Appendix A

Transmission line routing

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1.0   Transmission line routing

1.1   Overview

This appendix is intended to be read as supporting material to chapter 3 of the environmental assessment report for the BP6/BP7 transmission project. It describes the models used in the transmission line routing process used to determine the location of the final preferred route.

The routing methodology used for this project is based on the EPRI-GTC overhead electric transmission line siting methodology[1].

1.2   Routing methodology

The EPRI-GTC methodology is a quantitative, computer-based methodology developed by the Electric Power Research Institute (EPRI) and Georgia Transmission Corporation (GTC) for use as a tool in evaluating the suitability of an area for locating new overhead transmission lines.

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 process, considers three broadly conceived perspectives that apply to land use, plus a fourth perspective that considers the other three equally. The three perspectives (and their project team representatives) are:

Built environment perspective 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 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 is concerned with cost, system reliability, constructability and other technical constraints. The engineering perspective

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[1] EPRI-GTC. 2006. EPRI-GTC Overhead Electric Transmission Line Siting Methodology. Tucker, GA: Georgia Transmission Corporation.

(engineering) group is represented by Manitoba Hydro project management, system planning, design, construction and maintenance staff.

1.2.1 Areas of least preference

The areas of least preference are 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 extensive mitigation or compensation to minimize impacts. The areas of least preference used for the BP6/BP7 routing process are provided in Table A-1.

Table A-1: Area of least preference

Aboriginal Lands
Airports/Aircraft Landing Areas (glide path)
Buildings
Campgrounds/Picnic Areas
Cemeteries/Burial Grounds
Contaminated Sites
Federal/Provincial/Municipal Heritage Sites
Heritage Plaques
Known Archaeological Sites
Military Current/Past Installations
Active Mines and Quarries
Non-spannable Waterbodies (>450m)
Provincial Park Reserves
Recreational/Natural Provincial Park
Recreational Centers (Golf, Skiing, etc.)
Religious Worship Sites
Schools/Day Care
Indian Reserves/TLE Selections
Towers/Antennae
Waste Disposal Sites
Wastewater Treatment Areas

1.2.2 Alternate route evaluation model

The alternative route evaluation model (Table A-2) was developed by Manitoba Hydro team members. 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. 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 A-3.

Table A-2: Alternative route evaluation model

Criteria	Weight
Built	
Relocated Residences	30%
Potential Relocated Residences	18%
Proposed Developments	16%
Diagonal Crossings of Agriculture Crop Land	11%
Proximity to Residences	6%
Special Features	5%
Historic / Cultural Resources	5%
Current Agricultural Land Use	4%
Proximity to Buildings and structures	3%
Land Capability for Agriculture	2%
Natural	
Crown Land (natural)	30%
Wetlands	25%
Stream/River Crossings	30%
Natural Forests	15%
Engineering	
Construction/Design Costs	60%
Seasonal Construction + Maintenance Restrictions	15%
Accessibility	10%
Proximity to infrastructure	15%

Table A-3: AREM criteria definitions

Criteria	Measurement	Criteria Description
Built		
Relocated residences	Count	Occupied residence categorized in buildings layer and windshield surveys that are within the right-of-way
Potential relocated residences	Count	Occupied residence categorized in buildings layer and windshield surveys that are within 100 meters of the edge of the right-of-way
Proposed Developments	Count	Quarter section of land within which there is an approved residential subdivision
Diagonal crossing of Agriculture Crop Land (Acres)	Acres	Diagonal crossings of land identified to be in agricultural capability classes 1-3
Proximity to Residences	Count	Occupied residence categorized in buildings layer and windshield surveys that are 100-400 meters from the edge of the right-of-way
Special Features	Count	Schools, Churches, Park Parcels, Recreational Trails, Campgrounds, Resorts and Lodges, Woodlots
Historic/Cultural Resources	Count	Designated and known heritage sites within 250 m of the edge of the ROW
Current Agricultural Land Use (Acres)	Acres	Annual crop (x 2.7) and hayland (x1) land cover classes
Proximity to Buildings and Structures	Count	All buildings and structures from buildings layer not including occupied and unoccupied residences, churches, schools, daycare, unobservable or unused buildings
Land Capability for Agriculture (Acres)	Acres	Soil classes 1-3 (x2) and 4-5 (x1).
Natural		
Crown land (natural)	Acres	Crown land with natural code.
Stream/River Crossings – Centreline	Count	Natural stream/river crossings based on Fisheries and Oceans Canada data. Types A, B, C, and D (Milani 2013).
Wetland Areas (Acres) – ROW	Acres	All wetland classes from Forest Resource Inventory data
Natural Forests (Acres) – ROW	Acres	All forested (*i.e.*, productive and non-productive) cover classes from Forest Resource Inventory data
Engineering		
Design / Construction Costs	Cost	Estimated costs including construction material costs, estimates of tower type based on terrain, additional costs for angle structures and clearing costs
Seasonal Construction and Maintenance Restrictions	Value	A value determined by the presence of wetland, forest, and agricultural land use/land cover patterns within the ROW
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)
Index of Proximity to existing infrastructure	Value	A value determined by the ROW's proximity to existing transmission lines, pipelines and rail lines

1.2.3 Preference determination model

In order to provide guidance to the decision-making process, prior to the development and evaluation of route segments, the transmission senior management team developed a list of key considerations and assigned each a weight based on relative importance for this project. This formed the basis of the preference determination model. Weights were based on technical experience, familiarity with the key issues in the project area related to its geographic and sociological makeup and input from the engagement process. The team determined the criteria in the model as well as the relative weights of each criterion (Table A-4).

Table A-4: Preference determination model

Criteria	Percent	Description
Cost	40%	Cost was based on high-level cost estimates for construction, materials, and property acquisition, used for relative comparison
Community	30%	Input received from public and First Nation and Metis engagement
Schedule risks	10%	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 environment route statistics with 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 environment route statistics with 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	5%	Consideration of external factors (e.g. weather events) that could affect the reliability of the transmission line during operation.