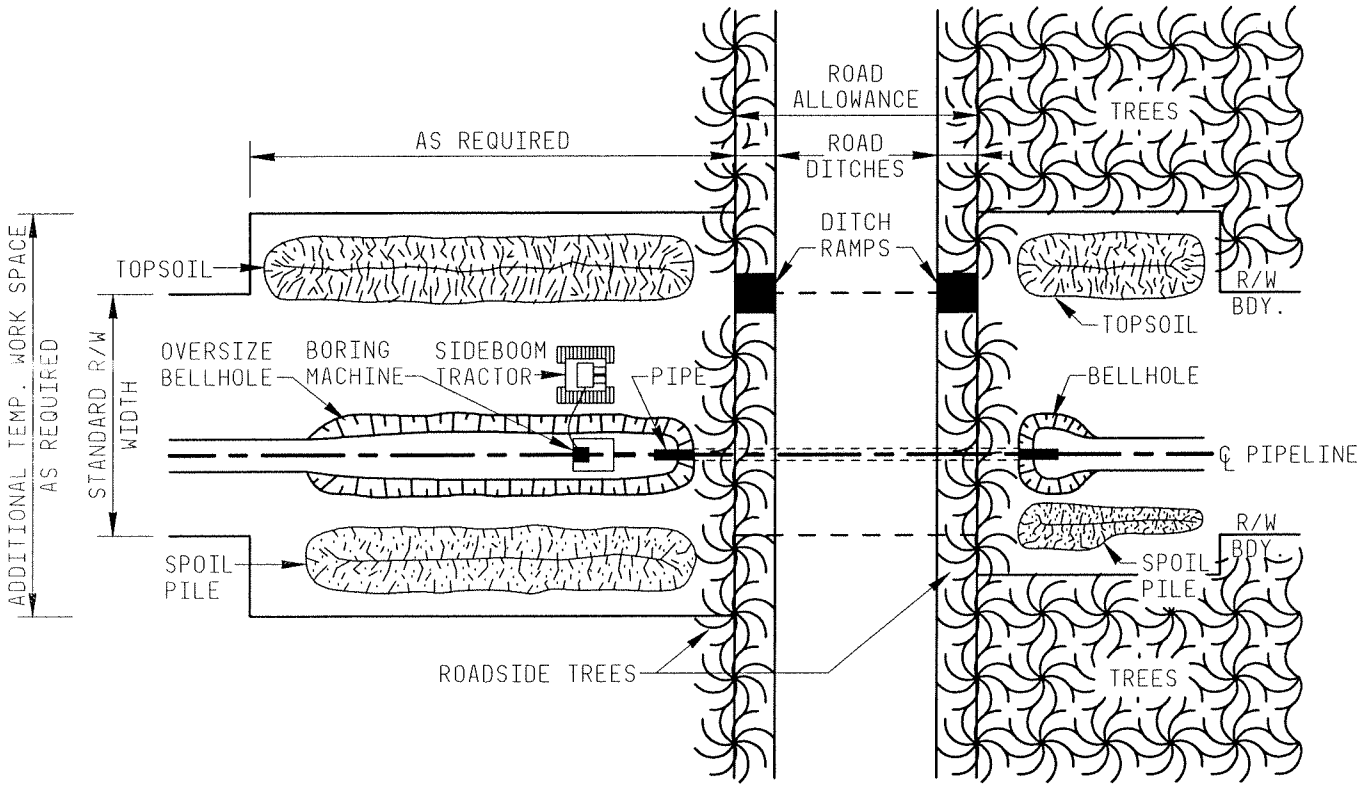
Figure 1

Two-Toning Grading
and Topsoil and Spoil Piles



PLAN VIEW

NOTES:

1. BORE PUBLIC ROAD CROSSINGS AND RAIL LINES TO PREVENT DISTURBANCE TO THE ROAD OR RAIL BED AND DISRUPTION OF SERVICES. BORING SHOULD ONLY BE PERFORMED WHERE SUBSOILS PERMIT. CONSIDER BORING IRRIGATION CANALS, SELECTED WATERCOURSES AND SHELTER-BELTS. CONTINUE BORING BEYOND ROADSIDE SHELTER WHERE POSSIBLE.
2. ACQUIRE AND MARK ADDITIONAL TEMPORARY WORK SPACE.
3. EXCAVATE BELLHOLE. STORE ON OPPOSITE SIDE OF RIGHT OF WAY, USE GRADED MATERIAL FOR DITCH RAMPS.
4. COMPLETE BORING AND TIE-IN TO MAINLINE.
5. BACKFILL AND COMPACT. LEAVE A CROWN TO ALLOW FOR SUBSIDENCE.
6. RESEED AND FERTILIZE AS APPROPRIATE.

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Figure 2

Road Crossing - Boring

FENCES and TEMPORARY GATES 02–9

Purpose

Before or during clearing of the right-of-way (ROW), existing fences and livestock barriers are cut or dismantled as necessary to allow access for construction equipment. In addition, temporary gates and/or fences are installed where required to restrict access to the right-of-way (ROW) and to control livestock movements. Temporary gates and fences remain in place until construction is complete, when permanent repairs or new fencing can be installed.

Improper cutting or replacement of wire fences can cause wires to slacken along the fence, possibly leading to livestock escaping and inconvenience to landowners. Similar problems may occur if gates are left open or if temporary fencing is not supplied where required.

Requirements

Bracing

Before cutting a wire fence, brace and secure the fence on each side of the new opening to maintain tension in the rest of the fence.

NOTE: Double end braces are especially necessary for high tension suspension fences in order to resist the fence tension.

Guidelines

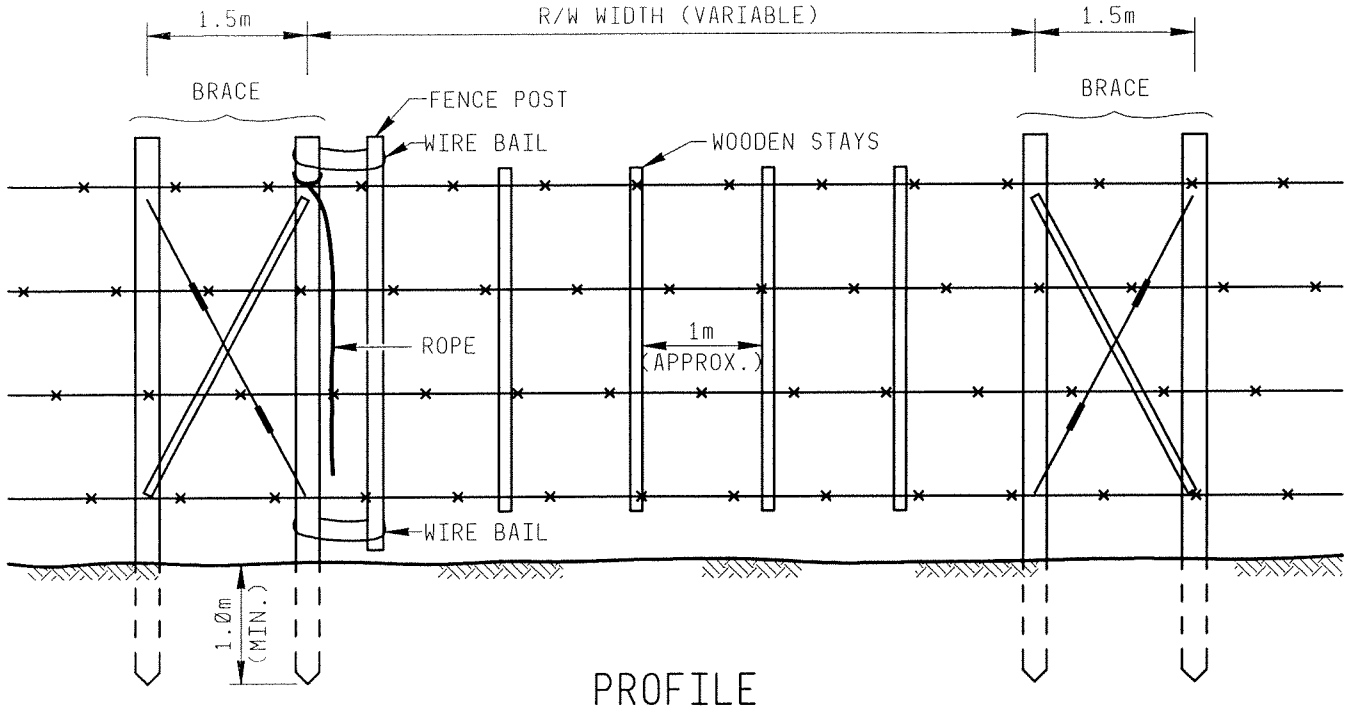
Make arrangements with landowners to keep livestock in fields not traversed by the ROW, if practical.

Carefully dismantle and store all unique fences (e.g., stump, stone or rail) for later reassembly.

Before dismantling or cutting fences, obtain consent from landowners, tenants or regulatory authorities, if practical.

Equip gates with facilities or construct them in a manner such that one worker can open and close the gates (see Figure 1, Temporary Wire Gate).

Install temporary fencing and gates of equal or better quality material as the original, where practical or as directed by the landowner.



PROFILE

NOTES:

1. INSTALL TEMPORARY GATES WITHIN ALL EXISTING FENCES CROSSING THE RIGHT OF WAY.
2. OBTAIN CONSENT OF LANDOWNER, TENANT OR GOVERNMENT AUTHORITY PRIOR TO CUTTING THE FENCE. CUT FENCE PRIOR TO ANY SUBSEQUENT CONSTRUCTION ACTIVITY.
3. BEFORE CUTTING THE FENCE, BRACE AND SECURE THE FENCE ON EACH SIDE OF THE NEW OPENING TO MAINTAIN TENSION IN THE REST OF THE FENCE. USE MATERIAL OF EQUAL OR BETTER QUALITY FOR THE BRACE. SALVAGE POSTS AND WIRE IF IN GOOD CONDITION.
4. INSTALL TEMPORARY GATE AS REQUIRED.
5. EQUIP GATES WITH FACILITIES OR CONSTRUCT THEM IN SUCH A MANNER THAT ONE WORKER CAN OPEN AND CLOSE THE GATE.
6. KEEP GATE CLOSED AT ALL TIMES EXCEPT DURING PASSAGE OF PEOPLE AND EQUIPMENT TO PREVENT LIVESTOCK FROM ENTERING OR LEAVING THE PROPERTY. IF NECESSARY, ASSIGN A WATCHMAN TO ENSURE GATE CLOSURE.
7. REMOVE TEMPORARY GATE AND REPLACE FENCE WITH MATERIAL OF EQUAL OR BETTER QUALITY FOLLOWING CONSTRUCTION UNLESS OTHERWISE REQUESTED BY LANDOWNER.

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Figure 1

Temporary Wire Gate

INSPECTION and MONITORING 02–10

Purpose

Environmental inspections during construction ensure compliance with applicable legislation and the terms and conditions of project approval by regulators. The company may be subject to fines or lawsuits if agreements with landowners or regulatory requirements are not fulfilled.

Requirements

Environmental Inspector

The company determines whether to appoint an environmental inspector for the entire project or for sensitive phases of the project (e.g., topsoil stripping, watercourse construction, cleanup), depending on:

- environmental sensitivity of the terrain
- complexity of environmental protection measures
- regulatory requirements

The company must employ qualified environmental inspectors to oversee construction activities. The environmental inspector must have:

- sufficient environmental knowledge to make appropriate field decisions
- sufficient pipelining experience to understand the constraints of construction

If an environmental inspector is not appointed, a company representative or supervisor must assume the responsibilities of the environmental inspector.

Specialists

Specialists, such as geotechnical engineers, archaeologists or drainage tile engineers, may be assigned or made available as required to inspect or monitor project activities.

Prejob Information

Before project activities begin, environmental inspectors must be briefed on the project and made aware of any special situations or areas of concern.

Before beginning project activities, environmental inspectors and contractors must have all relevant documents, including the most recent updates, revisions, amendments, conditions and requirements.

NOTE: For more information on prejob meetings, see 01-2, Planning and Preparation.

Communications

Establish a chain of command in the field so that environmental inspectors always communicate with the same workers.

Responsibilities

Environmental Inspector

Environmental inspectors:

- oversee contractors to ensure compliance with environmental requirements and permits

NOTE: When the environmental inspector is not onsite, the supervisor is responsible for implementing environmental protection measures.

- provide options and guidance to supervisors on environmental matters, and address unforeseen environmental concerns responsibly
- brief workers on the environment requirements of the project at the prejob meeting
- are present for all phases of project activities involving environmentally sensitive areas
- stop work activities and implement mitigative measures that are not in compliance with this document
- make daily written inspection reports and encourage frequent telephone contact with the environment department
- maintain regular liaison with government representatives
- obtain approval from the environment department before authorizing any major changes or decisions
- maintain appropriate records to ensure contractor compliance with environmental specifications and permits (i.e., take appropriate samples, photos and measurements at various stages of project activities)
- shut down project activity if significant environmental damage is occurring

Workers

Workers must:

- fully cooperate with environmental inspectors in the course of their duties

NOTE: Substantial fines and imprisonment may be imposed on workers and the company for noncompliance with legislation.

- understand the requirements regarding environmental rules and regulations
- report perceived environmental infractions to their supervisors

WATERCOURSES and WETLANDS 02–11

Purpose

Watercourses are a major environmental concern associated with pipeline construction. Poor construction schedules or inadequate environmental mitigation measures can damage fish habitat, harm aquatic life and interfere with downstream water users. Pipeline construction also may alter stream substrates, cause physical or chemical changes in water quality or block fish movement. Although many environmental impacts are relatively short-term (i.e., the impact stops soon after the crossing is completed), long-term impacts may result if the watercourse is not properly restored.

Due to the unstable nature of some wetland soils, construction activities may differ from typical pipeline construction. As such, construction activities may be minimized in wetlands and/or special construction techniques required to minimize disturbance to plants and soils, and to protect wetland hydrology.

Requirements

Project Scheduling

Carry out instream activities during periods of low flow unless government agencies request an alternate schedule.

Postpone construction in watercourses if excessive flows or flood conditions exist or are anticipated, and construction methods cannot be modified to cope with the increased flow.

To minimize the duration and severity of disturbance, complete all instream activity within 48 hrs, unless site-specific conditions make this impractical.

NOTE: For more information on scheduling construction activities, see 01-3, Project Scheduling.

Permits/Licenses/Approvals

Where instream activities are required, obtain approval from fish and wildlife authorities, including federal authorities if required.

Any alternatives or modifications to the wetland crossing requirements specified in permits must be approved by the company before construction begins.

Before starting work, the contractor must provide the company with a tentative watercourse construction plan and schedule, and confirm the schedule (a) 14 days before and (b) 2 days before starting crossing construction.

NOTE: For more information on activities that require environmental permits and/or regulatory approvals, see 01-2, Planning and Preparation.

Clearing and Grading

Restrict clearing and grading to the minimum necessary to safely complete the job (see 02-4, Clearing and Grubbing, and 02-7, Grading).

Trenching

When practical, salvage upper stream bed material and replace last during stream bed restoration.

For information on trenching in watercourses and wetlands, see 02-8, Trenching.

Fish Habitats

When sport fish are concentrated in a watercourse area that requires blasting, use blast reflectors or absorbers, time delay charges and the smallest charges practical. If practical, remove fish and block their access to the area.

Erosion Control

Install temporary erosion control measures within 24 hrs of backfilling the crossing (see 02-13, Slope Breakers and 02-14, Temporary Sediment Barriers. For information on backfilling, see 03-2, Backfilling).

Guidelines

Construction Methods

Select an appropriate watercourse construction method based on geotechnical, biological and hydraulic considerations, and discussions with government agencies. Use Table 1, Watercourse Construction Methods as a guide to selecting an appropriate watercourse crossing construction method.

NOTE: If contaminated stream substrate is suspected, e.g., by industrial pollution, use a construction method that minimizes disturbance of the substrate (e.g., drill, bore).

Table 1
Watercourse Construction Methods

Construction Method	Small Watercourse less than 10 m (33 ft)			Medium Watercourse 10 to 20 m (33 to 65 ft)			Large Watercourse greater than 20 m (65 ft)		
	L	M	H	L	M	H	L	M	H
Wet Trench									
• hoe	4	4	7	4	4	7	4	4	7
• dragline	$	7	7	$	7	7	4	7	7
• dredging	$	$	$	$	$	$	4	4	4
Dry Trench									
• flume	4	4	4	4	4	4	—	—	—
• dam and pump	4	4	4	4	4	4	—	—	—
• high volume pump	4	4	4	4	4	4	—	—	—
Trenchless									
• boring	$	4	4	$	4	4	—	—	—
• directional drilling	$	$	$	$	$	$	$	4	4
Aerial									
• bridge attachment	$	$	4	$	4	4	$	4	4

NOTES

L = Low sensitivity
- no downstream water users
- no fish habitat impacted by construction
- no flow

M = Medium sensitivity
- downstream water users
- no significant impact on fish habitat by construction
- low probability of downstream habitat impacted by sediment

H = High sensitivity
- downstream water users cannot tolerate sediment load
- fish habitat directly impacted by sedimentation

4 = environmentally acceptable
$ = environmentally acceptable, however, may not be practical due to high construction cost
7 = not environmentally acceptable
— = not usually possible from an engineering or construction standpoint

Wet Trench

Use a wet trench construction method on narrow and/or warm water streams and rivers that will not be flumed, dammed and pumped, or directionally drilled (see Figure 1, Typical Waterbody Crossing Wet Trench Method)

NOTE: For dry intermittent streams and agricultural drainage ditches, use standard construction procedures (i.e., involving stringing, welding, excavating the trench with backhoes, installing the pipe in the trench and backfilling the trench with native material).

Where sedimentation is not a major concern, use the wet open cut method (see Figure 2, Water Crossing-Wet Open Cut of Large Rivers and Figure 3, Wet Open Cut of Small Rivers).

Dry Trench

Use a dry instream construction method where sedimentation is a concern, and where required by permits.

Dam and Pump/High Volume Pump

Use the dam and pump method on narrow watercourses with low stream flow (see Figure 4, Typical Waterbody Crossing Dam and Pump). On watercourses with moderate stream flow, use the high volume pump method (see Figure 5, Water Crossing-High Volume Pump).

NOTE: Have two pumps on hand, each sized with the pumping capacity of the anticipated stream flow, to ensure standby function.

If fish passage is a concern, do not use either the dam and pump or high volume pump construction method.

The dam and pump method involves damming the stream before excavating:

- Construct upstream and downstream dams of sandbags, steel plates, Aquadams™ or clean gravel with a plastic liner.
- Prevent interrupting downstream flow by pumping the water simultaneously with dam construction.
- Pump water across the construction area through a hose and onto an energy dissipation device back into the dry stream bed downstream (see Figure 4, Typical Waterbody Crossing, Dam and Pump Method).
- Continuously monitor dams for proper seal.
- Adjust the dams as necessary to prevent large volumes of water from seeping around the dams and into the construction work area.

NOTE: For more information on dewatering, see 02-17, Dewatering.

Place the pump in an impermeable, bermed area on the upstream side of the construction site to prevent any spilled fuel from entering the watercourse.

NOTE: Electric submersible pumps are the best option and should eliminate concerns with fuel spills.

Monitor the pumping operation at all times, and adjust the pump as necessary to maintain an even flow of water across the work

area and near-normal water levels upstream and downstream from the crossing.

A backup pump of equal or greater capacity must be onsite at all times in case the primary pump fails.

Pump standing water that is isolated in the construction area by the dams, or any stream water that leaks around the dams or seeps from the ground into the trench into a filter bag or a dewatering structure (see 02-17, Dewatering).

Flume

Use the flume method to cross sensitive, relatively narrow streams that have straight channels and that are relatively free of large rocks and bedrock at the point of crossing.

NOTE: The diameter of conduit (flume) must be large enough to accommodate the maximum stream flow.

The flume method involves placing a conduit in the stream bed to direct stream flow across the construction area without introducing sediment into the water (see Figure 6, Typical Waterbody Crossing, Flume Method):

- Install the flume(s), typically at least 12–18 m (40–60 ft) long, before trenching.
- Align the flumes such that water is not impounded upstream of the flume(s).
- Construct dams of sandbags, metal plate, water dam, plastic sheeting or clean rock (or equivalent) around the upstream and downstream ends of the flume(s).

NOTE: Construct the upstream dam first, to funnel stream flow into the flume(s). The downstream dam prevents backwash of water into the trench and construction work area, and keeps water in the excavation from moving downstream if flooding occurs.

Continuously monitor dams to ensure a watertight seal.

Adjust the dams as necessary to prevent large volumes of water from seeping around the dams and into the trench and construction work area.

Pump standing water that is isolated in the construction area by the dams, or any stream water that leaks around the dams or seeps from the ground into the trench:

- if clean, into the watercourse downstream of the crossing

- if dirty, into a filter bag or a dewatering structure (see 02-17, Dewatering)

NOTE: Salvage any stranded fish and relocate upstream

After backfilling a high sensitivity watercourse with a gravel bed, consider washing the gravel before removing the flume to minimize sediment washing downstream from the construction zone.

Remove the flume(s) after the pipeline is installed and stream banks have been restored.

Directional Drilling

Use directional drilling for large watercourses that are environmentally sensitive to instream or streambank activity, or where conventional methods are not feasible due to engineering or navigational constraints (see Figure 7, Typical Waterbody Crossing Directional Drill Method).

Directional drilling may be economically feasible for large deep rivers that require considerable extra cover, expensive reclamation work, or where slope stability is a concern or bank disturbance must be avoided.

NOTE: Obtain geotechnical data before drilling. Drilling may not be feasible in streambed materials such as unconsolidated gravel.

Set up drilling equipment a minimum of 16 m (50 ft) from the edge of the watercourse. Do not clear or grade this 16 m buffer area.

Use water from an approved source (typically the river) in accordance with applicable permits to mix drilling mud. The mud mix must be appropriate for aquatic life in the stream, e.g., pure bentonite clay with no unapproved additives.

During drilling operations, prevent mud and slurry from flowing into the stream or adjacent wetlands by storing it well back from the river bank, contained by an earthen berm sediment control structure, tanks or other methods.

Minimize mud pump pressure during entry and exit of the bore to prevent frac-out, i.e., borehole fracture and escape of mud.

NOTE: For more information on temporary erosion and sedimentation control, see 02-14, Temporary Sedimentation Control.

After the pipe is in place, spread excess drilling mud and slurry over an upland area if approved by the company, or haul excess offsite to an approved location.

Boring

Use the boring (or punching) method to cross irrigation canals and where practical, to cross natural watercourses (see Figure 8, Water Crossing Bored or Punched). This method may not be possible if there is excessive groundwater, sand or gravel, cobbles, large boulders or bedrock.

Obtain geotechnical data before boring or punching.

Push/Pull Method

For large wetlands with standing water and saturated soils, assemble the pipeline in an upland area, and position the pipe in the trench using the push-pull and/or float techniques:

- excavate the trench using a backhoe supported on timber mats
- push-pull the prefabricated section of pipe into position or float the pipe across the wetland
- when the pipeline is in position, remove floats, if used
- backfill the trench

NOTE: The push-pull and float techniques usually requires additional temporary workspace next to the ROW (for more information, see 01-6, Determining Workspace.

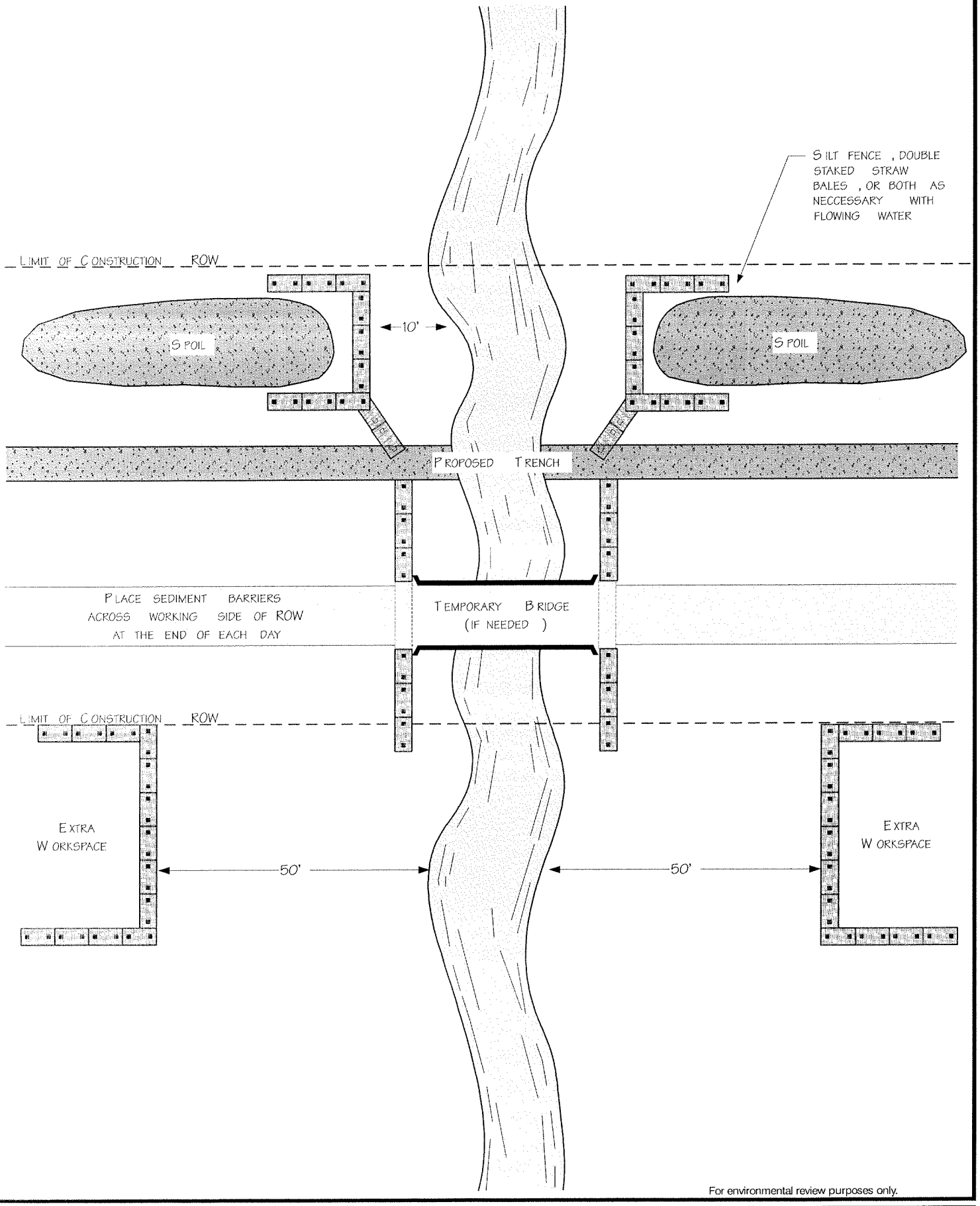

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Figure 1

Typical Waterbody Crossing
Wet Trench Method

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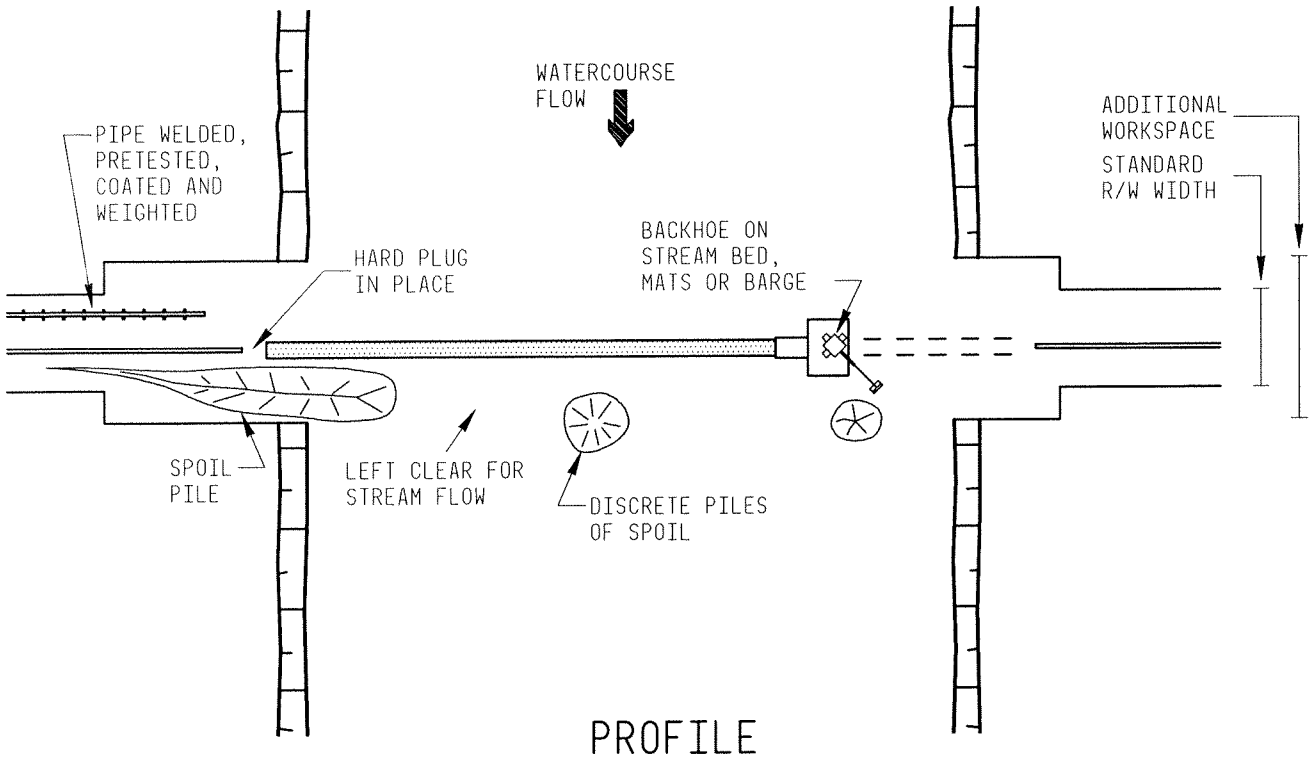

PROFILE

NOTES:

1. USE THIS TECHNIQUE ON LARGE WATERCOURSES WHEN A BACKHOE CANNOT REACH AT LEAST HALFWAY INTO THE CHANNEL.
2. SCHEDULE INSTREAM ACTIVITY FOR LOW FLOW PERIODS AND FOR THE APPROPRIATE TIMING WINDOW. OBTAIN ALL GOVERNMENT APPROVALS PRIOR TO INSTREAM CONSTRUCTION.
3. OBTAIN ADDITIONAL TEMPORARY WORK SPACE TO ALLOW INSTREAM SPOIL TO BE STORED ON BANKS WHERE POSSIBLE.
4. RESTRICT ROOT GRUBBING. DO NOT GRUB WITHIN 10m OF WATERCOURSE EXCEPT ALONG TRENCH LINE AND SPOIL PILE AREA WHEN ABSOLUTELY NECESSARY.
5. LEAVE HARD PLUGS AT BANK.
6. WELD, COAT, PRETEST AND WEIGHT PIPE PRIOR TO COMMENCEMENT OF INSTREAM CONSTRUCTION.
7. SERVICE OR REFUEL MOBILE CONSTRUCTION EQUIPMENT A MINIMUM OF 100m AWAY FROM WATERCOURSE.
8. TRENCH THROUGH WATERCOURSE RETAINING HARD PLUGS AT EACH BANK UNTIL JUST PRIOR TO PIPE INSTALLATION. STOCKPILE AS MUCH SPOIL ON BANKS AS POSSIBLE. PLACE INSTREAM STORAGE IN DISCRETE PILES AVOIDING AREAS OF HIGHEST WATER VELOCITY. DO NOT WINDROW SPOIL ACROSS THE CHANNEL OR BLOCK MORE THAN 2/3 OF THE CHANNEL. IF NECESSARY TO CONTROL WATER FLOW AND TRENCH SLOUGHING, INSTALL TEMPORARY SOFT PLUGS AND DEWATER TRENCH ON TO STABLE VEGETATED LAND, NOT DIRECTLY TO WATERCOURSE. MAINTAIN STREAMFLOW, IF PRESENT, THROUGHOUT CROSSING CONSTRUCTION. LOWER IN AND BACKFILL IMMEDIATELY. RESTORE STREAM CHANNEL TO APPROXIMATE PRECONSTRUCTION PROFILE AND SUBSTRATE. ATTEMPT TO COMPLETE ALL STREAM ACTIVITY WITHIN 24 HOURS.
9. RESTORE AND STABILIZE WATERCOURSE BANKS AND APPROACHES TO AS CLOSE TO ORIGINAL GRADES AS POSSIBLE (TO A MAXIMUM 3:1). INSTALL BANK PROTECTION WHERE APPROPRIATE.
10. SEED AND FERTILIZE BANKS IMMEDIATELY.

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Figure 2

Water Crossing -
Wet Open Cut of Large Rivers

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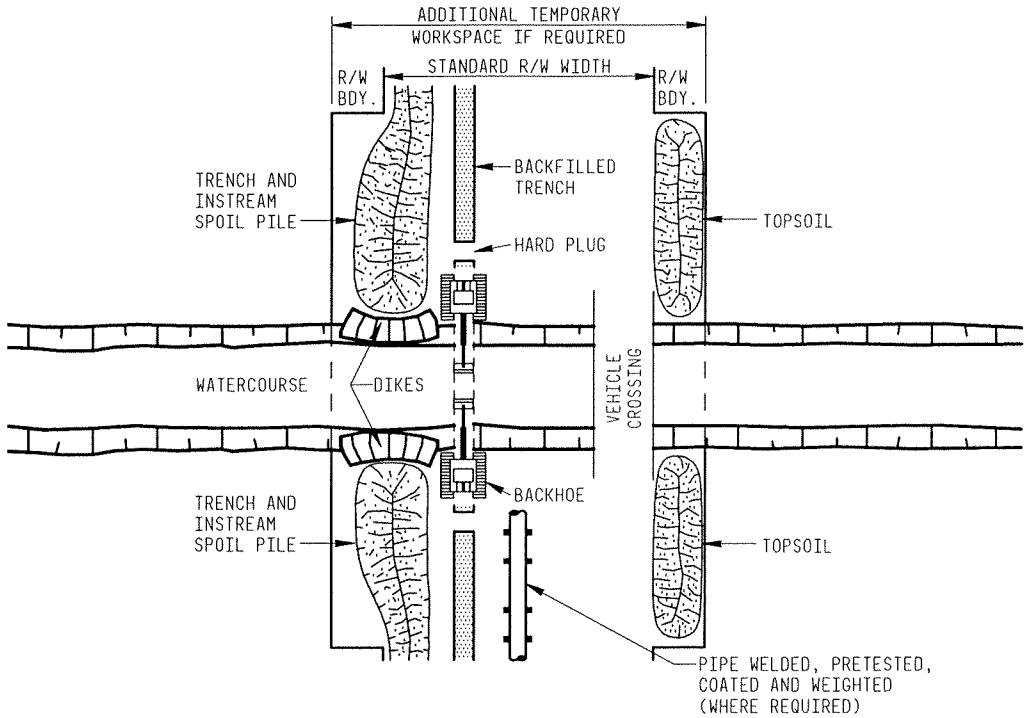

PLAN VIEW

NOTES:

1. USE THE WET CROSSING METHOD WHEN CONTROL OF SEDIMENTATION IS NOT A MAJOR CONCERN.
2. SCHEDULE INSTREAM ACTIVITY FOR LOW FLOW PERIODS AND FOR THE APPROPRIATE TIMING WINDOW. OBTAIN ALL GOVERNMENT APPROVALS PRIOR TO INSTREAM CONSTRUCTION.
3. OBTAIN ADDITIONAL TEMPORARY WORK SPACE TO ALLOW INSTREAM SPOIL TO BE STORED ON BANKS. ALL SPOIL SHOULD BE STORED ON BANKS OF ANY WATERCOURSES LESS THAN 20m WIDE.
4. INSTALL VEHICLE CROSSING IF REQUIRED.
5. RESTRICT ROOT GRUBBING. DO NOT GRUB WITHIN 10m OF WATERCOURSE EXCEPT ALONG TRENCH LINE AND SPOIL PILE AREA WHEN ABSOLUTELY NECESSARY.
6. WELD, COAT, PRETEST IFREGUIRED AND WEIGHT PIPE PROIR TO COMMENCEMENT OF INSTREAM CONSTRUCTION.
7. SERVICE OR REFUEL MOBILE CONSTRUCTION EQUIPMENT A MIN. OF 100m AWAY FROM WATERCOURSE.
8. TRENCH THROUGH WATERCOURSE RETAINING HARD PLUGS AT EACH BANK UNTIL JUST PRIOR TO PIPE INSTALLATION. STOCKPILE ALL INSTREAM SPOIL ON BANKS IF POSSIBLE. ON LARGER WATERCOURSES STOCKPILE AS MUCH SPOIL ON BANKS AS POSSIBLE. IF INSTREAM STORAGE IS REQUIRED; PLACE IN DISCRETE PILES AVOIDING AREAS OF HIGHEST WATER VELOCITY. DO NOT WINDROW SPOIL ACROSS THE CHANNEL OR BLOCK MORE THAN 2/3 OF CHANNEL. IF NECESSARY TO CONTROL WATER FLOW AND TRENCH SLOUGHING, INSTALL TEMPORARY SOFT PLUGS AND DEWATER TRENCH ON TO STABLE VEGETATED LAND, NOT DIRECTLY TO WATERCOURSE. MAINTAIN STREAMFLOW, IF PRESENT, THROUGHOUT CROSSING CONSTRUCTION. INSPECT, REPAIR OR REPLACE PIPE AND BACKFILL IMMEDIATELY. RESTORE STREAM CHANNEL TO APPROXIMATE PRECONSTRUCTION PROFILE AND SUBSTRATE. ATTEMPT TO COMPLETE ALL STREAM ACTIVITY WITHIN 24 HOURS.
9. RESTORE AND STABILIZE WATERCOURSE BANKS AND APPROACHES TO AS CLOSE TO ORIGINAL GRADE AS POSSIBLE (TO A MAXIMUM 3:1). INSTALL BANK PROTECTION WHERE APPROPRIATE.
10. SEED AND FERTILIZE BANKS IMMEDIATELY.

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Figure 3

Water Crossing -
Wet Open Cut of Small Rivers

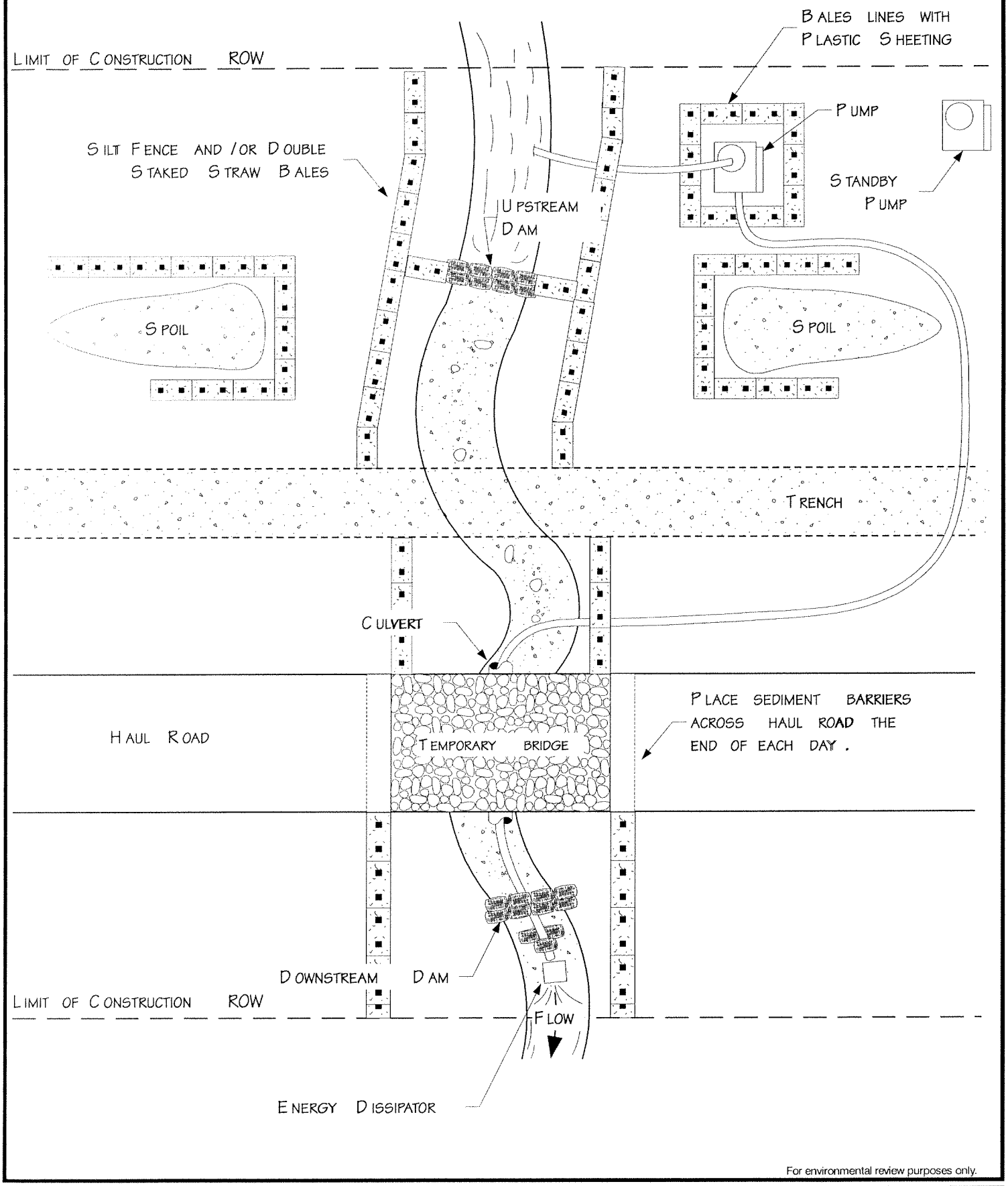

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Figure 4

Typical Waterbody Crossing
Dam and Pump Method

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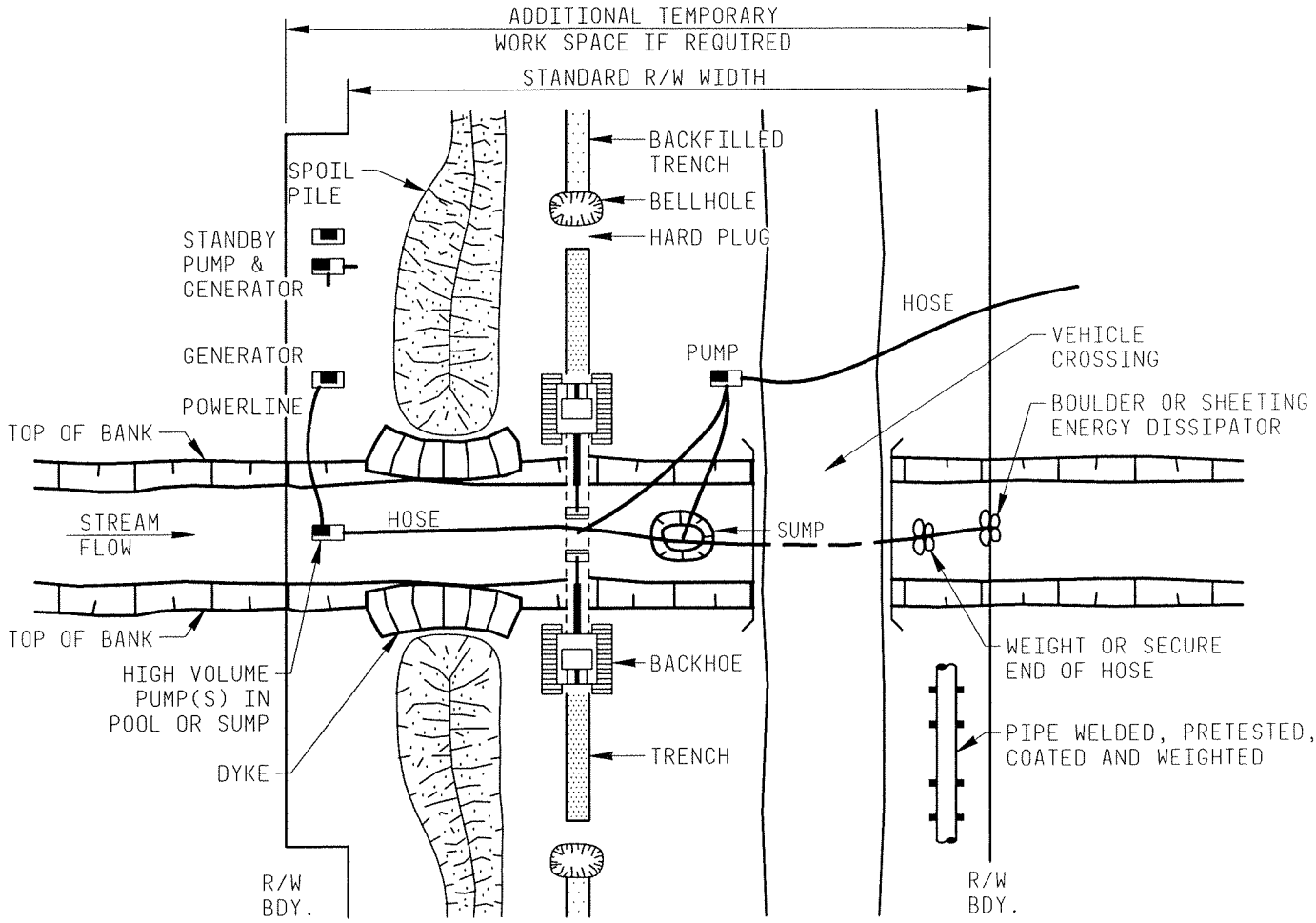

PLAN VIEW

NOTES:

1. USE HIGH VOLUME PUMP METHOD ON WATERCOURSES WITH MODERATE STREAMFLOW TO PREVENT SEDIMENTATION AND INTERRUPTION OF STREAMFLOW DURING INSTREAM WORK. THIS METHOD IS NOT APPROPRIATE IF FISH PASSAGE IS A CONCERN.
2. SCHEDULE CONSTRUCTION DURING LOW FLOW ON LARGE WATERCOURSES.
3. INSTALL TEMPORARY VEHICLE CROSSING
4. ENSURE ADEQUATE ELECTRIC POWER SUPPLY AND ADEQUATELY SIZED PUMPS. HAVE STANDBY PUMP(S) ON SITE.
5. INSTALL PUMP IN POOL LOCATED UPSTREAM OF THE EXCAVATION. DIG TEMPORARY SUMP UPSTREAM IF NO NATURAL POOL EXISTS. ADD ADDITIONAL PUMPING CAPACITY IF REQUIRED. DISCHARGE WATER THROUGH OR INTO AN ENERGY DISSIPATOR INTO THE RIVER CHANNEL SUFFICIENTLY DOWNSTREAM OF THE TRENCH TO PREVENT WATER FLOWING BACK INTO THE EXCAVATION.
6. IMMEDIATELY INITIATE FISH SALVAGE FROM ISOLATED POOLS. ENSURE FISH SALVAGE PERMIT(S) ARE ACQUIRED PRIOR TO INSTALLING PUMP.
7. DIG A SMALL SUMP DOWNSTREAM OF CROSSING TO COLLECT SILT LADEN WATERS. INSTALL SMALL PUMPS IN SUMP AND TRENCH TO DISCHARGE SILT-LADEN WATER ON TO WELL VEGETATED SOILS AWAY FROM THE WATERCOURSE.
8. EXCAVATE TRENCH, COMPLETE REPAIR WORK AND BACKFILL TRENCH. MOVE HOSE AS REQUIRED TO MAINTAIN STREAMFLOW.
9. WASH BACKFILLED TRENCH AREA INTO SUMP. PUMP SILT-LADEN WATER FROM TRENCH ONTO A WELL VEGETATED AREA OFF RIGHT OF WAY. ALSO COMPLETE THIS STEP IN THE EVENING PRIOR TO SHUTTING OFF UPSTREAM PUMP IF INSTREAM WORK IS TO OCCUR ON SUCCESSIVE DAYS.

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Figure 5

Water Crossing -
High Volume Pump

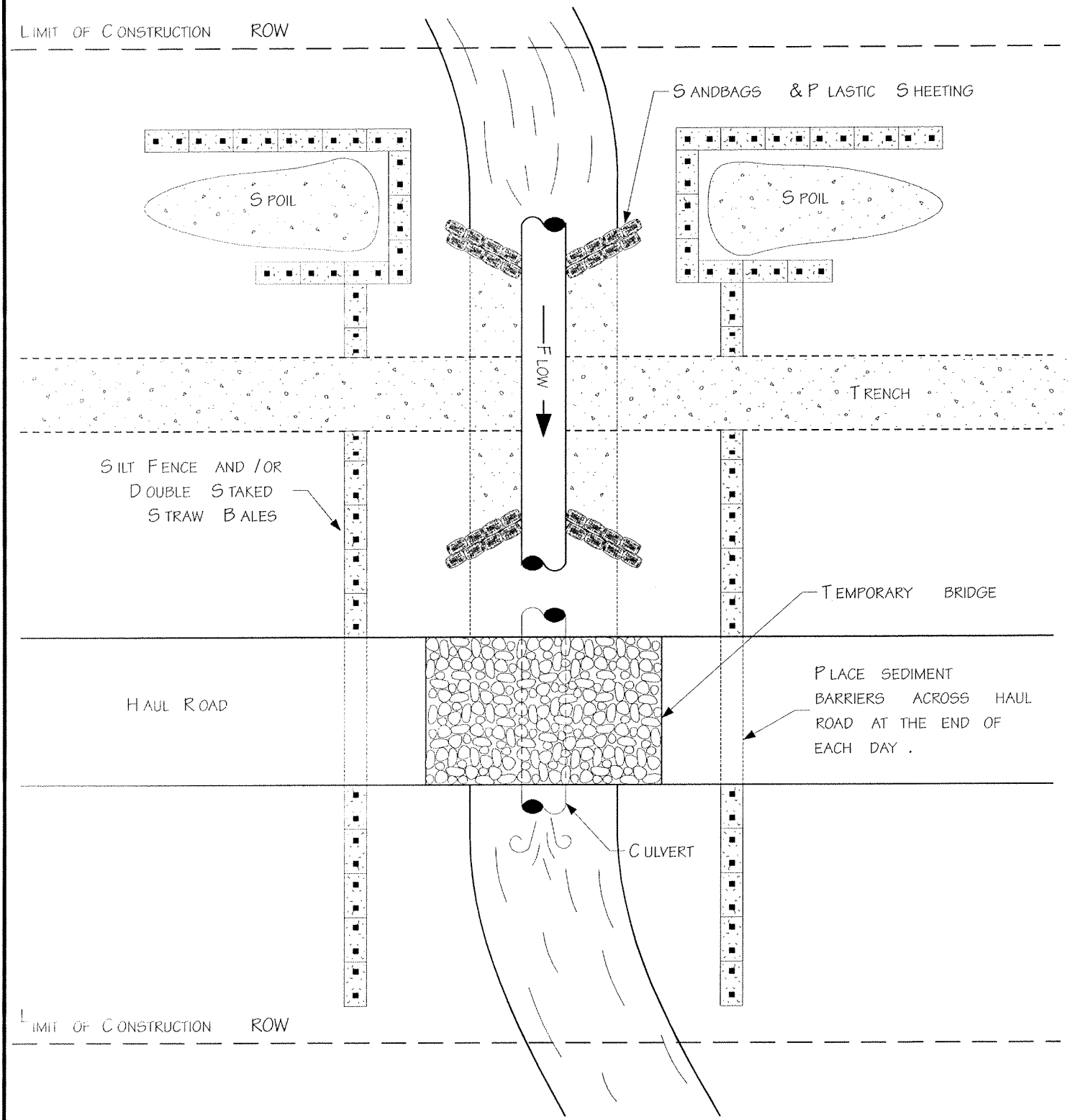

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Figure 6

Typical Waterbody Crossing
Flume Method

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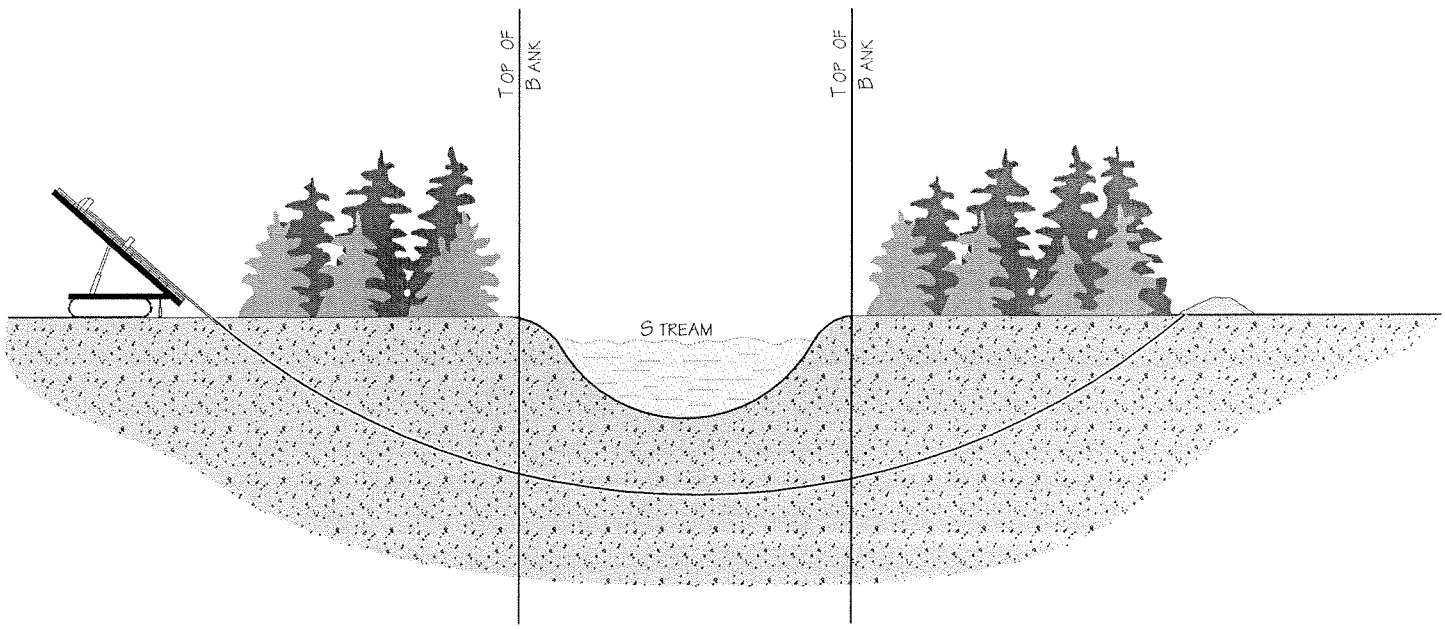

