Dorsey to Portage South 230 kV Transmission Line

Environmental Assessment Report

Submitted By:

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Transmission Planning and Design Division
Licensing and Environmental Assessment
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EXECUTIVE SUMMARY

Manitoba Hydro identified the need to provide transmission improvements in voltage support to southwest Manitoba. Increasing power demands in western Manitoba have led to load growth on the Manitoba Hydro 230-kV system. Manitoba Hydro forecasting studies indicated that without voltage support transmission planning criteria would be violated at the Portage South station. Specifically, load growth in western Manitoba has led to unacceptably low system voltages during winter peak single contingency outages. To address these concerns, Manitoba Hydro began the Winnipeg to Brandon Transmission System Improvements project. The Dorsey to Portage South Transmission Line (D83P) Project (The Project) is the final phase of this development project.

The proposed Project includes a new 66-km, 230-kilovolt (kV) alternating current (AC) transmission line. The transmission line will originate from the 230-kV switchyard of the Dorsey Converter Station, located 10 km northwest of Winnipeg. The Dorsey Converter Station is a main hub for the 230-kV transmission network, converting 500-kV direct current (DC) to AC current. The line will terminate at the Portage South Station, located 12.5 km southeast of Portage La Prairie. The Portage South station is connected to the 230-kV network by two 230-kV transmission lines, D12P and P81C. The D12P line connects the Portage South Station to the 230-kV switchyard at Dorsey Converter Station, and the P81C transmission line connects the Portage South Station to the Cornwallis Station near Brandon. Both Dorsey Converter and Portage South stations will require equipment modifications and additions to terminate the D83P transmission line and integrate the Project into the 230-kV electrical network. All station modifications and equipment additions are planned to be within the existing fenced areas.

At 230-kV, the proposed D83P transmission line constitutes a Class 2 development as defined by the Classes of Development Regulation 164/88 under The (Manitoba) Environment Act. Therefore, the Project will require an Environment Act License (EAL) prior to the initiation of any works. An EAL is the primary enabling permit for the Project. Class 2 developments are required to submit an Environment Act Proposal Form (EAPF) and Environmental Assessment Report (EA Report) to Manitoba Conservation and Water Stewardship to enable public and government agencies to examine the details of the proposed project, its anticipated impact on biophysical and socio-economic aspects of the environment, and measures that Manitoba Hydro intends to use to mitigate potential impacts. Under the provincial Environmental Assessment process, only the Project component requiring a permit should be included in the EA Report. An EAL is issued upon the Minister's acceptance of the EAPF and EA Report.

Within the Study Area, land is typically divided up using a section-township-range system. The vast majority of this land consists of privately owned agricultural parcels. Local government jurisdiction in the study area resides with the relevant rural municipalities (RMs). The Project is not in close proximity to any Protected Areas or First Nation reserve lands, although there are three First Nations around the periphery of the Study Area (Dakota Plains First Nation, Dakota Tipi First Nation and Long Plain First Nation). The Project would be located in a portion of Peguis First Nations Community Interest Zone. In addition, there is a substantial Metis population in the study area. Agricultural land use in the Study Area consists of intensive cropping on cultivated lands with cereal crops, canola, corn, soybeans and alfalfa being produced. Relevant infrastructure in the Study Area includes roads, rail lines, communications and other hydroelectric transmission infrastructure, a natural gas pipeline, aerodromes and water infrastructure.

Manitoba Hydro initiated a Site Selection and Environmental Assessment (SSEA) study in 2011 to identify a proposed route for the Project. The route selection process involved systematically refining and reducing alternatives within a broad study area to the single best balanced choice of a preferred route, with input from an on-going Environmental Assessment Consultation Program (EACP). The SSEA studies commenced with the definition of a study area broad enough for the identification of several alternative routes. Environmental information about the biophysical and socio-economic characteristics of the study area was assembled and, in combination with technical, cost and local factors was evaluated to identify alternative routes for the proposed transmission line. The selection of alternative routes avoided significant sensitivities where possible and also sought to minimize potential impacts where avoidance was not possible or practical.

Manitoba Hydro developed a two-round Public Engagement Program to guide consultation for the Project, intended to provide the public with meaningful opportunities to receive information on, and provide their input into, the SSEA for the Project. Several different tools were used throughout the engagement process: meetings with RMs, landowners, government and Aboriginal Peoples; open houses; comment forms; project newsletters; information packages for landowners; and newspaper advertisements. Invitation letters were sent to each of the First Nations and to the Manitoba Metis Federation. Telephone calls were placed in advance of the Open Houses to follow up on these invitations. Key concerns raised during public engagement were focused on three specific areas of the proposed transmission line: crossing the Assiniboine River, the segment near the Sunnyside Hutterite Colony, and the portion that parallels Highway 1. Participants also raised concerns related to agriculture (e.g., crop cultivation), property value, EMF and health, interference of cellular and related services, and aesthetics.

As part of the SSEA process, numerous biophysical and socioeconomic components were evaluated as potential Valued Environmental Components (VEC). The final VEC list was defined by the multi-disciplinary project team undertaking the assessment based on: identified regulatory requirements; consultation with regulatory authorities; information derived from published and unpublished date sources; comments and issues identified by stakeholders during the engagement process; field surveys; prior experience with other similar projects; and professional judgment of Manitoba Hydro and other EA team members. The following VECs were included in the effects assessment:

- Biophysical – Short-eared Owl
- Land Use – Property and residential development
- Land Use – Aboriginal lands
- Agriculture – Agricultural productivity
- Economy – Employment and business opportunities
- Infrastructure – Communication and transportation
- Infrastructure – Recreation
- Personal, Family and Community Life – Human health
- Personal, Family and Community Life – Public Safety
- Personal, Family and Community Life – Aesthetics

Detailed analysis and comparison of the alternative routes led to the identification of a preferred route, which produced the least overall impact, within cost and technical considerations. The D83P Preferred Route will originate at the south side of the Dorsey Converter Station 230-kV switchyard and then follow an independent alignment for 0.7 km before connecting to the north side of the D12P ROW. Between crossing Provincial Highway 26 and the Assiniboine River the D83P and D12P will converge into a double-circuit transmission line. Once across the Assiniboine River, the D83P and D12P will diverge into separate single-circuit transmission lines with D83P continuing to parallel D12P to the north until terminating at the Portage South Station. This route was identified as the best overall route in an unmitigated circumstance and was examined in further detail within the context of site-specific situations and local issues that were identified during the engagement process. The result of this examination was the recommendation of adjustments to the route to further minimize residual impacts. These adjustments were discussed with potentially affected landowners and examined in terms of technical and cost considerations, and potential environmental impacts. The proposed route avoids all known heritage locations.

The results of the VEC effects assessment are as follows:

- Residual effects to the Short-eared Owl are expected to be negligible as a result of limited habitat impacts along the final preferred route.
- The decision to double-circuit the existing D12P Assiniboine River crossing will result in no displacement of existing driveways or other infrastructure on adjacent properties; eliminates the need to acquire additional ROW and enter into easements with the owners of the two adjacent properties; reduces residents' concerns related

to EMF by not having a new line located closer to their residences than the existing line; and eliminates issues related to shelterbelt removal and future development opportunities.

- Potential challenges related to the Project and Highway 1, primarily related to clearance, were solved jointly with Manitoba Infrastructure and Transportation.
- The potential for minor property damage (including to shelterbelts and woodlots) during construction will be minimized by scheduling as much construction as practical in winter months (to avoid soil rutting and compaction) and by minimizing the amount of forest clearing required.
- No farm buildings will be displaced; farm structures within the ROW will be grounded (e.g., Sunnyside Hutterite colony).
- No agricultural land will be taken out of circulation on property not owned by Manitoba Hydro.
- Area under the towers will be maintained weed free through agreements with adjacent landowners or by line maintenance crews.
- No major damage or disruption to transportation, energy, communication, or recreation infrastructure is anticipated. Appropriate affected parties—including Manitoba Infrastructure and Transportation; the RMs of Portage la Prairie, Cartier, St. Francois Xavier and Rosser; the Canadian Pacific and Canadian National railways; and Manitoba Telecomm Services—have been consulted by Manitoba Hydro to identify and address their concerns.
- The potential for human health and public safety effects will be minimized by route selection and close coordination of construction and operations activities with RMs and other affected parties.
- Increased employment and business opportunities should develop during construction and operation of the Project.

No VECs have been identified for the upgrades to either station. The disturbance footprint of the components will remain unchanged from the current footprint of the station; therefore, VECs identified for the transmission line are applicable to the station upgrades.

Mitigation measures, monitoring and other follow-up actions identified in the effects assessment will be implemented through an Environmental Protection Program. Manitoba Hydro's Environmental Protection Program provides the framework for implementing, managing, monitoring and evaluating environmental and socioeconomic protection measures consistent with regulatory requirements, corporate commitments, best practices and public expectations. The co-location of the Project with the existing D12P ROW greatly reduces the potential for cumulative effects to VECs; only negligible cumulative effects are expected as the result of Project construction and operation.

Manitoba Hydro and the Province of Manitoba's sustainable development core principles and guidelines have been incorporated into the planning, design, construction, operation and maintenance, and eventual decommissioning of the Project.

GLOSSARY

Access Road: A road that affords access into and out of a construction area.

Access Trail: A trail that affords access into and out of a construction area.

Access: The ability to enter an area or reach a particular location.

Activity: Activity in relation to a project means actions carried out for construction, operation and eventual decommissioning; and in relation to human presence, actions carried out for domestic and commercial purposes including hunting, fishing, trapping, forestry, and mining.

Adaptive Management: The implementation of new or modified mitigation measures over the construction and operation phases of a project to address unanticipated environmental effects. The need for the implementation of adaptive management measures may be determined through an effective follow-up program.

Adverse Effects: Negative effects on the environment and people that may result from a proposed project.

Aesthetics: Characteristics relating to the appearance or attractiveness of something.

Aggregate: Soil aggregate consisting of two or more soil particles bound together by various forces.

Alignment: The vertical and/or horizontal route or direction of a linear physical feature.

Alternating Current (AC): The oscillating (back and forth) flow of electrical current; direct current (DC) is the unidirectional continuous flow of electrical current. AC is the common household electrical current and is used in transmission lines; DC is the form of current produced by battery (e.g., in a flashlight). High Voltage DC (HVDC) transmission is used in Manitoba for some transmission facilities (e.g., between Limestone Generating Station and Winnipeg).

Alternative means of carrying out a project: The various technically and economically feasible ways, other than the proposed way, for a project to be implemented or carried out. Examples include other project locations, different routes and methods of development, and alternative methods of project implementation or mitigation.

Alternative Routes: Options for routing transmission lines which are identified as part of the Site Selection and Environmental Assessment process.

Alternatives to a project: The functionally different ways, other than a proposed project, to meet the project need and achieve the intended purpose. For example, if a need for greater power generation has been identified, a proposed project might be to build a new power generation facility. An alternative to that project might be to increase the generation capacity of an existing facility.

Ampere (A or amp): The unit of measurement of electric current.

Amphibian: Animal of the Class Amphibia that typically lives on land but breeds in water (e.g., frogs, toads, salamanders).

Anchor: A foundation arrangement used to secure the guy wires supporting a transmission tower to the ground.

Anthropogenic: A descriptive term used to identify different aspects of nature that have been influenced by human activity or activities.

Aquifer: A body of rock or sediment that is sufficiently porous and permeable to store, transmit, and yield significant or economic quantities of groundwater to wells and springs.

Artesian Aquifer: A body of rock or sediment containing groundwater that is under greater than hydrostatic pressure: that is, a confined aquifer. When an artesian aquifer is penetrated by a well, the water level will rise above the top of the aquifer.

Audible Noise (AN): The measure of noise emanating from a source in an audible frequency. Usually measured in dBA.

Basal Treatment: Refers to the application of herbicide to the lower portion of individual woody plants or stems.

Baseline environment: A description of the environmental conditions at and surrounding a proposed action.

Bedrock: The solid rock that lies beneath the soil and other loose material on the Earth's surface.

Benthic Invertebrates: Small animals (without vertebrae) that live on or in the bottom of waterbodies (e.g., insect larvae, clams).

Biological Control: Limiting the growth or numbers of pests such as insects and weeds using natural means or chemicals.

Biological diversity (Canada): Variability among living organisms from all sources, including, without limiting the generality of the foregoing, terrestrial and marine and other aquatic ecosystems and the ecological complexes of which they form a part and includes the diversity within and between species and of ecosystems (Department of Justice 2012b).

Biological diversity (Manitoba): Means the variability among all living organisms and the ecological complexes of which they are part, including diversity within and among species and among ecosystems.

Bipole: In the HVDC transmission context, a transmission system consisting of a transmission line and converter facilities, and comprising both a positively and a negatively energized pole.

Boreal Shield Ecozone: As classified by Environment Canada; an ecological land classification consisting predominantly of boreal forest on soils overlying Precambrian shield rock. It extends as a wide band from the Peace River area of British Columbia the northwest to the southeast corner of Manitoba.

Borrow Area Zone: An area representing the originally anticipated extent of potential borrow area use at the time the quantitative habitat effects assessment was completed.

Buffer Zone: 1) An area that protects or educes impacts to a natural resource from human activity; 2) A strip of land along roads, trails or waterways that is generally maintained to enhance aesthetic values or ecosystem integrity.

Buffer: An area of land separating two distinct land uses that acts to soften or mitigate the effects of one land use on the other.

Burning: The act of setting something on fire.

Canadian Standards Association (CSA): Organization that sets standards and criteria for operation of the project.

Carbonate: A rock made up primarily of carbonate minerals (minerals containing the CO_3 anionic structure).

Carbonate-evaporite: A sedimentary rock that consists of carbonate minerals formed as precipitates from the evaporation of a saline solution, such as saltwater.

Centimeter (cm): A unit of length; 1 cm = 0.01 metre.

Chernozems: A soil common to grassland ecosystems. This soil is dark in color (brown to black) and has an A horizon that is rich in organic matter. Chernozems are common in the Canadian prairies.

Circuit (Electric): The complete path of an electric current or a distinct segment of it. In the transmission context, circuit refers to the three conductors that transmit the electricity between station terminals. Transmission lines and structures may carry one or more circuits.

Classification: The systematic grouping and organization of objects, usually in a hierarchical manner.

Clearing: The act of cutting and removing trees or other vegetation from a construction area. Vegetation may be cut by machine or hand methods.

Climate Change: A long-term change in the statistical distribution of weather patterns over periods of time that range from decades to centuries. It includes changes the average weather conditions or a change in the distribution of weather events with respect to an average, such as the amount and frequency of extreme weather events. Climate change is due to both natural causes (i.e., natural processes of the climate system) as well as human-based environmental effects (e.g., increase in concentrations of greenhouse gases resulting from human activity) (Natural Resources Canada 2007).

Committee on the Status of Endangered Wildlife in Canada (COSEWIC): Committee established by the *Species at Risk Act* as the authority for assessing the conservation status of species that may be at risk of extinction in Canada.

Compliance Monitoring: A broad term for a type of monitoring conducted to verify whether a practice or procedure meets the applicable requirements prescribed by legislation, internal policies, accepted industry standards or specific terms and conditions (e.g., in an agreement, lease, permit, license or authorization).

Conductor: Any material that will readily carry a flow of electricity. In the context of transmission lines, each of the two conductors or conductor bundles comprising a DC circuit, or the three comprising an AC circuit, is referred to as a conductor.

Conservation Data Centre (CDC) Ranking: A Manitoba Conservation status rank assigned to a species by the Conservation Data Centre on the basis of the species' province-wide status. Species are assigned a numeric rank ranging from 1 (very rare) to 5 (demonstrably secure).

Conservation: Any of various efforts to preserve or restore the earth's natural resources, including such measures as: the protection of wildlife, the maintenance of forest or wilderness areas, the control of air and water pollution and the prudent use of farmland, mineral deposits, and energy supplies.

Construction Camp: The temporary housing and support of workers for the purpose of constructing.

Construction: Includes activities anticipated to occur during Project development.

Contaminant: As defined by *The Manitoba Dangerous Goods Handling and Transportation Act;* "any solid, liquid, gas, waste, radiation or any combination thereof that is foreign to or in excess of the natural constituents of the environment and that effects the natural, physical, chemical or biological quality of the environment; or that is or is likely to be harmful or damaging to the health or safety of a person."

Contamination: The act or process of contaminating or changing the level of a contaminant in the natural environment.

Converter Station: The terminal equipment for a high voltage direct current transmission line, in which alternating current is converted to direct current or direct current is converted to alternating current.

Corridor: A band of land within which one or more alternative routes can be identified.

Country foods: Traditional foods from the land, such as wild animals, birds, fish, plants and berries.

Cover: Vegetation such as trees or undergrowth that provides shelter for wildlife. Also, the surface area of a stratum of vegetation as based on the vertical projection on the ground of all above-ground parts of the plant. Also, the material in or over-hanging the wetland area of a lake or stream providing fish with protection from predators or adverse flow conditions (e.g., boulders, deep pools, logs, vegetation).

Critical habitat: An area of habitat or the place in which an organism lives that is essential in providing the requirements needed for a specific species to live.

Cumulative effects assessment: An assessment of the incremental effects of an action on the environment when the environmental effects are combined with those effects from other past, present and future actions.

Current: The rate of motion of electrical charge through a conductor.

Danger Trees: Danger trees are trees located outside a cleared transmission line right-of-way but which may pose a risk of contact or short circuit with the line or structures.

Dangerous Goods: Any product, substance or organism that, by its nature, is able or likely to cause injury, or that is included in any of the classes listed in the Dangerous

Goods Handling and Transportation Regulation 55/2003 and Classification Criteria for Products, Substances and Organisms Regulation 282/87.

Deciduous: Refers to perennial plants from which the leaves abscise and fall off at the end of the growing season (Cauboue et al. 1996).

Decommissioning: Planned shut-down, dismantling and removal of a building, equipment, plant and/or other facilities from operation or usage and may include site clean-up and restoration.

Degradation: The diminution of biological productivity or diversity.

Development: as defined under *The Environment Act* – Any project, industry, operation or activity, or any alteration or expansion of any project, industry, operation or activity which causes or is likely to cause: a) the emission or discharge of any pollutant to the environment, or b) an effect on any unique, rare or endangered feature of the environment, or c) the creation of by-products, residual or waste products not regulated by *The Dangerous Goods Handling and Transportation Act,* or d) A substantial utilization or alteration of any natural resource in such a way as to pre-empt or interfere with the use or potential use of that resource for any other purpose, or e) A substantial utilization or alteration of any natural resource in such a way as to have an adverse effect on another resource, or f) The utilization of a technology that is concerned with resource utilization and that may induce environmental damage, or g) A significant effect on the environment or will likely lead to a further development which is likely to have a significant effect on the environment, or h) A significant effect on the social, economic, environmental health and cultural conditions that influence the lives of people or a community insofar as they are caused by environmental effects (Manitoba Laws 2012).

Direct Current (DC): Electrical current that flows in one direction only.

Direct effect: An environmental effect that is a change that a project may cause in the environment; or change that the environment may cause to a project. A direct effect is a consequence of a cause-effect relationship between a project and a specific environmental component.

Distribution System: The poles, conductors, and transformers that deliver electricity to customers. The distribution system transforms high voltages to lower, more usable levels. Electricity is distributed at 120/240 volts (V) for most residential customers and 120 to 600 V for the majority of commercial customers.

Disturbance: A disruption in the normal functioning of an organism or system.

Dolostones: A carbonate sedimentary rock that is crystalline in form and generally light colored. Dolostone is often found in montane areas or alluvial plains.

Drilling: The act of boring a hole in something (ground or bedrock) with a device such as a drill.

Easement: The permission or right to use a defined area of land for a specific purpose such as transmission line rights-of-way. Transmission line easements give Manitoba Hydro the right of access to the right-of-way to construct, operate and maintain the transmission line.

Ecoregion: A geographical area characterized by a distinctive regional climate as expressed by vegetation (Cauboue et al. 1996).

Ecosystem: A functional unit including the living and the non-living things in an area, as well as the relationships between those living and non-living things. For example, a decaying log comprises the ecosystem for a microbe because the log provides everything that the microbe needs to survive and reproduce.

Ecozones: An area of the earth's surface representing large and very generalized ecological units characterized by interacting abiotic and biotic factors; the most general level of the Canadian ecological land classification (Cauboue et al. 1996).

Electric and Magnetic Field (EMF): EMFs are invisible lines of force surrounding any wire carrying electricity, and are produced by all electric tools and appliances, household wiring and power lines. The strengths of EMFs depend on the voltage level and the amount of current flow. Fields fall off sharply with increasing distance from a transmission line; electric fields are easily blocked by vegetation, buildings or other obstacles, while magnetic fields are unaffected by such objects. Electric fields are measured in volts per metre. Magnetic fields are measured in milliGauss.

Electric Current: See Current.

Endangered: A species facing imminent extirpation or extinction (COSEWIC 2012).

Enhance: To improve by increasing in number or quality.

Environment (Canada): The components of the Earth and includes: a) Land, water and air, including all layers of the atmosphere, b) All organic and inorganic matter and living organisms, and c) the interacting natural systems that include components referred to in paragraphs a) and b) (Department of Justice 2011a).

Environment (Manitoba): Means a) air, land, and water, or b) plant and animal life, including humans.

Environmental Assessment (EA): Process for identifying project and environment interactions, predicting environmental effects, identifying mitigation measures, evaluating significance, reporting and following-up to verify accuracy and effectiveness leading to the production of an EA report. Used as a planning tool to help guide decision making, as well as project design and implementation.

Environmental Component: Fundamental element of the physical, biological or socioeconomic environment, including the air, water, soil, terrain, vegetation, wildlife, fish, birds and land use that may be affected by a proposed project, and may be individually assessed in the environmental assessment.

Environmental Effect: In respect of a project, a) any change that the project may cause in the environment, including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the *Species at Risk Act,* b) any effect of any change referred to in paragraph a) on i) health and socio-economic conditions, ii) physical and cultural heritage, iii) the current use of lands and resources for traditional purposes by aboriginal persons, or iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, or any change to the project that may be caused by the environment; whether any such change or effect occurs within or outside Canada (Department of Justice 2012a).

Environmental Management System (EMS): Part of an organization's overall management practices related to environmental affairs. It includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining an environmental policy. This approach is often formally carried out to meet the requirements of the International Organization for Standardization (ISO) 14000 series.

Environmental Monitoring: Periodic or continuous surveillance or testing, according to a pre-determined schedule, of one or more environmental components. Monitoring is usually conducted to determine the level of compliance with stated requirements, or to observe the status and trends of a particular environmental component over time.

Environmental Protection Plan (EnvPP): Within the framework of an Environmental Protection Program, an Environmental Protection Plan prescribes measures and practices to avoid and minimize potential environmental effects of a proposed project. A "userfriendly" guide for the contractor and Manitoba Hydro that includes: information such as a brief project description; updated construction schedule; summary identifying environmental sensitivities and mitigation actions; listing of all federal, provincial or municipal approvals, licenses, or permits that are required for the project; a description of general corporate practices and specific mitigating actions for the various construction and maintenance activities; emergency response plans, training and information; and environmental/engineering monitoring plans and reporting protocols.

Environmental Protection Program (EPP): Provides a framework for delivery, management and monitoring of environmental protection activities in keeping with issues identified in the environmental assessment, regulatory requirements and public expectation.

Erosion: Natural process by which the Earth's surface is worn away by the actions of water and wind.

Evaluation: The determination of the significance of effects. This involves making judgements as to the value of what is being affected and the risk that the effect will occur and be unacceptable.

Evaporite: A chemical sediment or sedimentary rock that has formed by precipitation from evaporating waters.

Extirpated: The extinction of a species within a given area, with the species still occurring within the remainder of their range.

Feet (ft.): Plural for foot. A foot is a linear unit of length equal to 12 inches. One foot equals 0.3 metres.

Feller Buncher: A type of harvester used in logging. A motorized vehicle with an attachment that can rapidly cut and gather several trees before felling them.

Fill: Natural soils that are manually or mechanically placed; soil or loose rock used to raise a grade.

Fish Habitat: Spawning, nursery, rearing, food supply and migration areas upon which fish depend (*Fisheries Act*).

Follow-up Program: A program for: a) verifying the accuracy of the environmental assessment of a project, and b) determining the effectiveness of any measures taken to mitigate the adverse environmental effects of the project (Department of Justice 2012a).

Footprint: The surface area occupied by a structure or activity.

Forest: A relatively large assemblage of tree-dominated stands.

Foundation: The surface or subsurface base that is in direct contact with the ground and supports a structure.

Fragmentation: The breaking up of contiguous blocks of habitat into increasingly smaller blocks as a result of direct loss and/or sensory disturbance. Eventually, remaining blocks may be too small to provide usable or effective habitat for a species.

Freshet: the occurrence of water flow from a sudden rain fall or snow melt

Furbearer: Referring to those mammal species that are trapped (e.g., marten, fox) for the useful or economic value of their fur.

Gauss (G): A common unit of measure for magnetic fields. There are 10,000 Gauss in one Tesla.

Generating Station (GS): A structure that produces electricity. Its motive force can be provided in a variety of ways, including burning of coal or natural gas, or by using water (hydro) power. Hydroelectric generating stations normally include a complex of powerhouse, spillway, dam(s) and transition structures; electrical energy is generated by using the flow of water to drive turbines.

Generator: A machine that converts physical energy, such as the flow of water over a dam, into electrical energy.

Geographic Information System (GIS): A computerized information system which uses geo-referenced spatial and tabular databases to capture, store, update, manipulate, analyze and display information.

Glaciofluvial: Descriptive of material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and may occur in the form of outwash plains, deltas, kames eskers, and kame terraces.

Glaciolacustrine: Pertaining to, derived from, or deposited in glacial lakes; especially said of the deposits and landforms composed of suspended material brought by meltwater streams flowing into lakes bordering the glacier, such as deltas, kame deltas, and varied sediments.

Gleysolic: An order of soils developed under wet conditions and permanent or periodic reduction. These soils have low chromas, or prominent mottling, or both, in some horizons.

Gleysols: An order of soils developed under wet conditions and permanent or periodic reduction. They occur under a wide range of climatic conditions; Gleysolic soils may or may not have a thin Ah horizon over mottled gray or brownish gleyed material. They may have up to 40 cm of mixed peat or 60 cm of fibric moss peat on the surface.

Grading: The act of leveling or sloping the ground evenly by mechanical means (e.g., grader).

Granular: In the context of construction materials, refers to materials composed of granules or grains of sand or gravel.

Grassland: Vegetation consisting primarily of grass species occurring on sites that are arid or at least well drained.

Greenhouse Gases (GHGs): Gases e.g., methane, carbon dioxide, chlorofluorocarbons emitted from a variety of sources and processes that contribute to global warming by trapping heat between the Earth and the upper atmosphere.

Groundwater: Water that occurs beneath the land surface and fills the pore spaces of soil or rock below saturated zone.

Grubbing: The act of removing roots from soil using a root rake, harrow or similar device.

Guideline: Non-mandatory, supplemental information about acceptable methods, procedures and standards for implementation of requirements found in legislation, policies and directives.

Guyes or Guy Wires: Supporting wires that are used to stabilize some transmission line structures.

Habitat: The place in which an animal or plant lives; the sum of environmental circumstances in the place inhabited by an organism, population or community. Habitat for a particular species is identified with a species prefix (e.g., fish habitat, jack pine habitat, moose habitat).

Hazardous Substance: Any substance which, by reason of being explosive, flammable, poisonous, corrosive, oxidizing or otherwise harmful, is likely to cause death or injury

Hazardous Waste: As defined by Manitoba Regulation 175/87: a product, substance or organism that is a source of danger and that meets the criteria set out in the Classification Criteria products, Substances and Organism Regulation, Manitoba Regulation 282/87, and that is intended for treatment or disposal, including recyclable material.

Hectares (ha): A metric unit of square measure equal to 10,000 square metres or 2.471 acres.

Herb (Herbaceous): A plant without woody above-ground parts, the stems dying back to the ground each year.

Herbaceous plants: A non-woody vascular plant.

Herbicide: A product used to destroy or inhibit plant growth.

Heritage Resource: A heritage site, heritage object and any work or assembly of works of nature or of human endeavour that is of value for its archaeological, palaeontological, pre-historic, historic, cultural, natural, scientific or aesthetic features, and may be in the form of sites or objects or a combination thereof (*The Heritage Resources Act).*

High Water Mark (Ordinary) (HWM): The visible high water mark of any lake, stream, or other body of water where the presence and action of the water are so common and usual and so long continued in all ordinary years as to mark upon the soil of the bed of the lake, river stream, or other body of water a character distinct from that of the banks, both in vegetation and in the nature of the soil itself. Typical features may include a natural line or "mark" impressed on the bank or shore, indicated by erosion, shelving, and changes in soil characteristics, destruction of terrestrial vegetation, or other distinctive physical characteristics.

Hydrocarbon: An organic compound that contains only carbon and hydrogen; derived mostly from crude petroleum and also from coal tar and plant sources (diesel fuel, fuel oil, gasoline and lubricating oils are complex mixtures of hydrocarbons); excessive levels may be toxic.

Hydrology: The science dealing with the properties, distribution and circulation of water.

Igneous: A rock formed by the crystallization of magma or lava.

Impact: General term referring to the overall effect of a project including. Accepted use includes Environmental Impact Statement, Economic Impact and Cumulative Impact.

Inch (in.): A unit of length equal to one twelfth of a foot. One inch equals 2.54 cm.

Indicator Species: species, groups of species or species habitat elements that focus management attention on resource production, population recovery, population viability or ecosystem diversity; these species often have narrower habitat requirements that can be used to indicate the relative suitability of habitat for other species that share a similar preference e.g., marten is primarily a denizen of mature or over mature forest dominated by spruce.

Indicators: Anything that is used to measure the condition of something of interest. Indicators are often used as variables in the modeling of changes in complex environmental systems. In an environmental assessment, indicators are used to predict changes in the environment and to evaluate their significance.

Indirect Effect: A secondary environmental effect that occurs as a result of a change that a project may cause in the environment. An indirect effect is at least one step removed from a project activity in terms of cause-effect linkages. For instance, a river diversion for the construction of a hydro power plant could directly result in the destruction of fish habitat causing a decline in fish population. A decline in fish population could result in closure of an outfitting operation causing loss of jobs. Thus, the river diversion could indirectly cause the loss of jobs.

Induction Effect: In a molecule, a shift of electron density due to the polarization of a bond by a nearby electronegative or electropositive atom.

Infrastructure: The basic features needed for the operation or construction of a system (e.g. access road, construction camp, construction power, batch plant).

Ingress: In the forestry context, refers to the establishment of natural regeneration in an opening.

International Electrotechnical Commission (IEC): An organization that sets and publishes standards.

Invertebrates: Animals without a spinal column.

Invasive: Invasive species are plants that are growing outside of their country or region of origin and are out-competing or even replacing native plants.

Kilometre (km): The unit measure of length equivalent to 1000 metres; one kilometre = 0.62 miles.

Kilovolt (kV): The unit of electromotive force or electrical pressure equivalent to 1,000 volts (V).

Lacustrine: Referring to freshwater lakes; sediments generally consisting of stratified fine sand, silt, and clay deposits on a lake bed.

Line Conductors: Conductors or conductor bundles suspended from transmission line structures.

Linear feature: A geographic feature, such as a trail or road, which can be represented by a line.

Load: The power requirement (usually measured in kilowatts) of an electrical system or piece of electrical equipment at a given instant.

Long-Term Effect: Effect which persists long after restoration or mitigation activities have been carried out.

Marsh: Tract of low wetland, often treeless and periodically inundated, generally characterized by a growth of grasses, sedges, cattails and rushes.

Marshalling Yard: An open area used to stock-pile, store and assemble construction materials.

Megawatt (MW): The unit of electrical power equivalent to 1,000,000 watts.

Metamorphic: Rocks that have been transformed by extreme heat and pressure.

Metre (m): A unit measure of length; one metre = 3.28 ft.

Mile (mi.): A unit of length equal to 5,289 feet. 1 mile equals 1.6 kilometres.

Millimetre (mm): A metric unit of length equal to one thousandth of a metre.

Mitigation: In respect of a project, the elimination, reduction or control of the adverse environmental effects of the project, and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means (Department of Justice 2012a).

Monitoring: Continuing assessment of conditions at and surrounding an activity. This determines if effects occur as predicted or if operations remain within acceptable limits and if mitigation measures are as effective as predicted.

Optical Protection Ground Wire (OPGW): Provides both lightning protection for a transmission line and communications for line control and protection.

Ordovician: A geological period 510 to 439 million years ago that saw the origin of land plants from their aquatic algae ancestors.

Overburden: The soil (including organic material) or loose material that overlies bedrock.

Paleozoic: A geologic era that is marked by the culmination of all classes of invertebrates except insects and the appearance of seed-bearing plants, amphibians and reptiles.

Parameters: Any set of physical, chemical or biological properties, the values of which determine the characteristics or behaviour of a system.

Permafrost: A condition where soil temperature remains below 0°C for at least two consecutive years. Perennially frozen material underlying the solum, or a perennially frozen soil horizon. Permafrost is subdivided into continuous and discontinuous permafrost, while sporadic permafrost is confined to alpine environments.

Permeability: The degree to which fluids or gases can pass through a barrier or material such as soil. The capability of soil or other geologic formations to transmit water. See hydraulic conductivity.

Policy: Basic principles and corresponding procedures and standards by which an organization is guided.

Precambrian bedrock: Extremely stable bedrock composed of ancient crystalline rocks whose complex structure attests to a long history of uplift and depression, mountain building and erosion. This bedrock was formed in the Precambrian era, which began with the consolidation of the earth's crust and ended approximately 4 billion years ago.

Pre-construction: Includes all project activities (surveying, staking, and mapping) that lead up to but do not include project construction, including all field studies (aquatic, plant, wildlife) and related public liaison activities.

Preferred Route: The best balanced choice of route based on public input, biophysical, socio-economic, and cost and technical considerations. Preferred routes are generally identified during a Site Selection and Environmental Assessment process.

Proglacial: Immediately in front of, or just beyond the outer edge of, a glacier; proglacial refers to lakes, streams, deposits, and other features produced by or derived from glacial ice.

Project (Canada): Means: a) In relation to a physical work, any proposed construction, operation, modification, decommissioning, abandonment or other undertaking in relation to that physical work, or b) Any proposed physical activity not relating to a physical work that is prescribed or is within a class of physical activities that is prescribed pursuant to regulations made under paragraph 59(b) (Department of Justice 2012a).

Project Activity: Elements of a project component that may result in environmental effects or changes. Example project activities include clearing, grubbing, excavating, stockpiling, and reclaiming.

Project Component: A component of the project that may have an effect on the environment. Example project components include access road, construction camp, and wastewater treatment facility.

Project Description: Any information in relation to a project that includes, at least: (a) a summary description of the project; (b) information indicating the location of the project and the areas potentially affected by the project; (c) to the extent possible, a summary description of the physical and biological environments within the areas potentially affected by the project; and (d) the mailing address, e-mail address and phone number of a contact person who can provide additional information about the project (*Canadian Environmental Assessment Act,* Federal Coordination Regulations).

Project Footprint: The land and/or water surface area affected by a project. This includes direct physical coverage and direct effects. Consequently, a project footprint may be larger than its physical dimensions if off-site activities are involved.

Proponent: A person who is undertaking, or proposes to undertake a development or who has been designated by a person or group of persons to undertake a development in Manitoba on behalf of that person or group of persons (Manitoba Laws 2011).

Protected Area: As defined by the World Conservation Union, a protected area is: an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.

Protected Species: Plant and animal species protected under the *Species at Risk Act* (Federal) or *The Endangered Species Act* (Manitoba).

Provincial Road (PR): Secondary route of travel in Manitoba. PRs are numbered from 200-632. It is not uncommon for these routes to be gravel.

Provincial Trunk Highway (PTH): Primary route of travel in Manitoba. PTHs are numbered from 1-200.

Pteriodophyte: A division of the plant kingdom; the sporophyte is vascular and independent of the gametophyte at maturity; generally they have stems, leave and roots.

Quaternary: Noting or pertaining to the present period of earth history, forming the latter part of the Cenozoic Era, originating about 2 million years ago and including the Recent and Pleistocene Epochs.

Radio Interference (RI): Any modification to the reception of sound or picture signals that makes them unacceptable.

Raptor: A predatory bird species with the physical traits adapted for grasping prey, sharp talons, and tearing flesh, hooked beak. The group of birds termed raptors includes the owls, falcons, eagles and hawks.

Rare Species: Any indigenous species of flora that, because of its biological characteristics, or because it occurs at the fringe of its range, or for some other reasons, exists in low numbers or in very restricted areas of Canada but is not a threatened species (Cauboue et al. 1996).

Reduction: Decrease in waste produced at its source in order to minimize the amount required for off-site treatment or disposal.

Region: Any area in which it is suspected or known that effects due to the action under review may interact with effects from other actions. This area typically extends beyond the local study area.

Regosols: Regosolic soils do not have an Ah or dark-colored Ap horizon at least 10 cm thick at the mineral soil surface. They may have buried mineral-organic layers and organic surface horizons, but no B horizon at least 5 cm thick.

Regulatory: Pertaining to legislated requirements (i.e., statues, laws, regulations).

Rehabilitation: To restore a disturbed structure, site or land area to good condition, useful operation or productive capacity.

Reliability Based Design (RBD): Any design methodology that incorporates the principles of reliability analysis (the consistent evaluation of design risk using probability theory) either explicitly or otherwise.

Remediate: To return to the state prior to alternation; to remedy.

Reptiles: Animals of the Class Reptilia that includes tortoises, turtles, snakes, lizards, alligators and crocodiles.

Residual Environmental Effect: An environmental effect that remains, or is predicted to remain, even after mitigation measures have been applied.

Resource Management Area (RMA): An area to be jointly managed by a Resource Management Board established by agreement between Manitoba and a First Nation or a local Aboriginal community.

Restoration: The return of an ecosystem or habitat to its original community structure, natural complement of species and natural function.

Reuse: Subsequent use without significant treatment of a material remaining after being used in a previous process.

Right-of-Way (ROW): Area of strip of land controlled and maintained for the development of a road, or transmission [or distribution] line (including construction, operation, and maintenance of the facility).

Riparian: Refers to terrain, vegetation or simply a position adjacent to or associated with a stream, flood plain, or standing body of water.

Risk: A state of uncertainty where some of the possibilities involve a loss, catastrophe or other undesirable outcome. Quantitatively, risk is proportional to both the expected losses which may be caused by an event and to the probability of this event. The greater loss and greater event likelihood result in a greater overall risk.

Root Collar: Position on a plant where there is a junction with where the roots begin to grow and the stem begins.

Scoping: An activity that focuses the environmental assessment of a proposal on relevant issues and concerns, types of effects, alternatives for consideration, timeframe, methodology, and establishes the boundaries of the assessment.

Sediment: Material, including soil and organic material that is deposited on the bottom of a waterbody.

Selective Clearing: Removal of specific or selected trees and vegetation, rather than all vegetation (e.g., at sensitive sites).

Self-Supporting Suspension Lattice: A steel structure supported on four separately founded legs.

Setback: Prescribed distance between a pollution sources or disturbance and a resource or ecosystem that needs protection.

Shrub: A perennial plant usually with a woody stem, shorter than a tree, often with a multi-stemmed base.

Significance: A conclusion about whether adverse environmental effects are likely to be significant, taking into account the implementation of appropriate mitigation measures. Significance is determined by a combination of scientific data, regulated thresholds, standards, social values and professional judgment.

Site Selection and Environmental Assessment (SSEA): Site Selection and Environmental Assessment process used to select a site or route for a transmission facility (e.g., a station or a transmission line) and assess any potential environmental impacts of that facility on the biophysical environment and socio-economic conditions.

Snag: A standing tree which is three metres or greater in height and either partially dead, dead, or dying. This is further classified into hard snags and soft snags. A hard snag is a tree in which the wood is predominantly sound (possibly merchantable), covered in bark, and retaining its branches. A soft snag is a tree in which the wood is largely decayed, containing little to no merchantable timber. These trees are of particular importance to a variety of wildlife species, particularly cavity nesters.

Spatial Boundary: The area examined in the assessment (i.e., the study area).

Special Concern: A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events (COSEWIC 2012).

Species: A group of organisms having a common ancestry that are able to reproduce only among themselves; a general definition that does not account for hybridization.

Species at Risk Act (SARA): The federal Act which provides for the legal protection for wildlife species listed under Schedule 1 of that Act.

Species at Risk: Means an extirpated, endangered or threatened species or a species of special concern (Department of Justice 2012c).

Species of Conservation Concern: Includes species that are rare, disjunct, or at risk throughout their range or in Manitoba and in need of further research. The term also encompasses species that are listed under the Manitoba Endangered Species Act (MBESA), or that have a special designation by the Committee on the Status of Endangered Wildlife In Canada (COSEWIC) (Manitoba Conservation 2011).

Standards: Descriptions of targets or goals used to measure the success of procedures. They may be general or specific.

Stewardship: Refers to general environmental care and protection.

Stratigraphy: The science of rocks: It is concerned with the original succession and age relations of rock strata and their form, distribution, lithologic composition, fossil content, geophysical and geochemical properties-all characters and attributes of rocks as strata-and their interpretation in terms of environment and mode of origin and geologic history.

Study Area: The geographic limits within which environmental effects are assessed.

Substation: An assemblage of equipment for switching and/or transforming or regulating the voltage of electricity.

Substrate: The medium on which plants grow.

Suckering: The growth of a plant that produces new shoots at the base or below ground traveling out from the plant base

Sustainability: Capacity of a thing, action, activity or process to be maintained indefinitely in a manner consistent with the spirit of Manitoba's Principles and Guidelines of Sustainable Development.

Sustainable Development (SD) (Canada): Development that meets the needs of the present, without compromising the ability of future generations to meet their own needs (Department of Justice 2012a).

Sustainable Development (SD) (Manitoba): Meeting the needs of the present without compromising the ability of future generations to meet their own needs.

Switchyard: An area within a substation used for switching (see Switching Station).

Temporal: Pertaining to time.

Termination: End point. The time when something ends or is completed.

Terrestrial: Pertaining to land as opposed to water (Cauboue et al. 1996).

The Manitoba Endangered Species Act (MESA): Enacted: 1) to ensure the protection and survival of endangered and threatened species in the province; 2) to enable the reintroduction of extirpated species into the province; and 3) to designate species as endangered, threatened, extinct or extirpated. Additions or deletions to list of species under each designation are recommended by the Endangered Species Advisory Committee.

Threatened: A species likely to become endangered if limiting factors are not reversed (COSEWIC 2012).

Threshold: A limit or level which if exceeded likely results in a noticeable, detectable or measurable change or environmental effect that may be significant. Example thresholds include water-quality guidelines, acute toxicity levels, critical population levels and wilderness criteria.

Till: An unstratified, unconsolidated mass of boulders, pebbles, sand and mud deposited by the movement or melting of a glacier.

Timber: The wood of growing trees suitable for structural uses; the body, stem or trunk of a tree.

Topography: The surface features of a region, such as its hills, valleys or rivers.

Towers: The transmission line structures which provide support for the conductors to ensure clearance from the ground. Towers are may be either free standing or guyed and are typically a steel lattice design.

Transformer: An electrical device, commonly located in substations, used to transform (convert) power from one voltage level to another.

Transmission Line: A linear arrangement of towers and conductors which carries electricity from generating stations and transmission stations to load centres like communities and industries to meet electrical needs.

Transmission System: The towers, conductors, substations, and related equipment involved with transporting electricity from generation source to areas for distribution— or to the power systems of out-of-province electrical utilities.

Transmission: A process of transporting electric energy in bulk from a source of supply to other parts of the electrical system (e.g., load centres like large communities of major industrial customers).

Treaty Land Entitlement (TLE): Refers to land owed to certain First Nations under the terms of the Treaties signed by the First Nations and Canada between 1871 and 1910. Each Treaty provided that Canada would provide reserve land to First Nations based on population size; however, not all First Nations received their full allocation of land. In 1997, the Manitoba Treaty Land Entitlement Agreement was signed by the TLE Committee of Manitoba Inc. (representing 20 First Nations), Canada and Manitoba.

Tributary: Any secondary stream or river that flows into a larger waterbody.

Unconsolidated: Not compact or dense in structure or arrangement; i.e., "loose gravel."

Understory: That portion of the trees or other vegetation in a forest stand that is below the main canopy level.

Understory: Vegetation growing beneath taller plants such as trees or tall shrubs.

Ungulates: Any of a number of mammals with hooves that are superficially similar but not necessarily closely related taxonomically.

Valued Environmental Component (VEC): Any part of the environment that is considered important by the proponent, public, scientists, and government involved in the assessment process; importance may be determined on the basis of societal or cultural values, or scientific interest or concern.

Vegetation: The general cover of plants growing on a landscape.

Vegetation Type: In phytosociology, the lowest possible level to be described.

Velocity: A measurement of the speed of flow.

Volt: The unit of measurement of electric pressure which causes current to flow.

Waterbody: Any location where water flows or is present, whether or not the flow or the presence of water is continuous, intermittent, or occurs only during a flood. This includes, but is not limited to, wetlands and aquifers.

Waterfowl: Ducks and geese (game birds that frequent water).

Watershed: The region draining into a river, river system or other body of water.

Water Quality: Description of the chemical, physical, and biological characteristics of water, usually in regard to its suitability for a particular purpose or use.

Watt: The unit of measurement of electrical power. (See kilowatt and kilowatt-hour)

Wetland: Land that is saturated with water long enough to promote hydric soils or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation, and various kinds of biological activity that are adapted to wet environments.

Wildlife: Free-ranging animals which live in the wild, natural or undomesticated state.

Work Camp: A temporary place to house workers when a construction site is far from their place of residence.

LIST OF ACRONYMS AND ABBREVIATIONS

AC	Alternating Current
ANSI	American National Standards Institute
CCME	Canadian Council of Ministers of the Environment
CEA	Canadian Electrical Association
CEAA	Canadian Environmental Assessment Act or Agency
CEWG	Cumulative Effects Working Group
CIZ	Community Interest Zone
cm	Centimetre
CNR	Canadian National Railway
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPR	Canadian Pacific Railway
CSA	Canadian Standards Association
CWQI	Canadian Water Quality Index
CWS	Canadian Wildlife Services
DC	Direct Current
DES	Provincial Designated Drains
DFO	Department of Fisheries and Oceans Canada
DWE	Dakota Wind Energy
EA	Environmental Assessment
EAL	Environment Act Licence
EAPF	Environmental Assessment Proposal Form
EIS	Environmental Impact Statement
EMF	Electric and Magnetic Field
ENGO	Environmental Non-Governmental Organization
EnvPP	Environmental Protection Plan
EPIMS	Environmental Protection Information Management System
EPP	Environmental Protection Program
FHCMAW	Fish Habitat Classification for Manitoba Agricultural Watersheds
GHG	Greenhouse Gas
GOC	Government of Canada
GPS	Global Positioning System
GS	Generating Station
HWM	High Water Mark
IEC	International Electrotechnical Commission
ISD	In Service Data
ISO	International Standards Organization
km	Kilometre
kV	Kilovolt
kWh	Kilowatt Hour
LiDAR	Light Detection and Ranging
LWD	Large woody debris
MBCDC	Manitoba Conservation Data Centre
MBESA	Manitoba Endangered Species Act
MIT	Manitoba Infrastructure and Transportation
MMF	Manitoba Metis Federation
MNR	Ministry of Natural Resources

MTS	Manitoba Telecom Services
MWQSOG	Manitoba Water Quality Standards Objectives and Guidelines
NERC	North American Electric Reliability Corporation
NGO	Non-Governmental Organization
OPGW	Optical Protection Ground Wire
PAI	Protected Areas Initiative
PEP	Public Engagement Program
PFRA	Prairie Farm Rehabilitation Association
PHC	Petroleum Hydrocarbons
PPPD	Portage la Prairie Planning District
PTH	Provincial Trunk Highway
RHA	Regional Health Authority
RM	Rural Municipality
ROW	Right-of-Way
RTAC	Road and Transportation Association of Canada
SARA	Species At Risk Act
SDA	Sustainable Development Act
SIPD	South Interlake Planning District
Snoman	Snowmobilers of Manitoba Inc.
SSEA	Site Selection and Environmental Assessment
TAC	Technical Advisory Committee
TN	Total Nitrogen
TP	Total Phosphorus
VEC	Valued Environmental Components
WHPD	Whitehorse Planning District

LIST OF UNITS

Unit	Abbreviation
Centimetre	Cm
cubic metre per second	m^3/s
degrees Celsius	°C
greater than	>
greater than or equal to	≥
hour	h (not hr)
ka	1000 years
kilogram	Kg
kilometre	Km
kilometres per hour	km/h
kilovolt	kV
less than	< (use only in tables)
less than or equal to	≤
metre	M
millimetre	Mm
millimetre squared	mm^2
Percent	%
second (time)	S
square kilometre	km^2

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF MAPS

1.0 INTRODUCTION

1.1 PROJECT OVERVIEW

Load growth in western Manitoba has led to unacceptably low system voltages during winter peak single contingency outages (Manitoba Hydro 2001). Manitoba Hydro identified the need to provide transmission improvements in voltage support to southwest Manitoba and began the Winnipeg to Brandon Transmission System Improvements project. The Dorsey to Portage South 230-kVTransmission Line Project (The Project) is the final phase of the development.

The proposed Project includes a new 66.14-km, 230-kilovolt (kV) alternating current (AC) transmission line. The transmission line will originate from the 230-kV switchyard of the Dorsey Station located 500 m west of the intersection of Provincial Road (PR) 221 and PR 236, northwest of Winnipeg. The line will terminate at the Portage South Station, located 12.5 km southeast of Portage La Prairie. There is an existing 230-kV transmission line between the Dorsey and Portage South stations designated D12P. The preferred route for the proposed D83P transmission line will parallel the D12P transmission line and will be located in part on the unused portion of the D12P right-of-way (ROW). The Project is located in an agricultural setting; therefore, any new ROW or extension of an existing ROW is primarily located on private property.

The Dorsey Converter Station is a major facility of the Manitoba Hydro electrical system. The Dorsey Converter Station converts 500-kV direct current (DC) to AC current and is a main hub for the 230-kV transmission network. The Portage South station is connected to the 230-kV network by two 230-kV transmission lines, D12P and P81C. The D12P line connects the Portage South Station to the 230-kV switchyard at the Dorsey Converter Station, and the P81C transmission line connects the Portage South Station to the Cornwallis Station near Brandon, Manitoba.

The Project will originate at the 230-kV Dorsey Converter Station switchyard and will terminate at the existing Portage South Station. Both stations will require equipment modifications and additions to terminate the transmission line and integrate the Project into the Manitoba Hydro 230-kV electrical network. All modification and equipment additions at the stations are planned to be within the existing fenced areas.

1.2 PURPOSE OF THE DOCUMENT

The purpose of this document is to satisfy Manitoba Hydro's Site Selection and Environmental Assessment (SSEA) process in order to secure provincial environmental licenses for transmission lines of 115 kV or greater and to present information required to meet the licensing requirements of *The (Manitoba) Environment Act.*

The Project is being designed for construction and operation at a voltage capacity of 230 kV. This project therefore meets the licensing requirements (Class II License) of *The (Manitoba) Environment Act*.

1.3 MANITOBA HYDRO'S TRANSMISSION SYSTEM

1.3.1 Mission, Vision, and Goals

Manitoba Hydro is a Crown Corporation and is owned by the Province of Manitoba and is headquartered in Winnipeg. Manitoba Hydro's mandate is to supply power adequate for the needs of the Province of Manitoba and to promote economy and efficiency in the development, generation, transmission, distribution, supply and end-use of power. Manitoba Hydro generates, transmits and distributes electrical energy throughout the Province and is a distributor of natural gas within certain Manitoba communities. The affairs of Manitoba Hydro are administered by the Manitoba Hydro-Electric Board appointed by the Lieutenant-Governor in Council. The Board reports to the Minister responsible for *The Manitoba Hydro Act* who, in turn, reports to the Manitoba Legislative Assembly.

Manitoba Hydro currently serves more than 537,000 electricity customers throughout Manitoba and provides natural gas service to over 265,000 customers in various communities. Manitoba Hydro is one of the largest integrated electricity and natural gas distribution utilities in Canada. Manitoba Hydro employs more than 6,200 people, has assets in excess of $12.5 billion and annual revenues of more than $1.7 billion (Manitoba Hydro 2011a). For 60 years Manitoba Hydro's projects, focused primarily on the development of renewable hydro-electric power, have played a major role in the development of the provincial economy and the Province as a whole. From the 1950s, Manitoba Hydro has been a principal engine chosen by a succession of Provincial governments to open Manitoba's north for the benefit of all of its citizens. Manitoba Hydro and its staff are key elements in the fabric of Manitoba.

Manitoba Hydro's Corporate Vision is:

> "To be the best utility in North America with respect to safety, rates, reliability, customer satisfaction, and environmental leadership; and to always be considerate of the needs of customers, employees, and stakeholders" (Manitoba Hydro 2011b).

1.3.2 Environmental Policy and Management System

Manitoba Hydro respects the need to protect and preserve natural environments and heritage resources affected by its projects and facilities and it does so through the following practices:

- Preventing or minimizing any adverse impacts, including pollution, on the environment, and enhancing positive impacts;
- Meeting or surpassing regulatory requirements and other commitments;
- Considering the interests and utilizing the knowledge of our customers, employees, communities and stakeholders who may be affected by our actions;
- Reviewing our environmental objectives and targets annually to ensure improvements in our environmental performance;
- Continually improving our Environmental Management System; and
- Documenting and reporting our activities and environmental performance. (Manitoba Hydro 2008)

In addition to the foregoing, Manitoba Hydro's environmental management policy has been incorporated into the Project development plan. Chapter 9 provides the Environmental Management Program under which a project-specific environmental Protection Plan (EnvPP) will be developed after all approvals are received. The use of an EnvPP is a practical and direct response to the implementation of Manitoba Hydro's commitment to responsible environmental stewardship.

Manitoba Hydro has developed and implemented an Environmental Management System (EMS) and has registered the system to the ISO (International Organization for Standardization) 14001 EMS standard. The Manitoba Hydro EMS enables the identification of environmental effects, setting of goals to manage effects, implementation of plans to meet the goals, and evaluation of performance. The EMS enables Manitoba Hydro to make continual improvements to its EMS and its environmental performance. As a member of the Canadian Electrical Association (CEA), Manitoba Hydro participates in the Sustainable Electricity Program. Under this program every member utility must implement an EMS consistent with ISO standards.

1.4 REGULATORY FRAMEWORK

1.4.1 Federal-Provincial Coordination

The Canada-Manitoba Agreement on Environmental Assessment Coordination provides a mechanism to address both provincial and federal requirements with a single environmental assessment, administered by both governments, but with the primary point of contact being the provincial environmental assessment agency, Manitoba Conservation and Water Stewardship.

1.4.2 Provincial Environmental Assessment and Permitting

At 230 kV, the proposed Project constitutes a Class 2 development as defined by the Classes of Development Regulation 164/88 under *The (Manitoba) Environment Act.* The Project will therefore require an Environment Act License (EAL) prior to the initiation of any works. An EAL is the primary enabling permit for the Project. Class 2 developments are required to submit an Environment Act Proposal Form (EAPF) and

Environmental Assessment Report (EA Report) to Manitoba Conservation and Water Stewardship to enable public and government agencies to examine the details of the proposed project, its anticipated impact on biophysical and socio-economic aspects of the environment, and measures that Manitoba Hydro intends to use to mitigate potential impacts. Under the provincial EA process, only the Project component requiring a permit should be included in the EA Report. An Environment Act License is issued upon the Minister's acceptance of the EAPF and EA Report.

The coordination of approvals begins with the establishment of an interdepartmental review panel called the Technical Advisory Committee (TAC), which is led by Manitoba Conservation and Water Stewardship - Environmental Approvals Branch and consists of provincial and federal government specialists with the technical expertise necessary to adequately assess the potential effects(s) of a project. Following submission of the EAP and EA Report, a technical and public review is conducted. This submission will be available for public review through the public registry system of Manitoba Conservation and Water Stewardship. At the end of the public review and comment period, the Director of Environmental Approvals will assess the level of public concern. If the Director determines there is significant public concern, the Director will recommend to the Minister that the Clean Environment Commission hold a public hearing. The Commission would make recommendations to the Minister based on the findings of the hearing. Based on the results of project screening, the Minister will either issue or refuse a License. Issuance of an Environment Act License, and the terms and conditions it may contain, will be based on this submission and public input.

This document describes the SSEA process and constitutes the EAPF and EA Report for the proposed Project. It is being submitted to Manitoba Conservation and Water Stewardship as the Manitoba Hydro application for environmental licensing of the project under *The (Manitoba) Environment Act*.

1.4.3 Federal Environmental Assessment and Permitting

The federal environmental assessment process is coordinated by the Canadian Environmental Assessment Agency (CEA Agency) under the *Canadian Environmental Assessment Act* (CEAA). The CEAA process is applied whenever a federal authority has a specified decision-making responsibility in relation to a project such as when the federal government is required to provide a license, permit, or an approval that is listed in the Law List Regulations to enable the project to be carried out. Federal authorities could become involved because of stream crossings (i.e., potential effects on fish habitat or navigable waters). Under CEAA, a 230-kV transmission line is not included on the Comprehensive Study List, but the development is classified as a project under the Act. What this means is should a Federal authority determine that a license, permit, or an approval listed in the Law List Regulations is necessary for the Project to proceed then a Federal environmental assessment will be conducted.

As of 21 January, 2010, when a project triggers a federal environmental assessment under CEAA, the Federal government is required to scope the environmental assessment to the extent of the proposed project works as defined by the proponent. As a result, the Federal environmental assessment requires that all works associated with the Project be included in the EA Report, whether or not a federal approval is required for the work. A Federal EA Report must include the transmission line and station modifications.

Federal government representatives have been consulted during the Project development. Although it is not anticipated that there is a Law List trigger for the Project, the EA Report has been prepared to include the information required under the Federal environmental assessment process.

1.5 OUTLINE OF THE ENVIRONMENTAL ASSESSMENT REPORT

The EA Report includes an examination and consideration of the potential effects that may result from the Project to:

- Physical Environment – Atmosphere (air, climate and climate change), land (terrain, geology, soils), and water (surface, groundwater, water quality).
- Biological Environment – Aquatic biota and habitat, terrestrial ecosystems and vegetation, terrestrial species and habitat (mammals, birds, amphibians, reptiles, invertebrates).
- Land and Resource Use – Commercial resource use (forestry, mining, agriculture, fishing), protected areas, Aboriginal land and resource use, recreation and tourism (including aesthetics), property ownership, infrastructure services and facilities.
- Socio-economic and Cultural Conditions – Population and demographics, economic base, personal, family and community life (including human health and well-being, employment and income), and heritage and cultural resources.

The EA Report is organized as follows:

- Chapter 2 explains the need for the Project, alternatives to the Project that were considered, and alternatives means of carrying out the Project;
- Chapter 3 provides a detailed description of the Project;
- Chapter 4 describes the overall EA approach including the SSEA process;
- Chapter 5 describes the existing biophysical and socio-economic environment in the Project area;
- Chapter 6 provides the purpose and objectives of the Public Engagement Program (PEP), along with a description of public involvement and the self-directed studies of First Nations and the Manitoba Metis Federation;

- Chapter 7 provides the criteria for selecting the transmission line route, an evaluation and comparison of the route alternatives, and a description of the Final Preferred Route;
- Chapter 8 identifies and evaluates the environmental effects of the Project, provides methods to mitigate potential and residual effects, provides an assessment of cumulative effects, and methods for sustainable development; and
- Chapter 9 provides the Environmental Management Program under which environmental protection commitments, mitigation measures and follow-up actions identified in the Project EA Report will be implemented, managed, reported and evaluated.

The technical reports and the results of the public engagement program are contained in the appendices. The information in these reports was used to prepare the EA Report.

2.0 NEED AND ALTERNATIVES

Manitoba Hydro is under a statutory obligation to ensure the availability of a supply of power adequate to meet the needs of the Province. Without improvement, the Manitoba Hydro transmission and distribution system in western Manitoba would reach system capacity and result in limitations to power availability and reliability and could potentially limit economic activities

2.1 NEED FOR THE PROJECT

Increasing power demands in western Manitoba have led to load growth on the Manitoba Hydro 230-kV system. Manitoba Hydro forecasting studies indicated that without voltage support transmission planning criteria would be violated at the Portage South station (Manitoba Hydro 2001). Specifically, load growth in western Manitoba has led to unacceptably low system voltages during winter peak single contingency outages.

2.2 ALTERNATIVES TO THE PROJECT

Alternatives to the Project are functionally different ways to meet the need for the Project and to achieve the Project's purpose. There are no functional alternatives to the Project: the need for the Project is one of capacity within the western Manitoba transmission and distribution system and not one of alternative sources of power. Furthermore, any power source alternatives, such as local power generation or power imports, would require similar improvements to the network in order to transmit and distribute the power.

2.3 ALTERNATIVE MEANS OF CARRYING OUT PROJECT

Alternative means are the various technically and economically feasible ways the Project can be implemented or carried out (CEAA 2007). Manitoba Hydro (2001) undertook a study to examine the feasibility of available alternatives for upgrading the 230-kV transmission system in western Manitoba to address existing issues as well as system loads forecasted to 2018 (Manitoba Hydro 2001). The study considered a number of alternatives, including:

- Station distribution component upgrades at the Portage South station and the Brandon generating station (GS);
- A new 230-kV transmission line;
- Station distribution component upgrades at the Portage South station and the Brandon generating station in combination with construction of a new 230-kV transmission line.

The study found that the station distribution component upgrades at the Portage South station and the Brandon GS could address some system load issues in the short-term but an additional 230-kV transmission line would be required before 2018 to meet forecasted system loads. The study also found that a new 230-kV transmission line alone would address some system load issues in the short-term but station distribution component upgrades at the Portage South station and the Brandon GS would be required to distribute the power. The study concluded that station distribution component upgrades at the Portage South station and the Brandon GS in combination with the construction of a new 230-kV transmission lines would meet the transmission planning criteria to 2018. The study then considered the feasibility of the station upgrades in combination with several 230-kV transmission line routes:

- Upgrading the YT10 115-kV transmission line to 230 kV;
- A new Laverendrye to Treherne to Glenboro transmission line;
- A new Dorsey to Cornwallis transmission line; and
- A new Dorsey to Portage South transmission line.

The study found that it was not feasible to upgrade the YT10 transmission line to 230 kV due to the age of the existing suspension structures and changes in the design standards: nearly all of the suspension structures would have to be replaced. A new Laverendrye to Treherne to Glenboro transmission line in combination with station distribution component upgrades at the Portage South station and the Brandon GS would still require system improvements as the Portage South station was forecast to experience voltage drops and outages before 2018. A new Dorsey to Cornwallis transmission line in combination with station upgrades was forecast not to require any additional system improvements before 2018. A new Dorsey to Portage South transmission line in combination with station upgrades was forecast not to require any system improvements before 2018.

2.4 CONCLUSION

Manitoba Hydro concluded that the combination of station distribution component upgrades at the Portage South station and the Brandon GS with a new Dorsey to Portage South 230-kV transmission line was the most cost effective alternative that also met the transmission planning criteria (Manitoba Hydro 2001). Both the Dorsey to Portage South alternative and the Dorsey to Cornwallis alternative would require the same station distribution component upgrades at the Portage South station and the Brandon GS however the transmission line from Dorsey to Cornwallis would be nearly three times the length of the Dorsey to Portage South alternative. Transmission line construction costs as well as the environmental and socio-economic footprints were estimated to be of similar proportions; therefore, the Dorsey to Portage South was selected as the preferred alternative.

3.0 PROJECT DESCRIPTION

3.1 PROJECT OVERVIEW

The proposed Project includes a new 230-kV AC transmission line and station modifications at the Dorsey Converter Station and the Portage South Station. The 66.14-km transmission line will originate from the 230-kV switchyard of the Dorsey Converter Station, located approximately 8 km northwest of Provincial Trunk Highway No.101, at the northwest side of Winnipeg. The line will terminate at the Portage South Station, located about 12.5 km southeast of Portage La Prairie. The Project will parallel the existing Dorsey Converter to Portage South (D12P) 230-kV transmission line and will be located in part on the unused portion of the existing D12P ROW. As this Project is located in an agricultural setting, the extension of the existing ROW will be primarily located on private property.

The Dorsey and Portage South stations will require equipment modifications and additions to support the transmission connections. These modifications are required to terminate the transmission line and integrate this project into the Manitoba Hydro 230-kV electrical network. All modification and equipment additions at the stations are planned to be within the existing fenced areas. The Dorsey Converter Station is a major facility of the Manitoba Hydro electrical system. The station converts 500-kV DC to AC current and is a main hub for conversion to 230 kV AC current. The Portage South Station is connected to the 230-kV network by two 230-kV transmission lines, D12P and P81C. The D12P line connects the Dorsey Converter Station 230-kV switchyard to the Portage South Station and the P81C transmission line connects the Portage South Station to the Cornwallis Station near Brandon, Manitoba.

3.2 PROJECT COMPONENTS

3.2.1 230kV Transmission Line

3.2.1.1 General Transmission Line Design Considerations

The technical details for the Project are based on preliminary designs, standard design criteria, and construction policies and practices. Final engineering design will be completed upon receipt of the EAL. Final design will incorporate any conditions included in the EAL. Specific structure locations will be finalized after the ROW has been procured and surveyed. Towers will be sited as far from waterways as possible.

Manitoba Hydro has identified a preferred transmission route using the Site Selection and Environmental Assessment (SSEA) process. The preferred route parallels and is adjacent to the existing D12P 230-kV transmission line (Map 3-1). The preferred route will be located in part on the unused portion of the ROW on the north side of the D12P transmission line. Except for the Assiniboine River Crossing, the Project is designed to be a single-circuit line configuration consisting of three conductors supported by self-supporting lattice steel towers (Figure 3-1). The span between the towers will be approximately 420 m in order to match the existing D12P tower locations. Sky or ground wires (two wires, each 9 mm in diameter) will be located above the conductors. If an Optical Protection Ground Wire (OPGW) is required, it will replace one of the sky wires. OPGW wires for this type of transmission line are typically 12 mm in diameter. At the Assiniboine River crossing the Project will be double circuited (Figure 3-1) with the existing D12P transmission line. The Project and D12P transmission lines will converge north of the crossing and diverge south of the crossing (Map 3-2). This will require the replacement of the existing D12P towers on either side of the river and one or more approach towers north and south of the crossing.

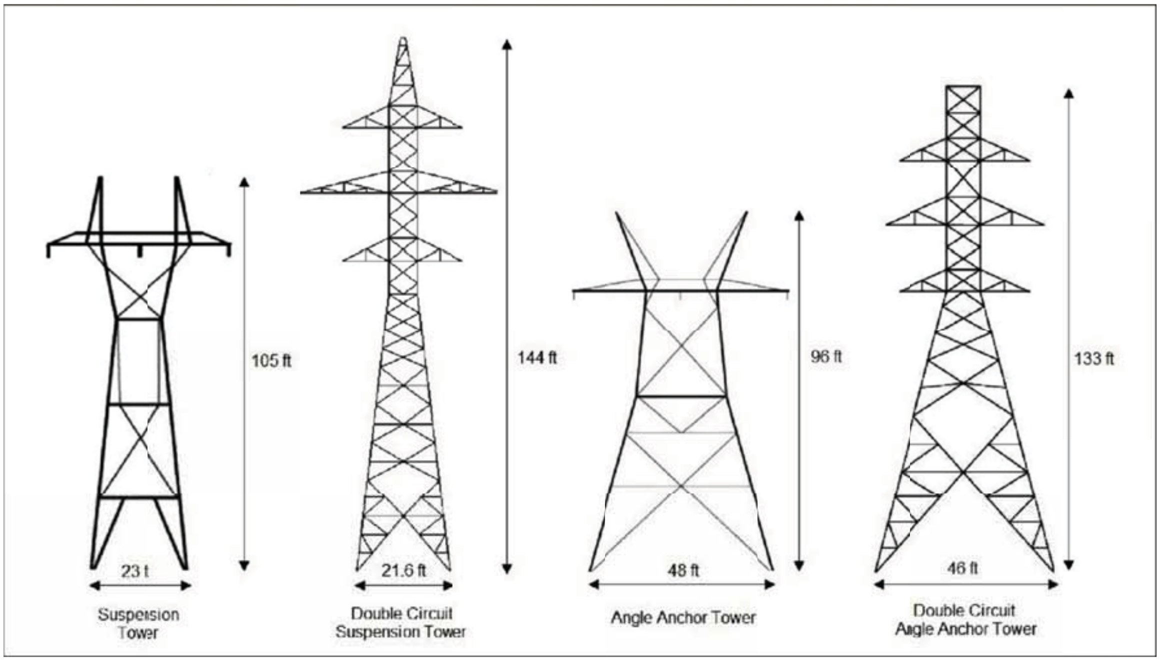


Figure 3-1 Schematic diagram of single-circuit and double-circuit towers.

The transmission line design and construction will meet or exceed the design standards as set out in the Canadian Standards Association (CSA 2010) as well as the planning, performance, and reliability standards of the North American Electric Reliability Corporation (NERC).

3.2.1.2 Right-of-Way Requirements and Acquisition Policy

Manitoba Hydro obtains the legal right to construct, operate, and maintain their transmission lines. This right is generally obtained through easement of privately owned lands, or by Crown Land Reservation for right of use on Provincial Crown Land.

The ROW widths are determined by a variety of factors including safe conductor swing or blow-out, radio interference and future maintenance. The ROW widths selected for various structure types will meet or exceed the requirements as adopted by the CSA for radio interference (IEC 2010). The ROW width also provides adequate lateral distance under strong wind conditions to prevent flashovers onto objects located near the edge of the ROW.

The preferred Project route will parallel the existing D12P along the north side and minimize the need for additional ROW. The existing D12P transmission line ROW is located on a 67-meter wide corridor owned by Manitoba Hydro. The D12P transmission line is offset to the south within the ROW such that the ROW extends 21.5 m south and 45.5 m north of the D12P centre line. The Project will make use of all the existing unused ROW north of D12P plus an additional 15 m of ROW acquired through easement in order to provide for adequate separation and clearance distances between the D12P and Project transmission lines (Figure 3-2). The total ROW width will therefore increase from 67 m to 82 m. The Project towers will be placed so as to match the spacing of the existing D12P towers. The cleared portion of the existing ROW is 43 m in width. This clearing will be extended 39 m to the north in order to accommodate the Project. By contrast a new alignment would require a new ROW width of approximately 60 m.

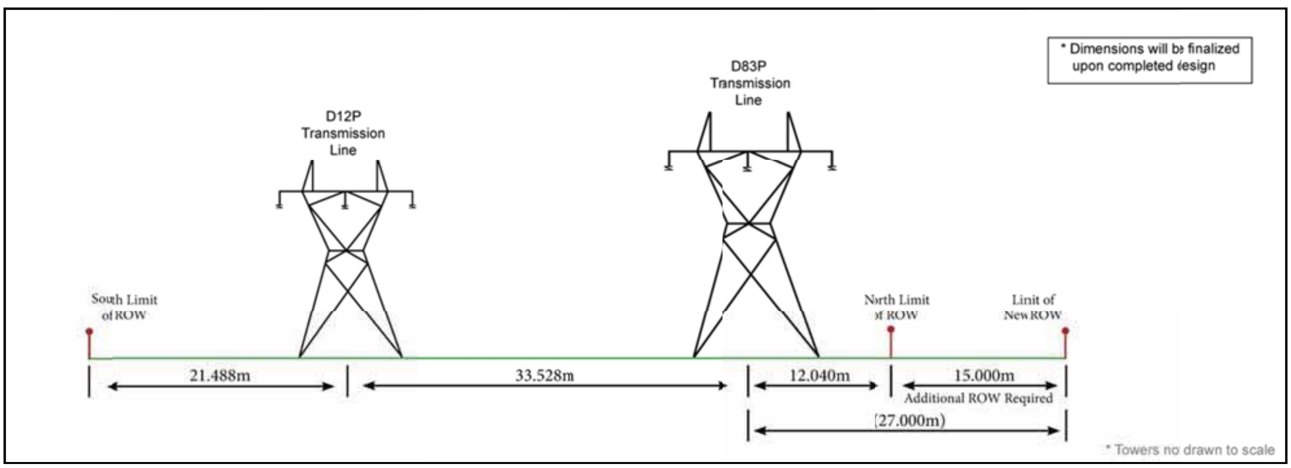


Figure 3-2 Preferred right-of-way for D83P transmission line.

3.2.1.3 Structures

Self-supporting lattice steel support towers will be used to support the Project's single-circuit transmission line (Figure 3-1). The tower height will be 32.2 m, with a footprint of 7.1 x 7.1 m, and a distance between the centreline and outer arm terminus of 6.7 m. If tower extensions are necessary at stream and transportation crossings the tower heights and footprints will increase. The Project towers will be similar in appearance to the D12P towers but taller. The difference in height is due to changes in design standards since the construction of D12P.

Specialized heavy angle and dead-end structures will be required for line redirection and to terminate the transmission line at each of the stations. These structures will also be single-circuit self-supporting lattice steel towers but wider and slightly shorter than the suspension structures (Figure 3-1). The heavy angle and dead-end tower heights will be 29.5 m, with a footprint of 14.9 x 14.9 m, and a distance between the centreline and outer arm terminus of 8.5 m.

At the Assiniboine River the D12P and Project transmission lines will converge north of the river into a double-circuit transmission line for the river crossing and diverge south of the crossing into separate single-circuit transmission lines. Specialized double-circuit towers will be required to support both sets of conductors. Double-circuit self-supporting lattice steel suspension towers will be required on either side of the river crossing. These towers will be taller than the Project's support towers in order to accommodate both sets of conductors as well as to provide sufficient navigation clearance over the Assiniboine River. The towers will be of a single-column design with three cross arms and a single ground wire at the apex (Figure 3-1). The tower height will be 43.9 m, with a footprint of 6.6 x 6.6 m, and a distance between the centreline and outer arm terminus of 7.3 m. Heavy angle / anchor suspension towers will be required at the convergence and divergence of the transmission lines as well as on either side of the river crossing support towers. As with the single-circuit heavy angle / anchor towers, the double-circuit towers are self-supporting lattice steel towers but wider and slightly shorter than the suspension structures (Figure 3-1). The heavy angle / anchor towers will be of a single-column design with three cross arms and a single ground wire at the apex. The tower height will be 40.5 m, with a footprint of 14.0 x 14.0 m, and a distance between the centreline and outer arm terminus of 7.4 m.

3.2.1.4 Conductors and Insulators

The Project transmission line has been designed to carry three 954 MCM 54 / 7 ACSR Cardinal type conductors. Each conductor consists of aluminum strands wrapped around a centre core of steel strands and will be suspended from each structure by insulator strings. The ground clearance will meet or exceed the requirements of Overhead Systems, C22.3 Standard No. 1-10 (CSA 2010). The minimum ground-to-conductor clearances for 230-kV power lines are:

- Farmland: 6.1 m
- Road and Highways Crossings: 6.325 m
- Railways: 9.3 m
- Underground Pipelines: 6.1 m
- Pedestrian only: 4.6 m
- Watercourse – Class 0: 6.1 m
- Watercourse – Class 1: 7.3 m
- Watercourse – Class 2: 9.3 m
- Watercourse – Class 4: 13.3 m

The insulator strings will be composed of 12 insulators on suspension towers and 14 insulators on heavy angle and dead end towers. The suspension insulators and conductors are free to move and may gallop or blow-out from their normal position during wind events.

3.2.1.5 Ground Wire

Two ground wires (skywires) will be strung parallel to the transmission line and along the tower apices to provide grounding and lightning protection. One of these wires in the future may be converted to an Optical Ground Wire (OPGW) which will provide communications during the transmission line operation. The ground conductor will be constructed of galvanized steel strands and have an outside diameter of approximately 9 mm.

3.2.2 Station Modifications

Station modifications will be required to terminate the Project at the Dorsey and Portage South stations. All station modifications and equipment additions will be conducted on existing Manitoba Hydro property and within the fenced area of each station.

3.2.2.1 Dorsey Converter Station 230-kV Switchyard

The Project will originate from Bay 13 at the 230-kV switchyard of Dorsey Converter Station which is located immediately west of the D12P origin. The equipment requirements for the Dorsey Converter Station will include:

- Re-conductoring of approximately 100 m of the high bus from 795 ACSR to 1272 ACSR single conductor;
- Add a second 230 kV intermediate bus “B” with approximately 70 m of parallel 795 ACSR;
- Installation of one 230-kV breaker;
- Installation of three current transformers for breaker protection;
- Installation of three, three-phase center break switches; and
- Three, single-phase 230-kV potential transformers for line protection.

The works will include the preparation of foundations to support the equipment necessary to connect the Project to the existing station apparatus (Figures 3-3 and 3-4). All station works will be conducted within the existing and secured station footprint.

3.2.2.2 Portage South Station

The Project will be terminated at the Portage South Station bus located to the south of the D12P termination. To accommodate this termination, specific equipment requirements for the Portage South Station will be required. These equipment components include:

- Re-conductoring of approximately 100 m of the high bus from 795 ACSR to 1272 ACSR single conductor;
- Adding a second 230-kV intermediate bus "B" with approximately 70 m of parallel 795 ACSR;
- Installation of one 230-kV breaker;
- Installation of three current transformers for breaker protection;
- Installation of three, three-phase center break switches; and
- Three, single-phase 230-kV potential transformers for line protection.

The works will include the preparation of foundations to support the equipment necessary to connect the Project to the existing station apparatus (Figures 3-5 and 3-6). All station works will be conducted within the existing and secured station footprint.

3.3 PROJECT CONSTRUCTION

Construction will be carried out by contractors under the supervision of Manitoba Hydro. Transmission line construction will begin following the receipt of the Environment Act license. Other work permits and/or authorizations will be obtained as required. Manitoba Hydro will prepare an EnvPP for the Project that will incorporate any license, permit or authorization conditions (Chapter 9). In addition, Manitoba Hydro will prepare a detailed Construction Phase EnvPP for project construction. Both EnvPPs will outline site-specific mitigation and on-ground procedures for preventing or minimizing environmental effects from construction activities. Manitoba Hydro field staff and the contractors will be provided with copies of the Construction Phase EnvPP and licenses/permits/authorizations.

All station modifications and equipment additions will be conducted within Manitoba Hydro's existing property and within the fenced area of each station. Only authorized Manitoba Hydro and contractor personnel will have access to the construction areas. If there is a need for alternative site access then access will be negotiated with the landowner.

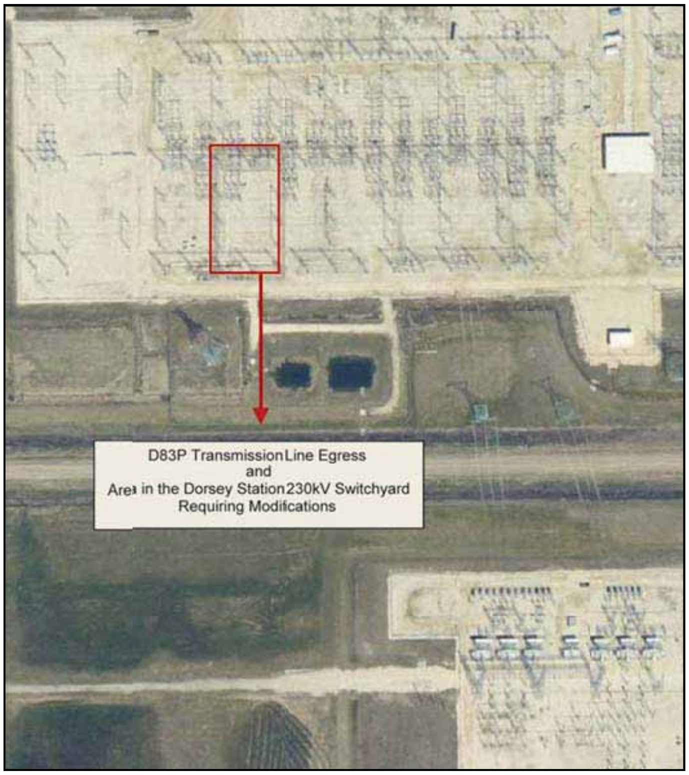


Figure 3-3 Locations of equipment additions and modifications to the Dorsey Converter Station.

Figure 3-4 Enhanced view of areas at the Dorsey Converter Station that will require modifications.

Figure 3-5 Locations of equipment additions and modifications to the Portage South Station.

Figure 3-6 Ground view of the D83P ingress location to the Portage South Station.

3.3.1 Transmission Line

Property easements for the required ROW will be secured through direct negotiations with affected landowners. The route will then be surveyed to establish a centreline for the transmission line. The edges of the ROW will also be surveyed and flagged to establish the limits for tree clearing. It is during this survey the tower locations will be established.

Transmission line construction will begin once the ROW is cleared. The basic construction steps involve auguring of holes for cast-in-place concrete pile foundations, framing and erection of structures, stringing of conductors, clean-up, and commissioning.

Typical construction equipment includes:

- Drill rigs for drilling piles;
- Backhoes with attachments for installing piles;
- Excavators and cranes for erecting towers;
- Bulldozers and stringing equipment such as tensioners and pullers for stringing conductors and skywires;
- Material delivery trucks and trailers;
- Concrete trucks; and
- Other smaller equipment for transportation and other minor tasks as required.

Access to construction sites along the ROW will generally be from within the ROW. The ROW will be accessed at intersections with roadways or road allowances or from roadways adjacent to the transmission line in order to minimize the need for pioneering access trail development. Permission will be requested from landowners where access is across private property.

3.3.1.1 Right-of-Way Clearing

The existing D12P transmission line ROW is located on a 67-meter wide corridor owned by Manitoba Hydro. The D12P transmission line is offset to the south within the ROW such that the ROW extends 21.5 m south and 45.5 m north of the D12P centre line. The Project will make use of the entire existing unused ROW north of D12P plus an additional 15 m of ROW acquired through easement in order to provide for adequate separation and clearance distances between the D12P and Project transmission lines (Figure 3-2). The existing ROW has a cleared width of 43 m centred on D12P. The remainder of the existing ROW as well as the additional 15 m of ROW will be cleared to accommodate the Project. The total ROW clearing requirements will be 39 m and result in a total ROW width of 82 m.

The ROW will be cleared of trees and understory to allow for safe and reliable operation of a transmission line. Clearing will be modified in environmentally sensitive areas (e.g., river and stream crossings) and will be subject to a variety of pre-determined but adaptable environmental protection measures. In forested areas shrubs and herbaceous vegetation ground cover will be maintained as much as possible to provide soil stability and prevent erosion and sediment transport. Clearing methods include machine clearing by "V" and KG blades, mulching by rotary drums, selective clearing by feller bunchers, and hand clearing. Trees will be cut within 10 cm of the ground surface. Ground vegetation will only be grubbed at tower sites for foundation installation, access trails for equipment, or for worker safety. Danger trees identified beyond the ROW will also be removed. In environmentally sensitive areas, such as at the Assiniboine River riparian zones, clearing will be conducted by hand. Tree removal in riparian zones along the ROW will be completed in accordance with the *Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat* (DFO and MBNR 1996).

Disposal of cleared vegetation typically involves a variety of options including piling and burning, mulching, collection and secondary use by local communities (e.g., firewood), or salvage and marketing of merchantable timber resources if feasible. The final decision for disposal of vegetation will be determined by the method of clearing used and the environmental license conditions applied to the project.

3.3.1.2 Foundation Installation

Tower foundation will be cast in place concrete piles. Pile foundations for suspension towers will be constructed by auguring 0.9 m diameter holes to a depth of 10 m below the surface. Pile forms will be placed in the holes and filled with concrete. Foundations for heavy angle or dead end structures will be constructed using the same methods above except the piles will be 1.2 m in diameter and extend to 11 m below the surface. Pile dimensions will vary to accommodate differences in ground conditions among tower sites.

3.3.1.3 Structure Erection

Structures will be assembled either onsite or assembled as components in a designated marshaling yard, transported to the construction site by truck, and erected by crane. Prior to structure erection the insulators will be attached to the cross-arms.

3.3.1.4 Conductor Installation

Reels of conductor, each holding about 3200 m, will be transported to site by truck, as required. The conductors will be lifted to the insulators by crane. Conductor lengths will be connected using either implosive sleeves or hydraulic crimping. Conductor tensioning will be completed by machine to provide the pre-determined ground to conductor clearances.

3.3.1.5 Double Circuit Section

The double-circuit towers will be constructed in-line or near in-line with the existing D12P transmission line using the construction methods described in the preceding sections and the following sequence of activities. The tower foundations will be constructed while the new tower sections are partially erected adjacent to the foundations. The D12P conductors will then be de-energized, cut, and temporarily guyed to the ground. The double-circuit towers will then be erected on the prepared foundations. The redundant D12P single-circuit towers will then be salvaged and removed from site for recycling. New conductors will be lifted onto the double-circuit towers and spliced into the cut ends of D12P. These tasks will require a one week outage on D12P.

3.3.1.6 Marshaling Yards

Marshaling yards will be used to store construction materials and equipment. The yards will be established near the transmission line route to minimize transportation requirements. The number and location of the marshaling yards will be determined once the final route has been licensed. Contractor specifications and agreements may influence the number and location of marshaling yards

3.3.1.7 Granular Materials

Granular materials will be required during the construction for granular back fill and/or concrete batching for tower foundations. Granular materials will be purchased from local suppliers.

3.3.1.8 Waste Disposal and Clean-up

Waste materials will be disposed of through local contract services and will be subject to any licensing conditions. Temporary waste disposal will be undertaken in accordance with provincial and municipal regulations and by-laws. Once the transmission line has been completed, all materials, equipment, debris, and unused supplies will be dismantled, if required, removed from the site and disposed of according to provincial and municipal regulations. Reclamation of construction sites, including marshaling yards, will be undertaken as required.

3.3.1.9 Workforce Accommodations

No construction work camps will be required for the project. Workforce accommodations will be available in local communities along the route.

3.3.1.10 Workforce Requirements

Previous experience suggests that a workforce of approximately 60 people will be required during construction.

3.3.2 Station Modifications

All station modifications and equipment additions will be conducted on existing Manitoba Hydro property and within the fenced area of each station. Manitoba Hydro personnel and their contractors will be involved in the construction of these station components. As personal safety and station security are of utmost importance, only authorized personnel will be allowed within the work areas. Any temporary station access, if necessary, will be negotiated with the adjacent landowners.

3.4 OPERATION AND MAINTENANCE

3.4.1 Transmission Line

The transmission line will be designed to operate continuously although the actual flow of electricity will vary with load requirements. In order to maintain the transmission line in a safe and reliable operating condition, regular inspection and maintenance must occur. This will include inspections of the ROW as a well as structures, hardware and stations equipment. The inspections of the transmission line can include air patrols, grounds patrols and non-scheduled maintenance by air or ground in the event that unexpected repairs are required. Ground travel can include snowmobile, flex-track type vehicles or road vehicles. Regular inspections typically occur on an annual basis.

The operations and maintenance phase of the project will adhere to the Manitoba Hydro Operations Phase EnvPP developed for the Project. Manitoba Hydro maintains a corporate manual for transmission line construction and maintenance procedures which is continuously updated.

3.4.1.1 Electric and Magnetic Fields and Corona

Fences that run parallel to 230-kV transmission lines are subject to induced voltages. Induced voltages vary with proximity of the fence to the transmission line, fence material and construction, and the length of the parallel run. To protect the landowner, livestock and the general public, standard grounding procedures have been defined for both non-electric and electric fences and gates.

3.4.1.2 Line Maintenance Procedures

Manitoba Hydro maintains a corporate manual for transmission line construction and maintenance procedures which is continuously updated.

3.4.1.3 Workforce Requirements

There will be no permanent or dedicated workforce required to operate and maintain the transmission line. The transmission line will be inspected every three years by a crew of two to three persons over a period of several days. Any maintenance requirements identified during the inspections will depend on the nature of the maintenance identified during the inspections.

3.4.1.4 Vegetation Management

An integrated vegetation management approach will be undertaken to address non-desirable and non-compatible vegetation issues within the ROW. A variety of vegetation management methods are available, including physical, chemical, and biological control techniques. The application of vegetation management is dependent on the location, costs, and the environmental sensitivity of the site.

Vegetation management methods include:

- Hand cutting: hand-cut trees using chainsaws, brushsaws, axes and brush hooks. Where local conditions permit, hand-cut deciduous trees might be stump treated with an approved herbicide to prevent re-growth. In areas were herbicide application is not an option more frequent follow-up maintenance will be required to address re-growth;
- Mechanical Cutting: Mechanical cutting is generally used where dense tree growth reoccurs on the ROW and the site is not environmentally sensitive (e.g., riparian zones). Follow-up maintenance is usually required within two to three years to manage suckering and re-growth;
- Winter Shearing: This is used when the ground is frozen and is performed by a tracked vehicle equipped with “V” or “K-G” blades to clear trees with a trunk diameter greater than 2.5 cm. Trees are sheared up approximately 6 cm above the ground surface to minimize damage to the ground cover and soil disturbance; and
- Herbicide Treatment: Herbicides are used to provide long-term control of tree growth problems and are generally applied in following - up to mechanical methods. All herbicide applications will be completed and supervised by licensed applicators and in accordance with a Pesticide Use Permit. Herbicide application rates will be determined by the Manitoba Hydro Chief Forester in accordance with product label instructions. Herbicide application methods include:
    - Broadcast stem or foliar application equipment such as machine applicators and hose and handgun applicators are used for controlled droplet applicators for tree heights of 2.5 m or less.
    - Selective stem applicators such as hose and gun sprayers are the preferred method of application for trees less than 2.5 m in height.
    - Basal treatment applications are used for a direct spray onto the lower 20 cm of the tree stem or root collar. This can be completed in any season and is generally used for tree growth over 2.5 m.
    - Stump treatment is used following hand cutting, where practical, to provide selective control of suckering deciduous tree species and to minimize effects on desirable species.
    - Tree injection methods might also be used on trees over 2.5 m, subject to aesthetic impact considerations.
    - Biological Control is a method of encouraging competing plant species, planting and maintaining desirable plant species, encouraging wildlife use or encouraging secondary use of the ROW.

Weed control in cultivated and uncultivated areas of the ROW is the responsibility of the landowner and included in the landowner compensation package for easement. Prior to any vegetation management work on private property, notification will be provided to the landowner or authority. On Provincial Crown Lands, a work permit will be obtained under the Manitoba Forest Act. In cases where private property is adjacent to Provincial Crown Lands, adjacent landowners will also be contacted in advance of the work. The Manitoba Hydro Chief Forester will coordinate the required approvals. The Chief Forester is responsible for obtaining the necessary Pesticide Use Permits and submitting Post-season Control Reports as required by Manitoba Regulation 94-88R.

3.4.2 Stations

The transmission stations are not manned on a continual basis; however, routine inspections and maintenance operations are required to ensure safe and reliable operation. Weed control within stations is necessary for the operating reliability of equipment as well as safety of personnel working within the stations. Areas of the stations that will be modified or to which equipment will be added will be included in existing site maintenance procedures and activities. The operations and maintenance phase of the station will adhere to the Manitoba Hydro Operations Phase EnvPP developed for the Project.

3.5 PROJECT DECOMMISSIONING

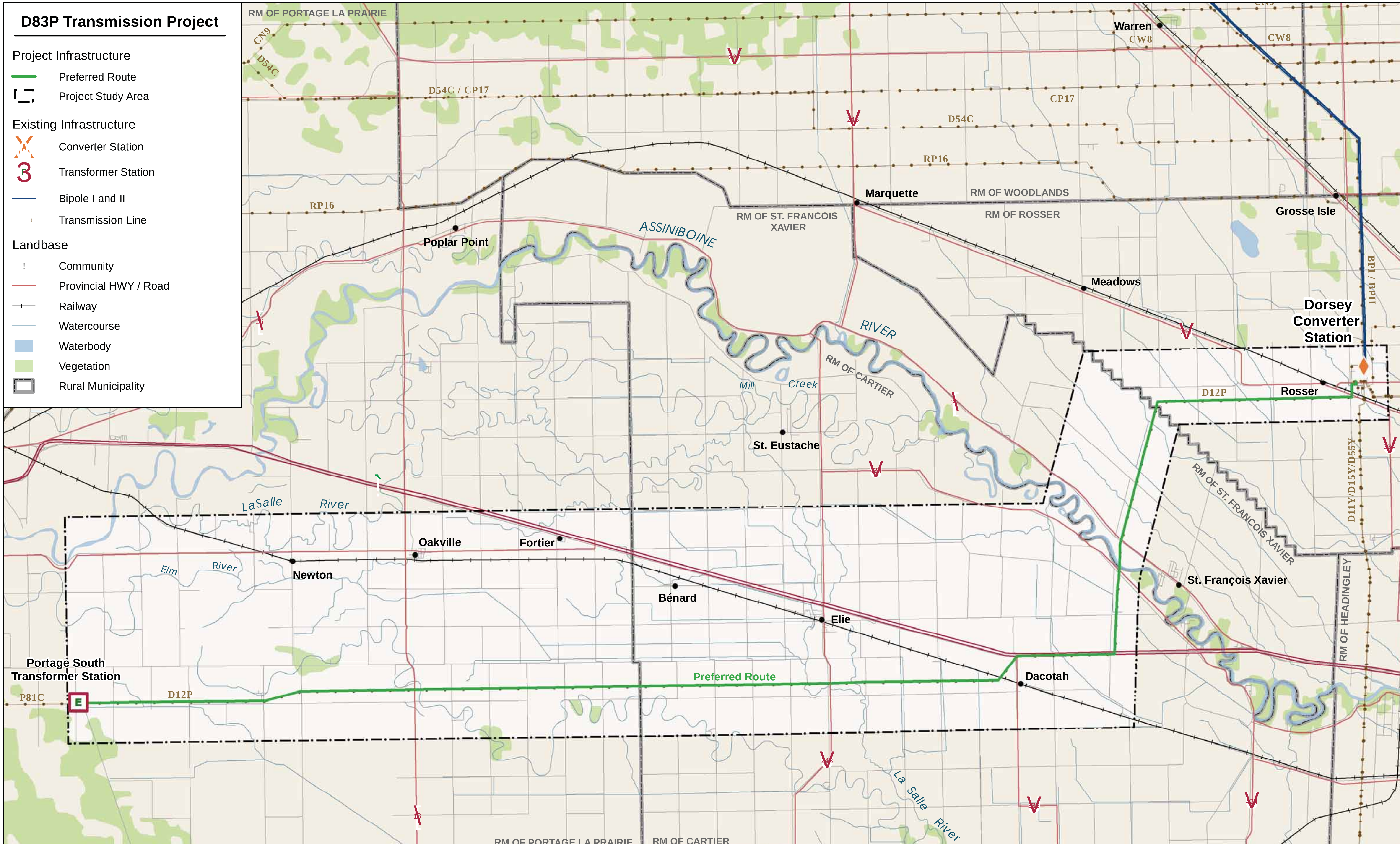
The Project has been designed to remain in service for several decades and with regular maintenance could be operated indefinitely. If and when decommissioning of the transmission line or stations is required, this will be completed in accordance with the Federal, Provincial, and municipal regulations in force at the time.

3.6 PROJECT SCHEDULE

The in-service date (ISD) for the Project is October 2014. To meet this timeline, tasks are anticipated to be completed according to Table 3.1.

Table 3-1 Project schedule

Project Task	Target Date
Preparation of the EA Report and Public Engagement	August 2012
EA Report and EAPF Submission	September 2012
Receipt of license under *The (Manitoba) Environment Act*	January 2013
Property Appraisals and ROW acquisition	June 2014
Completion of Transmission line Design	August 2014
Materials Procured	October 2014
Clearing of the ROW	October 2014
Transmission Line Construction	March 2015
Stations Modifications and Transmission Line Terminations	March 2015
Commissioning	March 2015
In-Service Date	April 2015



Manitoba Hydro

Coordinate System: UTM Zone 14 NAD 83
Data Source: MBHydro, Stantec, ProvMB, NRCan
Date Created: September 5, 2012

0 2.5 5 Kilometres
0 2.5 5 Miles

1:150,000

Dorsey to Portage (D83P) Transmission Project
Preferred Route

Map 3-1

Manitoba Hydro

D83P Transmission Project

Project Infrastructure

Preferred Route

Infrastructure

Transmission Line

Landbase

Provincial HWY / Road

Coordinate System: UTM Zone 14N NAD83
Data Source: MBHydro, Rawluk Assc., ProvMB, NRCAN
Date Created: September 5, 2012

0 75 150 Metres

1:6,000

Plan-view Showing Convergence and Divergence of D12P and D83P

Map 3-2

4.0 SITE SELECTION AND ENVIRONMENTAL ASSESSMENT

4.1 BACKGROUND AND PURPOSE

Manitoba Hydro uses a SSEA process to plan and assess new transmission infrastructure. The overarching objective in the SSEA approach is to provide effects avoidance and management opportunities at every stage in the process, from planning through post-construction and operations. The SSEA process for the Project is consistent with provincial and federal environmental assessment legislation, guidelines, and procedures, as well as industry best practices.

The SSEA process to select a route for the D83P transmission line considered a broad range of environmental, socio-economic, and stakeholder involvement information to systematically refine and reduce the route alternatives to the single best balanced choice of a preferred route. Throughout this process, the specific objectives of the D83P transmission line SSEA process were to:

- select a transmission line route in a technically, economically, and environmentally sound manner;
- assess the potential effects of the Project;
- conduct the SSEA process with consideration of inputs from landowners, resource users, interest groups, resource managers, and the public at large in a responsive, documented, and accountable manner;
- find practical ways to reduce potential adverse effects and enhance benefits; and
- prepare an EA Report which documents the results of the SSEA study.

4.2 SSEA METHODS

Manitoba Hydro attempts to balance ROW site selection for a transmission line project using biophysical, socio-economic, technical (engineering) and cost considerations through the SSEA process. Manitoba Hydro seeks to avoid adverse environmental effects and enhance potential benefits whenever possible and practical. Where project effects cannot be avoided, routes are selected that best lend themselves to effective mitigation and sound management for limiting potential effects to the environment and stakeholders. This general approach is consistent with Manitoba Hydro's policies on Sustainable Development (Section 8.7). The SSEA was comprised of four key areas of activities (Figure 4-1):

- Route Selection Studies;
- Biophysical and Socio-economic Studies;
- Stakeholder Involvement; and
- Government Involvement.

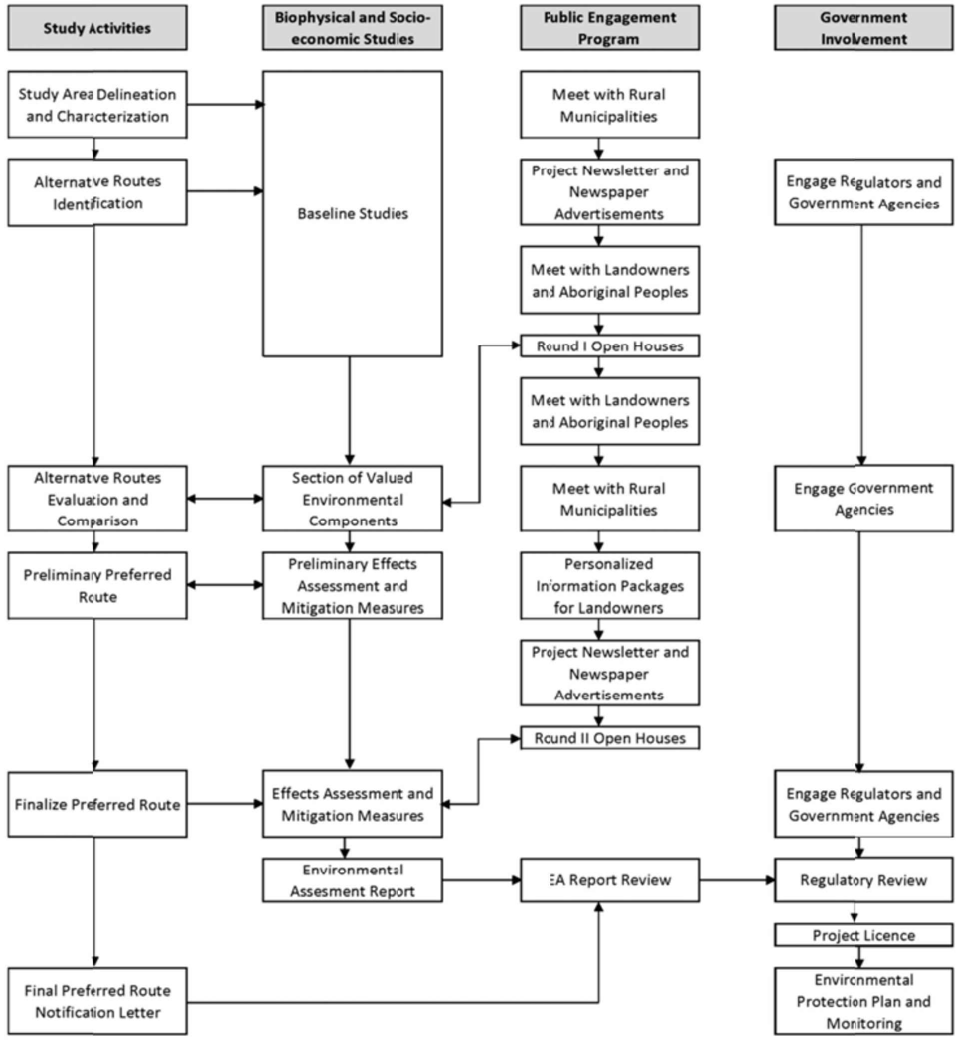


Figure 4-1 Project General Site Selection and Environmental Assessment Process

The key areas of activities were conducted concurrently so that information and results generated in each key area of activity could be used to provide feedback to and guide the development of the other key areas of activity.

4.2.1 Route Selection Studies

4.2.1.1 Study Area

The first step in the SSEA process was to define the Study Area. Once the spatial boundaries of the Study Area were established, the area was environmentally and socio-economically characterized to describe the existing conditions in the Study Area. The characterizations were updated and refined throughout the SSEA process as additional information was gathered through document review, field studies, stakeholder meetings, and open houses.

Delineation

The delineation criteria for the Study Area were:

- The area needed to meet the basic functional and feasibility requirements of a transmission line between the Dorsey and Portage South stations; and
- The area needed to be of sufficient size to contain several feasible route alternatives.

In order to establish the geographic boundaries of the Study Area, a preliminary, high-level assessment was conducted of potential route corridors between the Dorsey and Portage South stations. The assessment considered Project economics as well as the environmental and socio-economic footprints of the Project. The assessment concluded that a direct route corridor between the stations would provide several economically feasible route alternatives while at the same time having the smallest potential environmental and socio-economic footprints. Route corridors north of the Assiniboine River and south of the existing D12P transmission were considered but eliminated as the longer transmission line lengths would have resulted in higher total construction costs and would have correspondingly larger overall environmental and socio-economic footprints.

Several preliminary route alternatives were then outlined within the direct corridor. A preliminary Study Area was then defined that enclosed the preliminary route alternatives as well as both stations (Map 4-1). The preliminary Study Area was reviewed within the context of existing environmental and socio-economic information by the technical leads and finalized by the advisory group. The final Study Area provided the spatial boundaries for the collection and review of existing information, field study planning, and stakeholder identification.

Characterization

The purpose for Study Area characterization was to provide a broad understanding of the environmental and socio-economic landscape for the preliminary selection of route alternatives within the route corridor between the Dorsey and Portage South stations. Characterization included biophysical (e.g., vegetation, wildlife, aquatic resources) and socio-economic (e.g., location of settlements, infrastructure, heritage resources) characteristics using existing remote sensing and other existing sources of information (e.g., maps, reports). This information provided a high-level context for the selection of the route alternatives within the route corridor. Field reconnaissance was also conducted along the potential alternative routes to confirm the remote sensing information and identify any recent, undocumented route constraints. Some of this information is quantitative while other information is qualitative, illustrating social and cultural conditions or general landscape features.

For alternative route selection purposes, the Study Area limits are related to the full range of potential biophysical, socio-economic and technical siting features and constraints associated with each particular Project component. The Study Area encompasses a wide range of technically viable alternative routes and, at the same time, was considered to offer sufficient scope for identification and comparative assessment of alternative routes that might involve different biophysical or socio-economic effects. The relatively large Study Area facilitated an appropriate level of assessment of the nature and spatial scope of the potential effects associated with each of the Project components and provided a high level of certainty in the ability to select the alternative routes, from the combined biophysical, socio-economic, and technical contexts.

4.2.1.2 Alternative Routes Identification

Alternative routes were selected to avoid sensitive biophysical and socio-economic features and to make use of routing opportunities (e.g., municipal road allowances, half-mile lines, existing power line ROW) identified during the Study Area characterization task. Where avoidance was not possible or practical, encroachment on sensitive biophysical and socio-economic features was minimized. Engineering and cost requirements (e.g., number of heavy angle structures) were also considered in the selection of alternative routes.

The alternative routes were defined using the following method:

- A centreline was drawn for each alternative route. The centreline was approximated on orthophoto imagery, the accuracy of which was determined by the orthophoto imagery used;
- The ROW was estimated at 27 m on either side of the unencumbered centerline; and
- Two buffer widths which extended from the outside edge of each ROW. The first buffer extended 75 m from the outer ROW edge, and the second buffer extended 75 m from outer edge of the first buffer.

The purpose of each buffer area was to identify potential zones of direct and indirect biophysical and socio-economic effects along each alternative route alignment for evaluation and comparison.

4.2.1.3 Selection of Preferred Route

Information obtained through the biophysical and socio-economic baseline studies, preliminary engineering and cost requirements, and the PEP were used to evaluate and compare alternative routes (Chapter 7). The purpose of this was to select a preferred route that resulted in the least potential biophysical and socio-economic effects while remaining technically and cost effective.

4.2.2 Biophysical and Socio-economic Studies

4.2.2.1 Baseline Studies

Baseline studies consisted of a review of existing information as well as field studies. Primary literature (peer-reviewed sources), gray literature (e.g., government documents, consulting reports) and unpublished government data (e.g., Manitoba Conservation Data Centre records, Fisheries and Oceans Canada Agricultural Drain Database) were used to characterize the Study Area. Known locations of biophysical and socio-economic sensitivities were identified to aid in the selection of the alternative routes. Field studies were then conducted along the alternative routes to confirm the literature information and to provide site-specific information to aid in the evaluation and comparison of alternative routes and the Project environmental assessment. Appropriate limits on the data collection were established to meet the needs of the Project effects analysis and to identify any requirements for potential monitoring programs.

4.2.2.2 Selection of Valued Environmental Components

The environmental assessment was focused on Valued Environmental Components (VECs), which are those aspects of the natural and socio-economic environment that are particularly notable or valued because of their ecological, scientific, resource, socio-economic, cultural, health, aesthetic, or spiritual importance, and which have a potential to be adversely affected by project development or have the potential to have an effect on the project. Hence, a VEC must both be important and have the potential to be affected by, or to affect, the Project. The potential to be affected means there has to be some interaction, either directly or indirectly, between the environmental component and some component or activity associated with the project during planning, construction, or operation. In this way, the assessment was focused on the identification and management of potential adverse effects.

A biophysical VEC can be a particular habitat, an environmental feature, a particular assemblage (community) of plants or animals, a particular species of plant or animal, or an indicator of environmental health. Biophysical VECs were defined on the basis of their meeting one or more of the following criteria:

- Area of notable biological diversity;
- Significant habitat for locally important species;
- Significant habitat for uncommon or rare species;
- Important corridor or linkage for fish and/or wildlife movement;
- Sensitive receiving water environment;
- Species at risk;
- Notable species or species groups;
- Indicator of environmental health;
- Important component to the function of other ecosystem elements or functions;
- Component is of economic or cultural significance;
- Component is of educational, scientific, or aesthetic interest; and
- Component is of provincial, national or international significance.

The VECs assessed in the effects analysis were defined by the multi-disciplinary project team undertaking the assessment based on:

- Identified regulatory requirements;
- Consultation with regulatory authorities;
- Information derived from published and unpublished date sources;
- Information and comment received during the engagement of local communities;
- Feedback through the PEP; and
- Biophysical field surveys.

The VECs considered in the environmental assessment are detailed in Section 8.3 to 8.5.

4.2.2.3 Effects Assessment and Mitigation Measures

Environmental effects of the Project were identified, predicted or assessed using a stepwise approach. The first step involved characterization of the interaction between the project and a VEC, with respect to the nature of the interaction, the location, duration, and, where appropriate, the magnitude, severity, and intensity of the interaction. The reversibility of the interaction was also examined. The characterization of the Project interactions used a number of approaches, including remote sensing and direct observation through site surveys.

Identification of Mitigation Measures

Where effects could not be avoided during the route selection process, mitigation measures were identified and incorporated into the Project design. As more detailed designs are prepared, additional mitigation measures can be incorporated into the Project. Mitigation measures will be incorporated into the EnvPP for the construction and operation phases of the Project.

Residual Effects and Significance Evaluation

The determination of the significance of any potential residual effects of the Project on VECs was made after the application of all proposed mitigation measures. The mitigation measures to be applied to this project have been integrated into the Project design; consequently, it is only the residual effects of the Project which require assessment. Assessment of the significance of environmental effects of the Project involved the consideration and evaluation of specific characteristics, or attributes, of the effects. The attributes examined included the magnitude and geographic extent of the effects, the frequency of occurrence of the effects and their duration, the ecological and socio-economic context, the reversibility of the effect, and, the likelihood the effect will occur. The effects attributes and evaluation criteria for the VECs are defined in Tables 4-1 through 4-3.

Significance assessment involves the evaluation of each effect attribute against a three-level significance ranking scale:

- Level I - a negligible or limited potential to contribute to an overall significant environmental effect;
- Level II – a moderate potential to contribute to an overall significant environmental effect; and
- Level III - a high potential to contribute to an overall significant environmental effect.

An effect is defined as significant for a given VEC if it meets both of the following criteria:

- A Level II or III rating for ecological and/or socio-economic context; and
- A Level II or III rating for all of the attributes involving magnitude/extent, duration and frequency.

Effects not meeting both criteria were defined as “not significant”.

Table 4-1: Environmental Impact Significance Criteria

Significance Level	Context		Extent		Frequency	Reversibility	Likelihood of Occurrence
	Ecological	Socio-Economic[1]	Magnitude / Geographic Extent	Duration			
I	No meaningful adverse ecosystem effects – effects within the range of natural variation	No meaningful adverse effects to socioeconomic interests – effects within year to year variation	See Table 4.2 for VEC-specific criteria	See Table 4.3 for group-specific criteria	Effect expected to occur infrequently, or not at all (i.e., <once per year)	Effect is readily Reversible over a relatively short period (i.e., ≤ period of construction)	Unlikely to occur
II	Adverse effects outside the range of natural variation, but Involving only common species or communities, or affecting resources of limited importance	Adverse effects involve measurable disturbance to local residents or land users, or to community character or services in portions of the study area	See Table 4.2 for VEC-specific criteria	See Table 4.3 for group-specific criteria	Effect expected to occur intermittently, possibly with some degree of regularity (i.e., <once per month)	Effect is reversible at substantial cost, and/or over long period (i.e., lifespan of project)	Could reasonably be expected to occur
III	Adverse effects involve locally, regionally, or nationally important species, communities, or resources	Adverse effects involve measurable disturbance to livelihoods, Traditional Use activities, community character, or to services throughout the study area	See Table 4.2 for VEC-specific criteria	See Table 4.3 for group-specific criteria	Effect expected to occur regularly or continuously (i.e., >once per month)	Effect is not reversible	Will occur, or is likely to occur

[1]Limited to consideration of environmentally (biophysical) induced socio-economic effects

Table 4-2 Significance Criteria – Magnitude and Geographic Extent

Component	Factor	Level I	Level II	Level III
Physical Environment	Air Quality	Emissions above background but within applicable federal and provincial regulations and guidelines; or if guidelines exceeded, effects limited to the project footprint	Emissions have the potential to exceed federal or provincial guidelines for areas beyond project footprint, resulting in potential for meaningful adverse environmental effects to resources or residents outside the project footprint.	Emissions are likely to exceed federal or provincial guidelines for areas beyond project footprint, resulting in meaningful, and unacceptable adverse environmental effects to resources or residents outside the project footprint.
	Climate and meteorology	Greenhouse gas emissions of <0.1% of Canada's target CO_2 emission rate reduction of 240 Mt/a	Greenhouse gas emissions of 0.1 to 1.0% of Canada's target CO_2 emission rate reduction of 240 Mt/a	Greenhouse gas emissions of >1.0% of Canada's target CO_2 emission rate reduction of 240 Mt/a
	Terrain Soils and Geology	Effects considered minor, restricted to the project footprint. Soil alteration/loss restricted to the project footprint. Any soil contamination above background within applicable federal and provincial regulations and guidelines; or if guidelines exceeded, effects limited to the project footprint	Effects have the potential to extend beyond the project footprint. . Soil alteration/loss may occur outside project footprint. Any soil contamination exceeds applicable federal and provincial regulations and guidelines.	Effects likely to extend beyond the project footprint. . Soil alteration/loss likely to occur outside project footprint. Any soil contamination exceeds applicable federal and provincial regulations and guidelines resulting in alterations or restrictions to adjacent land uses.
	Water Quality - Surface	Water quality effects in receiving waters within applicable federal and provincial regulations and guidelines; or if guidelines exceeded, no anticipated adverse environment effects beyond any defined mixing zones	Water quality effects in receiving waters exceed applicable federal and provincial regulations and guidelines and have the potential to adversely affect[1] drinking water uses, aquatic life, and/or wildlife, beyond any defined mixing zones	Water quality effects in receiving waters applicable federal and provincial regulations and guidelines are likely to adversely affect[1] drinking water uses, aquatic life, and/or wildlife, beyond any defined mixing zones, likely resulting in an unacceptable effect
	Water Quantity - Surface	Change to creek and river flows is <15% of seasonal average	Change to creek and river flows is15 to 25% of seasonal average	Change to creek and river flows is >25% of seasonal average

Component	Factor	Level I	Level II	Level III
	Water Quality - Ground	Water quality effects in receiving waters within applicable federal and provincial regulations and guidelines; or if guidelines exceeded, no anticipated adverse environment effects beyond any defined mixing zones	Water quality effects in receiving waters exceed applicable federal and provincial regulations and guidelines and have the potential to adversely affect drinking water uses, aquatic life, and/or wildlife, beyond any defined mixing zones	Water quality effects in receiving waters applicable federal and provincial regulations and guidelines are likely to adversely affect[1] drinking water uses, aquatic life, and/or wildlife, beyond any defined mixing zones, likely resulting in an unacceptable effect
	Water Quantity - Ground	Change to groundwater fed creek or river flows or well production is <15% of seasonal average.	Change to groundwater fed creek or river flows or well production is15 to 25% of seasonal average	Change to groundwater fed creek or river flows or well production is >25% of seasonal average
Biological Environment	Aquatic Environment (aquatic life, fish, and fish habitat)	In water work or structures necessary but no net loss of the productive capacity offish habitats1	In water work or structures necessary resulting in a net loss of the productive capacity of local fish habitat[1]	In water work or structures necessary resulting in a net loss of the productive capacity of regional fish habitat[1]
	Aquatic species at risk – chestnut lamprey, shortjaw cisco, lake sturgeon, bigmouth buffalo, silver chub, maple leaf mussel	In water work or structures necessary but no net loss of the productive capacity of specific fish habitats[1]	In water work or structures necessary resulting in a net loss of the productive capacity of specific local fish habitat[1]	In water work or structures necessary resulting in a net loss of the productive capacity of specific regional fish habitat[1]
	Vegetation and wetlands	Effect considered minor (i.e., only affecting common species or communities), and confined to the project footprint.	Activity has the potential to measurably affect vegetation communities or species outside of the project footprint but effect limited to common species or communities.	Activity is likely to measurably affect vegetation communities or species outside the project footprint and may affect rare or protected species
	Wildlife and wildlife habitat, including: amphibians and reptiles, migratory birds, furbearers, and large game	Effect considered minor, occurring at the level of individuals and not affecting population size to a degree distinguishable from natural variation. Habitat alteration/loss restricted to project footprint.	Activity has the potential to measurably affect population size and/or habitat availability outside the project footprint.	Activity is likely to measurably affect population size and/or and habitat availability outside the project footprint.

Component	Factor	Level I	Level II	Level III
	Wildlife species at risk	Effect considered minor, occurring at the level of individuals and not affecting population size to a degree distinguishable from natural variation. Habitat alteration/loss restricted to project footprint and limited to non-critical habitat.	Activity has the potential to measurably affect population size and/or habitat availability outside the project footprint.	Activity is likely to measurably affect population size and/or and habitat availability outside the project footprint and may include critical habitat.
Human Environment (changes to resulting from a direct change in the natural environment)	Traditional use of lands and resources by aboriginal persons	Selected parameter changes by <10% from baseline conditions within project study area	Selected parameter changes by 10 to 20% from baseline conditions within project study area	Selected parameter changes by >20% from baseline conditions within project study area
	Human health (noise, air quality, drinking and recreational water quality, and country foods)	Selected parameter changes by <10% from baseline conditions within project study area	Selected parameter changes by 10 to 20% from baseline conditions within project study area	Selected parameter changes by >20% from baseline conditions within project study area
	Natural heritage features[2]	No change in ecological function of the feature[2]	Meaningful change in ecological function of ANSIs and candidate ANSIs[2]	Meaningful change in ecological function of parks and candidate parks[2]
	Heritage/archaeological structures/sites	Heritage/archaeological resources disturbed by the project but are recovered	Heritage/archaeological resources of local importance are disturbed by the project but are not recoverable	Heritage/archaeological resources of regional/national importance are disturbed by the project but are not recoverable

[1]Determined by DFO in consultation with Manitoba Water Stewardship

[2]Includes parks, candidate parks, ANSIs and candidate ANSIs. Determined through consultation with Manitoba Conservation and Water Stewardship – Parks Branch

Table 4-3 Significance Criteria – Duration (from the Canadian Environmental Assessment Agency)

Component	Level I	Level II	Level III
Physical and biological environment	Short-term - Effect not measurable beyond construction period (3 years)	Medium-term – Effect likely to persist though first 10 years of project operation	Long-term – Effect likely to persist beyond 10 years of project operation
Human environment (indirect effects resulting from a direct change in the environment)[1]	Short-term - Effect will occur for ≤3 years (construction phase)	Medium-term - Effect likely to persist though first 10 years of project operation	Long-term - Effect likely to persist beyond 10 years of project operation

[1]Significance determinations are not provided for non-environmentally induced socio-economic and socio-cultural components

4.2.3 Stakeholder Involvement

Public engagement was an essential part of the planning process for selecting the transmission line route. Its purpose was to facilitate public understanding about the Project and the SSEA process and to identify concerns and potential effects in advance of preferred route selection in order to ensure the least disruption to people and the environment. Federal, provincial and local governments, along with interest groups, potentially affected landowners and the general public were contacted at key junctures during the process. Information obtained through the stakeholder involvement process aided in the selection of the alternative routes, the final preferred route, and the design of the transmission line.

4.2.4 Government Involvement

The published Provincial and Federal permitting and environmental assessment requirements were reviewed at the onset of the SSEA process to establish an anticipated permitting and environmental assessment framework for the Project. Manitoba Conservation and Water Stewardship– Environmental Approvals Branch was engaged to confirm the anticipated provincial permitting and environmental assessment requirements. Fisheries and Oceans Canada and Transport Canada – Navigable Waters Protection Program were also engaged to confirm Federal permitting and environmental assessment as well as mitigation methods. This information was used to aid in the selection of the alternative routes and the design of the transmission line.

4.3 ENVIRONMENTAL PROTECTION PROGRAM

The Manitoba Hydro Environmental Protection Program consists of a framework for implementing, managing, monitoring, and evaluating environmental protection measures in a consistent and responsible manner with regulatory requirements, corporate commitments, best practices, and public expectations. The EPP consists of an implementation framework that outlines how environmental protection is delivered and managed, and environmental protection plans that prescribe measures and practices to avoid and minimize adverse environmental effects. Chapter 9 provides details on the Environmental Management Program under which a project specific EnvPP will be developed. The EnvPP is the main implementation tool for achieving effective implementation of mitigation measures and follow-up requirements identified in the environmental assessment.

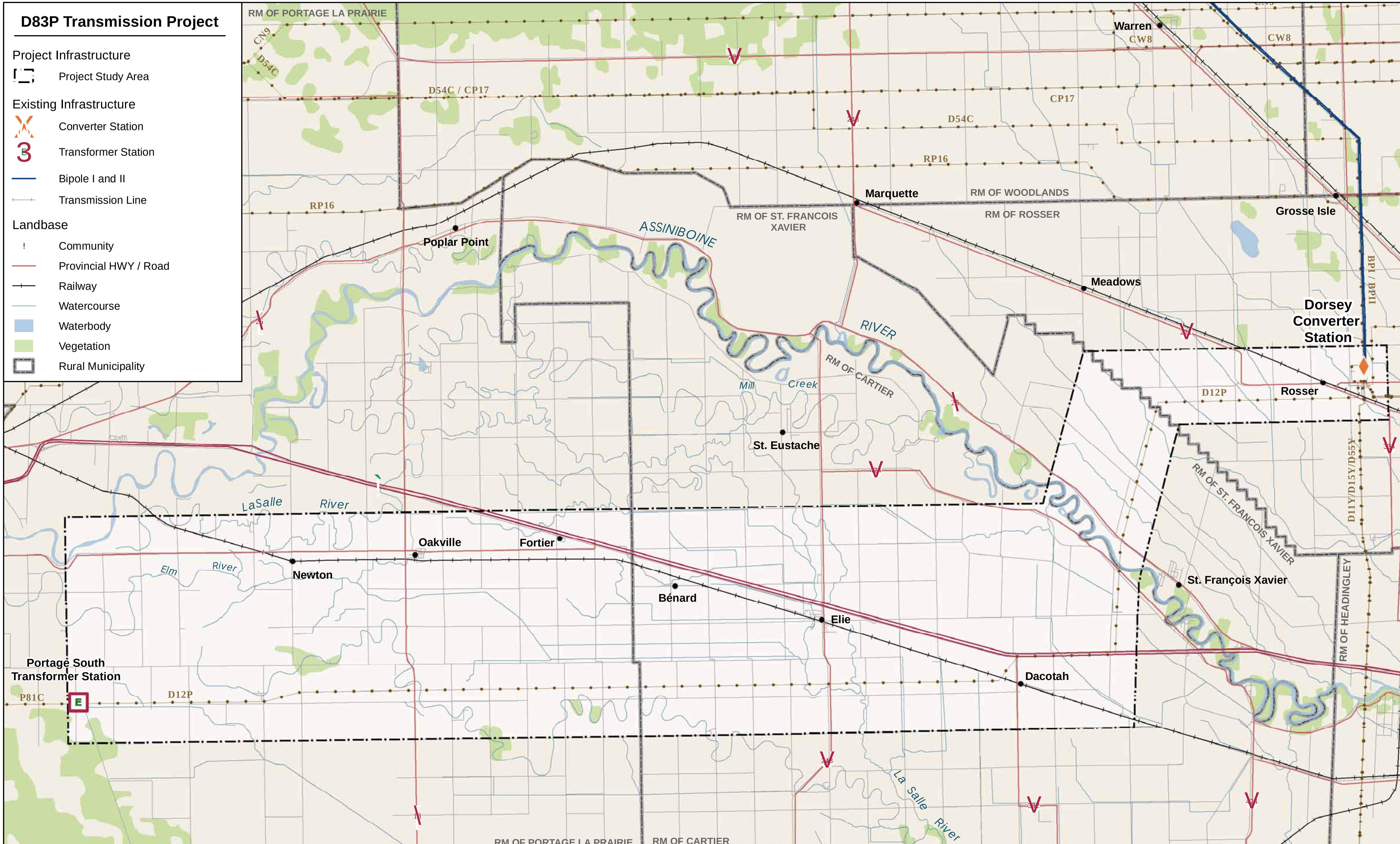
Following receipt of the required environmental license, the EnvPP will be finalized taking into account supplementary provisions following from any conditions attached by the regulatory authorities to approval of the facilities. The final EnvPP will outline specific mitigation measures, including any required monitoring, to be implemented during the construction, operation and maintenance phases of the Project. The EnvPP will generally be implemented to accomplish the following goals:

- To address the terms and conditions outlined in the EAL;
- To facilitate the mitigation of environmental effects throughout the life cycle of the Project by providing clear reporting protocols for field construction and operating personnel;
- To incorporate issues and concerns identified during the PEP;
- To identify modifications to construction methods or schedules, summarize environmental sensitivities and mitigation actions;
- To provide specific information on practices to be utilized during the clearing, construction and operation and maintenance phases of the Project; and
- To monitor and where required modify clearing, construction and operation and maintenance activities to ensure that work proceeds in accordance with the EnvPPs.

Upon final approval and completion of Project development, follow-up activities are used to verify the accuracy of the environmental assessment of a project or to determine the effectiveness of measures taken to mitigate adverse effects. The main components of environmental protection implementation and follow-up include the following:

- Inspection – To oversee adherence to and implementation of the terms and conditions of Project approval during Project construction and operation;
- Effects monitoring – To measure the environmental changes that can be attributed to Project construction and/or operation and check the effectiveness of mitigation measures;
- Compliance monitoring – To ensure that applicable regulatory standards and requirements are being met (e.g., for waste discharge and pollutant emissions);
- Management – Prepare plans to address important management issues, regulatory requirements and corporate commitments (e.g., access management, emergency response, waste management);
- Environmental auditing – To verify the implementation of terms and conditions, the accuracy of the predictions, the effectiveness of mitigation measures, and the compliance with regulatory requirements and standards; and
- Updating and review – Update and finalize the EnvPP to include stipulated license terms, conditions and other regulatory requirements, prepare construction phase EnvPPs and operational phase EnvPPs, and to annually review and update the EnvPPs to ensure their continued effectiveness.

The EPP is more fully outlined in Chapter 9.



Coordinate System: UTM Zone 14 NAD 83
Data Source: MBHydro, Stantec, ProvMB, NRCan
Date Created: September 5, 2012

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Manitoba Hydro

Dorsey to Portage (D83P) Transmission Project – Study Area

Map 4-1

5.0 EXISTING ENVIRONMENT

5.1 PHYSICAL ENVIRONMENT

5.1.1 Climate

Manitoba has a mid-continental climate characterized by four seasons with long, cold winters and short, hot summers. Climate data for the Study Area (Map 5-1) were obtained from two Environment Canada (EC) meteorological stations bordering the Study Area, located at the James Armstrong Richardson International Airport in Winnipeg (49° 55’ N / 97° 14’ W) and the Portage Southport station just south of Portage la Prairie (49° 54’ N / 98° 17’ W).

Data were assembled for the most recent 30-year period (Environment Canada 2011): Winnipeg station (1978-2007) and Portage Southport station (1971-1992, 1996-2007). Portage Southport data for 1993 to 1995 were not available and data for 2008 to 2010 from both stations were not included as EC has only completed preliminary quality reviews for these data sets. Monthly averages (Table 5-1) were calculated from the available daily data.

Hourly wind data were assembled for 2006 to 2010. Monthly averages (Table 5-2) were calculated from hourly data supplied by EC. Windrose PRO Ver 2.3.42 was used to create Windrose plots and determine prevailing wind direction for the region. Mean monthly wind speed was higher in Winnipeg (18 km/hr) compared to Portage la Prairie (14 km/hr). At both stations, wind speed varied little over the year, ranging from the lowest speeds in summer (16 km/hr in Winnipeg and 11 km/hr in Portage la Prairie) to the highest speeds in spring (19 km/hr in Winnipeg and 16 km/hr in Portage la Prairie). Maximum wind gusts reached 119 km/hr in Winnipeg and 113 km/hr in Portage la Prairie. The prevailing wind direction differs between the two cities; the wind is primarily from the south in Winnipeg and primarily from the west and northwest in Portage la Prairie (Table 5-2; Figures 5-1 and 5.2)

Annual average precipitation ranges from 511 mm to 512 mm with peak precipitation occurring from June to August (Table 5-1). In winter, precipitation in the Study Area falls primarily as snow with the greatest snowfalls occurring in November, December and January. The most recent rainfall frequency data were available up to the year 1996 in Winnipeg and 1991 in Portage la Prairie. Mean 24-hour rainfall intensity ranged from 55.1 mm to 52.9 mm (Tables 5-3 and 5-4)

Table 5-1: Summary of historical meteorological data collected at Winnipeg, MB, 1978-2007, and Portage la Prairie, MB, 1975-1992, 1996-2007.

		Temp Mean (°C)	Temp Mean Min (°C)	Temp Extreme Min (°C)	Temp Mean Max (°C)	Temp Extreme Max (°C)	Total Rain (mm)	Total Snow (cm)	Total Precip (mm)[a]	Wind Gust Max (km/nr)
Jan	Winnipeg	-16.8	-21.8	-41.0	-11.7	7.3	0.2	22.8	19.4	106
	Portage	-15.5	-20.4	-38.1	-10.6	8.5	0.4	24.8	20.4	109
Feb	Winnipeg	-13.7	-18.8	-41.8	-8.6	9.0	2.4	12.8	13.9	80
	Portage	-12.1	-17.1	-39.8	-7.2	11.2	2.5	18.8	19.0	91
Mar	Winnipeg	-6.2	-11.2	-37.4	-1.1	17.0	9.3	16.7	24.3	106
	Portage	-5.7	-10.7	-34.0	-0.8	17.2	8.7	22.8	29.7	96
Apr	Winnipeg	4.3	-2.1	-26.3	10.7	34.3	19.5	10.4	30.2	104
	Portage	4.6	-1.6	-23.3	10.6	34.8	21.1	12.0	32.1	90
May	Winnipeg	11.7	4.6	-10.1	18.7	37.0	55.7	2.7	58.5	98
	Portage	11.9	5.3	-9.4	18.4	37.8	55.5	2.8	58.3	85
Jun	Winnipeg	16.9	10.6	-1.0	23.2	37.8	86.4	0.0	86.4	115
	Portage	16.8	10.9	-1.6	22.7	37.3	84.9	0.0	84.9	113
Jul	Winnipeg	19.7	13.5	2.7	25.9	35.9	75.1	0.0	75.1	109
	Portage	20.1	14.0	3.5	26.1	37.2	71.8	0.0	71.8	107
Aug	Winnipeg	18.6	12.0	0.0	25.1	38.7	76.1	0.0	76.1	98
	Portage	18.4	12.0	1.4	24.7	40.2	59.5	0.0	59.5	93
Sep	Winnipeg	12.8	6.4	-7.0	19.0	38.8	47.4	0.2	47.6	98
	Portage	12.8	6.8	-5.8	18.7	37.8	50.7	0.8	51.5	83
Oct	Winnipeg	5.0	-0.5	-17.0	10.5	30.5	30.4	4.5	34.8	119
	Portage	5.4	0.1	-20.1	10.6	28.9	29.6	7.8	36.4	106
Nov	Winnipeg	-4.9	-9.3	-34.0	-0.5	18.2	6.6	20.3	25.2	106
	Portage	-4.2	-8.5	-34.5	0.2	22.8	6.4	21.6	24.0	107
Dec	Winnipeg	-13.3	-18.0	-37.0	-8.6	9.7	1.5	22.0	20.8	98
	Portage	-12.5	-17.1	-37.0	-7.8	11.2	1.9	27.1	23.6	89
Ann	Winnipeg	2.8	-2.9	-41.8	8.6	38.8	410.6	112.3	512.4	119
	Portage	3.3	-2.2	-39.8	8.8	40.2	393.0	138.6	511.2	113

[a]The sum of the total rainfall and the water equivalent of the total snowfall observed during the day.

Table 5-2: Monthly prevailing wind conditions at Winnipeg and Portage la Prairie, MB, 2006 to 2010 (Environment Canada 2011).

		Wind Speed Mean (km/hr)	Wind Speed Maximum (km/hr)	Wind Direction
Jan	Winnipeg	18	80	S
	Portage	14	65	W & NNW
Feb	Winnipeg	16	59	S
	Portage	14	48	NW & W
Mar	Winnipeg	19	59	S
	Portage	15	52	NNW & W
Apr	Winnipeg	19	56	S
	Portage	16	50	N & NNW
May	Winnipeg	19	59	N & S
	Portage	16	57	N
Jun	Winnipeg	16	63	S
	Portage	12	52	N & W
Jul	Winnipeg	16	56	W & S
	Portage	11	41	W & NW
Aug	Winnipeg	16	57	S
	Portage	12	39	W & S
Sep	Winnipeg	17	59	S
	Portage	13	48	S & NW
Oct	Winnipeg	18	63	S
	Portage	14	63	W & NW
Nov	Winnipeg	19	63	S
	Portage	14	43	W & NW
Dec	Winnipeg	17	52	S
	Portage	13	48	W & NW
Annual	Winnipeg	18	80	S
	Portage	14	65	W & NW

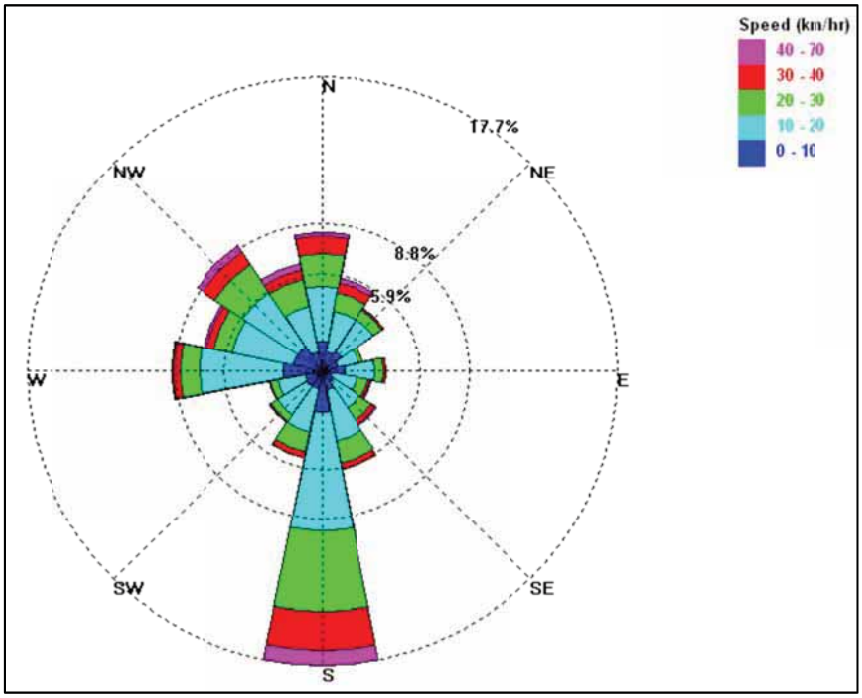


Figure 5-1: Windrose showing wind direction and speed at Winnipeg from 2006 to 2010.

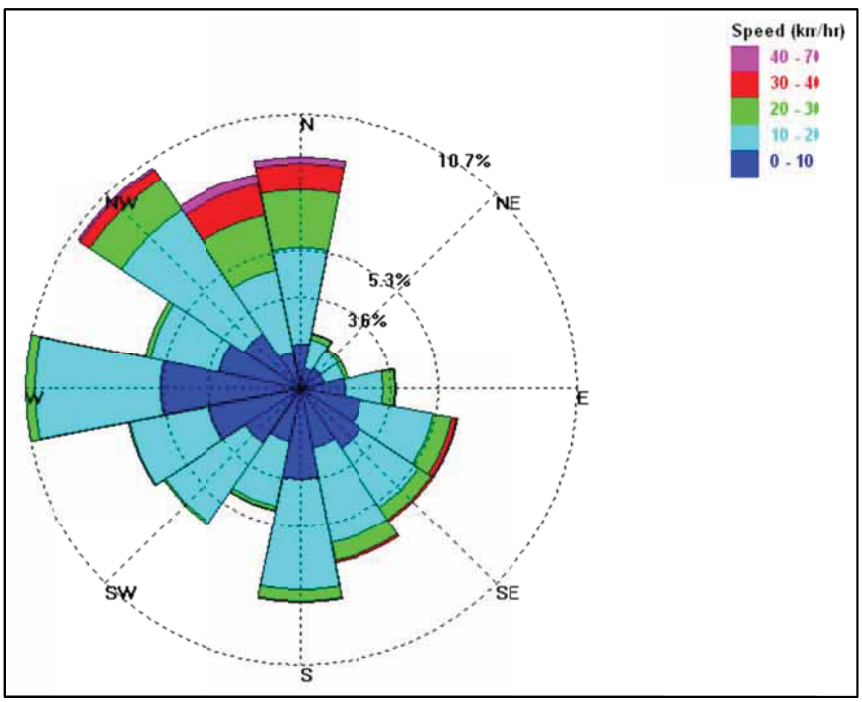


Figure 5-2: Windrose showing wind direction and speed at Portage la Prairie from 2006 to 2010.

Table 5-3: Rainfall intensity (mm) at Winnipeg, MB, 1967-1996 (Environment Canada 2011).

Year	5 Min	10 Min	15 Min	30 Min	1H	2H	6H	12H	24H
1967	12.2	24.1	25.9	31.7	33.0	57.9	63.2	63.5	63.5
1968	17.8	24.6	35.3	39.4	39.4	39.4	48.3	61.2	84.3
1969	7.1	10.4	12.7	15.2	21.8	23.4	25.4	39.1	49.3
1970	11.2	20.8	29.0	37.8	41.1	49.8	54.9	60.5	62.2
1971	4.6	6.1	8.4	11.7	14.5	19.8	25.4	29.0	31.0
1972	9.1	16.5	20.3	35.6	35.6	35.8	35.8	35.8	35.8
1973	6.3	10.4	14.5	19.8	29.7	40.4	45.7	45.7	45.7
1974	9.4	16.3	18.8	25.1	28.7	33.0	37.1	38.9	55.4
1975	9.4	14.5	17.8	22.6	27.9	27.9	44.7	53.8	54.4
1976	15.0	15.7	18.0	21.8	22.1	24.1	26.2	33.3	42.7
1977	7.4	12.4	15.2	19.8	21.6	32.5	50.3	57.7	61.7
1978	10.6	17.6	21.6	24.5	28.0	41.7	52.6	52.6	60.4
1979	10.6	19.1	25.4	36.3	39.3	39.8	40.7	40.7	40.7
1980	7.4	8.8	10.4	15.0	19.3	24.5	25.6	26.6	30.5
1981	10.6	12.4	15.9	18.2	24.1	29.0	53.3	53.4	63.0
1982	8.6	13.0	16.2	22.6	22.7	22.7	32.5	34.9	36.8
1983	13.2	17.2	19.3	23.2	28.0	30.9	51.9	52.3	52.3
1984	12.6	19.0	22.8	39.5	56.2	56.9	60.2	69.5	69.7
1985	5.0	7.3	9.3	12.4	18.4	33.1	61.5	84.0	97.4
1986	10.0	11.8	13.9	16.7	18.5	19.7	28.7	35.4	41.6
1987	7.1	9.0	10.4	20.8	24.8	36.6	46.2	57.2	57.3
1988	7.9	15.8	18.5	22.7	34.8	36.9	39.7	49.7	49.7
1989	4.4	7.7	10.4	12.3	14.1	16.2	34.6	41.1	53.5
1990	9.8	12.7	16.2	19.0	22.0	22.0	22.0	22.5	36.9
1991	11.6	16.4	18.0	18.2	19.3	31.2	43.1	43.5	64.0
1992	8.6	10.2	11.2	17.2	18.0	19.3	21.2	25.2	35.6
1993	6.2	12.4	18.6	29.0	41.6	70.1	72.2	78.4	87.4
1994	8.8	13.1	15.4	24.2	32.2	55.5	67.0	68.2	68.2
1995	7.5	9.9	12.0	18.0	23.0	23.4	35.6	44.0	63.9
1996	8.1	16.1	21.9	43.8	58.6	58.6	58.8	58.8	58.8
MEAN	9.3	14	17.4	23.8	28.6	35.1	43.5	48.6	55.1
SD	3.0	4.7	6.1	8.9	11.0	13.9	14.3	15.6	16.4

Table 5-4: Rainfall intensity (mm) at Portage la Prairie, MB, 1964-1991 (Environment Canada 2011).

Year	5 Min	10 Min	15 Min	30 Min	1H	2H	6H	12H	24H
1964	26.4	33.5	35.1	36.1	36.1	36.1	36.1	47.0	49.5
1965	5.6	7.4	7.9	11.7	15.5	20.1	34.8	34.8	34.8
1966	5.8	11.4	14.0	16.3	18.8	19.3	33.0	33.5	42.4
1967	22.6	27.2	28.7	33.8	33.8	33.8	33.8	33.8	33.8
1968	9.9	14.0	19.6	25.1	25.1	25.1	31.7	47.0	48.8
1969	10.4	16.0	21.1	38.1	49.0	67.6	78.7	82.0	82.0
1970	5.8	9.4	12.2	19.3	19.3	19.8	35.6	35.6	36.1
1971	7.1	9.7	10.9	13.2	23.6	37.1	41.1	42.9	52.8
1972	12.4	24.6	30.2	47.8	60.5	67.1	70.1	79.2	86.9
1973	8.6	10.2	12.2	14.2	16.0	18.3	25.7	33.5	38.4
1974	11.9	15.7	15.7	15.7	15.7	15.7	17.3	19.8	30.2
1975	10.4	13.5	14.5	18.0	24.6	25.1	35.6	37.3	37.3
1976	4.3	8.4	10.2	10.9	16.5	17.3	33.3	33.3	33.5
1977	9.9	10.4	12.7	17.5	23.1	25.7	26.7	34.0	43.2
1978	9.3	17.1	21.9	27.5	34.3	39.2	43.2	43.2	56.4
1979	5.9	7.3	9.6	14.5	17.7	18.2	36.5	50.3	55.1
1980	5.2	9.2	11.2	14.5	18.4	29.2	51.8	89.4	98.9
1981	10.8	14.8	18.7	25.0	25.4	25.7	26.9	32.9	57.0
1982	4.3	6.9	6.9	7.8	9.8	12.1	25.3	35.6	41.6
1983	1.0	1.6	2.4	3.4	6.6	9.5	18.7	19.3	23.4
1984	6.9	9.7	11.9	17.5	24.4	28.7	38.5	47.1	51.4
1985	5.9	6.9	9.8	13.7	17.7	30.6	70.9	108.8	121.4
1986	9.7	15.5	21.3	24.7	29.2	30.8	30.8	30.8	45.2
1987	9.4	11.8	13.7	17.3	20.4	33.8	63.1	85.7	86.4
1988	6.4	6.7	8.1	11.6	14.1	17.2	25.8	33.0	41.5
1989	4.5	5.9	8.2	8.8	9.6	11.2	22.2	36.3	45.7
1990	4.4	7.6	8.5	10.6	12.6	22.0	25.0	39.1	51.0
1991	11.0	22.0	29.6	38.2	49.4	51.2	51.2	51.8	56.6
MEAN	8.8	12.7	15.2	19.7	23.8	28.1	38.0	46.3	52.9
SD	5.3	7.1	8.0	10.7	12.7	14.5	16.0	22.1	22.6

5.1.2 Soils

Soils in the Study Area dominantly consist of clayey lacustrine sediments derived from glacial Lake Agassiz, along with stratified alluvial deposits which occur in the floodplain adjacent to the Assiniboine River and along the Portage la Prairie alluvial fan (Map 5-2). The flat topography throughout the area and the high clay content of the soils in the Study Area result in the majority of the soils being classified as imperfectly to poorly drained. The clay-rich soils are dominantly classified as Black Chernozems and Gleysols, whereas the soils along the alluvial deposits are dominantly classified as Regosols.

5.1.3 Surficial Geology

Surficial geology in the Study Area is dominated by offshore glaciolacustrine sediments from glacial Lake Agassiz and alluvial sediments of the Portage la Prairie alluvial fan (Map 5-3; GIS Map Gallery 2006). Distal glaciofluvial sediments occur in the southwest corner of the Study Area and alluvial deposits occur adjacent to the Assiniboine River

5.1.4 Hydrogeology

The Study Area is located in the Manitoba Lowland physiographic region, an area of gentle relief east of the Manitoba Escarpment (Betcher et al. 1995). The Manitoba Lowland is underlain by gently southwest dipping Paleozoic and Mesozoic sediments consisting primarily of carbonate rocks with some clastic and argillaceous units that form the eastern edge of the Western Canada Sedimentary Basin. Bedrock is overlain by glacial tills and proglacial lacustrine sediments. Stratigraphy in southern and central Manitoba includes the following units (Figure 5-3; Betcher et al. 1995):

Quaternary deposits: The upper clastic unit is overlain by unconsolidated pre-glacial and Quaternary sediments of variable thickness which contain significant overburden aquifers in the Study Area. These sediments consist of sand or sand and gravel aquifers interlayered with less permeable tills or clays. They often have limited areal distribution, but form an important source of groundwater supply in rural areas where the carbonate aquifer is not present.

Upper clastic unit: The carbonate-evaporite unit is overlain by thick shales, sandstones, and evaporates of Mesozoic and Cenozoic age which form the upper clastic unit. Paleozoic carbonate-evaporite unit: The Winnipeg Formation transitions conformably into the overlying carbonate-evaporite unit. The carbonate-evaporite unit consists of gently dipping layered sequence of dolostones and limestones with minor shales and evaporites of Ordovician through Mississipian age. This unit forms the most extensive aquifer system in the province. Groundwater flow direction is towards the east in the Study Area.

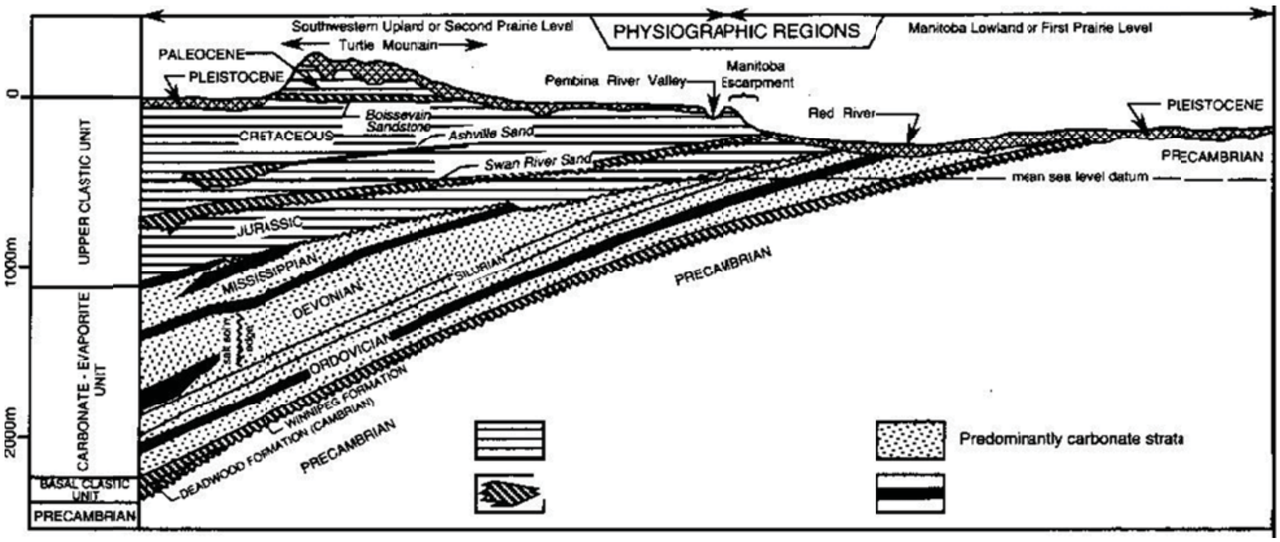


Figure 5-3: Geologic cross-section along the Manitoba-U.S.A border. Vertical exaggeration approximately 50:1 (Betcher et al. 1995).

Basal clastic unit (Winnipeg Formation): The basal clastic unit overlies Precambrian bedrock and consists of marine silica sandstones and shales of the Winnipeg Formation. Groundwater flow in this unit is towards the east/northeast.

Precambrian basement: Precambrian basement consists of igneous and metamorphic crystalline rock. Groundwater flow in these rocks is predominantly through fractures

5.2 AQUATIC ENVIRONMENT

5.2.1 Surface Hydrology

The Study Area includes two major watersheds: the Assiniboine River (20% of the study area) and the Red River (80%; Betcher et al. 1995).

5.2.1.1 Assiniboine River System

The Assiniboine River originates near Kelvington, Saskatchewan, and flows southeast 1,070 km to the confluence with the Red River at Winnipeg. The Assiniboine River flows southeast through the Study Area. Surface drainage between the Dorsey Station and the Assiniboine River is conducted through a series of small tributaries flowing southeast and parallel to the Assiniboine River and discharge into the river immediately downstream of the Study Area. There are seven watercourses north of the Assiniboine River: First Creek, Second Creek, Fourth Creek (a tributary of Sturgeon Creek), Sturgeon Creek, and three unnamed tributaries of Sturgeon Creek (Map 5- 4). All watercourses have been extensively modified into agricultural drains to carry surface drainage away from the adjacent and upstream farmlands. The largest tributary north of the river is Sturgeon Creek. Sturgeon Creek originates northwest of the Dorsey Station near Woodlands. Upstream of the Study Area Sturgeon Creek flows through agricultural lands and has diverted around Grants Lake, a remnant of the once extensive pre-agricultural marshes in the region. A control dam and backwatering system on Sturgeon Creek is used to modify water levels within the marsh. Downstream of the Study Area Sturgeon Creek and its tributaries remain extensively modified as agricultural drains. Sturgeon Creek enters the City of Winnipeg at the Perimeter Highway (PTH 101) where it passes through the Centre Port Canada construction site. South of Saskatchewan Avenue, Sturgeon Creek is characterized as an urban watercourse before discharging into the Assiniboine River in the Neighbourhood of Woodhaven. The Assiniboine River also receives surface drainage from the Study Area between the river and Dakotah. Surface drainage is received by the Assiniboine River through a series of agricultural drains the largest of which is Barickman Coulee.

There are approximately 67 km of dikes on either side of the Assiniboine River east of Portage la Prairie constructed to protect property from Assiniboine River flooding events. The most significant influence on the surface hydrology in the Study Area is the Portage Diversion Channel. The Portage Diversion originates 1.5 km upstream and southwest of Portage la Prairie and discharges 29 km north into Lake Manitoba. The channel was designed to divert up to 708 m^3/s of water from the Assiniboine River. The diversion channel is operated as required to attenuate the effects of flooding events on downstream property including Portage la Prairie and Winnipeg.

5.2.1.2 La Salle River System

The Red River originates at Lake Traverse in South Dakota, United States and flows north 877 km to discharge into Lake Winnipeg. Within the Study Area, the Red River watershed is comprised of the La Salle River sub-watershed. The LaSalle River begins 4.3 km east of Portage la Prairie and discharges into the Red River south of Winnipeg at St. Norbert. The LaSalle River main stem has a channel length of approximately 180 km, a drainage area of 2,407 km^2, and drops approximately 36 m between the origin and confluence with the Red River (Graveline and Larter 2006).

Surface water in the Study Area between Dakotah and the Portage South Station drains into the LaSalle River, a tributary of the Red River. The principle tributaries of the LaSalle River are the Elm River, Scott Coulee, and Crooked Lake Channel (a branch of the Elm Creek Channel; Map 5-4). Drainage and surface water flow patterns in the Study Area south of the Assiniboine River have been extensively modified over the past one hundred years through the construction of agricultural drainage channels and the modification of existing watercourses into agricultural drains to dewater marshes/swamps and extend agricultural land.

Beginning in the 1940s, the Prairie Farm Rehabilitation Administration (PFRA) constructed a series of eight dams along the LaSalle River to impound water for community and agricultural use. These dams are now provincially owned. The dam furthest upstream is located in the Study Area south of Elie and immediately upstream of the confluence with Elm River (Map 5-4; Figure 5-4). The remaining seven dams are located downstream of the Study Area between Starbuck and St. Norbert. The dams continue to impound water; however, siltation since construction has significantly reduced the reservoir capacity of the impoundments. There are 12 hydrometric stations along the La Salle River; however, actual volume of water carried along the river is difficult to determine as water is removed for irrigation, livestock watering, and domestic consumption at various locations along the river system. The largest point source withdrawal from the La Salle River is the RM of MacDonald Regional Water Treatment Plant at Sanford. The regional water system requires the equivalent of 0.04 m^3/s to meet demands during the peak month of June (RM of MacDonald 2009). Beginning in 1984, the La Salle River flow has been augmented through water transfers from the Assiniboine River in order to meet water demands (Lowman 2001). Flow augmentation is conducted at three pump stations upstream of the Study Area: the Elm River at Hoop and Holler Bend; the LaSalle River upstream of Norquay Provincial Recreation Park; and Mill Creek (La Salle River tributary) downstream of the Assiniboine River PTH 430 crossing (Graveline and Larter 2006). Together these stations on average contribute 0.70 m^3/s to the LaSalle River system and may operate seasonally or year round depending upon water levels in the river (Graveline and Larter 2006). Flows in the La Salle River system are managed to maintain a supply through a system of hydrometric stations and flow augmentation pumps although consumption is not accurately recorded.

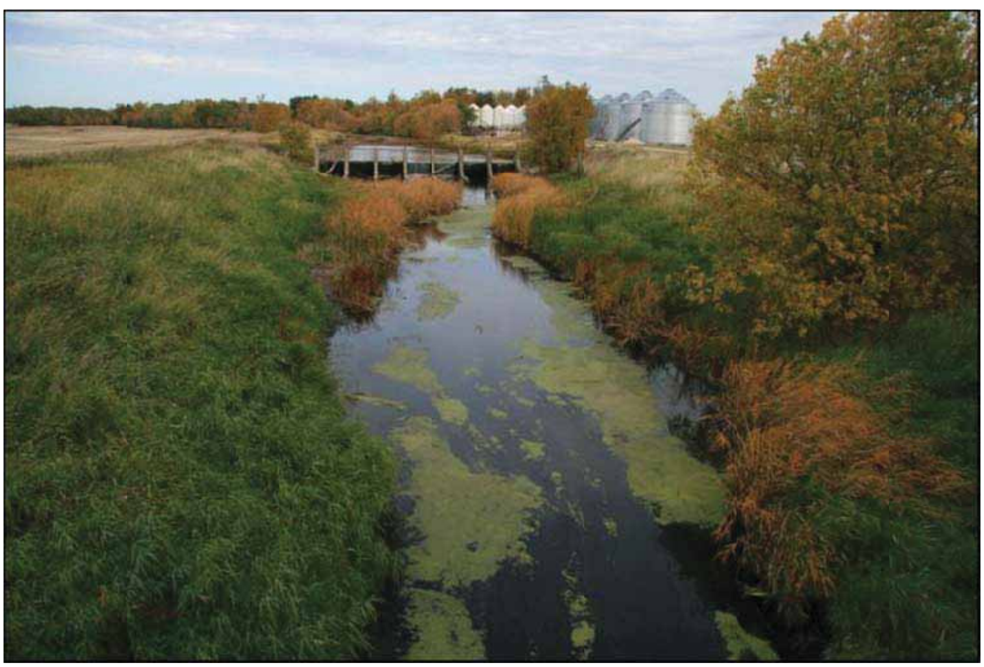


Figure 5-4: Stop-log dam on the La Salle River south of Elie.

Graveline and Larter (2006) analyzed 25 years (1979 to 2004) of hydrometric data for the LaSalle River at Elie (within the Study Area) and found that flows peaked in early April (mean of 1.52 m^3/s, range of 0.04 to 4.63 m^3/s), decreased rapidly in early May, and then remained relatively stable through to August (mean of 0.25 m^3/s, range of 0.0 to 1.12 m^3/s). Without accurate water withdrawal records it is not possible to determine what contributions natural surface flows contribute to the recorded flows.

5.2.1.3 2011 Flood Event

The Assiniboine River flows between Portage la Prairie and Winnipeg are managed through a number of flood control structures. A system of dikes, first begun in 1912, have been extended 67 km downstream of Portage la Prairie along the river banks and are designed to protect adjacent properties from flooding. The south bank dikes also prevent the Assiniboine River in flood stage from discharging into the La Salle River. As a consequence of the dike construction the river channel capacity has been progressively reduced from 680 m^3/s in the 1970s to the present 538 m^3/s. The Portage Diversion inlet is located immediately upstream of Portage la Prairie and is designed to maintain downstream flows of less than 538 m^3/s by diverting flood waters from the Assiniboine River into Lake Manitoba. The diversion structure and channel were completed in 1970 with a capacity of 708 m^3/s. The capacity of the diversion can be increased to 963 m^3/s through the construction of secondary dikes along the channel banks.

The Assiniboine River within the Study Area experienced an extreme and extended flood event in 2011 and was in flood stage throughout most of the year (Figure 5-5). Unofficial estimates placed the magnitude of the flood as a 1 in 300 year event (WFP 2011). The Assiniboine River flow at Portage Southport in January 2011 was already in a high flood stage, exceeding the upper quartile of the trailing 25-year spring freshet flows (Figure 5-5). Flows generally declined through the winter and early spring and declined rapidly once the Portage Diversion was activated on 5 April 2011 (Figure 5-5).

Figure 5-5: 25-year median, lower quartile, upper quartile, and 2011 flood event flows at Portage Southport on the Assiniboine River

As upstream flood control structures, such as the Shellmouth Dam, reached capacity and tributary flood crests reached the Assiniboine River, flows increased rapidly after 12 April 2011. Secondary dikes were constructed along the diversion channel to increase the flow capacity and to maintain downstream flows below the river channel capacity (538 m^3/s). As the Portage Diversion reached the augmented capacity the south bank dike was intentionally breached on 14 May 2011 at Hoop and Holler Bend to divert Assiniboine flow to the La Salle River via Elm River and to prevent a dike failure farther downstream. The breach was closed on 20 May 2011 after it was determined the flood had crested on 12 May 2011 and the risk of a dike failure had declined. River flows downstream of the Portage la Prairie had reached 534 m^3/s. Assiniboine River flows downstream of Portage la Prairies remained above 450 m^3/s for the rest of the summer and the diversion remained in operation until 5 August 2011. Normal summer water levels were not observed in the Study Area until late September 2011.

Flooding also occurred in the La Salle River system although, with a much smaller watershed than the Assiniboine River, the duration was reduced. However, residents installed temporary dikes around infrastructure in preparation for an uncontrolled dike breach along the Assiniboine River. Temporary dikes were maintained until the threat of an Assiniboine dike breach had subsided and flows from the Hoop and Holler breach had passed through the La Salle River system.

5.2.2 Water Quality

5.2.2.1 Assiniboine River System

Manitoba Conservation and Water Stewardship – Water Quality Management Section has conducted a long-term trend analysis of total nitrogen (TN) and total phosphorus (TP) at various locations along the Assiniboine River (Jones and Armstrong 2001). The study found that between 1973 and 1999 there was an incremental increase in TN and TP with increasing distance downstream between Brandon and Winnipeg (Jones and Armstrong 2001). At the PTH 334 crossing at Headingly, the nearest downstream sampling site to the Study Area, flow-adjusted concentrations of TN and TP increased 54.5% and 62.2%, respectively, over the period of study (Jones and Armstrong 2001). Jones and Armstrong (2001) attributed the change to increases in anthropogenic loading. Bourne et al. (2002) concluded that 29% of the TN load and 25% of the TP load observed at Headingly were attributable to municipal and industrial processes. The Water Quality Management Section is conducting several ongoing monitoring and modeling studies on the Assiniboine River but has not as yet published the results.

5.2.2.2 La Salle River System

Jones and Armstrong (2001) found that between 1974 and 1999 there was a 145.5% increase in TN and a 193.8% increase in TP flow-adjusted concentrations over the study period. Jones and Armstrong (2001) considered the increase dramatic and attributed the change to increases in anthropogenic loading. Hughes (2001) conducted a multi-year study to assess the water and biological quality in the La Salle River. The study was conducted from 1995 through 1998 and was designed to use the Canadian Water Quality Index (CWQI; CCME 2001). The study results reported by Hughes (2001) indicated water quality in the La Salle River was marginal during 1995, 1997, and 1998 and was fair in 1996 (CCME 2001; Hughes 2001). The CWQI defines marginal water quality as frequently threatened or impaired with conditions often departing from natural or desirable levels (CCME 2001). The CWQI defines fair water quality as usually protected but occasionally threatened or impaired with conditions sometimes departing from natural or desirable levels.

Lowman (2001) conducted a post-hoc assessment of the Assiniboine-La Salle diversion project with an emphasis on the predictions for water quality. The intent of the diversion was relieve the existing chronic water shortages and low water quality through maintaining live streams and providing dependable, stabilized flows in the La Salle River system (Lowman 2001). Water quality was expected to improve primarily by increasing the assimilative capacity of the river system through increased flows (Lowman 2001). Overall, water quality was not observed to have improved since the commissioning of the water diversion project (Lowman 2001). Lowman (2001) hypothesized that the lack of improvement in water quality was due to an increase in development facilitated by the water diversion. The La Salle River system flows are managed to meet a minimum flow; therefore, increases in water use for activities such as irrigation result in an increase in the return flow towards the river system, the transport of nutrients, sediment, and other substances which could degrade water quality, while not providing any additional assimilative capacity (Lowman 2001).

More recently, Graveline and Larter (2006) conducted an assessment of the La Salle River system in which they undertook field studies and reviewed historic physical, hydrological, water quality, and fish and fish habitat data. Graveline and Larter (2006) concluded that the La Salle River system is eutrophic and stressed with water quality significantly affected by historic and ongoing point- and non-point source anthropogenic inputs (e.g., cultivation, livestock operations, sewage lagoon discharges, recreational sites, urban storm drains, riparian zone reductions).

5.2.3 Fish and Fish Habitat

5.2.3.1 Riparian Habitat

North of the Assiniboine River the banks of all the watercourses passing through the Study Area have been cleared of historic native vegetation cover. Agricultural activities, including cultivation, pastures, and haying, occur to the waterline of the watercourses. Therefore, the riparian areas are periodically disturbed and native species, especially shrubs and trees, are unable to colonize the riparian zones. The extensive flood event in 2011 affected the riparian vegetation along both banks of the Assiniboine River. Riparian areas were flooded throughout the spring and summer leading to the loss or damage to the undergrowth and shrub species (Figures 5-6 and 5-7).

The riparian zone within the Study Area along the north bank of the Assiniboine River is 10.1 km long and characterized by an almost continuous band of riverbottom forest (Figure 5-6). This forest cover is interrupted in a number of areas, the six largest of which range from 30 to 275 m in bank length. Where there is forest cover it ranges from 5 to 90 m in width. Riparian zone vegetation is comprised of 92.1% (9,298 m) riverbottom forest and 7.9% (802 m) agricultural land or residential clearings. The D12P right of way clearing represents 3.7% (30 m) of the non-forested bank or 0.3% of the north bank riparian zone.

The riparian zone within the Study Area along the south bank of the Assiniboine River is 10.1 km long and composed primarily of riverbottom forest (Figure 5-7). This forest cover is interrupted in a number of gaps, the nine longest of which range from 30 to 745 m in bank length. Where there is forest cover it ranges from 5 to 170 m in width. Riparian zone vegetation is comprised of 75.1% (7,586 m) riverbottom forest and 24.9% (2,514 m) agricultural land or residential clearings. The D12P right of way clearing represents 1.2% (30 m) of the non-forested bank or 0.3% of the north bank riparian zone.

South of the Assiniboine River all altered watercourses passing through the Study Area have been cleared of historic native vegetation cover and agricultural activities, including cultivation, pastures, and haying, occur to the waterline of the watercourses. The riparian areas along the altered watercourses are periodically disturbed and native species, especially shrubs and trees, are unable to colonize the riparian zones. Riparian areas along unaltered watercourse sections such as the La Salle River, Scott Coulee, and upper Elm River are more diverse and alternate between deforested and forested areas (Map 5-5). Where forest clearing has occurred, bank vegetation includes cultivated plants to grasses and sedges. Forested riparian areas range in width from one or two trees to 50 m where the watercourses pass through woodlots.

Figure 5-6: Riverbottom forest undergrowth on the north bank of the Assiniboine River at the proposed Route Alternative C crossing

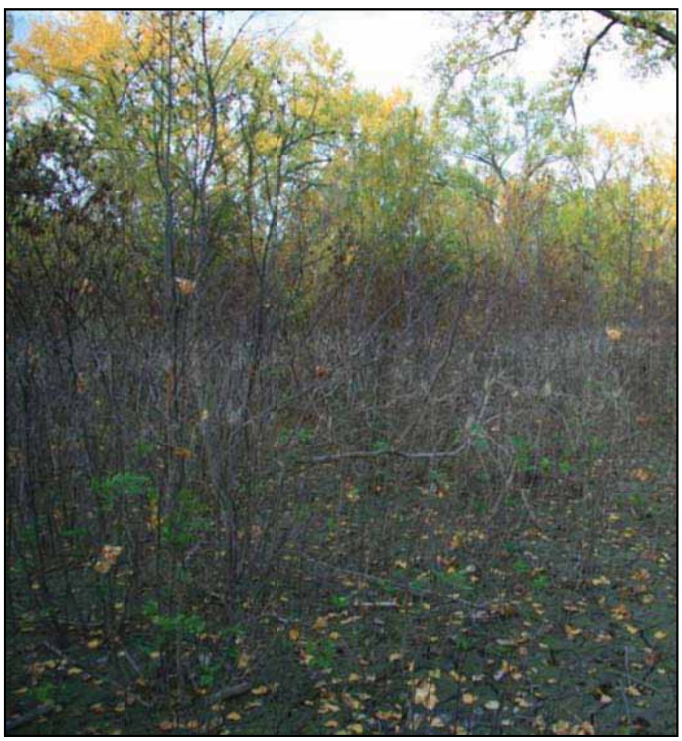


Figure 5-7: Typical riverbottom forest on the south bank of the Assiniboine River at the proposed Route Alternative B crossing

5.2.3.2 Fish Habitat

The Province of Manitoba and DFO are in the process of compiling watershed information into a National Hydrographic Network map set (Schwartz pers. comm.). Data sources include the Provincial Designated Drains (DES) map set and the Fish Habitat Classification for Manitoba Agricultural Watersheds (FHCMAW) map set prepared by DFO using unpublished field data. The FHCMAW classifies fish habitat in waterbodies based on the presence of habitat components, habitat complexity, and the presence or absence of indicator species (Table 5-5; DFO unpubl. data). Habitat sensitivity and risk due to works increases from Type A to Type E (Schwartz pers. comm.). Watercourses where there are data gaps or inconsistencies between the DES and FHCMAW map sets remain unclassified. The definition of terms used in habitat classification is as follows (DFO unpubl. data):

- Indicator Species: species that are harvested through the sport, commercial, and domestic fisheries or species on Schedule 1 of the Species at Risk Act (SARA). These species tend to be large-bodied although commercial bait fisheries for small-body fishes are present in some larger Manitoba lakes.
- Forage Species: small-body species that generally provide a forage base for predatory indicator species.
- Direct Habitat: waterbody provides one or more habitat components necessary for maintaining a fish population (i.e., spawning, rearing, feeding, overwintering, and migration habitat).
- Indirect Habitat: waterbody does not provide spawning, rearing, feeding, overwintering, or migration habitat but may contribute to downstream habitat through water flow, nutrient transport or drift (invertebrate food items).
- Complex Habitat: generally a natural waterbody with little to no disturbance and a variety of channel features that provide direct habitat components for one or more fish species.
- Simple Habitat: generally a highly modified or human constructed channel of uniform construction that provides little to no variety in channel features.

Table 5-5 Fish habitat classification types for Manitoba agricultural watersheds (DFO unpubl. data).

Classification	Fish Community	Habitat Complexity
Type A	Indicator Species	Complex
Type B	Indicator Species	Simple
Type C	Forage Species	Complex
Type D	Forage Species	Simple
Type E	None	Indirect (none)

Assiniboine River System

North of the Assiniboine River all the watercourses passing through the Study Area have been realigned to serve as agricultural drains, resulting in simple fish habitat (Map 5-4). Of the nine watercourses, one contains indicator species (Sturgeon Creek), three contain forage species (unnamed Sturgeon Creek tributaries), and five are classified as indirect fish habitat (including First, Second, and Fourth creeks; Map 5-4).

Hughes and Gurney (2001) conducted a rapid bioassessment study in 1997 and1998 in lower Sturgeon Creek between the Perimeter Highway and the confluence with the Assiniboine River. The methods were based on Plafkin et al. (1989). The study found that Sturgeon Creek was moderately to slightly impaired within the City of Winnipeg (Hughes and Gurney 2001). