MANITOBA – MINNESOTA TRANSMISSION PROJECT
Environmental Impact Statement

TRANSMISSION LINE ROUTING

CHAPTER 5
SEPTEMBER 2015

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ABBREVIATIONS AND ACRONYMS

AHP	analytic hierarchy process
AREM	alternative route evaluation model
ASI	Area of Special Interest
CEC	Clean Environment Commission
EPRI-GTC	Electric Power Research Institute – Georgia Transmission Corporation
FNMEP	First Nations and Metis engagement process
FPR	Final Preferred Route
kV	kilovolt
GIS	geographic information system
IPL	international power line
MB	Manitoba
MCWS	Manitoba Conservation and Water Stewardship
MMTP	Manitoba–Minnesota Transmission Project
PEP	public engagement process
PUB	Public Utilities Board
ROW	right-of-way
RVTC	Riel–Vivian Transmission Corridor
SARA	*Species at Risk Act*
SLTC	Southern Loop Transmission Corridor
WLC	weighted linear combination
WMA	Wildlife Management Area

GLOSSARY OF TECHNICAL TERMS

Alternative routes	Combinations of segments joined to form complete routes from the Project start and end points. Alternative routes are proposed transmission line routes that were developed with consideration of input from the public and stakeholder groups, biophysical, socio-economic, cost and technical considerations and are evaluated in the route selection process.
Analytic hierarchy process	A decision-making process designed to help groups set priorities and make the best decision possible when both qualitative and quantitative aspects of a problem need to be considered. By reducing complex issues to a series of pairwise comparisons and then synthesizing the results, the analytic hierarchy process helps decision-makers arrive at the best solution, and provides a clear rationale for the decision reached (from Expert Systems documentation).
Areas of least preference	Features to avoid when siting a transmission line due to physical constraints (extreme slopes, long water crossings), regulations limiting development (protected areas), or areas that would require more extensive mitigation or compensation to limit effects.
Built environment	An area of existing or proposed development found within the landscape, typically dominated by commercial, industrial, residential, and cultural structures.
Community perspective	Refers to feedback received during the public and First Nation and Metis engagement processes.
Constraint	Constraints (*i.e.*, protected areas or areas with non-compatible land use) are criteria that are either suitable (outside a protected area or non-compatible land use) or unsuitable (within a protected area).
Criteria	A standard on which a judgment or decision may be based. Criteria can either be a factor or a constraint.

Delphi process	A method developed to obtain the most reliable consensus among a group of experts by a series of questionnaires interspersed with controlled feedback; the process offers a structured method of discussion based decision-making that may reduce bias and allow groups of individuals as a whole to resolve a complex problem.
Environment	Includes both the biophysical and socio-economic environments.
Factor	Factors (*e.g.*, building density) represent categories of areas on the landscape (or geospatial features) that have varying degrees of suitability for routing a transmission line.
Feature	Feature in the EPRI-GTC siting methodology refers to individual components of a category of landscape or geospatial considerations that have differing levels of suitability for routing a transmission line. Features are the subcomponents that make up a “Factor” in the methodology.
Final Preferred Route	Based on the environmental assessment and Round 3 of the engagement processes, the Final Preferred Route is the best balanced approach of all disciplines’ understanding. The Final Preferred Route is submitted with the environmental impact statement.
Geographic information systems	An organized collection of computer hardware, software, geographic data and personnel designed to efficiently capture, store, update, manipulate, analyze and display all forms of geographically referenced information.
Geospatial	Referring to location relative to the Earth's surface.
Intactness	The degree to which a natural area is free from human disturbance.
Layer	In the EPRI-GTC siting methodology, these are represented within the siting model as green boxes. These layers are grids representing various aspects of suitability, such as slope, building density and proximity to cultural resources.
Layer weights	A percentage assigned to a specific layer of data based on its preference or importance as relative to the remaining variables in a given comparison of features or perspectives.

Least cost path	The path, among possibly many, between two points that has the lowest traversal "cost."
Linear infrastructure	An existing network or system in a given area composed of transportation or utility-based facilities (*i.e.*, roads, highways, railways, pipelines, and transmission lines).
Macro corridors	Large, uninterrupted and irregular paths that are developed by multiple models in order to define a study area for more detailed analyses.
Mitigative segments	A route segment added to the Transmission Line Routing Process based on feedback received from the public or discipline specialists for consideration.
Natural environment	Naturally occurring physical features of the landscape. These features are represented by the hydrography, flora, fauna, and topography of a given area.
Normalized	Scaling of route statistics such that the lowest value in each feature is equal to 0 and the highest value in each feature is equal to 1.
Pair-wise comparison	A structured comparison of two variables to determine preferences.
Perspective	In the siting methodology, alternatives for corridors selection have been standardized to represent community values (built environment), protection of biotic resources (natural environment), and engineering considerations (engineering requirements). They are represented within the siting model conceptual diagram as blue boxes.
Preferred route	The preferred route was determined as the best balanced choice of the Round 2 alternative routes and was based on input from the public and stakeholder groups, feedback from the First Nation and Metis engagement process, and biophysical, socio-economic, cost and technical considerations, as identified through the Route Selection Process.
Public	The public was identified as any individual with an interest in the outcome of the decisions for the Manitoba–Minnesota Transmission Project.

Public engagement process	The process that informs individuals, including stakeholder groups and the public about the Manitoba–Minnesota Transmission Project and allows them opportunities to provide input into in the routing and environmental assessment work being undertaken.
Refined alternative routes	The refined alternative routes are segments of the proposed transmission line that were representative of input from the public and stakeholder groups, and biophysical, socio-economic, cost and technical considerations, as identified through the route selection process.
Southern Loop Transmission Corridor	A dedicated transmission corridor between the Dorsey Converter Station (near Rosser) and the Riel Converter Station (east of Winnipeg).
Stakeholder group	An interested party that would potentially have feedback to provide, may be affected by the decisions made regarding route selection, have a specific interest or mandate in the area, data to share, and is able to disseminate information to membership or a general interest in the Project's route selection area.
Suitability surface	The data surface created by combining the individual geospatial data layers (factors and areas of least preference) into one layer.
Wildlife Management Area	Crown lands in Manitoba designated for the "better management, conservation and enhancement of the wildlife resource of the province." Wildlife Management Areas exist for the benefit of wildlife and for the enjoyment of people. They play an important role in biodiversity conservation and provide for a variety of wildlife-related forms of recreation, including birding and wildlife watching.

5 Transmission Line Routing

5.1 Overview

This chapter describes the transmission line routing process used to determine the location of the Final Preferred Route for the Manitoba portion of the Dorsey to Iron Range 500 kV transmission line (D604I). The process was initiated in February 2012 and resulted in the selection of the Final Preferred Route three years later, in April of 2015.

Determining the “best” or “preferred” route for a high voltage transmission line is a complex iterative process designed to balance multiple perspectives and limit overall effect. While the methodology for transmission line routing can be complicated in a detailed application, the concepts are straightforward in what the process is programmed to accomplish. The purpose of the methodology is to provide a transparent model for decision-making with the ultimate goal of reducing effects of a transmission line on people and the environment. Once start and end points are determined, the model helps Manitoba Hydro in working through a systematic process of narrowing and refinement to get to a preferred route. There are literally hundreds of thousands of ways to get from point “a” to point “b” in a given route planning exercise. How to choose a route that best balances sometimes-competing perspectives related to land use and meets the goal of the methodology can be daunting. To facilitate this process it is important to understand the basic concepts and how they are applied.

From the regulatory review of the Bipole III Transmission Project (Bipole III) environmental impact statement, Manitoba Hydro received a recommendation from the Clean Environment Commission (CEC 2013) to “develop a more streamlined, open and transparent approach to route selection, making more use of quantitative criteria”. As described in this chapter, the methodology applied to this Project enhanced the approach to route selection by incorporating stakeholder feedback earlier in the process and using it directly in selection and weighting of criteria that informed route development and evaluation. The approach also incorporated an “apples-to-apples” comparison of whole routes, conducted within a framework that was both transparent and streamlined.

Overall, transmission line routing is a preferred form of mitigation for potential effects on people and the environment because it can avoid many potential issues with judicious placement. A key function of the transmission line routing methodology is to provide a structured process for incorporating many, sometimes competing, perspectives on use of land and related potential effects, in order to frame and balance decision-making. A large part of this process involves identifying features on the landscape, the values associated with them and how best to protect or avoid them whether agricultural land use or wildlife habitat. Technical requirements also come into play that must be balanced with the natural environment along with what is already built or developed (human environment). At its core, all transmission line routing approaches consider environmental priorities, existing and future land uses, areas of constraint (least preference) and opportunities for routing. There are many factors that determine the suitability of transmission line

locations, such as housing density, wetlands, and land use. A robust route selection methodology identifies and considers these factors or criteria in making a selection.

The routing methodology used for this Project is based on the EPRI-GTC Overhead Electric Transmission Line Siting Methodology. Conceptually, the method first creates a route planning area to focus the transmission line routing process within. Then that area is narrowed down to suitable transmission line corridors that can have multiple alternatives within them. Next potential routes are drawn in the corridors and evaluated against each other to get to a preferred route. This concept corresponds with the main steps of the EPRI methodology, which are:

1. macro-corridor generation, which helps define the route planning area
2. alternative corridor generation, which helps define suitable areas for drawing alternative routes (described further in Section 5.3.3)
3. alternative route evaluation; comparison which leads to the selection of a preferred route. Two models are used at this step:
    a) the alternative route evaluation model (AREM), which compares routes based on criteria scoring grouped into the perspectives of built, natural and technical (described further in Section 5.4.3)
    b) the preference determination model, which takes a selected subset of routes from the AREM step and compares them based on higher level decision-making criteria including cost, environment, and community feedback (described further in Section 5.4.3)

The concept of narrowing and refining to get to a preferred route using the above steps is illustrated in the “funnel” diagram, which is central to the EPRI-GTC approach (Figure 5-1).

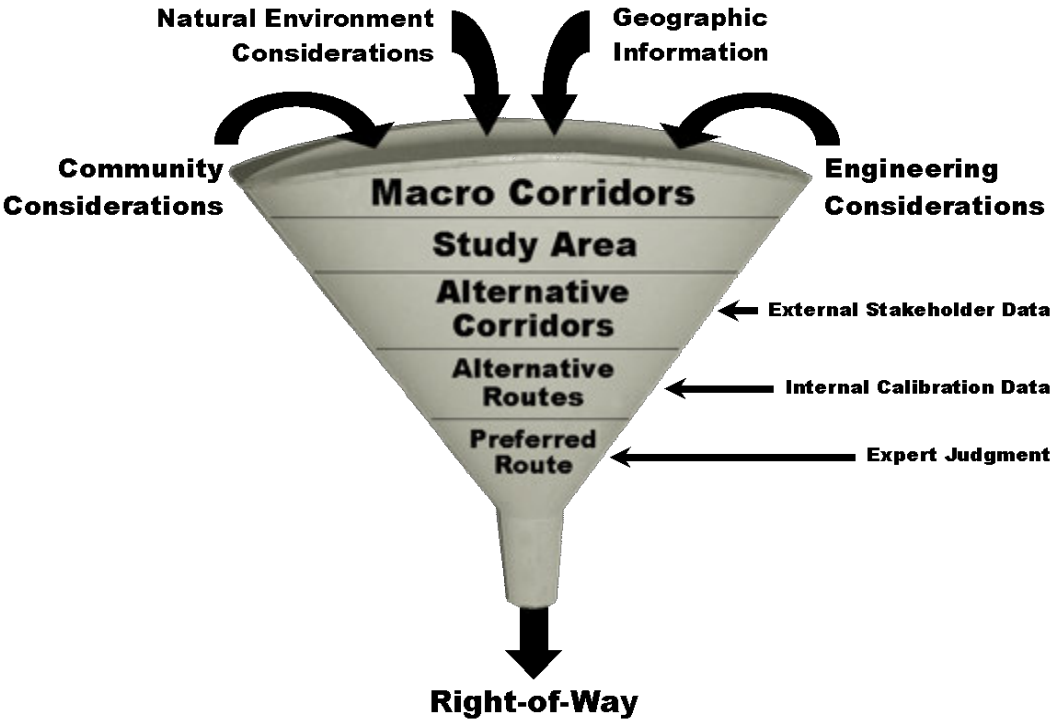

Figure 5-1 EPRI-GTC Methodology Conceptual Overview of Process Flow

Each of the steps in the funnel are informed by a model that uses criteria and associated weightings to describes the relative suitability of a feature on the landscape to coexist with a transmission line. Developing preference and least preference criteria is an important aspect of the method for siting a transmission line. These types of criteria can include paralleling existing ROWs as an opportunity or avoiding ecological reserves as a constraint. They can also include technical considerations of line length, corner structures and accessibility. Stakeholder input assisted in criteria development early in the process as participants made known what was important to them and what they valued on the landscape. Further details on the development of criteria and scoring are provided in Section 5.3.1.

With many interests and some competing, the methodology needs a way to incorporate the input and considerations to reach a routing decision. For each step in the EPRI-GTC model, route evaluation criteria are grouped into three perspectives – the natural environment (forest, wetlands, stream crossings), the built environment (residences, agricultural land use, historic resources), and technical (cost, accessibility).

With this backdrop on the concept, how the methodology was applied to this Project can be described. At the outset, due to the diverse nature of the route planning area, the EPRI-GTC once through the “funnel” process was modified. The alternative route evaluation step was used

multiple times to accommodate siting complexities. The siting issues that needed to be accommodated were:

- three potential border crossing points
- undefined start points along the Southern Loop Transmission Corridor (SLTC)

Before the route planning was presented through the public and First Nations and Metis engagement processes, several steps had been completed in the methodology including macro-corridor determination, routing planning area delineation, and alternative corridor generation. Stakeholder groups had direct input on criteria selection and weighting that was used in the alternative corridor selection step before engagement began. This pre-planning took transmission line routing to the third step in the methodology, alternative route evaluation, at the beginning of engagement rounds.

The public and First Nation and Metis Engagement processes were an important part of the transmission line routing process. Manitoba Hydro conducted multiple rounds of engagement to capture input at key decision points in the methodology as the route selection narrowed from border crossing determination to a Final Preferred Route. During each round, input was collected on route preferences, routing opportunities, issues, and concerns. The routing team used this feedback to consider route alterations, develop new routing segments, and for consideration when evaluating and ranking whole routes. The information was then used in the alternative route evaluation step at the conclusion of each engagement round. This is where there was repeat flow through the funnel and the modification of the “once through” approach for the EPRI-GTC methodology. The process then, consisted of planning, feedback and analysis, comparative evaluation, and selection for each routing and engagement round as illustrated in Figure 5-2.

Each round was tied to a planning and decision-making objective for the routes presented. Round 1 was designed to inform the selection of a preferred Canada-US border crossing for the line as well as a preferred alternative route to that point. Round 2 had the objective of determining a preferred route for the transmission line for presentation in Round 3. The conclusion of Round 3 was the selection of a Final Preferred Route to be used for completing the environmental assessment and submission to environmental regulators.

For the Manitoba-Minnesota Transmission Project, numerous route segments were added in each round to respond to community, stakeholder, and expert input resulting in 750,000 potential routes after Round 1 and 550,000 after Round 2 – demonstrating the need for a computational model to assist in selecting a preferred route. The computation models generated comparative statistics that helped inform the decision-making by the teams involved in route selection in each round.

Transmission line routing process

February 2012

Preliminary planning

Facility study and broad opportunities/constraints

Pre-engagement

Macro corridors → Route planning area → Alternate corridors

Initial communication to public

Fall 2013

Public engagement

	Planning	Feedback and analysis	Comparative evaluation	Selection
Round 1	**Select and negotiate border crossing for project**			
	• Alternate corridors • Alternative route development to three border crossing areas	• Community engagement • Analysis of new data collected from field studies (e.g. winter mammals survey) • Development of mitigative segments	• Alternative Route Evaluation Model (AREM) • Preference determination to explore strengths and weaknesses of routes and border crossings	• Preferred border crossing • Preferred alternative routes to border crossing
Spring 2014				
Round 2	**Evaluate alternative routes to selected border crossing**			
	• Windshield survey looking for new development • Alternative route development to selected border crossing • Electrical system planning studies	• Community engagement • Analysis of new data collected from field studies (e.g. birds and vegetation/wetland surveys) • Development of mitigative segments	• AREM • Preference determination	• Preferred route
Winter/Spring 2015				
Round 3	**Feedback and determination of a preferred route**			
	• Windshield survey looking for new development • Weather study • Electrical system planning studies	• Community engagement • Analysis of new data collected from field studies (e.g. visual quality/viewpoint studies) • Development of mitigative segments	• AREM • Preference determination	• Final preferred route and technical alignments for submission to regulators

Summer 2015

Complete environmental assessment of final preferred route

Figure 5-2 Transmission Line Routing Process

While computation models generate useful data, these data must be considered by professionals in the process of route selection, and information pertaining to features, land uses and perspectives that are more difficult to quantify geospatially must also be considered. Throughout the transmission line routing process, a large number of professionals bring their expertise to the planning, assessment, evaluation and ultimately decision-making steps. These professionals function as teams in the process, working together and bringing the expertise from their discipline into the process to both help represent the perspectives (built, natural, and engineering) but also the values of the corporation in the decision-making process. The teams that are involved in transmission line routing and their function are described in Table 5-1.

Table 5-1 Description of Various Teams Involved at Various Stages throughout the Routing Process

Name	Members	Involvement/Decisions
Management team	Manitoba Hydro: Vice President of Transmission Division Manager Transmission Planning and Design Division Manager – Transmission Systems Operations Division Manager – Gerald's title	Developed the criteria and weights for the preference determination model
Project team	Refers to any member of the environmental assessment team: Manitoba Hydro Team members from Licensing and Environmental Assessment, Design and Construction, System Planning, Transmission Projects, Property Consultants: Wildlife, vegetation, public engagement, socio-economic, etc. discipline specialists	Attended routing workshops, provided input into mitigative segments, formed parts of the built, natural or engineering perspective groups in route selection workshops; developed the scores in the preference determination exercise
Routing team	Transmission Line Design Staff, Licensing and Environmental Assessment Staff	Developed alternative routes and mitigative segments

The Final Preferred Route selected, using the EPRI-GTC modified methodology, represents a consideration of multiple perspectives and inputs accounting for diverse interests and objectives. Criteria representing the natural, built and technical perspectives were used for route comparisons to arrive at a balanced decision on routing. The result of the transmission line routing process is the selection of an optimal route based on a robust and transparent methodology that included extensive engagement through the public and First Nation and Metis engagement processes.

This optimal route selected, referred to as the Final Preferred Route, begins at Dorsey Converter Station and extends to a selected crossing point at the Manitoba-Minnesota border. The route makes use of Manitoba Hydro owned and eased lands to the greatest extent practical, travelling through the SLTC around the south end of Winnipeg and then east through the existing Riel–

Vivian Transmission Corridor (RVTC). From there, the new ROW associated with the Final Preferred Route travels through a transitional area where higher productivity soils become wetter and less productive. Land uses in this area include a greater prevalence of mixed forest and wetlands and rural residential development. The total length of the route travelling south from the RVTC requiring new ROW is 121 km, and of this 70% traverses private lands, while 30% traverse Crown lands.

The following sections describe the overall approach to routing that was taken by Manitoba Hydro, the steps in the process, the information considered and the decisions that were made to arrive at a Final Preferred Route. Appendix 5A includes detailed information relating to the process of model development, and specifics related to criteria used in decision-making. Each of the steps in the transmission line routing process corresponds to geospatial information and routing segments that are presented in a series of maps contained in the map book accompanying this chapter. To follow the logic and process of route selection, it is critical to review the maps alongside the corresponding sections presented below.

5.2 Transmission Line Routing Approach

Selecting a location for a transmission line is, at its core, a land use planning exercise driven by a need to meet an energy system requirement. All transmission line routing approaches incorporate the consideration of the environment, existing and future land uses, opportunities and constraints for transmission line development, and the interests and concerns that influence the use of the land or could be affected by the route. As indicated, the selection of a Final Preferred Route is also the first and best option to mitigate potential effects of a transmission project. Therefore, considerable analysis and feedback is conducted at each stage to inform the decision-making processes .The approach to transmission line routing that Manitoba Hydro has adopted over the past three years strives to limit the overall effect of the transmission line by considering and balancing the effect across various key perspectives. The approach, based on the EPRI-GTC methodology, has been adapted through application on a previous project in southern Manitoba to fit the Manitoba context and to include additional steps to provide opportunities for stakeholder, public, First Nations and Metis feedback.

Manitoba Hydro selected the EPRI-GTC methodology because it has been successfully applied on more than 200 linear projects across North America, including the St. Vital to Letellier Transmission Project, and because the tools used in the methodology provide a structured and transparent way to represent the trade-offs between competing stakeholder interests and land uses, along with the decisions made in a transmission line routing process. Figure 5-1 presents the “funnel” concept that is at the core of this methodology.

As introduced above, the methodology involves three main steps:

1. creating macro corridors, which help define the route planning area;

2. creating alternative corridors, which help define suitable areas for routing the transmission line; and
3. undergoing alternative route evaluation, which leads to the selection of the preferred route.

The EPRI-GTC methodology is informed by geospatial information (where features and activities occur on the landscape) and, with the help of models at each step through the funnel, considers three broadly conceived perspectives that apply to land use, plus a fourth perspective that considers the other three equally. Each perspective is represented by various Project team members for certain stages of the process, and routing decisions are made at each step by groups of people as outlined in Table 5-1, which consider the information from each perspective (*i.e.*, workshops). The three perspectives (and their Project team representatives) are:

- Built environment perspective, which is concerned with limiting the effect on the socio-economic environment. In routing decision-making, the built perspective (built) group is composed of agricultural, socio-economic, resource use and heritage discipline specialists, as well as Manitoba Hydro property and environmental assessment staff.
- Natural environment perspective, which is concerned with limiting the effect on the biophysical environment. the natural perspective (natural) group is composed of wildlife, fish and vegetation and wetland discipline specialists.
- Engineering environment perspective, which is concerned with cost, system reliability, constructability and other technical constraints. The engineering perspective (engineering) group is represented by Manitoba Hydro system planning, design, construction and maintenance staff.

The models that bring together the geospatial data and perspectives make use of weightings and suitability rankings to represent the values that each perspective holds for different features on the landscape. Scenarios can be developed that favour one or more perspective, or the simple average, which treats each perspective equally, can be used, which considers the three perspectives as being equally important. The specifics of the models are described further in Appendix 5A.

Manitoba Hydro has received feedback through regulatory review processes related to previous projects that indicated a need for better incorporation of stakeholder feedback on decision-making criteria, and pointed to the need for an approach that more clearly demonstrates how feedback is incorporated in route decision-making (Clean Environment Commission 2013). The EPRI- GTC methodology provided the building blocks to achieve these things; however, because of the complex nature of the Project, and the extensive multi-round approach to public engagement that is employed by Manitoba Hydro, the once-through, funnel approach outlined above was modified. These modifications helped to better align the routing process with the public engagement process, to allow additional steps in the routing process for stakeholder feedback to be considered, and to achieve the multiple steps of decision-making necessary for the Project. Figure 5-2 presents the stages in the transmission line routing process developed for this Project,

This feedback, and the associated decision-making tools are used in a process that produces decisions that balance perspectives between competing land use values, while respecting the fundamental physical and technical constraints on the landscape posed by non-compatible or legally prohibited areas. As noted in Figure 5-2, the overall transmission line routing process progressed through the following three major stages with corresponding planning and evaluation steps as described below:

Preliminary Planning

- Identification of need, start and delineation of initial route planning area and potential end points (border crossing areas)
- Development of macro corridors and delineation of route planning area
- Development of alternative corridors within the route planning area

Round 1

- Planning of alternative routes to border crossing areas
- Feedback and analysis : presentation of Round 1 routes in public and First Nation and Metis engagement processes; analysis of new data collected from the field; development of mitigative segments
- Comparative evaluation: alternative route evaluation; preference determination
- Negotiation and selection of border crossing

Round 2

- Planning of alternative routes to selected border crossing
- Feedback and analysis : presentation of Round 1 routes in public and First Nation and Metis engagement processes; analysis of new data collected from the field; development of mitigative segments
- Comparative evaluation: alternative route evaluation; preference determination
- Preferred route selection

Round 3

- Refinement of preferred route in consideration of windshield surveys and updated data
- Feedback and analysis: presentation of preferred route in public and First Nation and Metis engagement processes; analysis of new data collected from the field; development of mitigative segments
- Comparative evaluation: alternative route evaluation; preference determination
- Final Preferred Route selected

The route selection process considered a broad range of environmental, socio-economic, technical, and stakeholder information and feedback from the public and First Nation and Metis engagement processes in stepping through the stages listed above to determine a route that balanced these factors. The objective of the process was to determine the location of a route that limits overall effect through the balancing of perspectives categorized as built, natural and environmental, as described above.

In each round, the routing process considered increasingly detailed levels of information, public input and analysis of data to further delineate increasingly smaller route planning areas.

Section 5.4 provides details on the methodology as it applies to each major step of planning, feedback and analysis and comparative evaluation, alongside the application of this methodology in Round 1. Section 5.5 outlines the steps and considerations pertinent to Round 2 transmission line routing. In Section 5.6, the steps involved in process of finalizing the preferred route are described. Maps relevant to each section are contained in the attached T-line routing map book, and should be reviewed in tandem with the corresponding sections.

Detailed information pertaining to how models were developed, definitions of criteria, etc., can be found in the attached appendices.

5.3 Preliminary Planning for MMTP

Preliminary planning related to the location for the Project began in late 2012 with the consideration of high level geospatial data outlining current land use patterns and land cover to inform the development of potential US border crossing areas. Over the course of the next three years, Manitoba Hydro progressed through multiple decision-making stages, starting from a wide planning area with multiple end points and arriving at a Final Preferred Route from one start to one end point. Within each of the stages, a number of steps were taken in sequence.

Manitoba Hydro System Planning Department typically begins all of its transmission line projects with assessing the need for the project and developing alternative concepts to completing the project from an electrical transmission system perspective through a System Planning Report/Facility Study. The System Planning Report or Facility Study identifies the preferred concept. Following this, various departments within the Transmission Business Unit at Manitoba Hydro begin the process of planning the transmission routing process. This planning includes many aspects. Some key items include:

- preliminary line design – consideration of tower design and ROW size determination
- data gathering – compiling and sourcing data such as imagery, land use, buildings, protected areas
- Public/First Nation and Metis engagement – identification of stakeholders, First Nations and Metis (pre-engagement)
- property – determination of landownership type, identification of existing transmission corridors (existing corridors)

It is this preliminary planning that provides the basis to move forward with an organized and structured approach to routing the transmission line. Figure 5-3 outlines the major steps involved in preliminary planning.

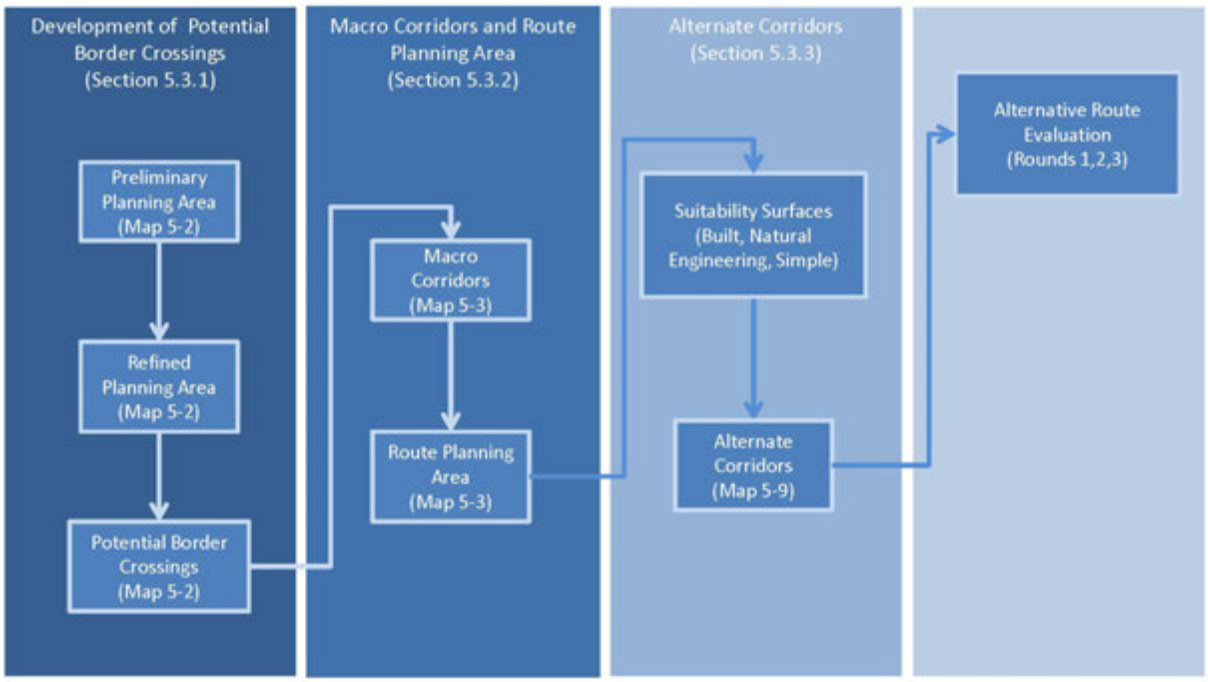

Figure 5-3 Major Steps in the Preliminary Planning Process

5.3.1 Development of Potential Border Crossings

During initial planning (fall 2012), in order to determine options to provide power to Minnesota, several general system planning concepts were considered for the Project (see Chapter 2 for further discussion of Project alternatives), including a 230 kilovolt (kV) alternating current (AC) transmission interconnection and a 500 kV AC transmission interconnection. The origin point for the Project is Dorsey Converter Station. The selection of Dorsey was to provide two geographically separate points of interconnection for the two 500 kV import export lines in the Manitoba Hydro system to the United States, for system reliability purposes. The other 500 kV line (M602F) terminates at Riel Converter Station.

The preliminary planning area (Map 5-2) was identified based on the various transmission system concepts initially considered. Refinements to the planning area were made as the various system options were refined and the 500 kV transmission configuration became the preferred option.

In accordance with Manitoba Order In Council 472/2013 issued pursuant to section 107 of *The Public Utilities Board Act*, C.C.S.M. c. P280, the Public Utilities Board (PUB) conducted a Needs For and Alternatives To review development plans proposed by Manitoba Hydro. One of the development plans included the construction of the Manitoba-Minnesota 500 kV international

power line (IPL). During the proceedings, the need for the Manitoba-Minnesota 500kV IPL was evaluated. The PUB's report was provided to the Province of Manitoba in June 2014, within the report was a recommendation to move forward with the Manitoba-Minnesota 500kV IPL.

Early in the planning process, Manitoba Hydro and Minnesota Power both understood the need to be congruent with their approach to selecting a border crossing area, even though route selection by each would use similar but differing methodologies. A constraints and opportunities exercise was undertaken by both utilities to understand the land use around the United States/Canada border from the Red River east to the Ontario Border. Both utilities identified constraints and opportunities using a common understanding and definition of each.

A list of criteria (Table 5-2) was identified to help create broad routing corridors that would lead to general border crossing areas. Areas of least preference (constraints) and biophysical, socio-economic and technical factors were defined. Routing corridors served to further narrow the area for consideration in route development and selection.

Table 5-2 Routing Criteria Used to Determine Potential Border Crossing Areas

Factor
Proximity to residential concentrations and other man-made structures
Wildlife Management Areas, Forest Preserves, Areas of Special Interest and conservation lands
Major industrial developments (*i.e.*, windfarms)
Managed private woodlots
Mining and High potential for mineral extraction
First Nations Lands and lands under nomination for land bases
Large scale centre pivot irrigation in agricultural areas
Ecologically Sensitive Sites, Ducks Unlimited areas, Seine River , Red River habitats and other managed features
Water Courses – Type A or B Habitat
Wetlands/Lakes
Forestry (Provincial Forests, Research and Monitoring Plots)
Airport Control Zones
Quarry Leases
Treaty Land Entitlement
Transmission Corridor
Flood Prone Areas and soil instability
Area of Least Preference (constraint)
Cities, towns and local communities
Designated Indian Reserves as per *The Indian Act*
Built up residential/community concentrations

Factor
Public and commercially licensed airports, airstrips
Churches, cemeteries and ceremonial sites
Communications towers
Federal and Provincial protected lands/Provincial and Federal Parks
Established public and private recreation areas
Protected *Species at Risk Act* (SARA) species locations and habitats
Water Bodies with SARA species: Carmine shiner
Water Bodies – Ecological Reserve
Intensive Livestock Operations
Designated Historic, Archaeological and Heritage Sites

Key considerations for Minnesota Power included limiting length, avoiding potential effects on residences, productive agricultural land, and environmental concerns. Key considerations for Manitoba Hydro included determining route corridors that considered biophysical, socio-economic and technical constraints.

This exercise resulted in the narrowing of the planning area to include border crossing areas that were technically feasible based on the parameters that were defined as necessary for an international power line crossing (Map 5-2).

The preliminary planning area (Map 5-2) boundaries for the 500 kV transmission line were determined by the following:

Northern boundary – Existing Riel–Vivian Transmission Corridor

Manitoba Hydro has an existing corridor from the Riel Converter Station site, which extends eastward to near the community of Vivian. This corridor was designed and acquired by Manitoba Hydro to accommodate multiple transmission lines. The north planning area boundary follows to the north of this transmission corridor in order to contain it within the planning area. From the Anola/Vivian area, the north planning area boundary extends east to the Prawda and Hadashville area.

Eastern boundary

The eastern boundary was delineated to be west of and to avoid the Whiteshell Provincial Park, Whitemouth Lake and Buffalo Point First Nation Reserve property and associated lands of interest. The delineation of the eastern boundary was intended to limit direct effects on these areas as much as possible.

Southern boundary

The southern boundary follows the Canada – U.S. border.

Western boundary

The western boundary was delineated to limit the effects of transmission routing on the various towns and communities located to the south of Winnipeg. The western boundary was intended to limit transmission routing effects on development and urban development extending immediately south from Winnipeg and cumulative effects on agricultural land use with St. Vital Transmission Complex and Bipole III Transmission Projects. The area adjacent to and west of PTH #12 also has higher density rural residential development, more intense specialized agricultural land uses and developed recreational sites. The western boundary was designed to avoid these built up areas and locations of increased human development.

The application of the regional criteria defined in Table 5-2, resulted in two major routing options within the refined preliminary planning area. The first major routing option runs north-south through a more densely populated, agricultural area in the west portion of the preliminary planning area. The second major routing option runs north-south through the more remote Sandilands Provincial Forest in the eastern portion of the preliminary route planning area. Within these two routing options, three regional corridors were defined. The study of the regional corridors led to the development of four potential border crossing areas. The four potential border crossing areas (Map 5-2) developed included Gardenton West, Gardenton East, Piney West and Piney East.

5.3.2 Macro Corridors and Route Planning Area

For the MMTP transmission line the preliminary route planning area and route planning area differ in that the preliminary route planning area was used to guide the development of potential border crossing areas for the Project, as discussed in Section 5.3.1. The route planning area described in this section is developed using the EPRI-GTC methodology, and includes the development of macro corridors from the defined start point to the border crossing areas that were defined through the process above. At this point macro corridors are generated to help define the route planning area that is subsequently the area within which alternative routes are planned for the Project. The macro corridor step is the first step in the EPRI-GTC funnel as indicated in Figure 5-1.

The macro corridors are developed using the macro corridor model (Appendix 5A). Three macro corridors are developed, each corresponding to a set of weighting designed to emphasize certain parameters that are often used to delineate a planning area for a new transmission line project. Conceptual routes (“optimal paths”) were generated with the model, running from a point near Riel Converter Station to each of the four border crossings. These optimal paths incorporated the following broad routing options:

- paralleling roads
- paralleling transmission lines
- cross country (without targeting paralleling opportunities)

The macro corridors developed from the model represent the top 5% (*i.e.*, the most suitable 5%) of "optimal paths" between the start and end points. The outside limits of the macro corridors are used to guide the creation of the route planning area.

Please review Map 5-3 in order to facilitate understanding of the explanation below.

The macro corridors developed by the model are intended to give a starting place for the routing team to make informed decisions with respect to the development of the route planning area. The routing team then used experience combined with knowledge of technical, environmental and built considerations to make decisions about the boundaries of the route planning area. The combined geographic extent of all the macro corridors to each of the border crossings (Map 5-3) was reviewed to create the route planning area. This area would be used as the bounds for route development by the routing team, as described in Section 5.4.2 (Map 5-4).

Considerations in defining the route planning area boundaries were:

- The southern limit of the route planning area is the Manitoba–Minnesota border.
- The northern limit of the route planning area is the RVTC.
- The western edge of the route planning area was limited to the western edge of the macro corridors just west of Highway 59. Paralleling the Letellier to Dayton (L20D) transmission line along provincial trunk highway(PTH) 75 was considered. The area along PTH 75 is heavily congested (development) and offers very limited routing options.
- The eastern edge of the route planning area was extended to approximately 20 km east of the Riel to Forbes transmission line (M602F) (with consideration of wetlands along the eastern boundary) to provide further area for alternative route development in this area.

The resulting route planning area (Map 5-4) is approximately 7245 km², and includes many types of land cover classifications, varying from cultivated, pasture, native grasslands and shrubland to deciduous forests, mixedwood forests, coniferous forests and varying types of wetlands. Agriculture (pasture and cultivated) is the most common land cover class in the route planning area. As the Project moves eastward, it shifts from cultivated land to pasture and hayland and then transitioning to a forested land cover in the southeastern portion of the route planning area. Land tenure within the route planning area includes a mix of primarily privately owned lands in the western region, transitioning to higher proportions of Crown land, and predominantly Crown lands in the eastern portions of the route planning area, with pockets of private lands around built communities in this area and the far southeast.

5.3.3 Alternative Corridors

The next step in the preliminary planning process (Figure 5-2, Figure 5-3) is to produce four alternative corridors (built environment, natural environment, engineering environment, and simple average) that represent the different perspectives (built, natural, technical and simple average) within the determined route planning area (Map 5-9). Alternative corridors map the suitability of areas within the route planning area for locating a transmission line and further narrow the geographic area under consideration for route development. Details on the development of the alternative corridors are provided in Appendix 5B. A summary is provided below.

Creating the alternative corridors involves the following :

- developing the alternative corridor evaluation model
- gathering data
- creating geospatial data layers
- creating suitability surfaces
- implementing least cost path analysis

Each of these steps is discussed briefly below. Details related to model development are provided in Appendix 5A.

5.3.3.1 Alternative Corridor Evaluation Model

The alternative corridor model is used to generate the alternative corridors. The alternative corridors are developed using the model (Table 5-3; Appendix 5A).

A model informed by stakeholders' preferences was developed (Appendix 5A) to represent the suitability of features on the landscape in southern Manitoba for transmission line routing. The resulting model (Table 5-3) includes:

- areas of least preference (red; *i.e.*, protected areas)
- factors (light green; *i.e.*, linear infrastructure) represented by a data layer
- features (light yellow; *i.e.*, unused ROW (Manitoba Hydro owned)
- suitability values (dark yellow; *i.e.*, 1 for unused ROW (Manitoba Hydro owned)
- layer weights (dark green; *i.e.*, 35.7% for linear infrastructure)

Details are provided in Appendix 5B.

Table 5-3 MMTP Alternative Corridor Evaluation Model

Engineering		*Natural*		*Built*	
Linear Infrastructure	**35.7%**	**Aquatics**	**10.0%**	**Proximity to Buildings**	**10.0%**
No Linear Infrastructure	1	No Aquatic Feature	1.0	> 800 m	1
Unutilized ROW (Manitoba Hydro Owned)	1.2	Ephemeral Streams (Non-Fish Bearing)	4.9	400 - 800 m	2.7
Parallel Existing Transmission Lines (<300kV)	3.8	Spannable Waterbodies (Lakes & Ponds)	6.1	100 - 400 m	6.5
Parallel Roads ROW	5	Ephemeral Streams (Fish Bearing)	6.3	ROW - 100 m	9
Parallel Provincial Highways ROW	5	Swamps	6.8	**Building Density**	**15.0%**
Parallel Oil / Gas Transmission Pipeline	7	Ephemeral Streams (CRA Fish Bearing)	6.9	< 1 Building / Acre (Rural Agricultural)	1.0
Parallel Railway ROW	7	Riparian Floodplain	7.1	1 Building per 1-5 acres	2.8
Future MIT Plans	7.8	Permanent Stream	7.5	1-3 Buildings/Acre (Rural/Residential)	3.7
>= 300 kV Transmission Line/Within Buffer	8.5	Bogs	7.7	3-10 Buildings / Acre (Suburban)	7.2
Within Road, Railroad, or Utility ROW	9	Fens	8.2	>10 Buildings / Acre (Urban)	9.0
Spannable Waterbodies	**10.4%**	Marsh	8.2	**Proposed Development**	**3.7%**
No Waterbody	1	Permanent Stream (CRA Fish Bearing)	9.0	No Proposed Development	1.0
Non-Nav. Spannable Waterbody (Standard Structures)	2.8	**Special Features**	**42.4%**	Proposed Development – Industrial	3.0
		No Special Land	1.0	Proposed Development – Agriculture	4.1
Nav. Spannable Waterbody (Standard Structures)	4.3	Managed Woodlots	5.4	Proposed Development - Commercial	5.1
		Crown Land With Special Code	7.0	Permitted Development	6.9
Non-Nav. Spannable Waterbody (Specialty Structures)	6	Community Pastures	7.3	Proposed Development - Rural Residential Zoning	6.9
Nav. Spannable Waterbody (Specialty Structures)	9	Flyways	7.5	Proposed Development - Urban Zoning	9.0
Geotechnical Considerations	**30.2%**	Areas of Special Interest (ASI)	7.8	**Soil Capability & Agricultural Use**	**11.9.%**
Rock	1	Recreation Provincial Park (Non-Protected Portions)	8.0	Other	1.0
No Special Geotechnical Considerations	1.3	Conservation Easements	8.0	Class 6 & 7 (Low Productivity)	3.3
100 Year Floodplain	6.6	Wildlife Management Area (Non-Protected Portions)	8.2	Organic Soils / Peat Bogs / Sod Production	3.9
Wetland / Peatlands	9	Proposed Protected Areas	8.6	Artisanal Farms / Wild Rice	4.3
Mining Operations / Quarries	**13.2%**	Heritage Rivers	8.7	Class 4 & 5 (Forages, Transitional)	5.9
No Mining Operation	1	Important Bird Areas	8.7	Class 1- 3 (Prime Ag./Cultivated Land)	9.0
Abandoned / Inactive Mines (Aggregate Piles, Pits, etc)	6.5	Heritage Marshes	8.9	**Land Use**	**16.0%**
		Conservation Lands	8.9	Forest	1.0
Mine-Owned Land	9	Natural Provincial Park (Non-Protected Portions)	9.0	Open Land (Sand & Gravel)	1.5
Slope	**5.4%**	**Land Cover**	**10.2%**	Industrial	1.6
Slope 0 - 15%	1	Exposed / Urbanized / Open Land	1.0	Burnt Areas	1.8
Slope 15 - 30%	3.1	Agricultural (Forage)	2.5	Active Forestry Operation	2.3
Slope > 30%	9	Agricultural (Crops)	2.8	Hunting / Trapping Locations	3.9
Proximity to Future Wind Farms	**5.1%**	Burnt Areas	4.9	Listed Trails (Existing & Planned)	4.6
500m - 10k	1	Grassland	5.0	Organic Farming	5.5
> 10k	9	Decidious Forest	5.5	WMAs (Unprotected)	5.8
		Coniferous Forest	5.7	Agricultural (Forage)	4.9
		Mixed Forest	6.0	Out-of-Park Recreational Development	6.4
		Non-Developed Sand Hills	8.1	Agricultural (Crops)	6.6
		Native Grassland	9.0	Intense Development & Use	6.5
		Wildlife Habitat	**37.4%**	500m Buffer of Irrigated Land	6.6
		Other	1.0	Intensive Livestock	6.9
		Ungulate Habitat (High)	6.1	In-Park Recreational Development	7.9
		Waterfowl Habitat (High)	6.3	Institutional	7.4
		Waterfowl Paired Density (High)	6.9	Agricultural (Aerial Application)	8.9
		Waterfowl Hotspots (High)	7.0	Irrigated Land	9.0
		Grouse Lek Area	7.7	**National/Provincial/Municipal Historic Sites**	**12.0%**
		Rare Species Habitat	8.0	> 300 m	1.0
		Critical Habitat	9.0	200 - 300 m	9.0
		Endangered Species Habitat	9.0	**Proximity to Heritage Sites**	**12.0%**
				> 300 m	1.0
				200 - 300 m	9.0
				Landscape Character (Viewsheds)	**7.8%**
				Other	1.0
				Recreational Trails	4.1
				Cottage Subdivisions	6.1
				Scenic Provincial Trails & Roads	6.8
				Escarpments (Timeless Topography)	7.5
				Resort Lodges & Campgrounds	8.6
				Residential	8.9
				Designated Historic Sites	9.0
				Edge of Field	**11.7%**
				Road Allowances	1.0
				Drains	1.8
				Quarter Section / Half-Mile Lines	2.0
				Vacant Rail ROW	2.1
				Parallel/Adjacent To Road Allowances	2.8
				Other (None of the Above)	9.0

Areas of Least Preference
Wastewater Treatment Areas
Buildings
Oil Well Heads
Waste Disposal Sites
Towers and Antennae
Existing Wind Turbine
Military Facilities / Past Military Installations
Protected Areas
Special Conservation Areas/Ecological Reserves
Non-Spannable Waterbodies (>300 m)
World Heritage Sites
Wildlife Refuge
Mines and Quarries (Active)
Contaminated Sites
Wildlife Management Area (Protected Portions)
National Parks
Wilderness/Heritage Provincial Park
Indian Reserves / TLE Selections
Campgrounds & Picnic Areas
Airports/Aircraft Landing Areas (glide path)
Recreational Centers (Golf, Skiing, etc.)
Federal/Provincial/Municipal Heritage Sites
Provincial Park Reserves
Heritage Plaques
Schools / Day Care Parcels
Cemeteries / Burial Grounds
Recreation / Natural Provincial Park (Protected Portions)
Known Archaeological Sites
National,Provincial,Municipal Historic Sites
Religious / Worship Site Parcels

The components that comprise the model (listed above) were initially developed by Manitoba Hydro for routing transmission lines in southern Manitoba using input from stakeholder groups that participated in a series of workshops conducted May 6-8, 2013. Over three separate days, stakeholder groups representing the three perspectives included in the model (built, natural, technical) participated in facilitated discussions and exercises that served to define the areas of least preference, the factors, and the features under consideration in each group of factors. The stakeholder groups' representatives that participated were technical knowledge holders that brought to the discussions their understanding of the features on the landscape and associated values/use, which made it possible for them to participate in discussions that examined the relative suitability of routing a transmission line across or in proximity to these features. Features and factors within the model had to be linked to geospatial information in order to be considered within the alternative corridor model, and stakeholder groups often provided these data as well, when it was not already available. For more details on the development of the alternative corridor model and stakeholder weighting process, refer to Appendix 5A. The resulting alternative corridor model areas of least preference, factors, features and corresponding weights are presented in Table 5-3 and are summarized below.

Areas of Least Preference

Areas of least preference are features to avoid when routing a transmission line due to physical constraints (extreme slopes, long water crossings), regulations limiting development (protected areas), or areas that would require extensive mitigation or compensation. During the route planning process, attempts are made to avoid these areas but in some cases, due to other constraints and factors in an area, and in consideration of the specific details of the feature it may be required to route across an area of least preference[1].

Features that constitute areas of least preference were determined by the stakeholder groups (Appendix 5A) and are listed below (and in red in Table 5-3).

Areas of least preference:

- Wastewater Treatment Areas
- Buildings
- Oil Well Heads
- Towers and Antennae
- Existing Wind Turbine
- Protected Areas
- Wilderness/Heritage Provincial Park
- Indian Reserves/TLE Selections
- Recreation/Natural Provincial Park (protected portions)
- Airports/Aircraft Landing Areas (glide path)
- Recreational Centres (e.g., golf, skiing)
- Provincial/Municipal Heritage Sites

[1] For example, while known archaeological sites were considered areas of least preference during route planning the predisturbed context of the site was well understood and adjacent features constrained where route alternatives could be developed.

- Wildlife Management Area (protected portions)
- Non-spannable Waterbodies (>300 m)
- Mines and Quarries (active)
- Cemeteries/Burial Grounds
- Campgrounds and Picnic Areas
- Provincial Park Reserves
- Schools
- Known Archaeological Sites
- National, Provincial, Municipal Historic Sites
- Religious/Worship Site Parcels

Factors (or layers) are groups are features on the landscape that are considered in transmission line routing, and represented in the alternative corridor model. The factors for inclusion were defined at the stakeholder workshops, and are represented in Table 5-3 as the light green items. An example of a factor in the natural perspective is land cover. Features comprise the subcomponents of the factor, and must capture all potential elements of the factor. Hence, in Table 5-3, the factor of land cover includes the features of forested land, grassland, burnt areas, as well as open/urban land. Each feature is linked to a corresponding geospatial data layer. As described below, the features is the model were assigned suitability values, and the factors were assigned weightings

Suitability Values

Suitability values (details provided in Appendix 5B) for each feature (yellow elements in Table 5-3: *e.g.*, fens, marsh) were scored at the stakeholder workshop (Appendix 5A) on a common scale. Numbers between one and nine were used to represent degrees of suitability for routing a transmission line across (or in proximity to) this feature, with one being most suitable (*i.e.*, <1 building per acre) and nine being least suitable (*i.e.*, 3-10 buildings per acre). Each factor requires a 1 and 9, the remaining features within each factor are given values based on suitability of routing a transmission line.

These values are described in the EPRI-GTC methodology (2006) as follows:

- High Suitability for an Overhead Electric Transmission Line (1, 2, 3) – these areas do not contain known sensitive resources or physical constraints, and therefore should be considered as suitable areas for the development of corridors
- Moderate Suitability for an Overhead Electric Transmission Line (4, 5, 6) – these areas contain resources or land uses that are moderately sensitive to disturbance or that present a moderate physical constraint to overhead electric transmission line construction and operation. Resource conflicts or physical constraints in these areas can generally be reduced or avoided using standard mitigation measures.
- **Low Suitability for an Overhead Electric Transmission Line (7, 8, 9)** – these areas contain resources or land uses that present a potential for significant effects that may not be readily mitigated. Locating a transmission line in these areas would require careful routing or special design measures. While these areas can be crossed, it is not desirable to do so if other, more suitable alternatives are available.

Layer Weight

After assigning suitability values to features, stakeholders (Appendix 5A) then assigned weights (details on weighting process provided in Appendix 5B) to each factor (data layer) based on their knowledge and opinion of its relative importance in the routing process.

Gathering Data

The next step in the creation of alternative corridors was to collect geospatial data that represented each factor in the alternative corridor evaluation model. Sources of data included aerial photography, geographic information system databases, publicly available data sets, and other sources.

Creating Geospatial Data Layers

As noted, each factor in the alternative corridor evaluation model must be represented by a geospatial data layer. The geospatial data layer divides the route planning area into grid cells (5 m x 5 m). Each cell is assigned a suitability value (between 1 and 9 with 1 being most suitable and 9 being least suitable) based on the alternative route evaluation model (Details Provided in Appendix 5B).

Creating Suitability Surfaces

The next step in the creation of alternative corridors is to create the suitability surfaces. A suitability surface is created by combining the individual geospatial data layers (factors and areas of least preference) into one layer (details are provided in Appendix 5B).

Suitability surfaces were created for each of the three perspectives: engineering environment, natural environment, and built environment, as well as one for the simple average. Each suitability surface represents a weighted combination of the three perspectives. Four scenarios were created by distributing the weight of each environment as follows:

Engineering environment suitability surface (Map 5-5): The data layers from the engineering environment perspective are given five times (72%) the emphasis of the built environment (14%) and natural environment (14%) perspectives.

Natural environment suitability surface (Map 5-6): The data layers from the natural environment perspective are given five times (72%) the emphasis of the built environment (14%) and engineering environment (14%) perspectives.

Built environment suitability surface (Map 5-7): The data layers from the built environment perspective are given five times (72%) the emphasis of the natural environment (14%) and engineering environment (14%) perspectives.

Simple average suitability surface (Map 5-8): The data layers for the simple average suitability surface are given equal emphasis (33.3% applied to all three perspectives).

5.3.3.2 Developing Alternative Corridors

The alternative corridors developed from the model (Map 5-9) represent the top 3%[2] (the most suitable 3%) of "optimal paths" within the route planning area. For the development of the alternative corridors, two separate start points were used. One start point was the western end of the RVTC. The other was the eastern end of the RVTC. Least cost path analysis was run from the first start point to each of the 4 border crossing areas. It was also run from the second point to Piney East and Piney West border crossing areas.

Alternative corridors were generated for each of the three perspectives (built environment, natural environment, and engineering environment) as well as the simple average (an average of the three perspectives).

Engineering Environment Alternative Corridor

Alternative route analysis was performed on the engineering environment weighted suitability surface (Map 5-5), producing the engineering environment alternative corridors (Map 5-9).

Natural Environment Alternative Corridor

Alternative route analysis was performed on the natural environment weighted suitability surface (Map 5-6), producing the natural environment alternative corridors (Map 5-9).

Built Environment Alternative Corridor

Alternative route analysis was performed on the built environment weighted suitability surface (Map 5-7), producing the built environment alternative corridors (Map 5-9).

Simple Average Alternative Corridor

Alternative route analysis was performed on the simple average suitability surface (Map 5-8), producing the simple average alternative corridors (Map 5-9).

Composite Corridors

The combination of the four alternative corridors results in the composite corridor. The composite corridor depicts the most suitable areas, based on the criteria used in the model, in which to plan potential routes for the transmission line. Map 5-10 shows the composite corridor for each of the four border crossing areas.

The area represented by the composite corridor also serves as the base for the next phase of data collection. Up to this phase, the route planning area has been examined almost exclusively by aerial photography and existing geospatial data. Subsequently, the features in the composite corridor were verified by the routing team through both ground and aerial based field surveys.

[2] When the EPRI-GTC siting methodology was first created, it was validated against recent electric transmission line siting projects. It was discovered that the routes selected for these projects typically fell within corridors created at 3% of all potential routes. For this reason, 3% has become widely used by utilities implementing this methodology to create alternative corridors.

During these field surveys, Project staff documented landscape features (such as new buildings, building types) and used this information to update geospatial data. This level of verification provided the routing team with the most accurate data needed to develop alternative routes.

5.3.4 Removal of Gardenton West Border Crossing

At the same time as composite corridor data collection was occurring, the border crossing areas were being reviewed by both Manitoba Hydro and Minnesota Power with the latest information and knowledge.

Feedback from the Bipole III, and the engagement processes for the St. Vital Transmission Complex Project indicated a high level of concern and resistance in the agricultural community regarding the development of transmission lines through prime agricultural and growing rural residential areas. The use of the Gardenton West Border Crossing would require routing through these areas of concern.

Minnesota Power had also indicated concerns with being able to find suitable routes to this crossing. It was proposed that the crossing be removed from further consideration. This was agreed to by both parties. Moving forward, both parties would continue the routing process with three border crossings: Gardenton (east), Piney East, and Piney West.

The route planning area was subsequently adjusted (Map 5-11) based on removal of the Gardenton West border crossing. The western boundary of the route planning area was moved just east of Highway 12 at Steinbach to limit the route planning area due to the following considerations:

- higher density rural and non-farm residential development;
- more intense specialized agricultural land uses and industrial developments;
- enhanced developed recreational sites;
- crossing of existing transmission lines and planned future transmission developments (Bipole III, St. Vital Transmission Project); and
- planning routes through this area with a high density of constraints would require numerous angle structures and few opportunities for cost-effective, straighter routes.

5.4 Round 1 Transmission Line Routing

Having completed the preliminary planning necessary to develop route alternatives for the transmission line, Manitoba Hydro moved into Round 1 of the transmission line routing exercise, which (as noted in Figure 5-2) includes planning, generating feedback and analysis, and ultimately selection. In each of these steps is described, along with the methodology applied at each step.

5.4.1 Objective

The objective of Round 1 transmission line routing was to determine a preferred border crossing for the Project. This was achieved by first planning a number of alternative routes to each border crossing, presenting these routes for feedback through the public and First Nation and Metis engagement processes, assessing the routes for potential effects by discipline specialists, analyzing the information presented, and then using the AREM and PDM tools to comparatively evaluate the alternative routes, and determine a rank order based on strengths and weaknesses for the routes presented. This information was used to inform the negotiation process with Minnesota Power, which resulted in the selection of a border crossing for the Project. Feedback gained through the engagement and assessment processes was also used to inform the development of alternative routes for Round 2.

5.4.2 Planning

Once alternative corridors are identified (as described in Section 5.3.3), the routing team identifies alternative routes within those corridors. The alternative routes are potential, preliminary centerline routes for the proposed transmission line that can be evaluated (using the alternative route evaluation model discussed below) by the Project team, presented to the public for feedback, and analyzed by the Project team. The routes are composed of individually numbered route segments that connect to form contiguous routes from the start to end point (Figure 5-4).

The route segments are individually numbered to allow for tracking. Segments in each round (new and old) are given a new series of numbers. Table 5-4 provides the various segment series in relation to each round of routing. These segments will be referred to throughout the chapter.

Table 5-4 Segment Series Descriptions

Segment Series	Transmission Line Routing Stage
0-74	Initial Segments presented to the public during Round 1.
100 Series	Mitigative Segments developed based on feedback received throughout Round 1.
200 Series	Segments developed to the preferred border crossing and presented to the public during Round 2.
300 Series	Mitigative segments based on feedback received throughout Round 2.
400 Series	Mitigative Segments developed based on feedback received throughout Round 3.
Final Preferred Route	

Figure 5-4 Routes are Composed of Individually Numbered Route Segments

(Segments 201-202-204-206 would form part of one route. Segments 201-202-203-204-206 would form part of another route. Segments 205-206 would form part of another route)

Alternative routes are developed by the Manitoba Hydro routing team and take into account a number of considerations. The routing team is made up of senior transmission technical specialists in both engineering and design, and environmental assessment. Planning considerations included the same factors that determined the alternative corridors but at a much smaller scale (finer level of detail) along with technical and environmental constraints such as the number and type of tower structures (in particular the need for larger, more costly angle structures), land use and environmental features.

The routing team developed alternative route segments instead of complete alternative routes as this provides the maximum number of routing possibilities that are not constrained by pre-conceived biases but instead informed by the technical experience of the routing team. An alternative route segment is simply a portion of the route between two intersections. The routing teams' drawing of alternative route segments was not to cross the model informed boundaries of the composite corridor (as described in Section 5.3.3), without just cause and rationale.

Manitoba Hydro System Planners requested that a 10 km buffer of existing 500 kV transmission lines be applied when drawing alternative route segments to maintain separation, a key mitigation strategy in the reduction of risk to reliability associated with critical system infrastructure such as 500 kV lines.

The routing team assessed the route planning area for routing "bottlenecks" which are areas, which limit the possibilities of route segments (*i.e.*, dense rural residential development, Trans Canada Highway, wetland complexes). Once bottlenecks are identified alternative route segments are drawn in these constrained areas first and then logical connecting segments are drawn outward to connect to the adjacent routing bottleneck or start/end point.

The routing team draws route segments initially on large format electronic maps that contain aerial imagery, the composite corridor, areas of least preference, and corresponding geospatial imagery to understand connectivity and logical flow between the start and end points. Once a first cut has been completed, the routes are digitized into a Geographic Information System where they are further refined and assessed with the full power of information that the hundreds of geospatial data layers, including areas of least preference, buildings, aerial imagery, and other model output corridors provide. The information reviewed included the additional data collected through field surveys of the corridor area by the Project team, which catalogued new development, buildings (new homes, structures) that had developed on the landscape.

5.4.3 Feedback and Analysis

Alternative segments (connecting from start to finish to form various route combinations) are then presented for feedback through the public engagement process (PEP) (Chapter 3) and First Nations and Metis engagement process (FNMEP) (Chapter 4). The alternatives presented in Round 1 PEP and FNMEP are represented by the solid dark pink lines on Map 5-11. Feedback was sought regarding: on the ground land uses in proximity to the alternative routes, future land use or development plans, and specific concerns. Recommendations were received through the

engagement processes regarding segment adjustments to mitigate concerns or land uses that are affected by the alternative routes (referred to as mitigative segments).

Project team discipline specialists gather data (through desktop studies, consideration of existing databases, and field surveys) and analyze the alternative routes from the perspective of potential effects from their perspectives. Recommendations are made by Project team members for segment adjustments to mitigate concerns.

Mitigative segments (see Figure 5-5 for example) are then evaluated by the routing team for technical feasibility and cost. Consideration is also given to whether the mitigative segment proposed results in net-minimization of effect (*i.e.*, does not shift effect from one landowner to multiple others). Segments determined to be reasonable against these considerations are retained and move forward for consideration in the next step of comparative evaluation. The dashed blue lines on Map 5-11 present the mitigative segments (routes) developed from consideration of the feedback received from Round 1 PEP and FNMEP that were evaluated.

The public were asked to provide feedback on the segments presented, and to provide input on features and uses of the landscape that might not have been identified on existing maps or through the windshield survey process.

Input received through engagement included the following:

- Key person interviews provided comments about specific features and considerations that could affect transmission line routing.
- Public open houses that included map stations permitted members of the public, particularly potentially affected local landowners and leasers, to indicate specific issues and concerns, and constraints associated with alternative route segments.
- Stakeholder workshops allowed stakeholder representatives to consider and identify evaluative criteria for route selection, and see how these criteria are applied to the route selection process.
- Stakeholder meetings provided opportunities for various stakeholders to participate in information sessions with Manitoba Hydro staff and to provide input on landscape features, land uses and specific route segments.
- A number of people emailed, telephoned or wrote to Manitoba Hydro and their consultants to provide a range of comments, some specific to alternative route segments.

Based on feedback during the public engagement process, several segments were modified or added from those presented in Round 1. Table 5-5 provides the segments added or modified and the rationale. Map 5-11 shows the new and adjusted segments discussed below. More information on feedback can be found in Chapter 3 – Public Engagement and Chapter 4 – First Nation and Metis Engagement.

Figure 5-5 Example of a Mitigative Segment

(The preferred route (purple line) was adjusted (blue line) to avoid homes and eliminate two crossings of the Trans Canada Highway)

Table 5-5 Additional Segments added to the Round 2 Evaluation Process

Segment	Rationale
114-117, 119	All these segments were derived from discussions with Manitoba Conservation and Water Stewardship (MCWS) Wildlife Branch, Nature Conservancy, Protected Areas Initiative, and Parks Branch based on proposed, existing or future ecological areas that were identified to have high biodiversity or conservation value.
118	Segment 118 was added to move to the edge of a proposed protected area, rather than through the middle.
122, 123, 126-130	These segments were added as various options to parallel M602F, R49R or R39M[3]. Public input favoured paralleling existing infrastructure. Therefore, these segments were added to increase the amount of paralleling.
121	This segment was added, in discussions with MCWS Wildlife Branch, to avoid a wetland area.
30/120/110	These segments were added to mitigate concerns on the eastern edge of the Watson P. Davidson Wildlife Management Area (WMA). MCWS Wildlife Branch indicated a preference for the route segment to be located farther east from the WMA to limit the effects of fragmentation and additional access. The extent to how far east the segments could be moved was constrained by another ecological area to the east.

Additional details regarding the feedback received at this stage of routing are provided in Chapter 3 – Public Engagement Process.

5.4.3.1 Comparative Evaluation

In the next step, all alternative routes are compared against each other and evaluated with the use of criteria that represent the three perspectives of natural, built, engineering and the simple average. Because the number of segments at this stage can combine into a large number of potential routes, and the number of criteria under consideration is large, the EPRI-GTC alternative route evaluation model is used to compare all options across the four perspectives, and to select a smaller subset of routes for further consideration, screening these routes into the next step of preference determination for further comparative evaluation.

[3] Prior to this point in the project, system planning constraints required a 10 km separation buffer from the D602F. Consideration of overall reliability by MH project engineers of risks of common outage to the overall project led to the relaxing of this constraint and the ability to include additional parallel options. However, the overall amount of parallel of the existing 500 kV transmission line is limited, and constrained in areas of higher weather risk.

Alternative Route Evaluation Model

An alternative route evaluation model was created by the Project team. The development of the model is summarized below and described fully in Appendix 5A.

The alternative route evaluation model (Table 5-6; Figure 5-6) is developed by the Project team and specific for each project. The Project team is composed of Manitoba Hydro and expert consulting staff, and includes transmission line design staff, civil design engineers, property agents, construction and operation staff, environmental staff, engagement staff and environmental assessment consultants from natural and socio-economic disciplines. The team determines the criteria in the model as well as the relative weights of each criterion. The criteria are informed by feedback received during previous projects and engagement processes, information from the alternative corridor model workshops, as well as professional knowledge. The criteria are grouped into engineering, natural, and built perspectives and each criterion is assigned a weight, using the analytic hierarchy process (Appendix 5B). Weights assigned represent a portion of the total weight of a perspective, with the total for each perspective equaling 100%. For example, of the 100% available for the built perspective, 27.1 % weight is given to the criteria of relocated residences. In calculating statistics and rankings, routes with residences located in the ROW will receive a relatively higher score than those that do not, all else being equal.

Table 5-6 MMTP Alternative Route Evaluation Model

Criteria	Weight
Built	
Relocated Residences – Within ROW	27.1%
Potential Relocated Residences (100 m) – Edge of ROW	17.1%
Proximity to Residences (100-400 m) – Edge of ROW	6.4%
Proposed Developments – Within ROW	15.5%
Current Agricultural Land Use (Value) – ROW	4.4%
Land Capability for Agriculture (Value) – ROW	2.2%
Proximity to Intensive Hog Operations (acres) – ROW	3.3%
Diagonal Crossings of Agriculture Crop Land (km)	9.9%
Proximity to Buildings and Structures (100 m) – Edge of ROW	3.2%
Public Use Areas (250 m) – Edge of ROW	7.4%
Historic/Cultural Resources (250 m) – Edge of ROW	1.8%
Potential Commercial Forest (acres) – ROW	1.7%
TOTAL	*100%*

Criteria	Weight
Natural	
Natural Forests (Acres) – ROW	8.0%
Intactness	25.9%
Stream/River Crossings – Centerline	16.4%
Wetland Areas (Acres) – ROW	16.4%
Conservation and Designated Lands (Acres) - ROW	33.3%
TOTAL	*100%*
Engineering	
Seasonal Construction and Maintenance Restrictions (Value) – ROW	16.5%
Index of Proximity to Existing 500 kV Lines	29.5%
Accessibility	16.5%
Costs[1]	33.0%
Existing Transmission Line Crossings (#)	4.5%
TOTAL	*100%*

NOTE:

[1] The costs calculated for alternative route evaluation purposes cannot be compared to actual project costs because they are estimated for the purposes of comparison between routes and reflect key cost considerations (such as line length, number and type of structures anticipated and clearing costs) but are not comprehensive or representative of full costs.

Raw and Normalized Statistics

Statistics are created to allow comparison of route segments or complete routes. Statistics are calculated for all criteria in the model for each of the alternative route segments. The statistics for all the segments can be summed, resulting in statistics for each of the overall routes.

The statistics are normalized (distributed along a scale from zero to one) to allow comparison between each of the criteria as the criteria comprise disparate data types (e.g., counts, acreages, lengths, monetary values). Normalizing the values allows the comparison of whole route statistics, on an “apples to apples” basis.

The routes are ranked based on the route statistics and overall normalized values, with the purpose of determining the top routes based on the statistical data. The statistics are then considered by the Project team, with the use of histograms and rankings of perspectives and a smaller subset of routes is selected for further consideration in the subsequent step of preference determination.

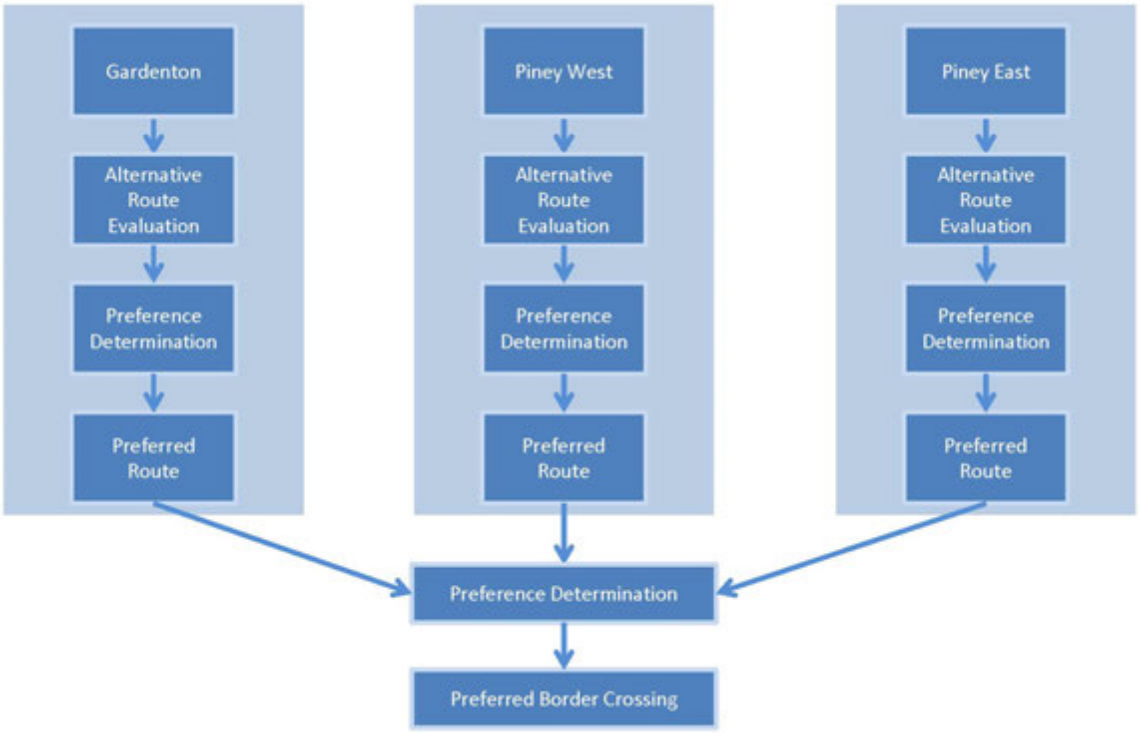

Figure 5-6 Round 1 Alternative Route Evaluation Flow Chart

Round 1 Comparative Evaluation

After studying the composite corridors, creating potential routes and including input from the public engagement process and discipline specialist analysis, there were 87 alternative route segments evaluated (numbered 1 to 132, Map 5-11).

Considering the network created by the arrangement of alternative route segments, analysis was performed to determine all reasonable combinations of segments resulting in routes that connected the endpoints (SLTC [4] start point and the three border crossing areas at this stage) of the Project. These are referred to as alternative routes. There were approximately 750,000 alternative routes between the start and the three end points (border crossings). Statistics were created for each of the routes to enable the comparison of the alternatives.

[4] The portion of the transmission line running from Dorsey Converter Station to this point on the SLTC was considered a fixed portion of the route. The statistics and associated alternative route evaluation exercise was applied to the alternative routes from this point to the border crossings.

Round 1 Route Selection Workshop

The alternative routes were evaluated at a workshop conducted February 4-6, 2014 (see Appendix 5C for workshop notes). Participants in the workshop included members of the Project team representing the various perspectives (built, engineering, natural). Team members responsible for engineering, technical design, construction and maintenance represented the Technical perspective. Team members responsible for the public and First Nation and Metis engagement processes represented feedback received from participants. Socio-economic discipline specialists represented the built perspective. Discipline specialists responsible for assessing the potential effect on the biophysical environment represented the natural environment. Quantum Spatial (formerly PhotoScience Consulting, part of the team that designed the initial EPRI-GTC methodology and worked with Manitoba Hydro to develop the Manitoba application of the model) facilitated the process from a methodological perspective.

Prior to reviewing the alternative route evaluation statistics, the number of possible routes (approximately 750,000) had to be reduced to a manageable size for evaluation. This reduction was accomplished by eliminating from further analysis all routes that were greater than 120% longer than the shortest route between the start and each border crossing. The decision to remove all routes greater than 120% of the total length of the shortest route is based on the logic of limiting overall effect—longer routes are generally less favourable, as the greater distance increases potential effects (*e.g.*, the route will cross more total land area creating, in most cases, increased costs, land effects, and affected a number of individuals). This also reduced routes that included backtracking segments, which are segments that cause the route to turn in a direction opposite to moving towards the end point.

The remaining approximately 6500 routes were brought forward into the analysis for each border crossing discussed below.

In this phase of the evaluation, the number of alternative routes was reduced to a set of finalists. This process is facilitated through discussion and examination of the statistical results of the alternative route evaluation model. These finalists are carried forward for further evaluation in the preference determination phase, which is discussed further in paragraphs that follow.

Each border crossing was evaluated separately in this phase, with a set of finalists determined for each border crossing as depicted in Figure 5-6. The final step was to compare the highest ranking routes from each border crossing against each other to determine overall route preferences and from that the preferred border crossing (Figure 5-6).

The following paragraphs step through the flow chart in Figure 5-6, working through the alternative route evaluation process and preference determination for each individual border crossing. The top route(s) from each border crossing is then moved into a final preference determination step to enable the comparison of the top routes against each other. This final preference determination helped to flesh out the strengths and weaknesses of the border crossings as illustrated by alternative routes deemed most ideal to reach these crossings.

Gardenton Border Crossing

Alternative Route Evaluation

Using the alternative route evaluation statistics (provided in Table 5-7 for the top 16 routes) and GIS software to display route locations, the top 10 alternative routes from each perspective were reviewed. After review, it was determined that the top five from each perspective (built, natural, technical, simple average) would move to the next step of evaluation. Sixteen routes moved on to the next step (less than 20 as there was overlap between the top routes from each perspective).

The 16 remaining alternative routes were represented by a histogram (Figure 5-7). For each alternative route, the histogram depicts the overall scores from each perspective (engineering, natural, built, and simple average). Using this histogram, it is possible to visually consider the strengths and weaknesses of each route and determine the top scoring routes. Lower values indicate relatively more suitable routes, and higher scores indicate relatively less suitable routes.

The histogram for the finalists to the Gardenton border crossing (Figure 5-7) showed 6 routes (Routes JL, RG, SP, SQ, SR, and SS) that scored less favourably in most categories than the others. It was decided to remove these routes. The remaining 10 routes were reviewed and compared. Table 5-8 outlines the routes carried forward to preference determination (Shown on Map 5-12) and the rationale for inclusion. In selecting from this smaller subset, consideration was given to ensuring that routes that provided characteristics of importance were maintained so the additional comparative analysis of preference determination could be applied. For example, Route SY was moved forward because it was considered important to maintain Segment 71 in further evaluation as it provided an alternative way of moving through the built up areas along the TransCanada Highway.

Table 5-7 Route Statistics for the Top 16 Routes from the Gardenton Border Crossing

FEATURE	Route JL	Route RG	Route SP	Route SQ	Route SR	Route SS	Route SU	Route SW	Route SY	Route TA	Route TC	Route UA	Route UC	Route UM	Route VC	Route VE
Built																
Relocated Residences (Within ROW)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Normalized	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
Potential Relocated Residences (100m from EOROW)	14	16	15	15	15	15	13	13	13	13	15	18	18	11	13	13
Normalized	0.43	0.71	0.57	0.57	0.57	0.57	0.29	0.29	0.29	0.29	0.57	1.00	1.00	0.00	0.29	0.29
Proximity To Residences (100m - 400m from EOROW)	81	64	65	65	67	67	89	91	84	86	89	73	75	53	82	84
Normalized	0.74	0.29	0.32	0.32	0.37	0.37	0.95	1.00	0.82	0.87	0.95	0.53	0.58	0.00	0.76	0.82
Proposed Residential Developments - Within ROW	4	0	0	0	0	0	4	4	4	4	2	2	2	1	4	4
Normalized	1.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	0.50	0.50	0.50	0.25	1.00	1.00
Current Agricultural Land Use (Value)	800	771	754	754	757	757	896	898	791	793	662	1019	1021	1027	798	801
Normalized	0.38	0.30	0.25	0.25	0.26	0.26	0.64	0.65	0.35	0.36	0.00	0.98	0.98	1.00	0.37	0.38
Land Capability for Agriculture (Value)	1560	1492	1455	1480	1457	1482	1537	1539	1458	1460	1393	1638	1640	1547	1454	1456
Normalized	0.68	0.40	0.25	0.35	0.26	0.36	0.58	0.59	0.26	0.27	0.00	0.99	1.00	0.63	0.25	0.25
Proximity To Intensive Hog Operations (Acres)	2623	1813	1750	1787	1760	1798	1854	1865	1810	1821	1534	1827	1838	2021	1810	1821
Normalized	1.00	0.26	0.20	0.23	0.21	0.24	0.29	0.30	0.25	0.26	0.00	0.27	0.28	0.45	0.25	0.26
Diagonal Crossings of Prime Agricultural Land (Acres)	62	51	55	55	50	50	50	46	64	60	58	34	30	24	73	68
Normalized	0.77	0.55	0.63	0.63	0.53	0.53	0.55	0.45	0.83	0.73	0.70	0.22	0.12	0.00	1.00	0.90
Proximity to Buildings & Structures (100m) - EOROW	14	11	11	11	19	19	10	18	12	20	9	14	22	9	12	20
Normalized	0.38	0.15	0.15	0.15	0.77	0.77	0.08	0.69	0.23	0.85	0.00	0.38	1.00	0.00	0.23	0.85
Public Use Areas (250m) - EOROW	20	14	14	14	14	14	21	21	20	20	20	18	18	16	19	19
Normalized	0.86	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.86	0.86	0.86	0.57	0.57	0.29	0.71	0.71
Historic Resources (250m) - EOROW	9	6	6	6	6	6	7	7	8	8	6	7	7	7	8	8
Normalized	1.00	0.00	0.00	0.00	0.00	0.00	0.33	0.33	0.67	0.67	0.00	0.33	0.33	0.33	0.67	0.67
Potential Commercial Forest (Acres)	28	50	36	50	36	50	54	54	60	60	50	54	54	50	60	60
Normalized	0.00	0.70	0.25	0.70	0.25	0.70	0.82	0.82	1.00	1.00	0.70	0.82	0.82	0.70	1.00	1.00
Natural																
Natural Forests (Acres)	239	278	254	275	254	275	251	251	266	266	264	252	252	240	266	266
Normalized	0.00	1.00	0.38	0.93	0.38	0.93	0.30	0.30	0.69	0.69	0.66	0.34	0.34	0.03	0.69	0.69
Intactness	351	342	365	342	365	342	269	269	290	290	342	269	269	269	290	290
Normalized	0.84	0.76	1.00	0.76	1.00	0.76	0.00	0.00	0.22	0.22	0.76	0.00	0.00	0.00	0.22	0.22
Stream / River Crossings - Centerline	15	11	11	11	11	11	14	14	14	14	11	14	14	14	15	15
Normalized	1.00	0.00	0.00	0.00	0.00	0.00	0.75	0.75	0.75	0.75	0.00	0.75	0.75	0.75	1.00	1.00
Wetland Areas (Acres) - ROW	211	228	218	225	218	225	197	197	206	206	214	198	198	190	206	206
Normalized	0.57	1.00	0.74	0.93	0.74	0.93	0.19	0.19	0.43	0.43	0.65	0.23	0.23	0.00	0.43	0.43
Conservation & Designated Lands (Acres)	165	223	245	223	245	223	143	143	143	143	216	143	143	143	143	143
Normalized	0.22	0.79	1.00	0.79	1.00	0.79	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.00	0.00
Engineering																
Seasonal Construction & Maintenance Restrictions	620.44	627.02	631.55	620.48	633.97	622.90	573.97	576.39	561.52	563.94	584.32	613.70	616.11	605.41	564.10	566.52
Normalized	0.81	0.90	0.97	0.81	1.00	0.85	0.17	0.21	0.00	0.03	0.31	0.72	0.75	0.61	0.04	0.07
Index of Proximity to Existing 500kV Lines	1.E+10	7.E+09	7.E+09	7.E+09	7.E+09	7.E+09	8.E+09	8.E+09	8.E+09	8.E+09	8.E+09	8.E+09	8.E+09	8.E+09	8.E+09	8.E+09
Normalized	0.29	0.01	0.00	0.00	0.00	0.00	0.07	0.07	0.07	0.07	0.05	0.07	0.07	0.08	0.06	0.06
Inverted	0.00	0.28	0.29	0.29	0.29	0.29	0.22	0.22	0.22	0.22	0.23	0.22	0.22	0.21	0.23	0.23
Existing Transmission Line Crossings	3.00	12.00	14.00	14.00	14.00	14.00	3.00	3.00	3.00	3.00	4.00	3.00	3.00	7.00	3.00	3.00
Normalized	0.00	0.82	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.36	0.00	0.00
Accessibility	2.89E+08	2.97E+08	2.96E+08	2.82E+08	2.97E+08	2.83E+08	2.55E+08	2.55E+08	2.56E+08	2.57E+08	2.61E+08	2.69E+08	2.70E+08	2.89E+08	2.57E+08	2.58E+08
Normalized	0.80	1.00	0.98	0.64	0.99	0.66	0.00	0.02	0.04	0.06	0.15	0.34	0.35	0.81	0.06	0.08
Total Project Costs	$128M	$133M	$131M	$132M	$131M	$132M	$125M	$125M	$120M	$120M	$119M	$131M	$131M	$130M	$119M	$119M
Normalized	0.64	1.00	0.86	0.94	0.88	0.96	0.41	0.43	0.08	0.11	0.05	0.87	0.90	0.80	0.00	0.02

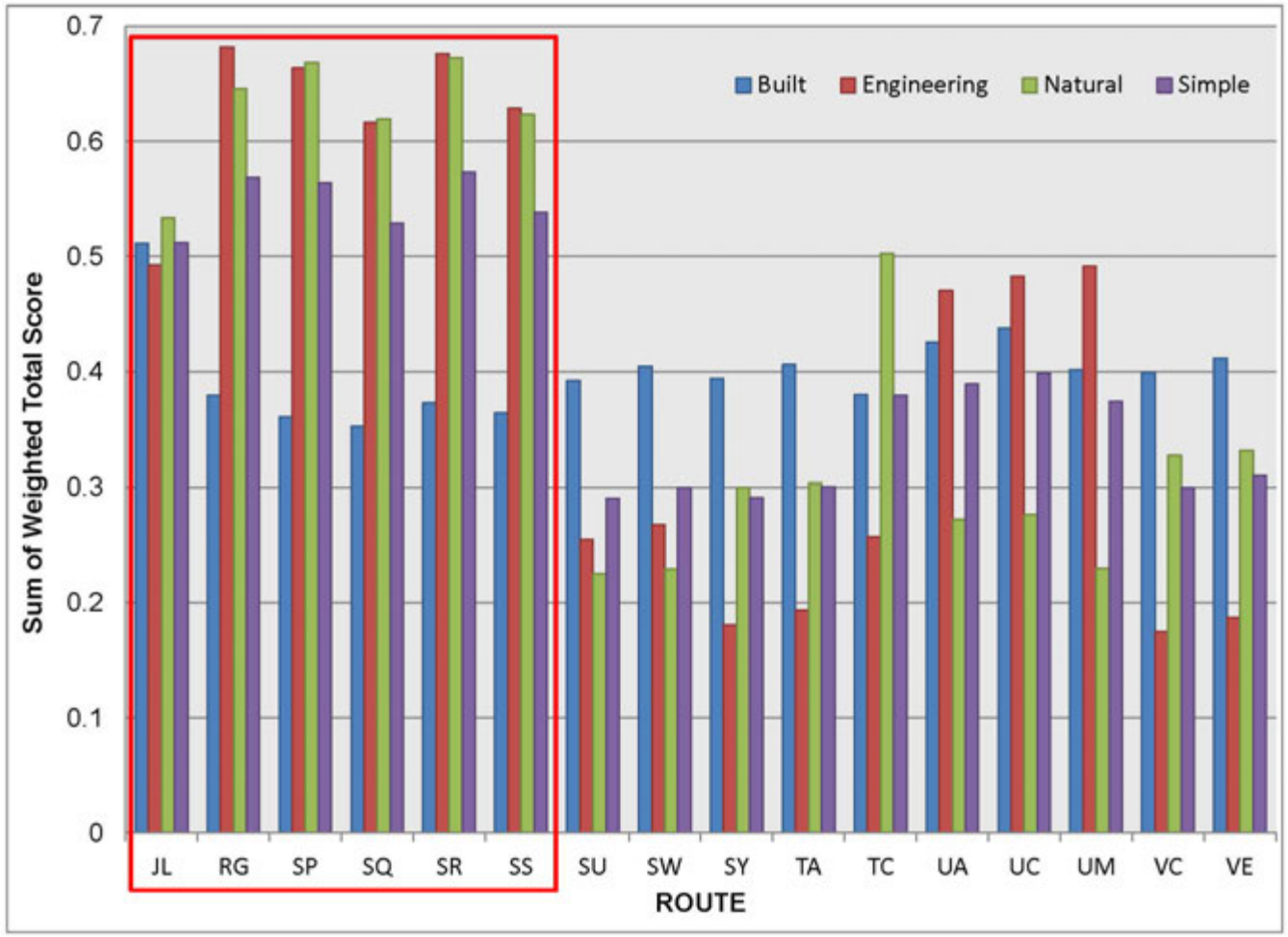

Figure 5-7 Histogram of the Total Scores for the Top 16 Routes (Gardenton)

Table 5-8 Gardenton Border Crossing Routes Selected for Preference Determination and their Rationale for Inclusion (Map 5-12)

Segment	Rationale
Route TC	The only remaining route that contains segment 50 which was a preferred segment from the public engagement process because it is further from developed areas and crosses the least amount of productive agricultural land.
Route SU	The best simple average score.
Route UM	The only remaining route that includes segment 70, which is a preferred segment from an engineering perspective.
Route UC	Maintains the most northeasterly segments, providing an additional alternative away from the development south of the TCH.
Route SY	The highest scoring route that maintains segment 71 (providing an additional alternative through the development south of the TCH).

Considering information obtained through public engagement, review of the statistical analysis and the histogram of the top 16 routes, routes TC, SU, UM, UC and SY were carried forward to preference determination.

Preference Determination

In the preference determination step (final step in the EPRI-GTC funnel, Figure 5-1), the preference determination model is used to select the preferred route from the route finalists identified from the alternative route evaluation process described in Appendix 5A. Senior Manitoba Hydro managers (management team) from the Transmission Business Unit set the criteria and weightings that are used in preference determination model, presented in Table 5-9). Because this is the final step in route selection, high-level criteria and weightings set by the management team represent the key considerations of Manitoba Hydro in decision-making related to transmission line projects.

In the preference determination step, the “finalists” from the alternative route evaluation step are considered in a comparative fashion by the Project team (design and construction engineers, Project managers, biophysical and socio-economic specialists). This step incorporates feedback received in the public (Chapter 3) and First Nation and Metis engagement (Chapter 4) processes together with route statistics, and additional research and analysis by discipline specialists, to provide input into the selection of a preferred route.

Once the subset for further consideration is selected from the route statistics in the alternative route evaluation model, the Project team identifies considerations that should be applied to the selection of the preferred route. Each consideration is given a percentage of weight relative to its overall importance. These considerations are gathered from the team’s awareness of the Project area, particularly its geographical and sociological makeup and input from the public engagement process.

Table 5-9 Preference Determination Model used for MMTP

Criteria	Percent	Description
Cost	40%	Cost was based on high-level construction cost estimates used for relative comparison, defined in the alternative route evaluation criteria (values do not represent actual cost estimates for the Project).
Community	30%	Input received from the public and First Nation and Metis engagement processes.
Schedule Risks	5%	Includes consideration of the need for additional approvals, seasonality of construction, overall level of complication expected that could result in delays.
Environment (Natural)	7.5%	Consideration of the natural based statistics from the alternative route evaluation criteria, further interpretation by the Project team and additional information not captured by the criteria that can inform the relative potential effect on the natural environment of different route alternatives.
Environment (Built)	7.5%	Consideration of the built statistics from the alternative route Evaluation criteria, further interpretation by the Project team and additional information not captured by the criteria that can inform the relative potential effect on the built environment of different route alternatives.
System Reliability	10%	Proximity of the route to existing 500 kV lines. Informed by considering the statistic calculated during route evaluation (index of proximity), as well as the number of crossing points with other high voltage transmission lines

For each of the preference determination steps described in this chapter, the Project team participated in a workshop, where the selected routes were discussed, reviewed, compared, and judged relative to one another. Each route received a value between 1 and 3, for each of the criteria in the model, with lower values indicating higher suitability. Discussions are guided by the experts responsible for each criterion. In some cases, decision-making frameworks are developed in advance of the workshop (*i.e.*, built framework, community framework) to guide the consideration of the additional information. Considerable research and data analysis occurs prior to the workshop; hence, Project team members are in a position to discuss, debate evaluate the information collectively, and arrive at a group decision regarding the selection of the preferred route.

Each criterion is represented by a subset of Project team members that develops the scores for each route within the preference determination framework. The cost criteria scoring (value between 1 and 3) and system reliability scoring were determined by technical staff and engineers from System Planning, Project Management, Transmission Line Design, and Civil Design and construction. The community criterion rankings were developed by the public and First Nations and Metis engagement teams (Manitoba Hydro staff and supporting consulting staff). The environment (natural) criteria scoring was determined by the specialist consultants on the Project

team that conducted the assessment on the biophysical and physical components of the Project that could be affected, together with Manitoba Hydro Licensing and Environmental Assessment staff. The environment (built) criteria scoring was determined by the specialist consultants on the Project team that conducted the assessment on the components of the socio-economic environment that could be affected by the Project (*e.g.*, land use, agriculture, heritage) and Manitoba Hydro Licensing and Environmental Assessment staff. Finally, the schedule risks criterion scoring was developed through consideration by the entire Project team as elements of each consideration (built, natural, technical) can contribute to schedule risks.

Round 1: Gardenton Preference Determination

The route alternatives evaluated in the preference determination step represent options that would mitigate the major concerns heard in Round 1 public engagement as outlined above, with varying features and strengths and benefits. In the preference determination step, these route alternatives were compared against each other.

As noted in Table 5-8, the routes carried forward to preference determination for the Gardenton border crossing were routes TC, SU, UM, UC and SY (Map 5-12). Table 5-10 provides the scores given for each criteria and the rationale for the scoring. Where the purpose of the preference determination step is normally to select one preferred route from the existing subset, at this stage of the Project the purpose was to further consider the strengths and weaknesses of the final routes to the crossing points. This allowed for the inclusion of data not represented in the alternative route evaluation matrix (*e.g.*, more qualitative community feedback, on-the-ground analysis not represented by a statistic).

Table 5-10 Gardenton Border Crossing Preference Determination Scores[1] and Rationale

(refer to Map 5-12 for the location of the segments discussed below)

Criteria	Route	Scores	Rationale
Cost	TC	1	A scaling factor was used to calculate the scores based on estimates for the total Project costs.
	UM	1.09	
	SU	1.04	
	UC	1.1	
	SY	1	
System Reliability	TC	1	Route UM has more transmission line crossings and is closer to pipelines than the other routes.
	UM	2	
	SU	1	
	UC	1	
	SY	1	

Criteria	Route	Scores	Rationale
Risk to Schedule	TC	2	Route TC has a high risk of construction delays due to breeding bird concerns (forested areas).
	UM	3	Route UM will require extensive private land acquisition and has the most transmission line crossings.
	SU	1	Route SU (which crosses less private lands) will require less private land acquisition and construction delays due to breeding bird concerns.
	UC	2	Route UC will require extensive private land acquisition (crosses more private landholdings).
	SY	1	Route SY will require less private land acquisition and construction delays due to breeding bird concerns.
Environment (natural)	TC	3	Route TC crosses wetlands, ecological reserves and more natural areas.
	UM	1	Route UM crosses the least natural area.
	SU	1.5	Route SU crosses more natural area than UM (but less than SY and TC).
	UC	1.5	Route UC crosses more natural area than UM (but less than SY and TC).
	SY	2	Route SY crosses more forested land, requiring more clearing and has more river crossings.
Environment (built)	TC	1	Route TC is preferred as it avoids most aerial application and agricultural production.
	UM	3	Route UM crosses the most class 1 soils.
	SU	2.5	Route SU slightly more preferred than UM.
	UC	2	Route UC affects some high quality soil areas.
	SY	2	Route SY has more diagonal crossings of farmland and is near proposed and existing residential developments.
Community[2]	TC	1	Route TC was preferred as it uses Segments 48 and 50 (less densely populated, less agricultural disturbance).
	UM	3	Route UM is the least preferred route based on feedback from the public (more agricultural land affected, Segment 70 had the highest concern from the public (residential area/business, prime ag land – dairy farms, aesthetics, significant development).
	SU	1.5	Route SU uses Segments 48 and Segment 73, which was preferred over Segment 71 (Route SY).
	UC	2	Avoids segment 70 (Route UM) but uses Segment 47, less preferred than Segment 48.
	SY	1.75	Uses Segment 48, preferred over Segment 47. Less preferred than Route SU (Segment 71 less preferred than Segment 73).

NOTE:
[1] Scores are between 1 (preferred) and 3 (least preferred)
[2] Community refers to the balance of feedback received throughout the public and First Nation and Metis engagement processes.

The scores given to each route, described in Table 5-10 were entered into the preference determination model. Table 5-11 provides the results of preference determination for the Gardenton border crossing. When the weights for each criterion were considered, a rank order of the remaining routes was established. Route TC received the lowest total score and (Map 5-12) was therefore preferred route to the Gardenton border crossing.

Table 5-11 Preference Determination, SLTC to Gardenton

(showing relative scores, weighted scores and total sum; lower values are preferred for routing)

Criteria	Weight	Routes				
		SU	SY	TC	UC	UM
Cost[1]	40%	1.25	1.02	1	1.6	1.53
Weighted		0.5	0.41	0.40	0.64	0.61
System Reliability	10%	1	1	1	1	2
Weighted		0.1	0.1	0.1	0.1	0.2
Risk to Schedule	5%	1	1	2	2	3
Weighted		0.05	0.05	0.1	0.1	0.15
Environment (Natural)	7.5%	1.5	2	3	1.5	1
Weighted		0.11	0.15	0.075	0.15	0.23
Environment (Built)	7.5%	2.5	2	1	2	3
Weighted		0.19	0.15	0.075	0.15	0.23
Community	30%	1.5	1.75	1	2	3
Weighted		0.45	0.53	0.3	0.6	0.9
TOTAL		**1.4**	**1.39**	**1.05**	**1.74**	**2.32**
RANK		**3**	**2**	**1**	**4**	**5**

NOTE:
[1] A scaling factor was used to determine the relative score for each route.

Piney East Border Crossing

The process described above was followed again for the Piney East Border crossing, beginning with alternative route evaluation, and then preference determination.

Alternative Route Evaluation

Using the alternative route evaluation statistics (provided in Table 5-12), and GIS software to display route locations, the top five alternative routes from each perspective were reviewed. After review it was determined to take the top five routes from each perspective, moving 19 routes to the next step (less than 20, as there was overlap between the top routes from each perspective).

Table 5-12 Route Statistics for the Top 19 Routes from to the Piney East Border Crossing

FEATURE	ROUTE																		
Built	**DKT**	**DLS**	**DRX**	**DUB**	**DUI**	**DVC**	**DWM**	**DWX**	**DXB**	**ECK**	**ECM**	**EDC**	**EDF**	**EED**	**EEH**	**EEL**	**FWZ**	**FXD**	**FXG**
Relocated Residences (Within ROW)	0	0	0	0	0	0	1	1	1	2	2	2	2	1	1	1	0	0	0
Normalized	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50	0.50	1.00	1.00	1.00	1.00	0.50	0.50	0.50	0.00	0.00	0.00
Potential Relocated Residences (100m from EOROW)	4	4	3	1	1	2	12	12	12	10	10	10	10	12	12	14	1	1	1
Normalized	0.23	0.23	0.15	0.00	0.00	0.08	0.85	0.85	0.85	0.69	0.69	0.69	0.69	0.85	0.85	1.00	0.00	0.00	0.00
Proximity To Residences (100m - 400m from EOROW)	20	20	17	12	12	18	81	76	78	45	47	40	42	74	76	79	13	13	13
Normalized	0.12	0.12	0.07	0.00	0.00	0.09	1.00	0.93	0.96	0.48	0.51	0.41	0.43	0.90	0.93	0.97	0.01	0.01	0.01
Proposed Residential Developments - Within ROW	0	0	0	0	0	0	4	4	4	1	1	1	1	4	4	2	0	0	0
Normalized	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25	1.00	1.00	0.50	0.00	0.00	0.00
Current Agricultural Land Use (Value)	396	375	443	393	393	426	896	791	794	1027	1030	922	925	799	802	670	394	394	394
Normalized	0.03	0.00	0.10	0.03	0.03	0.08	0.80	0.64	0.64	1.00	1.00	0.84	0.84	0.65	0.65	0.45	0.03	0.03	0.03
Land Capability for Agriculture (Value)	1025	960	1070	967	965	1059	1572	1493	1495	1582	1584	1503	1505	1488	1490	1423	855	867	836
Normalized	0.25	0.17	0.31	0.17	0.17	0.30	0.98	0.88	0.88	1.00	1.00	0.89	0.89	0.87	0.87	0.78	0.03	0.04	0.00
Proximity To Intensive Hog Operations (Acres)	386	386	490	235	235	464	1438	1393	1404	1605	1615	1560	1571	1393	1404	1117	235	235	235
Normalized	0.11	0.11	0.18	0.00	0.00	0.17	0.87	0.84	0.85	0.99	1.00	0.96	0.97	0.84	0.85	0.64	0.00	0.00	0.00
Diagonal Crossings of Prime Agricultural Land (Acres)	41	41	27	20	20	31	47	62	57	21	16	35	30	70	65	63	20	20	20
Normalized	0.46	0.46	0.20	0.07	0.07	0.27	0.59	0.85	0.76	0.09	0.00	0.35	0.26	1.00	0.91	0.87	0.07	0.07	0.07
Proximity to Buildings & Structures (100m) - EOROW	25	25	8	5	5	8	8	10	18	7	15	9	17	10	18	7	5	5	5
Normalized	1.00	1.00	0.15	0.00	0.00	0.15	0.15	0.25	0.65	0.10	0.50	0.20	0.60	0.25	0.65	0.10	0.00	0.00	0.00
Public Use Areas (250m) - EOROW	16	16	15	15	13	15	31	30	30	26	26	25	25	29	29	29	9	9	9
Normalized	0.32	0.32	0.27	0.27	0.18	0.27	1.00	0.95	0.95	0.77	0.77	0.73	0.73	0.91	0.91	0.91	0.00	0.00	0.00
Historic Resources (250m) - EOROW	14	14	14	14	8	14	15	16	16	15	15	16	16	16	16	14	5	5	5
Normalized	0.82	0.82	0.82	0.82	0.27	0.82	0.91	1.00	1.00	0.91	0.91	1.00	1.00	1.00	1.00	0.82	0.00	0.00	0.00
Potential Commercial Forest (Acres)	1605	1605	1605	1608	1586	1605	954	960	960	950	950	956	956	960	960	950	1547	1526	1514
Normalized	0.99	1.00	0.99	1.00	0.97	0.99	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.91	0.88	0.86
Natural																			
Natural Forests (Acres) - ROW	1,778	1,790	1,778	1,786	1,844	1,775	1,225	1,240	1,240	1,214	1,214	1,229	1,229	1,240	1,240	1,238	1,811	1,806	1,785
Normalized	0.89	0.91	0.89	0.91	1.00	0.89	0.02	0.04	0.04	0.00	0.00	0.02	0.02	0.04	0.04	0.04	0.95	0.94	0.91
Intactness	1305	1377	1305	1214	1394	1305	746	767	767	746	746	767	767	767	767	819	1375	1399	1515
Normalized	0.73	0.82	0.73	0.61	0.84	0.73	0.00	0.03	0.03	0.00	0.00	0.03	0.03	0.03	0.03	0.09	0.82	0.85	1.00
Stream / River Crossings - Centerline	8	8	8	8	7	8	24	24	24	24	24	24	24	25	25	22	12	12	15
Normalized	0.06	0.06	0.06	0.06	0.00	0.06	0.94	0.94	0.94	0.94	0.94	0.94	0.94	1.00	1.00	0.83	0.28	0.28	0.44
Wetland Areas (Acres) - ROW	173	185	173	178	258	170	271	280	280	263	263	273	273	280	280	288	263	279	271
Normalized	0.02	0.13	0.02	0.06	0.74	0.00	0.85	0.93	0.93	0.79	0.79	0.87	0.87	0.93	0.93	1.00	0.78	0.92	0.85
Conservation & Designated Lands (Acres)	228	271	228	278	115	228	0	0	0	0	0	0	0	0	0	73	126	126	126
Normalized	0.82	0.97	0.82	1.00	0.41	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.45	0.45	0.45
Engineering																			
Seasonal Construction/Maintenance Restrictions (Value)	935.09	948.18	950.16	975.58	1029.27	943.63	839.54	827.09	829.51	870.98	873.40	858.53	860.95	829.67	832.09	852.47	1014.31	1020.99	1030.24
Normalized	0.53	0.60	0.61	0.73	1.00	0.57	0.06	0.00	0.01	0.22	0.23	0.15	0.17	0.01	0.02	0.12	0.92	0.95	1.00
Index of Proximity to Existing 500kV Lines	4.50E+09	4.45E+09	4.45E+09	4.05E+09	3.97E+09	4.37E+09	6.66E+09	6.62E+09	6.64E+09	6.72E+09	6.74E+09	6.68E+09	6.70E+09	6.56E+09	6.58E+09	6.44E+09	3.50E+09	3.52E+09	3.71E+09
Normalized	0.31	0.29	0.29	0.17	0.14	0.27	0.97	0.96	0.97	0.99	1.00	0.98	0.99	0.95	0.95	0.91	0.00	0.01	0.06
Inverted	0.69	0.71	0.71	0.83	0.86	0.73	0.03	0.04	0.03	0.01	0.00	0.02	0.01	0.05	0.05	0.09	1.00	0.99	0.94
Existing Transmission Line Crossings	7.00	7.00	15.00	11.00	11.00	17.00	3.00	3.00	3.00	7.00	7.00	7.00	7.00	3.00	3.00	4.00	11.00	11.00	11.00
Normalized	0.29	0.29	0.86	0.57	0.57	1.00	0.00	0.00	0.00	0.29	0.29	0.29	0.29	0.00	0.00	0.07	0.57	0.57	0.57
Accessibility	6.04E+08	6.09E+08	6.06E+08	6.34E+08	7.62E+08	5.91E+08	3.15E+08	3.17E+08	3.18E+08	3.50E+08	3.50E+08	3.51E+08	3.52E+08	3.18E+08	3.18E+08	3.22E+08	8.11E+08	8.04E+08	7.35E+08
Normalized	0.58	0.59	0.59	0.64	0.90	0.56	0.00	0.00	0.01	0.07	0.07	0.07	0.07	0.01	0.01	0.01	1.00	0.99	0.85
Total Project Costs	$129M	$127M	$135M	$134M	$139M	$134M	$150M	$145M	$145M	$155M	$156M	$150M	$150M	$144M	$144M	$143M	$138M	$137M	$137M
Normalized	0.07	0.00	0.28	0.23	0.40	0.25	0.79	0.63	0.64	0.99	1.00	0.81	0.82	0.59	0.60	0.57	0.36	0.33	0.33

The 19 remaining alternative routes were represented by a histogram (Figure 5-8).The histogram depicts the overall scores from each perspective (engineering, natural, built, and simple average), allowing the visual comparison of the strength and weaknesses of routes across the four perspectives. Lower values indicate relatively more suitable routes, and higher scores indicate relatively less suitable routes.

The histogram (Figure 5-8) shows three distinct groups of routes. Routes DKT, DLS, DRX, DUB, DUI, and DVC fall into one group (Group 1) with low built scores and moderate scores for engineering, natural and simple average. Group 2 (DWM, DWX, DXB, ECK, ECM, EDC, EDF, EED, EEH, EEL.) had the highest built scores, and lower engineering, natural and simple average scores than the first group. Routes FWZ, FXD and FXG fall into another group (Group 3) with low built scores and higher engineering, natural and simple average scores. The top route from each group was moved forward to preference determination. Table 5-13 provides the selected routes from each group and the rationale for inclusion, and Map 5-13 shows the top routes. In addition, Route DWM was moved forward to preference determination, as it was the only remaining route to contain Segment 73, which was preferred by the natural group as it crosses over less natural lands.

Table 5-13 Preference Determination, SLTC to Gardenton

(showing relative scores, weighted scores and total sum; lower values are preferred for routing)

Segment	Rationale
DKT	Group 1 had very good built scores for all routes. DKT was selected because it had the best scores for engineering, built and simple average of the group.
EEL	Group 2 had good natural and engineering scores. Segment 50 was a preferred segment from a public perspective as it avoids homes and communities and limits crossing of agricultural land. Route EEL was the only route to contain segment 50.
FWZ	Group 3 routes all contain the eastern border crossing. Route FWZ had the best overall scores of the group.
DWM	Segment 73 was recommended by the natural perspective as an alternative to Segment 50 as it limits crossing of natural land. Route DWM was the only route to contain segment 73.

Considering information obtained through public engagement and review of route statistics (Table 5-14) and the histogram (Figure 5-8), routes DKT, EEL, DWM and FWZ were carried forward to preference determination.

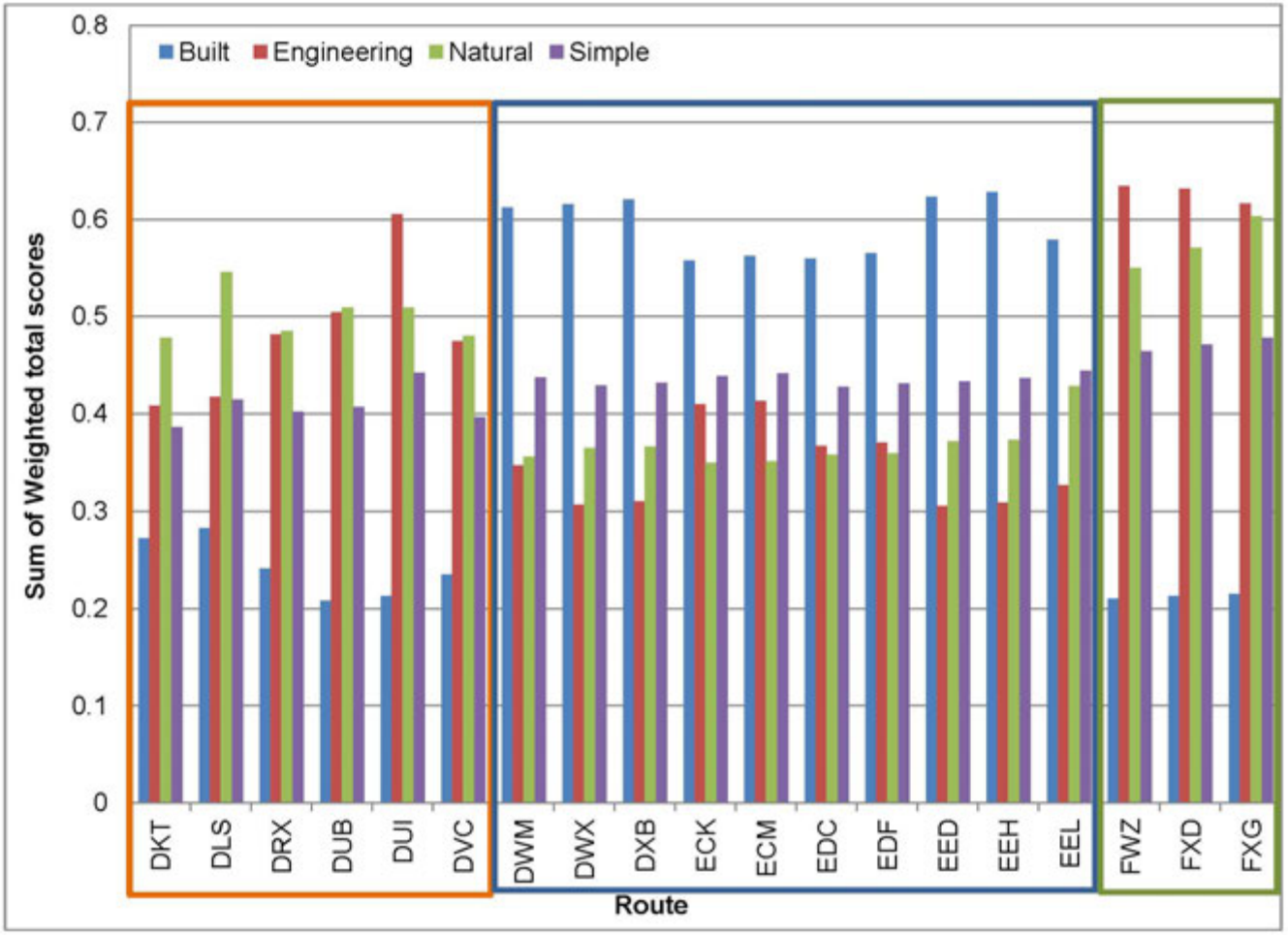

Figure 5-8 Histogram of the Total Scores for the Top 19 Routes (Piney East)

Preference Determination

Routes DKT, DWM, EEL and FWZ (Map 5-13) were selected for preference determination. The values assigned by the Project team were input to the preference determination model. See Appendix 5B (notes) for more detailed discussion of the Project team rankings.

Table 5-14 provides the scores given for each criteria and the rationale for the scoring.

Table 5-14 Piney East Border Crossing Preference Determination Scores and Rationale

Criteria	Route	Scores[1]	Rationale
Cost	DKT	1	A scaling factor was used to calculate the scores based on estimates for the total Project costs
	DWM	1.16	
	EEL	1.11	
	FWZ	1.06	
System Reliability	DKT	2	Route DKT crosses M602F twice.
	DWM	1	Route DWM has lower proximity and crossing of transmission lines and does not cross M602F.
	EEL	1	Route EEL has lower proximity and crossing of transmission lines and does not cross M602F.
	FWZ	2.5	Route FWZ has the closest proximity to transmission lines, has the most transmission line crossings and crosses M602F twice.
Risk to Schedule	DKT	2	Route DKT has some access issues, seasonal construction, slightly better than FWZ.
	DWM	1.5	Route DWM has good access, less clearing, a few more private properties than EEL.
	EEL	1	Route EEL has good access, less clearing and few private properties (less private land acquisition)
	FWZ	3	Route FWZ has potential access problems, possible risk due to seasonal construction constraints and has some historic sites along the route.
Environment (natural)	DKT	3	Route DKT crosses lots of natural habitat, wetlands and affects intactness.
	DWM	1	Route DWM has no wetlands, ecological reserves and proposed protected areas and avoids large intact natural areas
	EEL	1.5	Route EEL crosses some wetlands and an ecological reserve.
	FWZ	3	Route DKT crosses lots of natural habitat, wetlands and affects intactness.

Criteria	Route	Scores[1]	Rationale
Environment (built)	DKT	1.5	Route DKT crosses more ag land than FWZ (less than DWM and EEL).
	DWM	3	Route DWM has more relocated residences, more residences within 100 m, and more proposed developments and affects more agricultural land.
	EEL	2.5	Route EEL has more relocated residences, more residences within 100 m, more proposed developments and affects more agricultural land.
	FWZ	1	FWZ crosses less agricultural land and shelterbelts and affects fewer residences.
Community	DKT	1.5	Route DKT does not parallel M602F, an alignment that was preferred by feedback received from the PEP.
	DWM	1	Route DWM parallels M602F along the RVTC.
	EEL	1	Route DWM parallels M602F along the RVTC
	FWZ	1	Route DWM parallels M602F along the RVTC

NOTE:
[1] Scores are between 1 (preferred) and 3 (least preferred)

Table 5-15 provides the results of the preference determination for the routes terminating at the Piney East border crossing. When the weights for each criterion were considered, the result was a rank order in preference amongst the finalist routes and the selection of Route EEL (Map 5-13) as the preferred route to the Piney East border crossing.

Table 5-15 Preference Determination, SLTC to Piney East

(showing relative scores, weighted scores and total sum; lower values are preferred for routing)

Criteria	Weight	Routes			
		DKT	DWM	EEL	FWZ
Cost[1]	40%	1.00	2.02	1.71	1.41
Weighted		0.40	0.81	0.68	0.56
System Reliability	10%	2	1	1	2.5
Weighted		0.20	0.10	0.10	0.25
Risk to Schedule	5%	2	1.5	1	3
Weighted		0.10	0.08	0.05	0.15
Environment (natural)	7.5%	3	1	1.5	3
Weighted		0.23	0.08	0.11	0.23
Environment (built)	7.5%	1.5	3	2.5	1
Weighted		0.11	0.23	0.19	0.08
Community	30%	1.5	1	1	1
Weighted		0.45	0.3	0.3	0.3
TOTAL	**100%**	**1.49**	**1.58**	**1.43**	**1.56**
RANK		**2**	**4**	**1**	**3**

NOTE:
[1] A scaling factor was used to determine the relative score for each route

Piney West Border Crossing

The process described above was followed again for the Piney East Border crossing, beginning with alternative route evaluation, and then preference determination.

Alternative route Evaluation

Using the alternative route evaluation statistics (provided in Table 5-16 for the top 21 routes) and GIS software to display route locations, the top 5 alternative routes to the Piney West border crossing from each perspective were reviewed. After review, one additional route (Route BCW) was added to include segment 121 (Map 5-11) which was recommended by the natural group to avoid a large wetland. It was determined to take 21 routes to the next step.

The 21 remaining alternative routes were represented by a histogram (Figure 5-9). For each alternative route, the histogram depicts the overall scores from each perspective (engineering, natural, built, and simple average). Using this histogram, the top scoring routes are determined. Lower values indicate relatively more suitable routes, and higher scores indicate relatively less suitable routes.

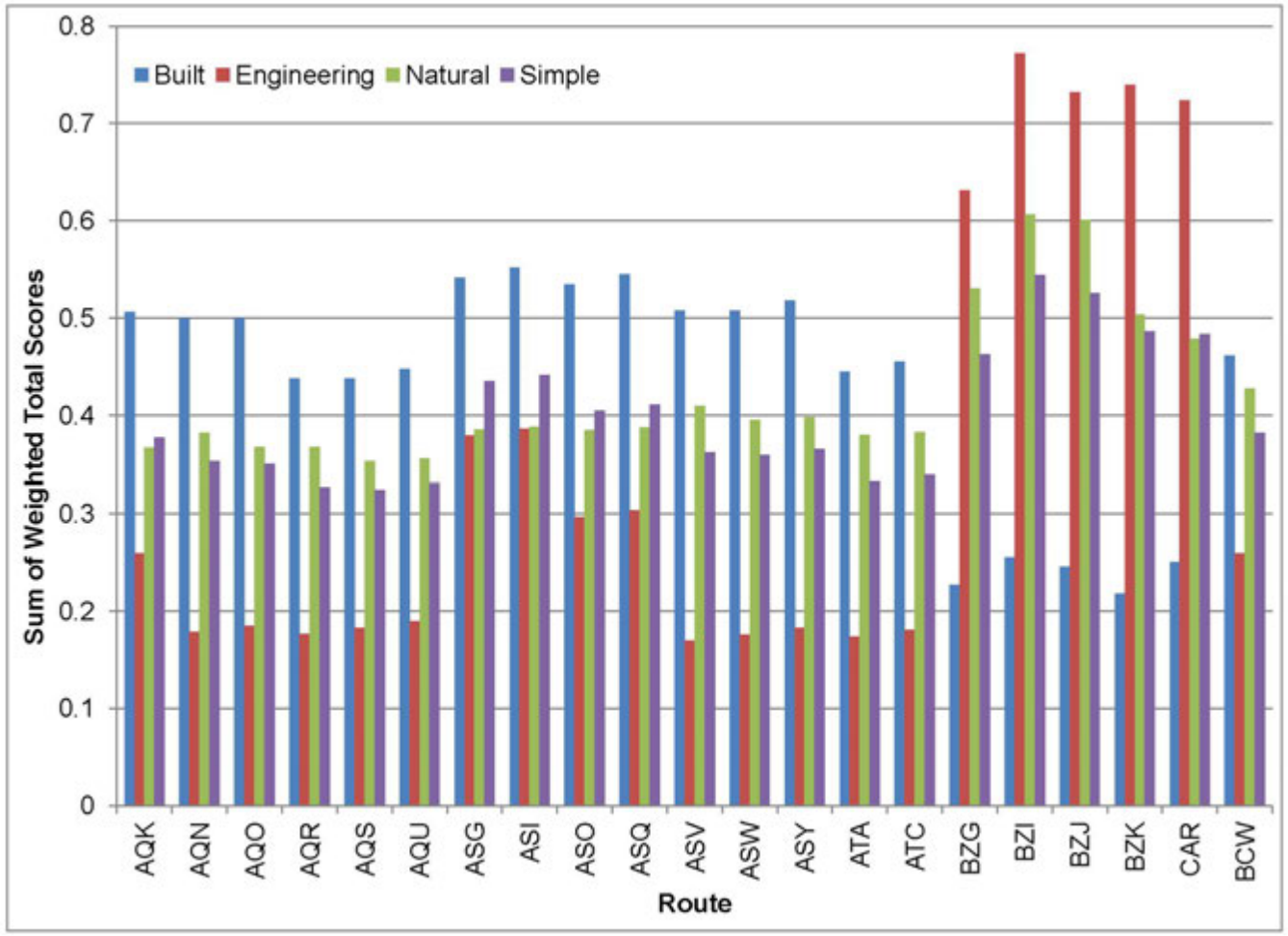

Figure 5-9 Histogram of the Total Scores for the Top 21 Routes (Piney West)

Table 5-16 Route Statistics for the Top 21 Routes from to the Piney West Border Crossing

FEATURE	ROUTES																				
Built	**AQK**	**AQN**	**AQO**	**AQR**	**AQS**	**AQU**	**ASG**	**ASI**	**ASO**	**ASQ**	**ASV**	**ASW**	**ASY**	**ATA**	**ATC**	**BZG**	**BZI**	**BZJ**	**BZK**	**CAR**	**BCW**
Relocated Residences (Within ROW)	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Normalized	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potential Relocated Residences (100m from EOROW)	11	11	11	13	13	13	9	9	9	9	11	11	11	13	13	1	1	1	1	2	13
Normalized	0.83	0.83	0.83	1.00	1.00	1.00	0.67	0.67	0.67	0.67	0.83	0.83	0.83	1.00	1.00	0.00	0.00	0.00	0.00	0.08	1.00
Proximity To Residences (100m - 400m from EOROW)	83	78	78	83	83	85	47	49	42	44	76	76	78	81	83	13	13	13	13	19	84
Normalized	0.97	0.90	0.90	0.97	0.97	1.00	0.47	0.50	0.40	0.43	0.88	0.88	0.90	0.94	0.97	0.00	0.00	0.00	0.00	0.08	0.99
Proposed Residential Developments - Within ROW	4	4	4	2	2	2	1	1	1	1	4	4	4	2	2	0	0	0	0	0	2
Normalized	1.00	1.00	1.00	0.50	0.50	0.50	0.25	0.25	0.25	0.25	1.00	1.00	1.00	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.50
Current Agricultural Land Use (Value)	875	770	770	641	641	644	1006	1009	901	904	778	778	781	649	652	459	459	459	459	492	642
Normalized	0.76	0.57	0.57	0.33	0.33	0.34	1.00	1.00	0.80	0.81	0.58	0.58	0.59	0.35	0.35	0.00	0.00	0.00	0.00	0.06	0.33
Land Capability for Agriculture (Value)	1385	1280	1305	1215	1240	1242	1395	1397	1315	1317	1276	1301	1303	1235	1237	892	943	937	890	981	1247
Normalized	0.98	0.77	0.82	0.64	0.69	0.69	1.00	1.00	0.84	0.84	0.76	0.81	0.81	0.68	0.69	0.00	0.11	0.09	0.00	0.18	0.71
Proximity To Intensive Hog Operations (Acres)	1877	1794	1832	1518	1556	1567	2043	2054	1999	2009	1794	1832	1843	1556	1567	235	235	235	235	464	1556
Normalized	0.90	0.86	0.88	0.71	0.73	0.73	0.99	1.00	0.97	0.98	0.86	0.88	0.88	0.73	0.73	0.00	0.00	0.00	0.00	0.13	0.73
Diagonal Crossings of Prime Agricultural Land (Acres)	47	62	62	55	55	50	21	16	35	30	70	70	65	63	58	20	20	20	20	31	55
Normalized	0.59	0.85	0.85	0.72	0.72	0.63	0.09	0.00	0.35	0.26	1.00	1.00	0.91	0.87	0.78	0.07	0.07	0.07	0.07	0.27	0.72
Proximity to Buildings & Structures (100m) - EOROW	8	10	10	7	7	15	7	15	9	17	10	10	18	7	15	5	5	5	5	8	7
Normalized	0.23	0.38	0.38	0.15	0.15	0.77	0.15	0.77	0.31	0.92	0.38	0.38	1.00	0.15	0.77	0.00	0.00	0.00	0.00	0.23	0.15
Public Use Areas (250m) - EOROW	20	19	19	19	19	19	15	15	14	14	18	18	18	18	18	12	11	11	10	10	19
Normalized	1.00	0.90	0.90	0.90	0.90	0.90	0.50	0.50	0.40	0.40	0.80	0.80	0.80	0.80	0.80	0.20	0.10	0.10	0.00	0.00	0.90
Historic Resources (250m) - EOROW	10	11	11	9	9	9	10	10	11	11	11	11	11	9	9	11	9	8	5	5	8
Normalized	0.83	1.00	1.00	0.67	0.67	0.67	0.83	0.83	1.00	1.00	1.00	1.00	1.00	0.67	0.67	1.00	0.67	0.50	0.00	0.00	0.50
Potential Commercial Forest (Acres)	505	497	511	487	501	501	501	501	507	507	497	511	511	501	501	1536	1594	1568	1513	1510	533
Normalized	0.02	0.01	0.02	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.02	0.02	0.01	0.01	0.95	1.00	0.98	0.93	0.92	0.04
Natural																					
Natural Forests (Acres)	811	805	826	804	825	825	801	801	816	816	805	826	826	825	825	1,752	1,824	1,819	1,810	1,798	876
Normalized	0.01	0.00	0.02	0.00	0.02	0.02	0.00	0.00	0.01	0.01	0.00	0.02	0.02	0.02	0.02	0.93	1.00	0.99	0.99	0.97	0.07
Intactness	754	798	775	850	826	826	754	754	775	775	798	775	775	826	826	1246	1162	1214	1426	1516	827
Normalized	0.00	0.06	0.03	0.13	0.10	0.10	0.00	0.00	0.03	0.03	0.06	0.03	0.03	0.10	0.10	0.65	0.54	0.60	0.88	1.00	0.10
Stream / River Crossings - Centerline	12	12	12	9	9	9	12	12	12	12	13	13	13	10	10	11	11	10	10	10	10
Normalized	0.75	0.75	0.75	0.00	0.00	0.00	0.75	0.75	0.75	0.75	1.00	1.00	1.00	0.25	0.25	0.50	0.50	0.25	0.25	0.25	0.25
Wetland Areas (Acres) - ROW	305	307	314	316	323	323	298	298	307	307	307	314	314	323	323	215	228	249	295	288	338
Normalized	0.73	0.75	0.81	0.82	0.88	0.88	0.68	0.68	0.75	0.75	0.75	0.81	0.81	0.88	0.88	0.00	0.11	0.27	0.65	0.59	1.00
Conservation & Designated Lands (Acres)	162	184	162	257	235	235	162	162	162	162	184	162	162	235	235	280	344	344	117	66	253
Normalized	0.35	0.43	0.35	0.69	0.61	0.61	0.35	0.35	0.35	0.35	0.43	0.35	0.35	0.61	0.61	0.77	1.00	1.00	0.18	0.00	0.67
Engineering																					
Seasonal Construction & Maintenance Restrictions	692.73	691.36	680.28	714.16	703.08	705.50	724.18	726.59	711.73	714.14	693.94	682.87	685.28	705.67	708.08	944.65	974.75	967.42	998.34	966.39	728.20
Normalized	0.04	0.03	0.00	0.11	0.07	0.08	0.14	0.15	0.10	0.11	0.04	0.01	0.02	0.08	0.09	0.83	0.93	0.90	1.00	0.90	0.15
Index of Proximity to Existing 500kV Lines	7.8E+09	7.8E+09	7.8E+09	7.7E+09	7.7E+09	7.7E+09	7.9E+09	7.9E+09	7.8E+09	7.9E+09	7.7E+09	7.7E+09	7.7E+09	7.6E+09	7.6E+09	4.0E+09	3.9E+09	3.9E+09	3.9E+09	4.3E+09	7.9E+09
Normalized	0.98	0.97	0.97	0.94	0.94	0.94	0.99	1.00	0.99	0.99	0.95	0.96	0.96	0.92	0.93	0.02	0.00	0.00	0.00	0.08	0.99
Inverted	0.02	0.03	0.03	0.06	0.06	0.06	0.01	0.00	0.01	0.01	0.05	0.04	0.04	0.08	0.07	0.98	1.00	1.00	1.00	0.92	0.01
Existing Transmission Line Crossings	3.00	3.00	3.00	4.00	4.00	4.00	7.00	7.00	7.00	7.00	3.00	3.00	3.00	4.00	4.00	11.00	11.00	11.00	11.00	17.00	4.00
Normalized	0.00	0.00	0.00	0.07	0.07	0.07	0.29	0.29	0.29	0.29	0.00	0.00	0.00	0.07	0.07	0.57	0.57	0.57	0.57	1.00	0.07
Accessibility	3.7E+08	3.9E+08	3.7E+08	3.9E+08	3.8E+08	3.8E+08	4.1E+08	4.1E+08	4.1E+08	4.1E+08	3.9E+08	3.7E+08	3.7E+08	3.8E+08	3.8E+08	6.5E+08	7.0E+08	6.9E+08	7.8E+08	7.4E+08	3.7E+08
Normalized	0.02	0.05	0.02	0.07	0.03	0.03	0.10	0.10	0.10	0.10	0.06	0.02	0.02	0.03	0.03	0.69	0.81	0.78	1.00	0.90	0.00
Total Project Costs	$132M	$127M	$128M	$126M	$127M	$128M	$138M	$138M	$133M	$133M	$126M	$127M	$127M	$127M	$127M	$134M	$140M	$138M	$137M	$138M	$138M
Normalized	0.48	0.08	0.16	0.05	0.13	0.15	0.86	0.88	0.51	0.53	0.00	0.07	0.10	0.04	0.07	0.57	1.00	0.86	0.82	0.86	0.42

The routes selected for preference determination from the group of 21 and the rationale for inclusion is provided in Table 5-17. Map 5-14 shows the routes and segments discussed below.

Table 5-17 Piney West Border Crossing Routes Selected for Preference Determination and their Rationale for Inclusion

Route	Rationale
AQS	Route AQS had the best scores for natural and simple average and was the next best route (excluding the routes in the above group) from a built perspective.
AQO	Route AQO includes segments 71 (preferred from a natural perspective) and 56 (better overall route statistics).
BZG	Five routes (BZG, BZI, BZJ, BZK, CAR) had very good scores from a built perspective. Route BZG also had the best engineering score of this subset.

Considering information obtained through the engagement processes and review of the route statistics (Table 5-18) and the histogram (Figure 5-9), routes BZG, AQS, and AQO were carried forward to preference determination.

Preference Determination

Routes BZG, AQS, and AQO (Map 5-14) were selected for preference determination. The values assigned by the Project team were input to the preference determination model.

Table 5-18 provides the scores given for each criteria and the rationale for the scoring.

Table 5-18 Piney West Border Crossing Preference Determination Scores and Rationale

Criteria	Route	Scores[1]	Rationale
Cost	AQS	1	A scaling factor was used to calculate the scores based on estimates for cost.
	AQO	1.02	
	BZG	1.32	
System Reliability	AQS	1	Route AQS does not cross M602F (existing 500kv transmission line), has fewer other transmission line crossings and lower proximity to transmission lines.
	AQO	1	Route AQO does not cross M602F, has fewer other transmission line crossings and lower proximity to transmission lines.
	BZG	2.5	Route BZG crosses M602F twice, has more other transmission line crossings and is in higher proximity to transmission lines.

Criteria	Route	Scores[1]	Rationale
Risk to Schedule	AQS	1	Route AQS is less remote has good accessibility and no seasonal construction issues. It does not cross M602F.
	AQO	1	Route AQO is less remote has good accessibility and no seasonal construction issues. It does not cross M602F.
	BZG	3	Route BZG is more remote has poor accessibility and seasonal construction issues. It also crosses M602F twice.
Environment (natural)	AQS	1.5	Route AQS crosses slightly more natural areas than AQO but much less than BZG.
	AQO	1	Route AQO crosses less natural areas than BZG.
	BZG	3	Route BZG crosses areas of special interest, crosses more intact natural areas, more wetlands and more ungulate habitat.
Environment (built)	AQS	2	Route AQS crosses more prime agricultural land (slightly less than AQO) hog land and proposed developments (slightly less than AQO).
	AQO	2.5	Route AQO crosses more prime agricultural land, hog land, rail lines and proposed developments.
	BZG	1	Route BZG has the least relocated residences and avoids the most prime agricultural land.
Community	AQS	1	Routes AQS and BZG were preferred as they use segment 50, which avoids more residences, potential development and prime agricultural land than Route AQS (segment 72).
	AQO	1.5	
	BZG	1	

NOTE:
[1] Scores are between 1 (preferred) and 3 (least preferred)

Table 5-19 provides the results of the preference determination. When the weights for each criterion were considered, the result was the selection of route AQS (Map 5-14) as the preferred route for the Piney West border crossing.

Table 5-19 Preference Determination, SLTC to Piney West

(showing relative scores, weighted scores and total sum; lower values are preferred for routing)

Criteria	Weight	Routes		
		BZG	AQS	AQO
Cost[1]	40%	1.32	1	1.02
Weighted		0.53	0.40	0.41
System Reliability	10%	2.5	1	1
Weighted		0.25	0.10	0.10
Risk to Schedule	5%	3	1	1
Weighted		0.15	0.05	0.05
Environment (natural)	7.5%	3	1.5	1
Weighted		0.23	0.11	0.075
Environment (built)	7.5%	1	2	2.5
Weighted		0.075	0.15	0.19
Community	30%	1	1	1.5
Weighted		0.30	0.30	0.45
TOTAL		**1.53**	**1.11**	**1.27**
RANK		**3**	**1**	**2**

NOTE:
[1] A scaling factor was used to determine the relative score for each route.

Preferred Border Crossing

The next step (Figure 5-6) was to run the preferred route from each border crossing through preference determination process, in order to determine a relative preference amongst the border crossing options. Routes TC (Gardenton), EEL (Piney East), and AQS (Piney West) (Map 5-15) were ranked highest through preference determination in the previous steps. In addition, route DKT (Piney East) was added to include an additional eastern route to the comparison. Route DKT was ranked number 2 for Piney East, was within 0.1 of the lowest score, and had the lowest cost. Considerable feedback was also received during the PEP that an option using predominantly Crown land should be considered to increase the distance from residential communities. Adding DKT made sure that an option meeting this consideration was included in further analysis. The values assigned by the Project team for each of the criteria were input to the preference determination model. Table 5-20 provides the scores given for each criteria and the rationale for the scoring.

Table 5-20 Piney West Border Crossing Preference Determination Scores and Rationale

Criteria	Route	Scores[1]	Rationale
Cost	TC	1	A scaling factor was used to calculate the scores based on estimates for the costs.
	EEL	2.2	
	AQS	1.4	
	DKT	1.49	
System Reliability	TC	1	Route DKT has more transmission line crossings and a lower proximity number (in general, the route is in closer proximity to other 500 kV transmission lines; less preferred) than the other routes and is the only route to cross M602F
	EEL	1	
	AQS	1	
	DKT	2.5	
Risk to Schedule	TC	1	Route TC has the fewest constraints to construction (less wetland areas, less clearing required) and is the most accessible.
	EEL	2	Route EEL will require more private land acquisition than EEL and TC due to a higher prevalence of private lands and a higher risk of a more lengthy Crown consultation process due to the prevalence of Crown lands along the route alternative.
	AQS	1.5	Route AQS will require more private land acquisition than TC due to a higher prevalence of private lands, otherwise similar.
	DKT	3	Route DKT has a higher risk of a more lengthy Crown consultation process due to the prevalence of Crown lands along the route alternative , crosses M602F, which may introduce additional scheduling issues, more clearing requirements (greater amounts of forested lands may have constraints to clearing outside of wildlife timing windows) and potential seasonal construction delays (wetlands/accessibility)
Environment (natural)	TC	1	Route TC disturbs the least amount of natural habitat
	EEL	1.5	Routes AQS and EEL are slightly less preferred than TC because they cross more conservation lands and wetlands.
	AQS	1.5	
	DKT	3	Route DKT crosses through a larger amount of intact habitat, forested and wetland areas and more proposed protected areas.

Criteria	Route	Scores[1]	Rationale
Environment (built)	TC	2.75	Route TC passes through more prime agricultural land but less development than EEL.
	EEL	3	Route EEL passes through existing and planned residential development around the town of Marchand, and passes through more prime agricultural land.
	AQS	2.5	Passes through more developed areas than DKT, but less than EEL.
	DKT	1	Route DKT avoids the majority of built up areas therefore is the most preferred route.
Community	TC	1	Route DKT was preferred from a public perspective as it avoids more communities and residences and crosses less prime agricultural land. Routes TC and AQS were preferred from a First Nation perspective as they generally limited routing through current and identified historical resource use areas Route EEL was the least preferred by the public and First Nation perspectives.
	EEL	2	
	AQS	1	
	DKT	1	

NOTE:
[1] Scores are between 1 (preferred) and 3 (least preferred)

Table 5-21 provides the results of the preference determination. When the weights for each criterion were considered, the result was a rank order preference for the alternative routes considered and their associated border crossings. Route TC (Map 5-15) was selected as the preferred route (lowest overall score), and consequently Gardenton was selected as the preferred Manitoba Hydro border crossing.

Table 5-21 Preference Determination for the Four Top Routes

(showing relative scores, weighted scores and total sum; lower values are preferred for routing)

Criteria	Weight	Routes			
		TC	EEL	AQS	DKT
Cost[1]	40%	1	2.2	1.4	1.5
Weighted		0.40	0.88	0.56	0.60
System Reliability	10%	1	1	1	2.5
Weighted		0.1	0.1	0.1	0.25
Risk to Schedule	5%	1	2	1.5	3
Weighted		0.05	0.1	0.075	0.15
Environment (natural)	7.5%	1	1.5	1.5	3
Weighted		1	1.5	1.5	3
Environment (built)	7.5%	2.75	3	2.5	1
Weighted		0.21	0.23	0.19	0.075
Community	30%	1	2	1	1
Weighted		0.3	0.6	0.3	0.3
TOTAL	**100%**	**1.13**	**2.02**	**1.34**	**1.60**
RANK		**1**	**4**	**2**	**3**

NOTE:
[1] A scaling factor was used to determine the relative score for each route.

5.4.3.2 Border Crossing Discussions

Because the overall Project is an international power line, the concerns and the preferences of the U.S. proponent (Minnesota Power) needed to be considered in the final selection of the border crossing for the Project. Therefore the next step entailed discussion with Minnesota Power to determine an agreed upon border crossing area.

Minnesota Power and Manitoba Hydro completed separate routing and engagement processes to determine their unique preferences related to border crossing locations. On March 3, 2014, Minnesota Power and Manitoba Hydro met to share details describing the reasons for their respective preferences, with the objective of determining a mutually acceptable border crossing location that would serve the needs of the overall Project.

Both parties had agreed previously to describe considerations related to length, effect on people, the environment, regulatory agency feedback, community feedback, as well as schedule.

5.4.3.3 Minnesota Power

Key considerations for Minnesota Power included limiting length, and avoiding potential effects on people, prime farmland and biological concerns.

Minnesota Power identified Piney East as their preferred border crossing option for the following reasons:

- fewer identified concerns from agencies and the public;
- shorter route on the U.S. side; and
- more homogenous terrain (fewer concerns related to effect on biodiversity).

The Gardenton crossing was not considered feasible by Minnesota Power due to a higher amount of prime agricultural land and concerns that the line may have to be routed west of Red Lake where considerable landowner concerns had been recorded and the risk that this could lead to Project delays in the process of pursuing property rights for the ROW. The area has also been recognized as having outstanding biological diversity, a concern echoed in communications received from the Nature Conservancy.

5.4.3.4 Manitoba Hydro

Key considerations for Manitoba Hydro included determining route options that balance natural, engineering and built considerations while taking into consideration feedback received throughout the engagement processes. Table 5-22 includes a comparison of the top scoring routes to the various border crossings. As discussed in Section 5.4, Manitoba Hydro identified Gardenton as the preferred crossing based on all criteria considered. It was determined that Piney East was not feasible as it traverses areas of high biological diversity that had been noted by government agencies and environmental non-government organizations, and is primarily located through Crown lands. Manitoba Hydro also considered feedback from the Clean Environment Commission, which stated “Manitoba Hydro discontinue using undeveloped Crown land as a default routing option without appropriate assessment of the effect on ecological, traditional or cultural values of those lands”. The routes to the Piney East crossing also represented the most expensive route alternatives.

Table 5-22 Top Scoring Routes

Border Crossing	Route Name	Length (km)	Cost[1] ($Million)	% difference	Homes		Cropland (acres)	Forest (acres)	Wet-land (acres)
					in ROW	within 100m of edge of ROW			
Gardenton	**SU**	132	124.6	4	0	13	1,177	251	197
	SY	130	119.9	0	0	13	1,028	266	206
	TC[1]	130	119.5	0	0	15	843	264	214
	UC	138	131.4	10	0	18	1,351	252	198
	UM	133	130.1	9	1	11	1,348	240	190
Piney West	**AQO**	142	128.0	7	0	13	1,024	826	314
	AQS[1]	142	127.0	6	0	13	839	825	323
	BZG	160	134.0	12	0	1	617	1,752	215
Piney East	**DKT**[1]	157	157.0	31	0	4	515	1,778	173
	DWM	163	163.0	36	1	12	1,202	1,225	271
	EEL[1]	160	160.0	34	1	14	878	1,238	288
	FWZ	165	165.0	38	0	1	526	1,811	263

NOTE:
[1] Costs used were high-level estimates of construction costs used for relative comparison.

5.4.3.5 Border Crossing Decision Process

Over the ensuing discussion both parties recognized similar concerns regarding route length, effect on people, the environment and agency and community feedback, as well as schedule the need to avoid and/or reducing potential effects on people and natural areas. Both parties also noted the importance of considering risk, schedule and potential delays.

Minnesota Power and Manitoba Hydro met and together determined an agreed to border crossing area and preliminary crossing point. At the Border Crossing Negotiation meeting, two border crossings were taken off the table (the Eastern most crossing and the Western most crossing for the reasons outlined in the preceding sections) resulting in one agreed upon border crossing zone.

As Gardenton was determined to be infeasible from Minnesota Power's perspective and Piney East is not feasible from Manitoba Hydro's perspective, both crossings were removed from further consideration. Piney West was then identified as the best option for moving forward as it was acceptable for both parties, and presented the best option from the perspective of overall Project schedule and balancing the above noted considerations.

5.5 Round 2: Preferred Route Selection

5.5.1 Objectives

With the selection of a border crossing achieved, the objective for Round 2 routing was to select a preferred route to this border crossing. As noted in Figure 5-2 this began with Manitoba Hydro developing alternative routes to the selected border crossing, and progressed through the steps of feedback, analysis and evaluation using the methodology outlined in Section 5.4.

5.5.2 Planning

In developing alternative segments and routes for consideration in Round 2, which would be used in the engagement processes, Manitoba Hydro started with the preferred route to the Piney west border crossing (Route AQS) that was selected through Round 1 evaluation. Additional segments were added based on the round 1 route selection process and feedback received in the PEP and FNMEP and by the Project team in order to provide additional alternatives for consideration and evaluation (Map 5-16).

Table 5-23 provides details on the segments included in Round 2 of the site selection process. Please see Map 5-16 as it shows the segments discussed below.

Table 5-23 Segments Added or Created to Create Route Alternatives to the Piney West Border Crossing

Segment	Rationale
205, 206, 208, 209, 211	These segments make up Route AQS (preferred route to Piney West from previous round), which was the starting point for the creation of routes to the Piney West border crossing.
201	Parallels M602F, which was an important consideration from the public perspective.
202, 203, 204	These segments were added based on public feedback that indicated a preference for paralleling existing infrastructure (transmission lines and roads) and limiting the amount of agricultural land crossed by the transmission line.
207	Is a modification of Segment 30 (from Round 1). Segment 207 avoids the community of Marchand and increases paralleling of existing transmission lines. The south end was modified from segment 30 as an efficient means to reconnect to route AQS.
210	Was recommended by Wildlife Branch in order to avoid a large wetland area (important wildlife habitat in the area).

5.5.3 Feedback and Analysis

The Round 2 segments were presented in Round 2 of the engagement processes (Map 5-16) in order to gather further input regarding appropriate valued components, criteria for route selection, concerns and preferences, and potential mitigation approaches related to the alternative route segments. This input would help to define a preferred route for the new transmission line, and to confirm the preferred border crossing location.

Several segments were added to those presented in Round 2, based on feedback during the process. Table 5-24 provides details on the segments added and the rationale for their inclusion and Map 5-17 shows the locations of these segments.

Additional details on specific input into the public engagement process can be found in Chapter 3.

Table 5-24 Additional Segments Added to the Round 2 Evaluation Process

Segment	Rationale
358	Recommended by the public engagement team. Segment 358 avoids several residences and avoids two crossings of the TransCanada Highway (Figure 5-10).
331/334	In discussions with the landowner, segments were created on a different portion of their property (Figure 5-11).
303, 333, 308	Segments 303, 308 and 333 were part of an alternative proposed by local landowners (Figure 5-12).
337, 341, 343, 344, 346	Based on feedback received from local residents, these segments were developed to mitigate effect on existing and future development plans. Segment 341 follows an existing 230 kV transmission line (recommendation received through the public engagement process (Figure 5-13).
363	Developed based on feedback from public to move away from homes on the mile road (Figure 5-14).
349	Developed based on feedback and in an effort to increase separation from homes (Figure 5-14).
353	Segment 353 avoids subdivisions on Segment 352 and takes advantage of paralleling existing transmission lines (Figure 5-15).
365	Segment 365 provides further separation between the route alternative and the Wildlife Management Area and avoids gravel resources (Figure 5-16).

Figure 5-10 Segment 358 (blue line) was Created to Avoid two Homes and two Crossings of the TransCanada Highway

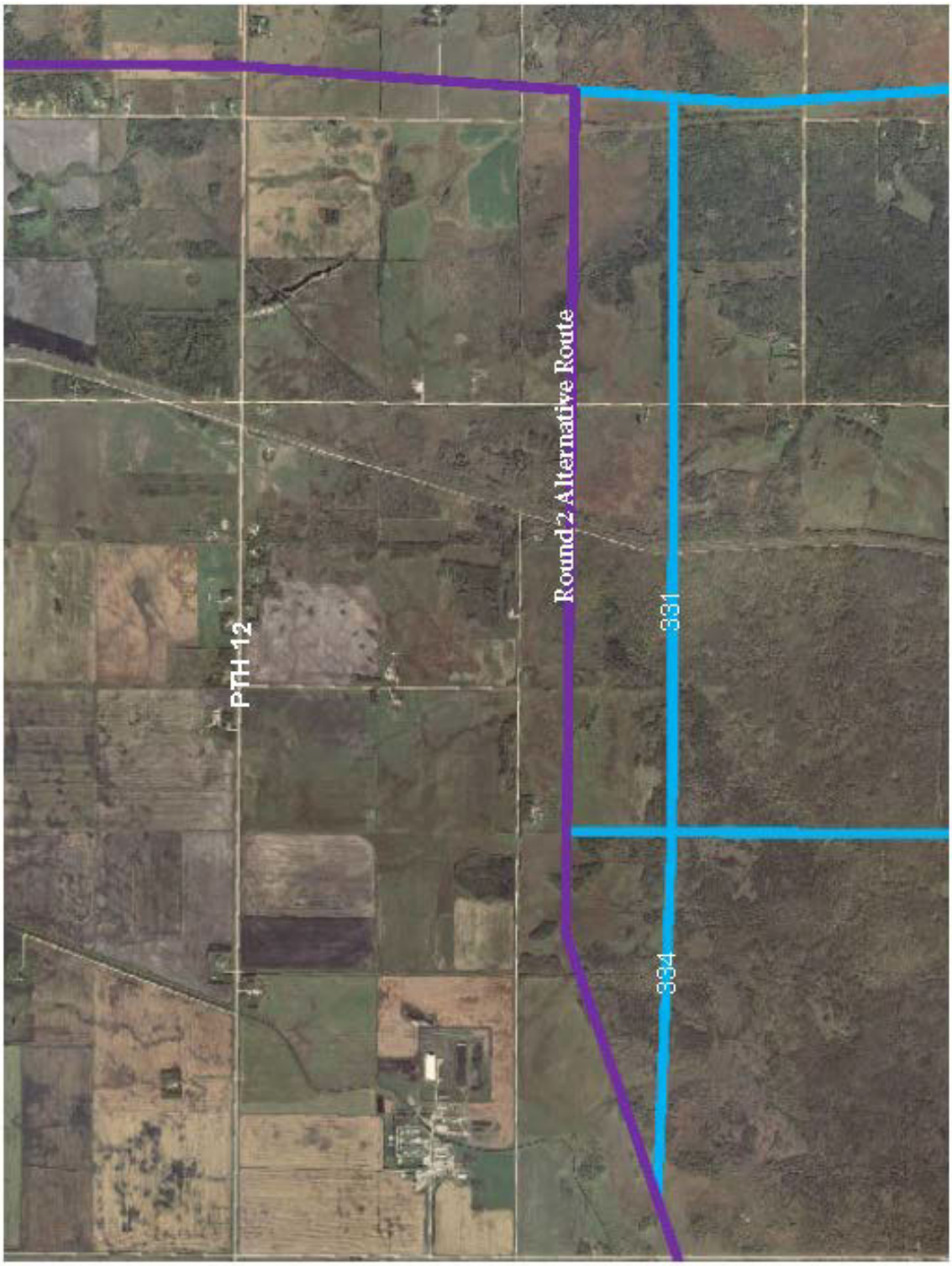

Figure 5-11 **Segments 331/334 (blue lines) were Created on a Different Portion of the Landowners' Property**

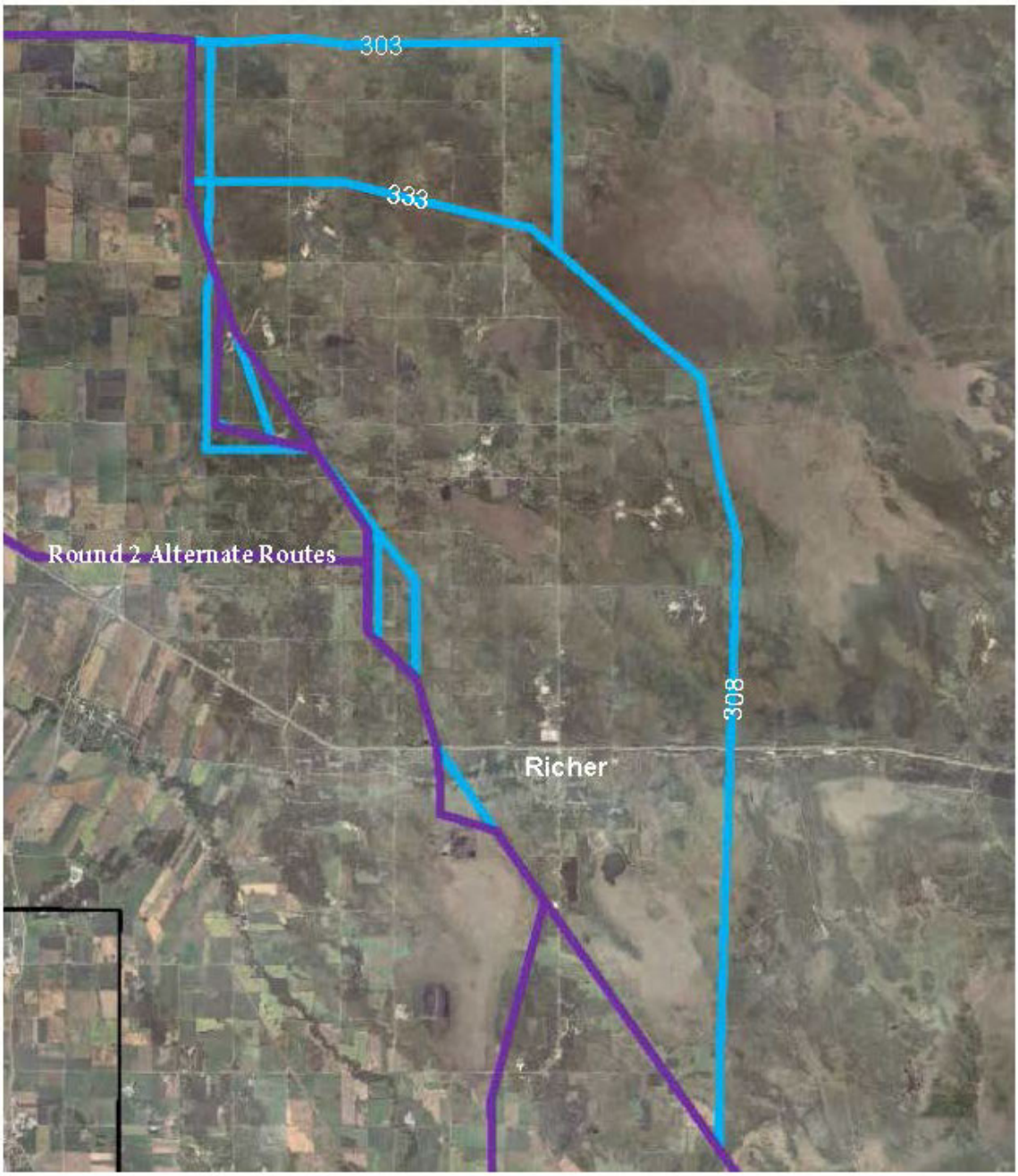

Figure 5-12 **Segments 303/308/333 (blue lines) were part of an Alternative Proposed by Affected Landowners**

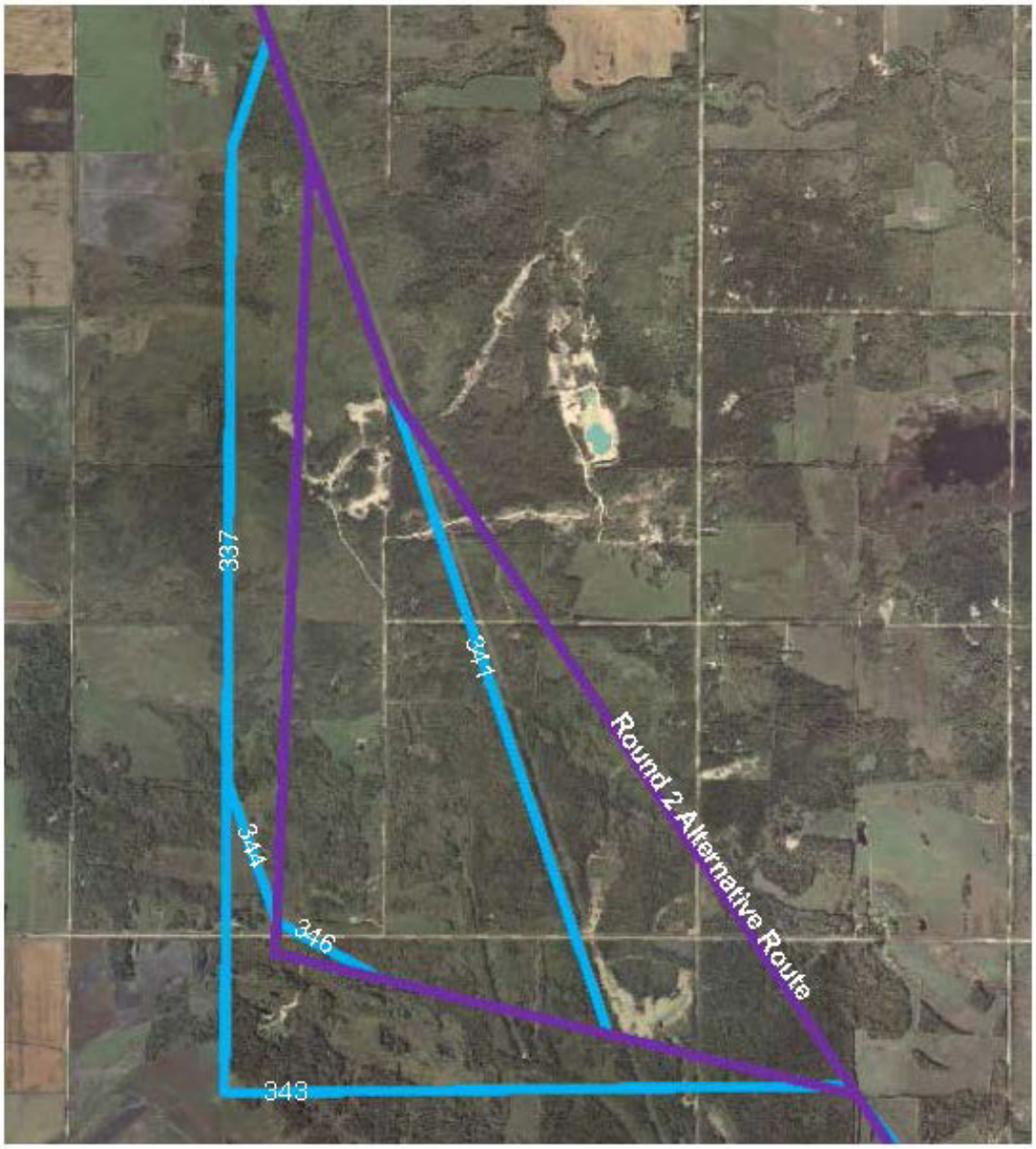

Figure 5-13 **Segments 337, 341, 343, 344, 346 (blue lines) were Developed with regard to Future Development**

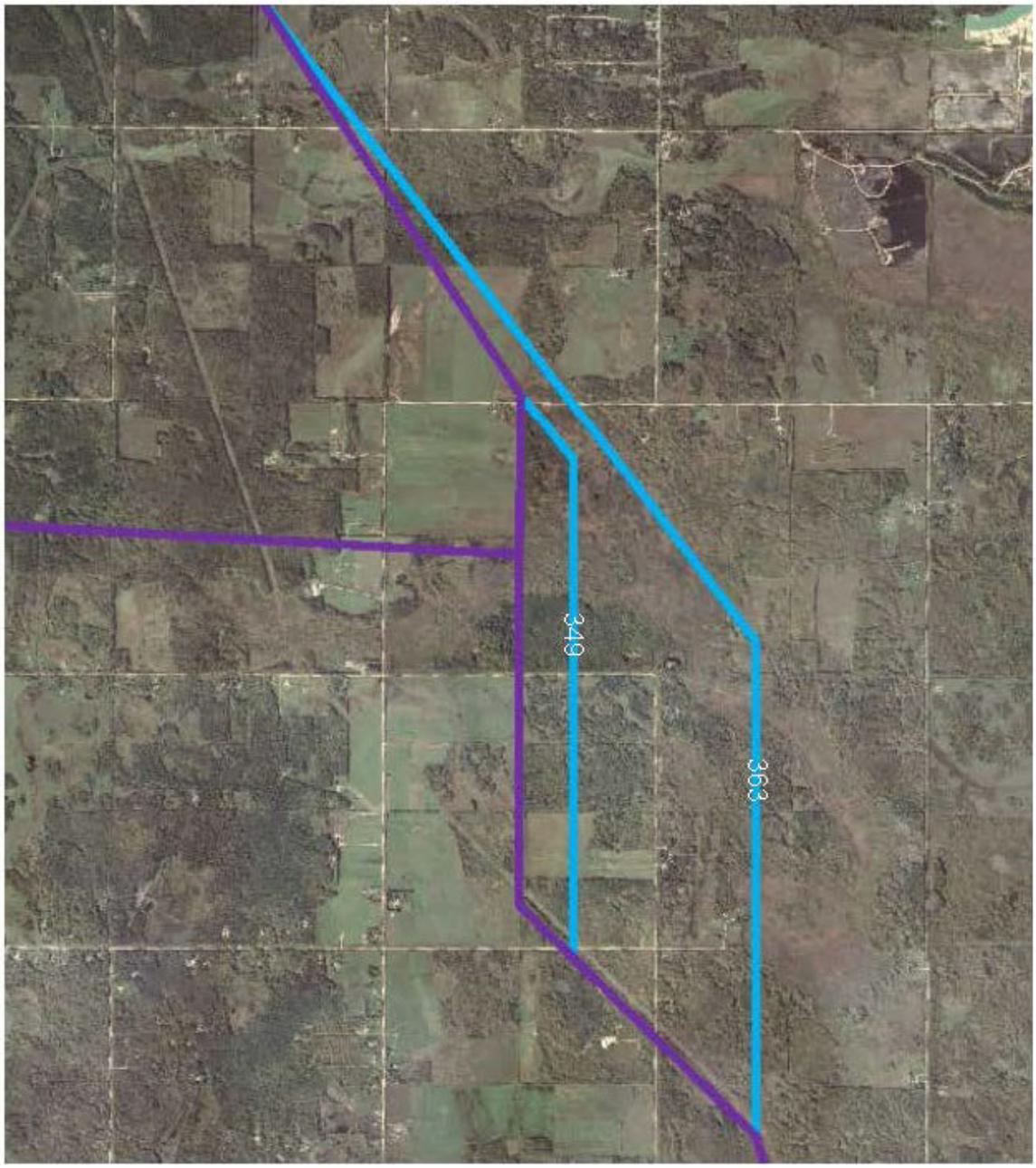

Figure 5-14 Segments 349/363 were Developed to Limit Effects on Homes

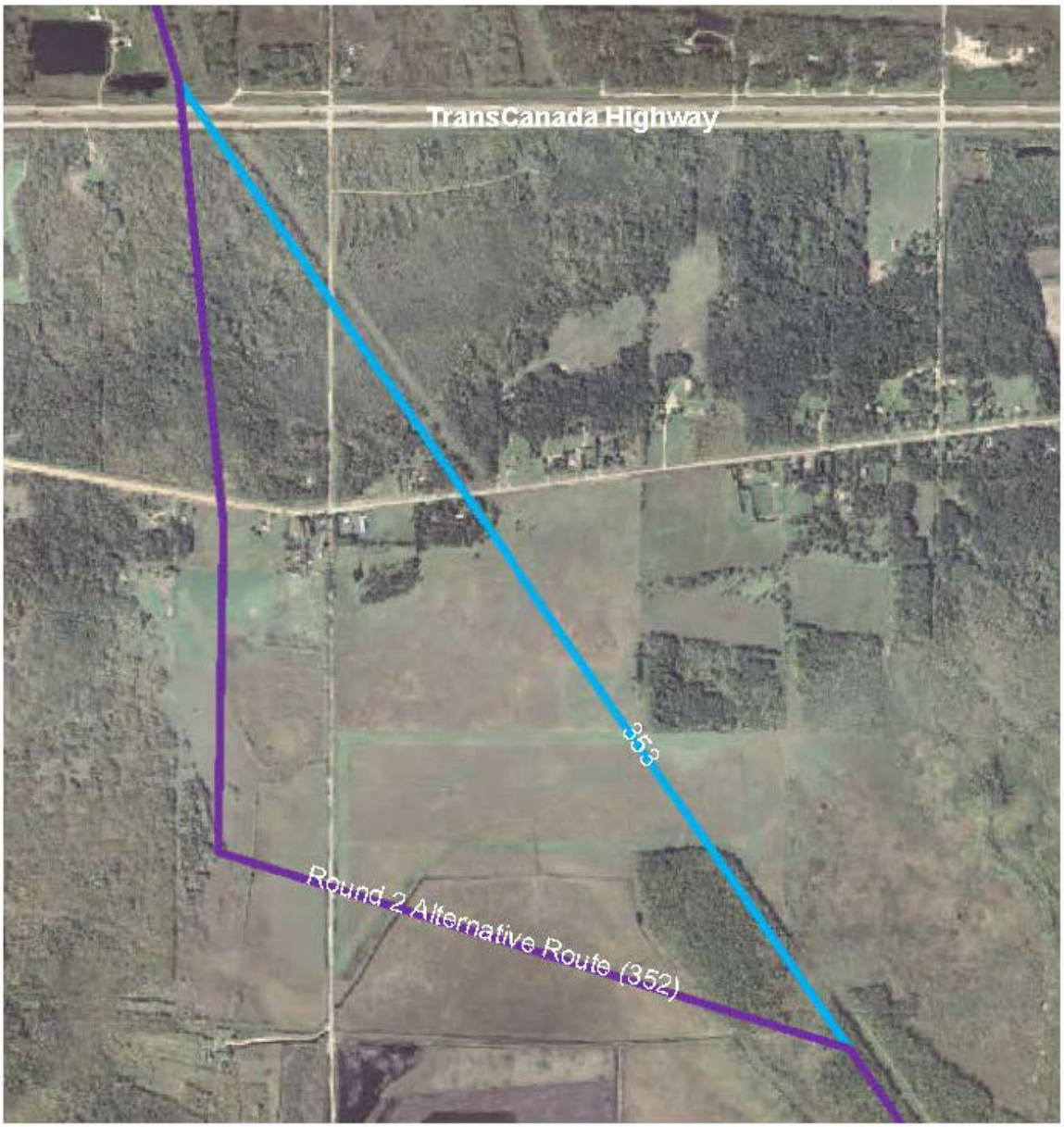

Figure 5-15 **Segment 353 avoids Subdivisions on Segment 352 and takes Advantage of Paralleling an Existing Transmission Line**

Figure 5-16 **Segment 365 provides further separation from the Wildlife Management Area**

Border Crossing Adjustment

In the course of Minnesota Power's review and consultation with state and federal agencies, and the public, Minnesota Power determined that the originally proposed border crossing submitted in its original Presidential Permit Application was no longer feasible in part due to the combined effect of constraints associated with future expansion of the Piney-Pine Creek Border Airport and the Roseau River Wildlife Management Area (Amendment to Border Crossing OE Docket No. PP-398). These constraints, along with others noted during the public review process related to scoping, effectively precluded routing of the Project to the originally proposed border crossing at this juncture by Minnesota Power.

With the new information, Minnesota Power and Manitoba Hydro reached an agreement on a new border crossing which shifted approximately 6.6 km (4.3 miles) east of the one previously proposed. Minnesota Power evaluated and determined that no other border crossings were feasible taking into account environmental, land use and ownership, and transmission reliability constraints on both sides of the border that still meet the stated purpose and need including having the Project in-service by June 1, 2020. Minnesota Power amended its Presidential Permit Application by eliminating the previously proposed border crossing and replacing it with the new border crossing (described below).

Alternative Route Modifications

The adjustment to the border crossing required additional segments to be created to connect the existing alternative route segments to the revised border crossing. Map 5-17 (Inset 3) shows the original segments to the Piney West border crossing and the new segments created to reach the adjusted Piney West border crossing.

Based on the border crossing modification, Manitoba Hydro felt it important to provide this new information to stakeholders through the public and First Nation and Metis engagement processes to obtain additional feedback on this modification. The revised crossing and new segments were presented to the public in November of 2014 in an additional round of engagement. Manitoba Hydro held an additional open house, landowner meeting, a stakeholder group meeting, and discussed the changes with participants in the First Nations and Metis Engagement process. Feedback received from the public regarding the modification was generally positive. Participants viewed the modification away from the Piney-Pine Creek Airport as positive as it would limit any potential interference if the airport were to expand the existing landing strip or develop an east/west landing strip in the future. The ATKS management team (Black River First Nation, Long Plain First Nation and Swan Lake First Nation) was intending to complete their ATK study in October 2014; however, the study was extended to February 2015 based on the border crossing modification. The ATKS team felt that based on the modification they were not able to complete a full determination and evaluation of interests in the area; therefore, requested that their findings remain preliminary. These concerns further motivated the team's interest in future monitoring and mitigation activities.

5.5.4 Comparative Evaluation

The Round 2 alternative routes were evaluated by the Project team at the Round 2 route selection workshop conducted November 17–18, 2014 (see Appendix 5D for workshop notes). Map 5-17 shows the segments considered in the analysis. They were based on the preferred route to Piney West from the first round, additions from the public engagement process and new segments created to reach the adjusted border crossing (discussed above in Sections 5.4.3, and 5.5.3 and shown in Map 5-17).

Route statistics were prepared for the alternative routes, using the alternative route evaluation model (Table 5-6).

With the addition of the Round 2 mitigative segments, the process started with approximately 550,000 possible routes (all possible combinations of segments between the start and end points to create routes). Initial route screening (pre workshop) involved removing illogical routes (for example, those that backtrack) and all routes greater than 120% longer than the shortest route (as stated above due to increase costs and increased potential effects associated with considerably longer routes). The remaining routes (~15,000) were brought forward into the alternative route evaluation.

As 15,000 are too many alternatives to compare in a histogram format, the first step in the evaluation was to complete pair-wise comparisons of similar segments and to eliminate segments thus reducing the number of alternatives for comparison. Table 5-25 outlines the segments under consideration and the rationale for selection of a segment. The segments compared (pair-wise comparisons) share a start and end point, and are short in distance, which makes comparison of the two a straightforward exercise. Longer segments or those with multiple connecting options on either end cannot be compared in this fashion because the number of factors that must be considered exceeds what is practical and are best compared with the help of the statistics generated by the alternative route evaluation model.

Table 5-25 Segment or Pair-wise Comparisons

Segments Compared	Segment Selected	Discussion
311 vs 312	Hybrid	Segment 312 runs near the Ridgeland Cemetery.[5] Segment 311 was created to move away (north) from the cemetery but was limited by a wetland area. It was decided to move the line away from cemetery, but not so far that it would encroach on the wetland area (Figure 5-17).
323, 327, 328, 329	New segment	The landowner would prefer the segment be moved to the edge of the property along the creek. However, discipline specialists raised concerns about paralleling the creek and potential effect on riparian habitat. It was decided to move the line closer to the creek but maintain the existing treed buffer along the creek to limit effect on riparian habitat (Figure 5-18).
309 vs 365	365	Segment 309 runs along the half-mile line adjacent to the Watson P Davidson WMA. Segment 365 was created to provide a buffer between the route and the WMA (as requested by Manitoba Conservation and Water Stewardship staff). The new segment introduced some new concerns (*e.g.*, quarries). It was decided to keep segment 365 with potential adjustments to limit effects on the quarries (Figure 5-19).
352 vs 353	353	The segments are in a rural residential area, west of Richer. Segment 353 would require purchase of a home. Segment 352 affects a 42-lot subdivision (under development). It was decided to select Segment 353 with the potential mitigation of tower type alignment to reduce ROW width and to limit effects on the future homes in the area (Figure 5-20).
358 vs 359	358	Segment 359 crosses over the TransCanada Highway (TCH) twice. Crossing the highway adds reliability risk and cost. Segment 358 does not cross the TCH therefore it was decided to keep segment 358 (Figure 5-21).
314/315/316	315/316	Segment 314 was least preferred based on a review of segment statistics. It crosses proposed conservation land (tall grass prairie), Leopard frog concentration, and is close to a known heritage site. It was decided to keep segments 315 and 316 (Figure 5-22).
337, 339, 341-345, 347, 362	341 and 342	Segments 341 and 342 are shorter and more direct, and when reviewing the statistics, routes including these segments scored more favourably for most perspectives (Figure 5-23).

[5] Further details regarding the Ridgeland Cemetery can be found in Chapter 12 – Heritage Resources

Figure 5-17 Segment 311/312 Comparison

(A new segment was created that was farther from the cemetery but maintained separation from the wetland)

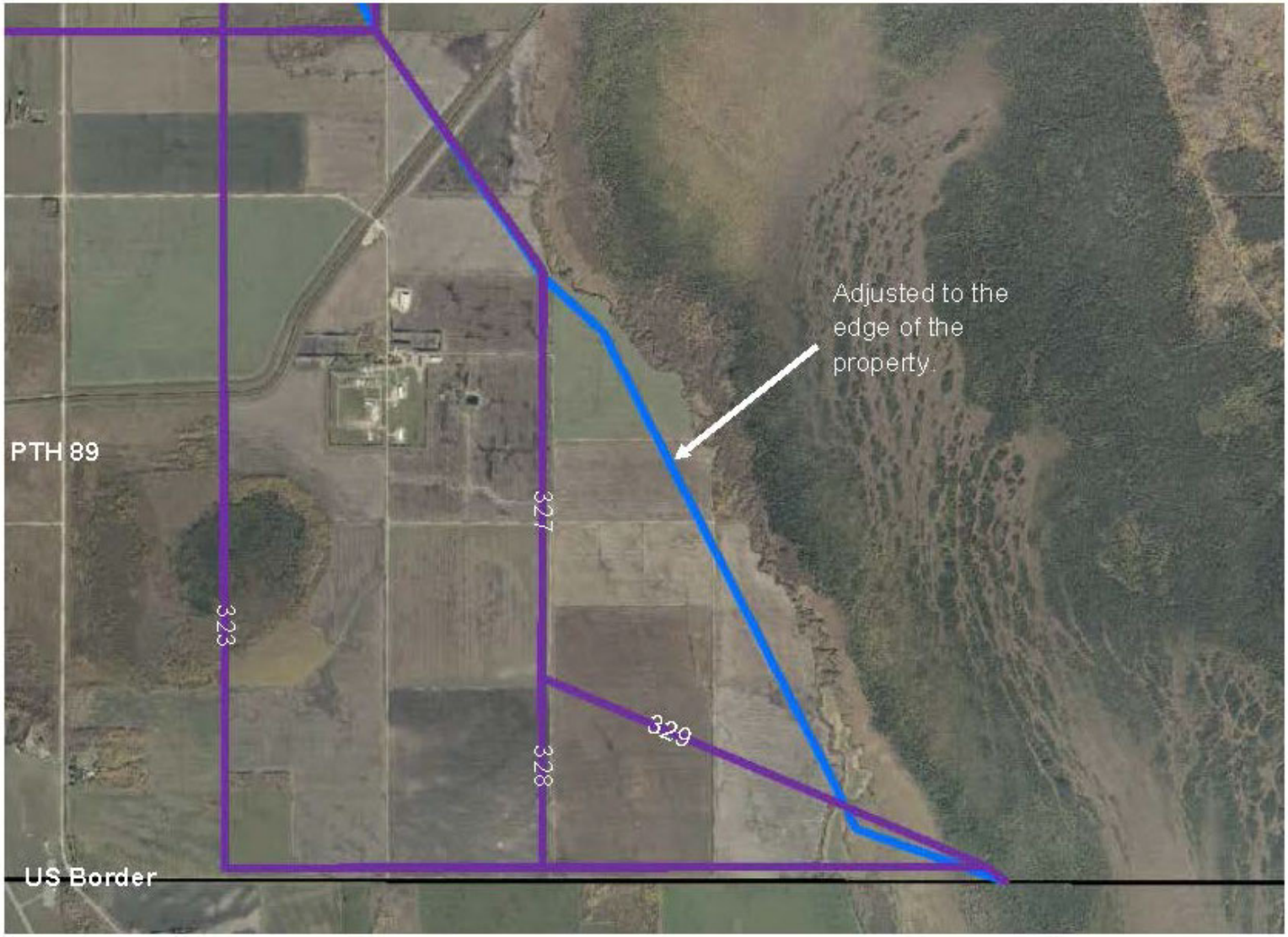

Figure 5-18 Segment 323, 327-329 Comparison

(A new segment [blue line] was created)

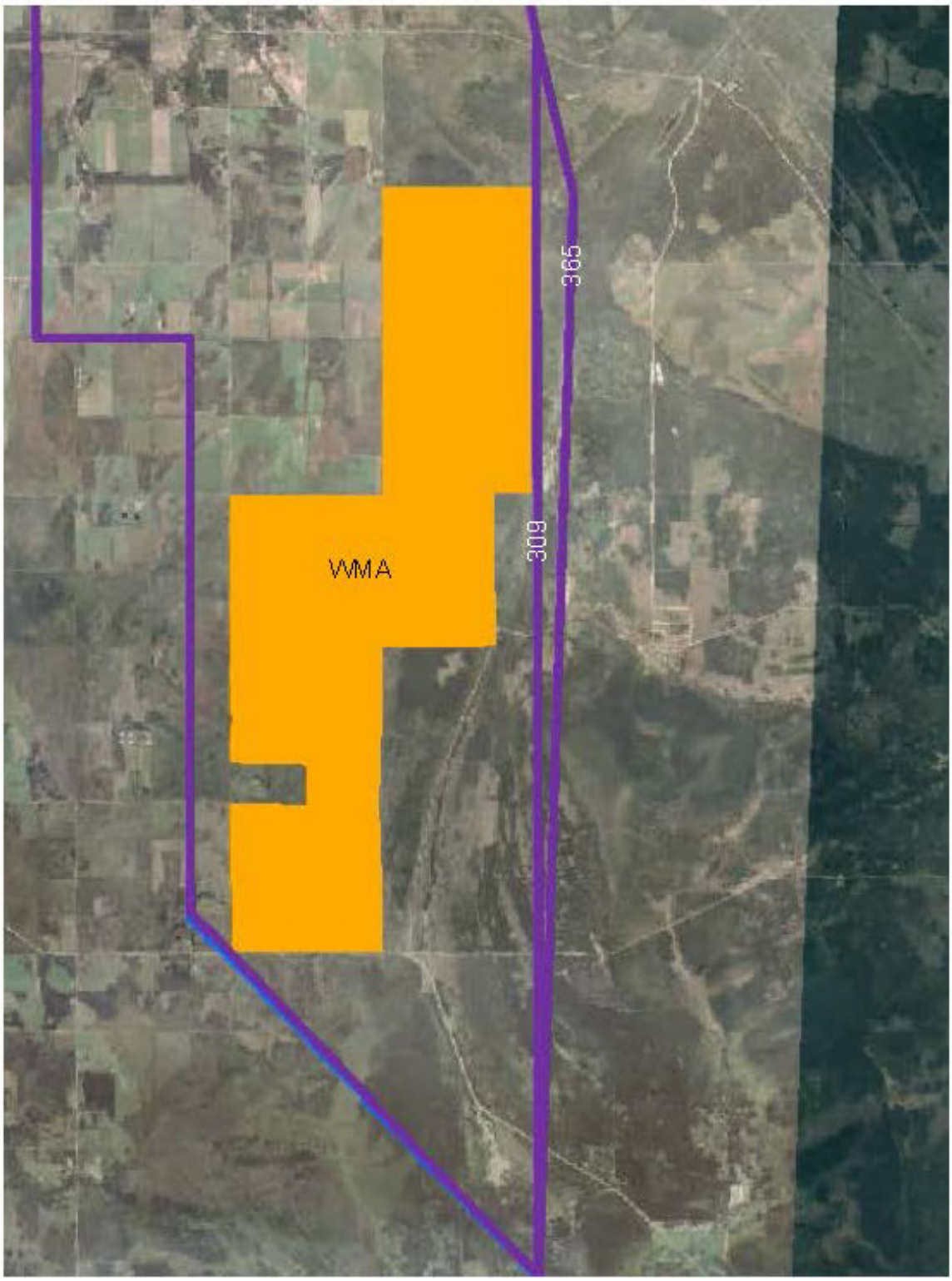

Figure 5-19 Segment 309/365 Comparison (Segment 365 was selected)

Figure 5-20 Segment 352/353 Comparison (Segment 353 was selected)

Figure 5-21 Segment 358/359 Comparison (Segment 358 was selected)

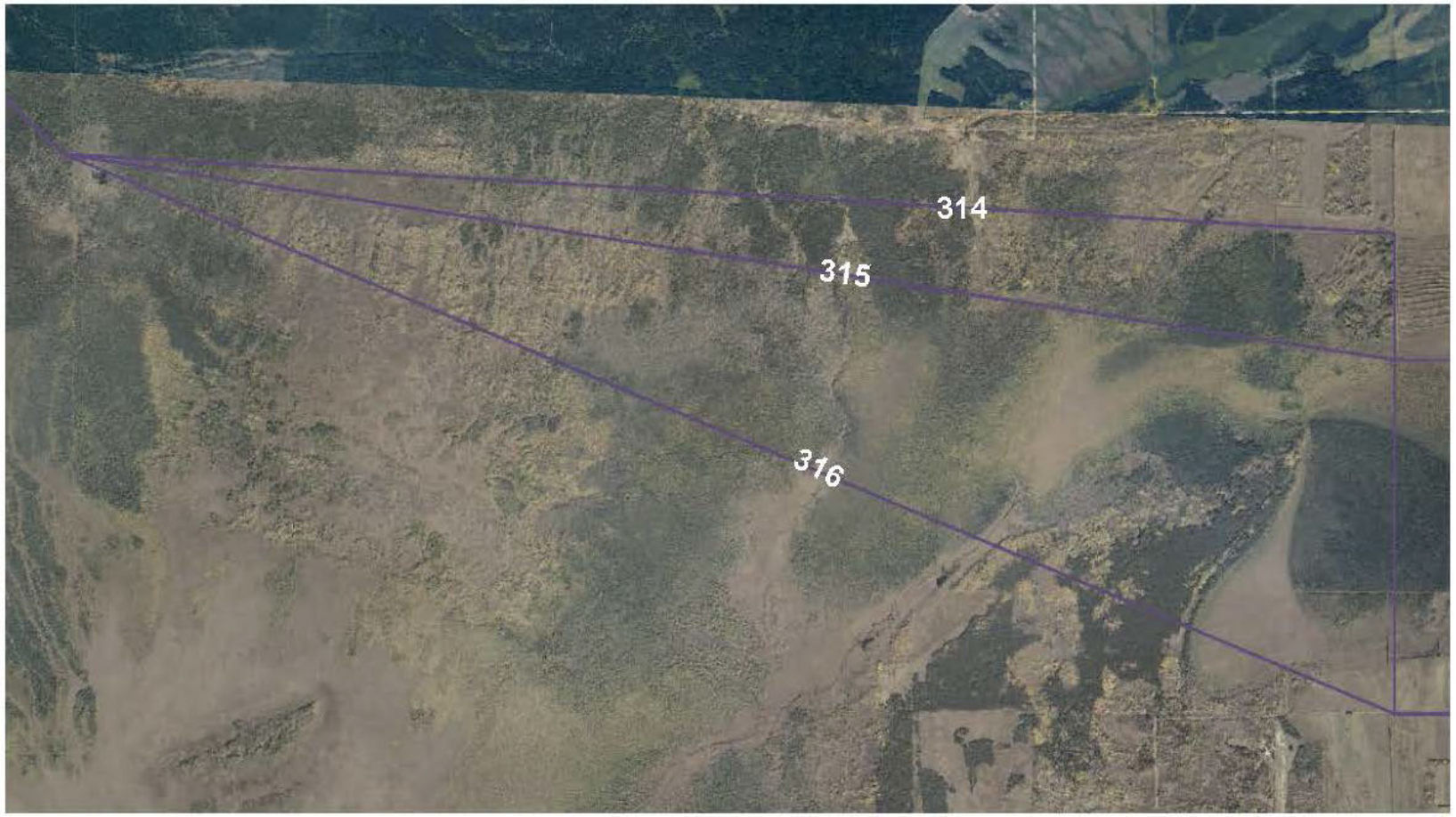

Figure 5-22 Segments 314/315/316 Comparison (Segment 314 was removed)

Figure 5-23 **Segments 337, 339, 341–345, 347, 362 Comparisons (Segments 341 and 342 [338/340/352] were selected)**

After the pair-wise comparisons and elimination of the segments described in the above table, 524 alternative routes remained.

Using the alternative route evaluation statistics, the top 5% of alternative routes from each perspective (built, natural, engineering and simple average) were reviewed. After considering the top 5% from each perspective, only 67 routes remained.

The top five routes from each perspective were reviewed and it was decided to take the top route from each perspective on to preference determination (URQ, AY, SGZ, and URV; Map 5-18). The top features of each route are summarized in Table 5-26 and the route statistics are presented in Table 5-27.

Route AY represented the top route from the built perspective. Making use of the RVTC, this route alternative travels east for the furthest extent of any of the alternatives considered at this stage, turning south just north of Ross, MB. Route AY parallels M602F for approximately 35 km then travels south, east of Richer, MB through primarily forested and wetlands. AY travels east of Marchand and down the eastern side of the Watson P. Davidson Wildlife management area through the Sandilands Provincial forest, connecting with route segments 312/313, common to all route alternatives at this stage, that run at an angle past sundown Manitoba, towards the border crossing point. AY makes use of a route segment that travels closer to the Spur Woods Wildlife Management area, travelling north of a large wetland complex.

Route URQ represented the top route from the natural perspective. Route URQ exits the SLTC west of Prairie Grove, Manitoba and from here travels east to the TCH, where it travels parallel to the Highway for approximately 13 km. Crossing over the highway just east of Dufresne to avoid residences on the south side of the TCH, the route alternative then travels east for approximately 10 km. From here URQ travels south through rural residential and agricultural lands, through the RM of La Broquerie staying west of the Watson P Davidson Wildlife Management area.

Route URV, the top route from the engineering perspective, is the same as Route URQ except for segment 316 (URQ uses 315).

Route SGZ represented the top route from the simple average perspective. Like AY, this route alternative travels along the existing RVTC, but exits the corridor sooner, south of Anola Manitoba, meeting up with and paralleling R49R for approximately 25 km. SGZ veers right of R49R near St. Genevieve Manitoba avoiding homes that were developed immediately alongside the existing t-line, and parallels again north of Hwy 1. This parallel alignment is maintained until east of La Broquerie, where the route turns south, and follows the same alignment as option AY, travelling east of the WMA. From the common segment 312/313 Route SGZ travels farther south of Piney, MB.

An additional route was included in the subset by the Project team – route SIL. The Project team felt it was important to consider in the analysis an alternative that included the use of the existing RVTC corridor, paralleling of the existing 230kV line, and travelled west of the WMA. Similar to alternatives URQ and AY this alternative travels through the RVTC paralleling M602F and continues along the same path as SGZ until the point near Richer South Station. From here, alternative SIL follows alternatives URQ and URV travelling west of the Watson P. Davison WMA.

Route SIL was the top scoring route that included these conditions.

Considering information obtained through public engagement, review of the statistical analysis and the top routes from each perspective, routes URQ, AY, SGZ, URV and SIL (Map 5-18) were carried forward to preference determination.

Preference Determination

The route alternatives evaluated in the preference determination step represent options that would mitigate the major concerns heard in Round 2 engagement processes as outlined above, with varying features and strengths and benefits. In the preference determination step, these route alternatives were compared against each other and a preferred route selected.

As indicated, Routes URQ, AY, SGZ, SIL and URV (Map 5-18) were selected for preference determination. Breakout groups during the workshop discussed the routes and determined the values for their criteria to be entered in to the model. All groups discussed risk to schedule as factors from each group could potentially affect schedule. These are discussed below. The values assigned by the Project team were input to the preference determination model.

Table 5-26 Comparison of the Top Routes

Perspective	URQ	URV	SGZ	AY	SIL
Built	Less preferred: • Higher potential effect on residences and residential development potential.	Less preferred: • Higher potential effect on residences and residential development potential.	Preferred because: • Less potential effects on residences, less homes in proximity (nuisance visual quality) and less potential effect on development potential.	Most preferred because: • Makes use of the Riel-Vivian Transmission Corridor. • Parallels M602F. • Preferred based on land use (*e.g.*, recreation/heritage) crosses less of these features.	Less preferred: • Higher potential effect on residences and residential development potential.
Natural	Most Preferred because: • Represented the top route. • Limits potential effects on intactness. • Stays west of the Watson P Davidson Wildlife Management area. • Travels farther south of the Spur Woods WMA, but stays north of a large wetland complex to the south.	Preferred because: • Represented the top route. • Limits potential effects on habitat intactness. • Stays west of the Watson P Davidson Wildlife Management area. • Travels farther south of the Spur Woods WMA but passes through a large wetland complex.	Less preferred because: • Crosses primarily forest and wetlands (but less than AY in the northern section). • Runs down the eastern side of the Watson P Wildlife management area and through the Sandilands Provincial forest. • Higher potential effects on Species at Risk.	Least Preferred because: • Crosses primarily forest and wetlands. • Runs down the eastern side of the Watson P Davidson Wildlife management area and through the Sandilands Provincial forest. • Travels just south of the Spur Woods WMA. • Higher potential effects on Species at Risk.	Less preferred because: • Crosses primarily forest and wetlands. • Higher potential effects on Species at Risk.
Engineering	Preferred because: • Fewer transmission line crossings. • Better reliability (proximity scores—the route is farther from other 500 kV transmission lines.	Preferred because: • Fewer transmission line crossings. • Better reliability (proximity scores—the route is farther from other 500 kV transmission lines.	Less preferred because: • Parallels M602F. • More transmission line crossings. • Higher proximity score (the route is closer to other 500 kV transmission lines).	Less preferred because: • Parallels M602F. • More transmission line crossings. • Higher proximity score (the route is closer to other 500 kV transmission lines).	Less preferred because: • Parallels M602F. • Higher proximity score (the route is closer to other 500 kV transmission lines).

Table 5-27 Route Statistics for Routes SGZ, AY, URU, URV and SIL

Feature	SGZ	AY	URU	URV	SIL
Built					
Relocated Residences (Within ROW)	1	0	4	0	0
Normalized[1]	0.25	0	1	0	0
Potential Relocated Residences (100 m from EOROW)	20	3	11	11	15
Normalized	0.91	0.14	0.50	0.50	0.68
Proximity To Residences (100 m-400 m from EOROW)	86	20	36	36	73
Normalized	0.80	0.12	0.29	0.29	0.66
Proposed Residential Developments – Within ROW	2	0	2	2	2
Normalized	1	0	1	1	1
Current Agricultural Land Use (Value) – ROW	1578	679	608	551	832
Normalized	0.79	0.22	0.17	0.14	0.32
Land Capability for Agriculture (Value) – ROW	2924	1276	1813	1767	2142
Normalized	0.82	0.17	0.38	0.36	0.51
Proximity To Intensive Hog Operations (Acres) – ROW	2810	344	2571	2571	2546
Normalized	0.79	0.04	0.72	0.72	0.71
Diagonal Crossings of Prime Agricultural Land (Acres) – ROW	75	47	45	45	59
Normalized	0.67	0.38	0.37	0.37	0.50
Proximity to Buildings and Structures (100 m) – EOROW	41	31	38	38	36
Normalized	0.69	0.53	0.64	0.64	0.61
Public Use Areas (250m) – EOROW	27	17	16	16	20
Normalized	0.64	0.24	0.2	0.2	0.36

Feature	SGZ	AY	URU	URV	SIL
Historic Resources (250m) – EOROW	19	10	17	18	20
Normalized	0.59	0.18	0.50	0.55	0.64
Potential Commercial Forest (Acres) – ROW	1544	1182	1166	1214	1529
Normalized	0.54	0.29	0.28	0.32	0.53
Natural					
Natural Forests (Acres) – ROW	2088	1370	1634	1675	2,056
Normalized	0.58	0.24	0.36	0.38	0.56
Intactness	1750	1324	1626	1663	1841
Normalized	0.50	0.30	0.44	0.46	0.54
Stream/River Crossings – Centerline	30	10	29	29	29
Normalized	0.81	0.07	0.78	0.78	0.78
Wetland Areas (Acres) – ROW	543	184	468	460	526
Normalized	0.63	0.13	0.52	0.51	0.60
Conservation and Designated Lands (Acres) - ROW	551	89	468	468	632
Normalized	0.72	0.03	0.60	0.60	0.84
Engineering					
Length (km)	156	166	149	148	161
Seasonal Construction and Maintenance Restrictions (Value)	1767	918	1201	1180	1481.67
Normalized	0.73	0.20	0.38	0.36	0.55
Index of Proximity to Existing 500kV Lines	15,837M	14,923M	15,548M	4,710M	16,953M
Normalized	0.70	0.13	0.67	0.66	0.77
Inverted	0.30	0.87	0.33	0.34	0.23

Feature	SGZ	AY	URU	URV	SIL
Existing Transmission Line Crossings	18	18	9	8	11.00
Normalized	0.53	0.53	0.05	0.00	0.16
Accessibility	929,299,532	602,801,210	745,652,388	743,356,357	850,204,623
Normalized	0.60	0.29	0.42	0.42	0.52
Total Project Costs[2]	$146M	$145M	$141M	$150M	$152M
Normalized	0.53	0.50	0.26	0.72	0.88

NOTES:

[1] Statistics are normalized between 0 and 1 (lower is better)

[2] Costs used were high-level estimates of construction costs used for relative comparison.

Engineering Perspective

The engineering perspective (engineering), composed of Manitoba Hydro system planning, design, construction and maintenance staff, compared the routes in the preference determination process against the criteria of cost (high level estimates of construction costs used for relative comparison) and system reliability, and also had input into risk to schedule (see Appendix 5D for meeting notes).

The costs for each route were estimated based on estimated construction costs per kilometre, estimated property acquisition costs (right-of-way [ROW] easements), specialty mitigation (*e.g.*, special towers/foundations), paralleling existing transmission line costs, transmission line crossings, and potential home and land purchase (for homes that would require relocation). The input value was then calculated based on relative costs.

Values for system reliability included consideration of the influence of poor weather (wind events, tornadoes, icing) and the amount of paralleling. Probabilities of each proposed route and existing routes both being affected by severe weather were determined and scores were given based on the relative probabilities.

Risks to schedule from an engineering perspective relate primarily to weather, which is consistent across routes and therefore should have no influence on the final rank of routes.

Built Perspective

The built perspective assessed the relative potential for each route alternative to affect the built environment. The group representing the built environment (agricultural, socio-economic, resource use and heritage discipline specialists, as well as Manitoba Hydro property and environmental assessment staff) created a framework (Appendix 5D) to analyze the routes and develop relative values for their criteria. The considerations included as part of the Built perspective evaluation were related to three primary areas:

- Residences and Residential Development (limiting or reducing potential interference with residences);
- Agricultural Use and Capability (limiting disruption or interference with agricultural operations); and
- Land, Resources and Heritage (reducing disturbance of areas of high public use and value).

Quantitative and qualitative measurements were used to compare routes according to a number of the criteria from the route statistics, as well as additional considerations such as the potential for development, crop production value, number of recreational features near the ROW and number of private shelterbelts. Routes were scored for each criterion, and then a weighted sum was used to rank each route.

Natural Perspective

The natural perspective group, composed of wildlife, fish and vegetation and wetland discipline specialists, was responsible for considering the relative potential of each route to affect the natural environment (see Appendix 5D for meeting notes).

This group reviewed each route. Routes URQ and URV are the same except for segments 315 (URV) and 316 (URQ). Natural prefers URQ as URV is farther within a major wetland complex that extends to the border, and would have greater potential to fragment habitat. The number of stream crossings was reviewed. SIL had the most high value stream crossings (7; Cooks Creek (x2), Edie Creek (x2), Seine, Seine tributary and Rat River), followed by SGZ (5; Cooks Creek (x2), Edie Creek (x2) and Rat River). URQ (Seine, Seine tributary and Rat River), URV (Seine, Seine tributary and Rat River) and AY (Cooks Creek, Edie Creek and Rat River) had three high value stream crossings.

Various segment comparisons were made, using the route statistics to determine which segments crossed over more natural features (such as forests, wetlands and wildlife habitat). Based on the review of routes and segments, the routes were ranked, and then scores were given between 1 and 3 based on the ranks and the relative differences in route statistics.

Community Perspective

A community group, composed of Manitoba Hydro engagement staff as well as consulting staff, was responsible for considering the relative acceptability of the various routes from the perspective of “community” (see Appendix 5D for meeting notes). The group considered feedback received from all rounds of both engagement processes. This included feedback from many different people and organizations and at times the feedback received included conflicting perspectives. The community group worked collectively to balance the viewpoints and concerns shared by the public, organizations, stakeholder groups, and participants in the First Nations and Metis engagement process. For example, a predominant preference Manitoba Hydro often heard from the public was for the route to be placed on unoccupied Crown Lands, whereas this routing option was often raised as a concern from First Nations. Routes ranked as “1” were viewed as those to best balance the concerns heard from both processes. Those ranked as “2” were the PEP and FNMEP individual engagement teams’ preference based on the feedback they received through their processes. Those ranked as “3” were the second best routes as viewed by the individual engagement teams.

Route SIL was ranked as 1 because it balanced perspectives brought forward by the community group including feedback through the engagement processes. SIL addressed feedback received such as future and existing residential and commercial development, paralleling existing transmission lines, and avoided sensitive cultural, spiritual and resource use areas.

Routes URV and AY were ranked second, receiving a score of 2. Route URV was the preferred route based on input from the First Nation perspective as it avoided the most sensitive cultural, spiritual and resource use areas. Route AY was the preferred route based on input from the public’s perspective as it used the least amount of private property/agricultural land; used

existing corridors when feasible, avoided more densely populated areas, and future commercial developments.

Routes SGZ and URQ were ranked 3. From information obtained through the engagement processes, these routes were the second most preferred, for the same reasons discussed above.

Risk to Schedule

Risk to schedule can be affected by considerations that are relevant to all of the perspectives. Risk to schedule was discussed at the workshop by all groups together.

The following are potentials risks to schedule from each perspective:

- Engineering:
  - Weather (consistent across all routes)
- Natural:
  - Construction timing windows (such as cessation of construction to avoid breeding birds). Larger tracts of natural areas (Routes AY and SGZ) have greater likelihood of supporting birds and amphibians and therefore more potential for delays.
- Community:
  - Higher proportions of undeveloped Crown lands: Risk of a more lengthy Crown consultation process is higher for routes crossing higher amounts of undeveloped Crown lands – AY and SGZ; contain higher proportions of Crown Lands).
  - Private Land Acquisition can also create a risk to schedule. Routes with higher numbers of private landowners (Routes URV and URQ) could require more time for land acquisition.
- Built:
  - The percentage of Crown Land versus private land on each route was considered. Due to Manitoba Hydro's established and clearly defined process for the acquisition of private land, the risk to schedule was seen as lower for routes with more private land. Routes with more Crown Land (AY and SGZ) were scored less favourably (*i.e.*, higher). If there is more Crown land, there is a potential increased amount of work and time associated with the Crown consultation[6] process.

[6] The Province must complete its Crown consultation process prior to Manitoba Hydro obtaining a licence for the Project. *Environmental Act* licences can be issued prior to the acquisition of all private land parcels for a project.

Table 5-28 provides the scores given for each criteria and the rationale for the scoring.

Table 5-28 Border Crossing Preference Determination Scores and Rationale

Criteria	Route	Scores[1]	Rationale
Cost	AY	1.05	A scaling factor was used to calculate the scores based on estimates for the costs.
	SGZ	1	
	URV	1.01	
	URQ	1.03	
	SIL	1.14	
System Reliability	AY	1.5	Routes AY and SIL parallel M602F therefore slightly higher scores due to higher risk to reliability.
	SGZ	1	
	URV	1	
	URQ	1	
	SIL	1.5	
Risk to Schedule	AY	2	Routes AY and SGZ cross more Crown Land therefore there is more risk to schedule and uncertainty around the potential length of associated Crown consultation process, than the private land acquisition process.
	SGZ	2	
	URV	1	
	URQ	1	
	SIL	1	
Environment (natural)	AY	3	Route AY affected the most natural areas (forests, wetlands) and affects the most species at risk (habitat)
	SGZ	2.7	Route SGZ slightly preferred over AY based on route statistics (Table 5-27).
	URV	1.2	Route URV (one segment difference from URQ) crossed through a large wetland complex.
	URQ	1	Route URQ affected the least forested area and had the best intactness score.
	SIL	2.2	Route SIL scored slightly better than AY and SGZ but not as good as URV and URQ because it affects less natural areas (forests/wetlands and Species at Risk Habitat))

Criteria	Route	Scores[1]	Rationale
Environment (built)	AY	1	Route AY affects fewer residences and less high value farmland, less public land uses (*e.g.*, recreation, heritage) and development potential than the other routes.
	SGZ	2	Route SGZ affects fewer residences and high value farmland.
	URV	3	Routes URV and URQ affect more residences and development potential.
	URQ	3	
	SIL	2.7	Route SIL scored better than URV and URQ but worse than the others for most built metrics.
Community	AY	2	Route AY was the public's preferred route as it avoids more residences, communities, and prime agricultural land.
	SGZ	3	Route SGZ was the least preferred because of the sensitive cultural, spiritual and resource use areas.
	URV	2	Route URV was the FNMEP perspective's preferred route as it avoids the most sensitive cultural, spiritual and resource use areas
	URQ	3	
	SIL	1	Route URQ was the least preferred, as it would travel through the most residential areas. Route SIL was the best compromise between the two perspectives (PEP/FNMEP) covered by the group as it balanced future and existing residential and commercial development, paralleling existing transmission lines, and avoidance of sensitive cultural, spiritual and resource use areas.

NOTE:
[1] Scores are between 1 (preferred) and 3 (least preferred).

Table 5-29 provides the results of preference determination. When the weights for each criterion were considered, the result was the selection of the lowest scoring route, SIL (Map 5-18) as the preferred route.

Table 5-29 Round 2 Preference Determination for the Preferred Route for MMTP

(showing relative scores, weighted scores and total sum; lower values are preferred for routing)

Criteria	Weight	Routes				
		URV	SIL	AY	URQ	SGZ
Cost[1]	40%	1.01	1.14	1.05	1.03	1
Weighted		0.40	0.46	0.42	0.41	0.4
System Reliability	10%	1	1.5	1.5	1	1
Weighted		0.1	0.15	0.15	0.1	0.1
Risk to Schedule	5%	1	1	2	1	2
Weighted		0.05	0.05	0.1	0.05	0.1
Environment (natural)	7.50%	1.2	2.2	3	1	2.7
Weighted		0.09	0.17	0.23	0.075	0.20
Environment (built)	7.50%	3	2.7	1	3	2
Weighted		0.23	0.20	0.075	0.23	0.15
Community	30%	2	1	2	3	3
Weighted		0.6	0.3	0.6	0.9	0.9
TOTAL		*1.47*	*1.32*	*1.57*	*1.76*	*1.85*
RANK		*2*	*1*	*3*	*4*	*5*

NOTE:
[1] A scaling factor was used for cost.

5.6 Round 3: Final Preferred Route Selection

5.6.1 Objectives

In the final round of transmission line routing, the objective was to finalize the placement of the Final Preferred Route, using the feedback received through the engagement processes and the additional assessment of natural and built (socio-economic) features (see Appendix 5E for workshop notes). At this stage, because the spatial extent of the route is more defined, analysis is more detailed and benefits from the data gathering that was conducted in previous rounds. Normally finalizing the preferred route would entail gathering input from the PEP and discipline specialists and making small changes to the route within a mile wide buffer. However, because of the level of concern received in Round 3 PEP activities regarding the proximity of the route to residential developments near LaBroquerie (described in more detail below), larger deviations were considered than would be usual at this stage. For this reason the exercise of finalizing the preferred route became more complicated and required a rigorous comparison of alternative options. The Project team opted to use the tools of the model to guide this decision-making and

hence the Final Preferred Route determination applies the steps outlined in Figure 5-2 and used in previous rounds here again. Each of these steps is described in detail below.

5.6.2 Planning

Route SIL, which was selected as the preferred route after Round 2 evaluation, was further reviewed by the technical team, as well as the engagement teams, to make sure the proposed route was technically feasible and that public input was fully considered. As a result, the route was further refined as described below. The technical review of the preferred route included:

- finer scale design where offsets from property lines, existing transmission and road ROW's are more accurately represented; and
- location of angle towers, in conjunction with field validation to confirm absence of buildings or new construction and other changes on the landscape.

Based on feedback from Round 2 public engagement, several route adjustments were implemented to SIL to be shared in the round 3 engagement process(details provided in Map 5-19; note that the location arising from the adjustment is the blue segment) including:

- At the request of a landowner, the preferred route was moved farther east to place the route on the edge of the property (Map 5-19; inset 1). This adjustment was requested by the landowners in the area during Round 2 engagement discussions. In addition, the route then remains on east side of R49R (230kV transmission line) and eliminates two crossings of R49R, which improves reliability, constructability and reduces the need for planned outages on R49R.
- The route was adjusted to the east to provide further separation between the route and homes and future subdivisions (Map 5-19; inset 2).
- The route was adjusted to the west, placing a corner tower near the provincial highway (PR 302) to improve clearances of the conductor across that would cross the highway (Map 5-19; inset 3).
- The route was adjusted to the west limiting the amount of clearing of a large forested area around a home (Map 5-19; insets 4).
- The route was adjusted to the north based on discussions with the landowner (Map 5-19; Inset 5)

The adjustments made that endeavored to satisfy concerns of individual landowners were reviewed first to determine whether the changes would create and/or increase effect on another landowner or component of the environment. If the change suggested was determined to have a net increase in effect or shift of effect from one receptor unfairly to another, it was not accepted. Additional details on specific input into the route selection process can be found in Chapter 3 – Public Engagement.

5.6.3 Feedback and Analysis

Round 3 Engagement Processes

The preferred route (modified Route SIL, solid blue line in Map 5-19) was presented in Round 3 of the engagement processes. Stakeholders, public, First Nations and Metis were once again encouraged to participate in order to provide input on concerns, preferences and potential ways to mitigate effects and concerns related to the more refined and detailed proposed transmission line location (details on the public engagement process for Round 3 can be found in Chapter 3. Suggested adjustments to the preferred route from Round 3 engagement activities and the subsequent route planning process were considered and feasible options were created, presented, and included in the AREM conducted at the end of Round 3 to select the Final Preferred Route.

The main concerns heard during Round 3 PEP related to:

a) Proximity of the preferred route to residential development and homes in the areas of St. Genevieve, the Town of La Broquerie, and in various discrete locations. Recommendations were made by individuals and the RM Council of La Broquerie to consider a route alternative that made use of the linear feature already created by the Fireguard 13. This alternative would be farther from homes in the town of La Broquerie, but bring the route closer to homes in the town of Marchand. The route segment was added as noted in Table 5-30 and evaluated along with all other options.

b) West of the Watson P. Davidson Wildlife Management Area, concerns were raised related to biosecurity risks associated with introducing a ROW in proximity to intensive livestock operations (*e.g.* Maple Leaf Foods). A segment of land used as a private conservation area was also noted as a feature to attempt to avoid through routing.

c) A private landowner raised concerns that the preferred route could affect (see Chapter 3 for further details) private lands of recognized importance to First Nations.

Full detail of the concerns raised and suggestions for route modifications can be found in Chapter 3. The following section outlines the segments that were added to the preferred route for evaluation in the route selection process, and the decisions made that led to the results of the comparative evaluation process.

5.6.4 Comparative Evaluation

Based on feedback from the engagement processes and discipline specialists, several additional segments were created and added to the preferred route as alternatives to be evaluated in the Route Selection process (Map 5-20). These segments, and the alternative routes that they formed a part of, were evaluated with the same rigour and consideration as the original preferred route.

Table 5-30 provides details on the segments included in Round 3 of the transmission line routing process. Map 5-20 shows the segments discussed below. Unless otherwise noted the segment was developed by the Routing and PEP teams in consideration of feedback.

Table 5-30 Segment or Pair-wise Comparisons

Segment	Discussion
400-408, 413-417, 420, 469	These segments made up the modified preferred route from the previous round.
450	Recommended by affected landowner to mitigate visual concerns (Figure 5-24).
451	Recommended by MH PEP team based on predominant public preference for paralleling and to limit the number of residences that would have a transmission line on two sides of a residence: “sandwiching” (Figure 5-25).
452	Based on feedback by landowners who requested that the distances between houses north and south on the line be equalized (Figure 5-26).
453–464	Developed by routing and PEP based on feedback received from Municipal councils to consider using Fireguard 13 as a possible route segment location and to evaluate alternatives east of the community of La Broquerie (Figure 5-27).
479	Developed by routing and PEP team to equalize separation between Quintro Road and existing subdivision to the east (Figure 5-28).
409, 465–482	Avoid concerns raised based on proposed residential development, recreational use, livestock operations (Maple Leaf Foods) and biosecurity (Hylife). And they acknowledge a proposed protected area (Figure 5-29).
474	Developed by routing team in consideration of feedback related to the cultural use of the cemetery this segment increases separation from Ridgeland cemetery and provides an alternative connection option to 417/475 (Figure 5-30).
475	Developed by routing team to address concerns raised regarding First Nations traditional and cultural land use on a privately held property (Figure 5-31).
420	Segment was proposed by the affected private landowner to reduce effect on a smaller land parcel (Figure 5-32).
478	Location of the angle structure associated with this segment was moved south at the request of the newly affected landowner (moved to alternative landowner; Figure 5-33).

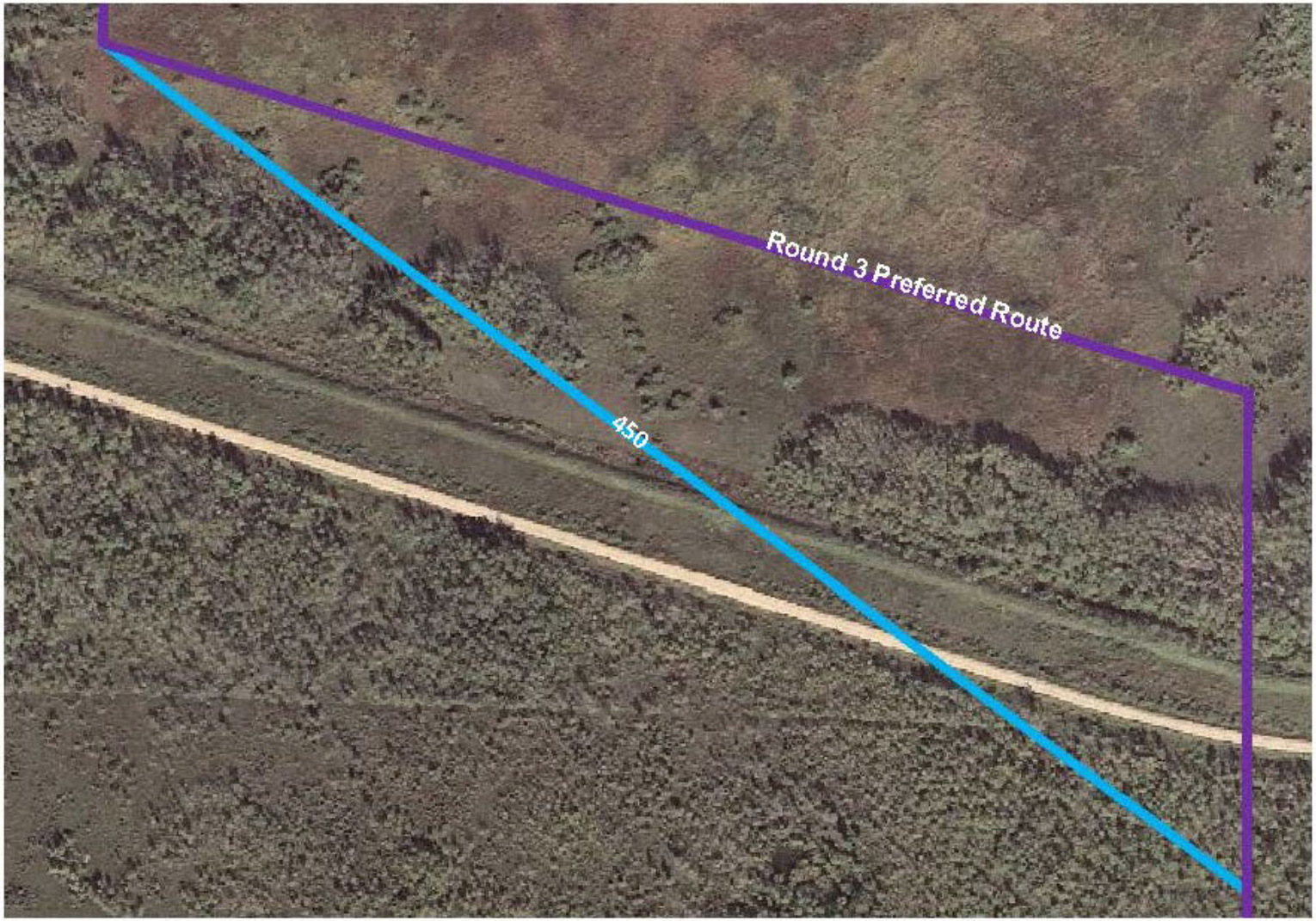

Figure 5-24 Segment 450 (blue line) was Created to Mitigate Visual Concerns Brought Forward by the Landowner

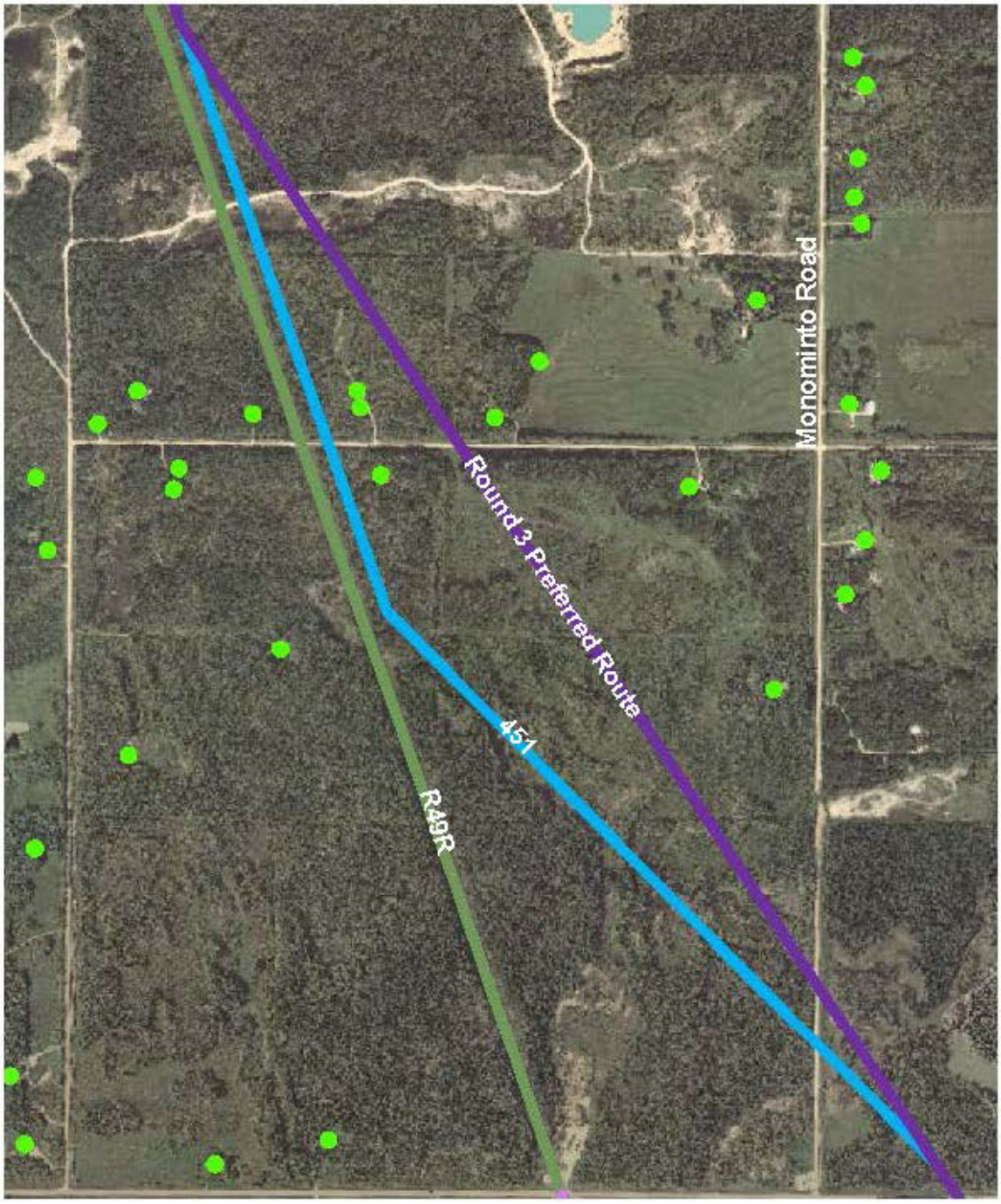

Figure 5-25 **Segment 451 (blue line) was Created to Limit Potential Effects on Residences (green dots) and Increase Paralleling of Existing Transmission Lines (R49R green line)**

Figure 5-26 Segment 452 (blue line) was Created to Equalize Distances between Houses North and South on the Line

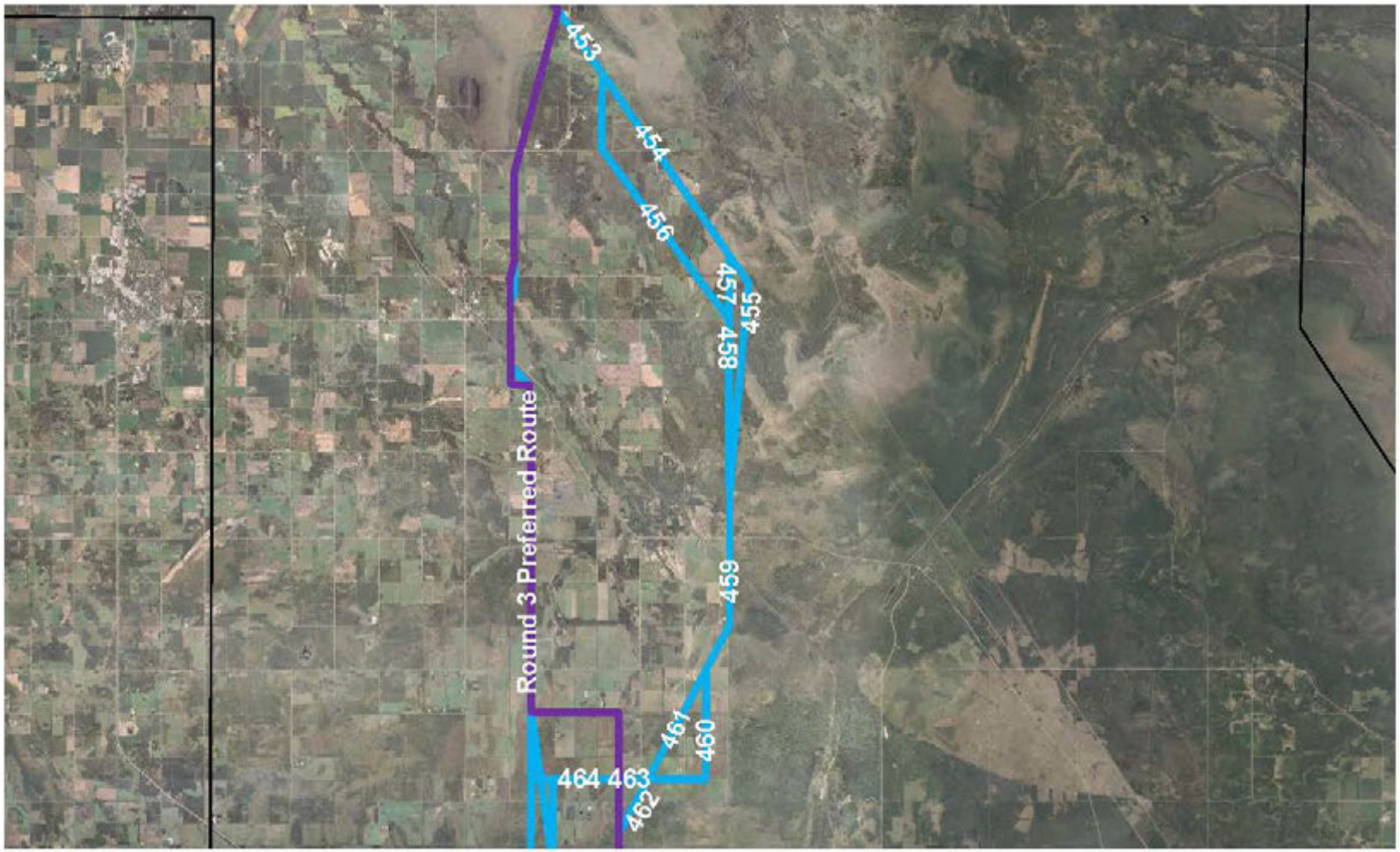

Figure 5-27 **Segments 453-464 (blue lines) were Created to Use Fireguard 13 and to Evaluate Alternatives East of the Community of La Broquerie**

Figure 5-28 **Segment 479 (blue line) was Created to Maintain Separation between Quintro Road and an Existing Subdivision to the East**

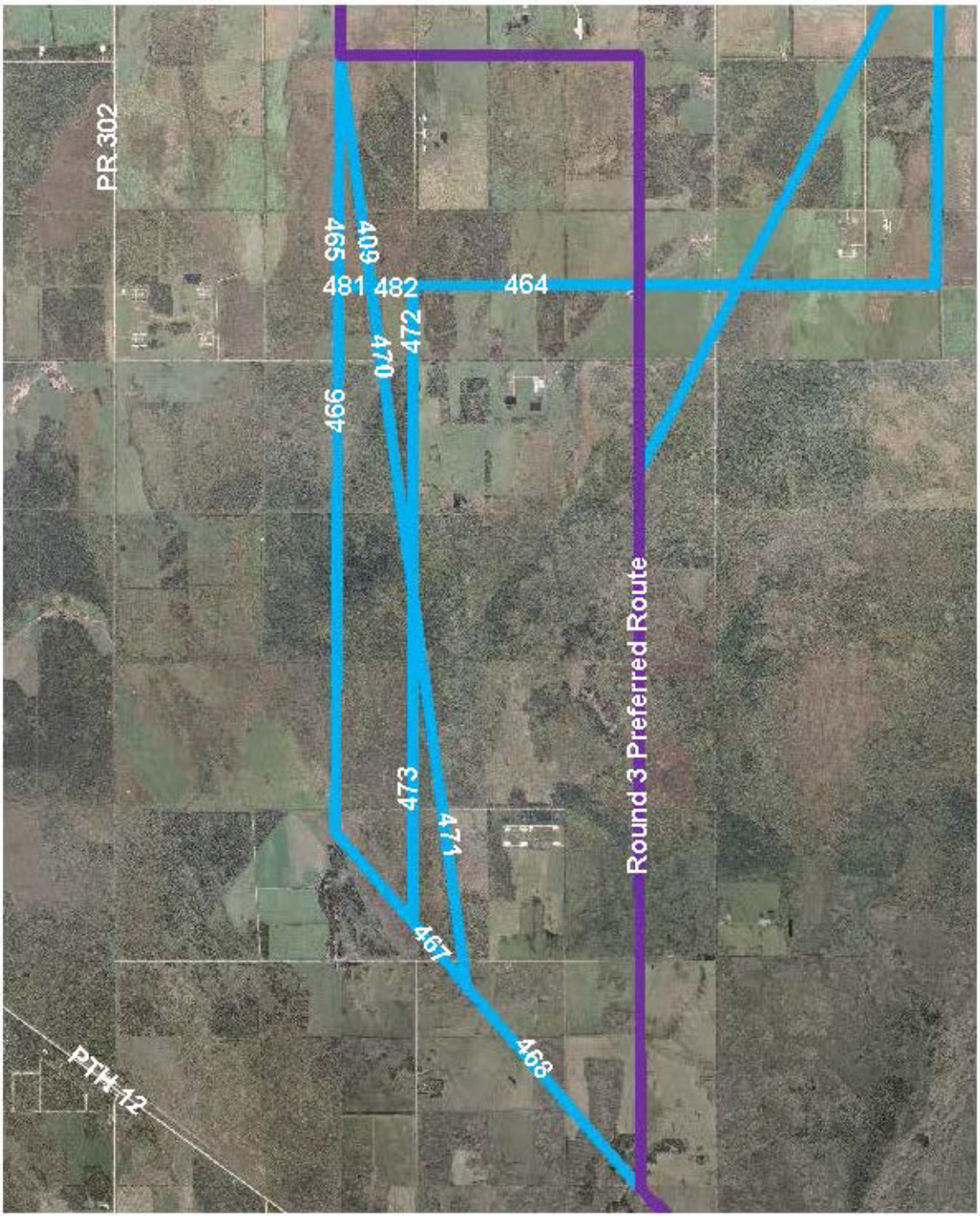

Figure 5-29 **Segments 409, 464-468, 470-473 and 481 (blue lines) were Created to Avoid Concerns Raised Based on Proposed Residential Development, Recreational Use, Livestock Operations and Biosecurity**

Figure 5-30 Segment 474 (blue line) was Created to Enhance Separation from Ridgeland Cemetery (white circle)

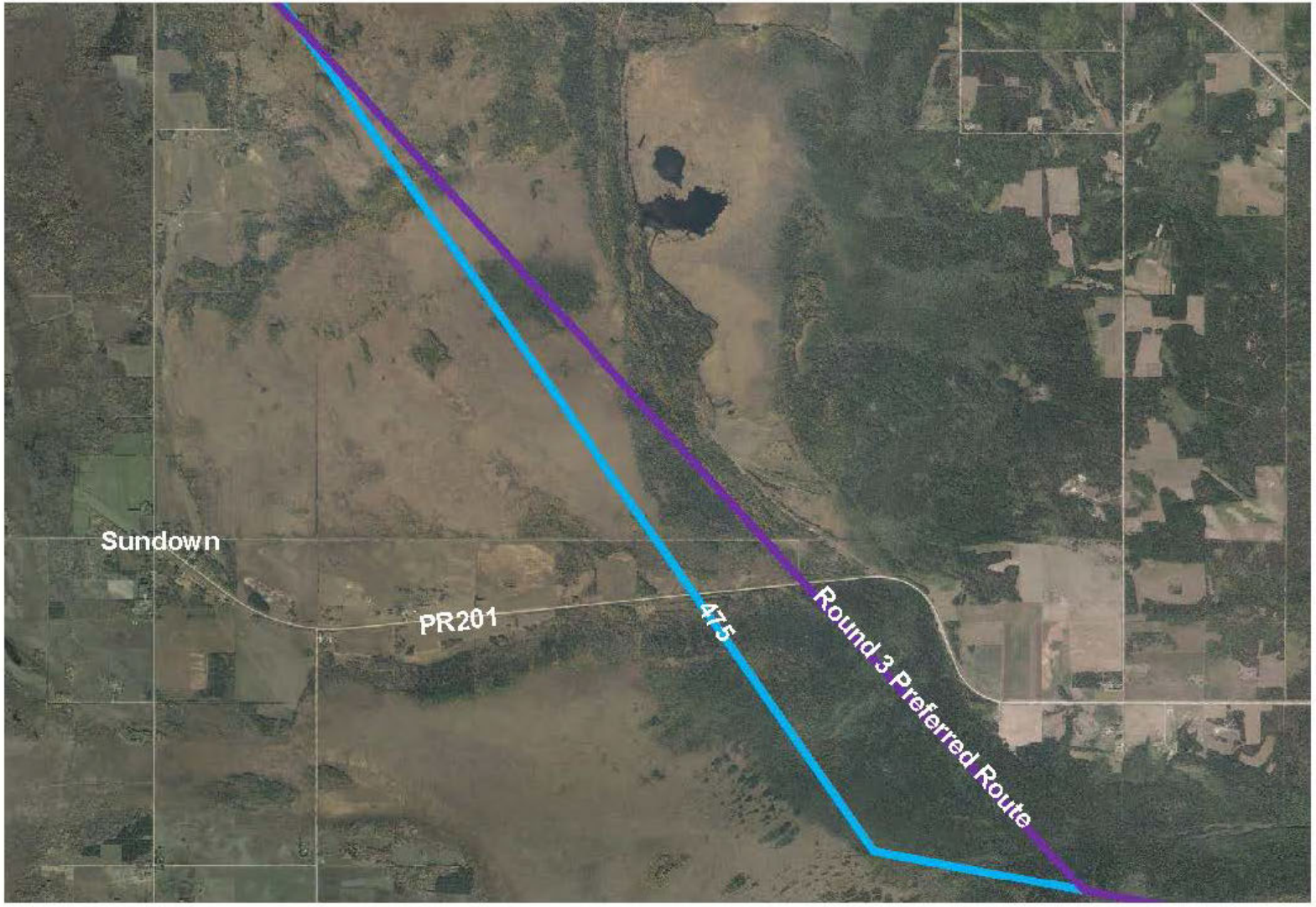

Figure 5-31 **Segment 475 (blue line) was Created to Address Concerns Raised Regarding First Nations Traditional and Cultural Land Use on Privately Held Property**

Figure 5-32 **Segment 420 was Created as a Routing Preference from the Private Landowner, Limiting Effect on a Smaller Land Parcel**

Figure 5-33 **Segment 478 (blue line) was Created to Accommodate an Angle Structure Modification**

The alternative route evaluation model (Table 5-6) was used to create route statistics for all possible routes. Because of the addition of mitigative segments (those listed above), the total number of potential routes that were evaluated was 3942. The alternative routes were evaluated during a route selection workshop held on April 30, 2015 (see Appendix 5E for workshop notes) that included Manitoba Hydro staff and discipline specialists who represented each of the perspectives.

Prior to the workshop, segment 450 was removed because of an existing water pipeline easement that would affect tower placement and spacing as well as a technical preference to cross the pipeline as close to a 90° angle as possible. Because this segment had been included in a number of possible routes, its removal left 1992 route alternatives for further review at the workshop.

During the workshop, the number of alternative routes was reduced to a set of finalists. This process was facilitated through discussion and examination of the statistical results of the alternative route evaluation model. It began with pair-wise comparison of similar segments to reduce the total number of alternatives for further consideration with the goal to reduce the number to a subset of three to five routes for consideration in the preference determination phase. Table 5-31 outlines the segments under consideration in that comparison, as well as the rationale for selection of a segment. In all cases, the segments that were compared serve a similar function (connecting a common start and end point) of one or more route alternatives. Discussion regarding the segment alternatives elicited input from all perspectives and discipline specialists, and segment selection was made by consensus.

Table 5-31 Segment or Pair-wise Comparisons

Segments Compared	Segment Selected	Discussion
451/403	451	Segment 451 parallels R49R, limits potential effects on the RM of Tache quarry and homes in the area, and requires less vegetation removal (Figure 5-34).
405/452	452	Segment 452 places the route equidistant between several homes in the area (Figure 5-35).
408, 469, 477-479,	479 (modified)	Segment 479 moves farther from a new subdivision and from the tree line along the golf course, and would reduce clearing along the riparian area of the Seine River (Figure 5-36).
417/475	NA	Segment 475 mitigates concerns related to the private land that supports medicinal plants and activities of recognized cultural importance to First Nations. Because of other features of importance in the area, no consensus decision could be made and both segments remained for further consideration (Figure 5-37).

Figure 5-34 Segment 451-403 Comparison (Segment 451 was selected)

Figure 5-35 Segment 405/452 Comparison (Segment 452 was selected)

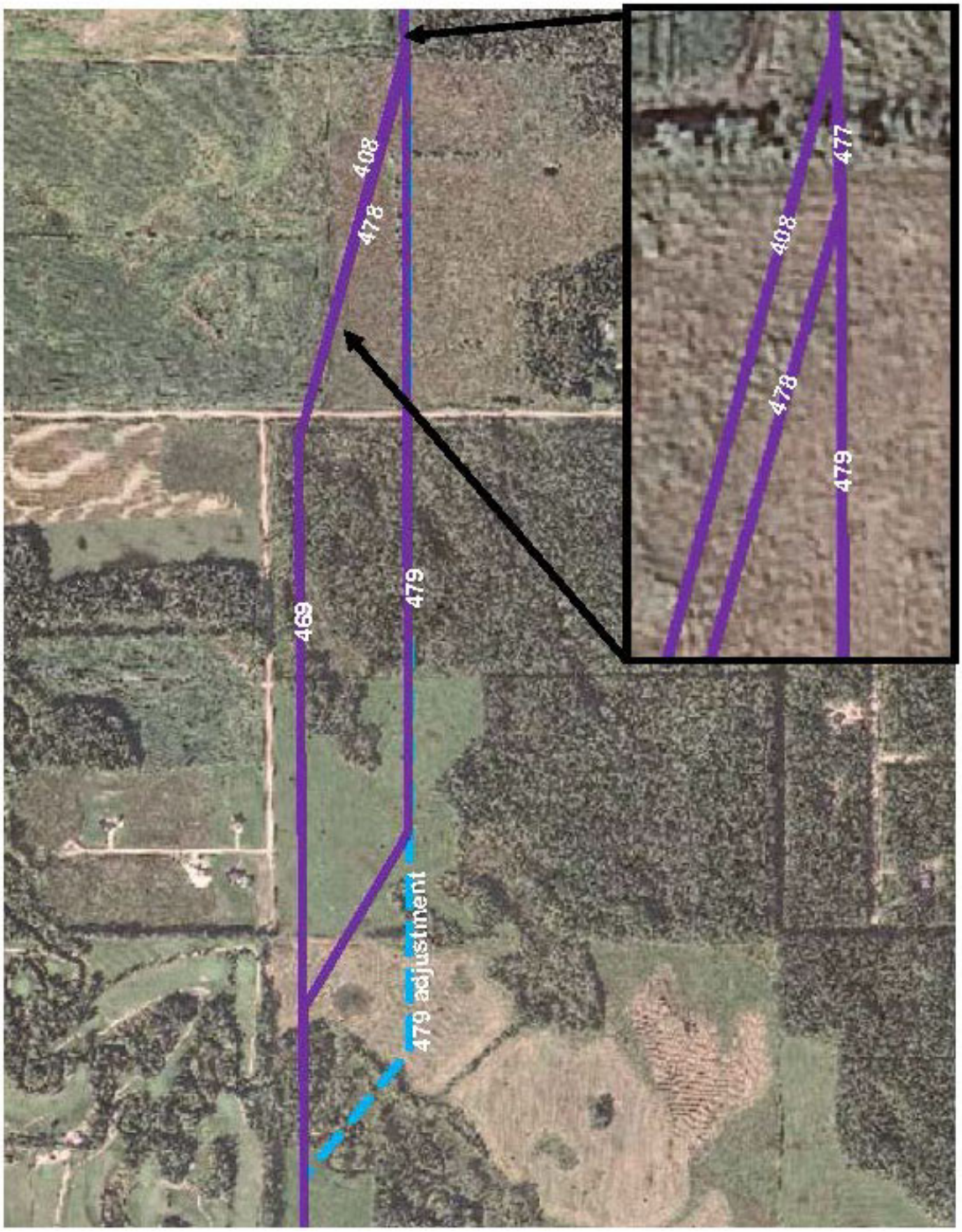

Figure 5-36 **Segment 408, 469, 477-479 Comparison (Segment 479 [modified – blue line] was selected)**

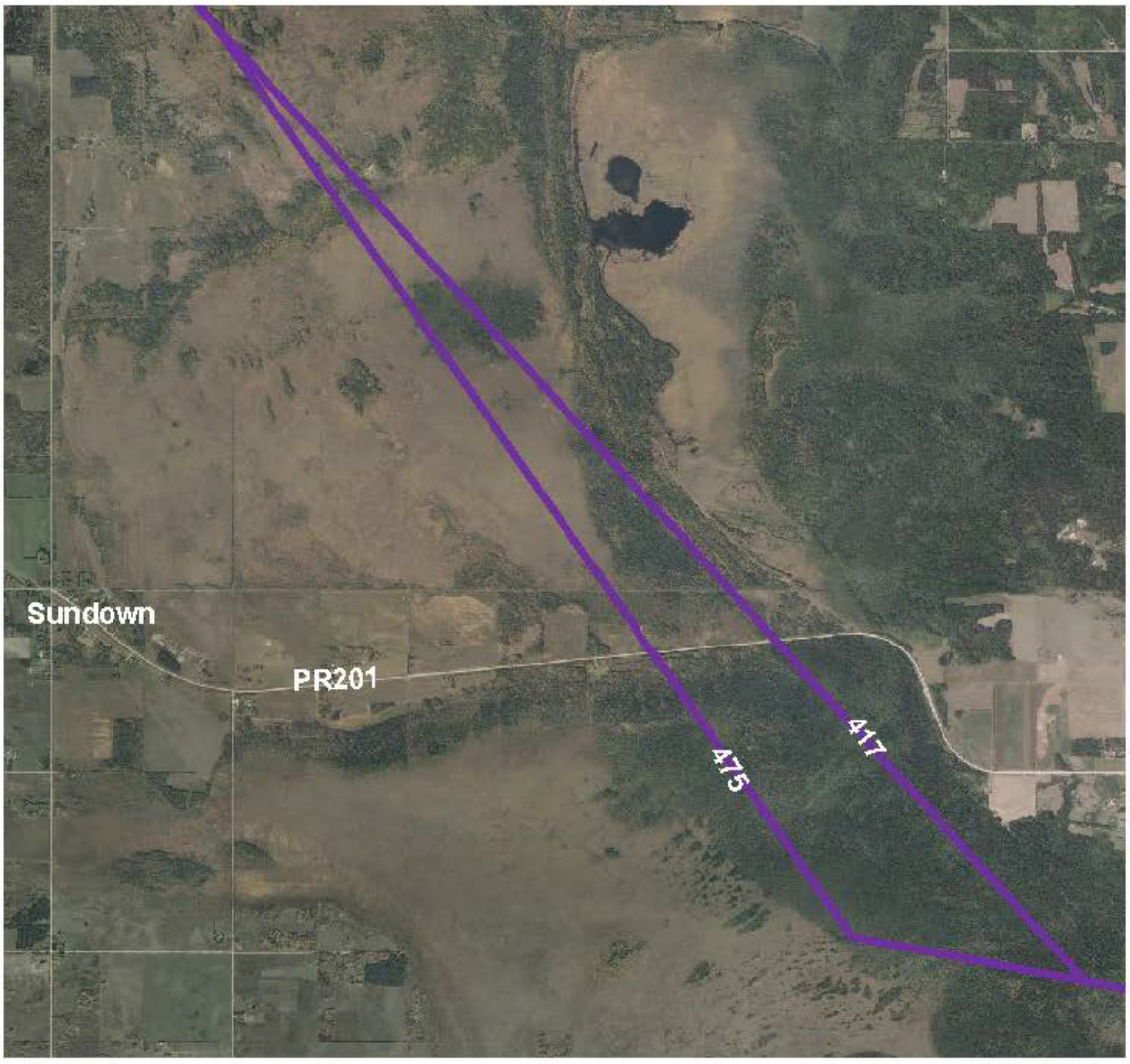

Figure 5-37 Segment 417–475 Comparison

Using the alternative route evaluation statistics, route statistics and geospatial data were discussed for each option by the Project team. The routes that were selected to carry forward to preference determination (presented in Table 5-32) represented strong alternatives statistically that mitigated the concerns described above (Section 5.6.2) to varying degrees through different combinations of segments. Map 5-21 presents the alternative routes that were selected for further consideration, which were BMX, BWZ, BXP, BOB and BMY. Table 5-32 presents the relative features of these routes from the 3 perspectives and denotes which concerns are mitigated by each route, and how. Table 5-33 presents the alternative route evaluation statistics for each of the top routes.

Table 5-32 Comparison of the Top Routes after Alternative Route Evaluation (Round 3; see Map 5-21)

Route	BWZ (eastern)	BXP (eastern)	BMX (western)	BMY (western)	BOB (western)
Segments	Segments 400,406,453,456,458, 459,401,464,472,463, 460,471,468,416,417, 420,402,451,404,452	Segments 400,406,453,456,458, 459,401,463,414,460, 415,416,417,420,402, 451,404,452	Segments 400,406,407,477,479, 401,412,409,482,472, 471,468,474,417,420, 402,451,404,452	Segments 400,406,407,477,479, 401,412,409,482,472, 471,468,416,475,420, 402,451,404,452	Segments 400,406,407,477,479, 401,412,465,481,482, 472,471,468,416,417, 420,402,451,404,452
Natural	Less preferred: • Fragmenting habitat and forested areas. • Runs through critical habitat. • Provides buffer for the WMA and avoids some wetlands (slightly better than BXP).	Least preferred: • Fragmenting habitat and forested areas. • Runs through critical habitat.	Preferred: • Avoids forest and habitat fragmentation. • Avoids critical habitat for endangered species. • Spans the southern tip of Lonesand Lake (Bird strikes are a concern; less preferred than BMY).	Most Preferred: • Avoids forest and habitat fragmentation. • Avoids critical habitat for endangered species. • Avoids a site of cultural importance. • Avoids Lonesand Lake	Preferred: • Avoids forest and habitat fragmentation. • Avoids critical habitat species and endangered species. • Crosses over an area of cultural importance (less preferred than BMY).
Built	Most Preferred: • Avoids La Broquerie, proposed residential developments and prime agriculture land. • Avoids Maple Leaf operation, a private recreational area, and Hylife's calving grounds. • Potentially affects culturally important lands.	Less Preferred: • Avoids La Broquerie, proposed residential developments prime agriculture land, and a private recreational area. • Passes through Hylife's calving grounds (mitigable with the use of self-supporting towers and protected bases). • Passes through Maple leaf agricultural area (biosecurity concerns).	Least Preferred: • Does not avoid La Broquerie, • Higher potential effect on proposed residential developments and prime agriculture land, Maple Leaf operation, and Hylife's calving grounds.	Least Preferred: • Does not avoid La Broquerie, • Higher potential effect on proposed residential developments and prime agriculture land.	Least Preferred: • Does not avoid La Broquerie, • Higher potential effect on proposed residential developments and prime agriculture land, Maple Leaf operation, and Hylife's calving grounds.
Engineering	Less Preferred: Extra line length (eastern route) increases the risk to reliability and cost.	Less Preferred: Extra line length (eastern route) increases the risk to reliability and cost.	Preferred: • Shorter line length (western route) limits risk to reliability and have lower overall costs.	Preferred: • Shorter line length (western route) limit risk to reliability and have lower overall costs.	Preferred: • Shorter line length (western route) limit risk to reliability and have lower overall costs.

Table 5-33 Route Statistics for Routes BMX, BMY, BOB, BWZ and BXP

Feature	Route BMX	Route BMY	Route BOB	Route BWZ	Route BXP
Built					
Relocated Residences (Within ROW)	0	0	0	0	0
Potential Relocated Residences (100 m from EOROW)	11	11	11	11	11
Proximity To Residences (100 m–400 m from EOROW)	87	89	87	65	63
Proposed Residential Developments – Within ROW	20	20	20	14	14
Current Agricultural Land Use (Value) – ROW	214	215	214	162	162
Acres of Annual Crop (72.9% weighting)	256	256	256	202	202
Acres of Hayland (27.1% weighting)	102	106	102	53	53
Land Capability for Agriculture (Value) – ROW	751	753	752	727	705
Classes 1-3 – Acres (66% weighting)	669	671	671	529	529
Classes 4-5 – Acres (33% weighting)	938	941	936	1,146	1,078
Proximity to Intensive Hog Operations (Acres) – ROW	1,481	1,481	1,491	1,619	1,535
Diagonal Crossings of Prime Agricultural Land (Acres) – ROW	222	226	222	173	173
Proximity to Buildings and Structures (100 m from ROW)	11	11	11	7	7
Public Use Areas (250 m from ROW)	11	11	11	7	7
Historic Resources (250 m from ROW)	4	3	4	3	3
Potential Commercial Forest (Acres) – ROW	493	438	488	485	509

Feature	Route BMX	Route BMY	Route BOB	Route BWZ	Route BXP
Natural					
Natural Forests (Acres) – ROW	1,709	1,709	1,718	1,983	1,921
Intactness	863	946	868	866	933
Stream/River Crossings – Centreline	13	13	13	15	15
Wetland Areas (Acres) – ROW	366	422	386	454	488
Conservation and Designated Lands (Acres) – ROW	246	245	245	179	165
Engineering					
Length (km)	121	122	121	128	125
Seasonal Construction and Maintenance Restrictions (Value) – ROW	620	639	616	660	659
Index of Proximity to Existing 500 kV Lines	7,239,274,441	7,321,078,286	7,277,883,925	6,974,453,647	6,663,453,350
Existing Transmission Line Crossings	3	3	3	3	3
Accessibility	435,541,250	435,541,250	438,629,914	444,550,446	418,938,885
Costs[1]	$106,265,017	$106,265,017	$105,059,864	$108,642,726	$106,358,864

NOTE:
[1] Costs used were high-level estimates of construction costs used for relative comparison.

Preference Determination

The route alternatives evaluated in the preference determination step represent options that would mitigate the major concerns heard in Round 3 engagement processes as outlined above, with varying features and strengths and benefits. In the preference determination step, these route alternatives were compared against each other and the Final Preferred Route selected. (The preference determination decision-making process was described in detail in Section 5.4.3) Table 5-34 presents the rationale for scoring in the preference determination step. Lower scores indicate a more preferred option, while higher scores indicate less preferred.

Table 5-34 provides the scores given for each criteria and the rationale for the scoring.

Table 5-34 Preferred Route Preference Determination Scores and Rationale

Criteria	Route	Scores	Rationale
Cost	BMX	1	A scaling factor was used to calculate the scores based on estimates for the total Project costs. BWX and BXP have a slightly higher cost driven primarily by the longer lengths of these route alternatives.
	BWZ	1.02	
	BXP	1.02	
	BMY	1	
	BOB	1	
System Reliability	BMX	1	The eastern routes (BWZ and BXP) are slightly longer (extra line length increases the risk) and closer to M602F.
	BWZ	1.5	
	BXP	1.5	
	BMY	1	
	BOB	1	
Risk to Schedule	BMX	1.5	The eastern routes (BWZ and BXP) have a higher prevalence of Crown land. The eastern routes (BWZ and BXP) traverse more wetlands (seasonal construction issues). The Maple Leaf Foods livestock operation has requested winter construction if the route remained in proximity to their facility, which could result in a scheduling, and construction delay (BXP). Route BMY ranks highest from a community perspective because it addresses many concerns heard from the RM of La Broquerie, Maple Leaf Foods, Sundown Cemetery, Hylife, the recreational area, and First Nations.
	BWZ	2.5	
	BXP	3	
	BMY	1	
	BOB	1.5	
Environment (natural)	BMX	1.5	Route BMY is preferred because it avoids a large amount of forest and introduces less habitat fragmentation, avoids critical habitat for a number of species and endangered species. Route BMY also allows for mitigation of potential effect on the culturally important area. Route BOB is slightly less preferred than route BMY as it crosses a culturally sensitive area. Route BXP is least preferred because it fragments forested areas and critical habitat
	BWZ	2.8	
	BXP	3	
	BMY	1	
	BOB	1.2	

Criteria	Route	Scores	Rationale
Environment (natural) (continued)			Route BWZ is slightly preferred to BXP because it provides a larger buffer between the route and the Watson P. Davidson WMA and avoids some wetlands. Route BMX goes over the southern edge of Lonesand Lake, therefore is slightly less preferred than Route BOB.
Environment (built)	BMX	2.9	Route BWZ is the preferred route as it avoids the town of La Broquerie, proposed residential developments and privately owned agricultural lands. Route BXP ranks slightly lower than Route BWZ because it avoids the Maple Leaf Foods operations. Route BOB is a little closer to the cemetery therefore it scores the lowest. Route BMY scores the same as BOB there is little difference between these routes from a built perspective.
	BWZ	1	
	BXP	1.1	
	BMY	3	
	BOB	3	
Community	BMX	2.5	The highest rank was given to the route(s) that best balances the overall concerns. Route BWZ ranks highest from the PEP perspective because it avoids the private recreational area, the Maple Leaf Foods operation and uses the easternmost segment, mitigating the concerns related to residential development in and around the Town of La Broquerie. The Hylife concerns relating to their calving grounds are mitigable with the use of self-supporting towers with protected bases. BWZ However does mitigate concerns with the regarding the land of a private property owner that is of importance to members of the Roseau River Anishinabe First Nation Route BWZ ranks lowest from the FNMEP perspective: It will cause more Crown land fragmentation and affect historical and contemporary use. It creates Archeology concerns (effect on areas identified as potential to contain heritage resources) and greater access to sensitive areas farther east. Route BMY ranks highest from the FNMEP perspective. Route BMY does not address the Town of La Broquerie concerns but accommodates concerns heard from private landowners and livestock operators located within the RM of La Broquerie and the RM of Stuartburn (Hylife, Maple Leaf, recreational lands, Sundown Cemetery and the land of a private property owner that is of importance to members of the Roseau River Anishinabe First Nation. Route BOB accommodates the concerns regarding the land of a private property owner that is of importance to members of the Roseau River Anishinabe First Nation.
	BWZ	2	
	BXP	2.5	
	BMY	1	
	BOB	2	

Table 5-35 provides the results of preference determination. When the weights for each criterion were considered, the result was the selection of Route BMY (Map 5-21) as the preferred route.

Table 5-35 Preference Determination for the Preferred Route for MMTP

(showing relative scores, weighted scores and total sum; lower values are preferred for routing)

Criteria	Weight	Routes				
		BMX	**BWZ**	**BXP**	**BMY**	**BOB**
Cost[1]	40%	1	1.02	1.02	1	1
Weighted		0.4	0.41	0.41	0.4	0.4
System Reliability	10%	1	1.5	1.5	1	1
Weighted		0.1	0.15	0.15	0.1	0.1
Risk to Schedule	5%	1.5	2.5	3	1	1.5
Weighted		0.075	0.13	0.15	0.05	0.075
Environment (natural)	7.50%	1.5	2.8	3	1	1.2
Weighted		0.1	0.21	0.23	0.075	0.09
Environment (built)	7.50%	2.9	1	1.1	3	3
Weighted		0.2	0.075	0.083	0.23	0.23
Community	30%	2.5	2	2.5	1	2
Weighted		0.75	0.6	0.75	0.3	0.6
TOTAL		**1.66**	**1.57**	**1.77**	**1.15**	**1.49**
RANK		**4**	**3**	**5**	**1**	**2**

NOTE:
[1] A scaling factor was used for cost.

5.7 Final Preferred Route

Route BMY was determined to be the Final Preferred Route for the portion of D604I running from Dorsey Converter Station to the Minnesota border. Map 5-22 shows the Final Preferred Route proposed for the Project. The assessment of potential effects (presented in the remainder of the environmental impact statement in Chapters 8–20) was based on this route. As noted in Section 5.6.2, the route selected mitigates a number of key concerns brought forward by participants in the public and First Nation and Metis engagement processes, and concerns raised by discipline specialists from the assessment team. The Final Preferred Route mitigates concerns related to major livestock operations south of La Broquerie (HyLife, Maple Leaf), lands used for private conservation and recreation and lands of recognized cultural importance to First Nations. Table 5-36 presents the statistics for the Final Preferred Route, as calculated by the criteria from the alternative route evaluation model. Note that these statistics cover the entire route (including the portions from Dorsey Converter Station through the SLTC, while the statistics for previous alternative route comparison exercises did not include the south loop portion as it would have been fixed for all routes) Therefore these statistics should not be compared to any previous statistics presented earlier in this chapter.

Table 5-36 Final Preferred Route Statistics[1]

Feature	Value
Built	
Relocated Residences (Within ROW)	1
Potential Relocated Residences (100 m from Edge of ROW)	23
Proximity To Residences (100 m–400 m from Edge of ROW)	198
Proposed Residential Developments – Within ROW	23
Current Agricultural Land Use (Value) – ROW	873
Acres of Annual Crop (72.9% weighting)	747
Acres of Hayland (27.1% weighting)	1,212
Land Capability for Agriculture (Value) – ROW	1,866
Classes 1-3 – Acres (66% weighting)	2,345
Classes 4-5 – Acres (33% weighting)	965
Proximity to Intensive Hog Operations (Acres) – ROW	355
Diagonal Crossings of Prime Agricultural Land (Acres) – ROW	53
Proximity to Buildings and Structures (100 m from ROW)	53
Public Use Areas (250 m from ROW)	18
Historic Resources (250 m from ROW)	9
Potential Commercial Forest (Acres) – ROW	433

Feature	Value
Natural	
Natural Forests (Acres) – ROW	1,717
Intactness	2,021
Stream/River Crossings – Centerline	49
Wetland Areas (Acres) – ROW	415
Conservation and Designated Lands (Acres) – ROW	254
Engineering	
Length (km)	213
Seasonal Construction and Maintenance Restrictions (Value) – ROW	1,041
Index of Proximity to Existing 500 kV Lines	11,300,841,036
Existing Transmission Line Crossings	17
Accessibility	587,715,776
Project Costs[2]	$211,300,000

NOTE:

[1] These route statistics are for the Final Preferred Route from Dorsey Converter Station to the U.S. border. Previous route statistics presented did not include the portion of the route through the SLTC. Therefore these statistics are not comparable to any previous statistics presented earlier in this chapter.

[2] Costs used were high-level estimates used for relative comparison.

This section provides a description of the final preferred transmission line route along with from its origin at Dorsey Converter Station to the border crossing location south of Piney, MB. The description begins with the SLTC, which was a fixed component of the route throughout the transmission line routing exercise.

5.7.1 Southern Loop Transmission Corridor

5.7.1.1 Dorsey Converter Station to La Verendrye

Starting from the Dorsey Converter Station, D604I heads south along the SLTC (Map 5-1). Use of the existing SLTC to traverse from Dorsey Converter Station to southeast Winnipeg will avoid the need to acquire a new ROW within prime agricultural land and rural residential development areas south of Winnipeg. This mitigative decision to design D604I within the existing SLTC was made early in the routing process.

The Final Preferred Route exits the west side of Dorsey Converter Station switchyard, and heads south along the SLTC. Just south of Dorsey Converter Station it crosses PR 221 then 2 double circuit transmission lines (D11Y and D15Y as well as D14S and D55Y) also exiting Dorsey Converter Station. It continues south through agricultural land, passing along the west side of an intensive hog operation, along SLTC for approximately 12 km until it crosses the TransCanada

Highway (TCH), just west of the town of Headingley. South of the TCH, the route crosses the Assiniboine River. This part of the Assiniboine River is part of the Assiniboine River Clam Beds proposed Ecological Reserve. It also crosses over Archaeological Site DILi-12 on the north bank of the Assiniboine River. South of the Assiniboine River, the route continues south along the SLTC through agricultural land for approximately 6.5 km, crossing over PR 241, PR 427 and the Canadian Pacific Railway. The route then crosses over two double circuit transmission lines (D11Y and D15Y and D14S and D55Y) then turns east paralleling these lines. It runs east through agricultural land crossing PR 334 heading to La Verendrye Station.

5.7.1.2 La Verendrye to Deacon's Reservoir

At LaVerendrye Station, the transmission line turns south, crossing three transmission lines (YM31, Y51L, YT10) connected to LaVerendrye Station. From LaVerendrye Station the route heads south along the SLTC through agricultural land. It crosses PTH 2 then heads east crossing YF11 and PTH 3. It continues east through agricultural land crossing PR 330. The route crosses PTH 75, heads northeast, crosses through Duff Roblin Provincial Park then over the Red River just north of the floodway inlet. East of the Red River, the route crosses over the floodway, then over PR 200 and parallels the floodway on the south side for approximately 14 km, crossing over PR 300 twice, then the Seine River just south of where it enters the floodway. The route then crosses PTH 59, one double circuit 115kV transmission line (VT63, VJ50) and one single circuit 230kV transmission line (V95L proposed). The route continues to parallel the floodway as it turns north crossing the TransCanada Highway. The route travels north for approximately 3 km, passing along the west side of Deacon Reservoir and the City of Winnipeg's Water Treatment Plant south of the Riel Converter Station as shown in Map 5-1.

5.7.2 Riel–Vivian Transmission Corridor

At this point, the transmission line route leaves the SLTC and heads east within the RVTC along the northern end of Deacon's Reservoir along the south side of Riel Converter Station. Within the RVTC there is one existing 500 kV ac transmission line (M602F) and one 500 kV dc transmission line (Bipole III) under construction. In an effort to mitigate the potential risk of losing both the M602F and D604I 500 kV transmission lines, a potential crossover was eliminated. To facilitate this, a portion of the structures and conductors used for the existing M602F from Riel Converter Station to PTH 12 (approximately 24 km) will become a portion of the new D604I transmission line. M602F would be transferred to new structures and conductors over the same 24 km distance just north of its current location within the transmission corridor. At the location that D604I exits the transmission corridor to the south along the new ROW, M602F will reconnect with the existing structures and conductors (Chapter 2 – Project Description Figures 2-1 and 2-2).

5.7.2.1 Transmission Line within New Right-of-Way

The portion of the Final Preferred Route that turns south from the RVTC to the U.S. border will require a new ROW. The ROW width varies throughout its 121 km length from 80 m when self-supporting steel lattice towers are used to 100 m when guyed steel lattice towers are used.

South of Springfield and east of PTH 12 the route turns south, entering a new ROW through agricultural land. South of Centre Line Road, the route crosses the Greater Winnipeg Water District aqueduct and rail line. At this point, the landscape starts to change from primarily agricultural land to a mix of pastureland and forested area and starts to run through a mix of Crown and private land. The route parallels an existing 230 kV transmission line (R49R) for just over 4 km. The landscape is a mix of pasture and forested area. The route continues southeast then turns south crossing over R49R then paralleling it on the west side, in a southeasterly direction for approximately 8 km. The route runs east (>200 m from the eastern boundary) of Cottonwood and Oakwood Golf Courses and crosses the TransCanada Highway for the third time.

The transmission line route separates from R49R at Richer South Station and turns southwest. It runs through several parcels of proposed protected area at Richer South Station. The route crosses PR 302 then heads generally south for approximately 37 km. The route runs along the eastern edge of La Verendrye Golf Course then crosses PR 210 and the Canadian National Railway. The route turns southeast running adjacent to the western boundary of the Watson P. Davidson WMA. At the south end of the WMA, the route runs southeast passing through the Caliento Bog. The route stays west of the Spur Woods WMA then runs east southeast through mixed pasture and natural areas, then turns southeast running west of Piney Creek and then crosses over Piney Creek and meets the international border just east of Piney Creek. The route meets the international border southwest of Piney Creek at geographic coordinates of approximate latitude 48.9999; longitude -95.9141 degrees.

5.8 Summary

The Final Preferred Route developed for the Manitoba Minnesota Transmission Project represents the culmination of years of study that included data gathering, analysis, multiple rounds of public and First Nations and Metis engagement, route evaluation and decision-making. Finding a route that balanced multiple perspectives and points of view and limited overall effect was the objective of this work. To do this, Manitoba Hydro used a transparent and comprehensive routing process, based on the EPRI-GTC methodology, that used criteria based models to evaluate and compare route alternatives and explicitly support decision-making.

During the preliminary planning stages of the Project and prior to the development of route alternatives, border crossing areas were determined in cooperation with Minnesota Power. Then the EPRI-GTC approach was used to develop macro corridors that subsequently helped to define a route planning area for the Project. The alternative corridor model, developed using direct stakeholder input, generated corridors that represented areas suitable for transmission line

development within the route planning area. From there, alternative routes were developed for consideration in the rounds of subsequent feedback, analysis, evaluation and selection.

Each of the rounds of routing and engagement made use of the criteria based, EPRI-GTC models and framework to guide the decision-making process. The EPRI approach was enhanced in order to incorporate key decision points and provide additional opportunity for inclusion of feedback from the PEP and FNMEP processes. This feedback informed route planning and evaluation leading to the addition of route segments that addressed concerns and took advantage of opportunities. These additions were evaluated alongside the alternative routes planned initially by Manitoba Hydro. In the first round of routing, over 750,000 alternatives were compared. This was reduced to 550,000 in the second round. And finally, in the last round of Final Preferred Route determination, nearly 4000 alternatives were compared.

The data collected from a variety of sources, to inform routing decisions was used in the comparative evaluation of route alternatives, alongside qualitative, yet critical feedback from engagement processes. Throughout all Rounds of routing, decision-making was undertaken by the Project team representing all key perspectives (natural, built, technical). The team considered route statistics as well as insights gained from field study and qualitative information that was difficult to measure on land but important to examine.

In Round 1, the objective was to determine a border crossing for the transmission line. Using the steps of the methodology to guide the decision-making, a preferred crossing point was selected by first selecting a preferred route to each possible crossing point, and then comparing the strongest routes to each crossing against each other. The statistics generated by the models (alternative route evaluation and preference determination) gave Manitoba Hydro a clear understanding of the strengths and weaknesses associated with each border crossing and the routes used to connect the crossing to the Project start point (Dorsey Converter Station). Manitoba Hydro's ensuing negotiation of a border crossing point with Minnesota Power required a compromise by both parties, but resulted in the selection of a border crossing (Piney West) that was a reasonable choice for the overall Project.

The objective for Round 2 was to select a preferred route to the selected border crossing. With the benefit of the analysis and feedback received during Round 1, alternative routes were developed to the border crossing and presented to the public. Previous engagement feedback had indicated a strong preference for the transmission line to be routed in existing corridors as much as possible. Manitoba Hydro made the decision at this point to allow the evaluation of an alternative that would make use of the existing RVTC resulting in the MMTP line paralleling an existing and a future 500 kV line. While this represented a risk to reliability, Manitoba Hydro can manage this risk as the parallel sections are in close proximity to Winnipeg and repair in the event of multi-line outage event could be quickly achieved. After conducting alternative route evaluation based on the input obtained in Round 2, a preferred route was selected that uses existing corridors from Dorsey Converter Station to the Anola area and then proceed south and east on new ROW to the Piney west border crossing. The route also parallels existing transmission line ROWs for 24 km.

As planning never remains static, a change in the border crossing location was requested by Minnesota Power after Round 2 engagement. With this late change in a fairly key decision point, the routing and engagement processes were adjusted to include development of new route segments and to solicit additional stakeholder input on the location change. The change was accommodated in the same inclusive and transparent way as all other aspects of route planning. A new border crossing was adopted 6.6 km east of the original location with the cooperation of affected landowners and input from stakeholders.

Two of the central issues raised and evaluated throughout the transmission line routing process were the competing values between the use of private or Crown Lands, and the relative effect on natural habitat versus farmland or residences. The models and related criteria used in the route evaluation process represented these trade-offs in the decision-making process, and helped guide the selection of a route that balances these overall concerns. On a smaller scale, considerable efforts were made throughout the routing and engagement processes to understand the concerns and preferences of individual landowners that would be directly affected by the transmission line. Wherever possible route adjustments were made to address these concerns, or alternative mitigation measures explored such as tower spotting, or selection of tower type (see Chapter 3 – Public Engagement for more details).

While controversial, Manitoba Hydro selected a preferred route in Round 2 that ran west of the Watson P. Davidson WMA through land with a higher proportion of private landholdings, across more agricultural lands and in closer proximity to homes than a more natural area east of the WMA. As discussed, this decision was made after careful analysis and consideration of feedback from all perspectives. The route selected was determined to be the preferred option because it mitigated concerns related to habitat fragmentation, effects on high quality wildlife habitat, and lands of importance from feedback through the First Nations and Metis engagement process. Concerns pertaining to effect on private lands, proximity to residential development and effect on agricultural activities were considered carefully. Every effort was made to address concerns of individual landowners and producers through more discrete route re-alignments and other mitigative measures (tower type, tower placement, biosecurity protocols).

The objective for Round 3 was to finalize the placement of the preferred route selected in Round 2. Usually finalizing the preferred route would entail gathering input from the PEP and FNMEP and discipline specialists and making small changes to the route within a mile wide buffer. However, because of the level of concern received from Round 3 PEP regarding the proximity of the route to residential developments near La Broquerie, larger deviations were considered than would be usual at this stage. For this reason the exercise of finalizing the preferred route became more complicated and required a rigorous comparison of alternative options, using the alternative route evaluation and preference determination models to guide decision-making.

The resulting 213 km long Final Preferred Route represents a reasonable balancing of perspectives and values, incorporating mitigation proposed during the public and First Nations and Metis engagement processes. By making use of 92 km of existing Manitoba Hydro

owned/eased lands in the existing corridors, only 121 km of new ROW is required for the transmission line. Of this new ROW, approximately 30% is Crown owned land, and 70% is privately owned. Other features of note include:

The routing process and methodology used for this Project was developed in direct response to recommendations the Clean Environment Commission made on earlier transmission projects to be inclusive, rigorous and transparent. The Final Preferred Route selected for tor this Project is representative of those objectives and has benefited from early engagement and input from the public and First Nation and Metis engagement processes.

5.9 References

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Appendix 5A
Model Development

5A Model Development

5A.1 Introduction

The transmission line routing process used to determine the route for MMTP, was enhanced by incorporating tools and techniques from the EPRI –GTC Transmission line siting methodology (EPRI-GTC 2006). The EPRI-GTC siting methodology requires the development of four separate models:

- macro corridor model
- alternative corridor model
- alternative route evaluation model
- preference determination model

Manitoba Hydro developed these models in 2013 to be applicable to routing 115 kV to 230 kV transmission lines in southern Manitoba. The original models and the models developed for MMTP are described in the following sections.

5A.2 Macro Corridor Model

The macro corridor model (Table 5A-1) identifies corridors that limit adverse effects on built and natural environments (EPRI-GTC 2006). In many cases, paralleling existing transmission lines or existing road rights-of-way can limit adverse effects on these environments therefore these criteria make up the model. The model is based on general preferences to parallel roads and transmission lines across various land use categories.

Table 5A-1 Macro Corridor Model[1]

Feature	Cross Country	Roads	T/Ls
Agriculture	6	6	6
Forage Crops	6	6	6
Coniferous Forest	3	3	3
Coniferous - Dense	3	3	3
Coniferous - Open	3	3	3
Coniferous - Sparse	3	3	3
Deciduous Forest	3	3	3
Broadleaf - Dense	3	3	3
Broadleaf - Open	3	3	3

Feature	Cross Country	Roads	T/Ls
Mixedwood - Forest	3	3	3
Mixedwood - Dense	3	3	3
Mixedwood - Open	3	3	3
Mixedwood - Sparse	3	3	3
Named Roads and Highways	5	1	5
Barren Non-vegetated	1	2	2
Herb/Open/Shrub	3	3	3
Herb - Grassland	3	3	3
Water (Spannable)	7	7	7
Shrubland	2	2	2
Shrub Tall	2	2	2
Shrub low/forest cutblocks	2	2	2
Snow/Ice	9	9	9
Rock/Rubble	1	2	2
Transmission Corridor	5	5	1
Exposed Land (Urbanized)	9	9	9
Wetland	6	6	6
Wetland - Treed	6	6	6
Wetland - Shrub	6	6	6
Wetland - Herb	6	6	6

NOTE:
[1] Values range from 1 (most suitable) to 9 (least suitable).

5A.3 Alternative Corridor Evaluation Model

The alternative corridor evaluation model, used to create the alternative corridors, was developed using input from stakeholders during workshops conducted May 6–8, 2013.

The stakeholders represented a broad range of interests:

- Engineering perspective
  - Manitoba Infrastructure and Transportation
  - Manitoba Hydro
- Natural perspective
  - Fisheries and Oceans Canada
  - Ducks Unlimited
  - Nature Conservancy of Canada
  - Protected Areas Initiative
  - Parks and Natural Areas Branch (MCWS)
  - Wildlife Branch (MCWS)
  - Forestry Branch (MCWS)
  - Manitoba Woodlot Association
  - Manitoba Trappers Association
  - Bird Atlas
  - Manitoba Lodge and Outfitters Association
  - Manitoba Hydro
  - Manitoba Trappers Association
  - Seine-Rat River CD
- Built perspective
  - KAP (Keystone Agricultural Producers)
  - University of Manitoba
  - Manitoba Aboriginal and Northern Affairs
  - Manitoba Agriculture, Food and Rural Initiatives
  - Manitoba Culture, Heritage and Tourism
  - Local Government Planners
  - Manitoba Aerial Applicators Association
  - Manitoba Hydro
  - Ruth Marr Consulting

- Manitoba Trappers Association
- City of Winnipeg - Planning Department

A model based on the stakeholders' preferences was developed to represent the suitability of features on the landscape in southern Manitoba for transmission line routing. The resulting model (Table 5A-2) includes:

- data layers (light green; *i.e.*, linear infrastructure)
- features (light yellow; *i.e.*, unused ROW [Manitoba Hydro owned])
- layer weights (dark green; *i.e.*, 35.7% for linear infrastructure)
- suitability values (dark yellow; *i.e.*, 1 for unused ROW (Manitoba Hydro owned)
- areas of least preference (red; *i.e.*, protected areas)

Definitions for each criteria are provided in Table 5A-3.

Based on each stakeholder's field of expertise and interest, each was assigned to a group for one of the three perspectives (built, natural or engineering environment). Guided by workshop facilitators, each group identified and defined a set of data layers, features within each data layer, and areas of least preference.

Areas of least preference are features to avoid when routing a transmission line due to physical constraints (extreme slopes, long water crossings), regulations limiting development (protected areas), or areas that would require more extensive mitigation or compensation. Features that constitute areas of least preference were determined by the stakeholder groups and are listed in red in Table 5A-2.

Table 5A-2 Southern Manitoba Alternative Corridor Evaluation Model

Engineering		*Natural*		*Built*	
Linear Infrastructure	**35.7%**	**Aquatics**	**10.0%**	**Proximity to Buildings**	**8.8%**
Unused ROW (Manitoba Hydro owned)	1	No Aquatic Feature	1.0	> 800 m	1
Parallel Roads ROW	2.6	Ephemeral Streams (Non-Fish Bearing)	4.9	400 – 800 m	2.8
Municipal Road Allowances	3.1	Spannable Waterbodies (Lakes and Ponds)	6.1	100 – 400 m	6.5
Parallel Provincial Highways ROW	3.4	Ephemeral Streams (Fish Bearing)	6.3	ROW – 100 m	9
Parallel Existing Transmission Lines	3.8	Swamps	6.8	**Building Density**	**14.4%**
No Linear Infrastructure	4.4	Ephemeral Streams (CRA Fish Bearing)	6.9	< 1 Building/Acre (Rural Agricultural)	1.0
Rebuild Existing Transmission Line	5	Riparian Floodplain	7.1	1 Building per 1-5 acres	2.8
Parallel Oil/Gas Transmission Pipeline	5.6	Permanent Stream	7.5	1-3 Buildings/Acre (Rural Residential)	3.7
Parallel Railway ROW	5.6	Bogs	7.7	3-10 Buildings/Acre (Suburban)	7.2
Future MIT Plans	7.8	Fens	8.2	>10 Buildings/Acre (Urban)	9.0
>= 300 kV Transmission Line/Within Buffer	8.5	Marsh	8.2	**Proposed Development**	**3.4%**
Within Road, Railroad, or Utility ROW	9	Permanent Stream (CRA Fish Bearing)	9.0	No Proposed Development	1.0
Spannable Waterbodies	**10.4%**	**Special Features**	**42.4%**	Proposed Development – Industrial	3.1
No Waterbody	1	No Special Land	1.0	Proposed Development – Agriculture	3.7
Non-Nav. Spannable Waterbody (Standard Structures)	2.8	Managed Woodlots	5.4	Proposed Development - Commercial	5.1
Nav. Spannable Waterbody (Standard Structures)	4.3	Crown Land With Special Code	7.0	Permitted Development	6.4
Non-Nav. Spannable Waterbody (Specialty Structures)	6	Community Pastures	7.3	Proposed Development - Rural Residential Zoning	6.7
Nav. Spannable Waterbody (Specialty Structures)	9	Flyways	7.5	Proposed Development - Urban Zoning	9.0
Geotechnical Considerations	**30.2%**	Areas of Special Interest (ASI)	7.8	**Soil Capability and Agricultural Use**	**11.7%**
Rock	1	Recreation Provincial Park (Non-Protected Portions)	8.0	Other	1.0
No Special Geotechnical Considerations	1.3	Conservation Easements	8.0	Class 6 and 7 (Low Productivity)	3.3
100 Year Floodplain	6.6	Wildlife Management Area (Non-Protected Portions)	8.2	Organic Soils/Peat Bogs/Sod Production	3.6

Engineering		*Natural*		*Built*	
Wetland/Peatlands	9	Proposed Protected Areas	8.6	Artisanal Farms/Wild Rice	4.1
Mining Operations/Quarries	**13.2%**	Heritage Rivers	8.7	Class 4 and 5 (Forages, Transitional)	5.6
No Mining Operation	1	Important Bird Areas	8.7	Class 1- 3 (Prime Ag./Cultivated Land)	9.0
Abandoned/Inactive Mines (*e.g.*, Aggregate Piles, Pits)	6.5	Heritage Marshes	8.9	**Land Use**	**16.0%**
Mine-owned Land	9	Conservation Lands	8.9	Forest	1.0
Slope	**5.4%**	Natural Provincial Park (Non-Protected Portions)	9.0	Burnt Areas	1.6
Slope 0 – 15%	1	**Land Cover**	**10.2%**	Open Land (Sand and Gravel)	2.0
Slope 15 – 30%	3.1	Exposed/Urbanized/Open Land	1.0	Industrial	2.1
Slope >30%	9	Agricultural (Forage)	2.5	Active Forestry Operation	2.4
Proximity to Future Wind Farms	**5.1%**	Agricultural (Crops)	2.8	Hunting/Trapping Locations	4.0
500m – 10 k	1	Burnt Areas	4.9	Listed Trails (Existing and Planned)	4.6
Within future wind farm	5	Grassland	5.0	Organic Farming	5.4
> 10 k	9	Deciduous Forest	5.5	WMAs (Unprotected)	5.4
		Coniferous Forest	5.7	Agricultural (Forage)	5.5
		Mixed Forest	6.0	Out-of-Park Recreational Development	6.0
		Non-Developed Sand Hills	8.1	Agricultural (Crops)	6.9
		Native Grassland	9.0	Intense Development and Use	6.9
		Wildlife Habitat	**37.4%**	500m Buffer of Irrigated Land	7.3
		Other	1.0	Intensive Livestock	7.3
		Ungulate Habitat (High)	6.1	In-Park Recreational Development	7.5
		Waterfowl Habitat (High)	6.3	Institutional	7.5
		Waterfowl Paired Density (High)	6.9	Agricultural (Aerial Application)	8.5
		Waterfowl Hotspots (High)	7.0	Irrigated Land	9.0
		Grouse Lek Area	7.7	**National/Provincial/Municipal Historic Sites**	**13.1%**
		Rare Species Habitat	8.0	> 300 m	1.0
		Critical Habitat	9.0	200 – 300 m	9.0
		Endangered Species Habitat	9.0	**Proximity to Heritage Sites**	**12.2%**
				> 300 m	1.0
				200 – 300 m	9.0

Areas of Least Preference
Wastewater Treatment Areas
Buildings
Oil Well Heads
Waste Disposal Sites
Towers and Antennae
Existing Wind Turbine
Military Facilities/Past Military Installations
Protected Areas
Special Conservation Areas/Ecological Reserves
Non-Spannable Waterbodies (>300 m)
World Heritage Sites
Wildlife Refuge
Mines and Quarries (Active)
Contaminated Sites

Engineering	*Natural*	*Built*	
Wildlife Management Area (Protected Portions)		**Landscape Character (Viewsheds)**	**8.7%**
National Parks		Other	1.0
Wilderness/Heritage Provincial Park		Recreational Trails	4.1
Indian Reserves/TLE Selections		Cottage Subdivisions	6.0
Campgrounds and Picnic Areas		Scenic Provincial Trails and Roads	6.3
Airports/Aircraft Landing Areas (glide path)		Escarpments (Timeless Topography)	7.4
Recreational Centers (*e.g.*, golf, skiing)		Resort Lodges and Campgrounds	7.9
Federal/Provincial/Municipal Heritage Sites		Residential	8.9
Provincial Park Reserves		Designated Historic Sites	9.0
Heritage Plaques		**Edge of Field**	**11.7%**
Schools/Day Care Parcels		Road Allowances	1.0
Cemeteries/Burial Grounds		Drains	1.8
Recreation/Natural Provincial Park (Protected)		Quarter or Half-Mile Section Lines	1.9
Known Archaeological Sites		Vacant Rail ROW	2.2
National, Provincial, Municipal Historic Sites		Parallel/Adjacent To Road Allowances	2.9
Religious/Worship Site Parcels		Other (None of the Above)	9.0

Table 5A-3 Alternative Corridor Model Criteria Definitions

Criteria	Description
ENGINEERING	
Linear Infrastructure	
No Linear Infrastructure	All areas not covered by one of the criteria below
Unused ROW (Manitoba Hydro owned)	Manitoba Hydro ROW that has room to accommodate the proposed line
Parallel Roads ROW	Buffers were placed on road, Provincial Highway, Existing Transmission Line (<300 kV), Pipeline and Railway Rights-of-Way. Areas within these buffers would constitute paralleling
Parallel Provincial Highways ROW	
Parallel Existing Transmission Lines (<300kV)	
Parallel Oil/Gas Transmission Pipeline	
Parallel Railway ROW	
>= 300 kV Transmission Line and Within Separation Buffer	A 10 km buffer (separation buffer) was placed on all transmission lines >= 300 kV
Within Road, Railroad, or Utility ROW	Existing Road, Railway and utility ROWs
Spannable Waterbodies	
No Waterbody	All areas not covered by one of the criteria below
Spannable Waterbody (Standard Structures)	All waterbodies less than 300 m across
Geotechnical Considerations	
Rock	Land cover class – Rock
No Special Geotechnical Considerations	All areas not covered by one of the other criteria
100-year Floodplain	Areas within the 100-year floodplain
Wetland/Peatlands	Land cover class – Wetland/Peatland
Mining Operations/Quarries	
No Mining Operation	All areas not covered by one of the criteria below
Abandoned/Inactive Mines (*e.g.*, Aggregate Piles, Pits)	All areas where an abandoned or inactive mine is present
Mine-owned Land	All parcels that are mine-owned

Criteria	Description
Slope	
Slope 0 – 15%	Areas with a slope less than 15%
Slope 15 – 30%	Areas with a slope between 15 to 30%
Slope >30%	Areas with a slope greater than 15%
Proximity to Future Wind Farms	
500 m – 10 k	All areas that are within 500 to 10,000 m from future wind farms
>10 k	All areas that are over 10,000 m from a future wind farm
NATURAL	
Aquatics	
No Aquatic Feature	All areas not covered by one of the criteria below
Ephemeral Streams (Non-Fish Bearing)	All streams classified Type E based on Fisheries and Oceans Canada habitat classification
Spannable Waterbodies (Lakes and Ponds)	All waterbodies less than 300 m across
Fens	Wetland classification based on the Forest Resource Inventory
Marsh	Wetland classification based on the Forest Resource Inventory
Permanent Stream	All permanent streams not classified Type A or B streams based on Fisheries and Oceans Canada habitat classification
Permanent Stream (CRA Fish Bearing)	All Type A and B streams based on Fisheries and Oceans Canada habitat classification
Special Features	
No Special Land	All areas not covered by one of the criteria below
Managed Woodlots	Areas of land designated as Manitoba Forestry Association Woodlot Locations
Crown Land With Special Code	Land that is Crown-owned with a special code
Areas of Special Interest (ASI)	Areas within the province that represent the enduring features found within the region designated as areas of special interest
Recreation Provincial Park (Non-Protected Portions)	Areas that are designated as recreational provincial parks, only the non-protected portions

Criteria	Description
Wildlife Management Area (Non-Protected Portions)	Areas that are designated as wildlife management areas, only the non-protected portions
Proposed Protected Areas	Areas that are being proposed as protected areas within the region
Heritage Rivers	Areas designated by the Canadian Heritage Rivers Systems as being protected
Heritage Marshes	Areas designated by the Manitoba Heritage Marsh Program as being protected
Conservation Lands	All locations off Nature Conservancy Canada property interests
Land Cover	
Exposed/Urbanized/Open Land	Land cover features as compiled by Landsat Thematic Mapper imagery. Data were collected in 2005-2006
Agricultural (Forage)	
Agricultural (Crops)	
Burnt Areas	
Grassland	
Deciduous Forest	
Coniferous Forest	
Mixed Forest	
Native Grassland	
Wildlife Habitat	
Other	All areas not covered by one of the criteria below
Ungulate Habitat (High)	Areas identified a ungulate wildlife habitat
Critical Habitat	Critical habitat as defined by SARA as “the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species’ critical habitat in the recovery strategy or in an action plan for the species”
Endangered Species Habitat	Land cover classified as having an endangered species habitat

Criteria	Description
BUILT	
Proximity to Buildings	
> 800 m	Areas that are farther than 800 m from buildings
400 – 800 m	Areas that are between 400 and 800 m from buildings
100 – 400 m	Areas that are between 100 and 400 m from buildings
ROW – 100 m	Areas that are between the ROW and 100 m from buildings
Building Density	
< 1 Building/Acre (Rural Agricultural)	Areas that have a building density of less than 1 building per acre
1 Building per 1-5 acres	Areas that have a building density of 1 building per 1 to 5 acres
1-3 Buildings/Acre (Rural Residential)	Areas that have a building density of 1 to 3 buildings per acre
3-10 Buildings/Acre (Suburban Density)	Areas that have a building density of 3 to 10 buildings per acre
Proposed Development	
No Proposed Development	All areas not covered by one of the criteria below
Proposed Development – Industrial Zoning	Administrative areas indicating the Development plan of the respective RM which is a long range development plan projected for the next 20-30 years
Proposed Development – Agriculture Zoning	
Proposed Development – Commercial Zoning	
Proposed Development – Rural Residential Zoning	
Soil Capability and Agricultural Use	
Other	All areas not covered by one of the criteria below
Class 6 and 7 (Low Productivity)	Soils classified from the MB Soils Database from a combination of all the digital RM soils data available on the MLI website
Organic Soils/Peat Bogs/Sod Production	
Class 4 and 5 (Forages, Transitional)	
Class 1-3 (Prime Agricultural and Cultivated Land)	

Criteria	Description
Land Use	
Forest	Land use features as compiled by Landsat Thematic Mapper imagery. Data were collected in 2005-2006
Open Land (Sand and Gravel)	
Burnt Areas	Areas that have been classified as having a fire occur in the vicinity
Active Forestry Operation	Areas representing quota holders for the 2010-2015 timber sale plan
Listed Trails (Existing and Planned)	Trails that are listed as snowmobile trails within Manitoba
Agricultural (Forage)	Land use features as compiled by Landsat Thematic Mapper imagery. Data were collected in 2005-2006
Intense Development and Use	
Agricultural (Crops)	
Intensive Livestock	All Hog Operation Farms within the region
National, Provincial, and Municipal Historic Sites	
> 300 m	Areas that are greater than 300 m from various historic sites
200 – 300 m	Areas that are between 200 and 300 m from various historic sites
Proximity to Heritage Sites	
> 300 m	Areas that are greater than 300 m from various heritage sites
200 – 300 m	Areas that are between 200 and 300 m from various heritage sites
Landscape Character (Viewsheds)	
Recreational Trails	All areas within the viewshed of these various layers
Identified Scenic Provincial Trails and Roads	
Resort Lodges and Campgrounds	
Designated Historic Sites	
Edge of Field	
Road Allowances	Areas between sections provided for roads, where no roads have been built
Drains	All drains
Quarter Section Lines/Half-Mile Section Lines	All quarter and half-mile section lines

Criteria	Description
Parallel Or Adjacent To Road Allowances	Areas between sections provided for roads, where no roads have been built, that are parallel or adjacent
Other (None of the Above)	All areas not covered by one of the criteria above

5A.3.1 MMTP Alternative Corridor Evaluation Model

For MMTP (500 kV), the model was reviewed and adjusted for the context of a 500 kV line (Table 5A-4). The following adjustments were made to components of the linear infrastructure feature of the engineering sub-model:

- Unused ROW (Manitoba Hydro owned)
  - Slightly less preferred than no linear features as there are more constraints and would need to consider other infrastructure in tower spotting and design.
- Parallel Roads ROW
  - Less desirable than with a 230 kV line due to the number of other constraining factors such as existing distribution lines, and how far in field towers would have to be placed.
- Municipal Road Allowances
  - Removed as 500 kV structures cannot fit in the municipal road allowance.
- Parallel Provincial Highways ROW
  - Slightly less preferred for a 500 kV line.
- Parallel Existing Transmission Lines (<300 kV)
  - No change.
- No Linear Infrastructure
  - Most preferred as there would be less impeding factors like other linear structures to avoid.
- Rebuild Existing Transmission and Sub-Transmission Line
  - Removed as this is not a consideration for this Project.
- Parallel Oil/Gas Transmission Pipeline
  - Slightly less preferred (potential for induction effects).
- Parallel Railway ROW
  - Slightly less preferred (potential for induction effects).
- Future MIT Plans
  - No change.
- >= 300 kV Transmission Line and Within Separation Buffer
  - No change.
- Within Road, Railroad, or Utility ROW
  - No change.

Table 5A-4 MMTP Adjusted Alternative Corridor Evaluation Model

Engineering		*Natural*		*Built*	
Linear Infrastructure	**35.7%**	**Aquatics**	**10.0%**	**Proximity to Buildings**	**10.0%**
No Linear Infrastructure	1	No Aquatic Feature	1.0	> 800 m	1
Unused ROW (Manitoba Hydro owned)	1.2	Ephemeral Streams (Non-Fish Bearing)	4.9	400 - 800 m	2.7
Parallel Existing Transmission Lines (<300kV)	3.8	Spannable Waterbodies (Lakes and Ponds)	6.1	100 - 400 m	6.5
Parallel Roads ROW	5	Ephemeral Streams (Fish Bearing)	6.3	ROW - 100 m	9
Parallel Provincial Highways ROW	5	Swamps	6.8	**Building Density**	**15.0%**
Parallel Oil/Gas Transmission Pipeline	7	Ephemeral Streams (CRA Fish Bearing)	6.9	< 1 Building/Acre (Rural Agricultural)	1.0
Parallel Railway ROW	7	Riparian Floodplain	7.1	1 Building per 1-5 acres	2.8
Future MIT Plans	7.8	Permanent Stream	7.5	1-3 Buildings/Acre (Rural/Residential)	3.7
>= 300 kV Transmission Line/Within Buffer	8.5	Bogs	7.7	3-10 Buildings/Acre (Suburban)	7.2
Within Road, Railroad, or Utility ROW	9	Fens	8.2	>10 Buildings/Acre (Urban)	9.0
Spannable Waterbodies	**10.4%**	Marsh	8.2	**Proposed Development**	**3.7%**
No Waterbody	1	Permanent Stream (CRA Fish Bearing)	9.0	No Proposed Development	1.0
Non-Nav. Spannable Waterbody (Standard Structures)	2.8	**Special Features**	**42.4%**	Proposed Development – Industrial	3.0
		No Special Land	1.0	Proposed Development – Agriculture	4.1
Nav. Spannable Waterbody (Standard Structures)	4.3	Managed Woodlots	5.4	Proposed Development - Commercial	5.1
		Crown Land With Special Code	7.0	Permitted Development	6.9
Non-Nav. Spannable Waterbody (Specialty Structures)	6	Community Pastures	7.3	Proposed Development - Rural Residential Zoning	6.9
Nav. Spannable Waterbody (Specialty Structures)	9	Flyways	7.5	Proposed Development - Urban Zoning	9.0
Geotechnical Considerations	**30.2%**	Areas of Special Interest (ASI)	7.8	**Soil Capability and Agricultural Use**	**11.9.%**
Rock	1	Recreation Provincial Park (Non-Protected Portions)	8.0	Other	1.0
No Special Geotechnical Considerations	1.3	Conservation Easements	8.0	Class 6 and 7 (Low Productivity)	3.3
100 Year Floodplain	6.6	Wildlife Management Area (Non-Protected Portions)	8.2	Organic Soils/Peat Bogs/Sod Production	3.9
Wetland/Peatlands	9	Proposed Protected Areas	8.6	Artisanal Farms/Wild Rice	4.3

Engineering	
Mining Operations/Quarries	**13.2%**
No Mining Operation	1
Abandoned/Inactive Mines (*e.g,* Aggregate Piles, Pits)	6.5
Mine-owned Land	9
Slope	**5.4%**
Slope 0 - 15%	1
Slope 15 - 30%	3.1
Slope > 30%	9
Proximity to Future Wind Farms	**5.1%**
500m - 10k	1
> 10k	9

Areas of Least Preference
Wastewater Treatment Areas
Buildings
Oil Well Heads
Waste Disposal Sites
Towers and Antennae
Existing Wind Turbine
Military Facilities/Past Military Installations
Protected Areas
Special Conservation Areas/Ecological Reserves
Non-Spannable Waterbodies (>300 m)
World Heritage Sites
Wildlife Refuge
Mines and Quarries (Active)
Contaminated Sites
Wildlife Management Area (Protected Portions)
National Parks

Natural	
Heritage Rivers	8.7
Important Bird Areas	8.7
Heritage Marshes	8.9
Conservation Lands	8.9
Natural Provincial Park (Non-Protected Portions)	9.0
Land Cover	**10.2%**
Exposed/Urbanized/Open Land	1.0
Agricultural (Forage)	2.5
Agricultural (Crops)	2.8
Burnt Areas	4.9
Grassland	5.0
Deciduous Forest	5.5
Coniferous Forest	5.7
Mixed Forest	6.0
Non-Developed Sand Hills	8.1
Native Grassland	9.0
Wildlife Habitat	**37.4%**
Other	1.0
Ungulate Habitat (High)	6.1
Waterfowl Habitat (High)	6.3
Waterfowl Paired Density (High)	6.9
Waterfowl Hotspots (High)	7.0
Grouse Lek Area	7.7
Rare Species Habitat	8.0
Critical Habitat	9.0
Endangered Species Habitat	9.0

Built	
Class 4 and 5 (Forages, Transitional)	5.9
Class 1- 3 (Prime Ag./Cultivated Land)	9.0
Land Use	**16.0%**
Forest	1.0
Open Land (Sand and Gravel)	1.5
Industrial	1.6
Burnt Areas	1.8
Active Forestry Operation	2.3
Hunting/Trapping Locations	3.9
Listed Trails (Existing and Planned)	4.6
Organic Farming	5.5
WMAs (Unprotected)	5.8
Agricultural (Forage)	4.9
Out-of-Park Recreational Development	6.4
Agricultural (Crops)	6.6
Intense Development and Use	6.5
500m Buffer of Irrigated Land	6.6
Intensive Livestock	6.9
In-Park Recreational Development	7.9
Institutional	7.4
Agricultural (Aerial Application)	8.9
Irrigated Land	9.0
National/Provincial/Municipal Historic Sites	**12.0%**
> 300 m	1.0
200 - 300 m	9.0
Proximity to Heritage Sites	**12.0%**
> 300 m	1.0
200 - 300 m	9.0
Landscape Character (Viewsheds)	**7.8%**
Other	1.0

Engineering	*Natural*	*Built*	
Wilderness/Heritage Provincial Park		Recreational Trails	4.1
Indian Reserves/TLE Selections		Cottage Subdivisions	6.1
Campgrounds and Picnic Areas		Scenic Provincial Trails and Roads	6.8
Airports/Aircraft Landing Areas (glide path)		Escarpments (Timeless Topography)	7.5
Recreational Centers (*e.g.*, golf, skiing)		Resort Lodges and Campgrounds	8.6
Federal/Provincial/Municipal Heritage Sites		Residential	8.9
Provincial Park Reserves		Designated Historic Sites	9.0
Heritage Plaques		**Edge of Field**	**11.7%**
Schools/Day Care Parcels		Road Allowances	1.0
Cemeteries/Burial Grounds		Drains	1.8
Recreation/Natural Provincial Park (Protected Portions)		Quarter Section/Half-Mile Lines	2.0
Known Archaeological Sites		Vacant Rail ROW	2.1
National, Provincial, Municipal Historic Sites		Parallel/Adjacent To Road Allowances	2.8
Religious/Worship Site Parcels		Other (None of the Above)	9.0

5A.3.1.1 Calibrating the Alternative Corridor Evaluation Model

Based on the available data, the alternative corridor evaluation model is adjusted. In some cases, a data set was not available to represent the factors in the model or certain components within each factor were not present in the route planning area. If a component within a layer is not present, or the data are not available, the component is removed from the model. If the component(s) removed had a suitability score of 1 or 9, the other features were adjusted as every layer requires a 1 and 9.

If a factor (*i.e.*, slope) was removed, the weight of that layer was redistributed evenly among the remaining factors. The adjustments made to each sub-model are provided below.

Engineering Environment

The adjusted engineering environment sub-model for MMTP is summarized below.

Table 5A-5 Engineering Environment Adjusted Layers and Weights

Engineering		
Linear Infrastructure	37.7%	Reason
Unused ROW (Manitoba Hydro owned)	1	
Parallel Roads ROW	2.6	
Municipal Road Allowances	3.1	
Parallel Provincial Highways ROW	3.4	
Parallel Existing Transmission Lines (<300kV)	3.8	
No Linear Infrastructure	4.4	
Rebuild Existing Transmission and Sub-Transmission Line	-	Not an option on this Project
Parallel Oil/Gas Transmission Pipeline	5.6	
Parallel Railway ROW	5.6	
Future MIT Plans	-	No data available
>= 300 kV Transmission Line and Within Separation Buffer	8.5	
Within Road, Railroad, or Utility ROW	9	
Spannable Waterbodies	11.0%	
No Waterbody	1.0	
Non-Nav. Spannable Waterbody (Standard Structures)	-	No data available
Nav. Spannable Waterbody (Standard Structures)	9.0	
Non-Nav. Spannable Waterbody (Specialty Structures)	-	No data available
Nav. Spannable Waterbody (Specialty Structures)	-	Does not occur in the route planning area
Geotechnical Considerations	31.9%	
Rock	-	Does not occur in the route planning area
No Special Geotechnical Considerations	1.0	
100 Year Floodplain	6.5	
Wetland/Peatlands	9.0	
Mining Operations/Quarries	14.0%	
No Mining Operation	1	
Abandoned/Inactive Mines (*e.g.*, Aggregate Piles, Pits)	-	Does not occur in the route planning area
Mine-owned Land	9	

Slope	0.0%	
Slope 0 – 1%	-	No slopes >15% within the route planning area.
Slope 15 – 30%	-	
Slope > 30%	-	
Proximity to Future Wind Farms	5.4%	
500 m – 10 k	1	
> 10 k	9	

Natural Environment

The adjusted natural environment sub-model for MMTP is summarized below.

Table 5A-6 Natural Environment Adjusted Data Layers and Weights

Natural		
Aquatics	10.0%	Reason
No Aquatic Feature	1.0	
Ephemeral Streams (Non-Fish Bearing)	4.9	
Spannable Waterbodies (Lakes and Ponds)	6.1	
Ephemeral Streams (Fish Bearing)	-	No data available
Swamps	-	No data available
Ephemeral Streams (CRA Fish Bearing)	-	No data available
Riparian Floodplain	-	Does not occur in the route planning area
Permanent Stream	7.5	
Bogs	-	Does not occur in the route planning area
Fens	8.2	
Marsh	8.2	
Permanent Stream (CRA Fish Bearing)	9.0	
Special Features	42.4%	
No Special Land	1.0	
Managed Woodlots	5.5	
Crown Land With Special Code	7.1	
Community Pastures	7.4	
Flyways	-	No data available
Areas of Special Interest (ASI)	7.9	
Recreation Provincial Park (Non-Protected Portions)	8.1	
Conservation Easements	-	No data available
Wildlife Management Area (Non-Protected Portions)	-	Does not occur in the route planning area
Proposed Protected Areas	8.7	
Heritage Rivers	8.8	
Important Bird Areas	-	Does not occur in the route planning area
Heritage Marshes	9.0	
Conservation Lands	9.0	
Natural Provincial Park (Non-Protected Portions)	-	Does not occur in the route planning area
Land Cover	10.2%	
Exposed/Urbanized/Open Land	1.0	
Agricultural (Forage)	2.5	
Agricultural (Crops)	2.8	
Burnt Areas	4.9	
Grassland	5.0	
Deciduous Forest	5.5	

Coniferous Forest	5.7	
Mixed Forest	6.0	
Non-Developed Sand Hills	-	No data available
Native Grassland	9.0	
Wildlife Habitat	37.4%	
Other	1.0	
Ungulate Habitat (High)	6.1	
Waterfowl Habitat (High)	-	No data available
Waterfowl Paired Density (High)	-	No data available
Waterfowl Hotspots (High)	-	No data available
Grouse Lek Area	-	No data available
Rare Species Habitat	-	No data available
Critical Habitat	9.0	
Endangered Species Habitat	9.0	

Built Environment

The adjusted built environment data layers and their relative weights are summarized below. Items in grey were not present in the route planning area or no suitable data source could be identified to represent their locations.

Table 5A-7 Built Environment Adjusted Data Layers and Weights

Built		
Proximity to Buildings	10.0%	Reason
> 800 m	1	
400 - 800 m	2.7	
100 - 400 m	6.5	
ROW - 100 m	9	
Building Density	15.0%	
< 1 Building/Acre (Rural Agricultural)	1.0	
1 Building per 1-5 acres	3.3	
1-3 Buildings/Acre (Rural Residential)	4.5	
3-10 Buildings/Acre (Suburban Density)	9.0	
>10 Buildings/Acre (Urban)	-	Does not occur in the route planning area
Proposed Development	3.7%	
No Proposed Development	1.0	
Proposed Development - Industrial Zoning	3.7	
Proposed Development - Agriculture Zoning	5.2	
Proposed Development - Commercial Zoning	6.6	
Permitted Development	-	No data available
Proposed Development - Rural Residential Zoning	9.0	
Proposed Development - Urban Zoning	-	No data available
Soil Capability and Agricultural Use	11.9%	
Other	1.0	
Class 6 and 7 (Low Productivity)	3.3	
Organic Soils/Peat Bogs/Sod Production	3.9	
Artisanal Farms/Wild Rice	-	No data available
Class 4 and 5 (Forages, Transitional)	5.9	
Class 1- 3 (Prime Agricultural and Cultivated Land)	9.0	
Land Use	16.0%	
Forest	1.0	
Open Land (Sand and Gravel)	1.7	
Industrial	-	No data available
Burnt Areas	2.1	

Active Forestry Operation	2.8	
Hunting/Trapping Locations	-	No data available
Listed Trails (Existing and Planned)	5.9	
Agricultural (Forage)	6.3	
Waters and Wetlands	7.1	
Organic Farming	-	Does not occur in the route planning area
WMA's (Unprotected)	-	Does not occur in the route planning area
Out-of-Park Recreational Development	-	No data available
Intense Development and Use	8.5	
Agricultural (Crops)	8.6	
500m Buffer of Irrigated Land	-	No data available
Intensive Livestock	9.0	
Institutional	-	No data available
In-Park Recreational Development	-	No data available
Agricultural (Crops Limited to Aerial Application)	-	No data available
Irrigated Land	-	No data available
National, Provincial, and Municipal Historic Sites	12.0%	
> 300 m	1.0	
200 - 300 m	9.0	
Proximity to Heritage, Archaeological Sites, and Centennial Farms	12.0%	
> 300 m	1.0	
200 - 300 m	9.0	
Landscape Character (Viewsheds)	7.8%	
Other	-	No data available
Recreational Trails	14.4%	
Cottage Subdivisions	-	No data available
Identified Scenic Provincial Trails and Roads	23.9%	
Escarpments (Timeless Topography)	-	No data available
Resort Lodges and Campgrounds	30.1%	
Residential	-	No data available
Designated Historic Sites	31.6%	
Edge of Field	11.7%	
Road Allowances	1.0	
Drains	1.8	
Quarter Section Lines/Half-Mile Section Lines	1.9	
Vacant Rail ROW	-	Does not occur in the route planning area
Parallel Or Adjacent To Road Allowances	2.9	
Other (None of the Above)	9.0	

Areas of Least Preference

The adjusted areas of least preference data layers are summarized below.

Table 5A-8 Areas of Least Preference Adjusted Data Layers

Areas of Least Preference	Reason
Non-Spannable Waterbodies (300 m)	
Mines and Quarries (Active)	
Wastewater Treatment Areas	
Buildings	
Oil Well Heads (100m)	
Waste Disposal Sites	No data available
Towers and Antennae Area of Potential Affect (< 200 m)	
Existing Wind Turbine Area of Potential Affect (< 500 m)	
Airports (Including Glide Paths - 2° Slope)	

Federal Park	Does not occur in the route planning area
Military Facilities	Does not occur in the route planning area
Protected Areas	
World Heritage Sites	Does not occur in the route planning area
Special Conservation Areas	Does not occur in the route planning area
Ecological Reserves	
Wildlife Refuge	Does not occur in the route planning area
Natural Provincial Park (Protected Portions)	
Recreation Provincial Park (Protected Portions)	
Wildlife Management Area (Protected Portions)	
National Parks	
Provincial Park Reserves	
Wilderness Provincial Park	
Heritage Provincial Park	Does not occur in the route planning area
Indian Reserves	
Treaty Land Entitlement Selection	
Campgrounds and Picnic Areas	
Aircraft Landing Areas (*e.g.*, STARS, Flying Farmers, Float Planes) (3 Miles In-Line with Glide Path or Transport Canada Designation)	
Recreational Centers (*e.g.*, Golf, Skiing)	
Federal Heritage Sites (200 m)	No data available
Provincial Heritage Sites (200 m)	
Municipal Heritage Sites (200 m)	
Heritage Plaques (200 m)	No data available
Day Care Parcels	No data available
Cemeteries/Burial Grounds	
Schools	
Past Military Installations	No data available
Contaminated Sites	No data available
Known Archaeological and Paleoarchaeological Site (300 m)	
National, Provincial, and Municipal Historic Site (200 m)	
Religious/Worship Site Parcels	

5A.4 Alternative Route Evaluation Model

The alternative route evaluation model (Table 5A-9) was developed by Manitoba Hydro team members during the model calibration meeting for transmission line routing in southern Manitoba (Table 5A-9). The team determined the criteria in the model as well as the relative weights of each criterion. The criteria are informed by feedback received during previous projects and engagement processes. The criteria are grouped into engineering, natural, and built perspectives and each criterion is given a weight. Definitions for each of the model criteria are provided in Table 5A-10.

Table 5A-9 Alternative Route Evaluation Model

Criteria	Weight
Built	
Relocated Residences – Within ROW	35.3%
Potential Relocated Residences (100 m) – Edge of ROW	19.1%
Proximity to Residences (100-400 m) – Edge of ROW	6.4%
Proposed Developments – Within ROW	1.1%
Irrigated Land (Acres) – ROW	2.6%
Shelter Belts (Acres) – ROW	6.5%
Diagonal Crossings of Agriculture Crop Land (km)	2.5%
Diagonal Crossings of Agriculture Crop Land (km)	6.7%
Proximity to Buildings and Structures (100 m) – EOROW	1.3%
Public Use Areas (250m) – EOROW	1.1%
Historic/Cultural Resources (250 m) – Edge of ROW	10.1%
Potential Commercial Forest (Acres) – ROW	7.3%
Natural	
Natural Forests (Acres) – ROW	4.4%
Stream/River Crossings – Centerline	1.7%
Wetland Areas (Acres) – ROW	11.2%
High Quality Wildlife Habitat (Acres) – ROW	15.6%
Floodplain/Riparian Areas (Acres) – ROW	8.0%
Special Areas (*e.g.*, ASI, Proposed Protected Areas)	27.5%
Native Grassland Areas (Acres) – ROW	31.7%
Engineering	
% Parallel Existing T/L	8.2%
% Parallel Roads	8.2%
% Rebuild Existing T/L (*e.g.*, Reconductor, Double Circuit)	24.6%
Length in Separation Buffer (Km)	37.1%
Existing Transmission Line Crossings (#)	3.8%
Accessibility	15.2%
Total Project Costs	**2.9%**

Table 5A-10 Model Criteria Definitions

Criteria	Measurement	Criteria Description
Built		
Relocated Residences – Within ROW	Count	Occupied Residence categorized in buildings layer and windshield surveys
Proximity to Residences (edge of ROW to 100 m)	Count	As Above
Proximity to Residences (100-400 m from Edge of ROW)	Count	As Above
Proposed Residential Developments - Within ROW	Count	Quarter section of land within which there is an approved residential subdivision
Current Agricultural Land Use (Acres) – ROW	Acres	Apply weighting based on production values to annual crop (2.7x) and hayland (1x) land cover classes
Land Capability for Agriculture (Acres) – ROW	Acres	Apply weighting to agricultural capability classes - Classes 1-3 (2x) and Classes 4-5 (1x)
Proximity to Intensive Hog Operations (Acres) – ROW	Acres	Apply 3 mile buffer to intensive hog operations identified from building layer and orthophoto interpretation
Diagonal crossing of Agriculture Crop Land (Acres) – ROW	Acres	Diagonal crossings of land identified to be in agricultural capability classes 1-3
Proximity to Buildings and Structures(100 m) – Edge of ROW	Count	All buildings and structures from buildings layer not including occupied and unoccupied residences, churches, schools, daycare, unobservable or unused buildings
Public Use areas) (250 m) – Edge of ROW	Count	Schools, Churches, Park Parcels, Recreational Trails, Campgrounds, Resorts and Lodges, Woodlots
Historic/Cultural Resources (250 m) – Edge of ROW	Count	Designated and known heritage sites within 250 m of the edge of the ROW
Potential Commercial Forest (Acres) - ROW	Acres	Potential commercial forests represented by "productive forest" areas from the Forest Resource Inventory which are not within protected areas or proposed ecological reserves

Criteria	Measurement	Criteria Description
Natural		
Natural Forests (Acres) – ROW	Acres	All forested (*i.e.*, productive and non-productive) cover classes from Forest Resource Inventory to be included during this evaluation
Intactness (Acres) – ROW	Acres	Intact natural habitat polygons >200 ha in size as determined from Forest Resource Inventory data (excluding agriculture areas and other disturbed/built-up areas) buffered by existing linear disturbances (high-use – 400-m buffer and low-use 200 m buffer)
Stream/River Crossings – Centreline	Count	Natural stream/river crossings based on Fisheries and Oceans Canada-provided data, including streams with complex and simple habitat types and supporting sport, commercial, domestic and SARA fish (Class Types A and B), and those with complex habitat types and supporting forage fish (Class Type C)
Wetland Areas (Acres) – ROW	Acres	All wetland classes from Forest Resource Inventory data to be included
Conservation and Designated Lands (Acres) – ROW	Acres	Proposed Protected Areas, High target value Nature Conservancy Canada Native Grasslands
Engineering		
Seasonal Construction and Maintenance Restrictions (Value) – ROW	Value	A value determined by the presence of wetland, forest, and agricultural land use/land cover patterns within the ROW
Index of Proximity to Existing 500 kV Lines	Value	A value determined by the ROW's proximity to existing 500kV electric transmission lines, including the planned Bipole III line
Accessibility	Value	A value determined by the ROW's proximity to the nearest public roadway (improving accessibility), and any wetland locations within the ROW (reducing accessibility)
Total Project Costs	Cost	Estimated cost of the Project including construction material costs, including estimates of tower type based on terrain, additional costs for angle structures and clearing costs
Existing Transmission Line Crossings	Count	Transmission Line Crossings

5A.4.1 MMTP Alternative Route Evaluation Model

For MMTP (500 kV), the model was reviewed and adjusted for the context of a 500 kV line (Table 5A-11). The following adjustments were made to criteria in the model:

- Built sub-model:
  - Weight for relocated residences, potential relocated residences, and proximity to residences was lowered as more criteria were added to the built model. Percent has to add up to 100.
  - Weight of proposed developments increased.
  - Agricultural crop land was removed as a criteria and replaced by (the weight of the three criteria below increased from the weight of the crop land criteria in the original model):
    - current agricultural land use
    - land capability for agriculture
    - proximity to intensive hog operations
  - Irrigated Land was removed.
  - Shelter Belts was removed.
  - The weight of Diagonal Crossings of Agricultural Crop Land increased.
  - Proximity to Commercial Buildings and Proximity to Industrial Buildings were combined into one criteria – Proximity to Buildings and Structures. Additional building types were added to the criteria (agricultural buildings – poultry barns, cattle feed lots).
  - The Special Features criteria (e.g., schools, churches) was renamed Public Use Areas. The weight was reduced as more criteria were added.
  - The weight of Historic/Cultural Resources was reduced as more criteria were added.
  - Potential Commercial Forest was added as a criteria.
- Natural Sub-model:
  - The weights of the Natural Forest, Stream/River Crossings and Wetland Areas criteria were increased as several criteria were removed.
  - Intactness was added as a criteria.
  - Conservation and Designated Lands was added as a criteria.
  - High Quality Wildlife Habitat, Floodplain/riparian areas, Special Areas and Native Grassland were removed as criteria as they are better represented by the new criteria.
- Engineering Sub-Model:
  - Seasonal Construction and Maintenance restrictions and Index of Proximity to Existing 500 kV lines were added as criteria.

- The weight of the Accessibility criteria increased slightly.
- The weight of total Project costs was increased.

The % parallel Existing Transmission Lines, % Parallel Roads, % Rebuild existing transmission lines and length in separation buffer were all removed as criteria.

Table 5A-11 MMTP Alternative Route Evaluation Model

Criteria	Weight
Built	
Relocated Residences – Within ROW	27.1%
Potential Relocated Residences (75 m) – Edge of ROW	17.1%
Proximity to Residences (75 – 250 m) – Edge of ROW	6.4%
Proposed Developments – Within ROW	15.5%
Current Agricultural Land Use (Value) – ROW	4.4%
Land Capability for Agriculture (Value) – ROW	2.2%
Proximity To Intensive Hog Operations (Acres) – ROW	3.3%
Diagonal Crossings of Agriculture Crop Land (km)	9.9%
Proximity to Buildings and Structures (100m) – EOROW	3.2%
Public Use Areas (250 m) – EOROW	7.4%
Historic/Cultural Resources (250 m) – Edge of ROW	1.8%
Potential Commercial Forest (Acres) – ROW	1.7%
Natural	
Natural Forests (Acres) – ROW	8.0%
Intactness	25.9%
Stream/River Crossings – Centerline	16.4%
Wetland Areas (Acres) – ROW	16.4%
Conservation and Designated Lands (Acres) – ROW	33.3%
Engineering	
Seasonal Construction and Maintenance Restrictions (Value) – ROW	16.5%
Index of Proximity to Existing 500 kV Lines	29.5%
Accessibility	16.5%
Total Project Costs	33.0%
Existing Transmission Line Crossings (#)	4.5%

For Round 2 and Round 3 route evaluation, the previous 10 km buffer separation distance from existing 500 kV transmission lines routing constraint to address system reliability was re-evaluated based on community feedback, new information garnered through the weather study and Minnesota Power's routing of the US portion of the Project known as the Great Northern Transmission Line which included options that paralleled the existing M602F 500 kV transmission line. The separation routing constraint was modified to be a proximity constraint which made the area closer to the 500 kV lines less suitable, but allowable for route segment development. Ultimate determination of what was acceptable reliability risk to Manitoba Hydro System Planners was evaluated for each segment when appropriate during the route evaluation step.

5A.5 The Preference Determination Model

On September 18, 2013, Senior Manitoba Hydro decision makers from the Transmission Business Unit met to discuss the criteria that would be used in Preference Determination. In addition to identifying the criteria, weights were also determined and represented as percentages for each criterion. The following criteria were selected and weighted as follows:

- Cost – 40% (e.g., constructability, line length, angle towers)
- Community – 30% (input received from engagement programs)
- Schedule risks – 10% (approvals, regulatory permits, property acquisition, seasonality of construction)
- Environmental concerns – 15% (effects on natural areas)
- System reliability – 5% (*e.g.*, separation from similarly purposed lines, risk of common mode outage)

On January 7, 2014, the Manitoba Hydro Project team met to review the preference determination model and adjust for the 500 kV line.

It was determined that system reliability was a relatively more important criteria for MMTP because the import capability of the line will be an important contribution to overall system reliability. System reliability as a criteria was therefore higher than the 5% used for St. Vital–Letellier.

As there is some flexibility built into the schedule, and a slightly longer time frame for the Project, it was determined that risk to schedule should be lower in importance than reliability. Therefore, system reliability was set to 10% and risk to schedule set to 5%.

In addition, it was determined that the environment criteria should be split into natural and built environment (equal weightings of 7.5% for each).

Appendix 5B
Alternative Corridor Development

5B Alternative Corridor Development

5B.1 Introduction

This document is intended to be read as supporting material to Chapter 5 – Transmission Line Routing of the environmental impact statement for the Manitoba–Minnesota Transmission Project. Chapter 5 describes the overall transmission line routing process, and this Appendix provides further details related to the development of the alternative corridor model that informs the development of alternative corridors—the second step in the EPRI-GTC siting methodology.

An alternative corridor is developed for each perspective (built environment, natural environment, engineering environment and simple average).

Factors are identified and evaluated in order to map the suitability of areas, within the route planning area, for locating a transmission line. The most suitable areas are assembled into alternative corridors.

Creating the alternative corridors involves:

- developing the alternative corridor evaluation model
- gathering data
- creating geospatial data layers
- creating suitability surfaces
- implementing least cost path analysis

Each of these steps is discussed briefly below. Details related to model development and calibration, including the stakeholders workshop(s) where standardization of features and determination of factor weight were completed, are provided in Appendix 5A.

5B.1.1 Alternative Corridor Evaluation Model

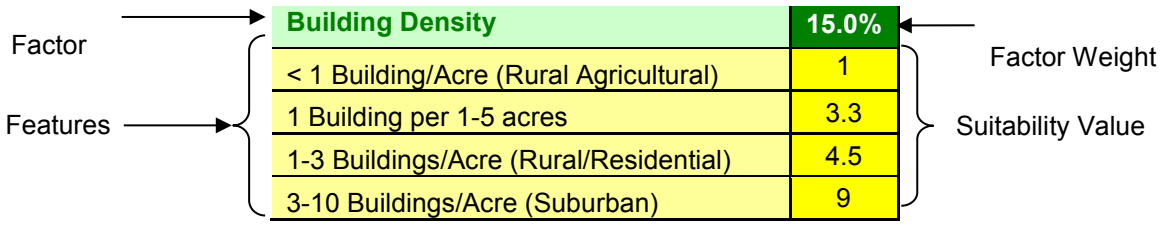
The alternative corridors are developed using the alternative corridor evaluation model (Table 5B-1).

A model based on the stakeholders' preferences was developed to represent the suitability of features on the landscape in southern Manitoba for transmission line routing. The resulting model (Table 5B-1) includes:

- areas of least preference (red – *i.e.*, protected areas; represented by a data layer)
- factors (light green – *i.e.*, building density; represented by a data layer)

- features (light yellow – *i.e.*, <1 building/acre)
- suitability values (dark yellow – *i.e.*, 1 for < 1 building/acre)
- layer weights (dark green – *i.e.*, 35.7% for linear infrastructure)

The following example is part of the built environment model:



Areas of least preference are features to avoid when routing a transmission line due to physical constraints (extreme slopes, long water crossings), regulations limiting development (protected areas), or areas that would require more extensive mitigation or compensation.

5B.1.1.1 Standardization of Features

Standardization of features is required to make comparisons possible. Suitability values for each feature were scored at the stakeholder workshop (described in Appendix 5A) on a common scale.

For each feature within the model, the stakeholders used a modified Delphi[7] process to develop a relative suitability value for each feature. Numbers between one and nine were used to represent degrees of suitability for routing a transmission line across (or in proximity to) this feature, with one being most suitable (*i.e.*, <1 building per acre) and nine being least suitable (*i.e.*, 3-10 buildings per acre).

These values are described in the EPRI-GTC methodology (2006) as follows:

- High Suitability for an Overhead Electric Transmission Line (1, 2, 3) – these areas do not contain known sensitive resources or physical constraints, and therefore should be considered as suitable areas for the development of corridors.
- Moderate Suitability for an Overhead Electric Transmission Line (4, 5, 6) – these areas contain resources or land uses that are moderately sensitive to disturbance or that present a moderate physical constraint to overhead electric transmission line construction and operation. Resource conflicts or physical constraints in these areas can generally be reduced or avoided using standard mitigation measures.

[7] A traditional method developed to obtain the most reliable consensus among a group of experts by a series of questionnaires interspersed with controlled feedback; the process offers a structured method of consultation that may reduce bias and allow groups of individuals as a whole to resolve a complex problem.

- **Low Suitability for an Overhead Electric Transmission Line (7, 8, 9)** – these areas contain resources or land uses that present a potential for significant effects that may not be readily mitigated. Locating a transmission line in these areas would require careful routing or special design measures. While these areas can be crossed, it is not desirable to do so if other, more suitable alternatives are available.

5B.1.1.2 Determination of Factor Weight

After assigning suitability values to features, stakeholders (at the workshop described in Appendix 5A) then assign weights to each data layer based on their opinion of its relative importance in the routing process.

This was accomplished by conducting pair-wise comparisons (Figure 5B-1) employing the Analytic Hierarchy Process (AHP), as described below.

The AHP was used at the workshop to determine the relative weights of each factor (shown in dark green in Table 5B-1). The AHP provides a framework for evaluating alternative options. Each option is analyzed independently. The AHP produces a best-fit set of weights (Eastman *et al.* 1995) for the factors.

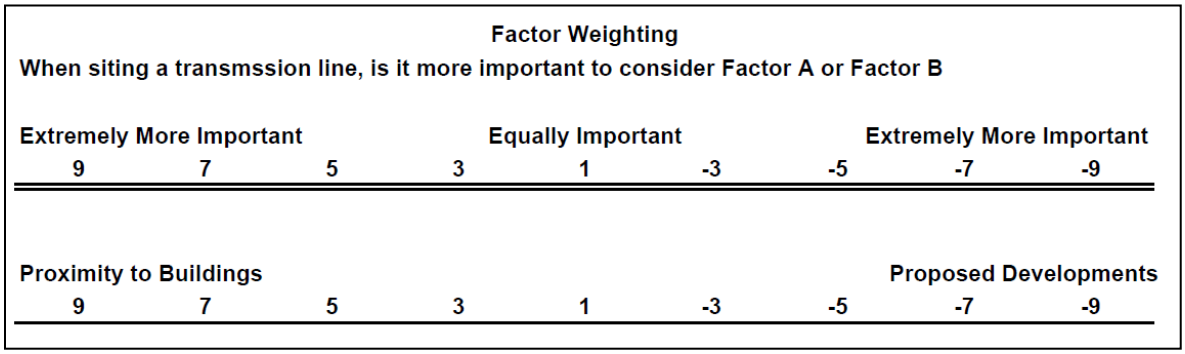


Figure 5B-1 Example of a Pair-wise Comparison

The stakeholders systematically evaluated each factor by comparing them to one another with respect to their suitability for routing a transmission line. A number is given (between 9 and -9) for each pair-wise comparison. Tables 5B-2, 5B-3 and 5B-4 show the values given for each of the perspective (built, natural and engineering).

The AHP converts these evaluations to numerical values. A numerical weight is derived for each factor, allowing the factors to be compared to one another in a rational and consistent way.

The result is a percentage weighting for each factor within each perspective, with all factors within each perspective totalling 100% (*i.e.*, Table 5-3; the percentages for the engineering sub-model equal 100% (linear infrastructure 37.7% + spannable waterbodies 11.0% + geotechnical considerations 31.9% + mining operations/quarries 14.0% + proximity to future windfarms 5.4% = 100%).

Table 5B-1 MMTP Alternative Corridor Evaluation Model

Engineering		*Natural*		*Built*	
Linear Infrastructure	**37.7%**	**Aquatics**	**10.0%**	**Proximity to Buildings**	**10.0%**
Unused ROW (Manitoba Hydro owned)	1	No Aquatic Feature	1	> 800 m	1
Parallel Roads ROW	2.6	Ephemeral Streams (Non-Fish Bearing)	4.9	400 – 800 m	2.7
Municipal Road Allowances	3.1	Spannable Waterbodies (Lakes and Ponds)	6.1	100 – 400 m	6.5
Parallel Provincial Highways ROW	3.4	Permanent Stream	7.5	ROW – 100 m	9
Parallel Existing Transmission Lines (<300kV)	3.8	Fens	8.2	**Building Density**	**15.0%**
No Linear Infrastructure	4.4	Marsh	8.2	< 1 Building/Acre (Rural Agricultural)	1
Parallel Oil/Gas Transmission Pipeline	5.6	Permanent Stream (CRA Fish Bearing)	9	1 Building per 1-5 acres	3.3
Parallel Railway ROW	5.6	**Special Features**	**42.4%**	1-3 Buildings/Acre (Rural/Residential)	4.5
>= 300 kV Transmission Line/Within Buffer	8.5	No Special Land	1	3-10 Buildings/Acre (Suburban)	9
Within Road, Railroad, or Utility ROW	9	Managed Woodlots	5.4	**Proposed Development**	**3.7%**
Spannable Waterbodies	**11.0%**	Crown Land With Special Code	7	No Proposed Development	1
No Waterbody	1	Community Pastures	7.3	Proposed Development – Industrial	3.7
Nav. Spannable Waterbody (Specialty Structures)	9	Areas of Special Interest (ASI)	7.8	Proposed Development – Agriculture	5.2
Geotechnical Considerations	**31.9%**	Recreation Provincial Park (Non-Protected Portions)	8	Proposed Development - Commercial	6.6
No Special Geotechnical Considerations	1	Proposed Protected Areas	8.6	Proposed Development - Rural Residential Zoning	9
100 Year Floodplain	6.5	Heritage Rivers	8.7	**Soil Capability and Agricultural Use**	**11.9%**
Wetland/Peatlands	9	Heritage Marshes	9	Other	1

Engineering	
Mining Operations/Quarries	**14.0%**
No Mining Operation	1
Mine-owned Land	9
Proximity to Future Wind Farms	**5.4%**
500m - 10k	1
> 10k	9

Natural	
Conservation Lands	9
Land Cover	**10.2%**
Exposed/Urbanized/Open Land	1
Agricultural (Forage)	2.5
Agricultural (Crops)	2.8
Burnt Areas	4.9
Grassland	5
Deciduous Forest	5.5
Coniferous Forest	5.7
Mixed Forest	6
Native Grassland	9
Wildlife Habitat	**37.4%**
Other	1
Ungulate Habitat (High)	6.1
Critical Habitat	9
Endangered Species Habitat	9

Built	
Class 6 and 7 (Low Productivity)	3.3
Organic Soils/Peat Bogs/Sod Production	3.9
Class 4 and 5 (Forages, Transitional)	5.9
Class 1- 3 (Prime Ag./Cultivated Land)	9
Land Use	**16.0%**
Forest	1
Open Land (Sand and Gravel)	1.7
Burnt Areas	2.1
Active Forestry Operation	2.8
Listed Trails (Existing and Planned)	5.9
Agricultural (Forage)	6.3
Waters and Wetlands	7.1
Intense Development and Use	8.5
Agricultural (Crops)	8.6
Intensive Livestock	9
National/Provincial/Municipal Historic Sites	**12.0%**
> 300 m	1
200 - 300 m	9
Proximity to Heritage Sites	**12.0%**
> 300 m	1
200 - 300 m	9
Landscape Character (Viewsheds)	**7.8%**
Recreational Trails	1

Areas of Least Preference
Wastewater Treatment Areas
Buildings
Oil Well Heads
Towers and Antennae
Existing Wind Turbine
Protected Areas
Wildlife Management Area (Protected Portions)
Non-Spannable Waterbodies (>300 m)
Mines and Quarries (Active)
Ecological Reserves
Wilderness/Heritage Provincial Park
Indian Reserves/TLE Selections
Recreation/Natural Provincial Park (Protected Portions)
Airports/Aircraft Landing Areas (glide path)

Engineering	*Natural*	*Built*	
Recreational Centers (*e.g.*, golf, skiing)		Scenic Provincial Trails and Roads	6.8
Provincial/Municipal Heritage Sites		Resort Lodges and Campgrounds	8.6
Provincial Park Reserves		Designated Historic Sites	9
Schools		**Edge of Field**	**11.7%**
Cemeteries/Burial Grounds		Road Allowances	1
Campgrounds and Picnic Areas		Drains	1.8
Known Archaeological Sites		Quarter Section/Half-Mile Lines	1.9
National, Provincial, Municipal Historic Sites		Parallel/Adjacent To Road Allowances	2.9
Religious/Worship Site Parcels		Other (None of the Above)	9

Table 5B-2 Built Environment Perspective Pair-wise Comparisons

	Edge of Field	Landscape Character (Viewshed)	Proximity To Buildings	Building Density	Proposed Development	Soil Capability and Agricultural Use	Land Use	National, Provincial, and Municipal Historic Sites	Proximity to Heritage, Archaeo-logical Sites, and Centennial Farms
Edge of Field		2.0[1]	1.0	1.0	4.0	1.0	-2.0[2]	1.0	1.0
Landscape Character (Viewshed)			1.0	1.0	3.0	-3.0	-3.0	1.0	1.0
Proximity To Buildings				1.0	3.0	1.0	2.0	3.0	3.0
Building Density					2.0	3.0	1.0	1.0	1.0
Proposed Development						-2.0	-5.0	-3.0	-3.0
Soil Capability and Agricultural Use							1.0	1.0	1.0
Land Use								1.0	1.0
National, Provincial, and Municipal Historic Sites									1.0
Proximity To Heritage, Archaeological Sites, and Centennial Farms									

NOTES:

[1] Edge of Field is slightly more important to consider than Landscape Character when routing a transmission line.

[2] Land Use is slightly more important to consider than Edge of Field when routing a transmission line.

Table 5B-3 Natural Environment Perspective Pair-wise Comparisons

	Aquatics	Special Features	Land Cover	Wildlife Habitat
Aquatics		-4.0	1.0	-4.0
Special Areas			5.0	1.0
Land Cover				-3.0
Wildlife Habitat				

Table 5B-4 Engineering Environment Perspective Pair-wise Comparisons

	Linear Infrastructure	Spannable Waterbodies	Geotechnical Considerations	Mining Operations/ Quarries	Slope	Proximity To Wind Farms
Linear Infrastructure		5.1	1.0	3.0	6.8	5.0
Spannable Waterbodies			-4.0	1.0	2.9	2.0
Geotechnical Considerations				2.1	6.6	7.0
Mining Operations/Quarries					3.1	3.0
Slope						1.0
Proximity To Wind Farms						

5B.1.2 Gathering Data

The next step in the creation of alternative corridors was to collect geospatial data that represented each factor in the alternative corridor evaluation model. Sources of data included aerial photography, geographic information system databases, publicly available data sets and other sources.

5B.1.3 Creating Geospatial Data Layers

Each factor in the alternative corridor evaluation model must be represented by a geospatial data layer. The geospatial data layer divides the route planning area into grid cells (5 m × 5 m). Each cell is assigned a suitability value (between 1 and 9 with 1 being most suitable and 9 being least suitable) based on the alternative route evaluation model.

Using the special features layer in the natural environment sub-model (see below) as an example, there are 10 features within the layer, each given a suitability value from 1 to 9 (*i.e.*, managed woodlots get a 5.4). Figure 5B-2 shows a portion of the special features data layer.

Special Features	**42.4%**
No Special Land	1
Managed Woodlots	5.4
Crown Land With Special Code	7
Community Pastures	7.3
Areas of Special Interest (ASI)	7.8
Recreation Provincial Park (Non-Protected Portions)	8
Proposed Protected Areas	8.6
Heritage Rivers	8.7
Heritage Marshes	9
Conservation Lands	9

5B.1.4 Creating Suitability Surfaces

The next step in the creation of alternative corridors is to create the suitability surfaces. A suitability surface is created by combining the individual geospatial data layers (factors and areas of least preference) into one layer (Figure 5B-2). Overlay analysis was used for the aggregation of the geospatial data layers.

Overlay analysis multiplies each standardized factor layer (*i.e.*, each grid cell within each map) by its factor weight and then sums the results.

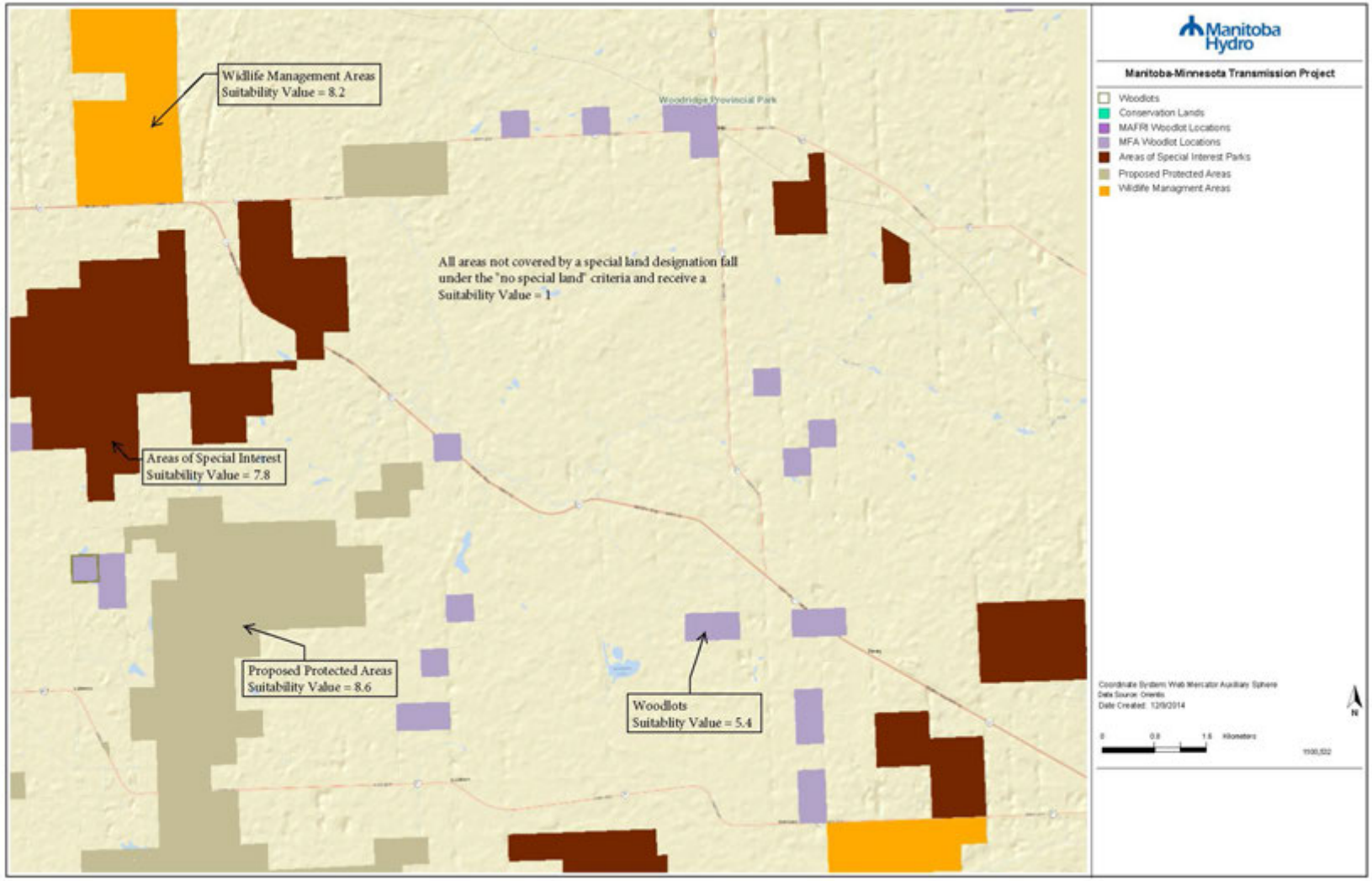


Figure 5B-2 Portion of the Special Features Layer within the Natural Environment Sub-Model

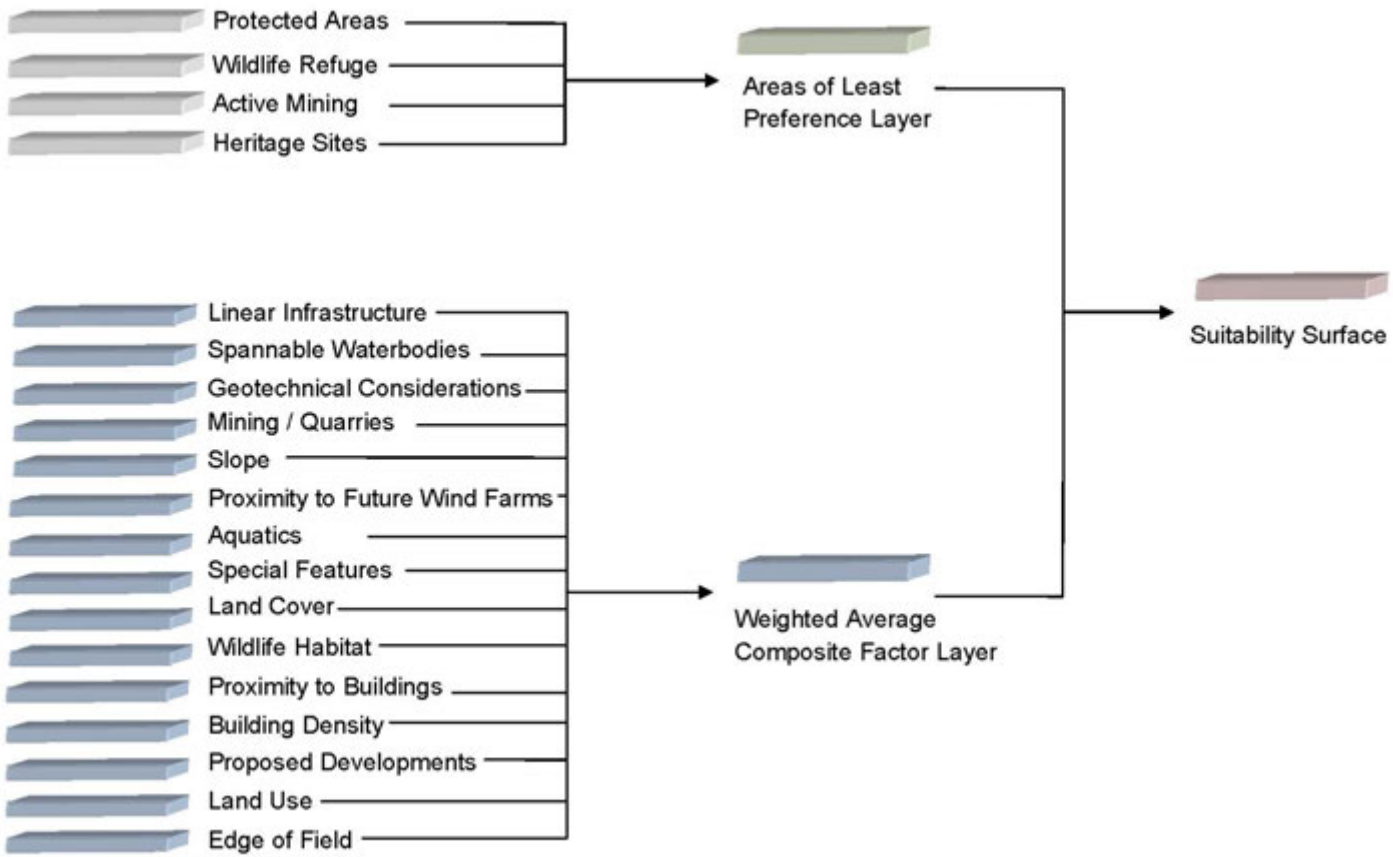


Figure 5B-3 Combining the Factor Layers and Areas of Least Preference Layer into the Suitability Surface

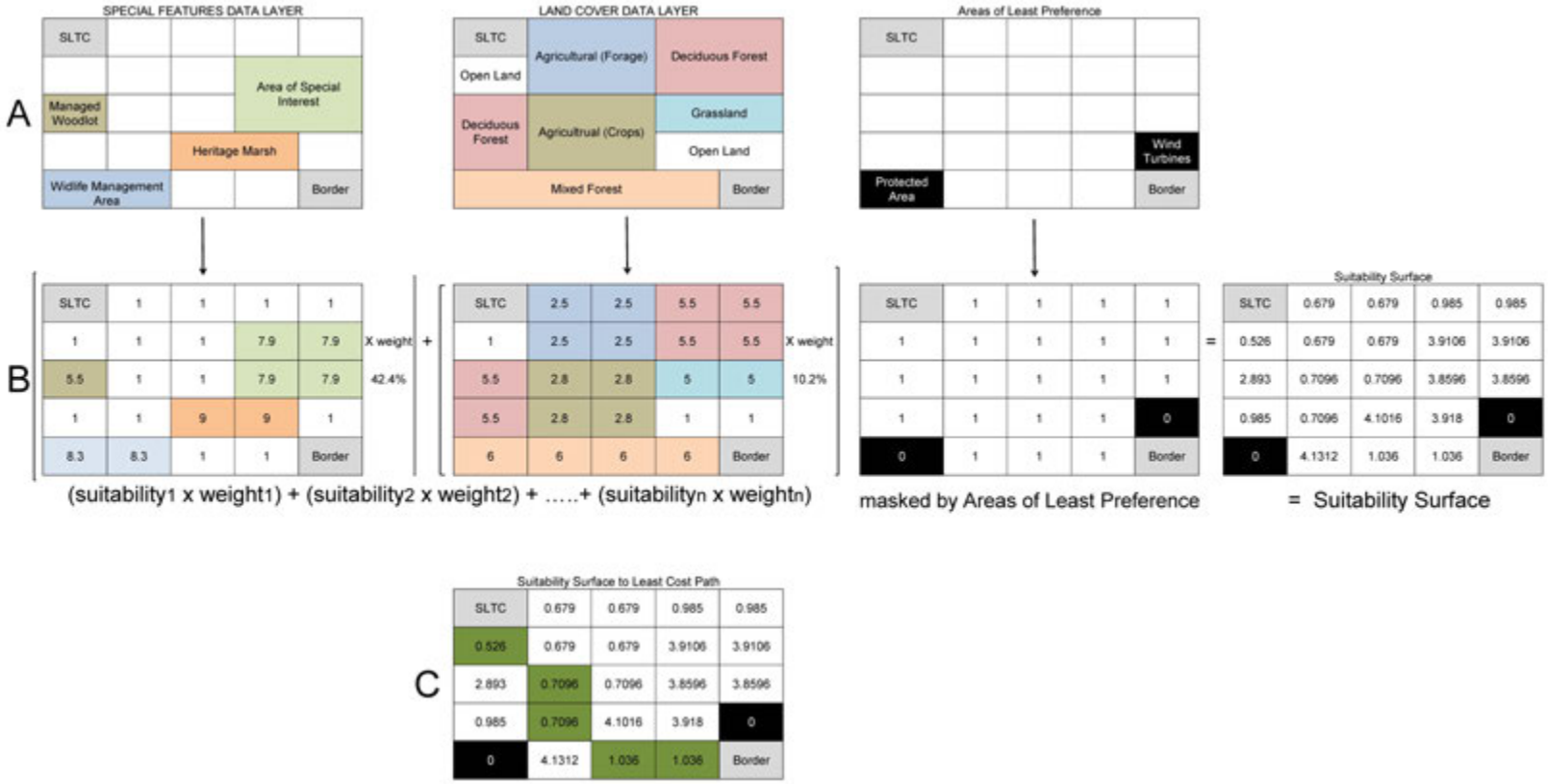


Figure 5B-4 Diagram of the Aggregation Process for Combining Factor Layers into the Suitability Surface

Overlay analysis involved each factor layer being:

- multiplied by an assigned weight (from the AHP process)
- summed and averaged as a continuous surface
- masked by the areas of least preference layer (all areas of least preference receive a 0; therefore, the model will not route there)

A simplified example is provided in Figure 5B-3.

The overlay analysis process produces a suitability surface that is represented by a map in which each grid cell is given a value that defines the suitability of that area for routing a transmission line.

5B.1.5 Least-Cost Path Analysis

The next step in the process is to create a series of corridors using least cost path analysis on the suitability surfaces created in the previous step.

The least-cost path, in a geographic information system (GIS), is guaranteed to be the “optimal” path relative to the “suitability values” defined by the “suitability surface” input into the weighted-distance tool (ESRI 2013).

An algorithm is used to find the “cost” of every possible path between the two end points. The “cost” in this case is the accrual of values of those grid cells, and not monetary in nature. A path is any continuous string of grid cells connecting the start and end points input into the system.

Lower summed values indicate relatively suitable paths, whereas higher summed values indicate relatively less suitable paths.

Figure 5B-3 demonstrates the development of a sample “optimal path” using information from a hypothetical situation. Figure 5B-3(A) displays an example area that has four components in the special features data layer (a managed woodlot, an area of special interest, a Heritage Marsh and a Wildlife Management Area) and several components within the land cover layer.

In Figure 5B-3(B), grid cells are overlaid and assigned suitability values based on the components present and the suitability values from the model.

Finally, Figure 5B-3(C) shows in dark green the most suitable path (corridor) through the area for locating a transmission line (the sum of each cell along the path will be less than the sum of any other combination of cells).

The alternative corridors developed from the model represent the top 3%[8] (the most suitable 3%) of "optimal paths" within the route planning area.

[8] When the EPRI-GTC siting methodology was first created, it was validated against recent electric transmission line siting projects. It was discovered that the routes selected for these projects typically fell within corridors created at 3% of all potential routes. For this reason, 3% has become widely used by utilities implementing this methodology to create alternative corridors.

Appendix 5C
Workshop Notes Round 1

Meeting Notes

MMTP ROUTING WORKSHOP – Selection of a preferred border crossing		
FEBRUARY 5-6, 2014	9:00 AM – 4:00 PM	West Side Cafeteria

Meeting called by	Maggie Tisdale
Type of meeting	Routing Workshop
Facilitator	Maggie Tisdale
Note takers	Dave Block / Robin Gislason

ATTENDEES

NAME	COMPANY	NAME	COMPANY
James Matthewson	Manitoba Hydro	Don Hester	AECOM
Dave Block		Natalie Henault	
Ken Ducheminsky		Jesse Glasgow	Quantum Spatial
Tim Kirkham		Patrick Baber	
Pat McGarry		Joey Siemens	Stantec
Eryn Brown		Leane Wyenberg	
Joe Petaski		George Kroupa	
Jon Kell		Jocelyn Hiebert	
Trevor Joyal		Wara Chiyoka	
David Jacobson		Mike Sweet	
Brett McGurk			
Maggie Tisdale			
Robin Gislason			

Introductory Presentation

Maggie Tisdale / Jesse Glasgow

Introduction to purpose of meeting and overall project. Details on workshop format, goals, objectives, and final outcomes.

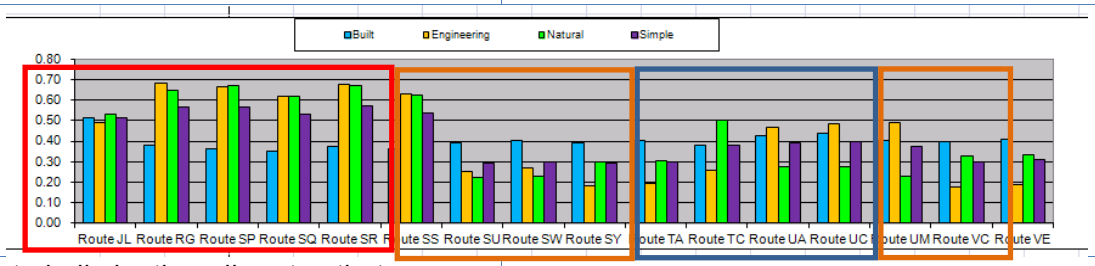
Discussion

There are > 750 000 possible routes from the start of the project to the three crossing points. It was recommended that for each crossing, only those routes that are within 120% of the total length of the shortest route move on to the next step. All in agreement. 6500 Routes remain.

Gardenton Crossing

Discussion	Decision
Top 10 routes from each perspective shown via GIS and reviewed.	
Suggested as the next step to take top 5 routes from each perspective to move on to the next step	Lost segments reviewed spatially.
Concern about losing Segment 63, publically preferred from the 4 available.	Compared segment stats for 62 and 63 and best route containing Segment 63. Segment 63 stats and best route do not justify moving it forward.
Taking top 5 from each perspective leaves 16 routes moving forward.	All in agreement.

Meeting Notes

Based on the 16 routes western most crossing, eliminated.	Public concern as above. Continued inclusion not justified as above.
Review bar chart (below) for top 16 Routes.	Need to move on with the top 3-5 routes.
Based on bar chart, there are ~ 6 routes that stand out as higher in most categories (red box). Suggest eliminating based on this?	SR is high in most, but 4th in built, review raw data.
	
Suggested eliminating all routes that are higher than 0.4 simple average, as there is a natural break in the data, the next lowest is > 0.5.	Reviewed routes that would be eliminated.
Suggested taking top route from each of the "Chart groups" (see chart above – colored boxes mark groups) and move those on to Preference Determination.	
If we remove JL, RG, SP, SQ, SR, and SS, what segments are lost.	We have one crossing, southern third of the remaining routes are all the same.
What is the decision point for dropping these routes?	OK from Engineering, poor from Natural.
Are we all OK with eliminating all of the segments shown?	YES – all in agreement
TOP TEN routes moving forward	
Segment 48 under discussion, it has two angle structures adjacent to the TransCanada Highway (TCH).	
Comparing Segments 42, 48, 49 and 72 (crossing the TCH) to Segment 70 (the south route).	Why does crossing the TCH come out better than 70, reliability is better on the TCH crossing. 70 parallels Bipole III.
Proposed to eliminate UA and UC.	No decision (doesn't keep the eastern most segments).
Proposed to choose between Segments 52 and 53.	Land Owner (owns all) prefers 53.
	53 doesn't parallel rail (good).
	No natural values.
	Decision to Pick 53 – eliminate 52
By removing Segment 52, we lose several other segments	Decision was made to reverse eliminating Segment 52.
Only Route TC keeps segment 50 (publically preferred)	Decision to move Route TC forward to preference determination.
SU, SW, SY all score lowest on Simple Average.	

Meeting Notes

SU scores best for simple average and very high for natural.	Decision to move Route SU forward to preference determination.
Segment 70 is currently not available. Only route UM would keep it in play. Do we keep it in?	Decision to move Route UM forward to preference determination.
Segment 70 would be preferred from engineering.	
Route UC maintains the easterly segments. Propose keeping Route UC	Decision to move Route UC forward to preference determination.
Moving forward with the proposed routes Segment 71 is lost (as compared to 73).	Statistics for both segments were reviewed. Segment 71 less preferred for natural andengineering. Public engagement prefers 73.
4 routes share segment 71, propose moving one forward. SY keeps 71 and has highest overall scores.	Decision to move Route SY forward to preference determination.
Review of all 5 routes moving to preference determination.	No concerns raised.
Conclusion	Moving on to preference determination with routes TC – UM – SU – UC - SY

Preference Determination - Gardenton	
Discussion	Decision
Routes are all the same for the southern 2/3 of the distance. Decisions will be made on the northern 1/3. Review all 5 routes.	
Cost Proposed to use an equation to rate cost. Agreed to use weighted average.	TC - 1 UM - 1.09 SU - 1.04 UC - 1.1 SY - 1
System Reliability Review of Transmission line Crossings (>69 kV) Route UM has 7 crossings, others have 3-4. Route UM is intermediate for proximity. Route UM also crosses St. Vital to Letellier (proposed). No routes near D602F, all cross Bipole III once.	TC - 1 UM - 2 SU - 1 UC - 1 SY - 1

Meeting Notes

Schedule Routes UC - UM will have more difficulty associated with property acquisition due to Segments 70 and 47. Route UM has the most Transmission Line Crossings, all others are equal. Accessibility is the same for all routes. Traffic control on TCH, not a concern. Route TC has more potential for breeding bird issues (seasonal construction). Route UM has the highest risk for a lengthy easement process - 3, then Route UC - 2. All others are equal regarding property right acquisition. Route TC - 2 for breeding bird issues.	TC - 2 UM - 3 SU - 1 UC - 2 SY - 1
Environment - Natural Segments to the east (Route TC) have wetlands, ecological reserves etc. - 3 Middle route (Route SY) has more clearing and river crossings – 2 Routes UC and SU are good – 1.5 Route UM the preferred for natural. All others have a segment that has some natural value. - 1	TC - 3 UM - 1 SU - 1.5 UC - 1.5 SY - 2
Environment - Built Route TC avoids most aerial application areas and most agricultural production (preferred). Segment 73 (Routes UC and UM) crosses lots of class 1 soils. Route UC west segment affects high quality soils, segment 47 (Route UC) also crosses Class 1 soils. Route TC affects more potential developments and river lots. Route SY is near proposed and existing developments and also has more diagonal crossings. Routes UC and UM potentially impact shelterbelts parallel to the line.	TC - 1 SY - 2 UM – 3, SU – 2.5, UC - 2.

Meeting Notes

Community Route TC is preferred. It takes advantage of Segments 48 and 50 (preferred based on public feedback) and avoids Segments 70 and 47 (least preferred based on public feedback). - 1 Next best route is Route SU (Segment 48) and Segment 73 which was preferred over Segment 71 (Route SY). – 1.5 Next best route is Route SY as it avoids Segment 47. - 1.75 Next best route is Route UC as it avoids segment 70 (Route UM). - 2 Route UM is least preferred based on feedback from public (affects the most agricultural land, pipeline, and uses Segment 70 which was the least preferred segment), significant development, lagoons etc. - 3	SY – 1.75 SU - 1.5 UC - 2 UM - 3 TC - 1

Conclusion	TC moves forward to overall preference determination

At the end of the day Feb 6, concern was raised about the way cost was considered. Suggestion made as follows:

The relative score of 1 to 3 based on the delta cost between the highest and lowest projects. The lowest project gets a 1. If the delta (difference) between highest and lowest projects is $40 million (the cost to defer the entire project by one year) or greater, the highest cost project(s) get a 3.

There is a linear scaling between 0 and $40 million and the score 1 to 3.

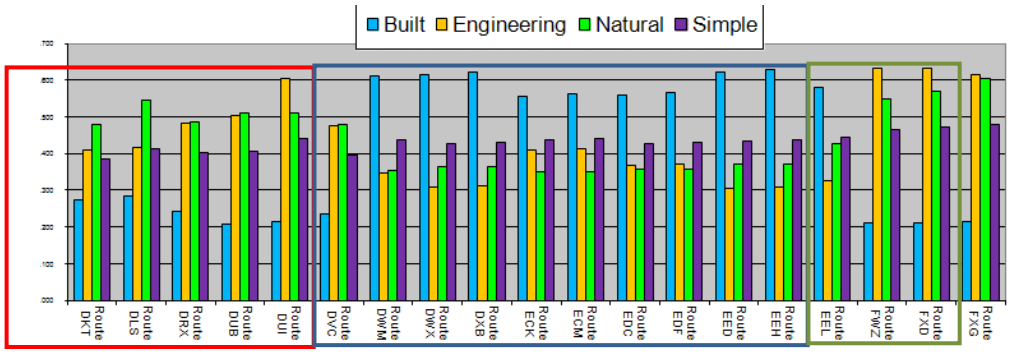
February 6, 2014 – agreed to use cost calculation as above.

New Gardenton Cost Ranks	SY - 1.02 SU - 1.25 TC - 1 UC – 1.6 UM - 1.53

Based on the above change to cost, Route TC still moves on to preference determination as the preferred route for the Gardenton border crossing.

Piney East Crossing	
Comments	Decision
Discussion	
1600 crossings after the 120 % reduction.	
Suggested using the top 5 from each perspective as above.	
Review of routes and segments lost.	No concerns.
Proposed moving forward with 19 routes to next step	Agreed.
Review of bar charts for the top 19 routes (see bar chart below)	

Meeting Notes



Bar chart shows three groupings, no clear winners or losers. Built statistics are good for 2 groups, not good for one group(blue rectangle).	
Propose to take top route from each 'group' in the bar chart	Agreed
First group (north and east – DKT, DLS, DRX, DUB, DUI, DVC) Routes DUI and DVC are slightly higher than others neither are preferred for any perspective (removed). Lose some segments Route DUB is preferred for Built. Route DKT preferred for Natural, Engineering and simple average. Propose DKT to move on to preference determination - AGREED Lose 5 routes (DLS, DRX, DUB, DUI, FXG)	Route DKT moves on to next round.
Next group is DWM thru EEL (see Bar Chart Above). Segment 70 was an issue from a public perspective. If it is removed we lose ECK, ECM, EDC, EDF, no concerns, DONE. Natural would like to ensure that both border crossings go through to preference determination. To keep segment 50 (preferred from a public perspective) Route EEL needs to remain. Propose EEL to move on to preference determination. AGREED. Natural has concerns, as Route EEL is least preferred for Natural. Propose to take Segment 73 as well, route DWM. AGREED. Proposed DWM and EEL from this group - DONE	Routes EEL and DWM move on to next round
Final group - FWZ, FXD, FXG - would include most eastern border crossing. FWZ preferred for all except engineering. Propose to move forward. - DONE	Route FWZ moves on to next round
Conclusions	Move to preference determination with DKT, DWM, EEL, and FWZ

Meeting Notes

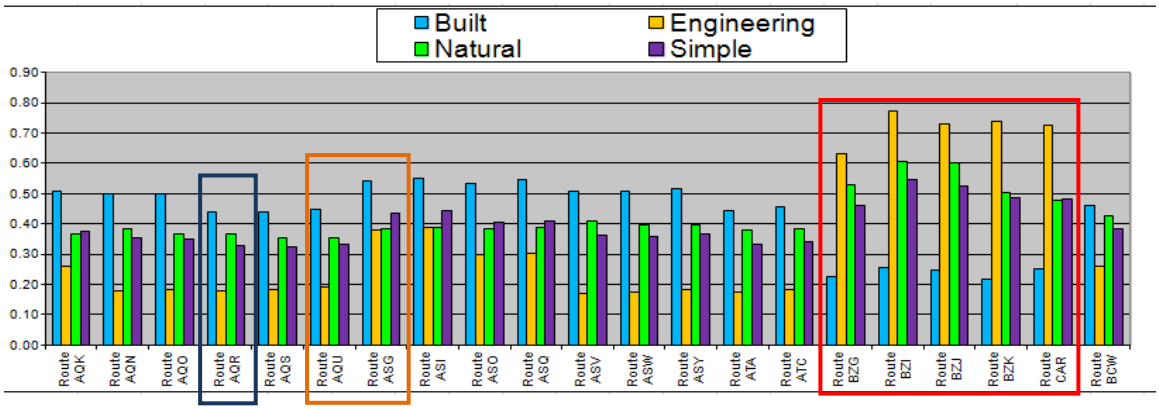
Piney East Crossing – preference determination	
Comments	Decision
Cost (using scaling based on difference between 0 - $40 million)	DKT - 1 DWM - 2.02 EEL - 1.71 FWZ - 1.41
System Reliability Route FWZ has the closest proximity to Transmission Lines (significant), most Transmission Line crossings and crosses D602F twice (least preferred) - 2.5 Routes EEL and DWM are similar for proximity transmission lines. All route cross Bipole III. Route DKT crosses D602F. - 2 Routes DWM and EEL do not cross D602F. - 1 Each route crosses the same pipeline	DWM - 1 EEL - 1 DKT - 2 FWZ - 2.5
Risk to schedule Route FWZ has highest seasonal construction (wetlands), least preferred based on input during the FNMEP because of a high number of historic sites. It crosses D602F (NEB permitting required), and is least accessible. - 3 Routes DKT crosses D602F (require NEB permitting), has some eastern portions where First Nation concerns were identified and crosses wetlands (access and seasonal construction). - 2 Routes DWM and EEL have fewer overall concerns – more access, less clearing, small property delays. Route EEL slightly better, less private land (Segment 73 vs 50).	FWZ - 3 DKT - 2 DWM - 1.5 EEL - 1
Natural Environment Route DWM – does not cross any Conservation lands and the least impact on intactness. - 1 Routes DKT and FWZ cross lots of natural habitat, wetlands, and have the most impact on intactness - 3 Route EEL crosses a wetland and ecological reserve but less natural habitat than Routes DKT and FWZ.	DWM - 1 EEL - 1.5 DKT - 3 FWZ - 3

Meeting Notes

Built Environment DWM and EEL have more relocated residences, more residences within 100 m, more proposed development (60% of built model) and cross more agricultural lands. Route EEL crosses less primary lands than DWM. Route FWZ traverses less agricultural lands and shelterbelts. Route DKT crosses slightly more agricultural lands than FWZ.	FWZ - 1 DKT - 1.5 EEL - 2.5 DWM - 3
Community Generally, public input has preferred the eastern routes (DKT-FWZ). First Nation input has indicated a preference for the western routes (DWM-EEL). Route DKT from a public perspective would rather follow D602F than agricultural lands. – 1.5 All others 1.	FWZ - 1 DKT - 1.5 EEL - 1 DWM - 1
Based on the preference determination model Route EEL is preferred.	

Piney West	
Comments	Decision
Based on removing all routes > 120% the shortest route, 1300 routes remain. Proposed to take top 5 from each again (20 routes). Segment 121 would be removed. Two crossing points would still be in play.	
The best route with Segment 121, simple average statistics, would be ranked 53rd.	
The best route with Segment 121, natural statistics, ranked 80, best engineering statistics ranked 17, and best built statistics ranked 299.	
Proposed to add top simple average with Segment 121 (Route BCW).	Accepted to take 21 routes to next round.

Meeting Notes



Routes BZG, BZI, BZJ, BZK, CAR score poor for engineering, natural and simple average statistics, but top 5 for built. Proposed to keep top engineering from top 5 built, Route BZG (top engineering and #2 built).	Agreed to move BZG to preference determination
Propose to move Route AQS as it was best for natural and simple average and the best of the remaining for built.	Agreed to move AQS to preference determination
Propose Route BCW to move forward (Segment 121 – which was added).	Decided not to move BCW forward as the route did not score highest in any categories.
Proposed to eliminate ASG and ASI as they are the lowest simple average, engineering and built (and includes Segment 70).	Agreed to eliminate these routes.
Routes AQN and AQO bring in Segment 71, Route AQO selected as it includes Segment 56 as well (preferred).	Agreed to bring forward AQO to Preference determination.
CONCLUSION - Moving forward with BZG, AQS and AQO to preference determination	

Preference Determination – Piney West border crossing	
Comments	Decision
Preference determination BZG + AQS + AQO	
Cost – cost calculator	AQS - 1 AQO - 1.02 BZG - 1.32
System reliability Route BZG Crosses D602F twice, has 11 Transmission Line crossings (4 for the others), and has lowest Index of proximity (less preferred)	BZG - 2.5 AQO - 1 AQS - 1

Meeting Notes

Risk to Schedule Route BZG is more remote, has poorer accessibility, is in the First Nation priority zone and has 2 D602F crossings.	AQO - 1 AQS - 1 BZG - 3
Natural Routes AQO and AQS cross less natural area, AQO is slightly better (no wetlands or ecological reserve). Route BZG has more potential effects to intactness, crosses more wetlands and ungulate habitat.	AQO - 1 AQS - 1.5 BZG - 3
Community Route AQO, segment 50 is preferred over Segment 72, moving away from the river lots. Public Input prefers the eastern route (Route BZG). Input received during the First Nation and Metis engagement process indicates a preference for the western route (Route AQS). Opposing / offsetting input and interests based on the public and First Nation and Metis engagement processes. Preferred from each perspective received a 1, the other a 1.5.	AQS - 1 AQO - 1.5 BZG - 1
Built Route BZG has the least relocated residences. Route AQO traverses more prime agricultural lands, more hog lands, rail line, proposed developments. Route AQO avoids development in the ST. Anne and La Coulee areas. Route AQS avoids more prime agricultural lands and shelterbelts (than Route AQO) . Route BZG avoids the most agricultural lands.	AQS - 2 AQO - 2.5 BZG - 1
Based on the preference determination model Route AQS moves on to preference determination from Piney West.	

Meeting Notes

Preference Determination - Three border crossings	
Comments	Decision
Preference Determination AQS (Piney West) EEL (Piney East) TC (Gardenton) DKT (Piney East) – was added to include an additional eastern route to the assessment (DKT was number 2 for Piney East, within 0.1 and lowest cost). Did not bring in other routes because the second place routes for the other two crossings were not as close.	Move forward with AQS, EEL, TC, and DKT
Cost using scaling factor	TC - 1 EEL 2.2 AQS - 1.4 DKT - 1.49
System reliability Route DKT has 7 transmission line crossings (others have 4), lowest proximity number (least preferred) and crosses D602F (others don't).	TC - 1 EEL - 1 AQS - 1 DKT - 2.5
Risk to Schedule Route DKT Crosses D602F (NEB permitting), Manitoba Hydro has heard concerns during the FNMEP and more wetlands (seasonal construction delays and reduced access etc.) Route EEL has fewer concerns, more access, less clearing, small property delays. Route TC has the best constructability and access. Property concerns for western routes (TC, AQS, EEL). Proportion of Crown land and the risks of a lengthy Crown Consultation process are higher the further east you go. EEL has higher property risk than AQS and slightly more potential for First Nation and Metis interests and concerns.	TC - 1 AQS - 1.5 EEL - 2 DKT - 3

Meeting Notes

Community Gardenton (TC) and Piney west (AQS) ranked 1 - Preferred based on perspectives during the public and First Nation and Metis engagement processes. Route DKT - ranked 1, least preferred border crossing based on First Nation and input, preferred crossing based on public input. Route EEL (Piney east) scores poor from public and First Nation perspectives - 2	TC - 1 AQS - 1 DKT - 1 EEL - 2
Natural Route DKT is least preferred as it crosses large blocks of intact habitat, forested areas, wetlands and proposed protected areas Route TC most preferred as it crosses more developed land in general, affecting the least natural habitat. Routes EEL and AQS are less preferred than route TC because it has they cross more conservation lands and wetlands, but better than DKT.	TC - 1 AQS - 1.5 DKT - 3 EEL - 1.5
Built DKT - avoids most built up areas and proposed developments EEL least preferred poor around Marchand – extensive development AQS and TC similar – no major difference between both, regarding proposed developments and built up areas. Agricultural lands DKT preferred, avoids prime Agricultural lands and shelterbelts AQS ranked 2nd, passes thru less productive lands than EEL EEL ranked 3rd, passes through more productive land than AQS. TC - traverses the most prime agricultural lands and lots of shelterbelts.	DKT - 1 EEL - 3 AQS - 2.5 TC - 2.75
Base on preference determination model TC 1.13 AQS 1.34 DKT 1.60 EEL 2.02 Matches what evaluation model bar chart statistics show.	TC Preferred Route

Appendix 5D
Workshop Notes Round 2

Meeting Notes

MMTP ROUTING WORKSHOP		
FEBRUARY 17/18, 2014	10:00 AM – 4:00 PM	West Side Cafeteria

Meeting called by	Maggie Tisdale
Type of meeting	Routing Workshop
Facilitators	Jessie Glasgow / Maggie Tisdale
Note taker	Dave Block / Robin Gislason

ATTENDEES

NAME	COMPANY	NAME	COMPANY
James Matthewson	Manitoba Hydro	Natalie Henault	AECOM
Dave Block		Jesse Glasgow	Quantum Spatial
Richard Goulet		Patrick Baber	
Maria M'Lot		Dave Whetter	Stantec
Jon Kell		Leane Wyenberg	
Trevor Joyal		George Kroupa	
Brett McGurk		Glenda Samuelson	
Maggie Tisdale		Bill Krawchuk	
Robin Gislason		Frank Bohlken	
Lindsay Thompson		Carmen Anseeuw	
Sarah Coughlin		Dave McLeod	
Amna Mackin		Butch Amundson	
Shannon Johnson		Marcel Gahbauer	
Rob Kalichuk		Lisa Peters	
Andrea Almeida		Sarah Garner	
Janet Mayor		Evan Rogers	
Doug Bedford		Vince Keenan	Maskwa
Monica Dominguez		Brian Ward	MMM
		Bob Brown	

Introductory Presentation

Maggie Tisdale / Jesse Glasgow

Introduction by Maggie, Introductions around the room. What is to come. Starting with evaluative routes, labeled in the 300's on Orientis.

Based on the segments that were created for this round, we started with ~550,000 possible routes.

Initial route screening (pre workshop) involved removing illogical routes (backtracking etc.) and all routes greater than 120%(confirm) of the shortest route.

This brought the total number of routes down from 550,000 to 15,049 routes.

The first step to reduce the number of routes was to do pair-wise comparisons of similar segments.

Meeting Notes

First Comparison:

Start with Ridgeland cemetery, two segments (311 and 312) on either side (reviewed map). Discussed concerns raised by Sundown Coalition.

- 312 runs near the cemetery. 311 was drawn to move away (north) from the cemetery but was limited by a wetland area. Proposal made to eliminate segment 312.

- Public perspective does not prefer 312 as it clears forest around the cemetery therefore decreases the experience of the cultural use of the cemetery. The move would likely satisfy the public concern. RM of Stuartburn also on board. Built would prefer the move (based on cemetery), the other differences in other criteria is equal. Based on input received from First Nations, there would be a preference to avoid cemetery.

The distance between the two segment options is about 150 m apart at widest point. Difference in length minimal. Discussion regarding deflection and if it can be handled without tangents. If we limit deflection angle to < 1%, then no tangent requires (saves on potential increased costs).

- From a natural perspective, 311 is closer to the wetland, distance of ~500 m it parallels 311, no forested buffer, potential bird collision risk.

- Currently 312, 70 m to edge of cemetery. Discussion that with tower placement could we minimize clearing, and reduce aesthetic impact.

- Proposal to split the difference, place segment 100 m away. At 100 m then no cost increase because no tangent towers required. Tree buffer on either side would help both the cemetery users and the wetland / bird collision risk. To reduce bird collision risk treed buffer between the wetland and conductor would be helpful, 100 m seems to allow this.

DECISION: Decided to split the difference – redraw the segment to be a hybrid of 311/312.

For further discussion 312 was kept (With the understanding that it would be 100m away from the cemetery and the wetland.

Removed ~7500 routes.

Meeting Notes

Southern most pair-wise comparison (323, 327, 328, 329 – Map reviewed):

- One primary landowner, the colony, in the general area. The colony has indicated a preference for the route to follow the creek (new segment) on the east side of their property.
- Segment 323 is the colony's least preferred segment. Public: Segment 323 least preferred. First Nations have indicated they have a preference that is aligned with the public. Segments 327-329 most closely resemble the public's preferred choice.
- It was recommended to pick one route through the area as it is all one property owner.
- Natural - the closer you are to the creek / wildlife area, the higher the impact. Colony is aware of wildlife issues, would be OK with slight offset from the creek, leaving a vegetated buffer.
- Stream is Type A prime fish habitat, sedimentation is main concern. There is currently a good buffer between the ag land and the creek. There would be concern if buffer is cut back any more.
- First Nation feedback, also agrees that away from creek is preferred.
- Propose taking 327 and 329 forward, to be adjusted later to suit all concerns. It will be moved, but stay on property of same landowner.

DECISION: Take 327-329 forward. The route will be adjusted as required in discussions with stakeholders.

Removes 4700 routes. Down to 2700.

Meeting Notes

398 - 365 comparison. 398 (west) 365 (east)(see map):

398 is the original route along the half mile line adjacent to the WMA. It was recommended to introduce further setback from WMA (365).

365 does thread through quarries and there is some rail in the area.

There were several Species at Risk observations on 398 (wood peewee, golden winged warbler, whip-poor-will, and amphibians). Natural prefers further east option.

Built - 365 preferable, less commercial forest, less potential production for ag. 3 causal quarry permits on 365. They are gravel quarries, possibly no blasting which is the main concern. Because of the quarries, built says 398 preferred.

365 parallels rail line for ~ 5 km. Paralleling the rail is good from a natural perspective, less new linear corridors.

Heritage – segments are equal. More ag land better, already disturbed.

Main concern from PEP, generally equal, 365 would be less new access, slightly preferred.

Engineering state paralleling is the same for both from their perspective. Engineering agrees that avoiding quarries is preferred.

Moving segment 365 to the east avoids the quarries, but brings in new concerns and moves closer to the town of Sandilands, they have concerns about an aquifer.

Is it an issue being next to protected area? According to the Wildlife Branch, yes.

Natural – the wetland in the south end extends across the eastern segment but doesn't the western segment. The wetland is possible yellow rail habitat. This is at odds with natural in the north. There are no federally listed vegetation species.

Using stats, 365 versus 398:

- Routes through 365 Of the remaining 43rdbuilt 33rd engineering natural 11th, simple average is 12th.
- Routes through 398, Built 41st. 71 engineering, natural 420. Simple average 61st.
- Built tie, engineering slight to 365, simple average preferred, natural big difference.

Engineering prefer 398, built 398, natural 365. Heritage etc. equal. Public, 365 slightly. Move to leave it in. Can we realign to avoid quarries, then we can choose 365?

Propose to eliminate 398, noting that we need to align around active quarry permits. As long as the route misses the family test sites under the forestry banner.

DECISION: Eliminate Segment 398

1870 routes remain.

Meeting Notes

Next comparison 352 and 353.

Segment 353 crosses over a home. Segment 352 crosses over a large, approved, partially built subdivision.

First Nation feedback – prefers 353 because it parallels an existing TLine (already impacted), less tracts of vegetation.

Heritage 353 same reasons as above. The road is the Old Dawson Trail, but it has been developed.

Natural, 353 preferred, shorter, few SAR along 352, more intactness and wetlands on 352.

Engineering prefers353, shorter.

Built – 353 is closer to more structures, relocate 1 house. Subdivision, 42 lots, line directly affects 7-8 lots. Right now MH has no compensation policy for developers for the loss of the 8 lots in the new development.

PEP both are bad from PEP feedback. 353 has one relocate, 3 potential. 352, only has two potential relocate. PEP slight preference for 353.

Route Stats:
353:built 1313, Natural 29, Engineering 2, Simple 131.
352: built 322, natural 11, Eng 14, Simple 12.

Stats do not fully represent impact to the subdivision.

General public has said 10 homes on the edge of a transmission line worse than buying one. Buy-out has effective mitigation, adjacent homes no 'effective' mitigation.

More wells affected with 352 than 353.

Proposal to eliminate Segment 352.

DECISION: Eliminate Segment 352

940 routes remain.

Segment 358 and 359 comparison.

In the vicinity of TransCanada Highway (TCH). Segment 359 is the original route, crosses TCH twice.

Through PEP it was proposed to avoid TCH which also avoids more homes. The route was in place because of other segments heading east.

Proposed to eliminate 359. PEP agrees. Natural no concerns. Built no concerns.

DECISION: Eliminate Segment 359

915 routes remaining.

Meeting Notes

Proposal to compare 314 / 315 / 316.

314 crosses proposed conservation land - tall grass prairie.

Natural – stats are not all pointing in the same direction. Leopard frog concentration along 314. Several of the metrics suggest 315 is preferred, both are a lot better than 316

PEP both good options with the caveat to avoid stair-casing across the landscape.

314 exists because Wildlife Branch requested avoiding crossing through the swampy area (which was more effected with old border crossing).

Natural prefers 315 over 314. Built prefers 315, for ag all else seems equal.

Heritage prefers 316, can accept 315. 314 least preferred - 0.5 off known site.

FN: prefers 315 for same reason as natural.

DECISION: Remove 314.

524 routes remain.

Move on to route statistics to get to top 3-5.

First Nation feedback - historical resources such as Chief Dawson Trail and the Yellow quill Trail are important. The heritage group will do some cross referencing work with the First Nations group.

Meeting Notes

Review of Route Statistics
Discussion
Show top 5% of all possible from the built perspective. 27 routes. Historical trade route, lots of heritage resources possible. Not mapped. Part of built, but not properly represented by statistics alone.
Reviewed (routes shown on maps) top 5% for each of the perspectives Natural top 5% removes northeastern section. Engineering top 5% loses one segment. Top 5% simple average. If top 5% from each perspective are taken, what segments are lost? Move from 523 to 67 routes. Segments 339 and 343 are lost.

Meeting Notes

PEP Segment 343 would be more accepting than 345, 346.

Public – SW corner of 343 follows parcel fabric that has approval for a conservation easement. If 343 becomes a conservation easement But there is uncertainty what agency the conservation easement is from. There are currently no data sets for conservation easements on private property.

Segment 343 crosses fish creek twice, which had value based on First Nation feedback.

One First Nation stated they have important cultural values on 342.

341 and 342 has critical golden winged warbler habitat (SARA species legally protected.)

341 already has a transmission line on it, demonstrating the species have adapted to existing transmission ROW.
337 and 343 are 30% longer than 341 or 342 (more general disturbance – more cost).
Built – 343 vs 347 – 347 is not preferable due to creek crossings. 341 is preferred as it is along the existing row.

337 preferred from warbler perspective.

Built, 347 more preferable than 343.

341 preferred for heritage.

Engineering indicated there is more paralleling but not with the 500kv, so system planning should not have a concern

337 crosses a home (as does 341).

PEP is fine with dropping all but 341, 342.

Engineering OK (more paralleling with 341)

Built OK, avoids homes and ag land, domestic wells.

Natural OK, 341, 342 affect more warbler.

Decision: Remove Segments 343, 347, 344, 339, 362, 337

Lose 8 routes. 59 routes remain.

Need to get from 59 to 3-5. Look at top scoring for each perspective.

Meeting Notes

Looking at 330 and 331.

3 landowners own the three quarter sections.

330 – three owners indicated they would be accepting if the line was moved to the eastern edge of their property line. MH prefers to be along the property line. Would go through more natural forest and wetland than the west side of the ¼ sections. Natural would be against this as it would interfere with a large tract of untouched natural area.

Two proposed home sites on 330.

PEP proposes to eliminate 330 and 335 (332 also lost).

Natural would prefer 330 and 335. Can 331 be adjusted to avoid more forest?

No decision made. All segments remain in.

Segment 301 versus the TransCanada (357, 358, 360)

Compare all routes that use 301 versus all routes that use the others.

Segment 301: top built 43, eng 331, natural 29, simple 131
357/358/360: built 13924, eng 5, natural 134, simple 2642

301:
Engineering - parallels BP3 and D602F and is longer. System planning is willing to accept paralleling here.
Natural – stats are unclear, why 301 would be viewed more positively than 360. More stream crossings on 360 that might be driving the difference.

URV - In natural and engineering is in the top routes but is 13,924 in built. This number is pulling the natural and engineering numbers further in the direction of the built.

Paralleling causing high numbers, low score for the south, could be mitigated. May be more willing to accept paralleling here. 55 km north length, 43 km south, 12 km difference.

No Decision Made

Reviewing top 5 from each perspective.

Route RPL best natural route. Why (seems counterintuitive)? RPL has higher forests, intactness, wetland disturbance. RPL has fewer conservation lands and stream crossings. Looking at just the natural statistics, these balance out. Therefore the very low built score is driving the numbers.

RPL and URV are same for natural only, the difference becomes when it is compared with other perspectives.

URV is almost last for built, near equal for natural, therefore the less intuitive route comes out ahead.

12th best natural route (statistically) intuitively should be the best choice for natural.

Natural wants to select the best route that uses segments 357, 358, 360, 355. Best route for Natural is URV.

Top 5 engineering, appears to be length driven. Cost is the most important criteria.

Top 5 built seems logical.

Meeting Notes

Route AY best for built.

Top scoring simple average is route SGZ, next is RPL, SIL, SGU, SGW.

Recommendation to take top route from each perspective to move on to expert judgment.

Natural and simple would be the same. Unless judgment instead of stats is used.

Review of segments not in the top three routes, to determine if any other routes will be moved forward to expert judgment.

Segment 333 is lost. Is it better than 303 overall?

303 vs 333 – First Nation - there is TLE on 303, 333 is also not preferable / Built would be ok if 333 was back on the table.

333: ranks Built – 131, Natural – 14825, Engineering – 14898, Simple – 14566

Leave Segment 303 and not introduce Segment 333 into expert judgment

331 has been eliminated and 330 will stay

341 and 362 are meant to be eliminated in this process with 342 as the preferred. Natural - not a big difference between the two. Built – 342 takes out a lot and impacts a 2nd lot. 341 less impact. 341 crosses an existing home. 342 has 16 ground water wells 341 has 6. 342 public perspective the lot issue can be mitigated. Therefore 341 and 362 can be accepted.

Lose 348, 350 and 349 in favor of 363, and 360 and 361.

Also lose 318 and 322.

Each group (Built, natural engineering, community) asked to review the current top three routes (AY, URV, and SGZ). Is the preferred route from that perspective in? is a route or segments eliminated that any group thinks should still be an option?

Natural would like to alter the preferred engineering route (URV) by removing Segment 316, and adding Segment 315 - Route URQ - Built 14794, Engineering 32, Natural 1531, Simple 5642.

PEP prefers simple average route - SGZ. Best heritage route is still in. First Nation feedback - preferred route is in.

Current top 4:
URQ (Natural)
AY (Built)
URV (Engineering)
SGZ (Simple)

DECISION: Routes URQ, URV, AY and SGZ will move on to expert judgment.

The next step each perspective (built, natural, engineering community) to move to breakout group, review routes and prepare scores for the criteria in the expert judgment model.

Meeting Notes

Breakout session group notes are at the end.

A recommendation was made to add a route with the northern (paralleling D602F) and western (west of the WMA) combination. It was agreed to add route SIL to the final list of routes moving on to expert judgment. SIL was the top scoring route that included the north and west combination.

Expert Judgment

Risk to schedule

The following are potentials risks to schedule from each perspective.

Engineering - weather

Natural - avoiding breeding birds, generally spring summer, some fall restrictions. Larger tracts of natural areas, have larger chance of birds, amphibians.

Community

First Nation feedback – potential further field studies (some newer segments have not been studied) and potential for significant delays in the Project.

PEP – land acquisition. Higher numbers of land owners would take more time.

Built - number of landowners, farmers etc. more people more time. More potential for legal challenges. One route will go through prime ag, aerial application different challenges.

Can all agree to the route with the least risk to schedule. Natural issues and First Nation concerns - linked to undeveloped crown land. This would be AY.

Built/PEP has opposite concerns

Engineering – weather all the same.

Percent Crown Land per route:

AY / SGZ 45-47% crown.
SIL 29%
URV/URQ 25%

Does license acquisition reduce risk - NO, still lots of risk.

Is AY a concern because it hasn't been assessed - YES.

AY is worst because it has high natural, FNMEP concerns.
From public it would be URQ and URV, SIL close second.
FNMEP: AY and SGZ highest risk to schedule.

More crown land more risk to schedule. .

Because there are trade-offs all over, if crown versus private, 2 and 1?

Would give slight edge to private.

DECISION: Using Crown (2) versus private (1) the scores for expert judgment for Risk to Schedule Are

Meeting Notes

AY / SGZ 2. - URV / URQ / SIL 1

BUILT Perspective Breakout Group Notes Summary

Did pseudo-quantitative analysis

Created three categories:

- Residences and development
- Ag use and land capability
- Land / resource uses and heritage

Used AHP information for importance (weight) between categories, weighted the results based on this.

Rolled up scores

AY 1.1 / SGZ 1.8

These routes affect fewer residences (within ROW none in AY), less homes in proximity (nuisance visual quality). Less affect on development potential

AY skirts more high value ag areas.

Land and resource use (recreation, heritage, quarries, groundwater resources), AY was best – worst on quarries otherwise better in all other land use considerations.

URQ 2.5 / URV 2.5 / SIL 2.3

These routes affected more residences and development potential.

DECISION: The following were scores for the built criteria in the expert judgment table:

AY 1
SGZ 2
SIL 2.7
URQ 3
URV 3

NATURAL Perspective Breakout Group Notes Summary.

Focused on the natural metrics across the five routes. How much did they differ, used species at risk, and field study observations (warbler and rail) for additional information (not covered in metrics).

Used URQ (natural preferred route) as reference point

URQ had - 70% more forest than AY and SGZ, more than 3 times than AY

Intactness score was50% more than AY

Of the 5 routes, AY was clearly the least favorable = 3.

Species at Risk affected most by AY and SGZ

SGZ next least preferable = 2.7

Meeting Notes

URQ and URV differed by only one segment. URQ skirts the wetland according to the data used for the metrics, but goes through a larger wetland complex, therefore got slightly higher score.

DECISION: The following were scores for the natural criteria in the expert judgment table:

URQ 1
URV 1.2
SIL 2.2
SGZ 2.7
AY 3

Community Group breakout notes summary

Balances the perspectives of FNMEP and the PEP.

SIL was given a 1 as it was a reasonable compromise of the two perspectives.

AY and URV were given a 2 as they were the preferred from each perspective. (AY publics preference / URV was FN preference)

SGZ and URQ, the least preferred for each perspective were given a 3.

URQ FN number 2, SGZ PEP number 2.

Did not do decimals, more of a rank.

DECISION: The following were scores for the community criteria in the expert judgment table:

SIL 1
AY 2
URV 2
SGZ 3
URQ 3

Meeting Notes

ENIGNEERING

Reliability

Reliability was proximity and amount of parallel. AY and SIL parallel D602F others don't.

DECISION: The following were scores for the reliability criteria in the expert judgment table:

URV 1, URQ 1, SGZ 1, AY 1.5 SIL 1.5

Cost – took average of all costs (using construction costs from the metrics, added acquisition, specialty mitigation, number of TLine crossings, house acquisition).

If actual within 5% of average than 1, if greater than 10% over, was a 2.

DECISION: The following were scores for the Cost criteria in the expert judgment table:

AY, SGZ, URQ, URV 1, SIL at 2.

EXPERT JUDGMENT for routes URV, URQ, SIL, AY and SGZ

		Routes				
Criteria	**Weight**	**URV**	**SIL**	**AY**	**URQ**	**SGZ**
Cost*	40%	1	2	1	1	1
Weighted		0.4	0.8	0.4	0.4	0.4
System Reliability	10%	1	1.5	1.5	1	1
Weighted		0.1	0.15	0.15	0.1	0.1
Risk to Schedule	5%	1	1	2	1	2
Weighted		0.05	0.05	0.1	0.05	0.1
Environmental (Natural)	7.50%	1.2	2.2	3	1	2.7
Weighted		0.09	0.165	0.225	0.075	0.2025
Environment (Built)	7.50%	3	2.7	1	3	2
Weighted		0.225	0.2025	0.075	0.225	0.15
Community	30%	2	1	2	3	3
Weighted		0.6	0.3	0.6	0.9	0.9
TOTAL		1.465	1.6675	1.55	1.75	1.8525

Based on the inputs to the expert judgment model, URV is the preferred route.

Meeting Notes

GENRAL DISCUSSION REVIEW and COMMENTS ON URV and the process:

Are there any other soft issues that should be considered?

If calculation for cost used, instead of a rank (as has been done previously), then:

AY 1.05
SGZ 1
SIL 1.14
URQ 1.03
URV 1.01

		Routes				
Criteria	**Weight**	**URV**	**SIL**	**AY**	**URQ**	**SGZ**
Cost*	40%	1.01	1.14	1.05	1.03	1
Weighted		0.404	0.456	0.42	0.412	0.4
System Reliability	10%	1	1.5	1.5	1	1
Weighted		0.1	0.15	0.15	0.1	0.1
Risk to Schedule	5%	1	1	2	1	2
Weighted		0.05	0.05	0.1	0.05	0.1
Environmental (Natural)	7.50%	1.2	2.2	3	1	2.7
Weighted		0.09	0.165	0.225	0.075	0.2025
Environment (Built)	7.50%	3	2.7	1	3	2
Weighted		0.225	0.2025	0.075	0.225	0.15
Community	30%	2	1	2	3	3
Weighted		0.6	0.3	0.6	0.9	0.9
TOTAL		1.469	1.3235	1.57	1.762	1.8525

Then SIL becomes the winner.

BREAK TO REVIEW PREFERRED ROUTE

Meeting Notes

AFTER BREAK

Other than cost, which is data driven, preference determination is subjective and the point is to use expert judgment.

Numbers will be reviewed and review the spread. Sensitivity analysis etc. will be done.

Was the best route picked?

A compromise of interests was made, it did not favor one stakeholder over another.

If rank for each category is considered, then SIL is an average for each.

These routes are the best of the best to start with.

DECISION: SIL has been chosen as the preferred route for review. The data will be checked (QA/QC). A Final decision will be made after review and check of the data.

Meeting Notes

MMTP ROUTING WORKSHOP - ENGINEERING BREAKOUT GROUP		
FEBRUARY 18, 2014	9:00 AM – 11:00 PM	

Meeting called by	Maggie Tisdale
Type of meeting	Engineering BREAKOUT GROUP NOTES
Facilitator	Dave Block / Maggie Tisdale
Note taker	Dave Block

ATTENDEES			
NAME	**COMPANY**	**NAME**	**COMPANY**
Amna Mackin	Manitoba Hydro		
Andrea Almeida			
Rob Kalichuk			
Jon Kell			

Engineering Breakout Group Notes

4 homes along TCH route will need buy out. Need to consider with project costs. Property has said around $500,000 (in fees etc.) and $500,000 for property to buyout . Add 4 million to TCH route.

Is it better along TCH or along existing corridor, corridor may be better.

Lots of properties along Prairie Grove, route URV. RM of Tache has commercial development near route.

RM of Tache says TCH prime conduit for development.

CN would have issues with 500 kV along CN main line. Cost to mitigate would be high. Biggest impact is signaling.

In general discussion engineering prefers D602F (AY) route.

Generally shorter / cheaper depending on property costs.

Meeting Notes

All things being equal, TCH route is preferred as it is shorter.

TLine maintenance puts heavy weight on accessibility.

D602F and TCH similar as they are opposite. Reliability on D602F (AY) and property issues on TCH (URV).

Existing towers on existing ROW (more expensive), R49R and MMTP double circuit.

Built route(AY) no buy outs.

Difference on cost 122M to 142M.

Risk to schedule on AY none.

AY and URV ranked no. 1 by engineering.

TCH affects rail which is URV, URQ and SIL.

TCH routes don't cross D602F

Extra line length offset by special circumstances.

Cost of Crown land versus cost of private very different, not in current cost value.

Land Use compensation.

Private land $115,000 / km, $30,000 / km for crown.

Additional Costs - specialty towers, special mitigation.

Can cost be added in cultivated versus cost in forested add additional costs for additional length in cultivated land?

Additional costs for proposed subdivision? Subdivision no policy, not zoned agriculture no tower payment.

Meeting Notes

	Construction Costs from metrics last round	Acquisition (multiplied by cultivated versus non)	Specialty Mitigation	Paralleling Costs	TLine Crossings $250000 / crossing	Homes ($1M / house)	Total Cost
AY	131.9	7.4		0.69M	2.75	0	142.8
SIL	142.5	7.5			3.2	1	154.2
URQ	123.9	8	0.8M[1]	1.5 M	1.25	4	139.5
SGZ	123.8	7.1		0.69M	3.2	1	135.8
URV	122	7.9	0.8M[1]	1.5 M	1.25	4	137.5
[1]207 interchange							

See table at end for scores based on the above costs.

	Weather	
AY	35	1%
SIL	24	1%
SGZ	24	1%
URV		0.3
URQ		0.3

See table at end for scores for reliability based on the above.

Risks to schedule issues:

winter construction restrictions.

Property issues (risk of expropriation– partially mitigated)

Weather – long cold winters better, wet springs road restrictions. Affects all 5 equally.

Meeting Notes

Criteria	Weight	Routes				
		URV	SIL	AY	URQ	SGZ
Cost*	40%	1	2.5	1	1	1
Weighted						
System Reliability	10%	1	2	2	1	2

Meeting Notes

MMTP ROUTING WORKSHOP - NATURAL BREAKOUT GROUP		
FEBRUARY 18, 2014	9:00 AM – 11:00 AM	West Side Cafeteria

Meeting called by	Maggie Tisdale
Type of meeting	Engineering BREAKOUT GROUP NOTES
Facilitator	Marcel Gahbauer
Note taker	Glenda Samuelson

ATTENDEES

NAME	COMPANY	NAME	COMPANY
Marcel Gahbauer	Stantec	Glenda Samuelson	Stantec
Leanne Wyenberg		Evan Rogers	
Lisa Peters			

Breakout Session - Natural

Discussion	Decision

Information used to inform rankings included GIS metrics calculated from the model related to Conservation and Designated Lands, Intactness, River/Stream Crossings, Wetlands, Natural Forests, along with MBCDC and Stantec records of SAR and SOCC, aerial and field observations, and expert judgment related to SAR and SOCC habitat.

An initial “from the gut” expert opinion ranking of the 4 routes was polled from the group with the following results

URQ 1
URV 1.2
SGZ 2.5
AY 3

The larger group reconvened to discuss whether a 5th route should be considered in the preferred route selection. All groups were in agreement that route SIL should be added to the evaluation process. The natural environment group generally agreed that this route would likely be a mid-point route option.

Areas of concern and/or interest were identified and discussed by the group:

1) Segment 316 (Route URV) versus 315 (Route URQ) – these segments represent the only difference between these 2 routes. In general the natural environment metrics for segment 316 are slightly better than the metrics for segment 315. Aerial imagery and FRI mapping were reviewed to confirm. It was observed that although segment 316 transects a shorter distance of wetland, it is farther within the major wetland complex that extends to the border, and would have greater potential to fragment habitat. Metrics also suggest there is slightly more forest along Segment 315, but a recent clearcut observed in the vicinity during the October aerial reconnaissance may have included this woodlot (and even if not, it is relatively small and isolated and does not offset the fragmentation concerns associated with Segment 316). It was agreed that despite metrics to the contrary that segment 315 was preferred to segment 316, and therefore route URQ is preferable to URV, although by a slight margin, especially given that the majority of the length of both routes is shared.

Meeting Notes

2) Stream crossings – it was noted that in the model the stream crossings were likely over counted and therefore given more weight in the metrics than appropriate. Review of the stream crossings for all 4 routes focussed on high potential streams (Class A) for fish habitat.

URQ 3 crossings: Seine, Seine tributary and Rat River
URV 3 crossings: Seine, Seine tributary and Rat River
SIL 7 crossings: Cooks Creek (X2), Edie Creek (X2), Seine, Seine tributary and Rat River
SGZ 5 crossings: Cooks Creek (X2), Edie Creek (X2) and Rat River
AY 3 crossings: Cooks Creek, Edie Creek and Rat River

A review of field photos indicated that these crossings are likely mitigable with existing access roads to both sides of the creek and tower placement outside of the riparian area; as such the weight is reduced for this factor in the consideration of the routes.

3) Segment 301 versus combined Segments 357/358/360. Natural considered there was minimal difference between these 2 segments in terms of natural areas and wetlands. Both segments cross small amounts of natural areas and parallel existing transmission lines and highways. The exception is that combined Segments 357/358/360 have no stream crossings and Segment 301 has 2 stream crossings, however both of these streams are already crossed by the existing transmission line.

4) Segment 355 versus Segment 365. Although Segment 355 is 4-5 km longer than Segment 365, it crosses significantly less natural areas and wetlands. Field observations of Segment 355 indicated that the areas of pasture and grassland were not high quality native prairie and that there was not high potential for SAR or SOCC along this segment. The exception is the 2 stream crossings on Segment 355; however, it was agreed that with mitigated crossings it was the preferred segment.

5) Segment 330/341. This Segment is part of routes SIL and SGZ and a number of concerns were raised. There are 2 stream crossings which were not assessed due to lack of private land access. There is the presence of good quality native shrubland with high potential for SAR and SOCC. There is the highest number of MBCDC records (16) of golden-winged warbler (Threatened under SARA) of any of the segments (no others had more than 2), and Environment Canada has recently defined Critical Habitat to include occupied suitable habitat in southeastern Manitoba. This is a potential risk to the project in terms of permitting approvals and schedule delays.

Meeting Notes

6) The model metrics related to Conservation and Designated Lands, Intactness, River/Stream Crossings, Wetlands and Natural Forests were reviewed for general trends. Additionally, the individual metrics were color-coded green (most preferred), yellow (2nd preferred), orange (3rd preferred) and red (least preferred).

URQ 149.9 km in length, ranked 2nd for overall metrics
URV 148.3 km in length, ranked 1st for overall metrics by 7%, however this is explored in detail in point #1 above
SIL 160.7 km in length, ranked 3rd for overall metrics, with a 3-20% decline from URQ, but with significantly more Golden-winged Warbler records than URQ or URV
SGZ 156.2 km in length, ranked 4th for overall metrics, with a 30-100% decline from URQ, and with a similarly high level of Golden-winged Warbler records to SIL
AY 166.2 km in length, ranked 5th for overall metrics, with a 150-300% decline from URQ in all major categories

7) Taking into consideration all of the available data and the discussions outlined above the final rankings for the routes were:
URQ 1
URV 1.2
SIL 2.2
SGZ 2.7
AY 3

Meeting Notes

MMTP ROUTING WORKSHOP - COMMUNITY BREAKOUT GROUP		
FEBRUARY 18, 2014	9:00 AM – 11:00 AM	Room 01.401

Meeting called by	Maggie Tisdale
Type of meeting	COMMUNITY BREAKOUT GROUP NOTES
Facilitator	Sarah Coughlin
Note taker	

ATTENDEES			
NAME	**COMPANY**	**NAME**	**COMPANY**

Breakout Session – Community		
Route	FN Advantages/Risks	Public Engagement Advantages/Risks
SIL – New route **Score 1:** This is considered the most balanced route option from the community perspective	Route SIL best balanced the non-mitigable concerns from both the public and First Nation. Experience in BPIII hearings indicated that there was much focus on the matrix/weighting used to arrive at values assigned to each route. Through group discussion, the Community team decided that because the feedback is not confined to a distinct set of measurable parameters, the focus of the evaluation would not be on detailed weights/calculations and would instead rank routes based on the best alternative that represents all Community viewpoints. This route addresses concerns raised by the community group and balances perspectives brought forward by the community including public and First Nations.	

	This route avoids the most sensitive cultural, spiritual and resource use areas; however, it might potentially traverse an area identified as important to a community on private lands. It is felt that this risk can potentially be mitigated.	• Takes advantage of linear development with other transmission lines. • Development plans in the Ste. Genevieve area have the potential to interfere with the project. However, potential to be minimized through avoidance and removal of least preferred routes in the area. • Addresses public concerns over avoiding proposed developments along PTH 1. • Lesser risk of expropriation than URQ/URV. • Less agricultural land than URQ/URV. • It is in close proximity to existing residential developments and has the potential to interfere with future development plans (already approved). • The RMs along this route option have expressed potential opposition to the routes through highly populated areas. • Public indicated that a route in developed areas can also affect property values of neighboring properties. • Does not address the preference of the public to avoid developed areas.
URV (Engineering) **Score 2** This is the preferred route based on the First Nation and Metis Engagement Process This is a least preferred route from a public perspective.	This is a preferred route from feedback received during the FNMEP as it avoids the most sensitive cultural, spiritual and resource use area.	This route is not viewed favorably by the public as it is predominantly on private lands and may affect future development. Concerns noted during public engagement include: • It is in close proximity to existing residential developments and has the potential to interfere with future development plans (already approved). • Public indicated that a route in developed areas can also affect property values of neighboring properties. • The RMs along this route option have expressed their potential opposition to the routes through highly populated areas. • Proposed highway upgrades and expansion plans along PTH1. • Proposed commercial developments along PTH1. • Higher risk of expropriation. • Aesthetic concerns along PTH 1 and the proximity of La Broquerie. • Increased potential impact to prime agricultural lands, aerial applicators and higher number of diagonal crossing of agricultural land. • Does not address the preference of the public to avoid developed areas.

Meeting Notes

AY (Built)
Score 2
This is the preferred route from a public perspective.
 	
This is considered the worst route from input received during the First Nations and metis Engagement Process
	Five First Nations have identified cultural, spiritual and resource uses along this route:
	• Although this area is not 'pristine wilderness', it seems to offer a successful balance of access and habitat to support the following verified activities:
	  • hunting, trapping, fishing,
	  • berry, ginger, rice and mushroom, medicinal plants picking,
	  • the presence of at least one sacred site
	• Elders have also expressed concern over impacts to wildlife in the area, including large game, waterfowl and impacts to sensitive nesting and calving areas
	• There were Metis villages identified with connection to Ojibway communities of high importance to participating First Nations
	• This route would result in a higher impact to First Nations and Metis ability to access Crown Land for TLE selection and exercising Constitutional rights.
	• This area has not been studied. Risks to First Nation culture, spirituality and resource use are unknown. Peguis has indicated this is an area of community interest, where we anticipate strong opposition to the project.
	• Additionally, the relationship that has developed with Swan Lake, Black River and Long Plain is a relatively new way of working with First Nation communities. The First Nations on the team also consider this a successful new platform for communicating with MH.
	  • New CAs with all participating FNs, increased field time (extending to spring) and potential challenges for the team to provide input to EIS.
		This is a preferred route from a public engagement perspective. Addresses issues identified by the public including:
		• Uses the least amount of private property/agricultural land.
		• Least potential for expropriation.
		• Makes use of existing transmission corridors when feasible.
		• Avoids more densely populated areas, and avoids future commercial/developments.

Meeting Notes

	Schedule delays associated with First Nations: • We would anticipate lack of further buy-in for remainder of project, delaying future deliverables and EIS review. NEB requires Aboriginal engagement that is timely, accessible, responsive and inclusive. The responsiveness and legitimacy of this engagement would be harder to defend with either of these routes. • Increased time associated with Crown Consultation for Simple Average, and perhaps significant additional time for Built route. **Increased Cost** associated with FN Concerns • Increased potential for FNs intervener presence (increased cost to fund, time at hearings, loss of benefit of funds provided to date) • Potential for additional licensing conditions • Difficulty with future projects based on lack of faith in MH process – cost of time and $ • Same as above, with additional risk of alienating FNs from MH for this and future projects • Increase risk of hearings and court challenges • Increased likelihood of Provincial hearing if FNs indicate extreme objection to project	

Meeting Notes

SGZ (Simple Average) Score 3 Although this is the second best route of Public Engagement Team, this route is scored a 3 to reflect Community perspectives.	Five FNs have identified cultural, spiritual and resource use of including those mentioned above in the AY. **Schedule delays** associated with First Nations: • Increased time associated with Section 35 for Simple Average, and perhaps significant additional time for Built route. **Increased Cost** associated with FN Concerns • Same as above in built	The route is identified as a secondary preference from a public engagement perspective: • Takes advantage of linear development with other transmission lines. • In the southern portion, it supports information gathered from the public throughout the PEP. • Takes advantage of crown and private lands. • Little to no expropriation required in southern portion of the route. • Potential for expropriation on northern portion of transmission line may cause additional schedule delays. • Development plans in the Ste. Genevieve area have the potential to interfere with the project. However, potential to be minimized through avoidance and removal of least preferred routes in the area.
URQ (Natural) Score 3 Although this is the second best route based on feedback during the FNMEP, this route is scored a 3 to reflect Community perspectives.	Concern with Natural: • Roseau River Anishinabe First Nation have provided maps indicating hunting and resource gathering use of the 314 area. Other First Nations have noted no preference of three routes in area FN Schedule Concerns • MH would likely offer additional time to Roseau River to better characterize sites of special importance • Additional mitigative measures may need to be applied along route FN Cost Risks • Small increased cost for Roseau River Anishinabe First Nation to better characterize area and elders gathering	This route is not viewed favorably by the public as it is predominantly on private lands and may affect future development. Concerns noted during public engagement include: • It is in close proximity to existing residential developments and has the potential to interfere with future development plans (already approved). • Public indicated that a route in developed areas can also affect property values of neighboring properties. • The RM's along this route option have expressed potential opposition to the routes through highly populated areas. • Proposed highway upgrades and expansion plans along PTH1. • Proposed commercial developments along PTH1. • Higher risk of lenghty property acquisition process. • Aesthetic concerns along PTH 1 and the proximity of La Broquerie. • Increased potential impact to prime agricultural lands, aerial applicators and higher number of diagonal crossing of agricultural land. • Does not address the preference of the public to avoid developed areas.

Meeting Notes

MMTP ROUTING WORKSHOP - BUILT BREAKOUT GROUP		
FEBRUARY 18, 2014	9:00 AM – 11:00 AM	Room Bipole Room

Meeting called by	Maggie Tisdale
Type of meeting	BUILT BREAKOUT GROUP NOTES
Facilitator	Frank Bohlken
Note taker	Bill Krawchuk

ATTENDEES

NAME	COMPANY	NAME	COMPANY
Frank Bohlken	Stantec	Vince Keenan	Maskwa
Bill Krawchuk		Bryan Ward	MMM group
Dave McLeod		Doug Bedford	MB Hydro
David Whetter			

Breakout Session – built
ITEM
DAY ONE P.M. – BREAKOUT SESSION
An overview of the expert judgment framework document, expectations and the process for looking at trade-offs for route comparison was provided.
Explained Tables 1 (Consequences Table – Raw Data) and 2 (Consequences Table – Scores).
Reviewed the proposed scoring methodology for Socio-economics and Land Use. For the Built Environment, route alternatives were compared on the basis of three criteria categories (and associated sub-categories), Residences and Residential Development, Agricultural Use and Capability and Land, Resources and Heritage. Routes were ranked based on the criteria categories based on “1”, “2”, and “3” scores, with “1” being least impact (or most preferred) and “3” being most impact (or least preferred).
Once the raw data is obtained and the scoring rankings applied, then look at scoring results and ask if there are criteria that have similar scoring across routes that could be dropped from further consideration as these criteria will cease to become decision-making.
In the tradeoff assessment, we will consider weighted versus unweighted rankings in determining the relative importance of the attributes.
Development plan/zoning bylaw rankings are now available in shape file format; Provide for incorporation into the GIS database for route comparison.

Meeting Notes

Four routes have been identified for further consideration by all teams: AY, SGZ, URQ, and URV.
Analysis done on subdivision applications by route segment and presented at tomorrow morning's session.
Development potential of land was also analyzed and presented
Based on review of all Zoning By-laws, a ranking of 1-20 was established based on zoning parcel characteristics.
– All the applicable Development Plans were also reviewed, and a ranking from 1-11 was established. Rankings from the Zoning By-laws and Development Plans were merged to arrive at a combined ranking for land development potential from 1-12.
Based on the combined rankings, a final rank on a scale of 1-3 was derived, including intermediary rankings of 1.5 and 2.5. The 1 to 3 scale represented the value on the potential for intensification of development.
• Raw data and scoring will be conducted by the team during the evening of Day One to support evaluation and discussion on Day Two Day One session concluded at 5:00 p.m.
DAY TWO A.M. – BREAKOUT SESSION
Route (SIL) was added to the discussions. As a result, there will now be five routes to consider going forward.
FB indicated that viewpoint data for the Visual Quality Assessment were underestimated as there are some candidate viewpoints where there was no locational data collected to go along with the points documented as part of the public engagement program.
Forestry - there was a missing data set related to commercial Crown forest plantations while there is data on private plantations.
Process to follow for the morning session will be to look at the built environment tables by major category (i.e., residences and residential development, agricultural use and capability and land, resources and heritage), discuss the implications of our trade-off assessments and make our recommendation as to the preferred route.
Residences and Residential Development:
Reviewed the results for the potential development of land based on review of all development plans and zoning by-laws applicable to the Project.
The Development Plan designations for all lands were reviewed and ranked on a scale of 100-400 (100 being agricultural and 400 coinciding with urban).
The same process was followed in the review of applicable Zoning By-laws.
A ranking of 1-20 was developed looking at the potential for private land development.
A final ranking was provided based on a scale of 1, 1.5, 2, 2.5, 3. A rank of 1 (green) reflected a use that was mostly agricultural, rural, with large lots. A ranking of 3 (red) was indicative of townsites and general development areas.

Meeting Notes

The green and light green areas are where one would want to route a transmission line.
The result was that green was indicated for all routes, with some having small pockets of orange (indicative of some rural residential development.
The analysis looked at the total lengths for each route. For all routes, the vast majority were ranked as 1-1.5, with some small sections ranked as 2-2.5. The total lengths for all routes shown as green were over 99% each.
Route AY was found to have 3 times more areas ranked as 2, 2.5, which could coincide with rural residential.
In conclusion: there was no more impact on land development potential from one route to the other and not much difference between routes.
If one were choosing, would chose route AY with a score of 99.4%.
All route scores were the following from the potential development of land perspective:
Route AY Score: 1 – 99.4%
Route SGR Score: 1 – 99%
Route URQ Score: 1.5 – 99.57%
– Route URV Score: 1.5 – 99.56% Route SIL Score: 1.5 – 99%
Subsequently reviewed subdivision applications: all attributes of the subdivision parcels were reviewed and then were ranked on a scale of 1-3.
The individual segments for each of the routes were reviewed.
The sum totals were provided for all five routes. Separate totals were provided for those segments with the routes where there was a rank of 1 and those where residual parcels were left over. The sum total scores were as follows:
– Route AY Score: 1 – Route SGZ Score: 2 – Route URQ Score: 3 – Route URV Score: 3 Route SIL Score: 2.5
Limitations: the review of subdivision applications resulted in scores where there was some double counting (i.e., where there were two segments within a particular parcel of quarter-section subject to a subdivision application. In addition, only 2014 subdivision applications were counted in the analysis.

Meeting Notes

- Rationale for scores: under an unmitigated scenario, routes AY, SGZ are lower across the board; URQ/URV have more residences within ROW, in proximity to the ROW, have a higher impact on subdivision applications; and the presence of line remains an issue.

- There is no way to mitigate subdivision potential at the moment.

- Under a mitigated scenario, route SIL is a hybrid of the all the other routes, but not preferred route. Its alignment with respect to potential development is likely the worst of all routes.

Higher scoring routes will have more landowner in opposition. Municipalities could also express unhappiness with the potential loss in revenue from subdivision development. People may want to suggest adjustments to the chosen route. We have picked a route that has the potential to disrupt the least amount of people.

Agricultural Use and Capability:

- Route AY: all agricultural criteria scored 1 (green highlight in table)

Route SGZ: of the agricultural criteria, there was one 1 (green), two 2 (yellows), and one 3 (red) scores

Route URQ: all agricultural criteria scored 3 (red)

Route URV: all agricultural criteria scored 3 (red) – scored the worst based on raw data

Route SIL: of the agricultural criteria, there was one 2 (yellow), 4 red, and one 1 (green)

The scores for mitigated and unmitigated scenarios were similar between the two scenarios. The rationale behind taking the scores forward unchanged includes the following considerations:

Provide compensation for agricultural effects because of nuisance factor and presence of line.

Mitigation measures can include tower placement considerations and adhering to other protocols related to routing as part of the design phase and during the construction phase.

Conclusion: we will stick with the relative scores as presented. Route AY has least direct effect on agricultural use and capability.

There is still some effect on agricultural values with Route AY; others routes would attract more opposition.

Land, Resources, and Heritage:

Discussion focused on the trade-offs in land use values based on scores derived from the data.

All features that scored the same across all routes were removed from further consideration, including heritage resources, tree improvement sites, research/monitoring sites, and forest plantations.

Routes AY, SGZ overall had the lowest scores, based on all criteria being weighted equally.

- Commercial forests are likely less of an issue than other considerations as they are compensated for through a forest damage appraisal.
- Woodlots are mostly unmanaged and most will not be affected by the routes.
- With resource areas (quarries, aggregate), issues relate to construction associated with dust generation, blasting. The only mitigation includes route adjustment to address potential effects.

Shelterbelts along the routes are mostly residual pieces left over from natural forest; the most valuable ones are around residences.

Based on an unmitigated scenario (unweighted), route AY scores 1.22 and is the best. Based on a mitigated (weighted) scenario, route AY is still chosen as the preferred route from the built environment perspective.

DAY 2 P.M. – GROUP SESSION

Route Preference

- All discipline groups reported back on their scoring results for the five selected routes in the group session. The built environment weighted and unweighted scores were normalized for reporting in the group session so that the built environment scores would be comparable to other groups that had scores ranging from 1 to 3.
- Summarized all scores from the discipline groups relative to the five selected routes. General observations included:
  - Route AY is the worst from the Public and FNMEP perspectives, worst from the Natural Environment perspective and best from the Built Environment perspective. Route SGZ includes 45-47% of Crown land, with 29% Crown land for route SIL, and 25% for routes URQ and URV.
  - Discussion took place on the scores reported by the Public Engagement and FNMEP Group under the Community category for the five selected routes. Focus of the discussion was related questions on the use of the 1 to 3 scoring range used the group given the relative importance placed on the Community criteria, representing 30% of the total for selecting a preferred route, and the rationale behind the decision-making on the scoring that occurred under expert judgment.
  - Shannon Johnson indicated that Section 35 Consultations will likely be more of an issue with respect to risk to schedule than expropriation. MB Hydro has a defined process in place to manage expropriation. Section 35 Consultations are less well-defined.

Expert Judgment Table Scores by Route were as follows:

Routes:	AY	SGZ	*SIL	URQ	URV
Risk to Schedule:	2.0	2.0	1.0	1.0	1.0
Built Environment:	1.0	2.0	2.7	3.0	3.0

Meeting Notes

Natural Environment:	3.0	2.7	2.2	1.0	1.2
Community:	2.0	3.0	1.0	3.0	2.0
System Reliability:	1.5	1.5	1.5	1.0	1.0
Cost:	1.05	1.0	1.14	1.03	1.01
Total:	1.57	1.90	1.32*	1.76	1.47
The meeting adjourned at 3:30 PM.					

Appendix 5E
Workshop Notes Round 3

Meeting Notes

MMTP ROUTING WORKSHOP – Selection of the final preferred route		
April 30, 2015	9:00 AM – 4:00 PM	Conference Rooms A/B

Meeting called by	Maggie Tisdale
Type of meeting	Routing Workshop
Facilitator	Maggie Tisdale
Note taker	Robin Gislason

ATTENDEES

NAME	COMPANY	NAME	COMPANY
Maggie Tisdale	Manitoba Hydro	Marc Wankling	Manitoba Hydro
Trevor Joyal		Sophia Garrick	
James Matthewson		Larry Wiebe	
Sarah Coughlin		David Whetter	Stantec
Shannon Johnson		Leane Wyenberg	
Jon Kell		Bill Krawchuk	
Ken Duchminsky		Frank Bohlken	
Amna Mackin		Lisa Peters	
Jim Keil		Stephen Biswanger	
Patrick Allan		Dan Routhier	
David Jacobson		Nick De Carlo	
Lindsay Thompson		Butch Amundson	
Robin Gislason		Lindsay Stokalko	
Rob Kalichuk		Nicole Kearns	

Introduction

Maggie Tisdale

Introduction to purpose of meeting and overall project. Details on workshop format, goals, objectives, and final outcomes.

Discussion

This meeting will be the last chance for specialists to bring up questions and concerns regarding route segments from the route selection team.

Today is the end of Round 3 – all PEP feedback and specialist feedback, developed mitigative routes and segments. Today we will be discussing 3942 possible routes.

- The workshop began with round table introductions.
- The workshop agenda was reviewed, and the routing process was explained.
- Only the proposals put forward from PEP that are possible and actually lower the impact without placing impact from one landowner to the other are being considered today.

Meeting Notes

Comparison between segments 451 and 403

- There was some preference to parallel existing 230 kV R49R with segment 451.
- The RM of Tache has high value quarry that they don't want disrupted. They have concerns regarding slope set back and restrictions to quarrying activities
    - The RM of Tache anticipates a 30 million dollar impact to over 60 years because of quarry impacts.
- There are 3 residences pinched in between the R49R and segment 403.
    - The residences are roughly 115 meters from the centerline of 451.
    - Despite the close proximity, the landowners would rather MMTP parallels R49R even though it's closer to their homes.
- The two segments are neutral from a wildlife perspective.
    - Both are in golden winged warbler habitat.
    - The wildlife representative leans towards the segment that parallels (451).
- From a construction perspective, there is a preference to parallel with segment 451.
    - It provides easier access for construction and maintenance.
    - Manitoba Hydro wouldn't need the full ROW.
- It appears there is no room for a buffer for the homes on each side.
- There are no extra angle structures for either of the segments.
    - The angle on segment 451 is only a deflection
- From a built perspective, segment 451 appears to be a better option
    - It reduces impacts on the residences and RM of Tache quarry
    - There are no forestry, heritage and agriculture issues with either segment
- Peguis First Nation indicated hunting and recreational activities along segment 403
    - Peguis First Nation has not indicated a level of importance yet.
    - It is suspected that the existing use is associated with the access from R49R
    - Manitoba Hydro anticipates that First Nations would probably indicate that paralleling is preferred because less vegetation is removed.
- There is less vegetation removal along segment 451
- The group concludes to eliminate segment 403. 1696 routes are left.
- The engineering team discusses the angle deflection at the 451 and 404 intersection.
    - They determine it is only a light angle that will cost around 10,000 dollars.
    - This is negligible to the project cost.

Meeting Notes

Comparison between segments 405 and 452

- An effort was made to leave all the homes equal distance from the line in the modified segment.
    - The preferred route segment favors homes to the west.
- There is a new home site in the area.
    - The landowners suggested a modification that keeps transmission line on their property but adds some distance between their future home.
- Another landowner is concern about access to his pasture land
    - The modification may permit the transmission line to span the pasture
- The wildlife group's only concern is the sharp tailed grouse lek nearby segment 452
    - There is a 400meter setback guideline that Manitoba Conservation and Water Stewardship adheres to. Leks are very traditional and use year after year. The grouse arrive in the spring. Construction activities and other disturbances may displace birds from the breeding ground. It is important to protect the courtship display ground and nesting habitat.
    - The grouse lek is 520 meters from center line of segment 452. Disturbance from construction activities and collision risks are higher because the grouse are concentrated.
    - Mitigation measures that are used for grouse leks and timing windows are explained.
    - The crucial time period for grouse is the first couple months in the spring.
    - There would be no activity in the areas from April to August.
    - The area is very wet therefore construction would likely occur during winter months.
    - 452 is closer in the wetland, so there would be a small increase risk for bird collisions
    - The wildlife representative believes the effects on grouse can be mitigated with timing windows and barbed wires on towers (Manitoba Hydro can use spikes instead of barbed wire to prevent predators from using the towers as hunting lookouts)
- There are no formal concerns from the FNMEP in the area.
- From the built perspectives, both options quite similar.
    - PEP:, segment 452 is actually preferred by the landowners even though it crosses their property more because it's further from their home.
- Construction has a preference for segment 405.
    - It is higher and dryer, which is easier for construction.
- The cost difference between segment 452 and 405 is negligible.
    - 19.45 million for segment 405
    - 19.21 for segment 452
- There was a consensus among the group for segment 452. 848 routes remain.

Meeting Notes

Comparison between segments 477 and 478/479/409

- The RM of La Broquerie and Town of La Broquerie have a strong opposition to the transmission line.
    - They are concerned with EMF and health effects.
    - They want the transmission line away from people and development.
    - Manitoba Hydro has picked the more permissible development zone.
- The landowners along segment 479 want the transmission line on her property and noted satisfaction with the compensation package.
- The forested area is a wildlife corridor to the stream area.
- There are subdivision plans to the west and north of Quintro Road
    - There is a new subdivision with homes that has been in the area for roughly 10 years.
    - Segment modification does not affect any subdivisions.
- From a wildlife perspective neither segment is significantly better.
    - Both segments fragment the forest.
    - Segment 479 would increase forest fragmentation but distances the line from the Seine River.
- Peguis First Nation indicated extensive hunting uses and a sensitive site in nearby patch of trees.
- Roseau River mentioned that there is cedar and sage botanical area nearby.
    - The level of importance and exact location is unknown, however the general area is known.
- One of the landowners has indicated there is 'every species of concern' in his quarter section.
- The route could go either way based on a public perspective.
    - No matter what segment is selected, the transmission line will be vocally opposed in the area.
- From the built and agricultural perspective, the modification is only a marginal improvement because there is no screening for viewshed.
    - The tower should be placed in line with the east-west road just north of the golf course.
    - The windows along the road all face north and south.
    - Caution must be taken with structure placement at the end of the road because of the stream/Seine River Crossing directly south.
        - The corner could be pulled north in the grove of trees, and the next span could be maximized.
        - AG landowner will have one tower in his field either way
        - Cutting angle higher will bring line closer to subdivision
- There is easier access to segment 469 from a construction perspective.
    - Access off of Quintro Road.
- It appears there is no clear feeling on these segments. Should the statistic decide the best segment?
- The golf course owner expressed concerns over the potential loss of the Northwest tree line along the road allowance.
    - Concerned about improved access and snowmobiles and ATV ripping up golf course
- There was a suggestion to push segment 479 down to river crossing.
    - This would mitigate concerns including proximity to Quintro Road, tree clearing along the golf course, visibility and noise.
    - However this modification will move the view of the angle tower to landowner across the golf course.
    - This new modification is better from natural perspective because of less clearing in the riparian area.
    - This new modification is better from a built perspective.
- The group concluded that the new modified 479 segment is preferred.

Meeting Notes

Comparison between segments 417 and 475

- Segment 417 crosses private land that is used for gathering traditional medicines and cultural practices. The landowner allows other First Nations to use the property as well.
    - An individual from Roseau River Anishinabe First Nation contacted Manitoba Hydro on the landowner's behalf because the landowner is ill.
    - The landowner does not want the transmission line on her property and has concerns that clearing and herbicide applications will interrupt the medicinal gathering activities on the property
    - Segment 475 was developed in response to the landowners concerns
    - Segment 475 moves closer to homes and is longer
- Segment 475 in not in the top routes. It is ranked 105th in the statistical analysis.
- There are concerns from Long Plain First Nation, Black River First Nation and Swan Lake First Nation with segment 417.
    - Manitoba Hydro anticipates that Segment 475 would be supported by participants in the First Nation and Metis engagement process.
    - Preference to keep final preferred route as similar as possible to the preferred route presented in Round 3.
- The group concludes that both segments need to be kept in the evaluation.

Meeting Notes

Top 5 routes from statistical analysis

- The statistical analysis produced the top 5 routes from each perspective.
- Simple average: BMX, BMZ, BNZ, KG, KJ
- Built perspective: BXN, BXP, BXT, SL, SN
    - All routes use segment 453, which would go further east and avoid the town of La Broquerie.
        - Throughout public engagement we heard property value, EMF, and noise concerns associated with the alternative to this segment (running through La Broquerie.
        - Many members of the public requested we look at utilizing fireguard 13.
        - This mitigative segment takes the concerns into consideration.
        - This mitigative segment moves the route mostly on Crown land in the RM of Reynolds, but would affect Marchand more than La Broquerie.
    - The transmission line would not be visible to people living in the subdivision on the west side of Marchand because their houses are in the bush.
    - It would only be visible to people on the east side of Marchand.
    - Overall far better from a built perspective.
- Natural perspective: BMX, BWT, BWX, RR, RV
    - These routes are preferred as the go further west.
- Engineering perspective: BML, BMN, BNR, BNT, BOJ
    - These routes preferred as the go west
- None of the top five routes from the different perspectives take into account the modifications to avoid the private land sections used for medicinal and cultural practices.
    - Route BMW includes the medicinal modification segments but ranks 712 in the statistics.

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The routes BMX, BMZ, BNZ and BOB are evaluated.
BMX uses segment 409 whereas BMZ, BNZ and BOB use segment 465. Suggestion to move BMX forward.

- In the region northwest of WPD Wildlife Management Area, there is Maple Leaf's sensitive agricultural operation, a private recreational area, HyLife calving ridge, a future home development and a proposed protected area in the region.
- Segments 409 and 470 were originally drawn to mitigate the proposed protected area but are no longer necessary.
- BMX can be moved further east to avoid some angle towers.
    - BMX is also further away from the cemetery.

BOB and BMX differ near the Sundown Cemetery area.

Meeting Notes

Comparison between Segments 416 and 474

- Segment 474 gains more separation from the Sundown (Ridgeland) Cemetery and Ukrainian cultural/celebration purposes.
- Mitigation measures include tower placement and avoiding construction and maintenance activities when cultural celebrations occur. Mitigation measures could be applied to segment 416 as well.
- Lonesand Lake is located just north of segment 474 and east of Sundown Road.
    - Segment 474 spans the southern tip of the lake and bird strikes are a concern.
    - It is important to maintain a tree buffer between the lake and the transmission line. The natural tree line would cause the birds to start climbing before they reach the transmission line.
- Due to natural concerns, segment 474 cannot proceed. BOB will move forward.
- The top of BMX and bottom of BOB would be a great alternative.
- BXN and BXP are the preferred options statistically.
    - They only differ near the Cemetery.
- BXP is the best eastern option numerically, but passes through Hylife's calving grounds.
    - Hylife is okay with the use of self supporting towers and protected bases for mitigation.
    - Access is still a concern with private recreational land.
    - Maple leaf biosecurity issues are still a big concern.
        - The transmission line would add risk to their biosecurity.
        - Maple Leaf has the most stringent biosecurity policy in the province.
        - The two Maple Leaf barns in the area are their most sensitive and important.
    - BXP costs $106 million.
- The next best option numerically is BWZ ($109m).
    - Avoids Maple Leaf operation, the private recreational area and Lonesand Lake.
    - BWZ is the worst option from the engineering perspective.
    - From public perspective, either route will be challenging.
- The cost difference $105 million (BMZ) and $109 million
    - BMZ is back tracking but it is good from a public perspective
- BMZ mitigates the Maple Leaf and Hylife concerns.
- BMW
    - Not a good route statistically, but mitigates concerns brought up by the medicinal land owner.
    - The route should be brought forward from a public and natural perspective.
    - BMW is closer to one home.
- Routes BMX, BWZ, BXP, BOB, and BMW are moved into expert judgment.
    - BMY was previously BMW.

Meeting Notes

Natural Rankings

- BMY is the best route and ranks number 1.
    - Avoids a lot of forest and habitat fragmentation.
    - Avoids critical habitat for a lot of species and endangered species.
    - Allows for medicinal plant area mitigation.
    - Similar to the preferred route that was presented in Round 3.
- BMY is the same as the top of BOB with the Violet modification.
- BXP is the worst route
    - Fragmenting habitat and forested areas.
    - Runs through critical habitat.
- BWZ is only slightly better because it provides a bigger buffer for the WMA and avoids some wetlands.
- BMX goes over Lonesand Lake. It would be the same as BOB if it didn't go over Lonesand Lake.

Built Rankings

- BWZ is the best route and ranks number 1.
    - The eastern route avoids La Broquerie, proposed residential developments and agriculture perspectives
- BWZ ranks higher than BXP because it avoids biosecuirty issues with respect to the Maple Leaf operation.
- BOB is a little closer to the cemetery, which is why it scores worst.
- There is no major difference between BMY and BOB.

Engineering Rankings – System Reliability

- The routes are all the same for reliability, because they are so close together.
    - The closest point between the proposed routes and D602F is 4 km.
- Extra line length increases the risk so the more eastern routes would have slightly more reliability concerns.
- Both Western routes are equal and will rank 1. The eastern routes are slightly worst and will rank 1.5.

Meeting Notes

Community Rankings

- BWZ ranks highest from a public perspective.
    - It avoids the private recreational area, Maple Leaf operation and uses eastern route (La Broquerie.
    - The Hylife concerns are mitigable.
    - However does not deal with the medicinal plant property.
- BWZ ranks lowest from based on input received during the First Nation and Metis engagement process.
    - BWZ will cause Crown land fragmentation and affect historical and contemporary use.
    - BWZ creates Archeology concerns and greater access further east.
- Manitoba Hydro anticipates that BMY is the best based on input received during the First Nation and Metis engagement process.
- BMY does not address the Town of La Broquerie but accommodates others in the RM of La Broquerie (Hylife, Maple Leaf, recreational lands, Sundown Cemetery and medicinal plant property).
- If an eastern route is selected, the schedule is put at risk (potential Round 4) and this challenges the process.
- BOB accommodates the medicinal plant property.

Engineering Rankings – Cost

- Western routes ranks highest from a cost perspective (rank number 1)
- Eastern routes are given 1.02.

Meeting Notes

Risk to Schedule Rankings

- The eastern routes have higher prevalence of Crown land.
- The eastern routes traverse more wetlands.
    - This creates a preference for winter construction and shorter construction season potentially adding to longer overall schedule
    - Agriculture lands also have a winter construction preference.
- Eastern routes would require more time for TK studies.
- Accommodating the medicinal plant property will create two light angles but will address concerns raised by multiple FN communities.
- Maple leaf would request winter construction (BXP).
- BWZ is slightly better than BXP.
- BMY ranks highest from a community perspective because it addresses many concerns heard from the RM of La Broquerie, Maple Leaf, Sundown Cemetery, Hylife, the recreational area, and during the First Nation and Metis engagement process.
- BWZ is preferred from a public perspective because it addresses every issue excluding the medicinal plant property.
- BMX and BXP does not mitigate any of the specific concerns raised in PEP

Based on the inputs to the preference determination model (below), BMY is the preferred route.

Meeting Notes

Preference Determination for the preferred route for MMTP (showing relative scores, weighted scores and total sum. Lower values are preferred for routing)

Criteria	Weight	Routes				
		BMX	BWZ	BXP	BMY	BOB
Cost*	40%	1	1.02	1.02	1	1
Weighted		0.4	0.41	0.41	0.4	0.4
System Reliability	10%	1	1.5	1.5	1	1
Weighted		0.1	0.15	0.15	0.1	0.1
Risk to Schedule	5%	1.5	2.5	3	1	1.5
Weighted		0.075	0.13	0.15	0.05	0.075
Environment (Natural)	7.50%	1.5	2.8	3	1	1.2
Weighted		0.1	0.21	0.23	0.075	0.09
Environment (Built)	7.50%	2.9	1	1.1	3	3
Weighted		0.2	0.075	0.083	0.23	0.23
Community	30%	2.5	2	2.5	1	2
Weighted		0.75	0.6	0.75	0.3	0.6
TOTAL		1.66	1.57	1.77	1.15	1.49
Rank		4	3	5	1	2

*A scaling factor was used for cost.

The next steps in the environmental assessment and licensing process are reviewed and the meeting is concluded.

Meeting Notes