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Figure 7

Typical Waterbody Crossing
Directional Drill Method

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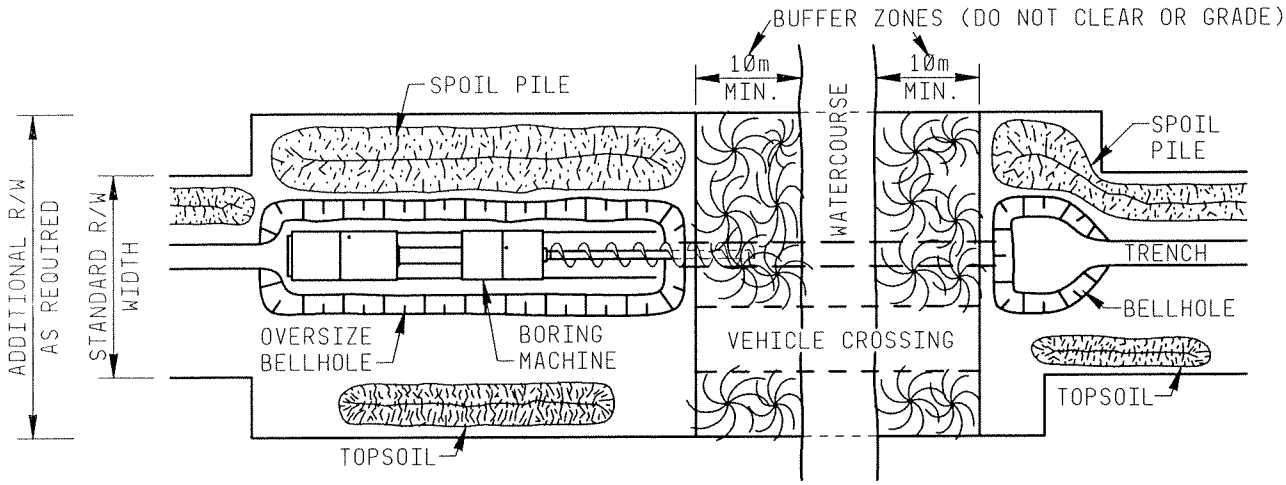
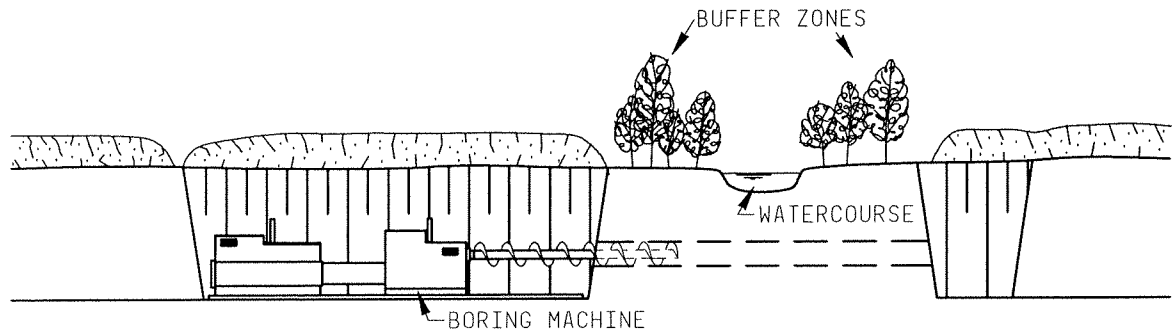


PLAN VIEW



PROFILE

NOTES:

1. BORE (OR PUNCH) WATERCOURSE CROSSING TO PREVENT SEDIMENTATION OF WATERCOURSE, INTERRUPTION OF STREAM FLOW, AND ALTERATION OF STREAM SUBSTRATE. THIS METHOD IS APPROPRIATE FOR CROSSING IRRIGATION CANALS AND OCCASIONALLY, FOR CROSSING NATURAL WATERCOURSES. HOWEVER, IT MAY NOT BE POSSIBLE IF THERE IS EXCESSIVE GROUNDWATER, OR A PERMEABLE OR ROCKY SUBSTRATE OF GRAVEL, COBBLES, LARGE BOULDERS OR BEDROCK. OBTAIN GEOTECHNICAL DATA PRIOR TO COMMENCING BORING (OR PUNCHING).
2. AQUIRE AND MARK ADDITIONAL TEMPORARY WORK SPACE.
3. INSTALL VEHICLE CROSSING.
4. EXCAVATE BELLHOLE. STORE SPOIL ON OPPOSITE SIDE OF RIGHT OF WAY.
5. COMPLETE BORING AND TIE-IN TO MAINLINE.
6. PUMP BELLHOLE DRY IF SEEPAGE BECOMES A PROBLEM.
7. BACKFILL AND COMPACT. LEAVE A CROWN TO ALLOW FOR SUBSIDENCE.
8. RESEED AND FERTILIZE AS APPROPRIATE.

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Figure 8

Water Crossing -
Bored or Punched

EQUIPMENT CROSSINGS 02–12

Purpose

Temporary equipment crossings are constructed at watercourses (except for drainage ditches and intermittent streams) to allow machinery and vehicles to travel along the right-of-way (ROW). Stream beds and banks can be excessively damaged if inappropriate crossings are used or if heavy equipment travels before crossings are installed.

NOTE: Equipment crossings are usually installed in conjunction with clearing activities.

Guidelines

Planning and Preparation

Obtain permission from appropriate government agencies before constructing an equipment crossing. Contact the environment department for assistance.

NOTE: Bridge construction or installation is usually specified in the regulatory permits required for water crossings; review permits before proceeding.

NOTE: For more information on project planning, see Tab 01, Pre-Construction.

Installation

Install equipment crossings in locations that will not interfere with pipeline work activities, typically close to the workside ROW boundary.

Install equipment crossings on adjacent previously disturbed ROW, if available and practical, to minimize clearing and grading at the proposed crossing.

Crossing Methods

Select an appropriate equipment crossing method (see Table 1, Equipment Crossing Methods) based on geotechnical, biological and hydraulic considerations, and on discussions with government agencies

Table 1
Equipment Crossing Methods—CAN

Crossing Method	Small Watercourse less than 6 m (20 ft)			Medium Watercourse 6 to 15 m (20 to 50 ft)			Large Watercourse greater than 15 m (50 ft)		
	L	M	H	L	M	H	L	M	H
Bridge									
• existing bridge	4	4	4	4	4	4	4	4	4
• permanent bridge	$	$	$	$	$	$	$	$	$
• temporary bridge	$	$	4	$	4	4	4	4	4
• ice bridge	$	$	4	$	4	4	4	4	4
Fill									
• swamp mat	4	4	41	—	—	—	—	—	—
• log/pipe fill	4	4	41	—	—	—	—	—	—
• snow fill	4	4	41	—	—	—	—	—	—
• clean rock ramp &culvert/flume	4	4	41	—	—	—	—	—	—
Ford									
• travel pad	$	7	7	4	7	7	4	7	7
• ford	4	7	7	7	7	7	7	—	—
Barge									
• barge	—	—	—	$	$	4	$	4	4

NOTES

L = Low sensitivity
- no downstream water users
- no fish habitat impacted by construction
- no flow

M = Medium sensitivity
- downstream water users
- no significant impact on fish habitat by construction
- low probability of downstream habitat impacted by sediment

H = High sensitivity
- downstream water users cannot tolerate sediment load
- fish habitat directly impacted by sedimentation

4 = environmentally acceptable
$ = environmentally acceptable, however, may not be practical due to high construction cost
7 = not environmentally acceptable
— = not usually possible from an engineering or construction standpoint

1 Environmentally acceptable only when constructed within a dry crossing or nonflowing water.

Bridges

Design and Maintenance

Equipment bridges must be designed to withstand the maximum expected flow of the stream, and maintained to prevent flow restriction while the bridge is in place, e.g., remove any debris that restricts flow.

Bridges must be constructed with clean materials, and maintained to minimize soil from equipment falling into the water, e.g., built with a solid deck and remove any mud or soil that builds up, or geotextile covered with wooden treads.

Existing Bridges

Use existing bridges where the ROW is accessible from both sides of the watercourse (see Figure 1, Vehicle Crossing-Existing Bridge).

Temporary Bridges

Install temporary bridges (e.g., flexi-floats, railway flat car) to allow equipment to cross streams that:

- are sensitive
- have unstable bed and banks (see Figure 2, Vehicle Crossing-Temporary Bridge).
- are too deep, wide or fast for an alternate crossing structure.

NOTE: Temporary bridges are not required for drainage ditches or intermittent and other waters that are not fish bearing, unless required by permit.

Do not typically install temporary bridges at directionally drilled streams.

Limit temporary bridges to watercourses less than 30 m (100 ft) wide.

Use approach fills made of clean granular material rather than cuts in stream banks. Do not constrict flow with approach fill or support structures.

Ensure there is adequate distance between the bridge and the water level to handle anticipated stream flow and boaters.

Install an apron of logs or plywood to ensure fill material does not spill into the watercourse, where required.

Ice Bridges

Locate ice bridges at sites with gently sloping banks to minimize cuts in watercourse banks. Use snow and ice to slope approaches, rather than cutting stream banks (see Figure 3, Vehicle Crossing-Ice Bridge).

Flood the ice surface with water to increase load-bearing capacity.

Install logs to strengthen the bridge, if necessary.

NOTE: The ice bridge should not impede stream flow.

Fill

Culverts

Design culverts to handle 150% of maximum anticipated flows. Where fish passage is required, consult with local fisheries officers to develop design guidelines.

Contact government agencies for maximum water depth specifications and maximum water velocities; then choose an appropriate culvert(s).

Place ends of culverts below the natural grade of stream at an angle that does not exceed normal stream gradient.

NOTE: Depth of placement depends upon streambed type, culvert size and expected flow conditions—lower is better.

Log/Pipe Fill

Install log/pipe fill to cross small watercourses with square, U- or V-shaped channels. Log/pipe fill is not appropriate where fish passage is required.

Log/pipe fill should not impede flow or cause flooding.

Install a cable under the logs, or cable the logs together to facilitate removal.

Add compacted snow if necessary to bring up to grade.

If soil is used, first install filter fabric or equivalent to prevent soil from entering the watercourse.

Timber Riprap and Mats

Where a wetland cannot support vehicle traffic and low-ground pressure equipment is not used, carry out construction activities from a temporary platform of timber riprap or, preferably, from timber mats (see Figure 4, Typical Wetland Crossing).

Obtain approval from the company before using timber riprap.

For additional stabilization, place subsoil from the pipeline trench within the immediate wetland on top of the timber riprap then level for access.

Logs and timber mats are the only materials that can be brought into a wetland and placed on the working side.

CAN

Ford

Do not use fords during fish spawning, incubation or migration periods.

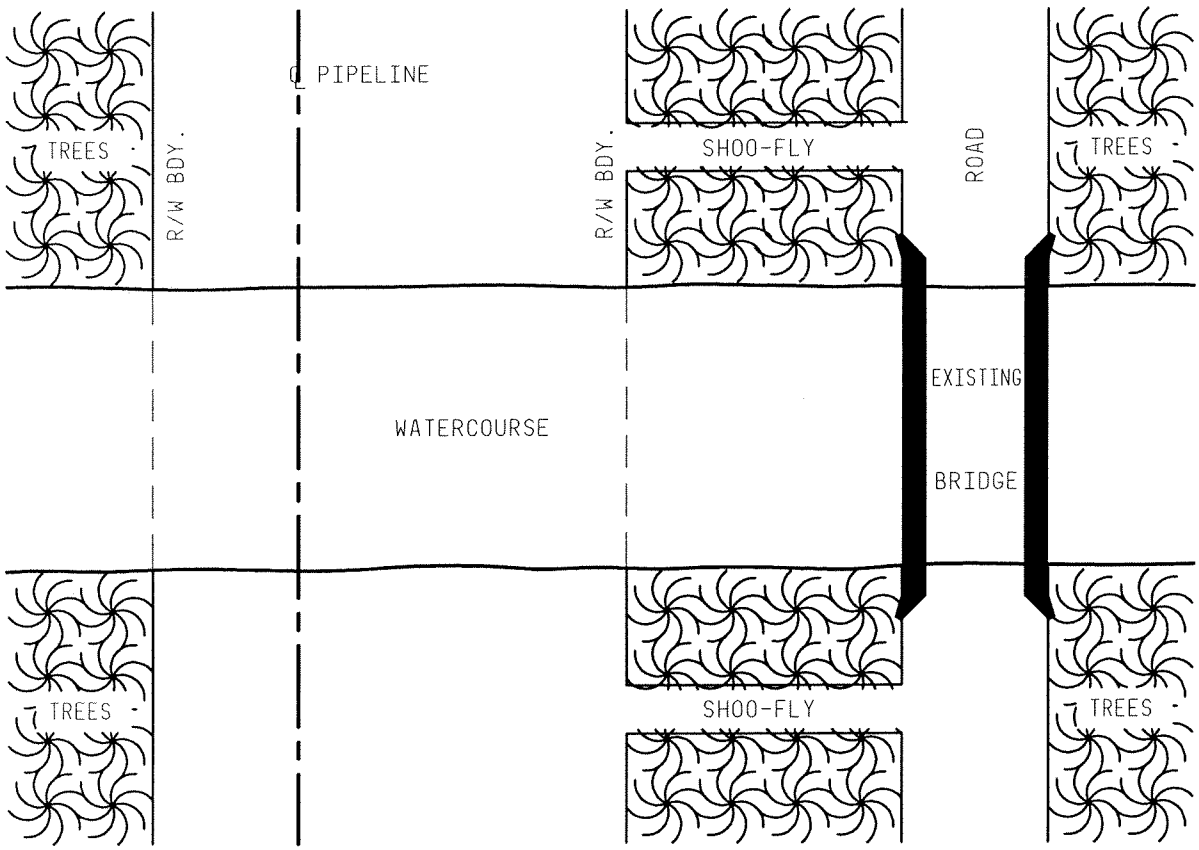
Stabilize banks and approaches with granular material underlain with a geotextile, if required.

Mark the ford boundaries on both sides of the crossing to help confine all equipment traffic to the ford.

When the ford is no longer required, restore and stabilize stream beds and bank to their original contour. Do not remove the granular material unless it is a barrier to fish during low flow conditions.

Cleanup

Remove equipment crossing structures as part of cleanup and restoration (for more information, see 03-3, Cleanup).



PLAN VIEW

NOTES:

1. USE EXISTING BRIDGE WHENEVER POSSIBLE TO PREVENT SEDIMENTATION OF WATERCOURSE, BANK DISTURBANCE, AND ALTERATION OF STREAM BEDS CAUSED BY VEHICLES CROSSING THE WATERCOURSE.

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ENBRIDGE

Figure 1

Vehicle Crossing - Existing Bridge

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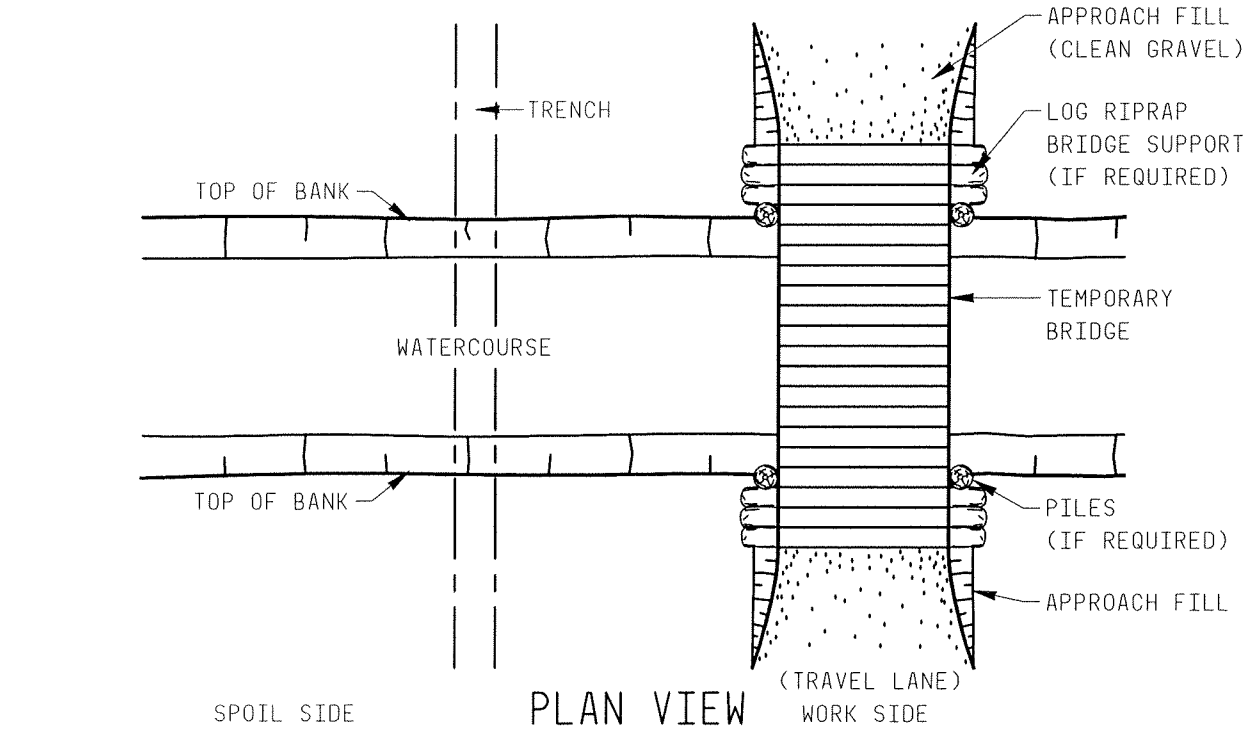

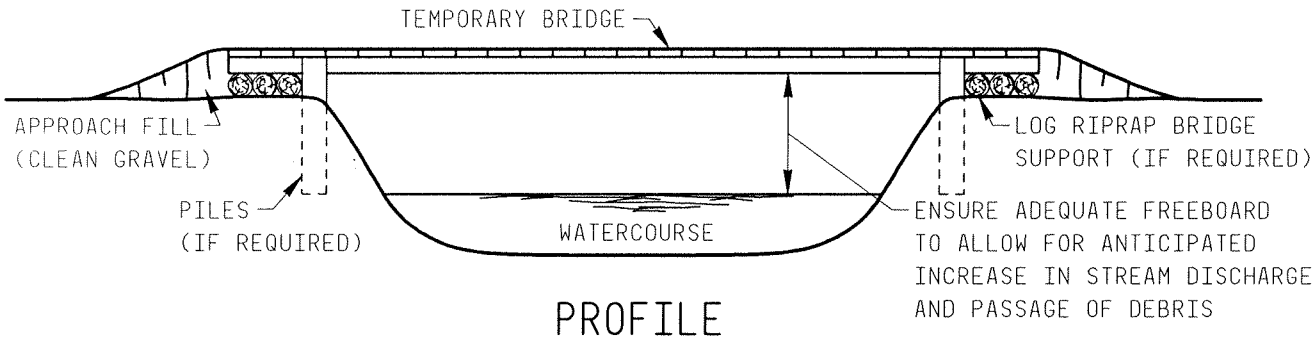

PROFILE

NOTES:

1. INSTALL A TEMPORARY BRIDGE TO ALLOW VEHICLES TO CROSS A WATERCOURSE THAT IS HIGHLY SENSITIVE OR THAT HAS UNSTABLE BED AND BANKS. BRIDGES ARE ALSO USED WHERE WATERCOURSES ARE TOO DEEP, WIDE OR FAST TO PERMIT AN ALTERNATE CROSSING STRUCTURE. THIS METHOD MINIMIZES SEDIMENTATION OF THE WATERCOURSE, AND STREAM BANK AND BED RESTORATION WORK. IT IS GENERALLY LIMITED TO WATERCOURSES LESS THAN 30m IN WIDTH.
2. UTILIZE APPROACH FILLS OF CLEAN GRANULAR MATERIAL RATHER THAN CUTS IN STREAM BANKS TO MINIMIZE EROISION POTENTIAL. DO NOT CONSTRICT FLOW WITH APPROACH FILL OR SUPPORT STRUCTURES. ENSURE ADEQUATE DISTANCE BETWEEN THE BRIDGE AND THE WATER WELL (FREE-BOARD) TO HANDLE ANTICIPATED STREAM FLOWS AND BOATERS.
3. INSTALL APRON OF LOGS OR PLYWOOD TO ENSURE THAT FILL MATERIAL DOES NOT SPILL INTO THE WATERCOURSE. WHERE REQUIRED.

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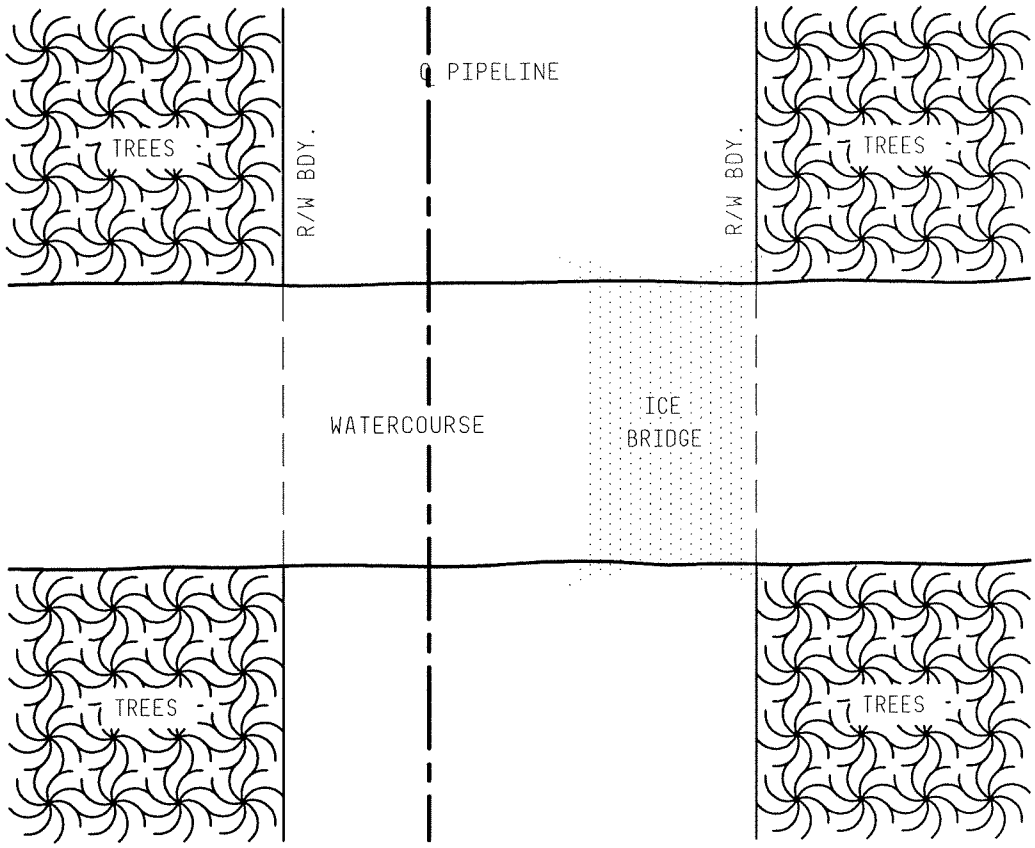
Figure 2

Vehicle Crossing - Temporary Bridge



PLAN VIEW

NOTES:

1. INSTALL ICE BRIDGES ON WINTER PROJECTS WHEN A SAFE ICE THICKNESS CAN BE MAINTAINED.
2. LOCATE ICE BRIDGES AT SITES WITH GENTLY SLOPING BANKS TO MINIMIZE CUTS IN WATERCOURSE BANKS. USE SNOW AND ICE TO SLOPE APPROACHES, RATHER THAN CUT BANKS.
3. FLOOD ICE SURFACE WITH WATER AND COVER WITH SNOW TO INCREASE LOAD BEARING CAPACITY. LOGS MAY BE USED AS A BASE TO STRENGTHEN THE BRIDGE.
4. ICE BRIDGE SHOULD NOT IMPEDE FLOW.

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Figure 3

Vehicle Crossing - Ice Bridge

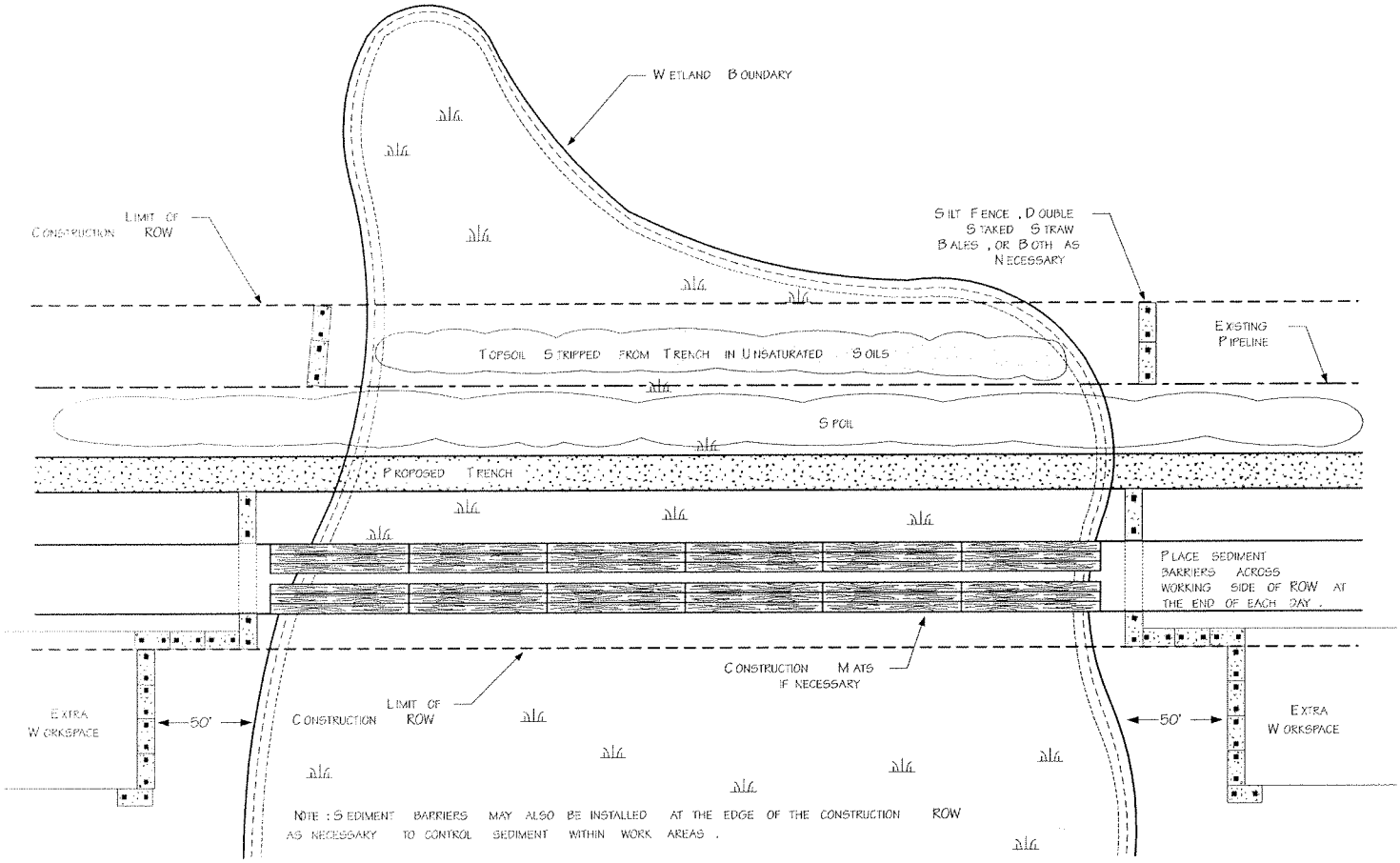

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Figure 4

Typical Wetland Crossing

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SLOPE BREAKERS 02–13

Purpose

Slope breakers, also called berms or diversion berms, may be temporary or permanent. Slope breakers are installed to divert water away from disturbed areas and to reduce erosion from runoff.

Guidelines

Determine the location and direction of slope breakers based on local topography and drainage patterns.

Construction

Ensure the backfill is well compacted uphill of and underneath the slope breaker. If the backfill cannot be compacted, line the uphill side of the breaker with geotextile over the ditchline.

Construct slope breakers using compacted native materials, i.e., earthen material, with a 4-ft base and a height of 0.45 m (1.5 ft), or 1 m (3 ft) high for winter [frozen] construction) (see Figure 1, Slope Breaker – Elevation View). Silt fence or hay bales also may be used to construct temporary slope breakers.

If groundwater flow is a concern in the construction area, install the slope breaker berm with a trench breaker to direct subsurface flow out of the trench and to the surface.

Where trench breakers are installed, install berms immediately downslope of the gravel drain and overlying the trench breaker.

NOTE: For more information, see 02-15, Trench Breakers.

Where native material is erodible, protect the upslope of the berm and the base of the cross ditch with riprap.

NOTE: For more information, see 03-6, Installing Rock Riprap.

Install soil berms with a downhill gradient of 5°–10° [95°–100° of fall line]) to prevent water from ponding behind berms and to allow for drainage away from the trench line (see Figure 2, Typical Temporary or Permanent Berms – Perspective View).

Terminate slope breakers toward appropriate energy dissipating devices (e.g., in a well-vegetated area, silt fence, rock apron), and staggered a minimum of 2 m (6 ½ ft) off the right-of-way (ROW) if possible.

Tie new berms into existing berms where possible.

Ensure there is no crown in the diversion ditch.

Installation

Temporary Breakers

Install temporary slope breakers:

- at the base of slopes leading to streams or wetlands
- immediately uphill from disturbed areas
- spaced according to Table 1, Typical Spacing for Slope Breakers

Do not install temporary slope breakers during frozen conditions unless snow melt and runoff are likely during construction.

Inspect temporary slope breakers daily and repair as necessary to maintain operational integrity and to prevent erosion.

Remove temporary slope breakers as necessary during working days and replace before leaving the area.

Where a temporary slope breaker crosses an open trench, leave a hard plug in place.

Permanent Breakers

Install permanent slope breakers according to the spacing in Table 1, Typical Spacing for Slope Breakers.

If the length of the slope is less than the distance of the required spacing in Table 1, no slope breakers are required unless the slope is to a watercourse, where one large breaker should be installed at the toe of the slope.

Do not install permanent slope breakers on agricultural land unless specifically requested by the landowner

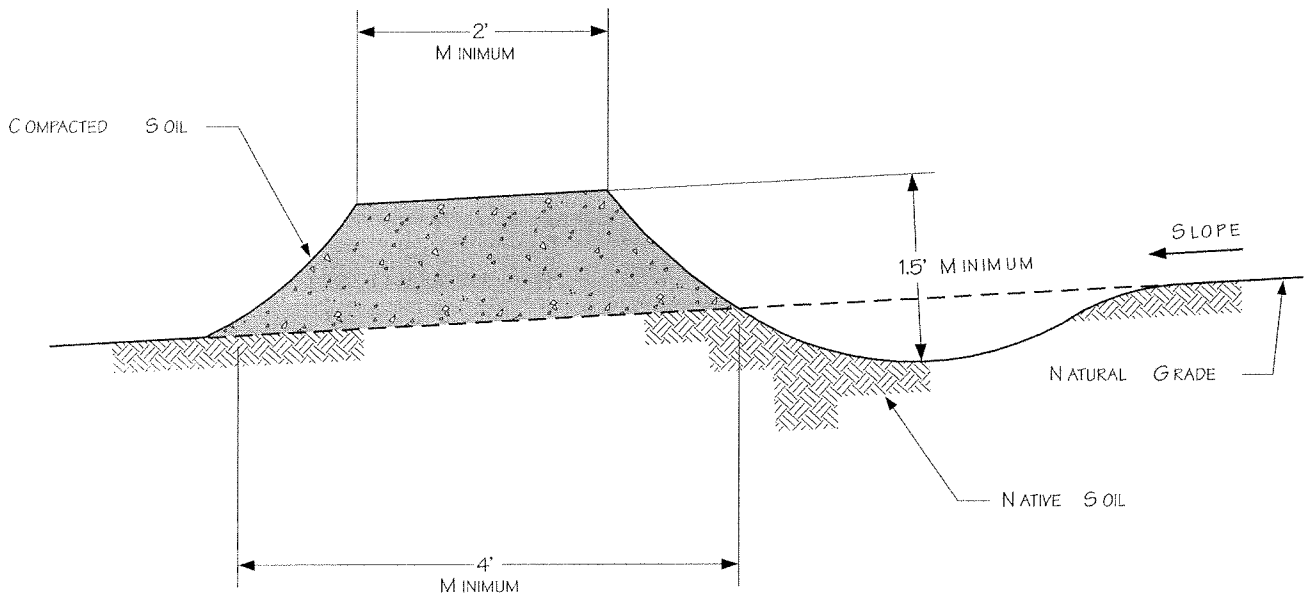
Table 1—CAN
Typical Spacing for Slope Breakers

Slope		Spacing[1]	
(°)	(%)	(m)	(ft)
<8	<15	as required	
8–14	15–25	45	148
14–17	30–35	35	115
17–20	30–35	20	65
>20	>35	10–15	32–50

NOTES
1 Rely on field judgment to determine appropriate spacing.

Table 1—USA
Typical Spacing for Slope Breakers

Slope	Spacing	
(%)	(m)	(ft)
>5–15	92	300
>15–30	61	200
>30	31	100



NOTES

1. BERMS SHALL BE CONSTRUCTED WITH 2 TO 8 PERCENT OUTSLOPE .
2. BERMS SHALL BE OUTLETED TO WELL VEGETATED STABLE AREAS , SILT FENCES , STRAW /HAY BALES OR ROCK APRONS .
3. BERMS SHALL BE SPACED AS DESCRIBED IN CONSTRUCTION SPECIFICATIONS .

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Figure 1

Slope Breaker - Elevation View

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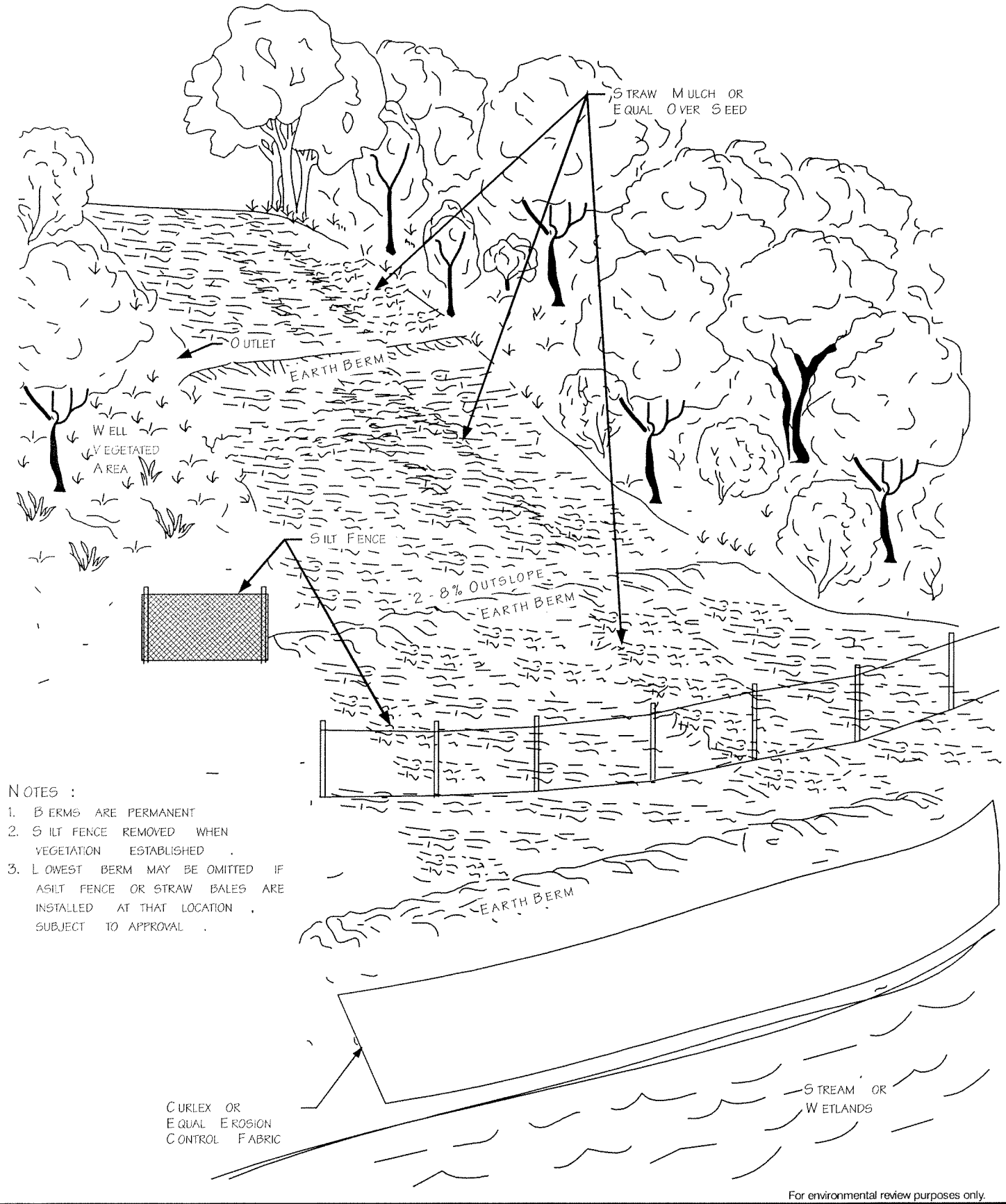

NOTES :

1. BERMS ARE PERMANENT
2. SILT FENCE REMOVED WHEN VEGETATION ESTABLISHED .
3. LOWEST BERM MAY BE OMITTED IF ASILT FENCE OR STRAW BALES ARE INSTALLED AT THAT LOCATION , SUBJECT TO APPROVAL .

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Figure 2

Typical Temporary or Permanent Berms
Perspective View

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TEMPORARY SEDIMENT BARRIERS 02–14

Purpose

Temporary sediment barriers (e.g., silt fence, straw bales) are installed to stop the flow of sediment from spoil piles and disturbed areas into watercourses/wetlands or from sloped approaches leading to watercourses/wetlands.

Guidelines

Where possible, leave a buffer of undisturbed vegetation between disturbed areas and potential receivers of off-site sediment, e.g., watercourses, wetlands, roads.

NOTE: For more information, see 02-4, Clearing and Grubbing.

Construction

Construct temporary sediment barriers with silt fence or staked straw bales (see Figures 1, Typical Silt Fence Installation & Figure 2, Typical Strawbale Intstallation). If large amounts of silt are expected, consider reinforcing the installation by installing snow fence behind the silt fence and tying them together.

Use steel reinforcing rods to stake straw bales if frozen conditions make wooden stakes impractical.

Silt fence must be a minimum of 36 in. high.

Installation

Install temporary sediment barriers:

- before or immediately after the ground is disturbed
- at the base of slopes leading to watercourses and wetlands
- between the edges of the disturbed area and watercourses
- at other sloped areas with watercourses downslope
- at the base of slopes leading to road crossings where vegetation has been disturbed (see Figure 3, in Section 02-13, Typical Temporary or Permanent Berms-Perspective View.).
- at the edge of the right-of-way (ROW) as needed to prevent siltation of watercourses downslope of the ROW

During frozen conditions, do not install temporary sediment barriers until final grading and cleanup, unless snow melt and runoff are likely during construction.

Maintenance

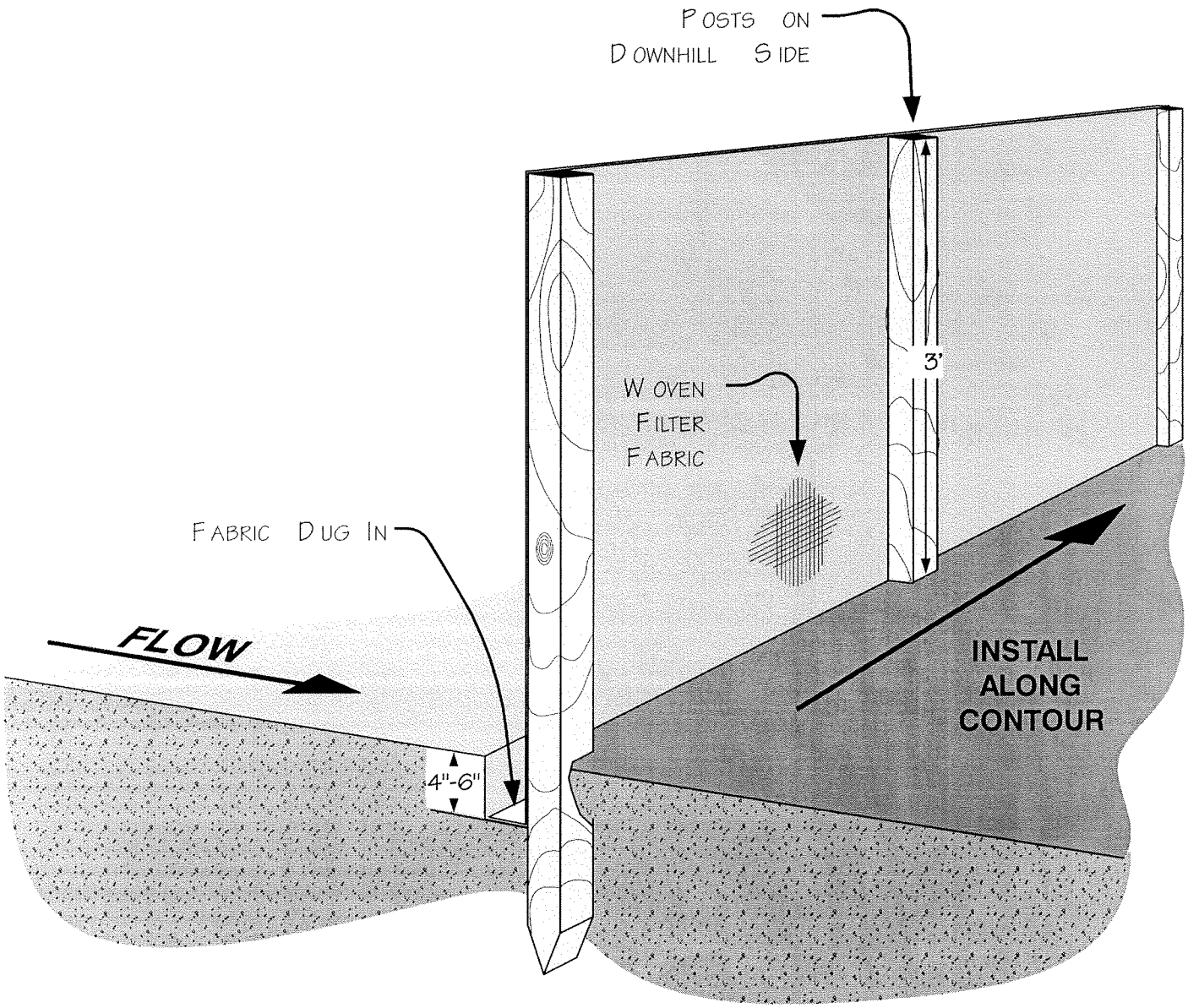
Inspect sediment barriers regularly, typically weekly and within 24 hrs of significant rainfall.

When the depth of sediment reaches one-third the height of a sediment barrier, replace the barrier and/or remove the sediment.

Repair or replace nonfunctional sediment barriers within 24 hrs of discovery.

Cleanup

Remove temporary sediment barriers after the disturbed area is restored/revegetated to pre-excavation condition and the area is stable.



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ENBRIDGE

Figure 1

Typical Silt Fence Installation

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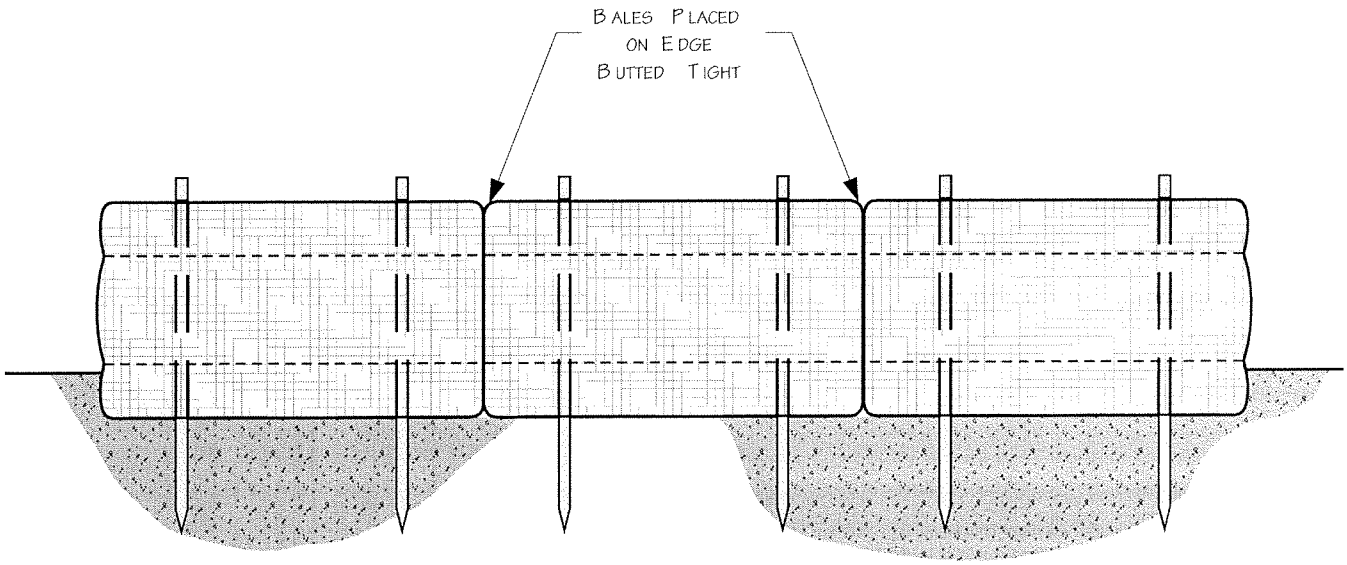
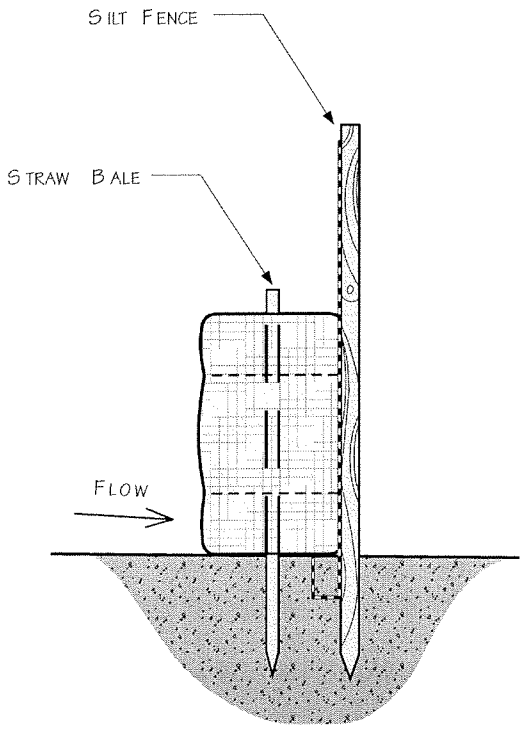
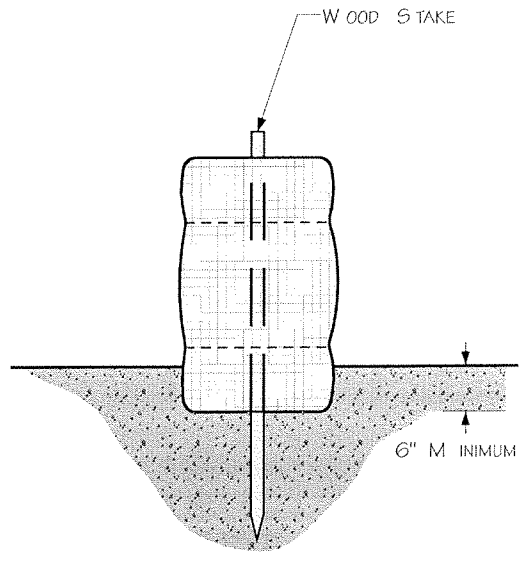




STRAW /HAY BALES &
SILT FENCE



STRAW /HAY BALES ONLY

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ENBRIDGE

Figure 2

Typical Straw Bale Installation

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TRENCH BREAKERS 02–15

Purpose

Trench breakers are installed around the pipe after it has been lowered in the trench to prevent water from channeling down the pipe and subsequently prevent subsurface erosion from occurring along the pipe once the trench is backfilled.

Guidelines

Installation

Determine the location of trench breakers by onsite investigation, considering the potential for subsurface flow and degree of slope. Typically, install trench breakers:

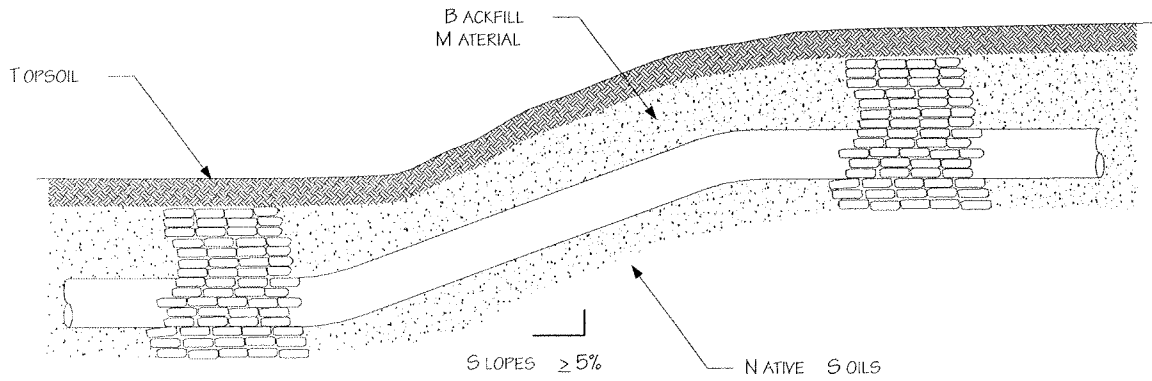
- on slopes leading to wetlands, watercourses where a trench is longer than 30 m (100 ft)
- on slopes greater than 5% next to watercourses and edges of wetlands
- where springs are evident in the ditch walls

Construction

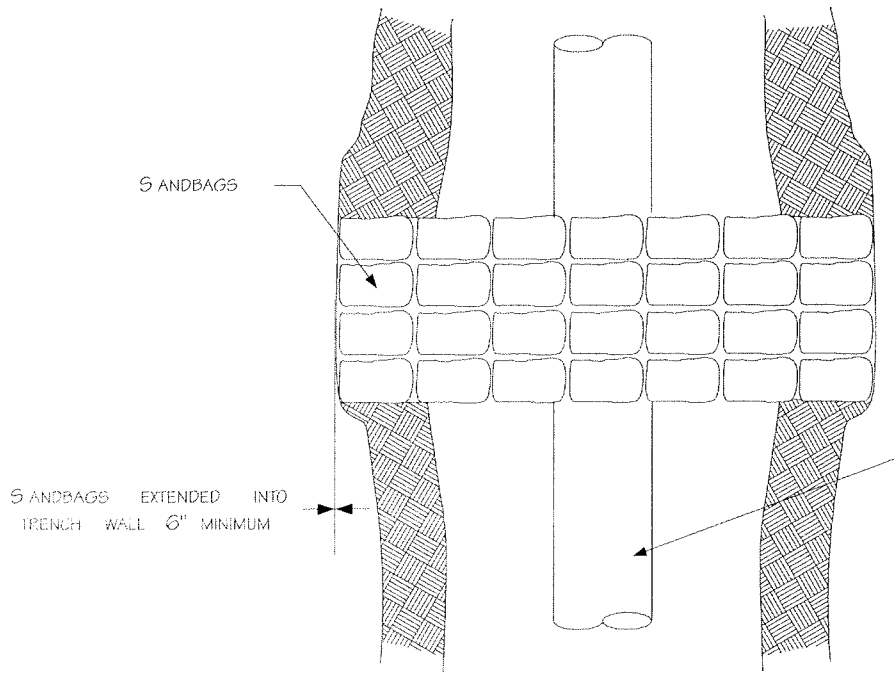
Construct trench breakers using sacks filled with subsoil or sand that is free of rock, bentonite, urethane foam or other compacted impervious materials. Do not fill bags with topsoil.

Place trench breakers from the bottom of the trench to near the top of the trench, completely surrounding the pipe (see Figures 1, Typical Trench Breakers Plan and Profile View & Figure 2, Typical Trench Breakers Perspective View). Ensure the upslope surface is level to slightly sloping downhill to allow drainage into the cross ditch.

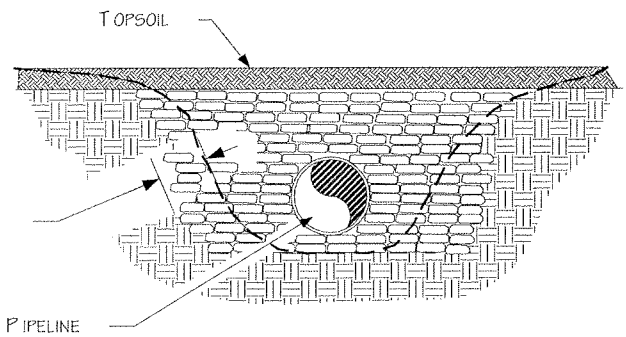
Space trench breakers the same as berms (see Table 1 in 02-13, Slope Breakers), or as otherwise specified by the company.



PROFILE VIEW
(NOT TO SCALE)



PLAN VIEW
(NOT TO SCALE)



FACE VIEW
(NOT TO SCALE)

NOTES

1. BAGS WILL NOT BE FILLED WITH TOPSOIL

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ENBRIDGE

Figure 1

Typical Trench Breakers - Plan & Profile Views

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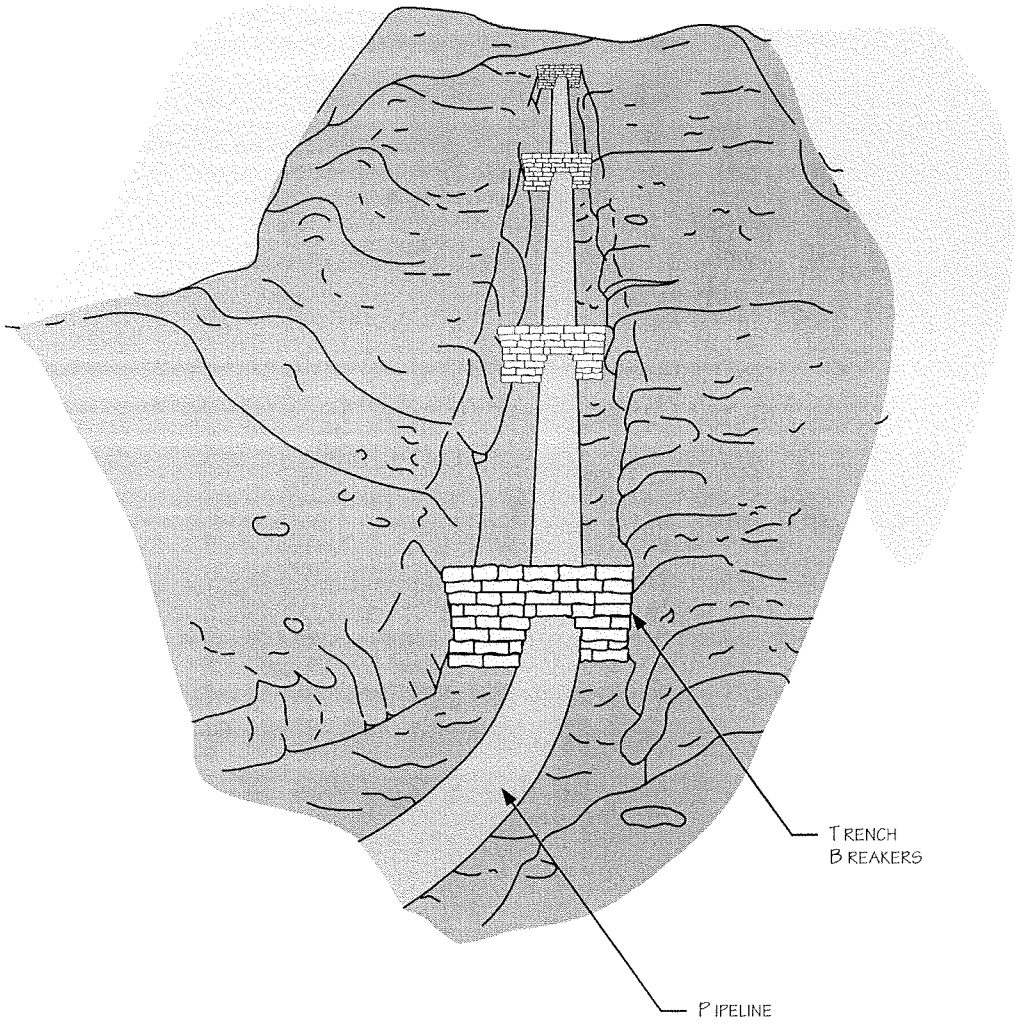

NOTES

1. BAGS WILL NOT BE FILLED WITH TOPSOIL .

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ENBRIDGE

Figure 2

Typical Trench Breakers - Perspective View

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WET/THAWING SOILS 02–16

Purpose

Wet or thawing soil in agricultural land may require delaying certain construction activities in order to avoid topsoil and subsoil compaction, or to avoid mixing, rutting and loss of soil structure.

Indications of wet or thawed soils include:

- wheelslip
- mud buildup on tires and cleats
- formation of ruts
- water ponding

Guidelines

To determine whether to shut down construction activities in wet conditions, consider the following factors in consultation with the environmental inspector:

- plasticity of the surface soil to a depth of 10–20 cm (4–8 in.)
- location and depth of the wetting front in relation to the A and B horizons
- extent of surface ponding
- extent and depth of rutting
- whether traffic can be rerouted around a wet area
- type of equipment and nature of the construction operations proposed for that day

Upon indication of wet or thawing soils, stop all affected construction activity immediately. Resume construction activities only after soils have dried or frozen.

If heavy runoff, spring breakup or heavy storms are imminent and there is a risk of significant soil erosion, use temporary erosion control measures such as silt fences, straw bales or temporary sand bag berms (for more information, see 02-6, Temporary Erosion and Sedimentation Control).

Respect road bans posted on private and public roads.

Shutdown Alternatives

As an alternative to shutting down all construction in wet weather:

- suspend construction activities only along affected portions of the right-of-way (ROW)
- continue selected activities along the ROW, or along a portion of the ROW, that will not damage soils, e.g., bored crossings, welding

Mitigation

If construction during wet or thawing soils is absolutely necessary, implement one or more of the following:

- restrict construction activity to the narrowest possible area
- use ground surface protection such as swamp mats, corduroy ramps or geotextiles
- limit traffic to equipment with wide tracks or low ground pressure tires
- operate equipment at night or early morning when the ground is frozen
- strip topsoil from the full ROW if soil conditions permit (see 02-5, Topsoil Stripping and Segregation)
- pump standing water to a vegetated area of the ROW
- backblade ruts to disperse water and allow faster drying

DEWATERING 02–17

Purpose

Before lowering the pipe into the trench, it may be necessary to dewater the ditch to visually inspect the trench bottom for rocks or adequate depth. Trench dewatering also may be necessary:

- where tie-in welds are required
- at road-boring sites
- at locations where set-on weights are placed over the pipe
- in other areas where increased visibility or physical access to the trench is needed

Guidelines

Before commencing dewatering activities, ensure appropriate discharge permits and approvals are in place. Contact the environment department for further information. Before dewatering, any oil (free product) on the water must be completely removed or contained in the excavation as follows:

- Use sorbent booms or other means to hold the sheen to a portion of the excavation well away from the pump intake hose.
- Keep the pump intake hose submerged throughout dewatering to prevent the sheen from entering the hose.
- Direct discharge to a filter bag or hay bale structure.

If excavating in significantly contaminated soil, petroleum compounds may be dissolved in excavation water in amounts that require treatment or special dewatering approaches (e.g., tank truck). Before discharging potentially contaminated water, contact the district/regional manager and the environment department.

Siltation

Secure the pump intake hose at least 30 cm (1 ft) above the bottom of the trench.

Dispose of used filter bags in an approved landfill.

Watercourses and Wetlands

To prevent silt-laden water from flowing into wetlands and watercourses, direct dewatering discharge onto an appropriate energy dissipation device, e.g., sheet of plywood located in a well vegetated upland area (see Figure 1, Typical Dewatering Measures).

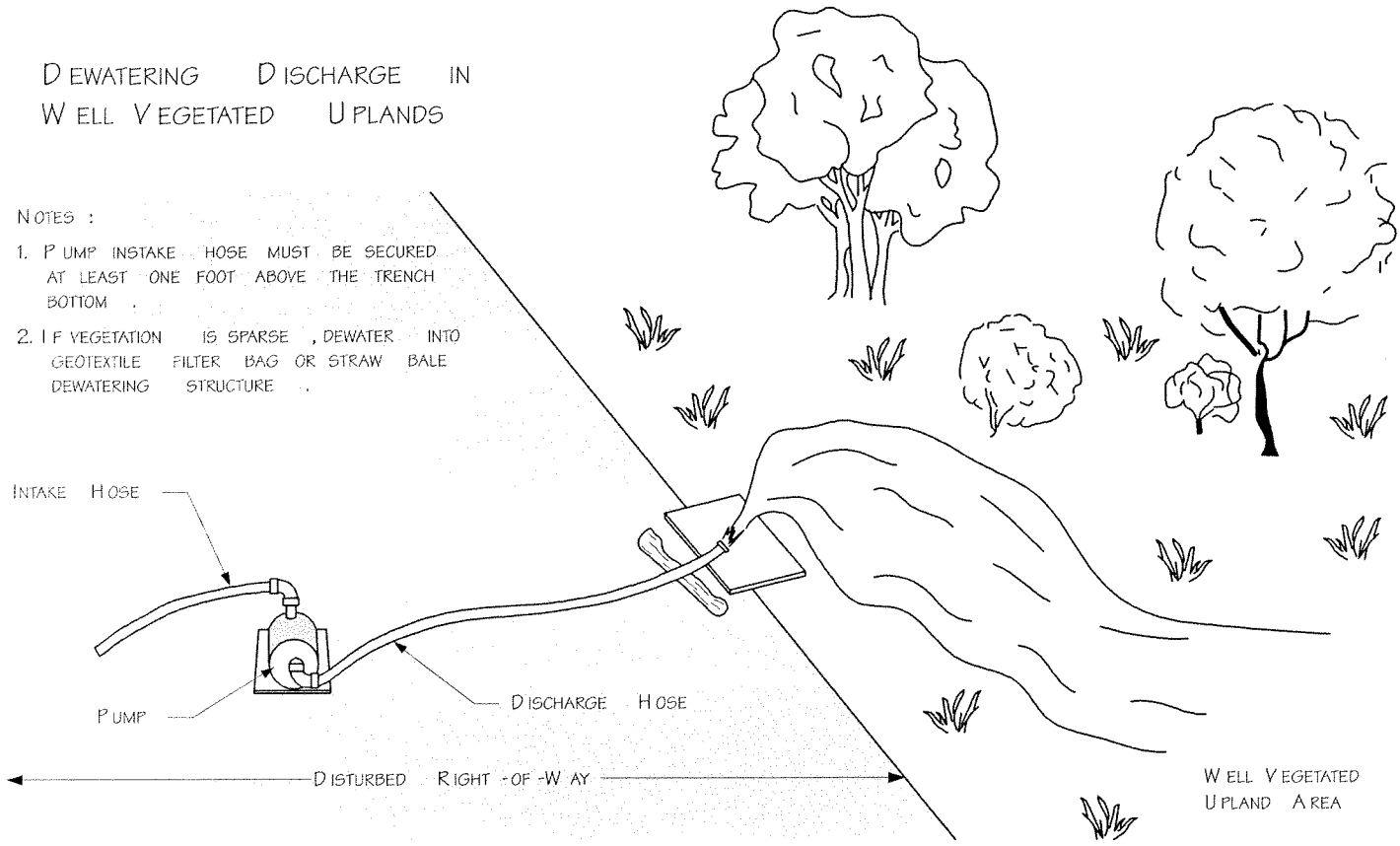
If vegetation is sparse and/or discharge is near a stream or wetland, direct dewatering discharge into a geotextile filter bag or a straw bale/silt fence dewatering structure (see Figure 2, Typical Straw Bale Dewatering Structure) then onto an upland area well away from watercourses, wetlands or drainage ditches.

NOTE: Use only nonwoven fabric filter bags for dewatering.

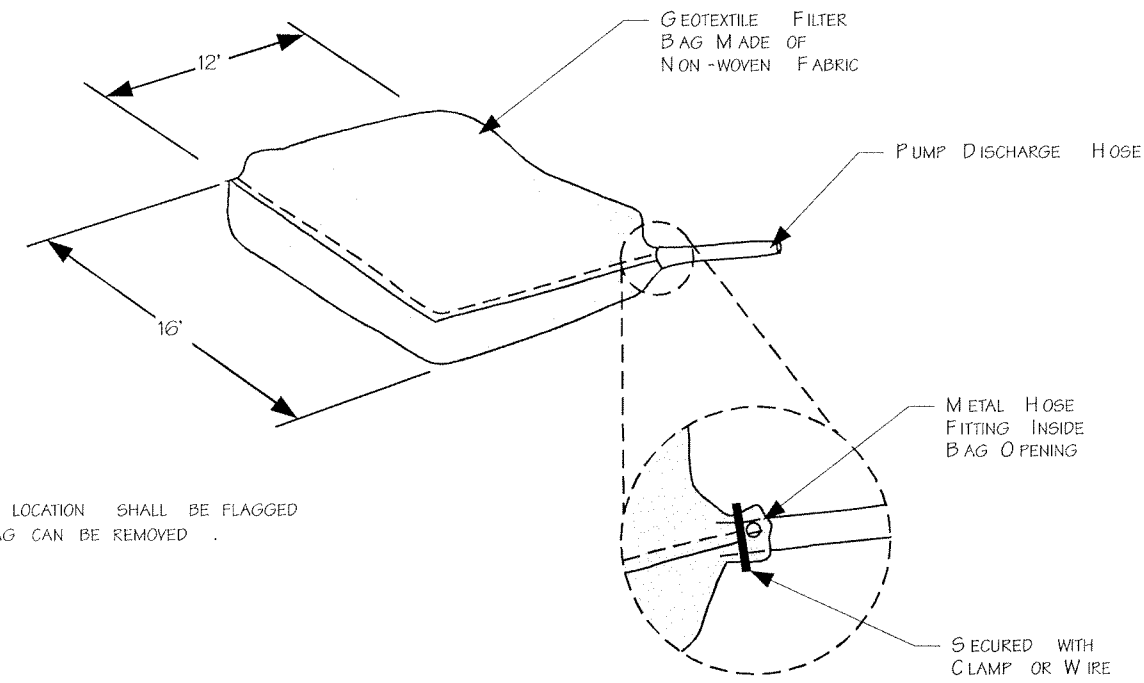
DEWATERING DISCHARGE IN WELL VEGETATED UPLANDS

NOTES :

1. PUMP INSTAKE HOSE MUST BE SECURED AT LEAST ONE FOOT ABOVE THE TRENCH BOTTOM .
2. IF VEGETATION IS SPARSE , DEWATER INTO GEOTEXTILE FILTER BAG OR STRAW BALE DEWATERING STRUCTURE .



GEOTEXTILE FILTER BAG



NOTE :

1. FILTER BAG LOCATION SHALL BE FLAGGED SO THAT BAG CAN BE REMOVED .

For environmental review purposes only.

ENBRIDGE

Figure 1

Typical Dewatering Measures

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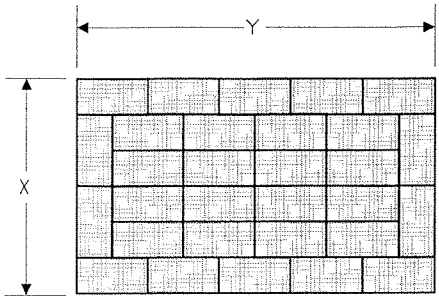
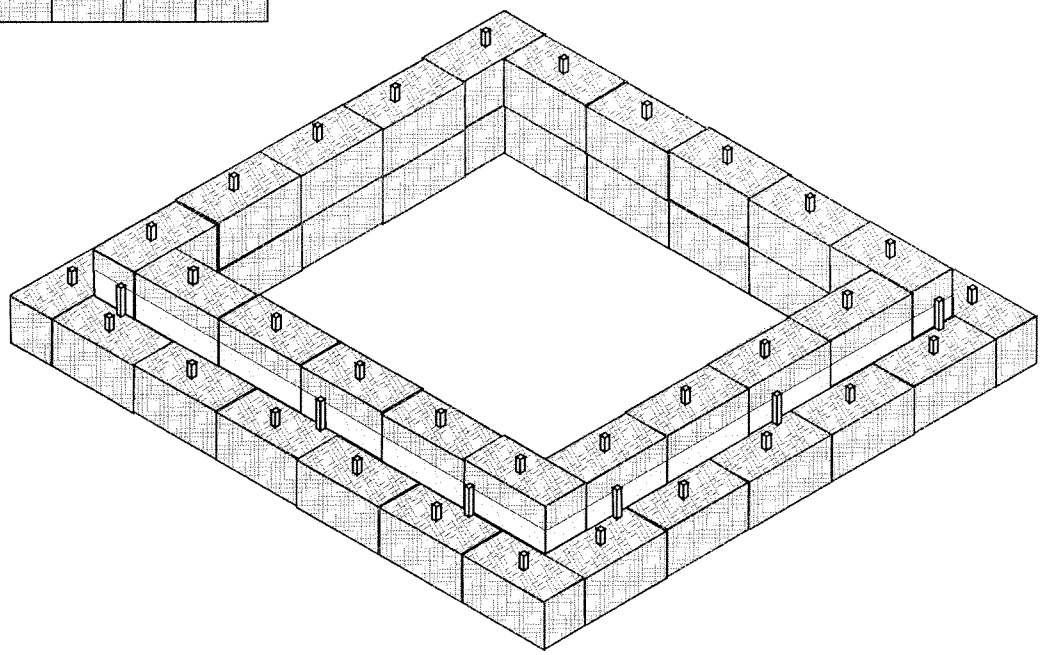
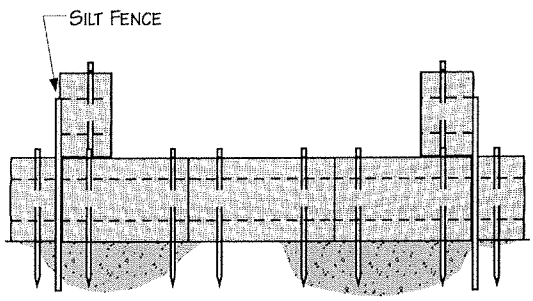


NOTES

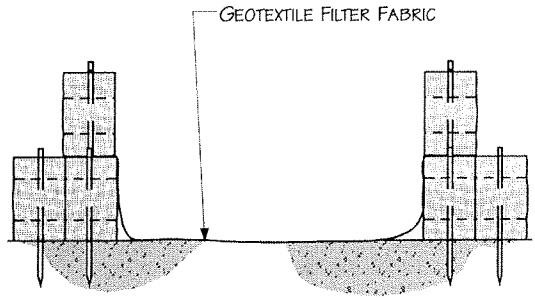
1. ARRANGE THE STRAW BALES TO THE X AND Y DIMENSIONS AS SPECIFICIED BELOW .
2. IF BOTTOM OF STRUCTURE IS NOT LINED WITH STRAW BALES (OPTION 1), LINE ENTIRE STRUCTURE WITH GEOTEXTILE FILTER FABRIC .



PERSPECTIVE VIEW



OPTION 1



OPTION 2

MINIMUM SUMP DIMENSIONS (FEET)		MAXIMUM PUMPING RATE
X	Y	GALLONS PER MINUTE
10	20	300
15	20	350
20	20	400
20	25	450
25	25	500
25	30	550
30	30	660

For environmental review purposes only.

ENBRIDGE

Figure 2

Typical Straw-Bale Dewatering Structure

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HYDROSTATIC TESTING 02–18

Purpose

Industry standards and government regulations require that pipelines and other facilities are tested before commissioning for integrity purposes. The withdrawal and discharge (dewatering) of test water must be properly managed to ensure adverse impacts on the surrounding environment are prevented. Therefore, it is very important to ensure that each test is planned well in advance to allow for water source and discharge management, proper regulatory notification and time to obtain the necessary permits.

Responsibilities

The Project Manager is responsible for:

- completing the Hydrostatic Permit Request form and submitting it to Safety & Environment
- ensuring the requirements of the environmental plan have been fulfilled

Safety & Environment is responsible for:

- acquiring the necessary water withdrawal and discharge permits or approvals for the pressure test
- notifying the test supervisor, either by copy of the approvals or verbally as appropriate at least 3 weeks before the date of the pressure test.

Guidelines

Hydrotest Permit Request Form

The objective of the Hydrotest Permit Request form is to inform Safety and Environment of upcoming hydrotests, as well as provide them with necessary information so applicable permits can be obtained.

Required information includes (see attached form):

- description of facility (i.e. tank, mainline, station piping, etc.)
- water source/withdrawal (i.e. water source, rate of withdrawal, dates, etc.)
- water discharge (i.e. discharge location, rate of discharge, dates, etc.)

Permits/Licenses/Approvals

Because in most cases regulatory approvals for hydrostatic testing can take 10 weeks (CAN) 26 weeks (USA), complete the Hydrostatic Permit Request form in the planning phases of the project, and submit it to Safety & Environment at least 10 weeks (CAN) or 26 weeks (USA) prior to the scheduled date of the pressure test.

NOTE: A Hydrotest Permit Request is not required for new facilities if the test medium will be (a) less than 10 m^3 (2600 [US] gal) of clean water obtained and returned to company property or (b) from a municipal water supply that will be clean at disposal.

Immediately notify Safety & Environment of any changes or additions after the Hydrotest Permit Request is submitted, or to accommodate an expedited schedule for permit requests.

Notification

The Project Manager is responsible for ensuring that appropriate notification(s) to landowners and other potentially affected local agencies are made prior to a mainline pressure test. Typical local agencies include:

- city, town, village, or municipal offices
- police and fire departments
- hospitals
- Emergency Measures Organization (EMO)
- railways that cross or follow the pipeline
- other pipeline companies and utility companies that cross the pipeline

Source/Withdrawal

Follow all conditions outlined in the withdrawal permit.

When planning the test, consider utilizing alternatives to natural bodies of water as a source of hydrostatic test water, municipal water supplies, such as industrial water supplies at plants or refineries, where possible.

Avoid using water bodies with known environmental sensitivities.

Ensure withdrawal sources have sufficient quantity and quality of water required for testing purposes. Avoid use of highly saline sources of water if practical.

Do no exceed permitted withdrawal rates, nor 10% of the flow or volume of the water source unless otherwise approved by authorities having jurisdiction.

Only withdraw from approved locations.

Screen intakes in order to minimize intake of debris and organisms (this may be regulated within the withdrawal permit).

If necessary, test source water quality and provide the environmental department with lab results well in advance of water withdrawal.

Location

Avoid locating water withdrawal/discharge sites on steep slopes, muskegs or other sensitive areas.

Discharge

Follow all conditions outlined in the discharge permit.

During pressure testing, discharge water only at approved locations.

Locate dewatering sites:

- downstream of municipal water intakes, or
- upstream of municipal water intakes at a distance approved by regulatory authorities

If possible, discharge the source water within the same watershed from where it was withdrawn.

Discharge water must not be more than 2°C (4°F) warmer or cooler than a receiving body of water if the receiving body of water supports sport fish. If the potential exists for a temperature change that exceeds these limits, contact Safety & Environment.

Dewater the pipe/tank in such a manner that prevents soil erosion and damage to the beds and banks of water bodies. Use low velocities, dissipate water energy and utilize protective riprap, sheeting, tarpaulins or equivalent to prevent washouts, flooding or erosion (see 02-17, Dewatering, Figures 1 & 2).

Undertake representative sampling and obtain a laboratory analysis of discharge test water and obtain soil chemistry analysis, if required, prior to discharging on land.

NOTE: Other requirements for water discharge are handled on a project specific basis. For more information, contact Safety & Environment.

Water Additives/Saline Test Water

Safety & Environment must approveany additives to test water before use. Avoid or minimize the use of additives, although non-toxic, biodegradable, or photodegradable additives at minimum dosages may be permitted with regulatory approval.

Recover all methanol, ethylene glycol and water contaminated by freezing depressants in tanks. Do not allow contaminants to enter natural bodies of water or soils.

Dispose of contaminated test water at approved sites/facilities.

When using additives or saline test water, the test supervisor must develop a contingency plan for handling spills and leaks.

Hydrotest Permit Request Form

Project/AFE: _____ Request Date: _____
Test Report No: _____ Page __of ____ Proposed Test Date: _____
Pipeline Contractor:_____
Testing Contractor: _____

Description of Facility

☐ Mainline Line - No. _____ From MP _____ To MP _____
☐ Station Piping - Station _____
☐ Tank Hydrotest - Tank No. _____ Volume _____
☐ Emergency Stock Pipe - Pipe ID _____
☐ Drawing Attached - No. _____

Pipe Data: OD _____ Length_____

Test Medium _____ Fill Volume _____ Squeeze Volume _____

Water Source/Withdrawal

Water Withdrawal Date: Start _____ Finish _____Duration _____
Analine Dye: ☐ No ☐ Yes
Water Additives/ Others ☐ No ☐ Yes (Describe) _____

Primary Water Source/Location: _____
Secondary Water Source/Location: _____

Rate of Water Draw: _____ Screen Size on Intake: _____
Method of Transporting Water to Site, if applicable ☐ Temporary Piping ☐ Tank Truck
(If temporary pipe is required, attach maps/drawings and description.)

Water Discharge

Water Discharge Date: Start _____ Finish _____ Duration _____
Primary Discharge Location: _____
Secondary Discharge Location: _____

Rate of Discharging Water: _____
Method of Water Treatment: _____
_____
Discharge Control Measures (e.g., baffles, straw filters, rip rap, tarpaulins): _____
_____
_____

Requested By: _____ Phone: _____

Signature : _____

Fax this form to Safety and Environment (780) 420-8253 (CAN) (715) 394-1570 (US)

OVERVIEW of RESTORATION 03–1

Purpose

Once pipe laying is complete, the company is required to clean up, restore and maintain the project site and right-of-way (ROW) in a condition that is acceptable to both landowners and regulatory agencies. Poor clean up and restoration may result in reduced agricultural, recreational and other land use capabilities, and may cause long-term impacts to fish populations and wildlife habitats. In addition, public relations with landowners and government agencies may be adversely affected.

The standards and procedures in this tab ensure the effectiveness of ongoing long-term environmental protection. Where environmental impacts are suspected, a post-activities inspection and monitoring program must be established as required by government agencies.

Legislation

CAN

Canada

National Energy Board (NEB):

- Onshore Pipeline Regulations, latest edition

Land Use Regulations

USA

United States

Department of Transportation (DOT), Pipeline Safety Regulations:

- Part 195, Transportation of Hazardous Liquids by Pipeline

Area contingency plan/regional contingency plan
Clean Air Act
Clean Water Act
Comprehensive Environmental Response Cleanup and Liability Act (CERCLA)
Emergency Planning and Community Right to Know Act (EPCRA)
Federal, state and local environmental agency regulations
National Environmental Policy Act (NEPA)
Oil Pollution Act (OPA)
Safe Drinking Water Act

BACKFILLING 03–2

Purpose

Backfilling generally involves replacing the material excavated from the trench and is the first stage in restoring the right-of-way (ROW). In areas where topsoil has been segregated, the subsoil is replaced and the topsoil spread uniformly over the area where it was removed. An earth crown is left over the trench line (except in wetlands) to allow backfill material to settle.

Improper backfilling can affect the quality of final restoration on the project. Poorly compacted backfill material or an excessive crown can cause drainage problems and inconvenience to landowners, livestock and wildlife. In addition, mixing topsoil with subsoil during backfilling may reduce soil capability.

Guidelines

Before backfilling, inspect the trench for small mammals and reptiles, skids, refuse, welding rods and other debris, and remove if present. Inspect the backfill material to ensure it is free of debris or other material that could damage the pipeline.

Backfill as soon as practicable after lowering-in the pipe to the desired depth. During winter construction, ensure backfill is completed by nightfall.

Confine backfill activities to the ROW. To prevent damage off the ROW, use a Mormon board, backhoe or specialized excavator (e.g., Gradall) where there is insufficient working space for bulldozers.

Use a backfill auger (e.g., Brown Bear), power dozer or suitable equipment to break up clods or frozen soils if required.

Avoid mixing snow with spoil.

Pad the pipe if backfill is frozen or stony, or if bedrock must be replaced. Dispose of surplus rocks at sites approved by the landowner or government agency.

On cultivated lands, leave the top 0.5 m (20 in.) of trench free from rocks to prevent interference with farm equipment. The average spacing and size of rocks left on the ROW should be no more than on adjacent lands.

On pasture lands and woodlands, avoid scalping the sod layer when replacing the topsoil and spoil. To prevent scalping, mount a urethane “prairie protector” attachment to backfill equipment, or use modified street sweepers to protect the sod layer.

On sandy soils and dunes, replaced graded fill to less than the natural angle of repose so that continual sloughing does not become a problem.

Trench Breakers

Before backfilling on steep slopes, install any necessary trench breakers to force groundwater along the pipe to the surface (see 02-15, Trench Breakers).

Subdrains

Before backfilling, install any necessary subdrains to divert shallow groundwater flow from the ROW and to improve slope stability (see Figure 1, Subdrains).

Drain Tiles

Before backfilling, determine whether any drain tiles crossed during trenching were damaged during construction. Use a sewer rod or pipe snake to probe open ends of tiles (see Figure 2, Drainage Tile Restoration).

Repair any damaged tiles by inserting a competent support (e.g., length of solid pipe) around the tile to prevent settling. If damage is extensive, remove broken tile and replace with new tile.

Drain tiles damaged during construction must be repaired to their preconstruction condition or better.

Backfill around drain tiles in lifts. Compact each lift.

Compaction

Backfill the trench with soil to a height approximately 300 mm (1 ft) above the level of the surrounding ground, except at potential drainage courses.

To compact backfilled spoil, run a grader along the trench once it has been filled just below the level of the surrounding ground.

NOTE: Compaction with a grader is essential to avoid ditch subsidence. Although the degree of compaction is limited by factors such as soil type, frost and moisture content, depth of cover, pipe strength and insulation, compaction is typically achieved by a few passes with a grader.

CAUTION: Do not run a grader over foreign lines. To compact backfill near foreign lines, use manually operated compaction equipment or another approved method.

On irrigated fields and open cut road crossings, 100% percent compaction is desirable. Use appropriate-sized compaction equipment and compact in multiple lifts.

To minimize subsidence on irrigated fields, compact backfill in a series of 15 cm (6 in.) lifts, or as indicated in project specifications. Avoid the formation of a trench crown or other obstacles that may impede the movement of sprinkler systems.

Compact the trench crown where pivot irrigation wheels pass. If compaction is not adequate at pivot wheel crossings, install a steel plate until compaction is achieved.

NOTE: Inspect and monitor the trench before and during the first irrigation season to determine the success of the trenchline compaction and leveling.

Take extra care to avoid using saturated, wet spoil when compacting the trench at the banks of watercourses.

If trench spoil is frozen, postpone compaction until cleanup in mid to late spring.

Watercourses

Backfill stream beds to their original contour with original stream bed material unless permits specify otherwise.

When backfilling stream banks, pump the ditch dry, then use dry soil in compacted lifts to prevent stream bank sloughing.

At watercourses where sport fish spawn, replace the upper layer of streambed material with previously salvaged materials (see 02-11, Watercourses and Wetlands), or backfill the upper layer of the trench with material equal to, or better than, original stream bed material.

Wetlands

When backfilling wetlands, replace subsoil material removed from the trench during construction so that no crown remains, unless soils are frozen. If a crown is left over the trench in wetlands to account for settling of frozen backfill, leave periodic breaks to prevent damming, and restore the original contours during cleanup the following spring or summer.

Do not use segregated topsoil as padding. Return segregated topsoil to its original horizon over the backfilled trench.

Crowning

Crown the trench with remaining spoil to allow for settlement. The height of the crown depends on:

- land use
- degree of compaction desired
- swell coefficient of backfill (see Table, Swell Coefficient of Backfill)
- soil temperature

Ensure the crown is centered over the ditchline.

On forested lands, a higher crown is acceptable provided drainage and wildlife are unaffected.

Frozen soils require higher crowns than unfrozen soils.

On agricultural lands with unfrozen soils, the crown should be low and wide to facilitate replacing topsoil.

Feather excess spoil over the stripped portions of the ROW to create a smooth mound. If more room is needed for excess spoil, strip one blade width (approximately 3–4 m [10–13 ft]) of topsoil from the spoil or work areas of the crown to facilitate feathering out excess trench spoil without mixing subsoil with topsoil.

Leave breaks in the trench crown:

- in obvious drainage runs
- whenever seepage occurs
- at regular intervals where sidehill is encountered

Compact backfill where breaks in the trench crown are left.

NOTE: The breaks may require maintenance the following year to fill in settled areas.

Table 1 shows the swell coefficient of various soil types. To calculate the height of a crown, use the formula:

$R = s \times D$

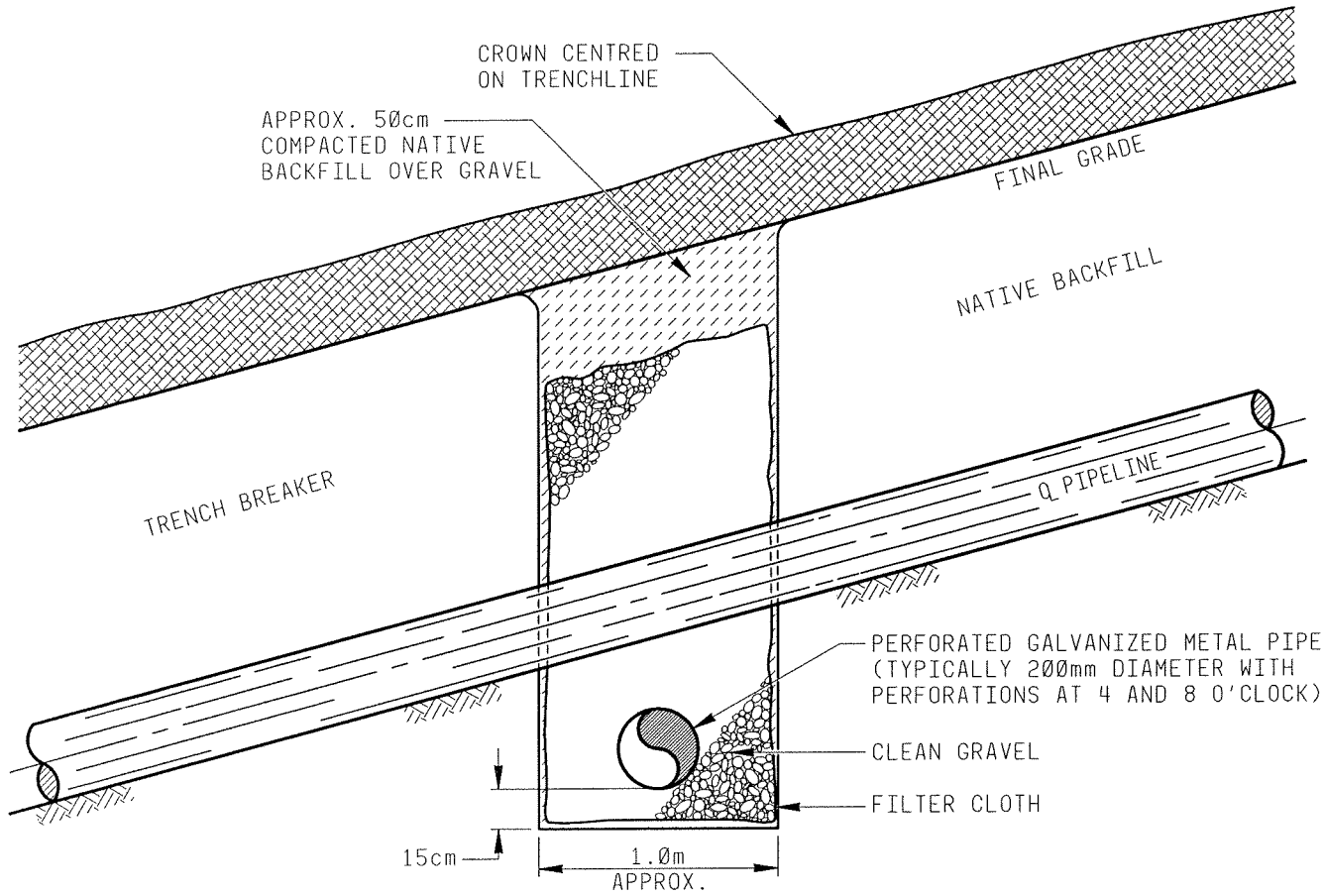
Where:

R = height of crown
s = swell coefficient
D = depth of trench

Table 1
Swell Coefficient of Backfill

Type of Backfill	Swell Coefficient
blasted rock	.00–.05
sand and gravel	.05–.10
sand	.08–.15
silty sand	.10–.15
silt	.10–.20
clay	.10–.25
organic (muskeg)	.50–1.00

NOTE: The higher numbers in the range represent the worst case (i.e., frozen or clods).



PROFILE

NOTES:

1. INSTALL A SUBDRAIN TO DIVERT SHALLOW GROUNDWATER FLOW AWAY FROM THE PIPELINE, TO IMPROVE SLOPE STABILITY. CLEAN GRAVEL, WRAPPED IN FILTER CLOTH, PERMITS DRAINAGE AIDING IN RETENTION OF BACKFILL. IN CERTAIN CIRCUMSTANCES, A PARALLEL DRAIN MAY BE INSTALLED LENGTHWISE DOWN THE SLOPE UNDERNEATH THE PIPELINE. A GEOTECHNICAL ENGINEER CAN ADVISE IN WHICH METHOD IS MOST APPROPRIATE.

2. DETERMINE THE LOCATION OF DRAIN BY ON-SITE INVESTIGATION CONSIDERING SUCH FACTORS AS GROUNDWATER CONDITIONS IN TRENCH, SOIL TYPES, LOCAL TOPOGRAPHY, AND DRAINAGE PATTERNS.

3. SKEW CROSS DRAIN WITH DOWNHILL GRADING AT 5° TO ENSURE SUFFICIENT DRAINAGE.

4. INSTALL TRENCH BREAKER DOWNSLOPE OF DRAIN, WHERE DRAINS CROSS PIPELINE TRENCH, TO PREVENT DRAIN WATER FLOWING DOWN PIPE TRENCH

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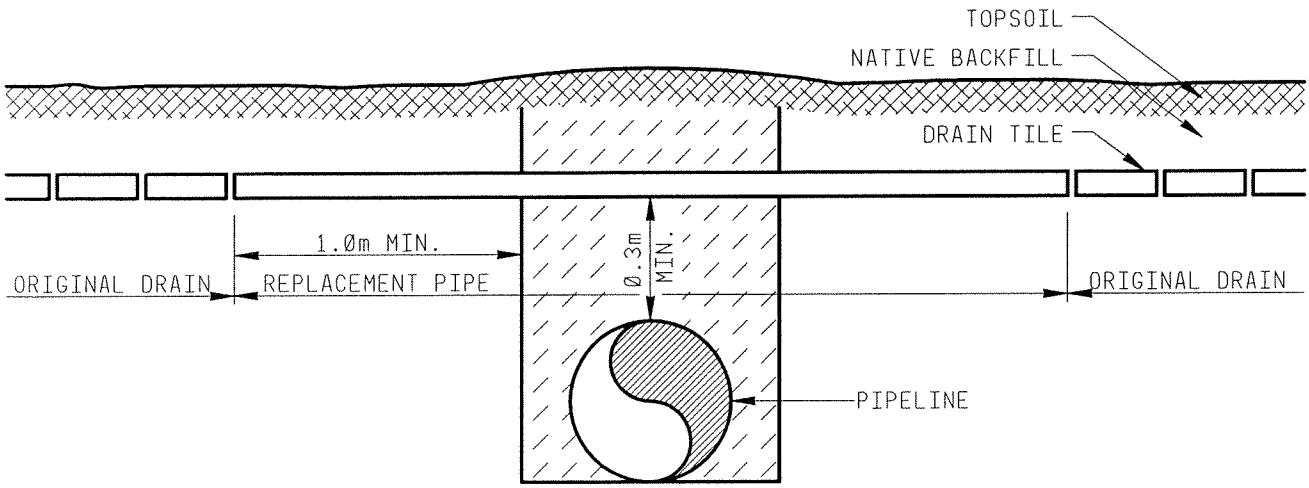
Figure 1

Subdrain



PROFILE

(CROSS-SECTION OF TRENCH)

NOTES:

1. IF TILE OR TUBE DRAINS ARE CUT DURING TRENCHING, MARK LOCATIONS, CAP DRAINS TO PREVENT CLOGGING WITH DIRT OR DEBRIS, AND INSTALL A TEMPORARY FLUME TO MAINTAIN DRAINAGE.

2. PROIR TO TOPSOIL REPLACEMENT, REPLACE DRAINS WITH A LENGTH OF SOLID PIPE TO PREVENT SETTLING. IF DISTURBANCE IS EXTENSIVE, REPLACE WITH NEW DRAIN TUBING, OR PERFORATION SOLID PIPE ON A COMPACTED BED.

3. INSERT A SEWER ROD OR PIPE SNAKE INTO OPEN DRAIN ENDS FAR ENOUGH TO ENSURE THAT RIGHT OF WAY TRAFFIC HAS NOT DAMAGED OR DISPLACED DRAINS

4. REPAIR ANY DAMAGED TILES BY INSERTING A COMPETENT SUPPORT (E.G. LENGTH OF SOLID PIPE) AROUND THE TILE TO PREVENT SETTLING.

5. IF DAMAGE IS EXTENSIVE, REMOVE BROKEN TILE AND REPLACE WITH NEW TILE.

6. REPLACE DRAIN TO ITS FORMER GRADIENT AND ALIGNMENT.

7. BACKFILL AND COMPACT SUBSOIL IN LIFTS BENEATH AND AROUND PIPE.

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Figure 2

Drainage Tile Restoration

CLEANUP 03–3

Purpose

Cleanup typically involves removing construction refuse and debris from the right-of-way (ROW), grading to restore disturbed areas to original contours, installing or repairing erosion control structures, and replacing topsoil and fences removed during construction. The quality of work done during cleanup often directly affects future relations with landowners and government agencies.

Guidelines

Scheduling

Summer/Fall

Clean up summer/fall projects as soon as possible after backfilling, and before freezeup, if possible.

Postpone cleanup on wet ground until soils dry out.

Winter/Spring (Rough)

Begin rough cleanup of winter projects as soon as possible after backfilling (frozen conditions) and before spring breakup.

Winter/Spring (Final)

Begin final cleanup of projects not completed before freezeup and cleanup of winter projects as soon as possible after spring breakup.

Schedule cleanup to minimize interference with agricultural operations, migratory birds and fish spawning as much as possible.

For damaged soils, postpone cleanup until soils dry out.

Before final cleanup, consult with the landowner to ensure any special concerns can be addressed before completing restoration.

Waste

Collect and dispose of all construction-related garbage, debris, wastes and hazardous materials from the ROW in designated containers or at approved facilities.

NOTE: For appropriate waste management practices, see the Waste Management Plan.

Do not leave waste on or along the ROW, or buried in an excavation.

Remove stones to achieve equivalence with the surrounding subsoil/topsoil, as well as stones from the upper 30 cm (1 ft) of soil that will interfere with topsoil replacement or cultivation, i.e., stones larger than 10 cm (4 in.) in diameter. Dispose of stones at locations approved by landowners or government agencies.

Dispose of excess rock displaced from the trench or ROW by blasting as directed by landowners or government agencies.

Topsoil Replacement

Replace topsoil as evenly as possible over stripped areas of the ROW.

Postpone replacing topsoil during wet weather or high winds to prevent damaging soil structure or erosion of topsoil.

Immediately before replacing topsoil, cut a clean edge with a grader. Distribute edge cut material evenly over the prepared subsoil surface.

Regrading

Regrade areas with vehicle ruts, erosion gullies, settled trenches or where the trench crown is misaligned.

Regrade stream banks and approaches to a maximum of 1:3 (rise over run), unless otherwise directed by a geotechnical engineer.

Recontouring

Recontour the right-of-way (ROW) to restore surface drainage and the approximate preconstruction profile. When replacing sidehills or other graded areas is not practical due to the risk of slope failure or ovalling the pipe, recontour slopes to grades not exceeding 1:3 (rise over run) or as advised by a geotechnical engineer.

If fill is frozen, postpone recontouring until spring.

On flood irrigated lands, recontour the ROW to preconstruction profile.

Wetlands

Restore the original contours of wetlands, and remove any excess backfill to an upland area approved by the environmental department.

Damaged Soils

Rip compacted subsoils, temporary access trails and soils damaged during wet weather with a multishank ripper to a depth of 30 cm (12 in).

Use a disk plow or cultivator on ripped subsoils to break up lumps and to smooth the surface.

NOTE: To minimize further compaction, limit disking to what is necessary to break up clods.

Till or cultivate fields and any severely compacted or rutted areas with a deep tillage device or chisel plow to loosen compacted soils.

Corduroy

Remove corduroy from locations where drainage disruptions are likely, where requested by landowners or government agencies, and from mineral soils.

Remove and return clay or sand caps overlying corduroy to the original location, unless otherwise requested by landowners or government agencies.

Ensure adequate culverts or other cross drainage is provided in any capped corduroy that is left in place.

Dispose of corduroy, slash and any remaining leaning trees in the same manner as the original clearing (see 02-4, Clearing).

Cultivation

Cultivate the ROW where it crosses fields, bush or woodlands to a depth adequate to alleviate surface compaction and in a manner acceptable to the landowner. Do not pulverize soil.

If seeding immediately after topsoil is replaced, harrow the ROW.

Cultivate hay and pasture land if the sod layer is broken or badly compacted.

With the approval of the landowner at problem sites, add manure or plant legumes to increase organic matter.

Equipment Crossings

Where possible, remove equipment crossing structures before freezeup (summer/fall projects) or before spring breakup (winter projects).

If equipment crossings are needed for access during final seeding, they can be replaced after spring breakup.

Temporary Erosion Control

Use temporary erosion control measures, e.g., sandbags, logs or straw bales, during rough cleanup on undisturbed pasture or well-sodded right-of-way (ROW).

Install temporary stream bank protection during rough cleanup if erosion is evident at water crossings (see 02-13, Slope Breakers and 02-14, Temporary Sediment Barriers).

To minimize drifting soils and loss of topsoil in areas prone to wind erosion:

- spread wood chips or straw crimping
- sow a fast growing ground cover
- walk down tree and shrub debris over exposed soils

If winter conditions preclude final cleanup, stabilize the area (e.g., flatten topsoil piles, partially fill grade cuts) and keep temporary erosion control measures in place until permanent erosion control measures can be installed.

Temporary Slope Breakers/Sediment Barriers

During frozen conditions, install temporary slope breakers and sediment barriers during rough cleanup if final cleanup is not completed until the following spring (see 02-13, Slope Breakers and 02-14, Temporary Sediment Barriers).

Mulch

Mulch slopes greater than 5%. Apply mulch after the last grading operation of winter construction.

NOTE: Mulch can be applied to snow-covered ground.

Do not apply mulch by hand or apply more than 2 tons per acre, as it may be removed the following spring before seeding.

Wetlands

Restore the original contours of wetlands, and remove any excess backfill to an upland area approved by the environmental department.

Damaged Soils

Rip compacted subsoils, temporary access trails and soils damaged during wet weather with a multishank ripper to a depth of 30 cm (12 in).

Use a disk plow or cultivator on ripped subsoils to break up lumps and to smooth the surface.

NOTE: To minimize further compaction, limit disking to what is necessary to break up clods.

Till or cultivate fields and any severely compacted or rutted areas with a deep tillage device or chisel plow to loosen compacted soils.

Corduroy

Remove corduroy from locations where drainage disruptions are likely, where requested by landowners or government agencies, and from mineral soils.

Remove and return clay or sand caps overlying corduroy to the original location, unless otherwise requested by landowners or government agencies.

Ensure adequate culverts or other cross drainage is provided in any capped corduroy that is left in place.

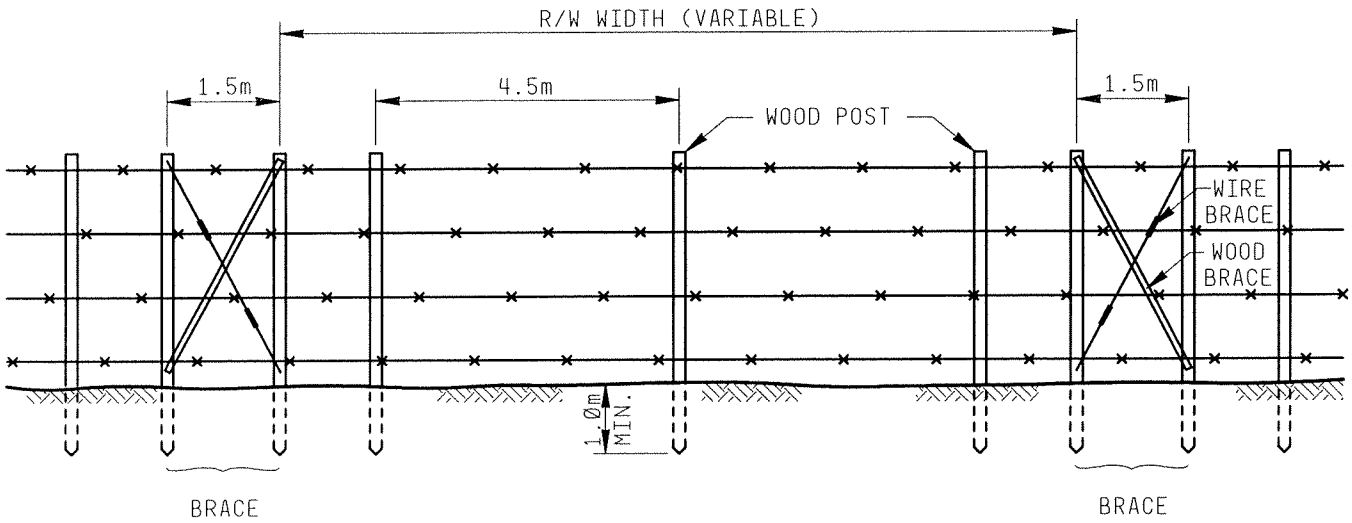
Dispose of corduroy, slash and any remaining leaning trees in the same manner as the original clearing (see 02-4, Clearing).

Cultivation

Cultivate the ROW where it crosses fields, bush or woodlands to a depth adequate to alleviate surface compaction and in a manner acceptable to the landowner. Do not pulverize soil.

If seeding immediately after topsoil is replaced, harrow the ROW.

Cultivate hay and pasture land if the sod layer is broken or badly compacted.



PROFILE

NOTES:

1. INSTALL POST AND WIRE FENCES TO REPLACE TEMPORARY GATES INSTALLED FOR PIPELINE CONSTRUCTION.

2. FOLLOWING PIPELINE CONSTRUCTION, REMOVE TEMPORARY GATE AND REPLACE WITH NEW FENCE USING MATERIAL OF EQUAL OR BETTER QUALITY THAN THE ORIGINAL FENCE. RETAIN BRACES AS PERMANENT PART OF FENCE STRUCTURE. IF GROUND IS FROZEN, USE METAL POSTS AND REPLACE WITH WOOD POSTS WHEN SOIL HAS THAWED. WHERE APPROPRIATE, MAINTAIN A MINIMUM BOTTOM WIRE ELEVATION OF Ø.4m TO ACCOMMODATE SMALL WILDLIFE SPECIES.

3. INSPECT FENCE FOR 1ØØm IN BOTH DIRECTIONS FOR SLACK WHEN TENSIONING THE WIRES.

4. REMOVE ALL EXCESS WOOD, WIRE, STAPLES, AND OTHER WASTE.

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Figure 1

Post and Wire Fence

REVEGETATION 03–4

Purpose

Permanent revegetation involves preparing the seed bed and seeding disturbed areas to establish a permanent groundcover.

Guidelines

Seed and fertilize disturbed areas of the right-of-way (ROW) as requested by landowners or government agencies as soon as possible after final cleanup, weather and soil conditions permitting.

When re-establishing cover, consider seasonal factors including:

- seed dormancy
- hot, dry conditions
- access during spring breakup

Mix and sow specific seed mixes as recommended in the project specifications or in consultation with the environment department for the following:

- steep slopes
- stream banks
- native pasture/prairie
- critical wildlife areas
- sandy soils or sand dunes
- highly erodible soils and locations
- areas with high visual impact
- contaminated soils
- wetland, muskeg, slough and marsh areas
- urban areas, lawns, etc. (sod as required)

Where problems may be expected in establishing vegetation (e.g., on sandy soils and dunes) consider using any or a combination of the following:

- install wind barriers such as slat fences, straw bales, brush grid, cover crops or straw crimping
- apply manure, green feed, peat or material rich in organic content to amend the soil
- prepare the surface to enhance seed germination by tilling or by creating gouges, furrows or impressions with specialized equipment, such as chisel plows or land imprinters

- install diversion berms and ditches on slopes
- apply slash rollback or mulches. Import slash as required
- seed drought resistant grasses and legumes, and a cover crop of annual rye or barley
- transplant container-grown native shrubs and herbaceous species
- apply fertilizer as per soil analysis and as identified in the construction specifications

Ensure straw mulch and seed mix used to revegetate the ROW are free of noxious weed seed. Use certified seed and retain the analysis certificate in case a dispute arises concerning weeds.

Restrict public vehicle access over newly grassed areas.

Agricultural Land

Seed and fertilize cultivated land on the ROW as part of normal farming operations where possible.

On those portions of the ROW where the landowner is not planting a crop during the next growing season:

- Purchase seed in accordance with Pure Live Seed (PLS) analysis for the seed mix, i.e., compare seed cost based on purity percentage multiplied by germination percentage (PLS).
- Use seed within 12 months of germination testing.
- Treat legume seed with an inoculant specific to the species. When hydroseeding, use four times the manufacturer's recommended rate of inoculant. Do not hold inoculated seed in a slurry without fertilizer for more than 1 hr.
- Fence the ROW if practical until seedlings are well established and to prevent damage from livestock.

Wetlands

Wetlands generally revegetate naturally. Revegetate disturbed wetland areas with annual ryegrass planted at a rate of 40 lb/acre, unless there is standing water or unless permanent planting or seeding with native wetland vegetation is required.

Do not apply fertilizer, lime or mulch in wetlands.

During frozen conditions, apply annual ryegrass as a dormant seeding. If dormant seeding is not feasible, seed annual ryegrass during the next growing season in wetlands that are sufficiently dry to support appropriate equipment.

Watercourses

On steep approaches to watercourses where the slope was extensively graded, transplant native shrubs, willow cuttings or use other bioengineering techniques, e.g., vegetative geogrid (see Figure 1, Vegetated Geogrid, and 03-7, Installing Willow Cuttings).

Revegetate watercourse banks and approach slopes with a standard mix plus an annual cover crop, i.e., barley or annual rye, applied at twice the standard rate. After seeding, apply erosion control blanket, e.g., high velocity curlex, or mulch.

Swales

Seed and mulch swales with straw for the width of the ROW.

Mulch

Mulch stabilizes the soil surface and limits soil movement and the availability of soil to enter runoff. Typical mulch materials include straw or hay, or erosion control fabrics, such as high and low velocity curlex or jute blanket.

Do not apply mulch to cropland unless specifically requested by the landowner.

After seeding, mulch slopes greater than 5% or sandy areas with 2 tons of straw or hay per acre, or as specified by the company (see Figure 2, Typical Low Relief Drainage Way Stabilization-Seed & Straw Mulch).

Mulch all areas of dormant seeding with 2 tons per acre of hay or straw, or as specified by the company to cover >75% of the ground surface.

Anchor mulch to minimize loss by wind and water. If soil conditions allow, use a mulch anchoring tool or farm disc set in the straight position to crimp the mulch 2–3 in. deep.

NOTE: Liquid tackifiers may be used after obtaining written approval from the company.

If final cleanup is delayed longer than 10 days, or if construction is interrupted for extended periods, apply mulch before seeding. To provide temporary vegetative cover for extended periods, seed upland areas with annual rye.

Do not apply mulch in wetlands.

Seed and Fertilizing Methods

To promote seed germination on dry or wind exposed sites:

- use straw crimping
- apply manure (with landowner approval)
- use or import small diameter slash (uncultivated areas)
- thinly spread wood chips (uncultivated areas)

Where terrain and soil conditions allow, apply seed using a seed drill equipped with packing wheels.

NOTE: Ensure the depth control on the drill is set correctly.

Broadcast or aerial seed and fertilize wet soils to minimize surface disturbance.

Broadcast seed and fertilizer on berms and other erosion control structures to ensure immediate revegetation or soil stability.

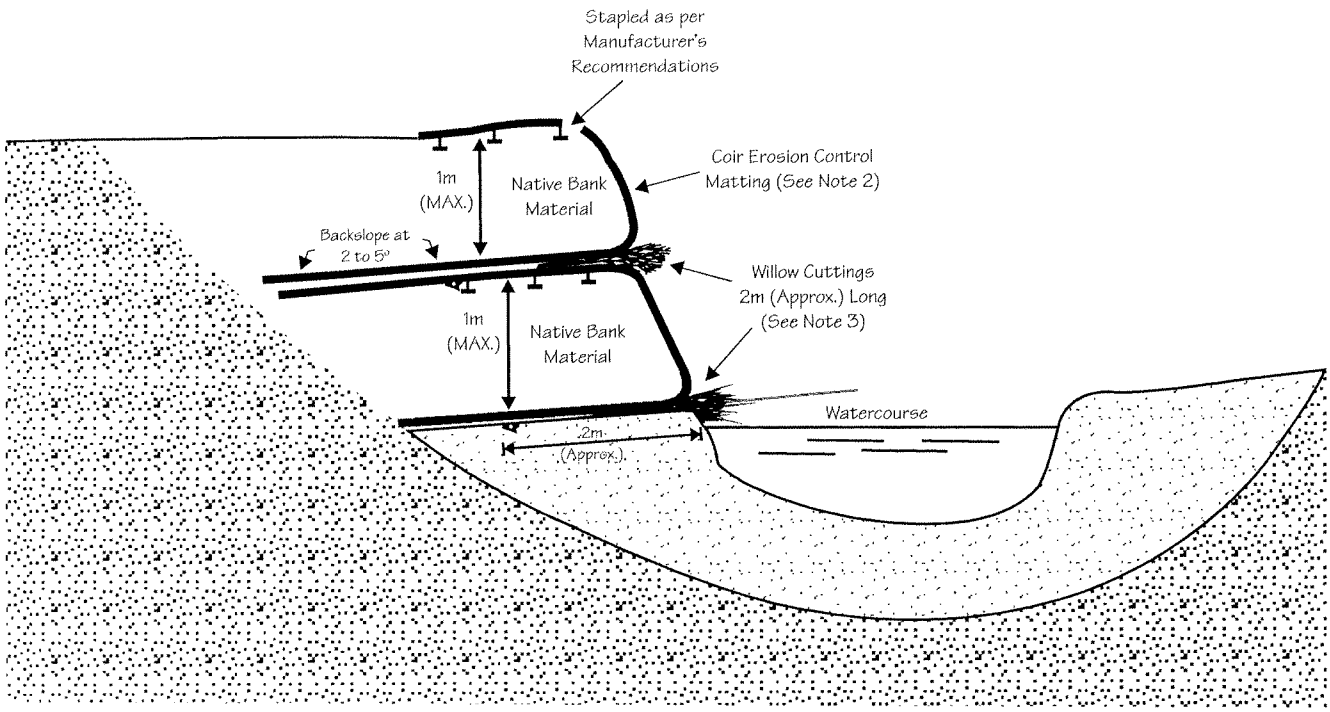
Use hydroseeders, mulches, tackifiers, seed impregnated netting or other suitable methods on steep or erosion-prone slopes.

Broadcast seed but do not fertilize next to watercourses. Harrow or hand rake to incorporate seed.

When broadcast seeding, firm the seed bed with a harrow-packer or roller after seeding.

Apply fertilizer and pH modifying agents, e.g., lime, as specified by the company and in consultation with landowners and government agencies.

NOTE: If spring cleanup extends to many weeks, a weed control program may be required.



PROFILE
(Not To Scale)

NOTES:

1. Install vegetated geogrid on steep approach slopes to watercourses where extensive grading of the slope was required.
2. Install coir erosion control matting shown above during nonfrozen conditions. Only matting that meets or exceeds the requirements noted in the construction specifications or is approved by the environmental department shall be installed. All materials used in the coir matting shall be biodegradable.
3. Ensure willow cuttings are fresh with a minimum 1cm (Min.) diameter at their base. Install willow cuttings at frequency of 25 (Approx.) per linear metre.
4. Compact, to the extent practical, each lift of backfill separately.
5. Hand broadcast seed prior to installation of the coir matting, if practical, or on the surface of the coir matting.

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Figure 1

Vegetated Geogrid

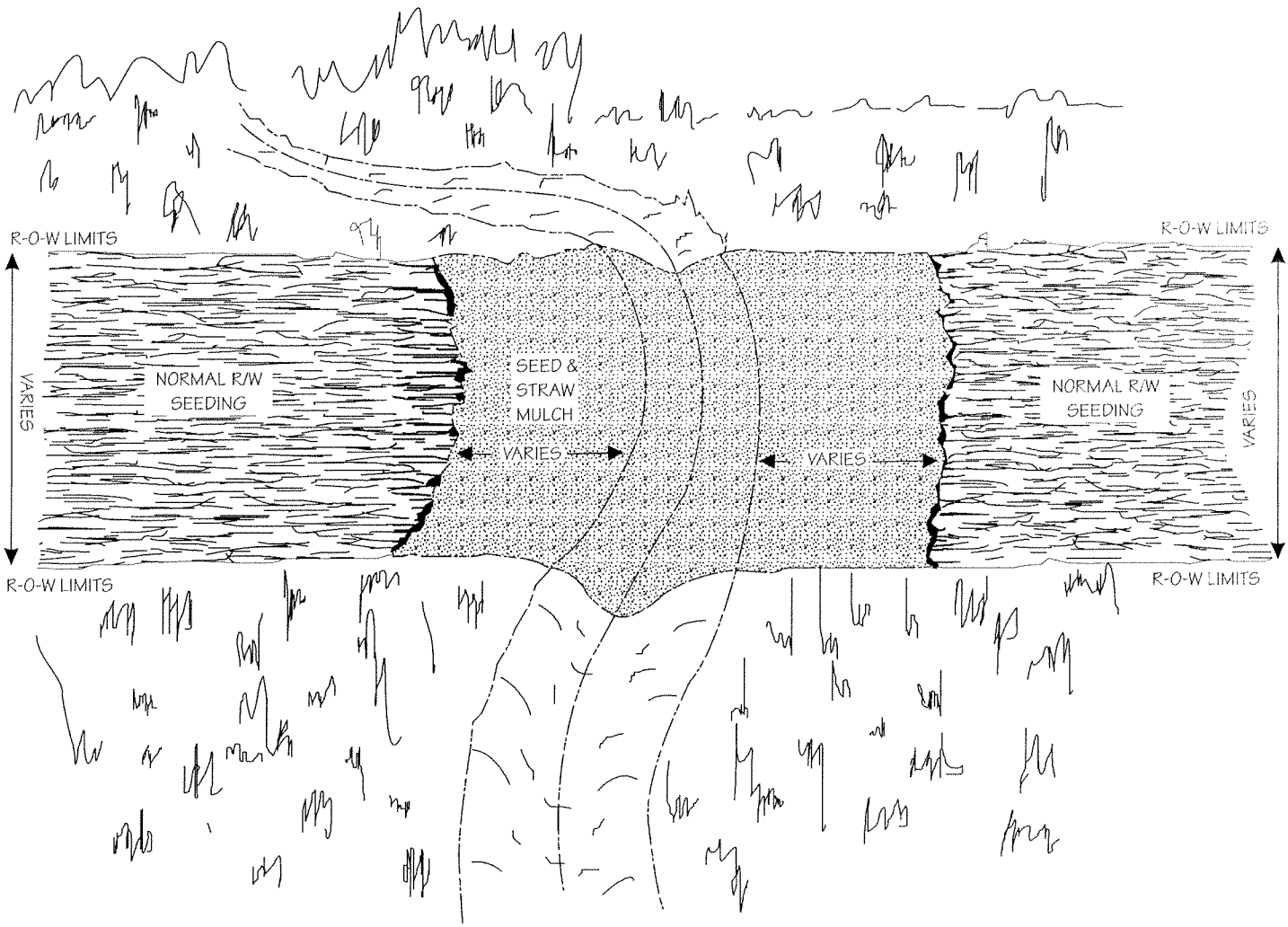

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Figure 2

Typical Low Relief Drainage Way Stabilization
Seed and Straw Mulch

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PERMANENT EROSION and SEDIMENTATION CONTROL 03–5

Purpose

Permanent soil erosion and sedimentation control begins as soon as possible upon completion of backfilling. Erosion control is necessary to prevent pipe exposure and the subsequent cost to restore the site to previous conditions. Erosion control is also required to minimize siltation in watercourses.

Guidelines

Slopes

After final grading, stabilize disturbed steep slopes in areas other than cropland with permanent erosion control structures (see Figure 1, Permanent Slope Breakers-Perspective View), especially if heavy runoff, spring breakup or heavy storms are likely and there is a risk of significant soil erosion. Consider any of the following:

- install cross ditches and diversion berms
- walk down tree and shrub debris over exposed soils
- armor berms and ditches with logs, polyethylene or sandbags
- install netting or filter cloth
- apply tackifier
- install and stake sod
- hydromulch
- hydroseed, spread straw and crimp
- seed an annual crop of barley, fall rye or oats
- plant native shrubs or willow cuttings

Install permanent slope breakers according to the same design and spacing used for temporary slope breakers (see 02-13, Slope Breakers).

On slopes over 30%, install erosion control blanket, e.g., curlex, jute, or equivalent (see Figure 2, Erosion Control Blanket-Steep Slopes > 30%).

Stream Banks

Since most water crossings have individually designed crossing plans, obtain the special instructions from a company representative before working next to watercourses. If there are no special conditions, use a company standard design to ensure appropriate erosion control measures are in place.

NOTE: For information on installing stream bank protection, see the procedures in this tab.

Install berms or other sediment filter devices at the base of sloped approaches to streams greater than 50% (for information on berms, see 02-13, Slope Breakers).

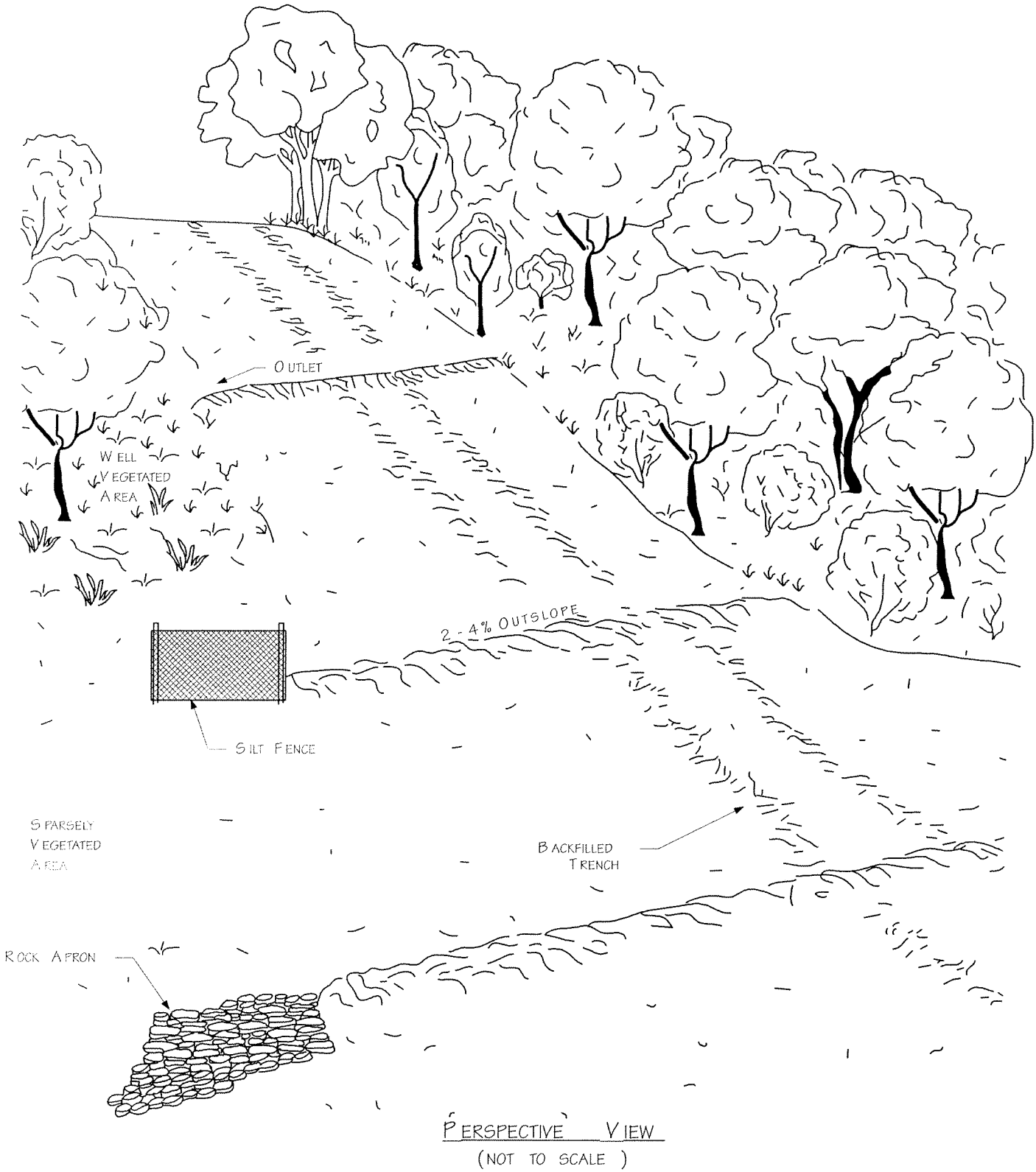
Immediately after stream banks are restored to their original contours, or to a 3:1 slope, whichever is less steep, install bank protection according to site and permit requirements:

- place riprap and geotextile fabric (see Figure 3, Typical Stream Bank Stabilization Riprap & Erosion Control Blanket) and prepare soil for seeding upslope
- if not riprapped with rock, seed with the specified seed mix and cover with an erosion control blanket (see Figure 4, Typical Streambank Stabilization Erosion Control Blanket - Seed and Straw Mulch).

NOTE: For more information, see 03-6, Installing Riprap.

Watercourses

Permanently restore and stabilize drainage ditches and intermittent streams with erosion control blanket, permanent seeding or other appropriate measures.



PERSPECTIVE VIEW
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Figure 1

Permanent Slope Breakers - Perspective View

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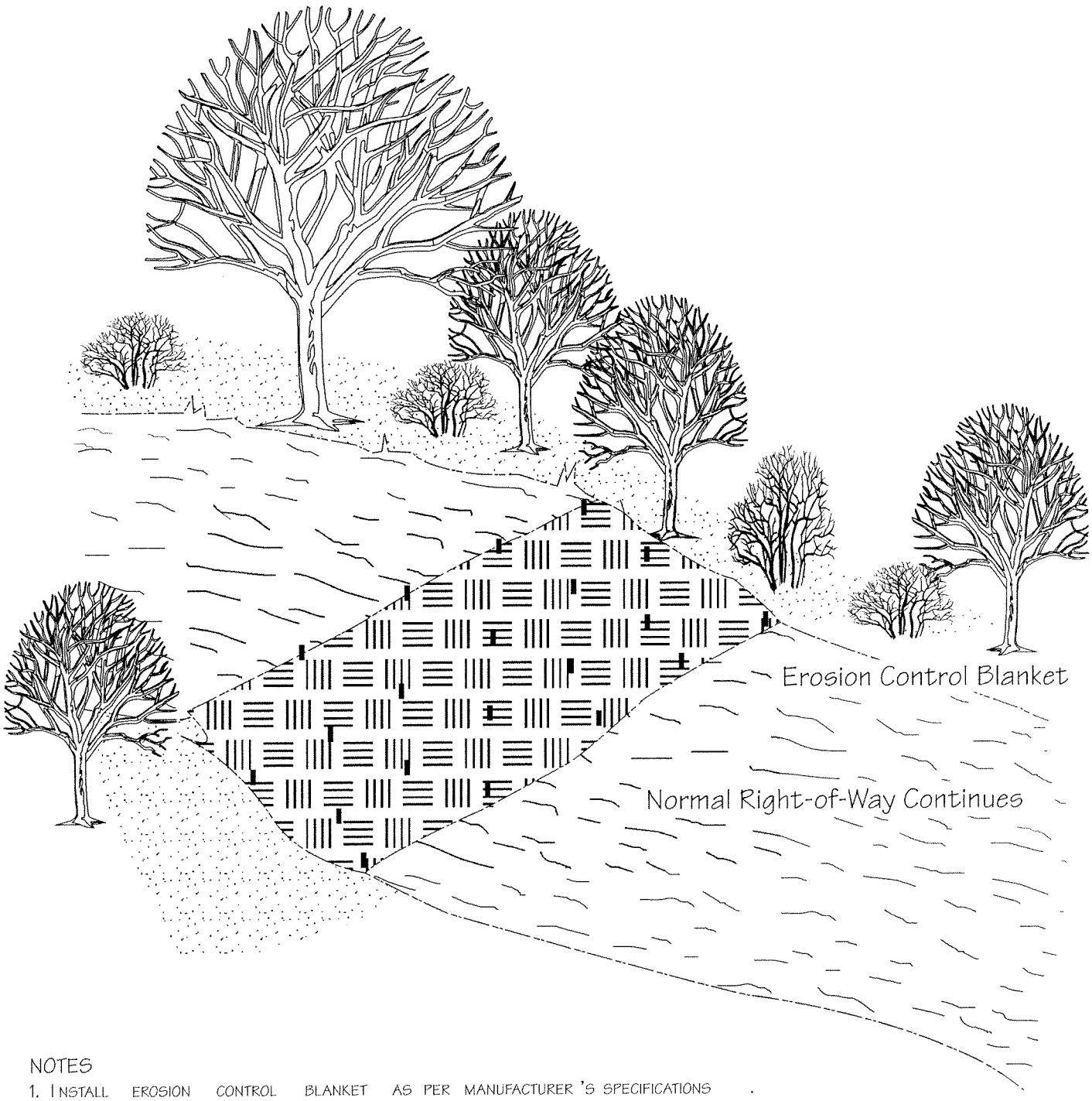

NOTES

1. INSTALL EROSION CONTROL BLANKET AS PER MANUFACTURER'S SPECIFICATIONS .

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Figure 2

Erosion Control Blanket - Steep Slopes (≥30%)

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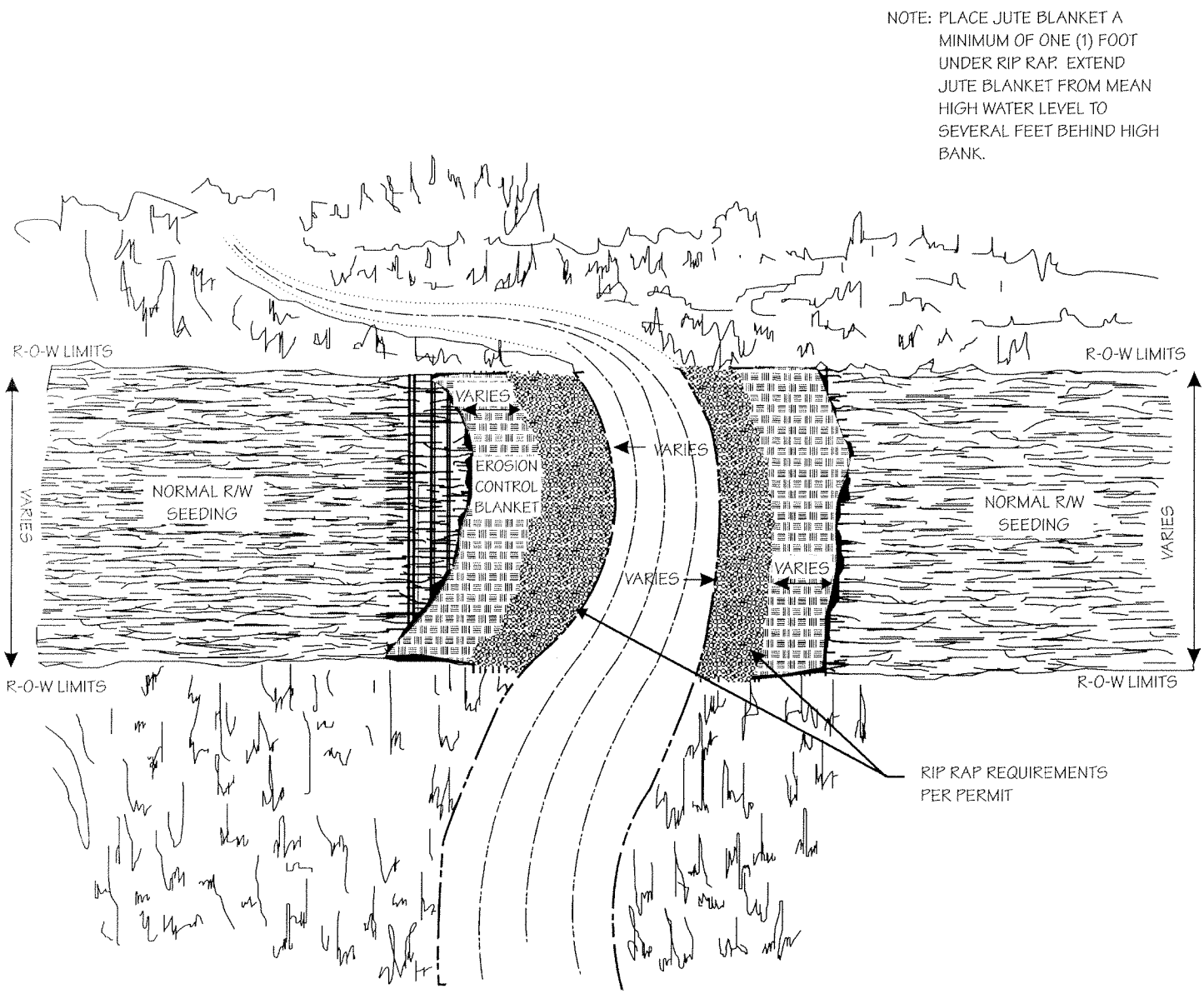

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Figure 3

Typical Stream Bank Stabilization
Riprap & Erosion Control Blanket

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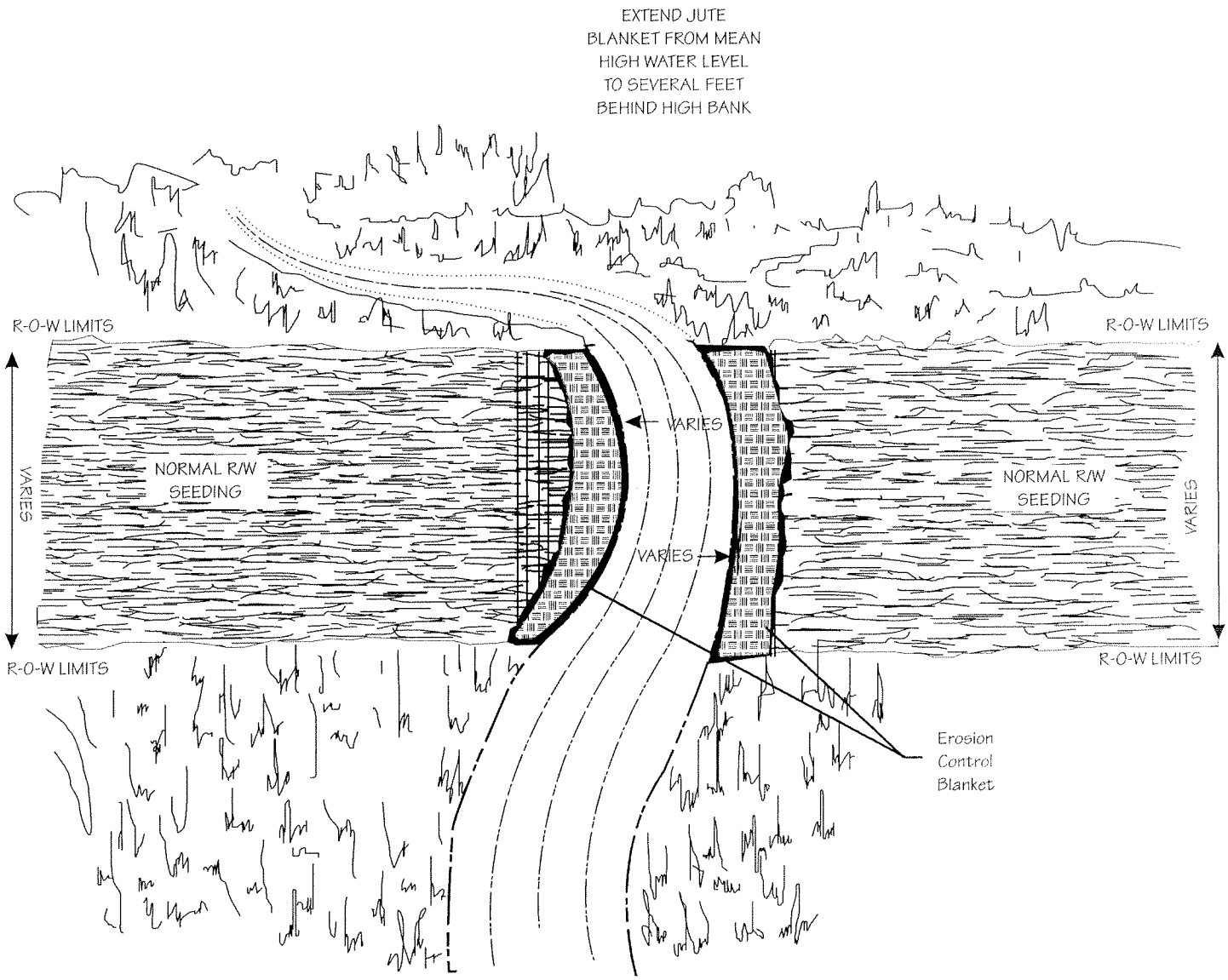

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Figure 4

Typical Stream Bank Stabilization
Erosion Control Blanket, Seed and Straw Mulch

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INSTALLING ROCK RIPRAP 03–6

Purpose

Rock riprap is installed immediately after streambank restoration or as required to stabilize erosion-sensitive watercourse banks at locations where pre-construction banks did not overhang or provide shade to provide significant fish habitat.

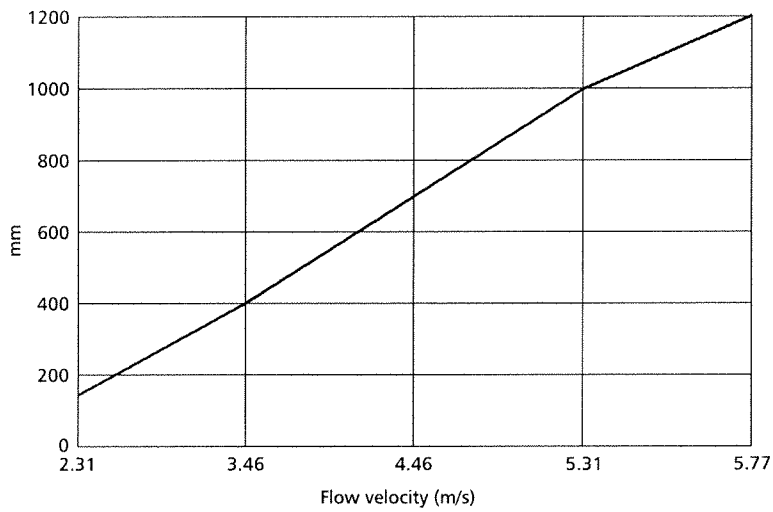
Guidelines

Use rock riprap on watercourse banks where flow conditions are likely to preclude vegetative stabilization.

Rock riprap should be dense, durable, roughly equal in dimension (not flat and thin), angular and clean.

Size of riprap depends on stream bank slope and water velocity. Recommended rock sizes for various flow rates are shown below. The size distribution of the riprap should ensure 50% of the mixture is larger than the median specified.

Geotextile is usually unnecessary under riprap and may inhibit vegetative growth.



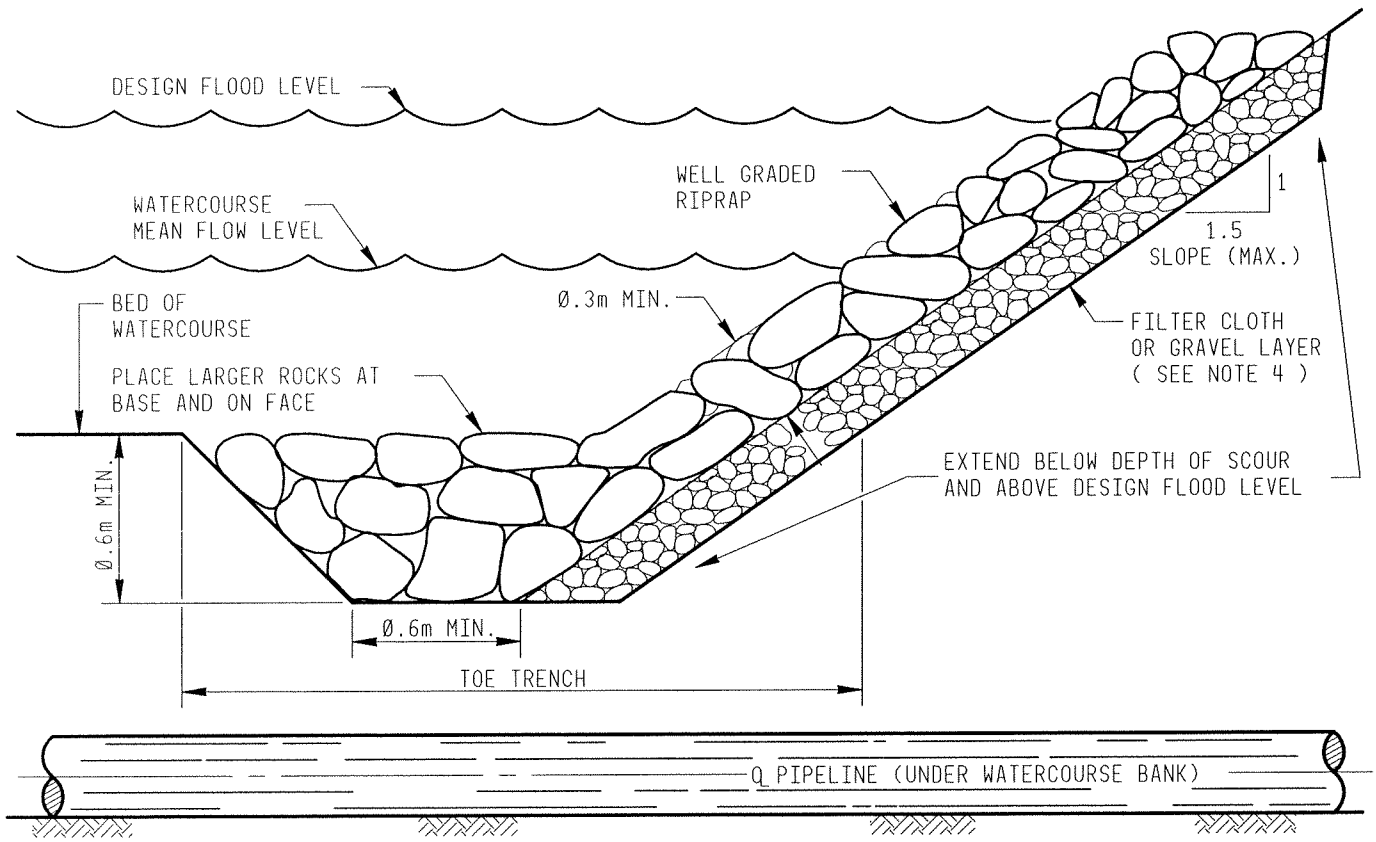
Median Size of Riprap for Maximum Flow Rates

Procedure

NOTE: Refer to Figure 1, Streambank Protection – Riprap Armour.

1. Remove all stumps, organic matter and work material.
2. Regrade watercourse banks to a 1.5:1 maximum slope.

3. Construct a toe trench to tie in the bottom of armor protection.
4. Install filter cloth if watercourse bank erosion could result between large rocks.
5. Place riprap on the slope to be protected.
6. Install riprap to a depth approximately two times the diameter of the riprap.
7. Construct riprap boundaries in a manner that riprap will not be undermined from the side.
8. Place riprap with flat surface up to resist movement by ice and water, minimize void space and ensure no rocks protrude more than 30 cm (1 ft) above design lines and grades.



PROFILE

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Figure 1

Streambank Protection -
RIPRAP Armour

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INSTALLING WILLOW CUTTINGS 03–7

Purpose

Live willow cuttings are installed when reconstructing watercourse banks to improve stability and to re-establish cover and habitat for fish-bearing streams.

Guidelines

Transplant willow cuttings as quickly as possible, preferably within 2 to 4 hrs of collecting, to prevent them from drying out.

NOTE: If necessary, cuttings may be stored instream for several days without ill effects.

Select cuttings from bottom branches approximately 12 to 25 mm ($^1/_2$ to 1 in.) in diameter and 0.3 to 0.6 m (1 to 2 ft) in length.

In hard soils, use a steel rod of equal diameter to the cuttings to make a pilot hole for the cuttings.

In soft soil, use a neoprene-lined post hole pounder or rubber mallet to minimize damage when driving willow cuttings into streambanks.

Plant cuttings in a random pattern, approximately 1 m (3 ft) apart.

If desired, transplant small clumps of willow bushes to the stream bank area.

Procedure

1. Make willow cuttings from nearby indigenous brush using sharp pruning shears, hand saw or knife to make clean cuts.
2. Mark the basal ends to ensure correct installation, i.e., cut top ends at 90° and bottom ends at 45° to form a point.
3. Ensure there are two lateral buds above the surface.
4. Trim side shoots close to the main stock.
5. Insert the cuttings into the soil at an angle by hand, approximately 1.5 m (5 ft) back from watercourse banks for the entire right-of-way (ROW) width.
6. If soil is compacted or extremely dry, use a frost pin to make a pilot hole.
7. Once installed, firm soil around cuttings and place mulch ≈1 in. deep around the cuttings to preserve moisture.

INSTALLING CRIBWALL 03–8

Purpose

Cribwalls are installed during restoration to provide erosion control and fish habitat.

NOTE: To avoid sedimentation of the stream, cribwalls should be installed as part of crossing activities—otherwise, it may be necessary to isolate the crossing a second time.

Guidelines

Install an overhanging cribwall where the original contour of stream banks was an overhang.

Install a vertical cribwall where the original contour of stream banks was vertical.

Constructing cribwall is a permit-specific activity; review permits before proceeding.

Procedure

Overhanging Cribwall

NOTE: Refer to Figure 1, Streambank Protection - Cribwall.

1. Install a log overhang if the vertical distance (A–B) is greater than 30 cm (1 ft).
2. Use native timber to build the structure (coniferous where possible).
3. Ensure the maximum distance (depth) from the streambed to ground level (A1–B1) is not less than the original distance (A–B).
4. Ensure the width of the stream channel (C1–D1) is not greater than the original width (C–D).
5. Backfill with coarse, nonerodible material.
6. Replace subsoil and topsoil.
7. Transplant native vegetation.
8. Sow an appropriate seed mix.

Vertical Cribwall

NOTE: Refer to Figure 1, Streambank Protection - Cribwall

1. Install pressure-treated (if allowed) vertical posts three times the length of the exposed height.
2. Use native timber or lumber for the horizontal structure.
3. Ensure the maximum distance (depth) from the streambed to ground level (A1–B1) is not less than the original distance (A–B).
4. Ensure the width of the stream channel (C1–D1) is not greater than the original width (C–D).
5. Anchor posts to a horizontal structure as required.
6. Backfill with coarse, nonerodible material.
7. Replace subsoil and topsoil.
8. Transplant native vegetation.
9. Sow an appropriate seed mix.

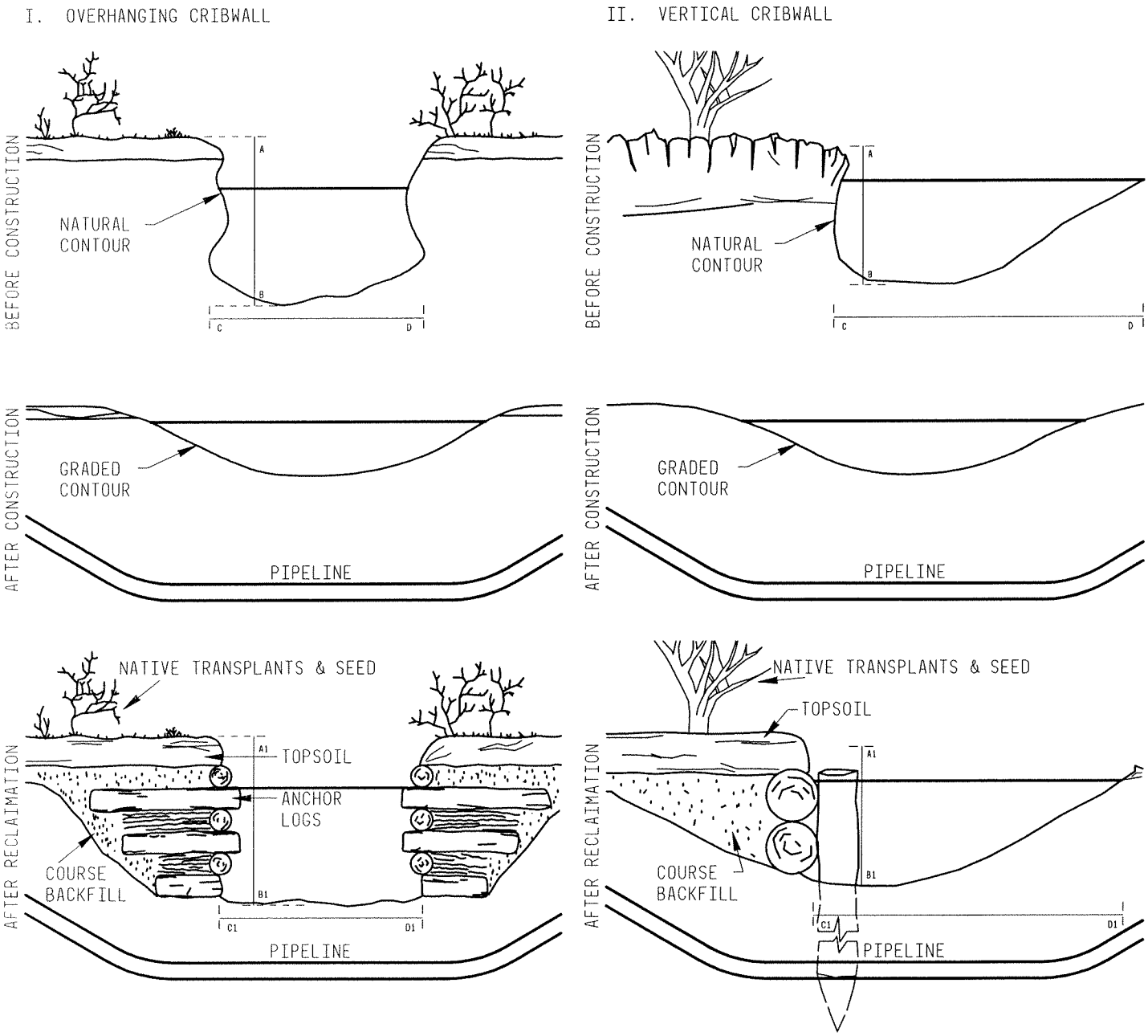

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Figure 1

Streambank Protection -
Crib Wall

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INSTALLING BERMS and DITCHES 03–9

Purpose

Diversion berms and cross ditches are installed on disturbed steep slopes as a permanent erosion control measure to direct surface water away from the trench line and off the right-of-way (ROW).

NOTE: For more information on stream bank erosion see 03-5, Permanent Erosion and Sedimentation Control.

Guidelines

Ensure there is no crown in the diversion ditch.

Tie new berms into existing berms where feasible.

Procedure

1. Determine the location and direction of diversion berms based on local topography and drainage patterns.

2. Construct diversion berms of compacted native materials, approximately 1 m (3 ft) for winter (frozen) construction and 0.6 m (2 ft) for summer construction. (see Figure 1, Configuration with Trench Breakers & Figure 2, Configuration without Trench Breakers).

   - If groundwater flow is a concern in the construction area, install the diversion berm with a trench breaker to direct subsurface flow out of the trench and to the surface.

   - Where native material is erodible, protect the upslope of the berm and base of the cross ditch with riprap (see 03-6, Installing Rock Riprap).

3. Skew berms with a downhill gradient of 5° - 10° (95° - 100° of the fall line) to prevent water from ponding behind berms and to allow for drainage away from the trench line (see Figure 3, Diversion Berm and Cross Ditch with Trench Breaker & Figure 4, Diversion Berm and Cross Ditch without Trench Breaker)

4. Where trench breakers are installed, install berms immediately downslope of the gravel drain and overlying the trench breaker.

5. Space berms as shown in Table 1.

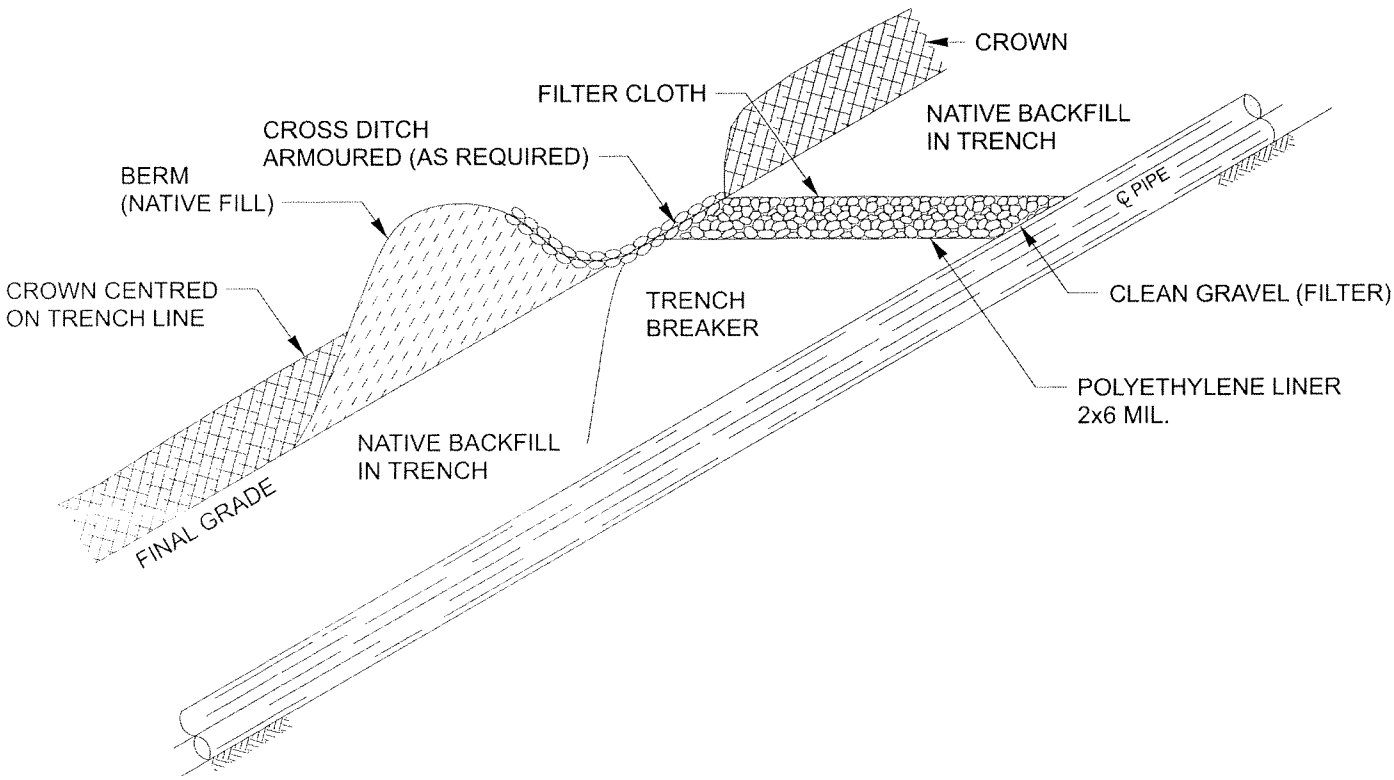
Table 1
Typical Diversion Berm Spacing

SLOPE GRADIENT		TYPICAL SPACING*	
(degrees)	(percent)	(m)	(ft)
<8	<15	as required	
8 – 14	15 – 25	45	148
14 – 17	30 – 35	35	115
17 – 20	30 – 35	20	65
> 20	> 35	10 – 15	32 – 50

NOTES
* Rely on field judgment to determine appropriate spacing.

6. Terminate berms in natural vegetation and staggered a minimum of 2 m (6 ½ ft) off the ROW.

7. Tie new berms into existing berms where possible.



PROFILE

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Figure 1

Configuration with Trench Breakers

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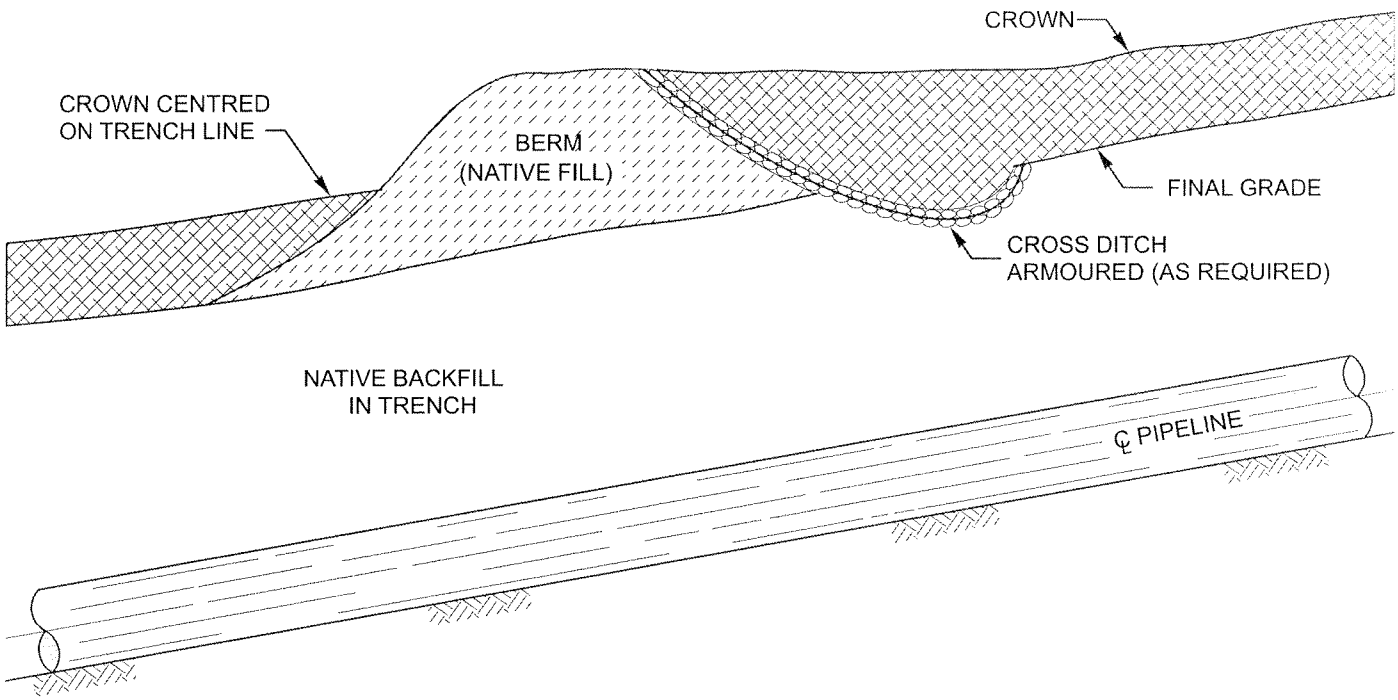

PROFILE

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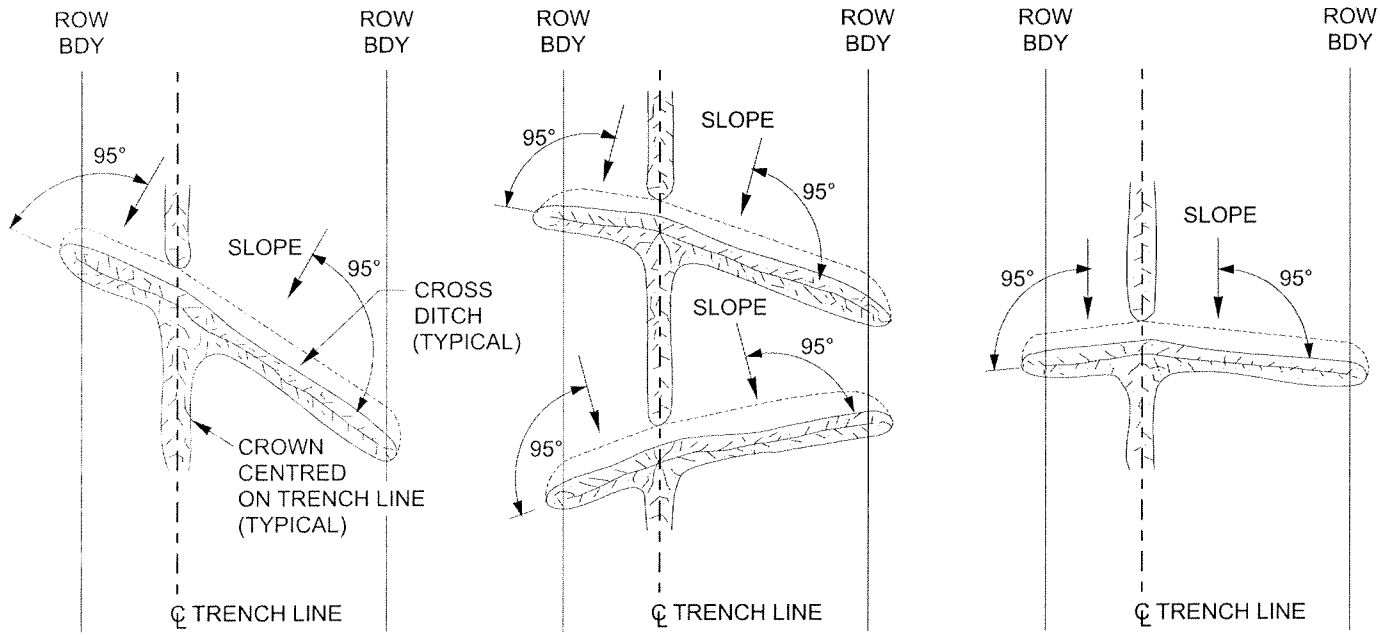
Figure 2

Configuration without Trench Breakers



PLAN VIEW

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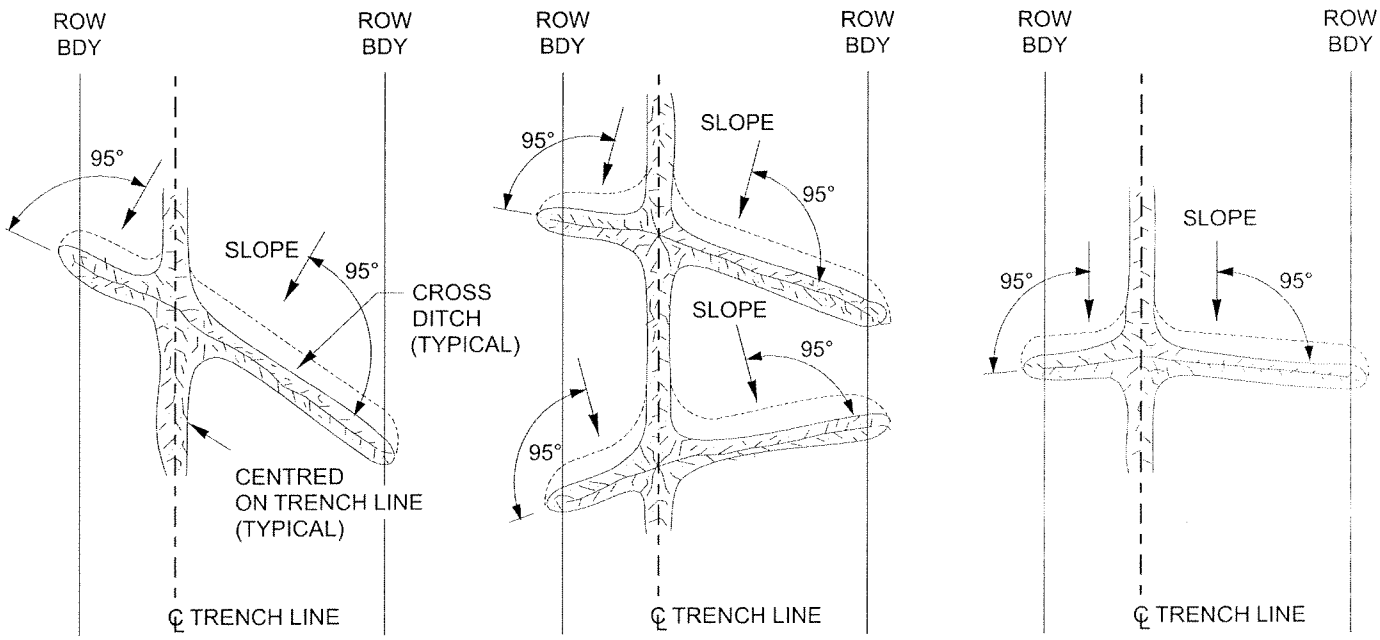
Figure 3

Diversion Berm and Cross Ditch with Trench Breaker



PLAN VIEW

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Figure 4

Diversion Berm and Cross Ditch without Trench Breaker

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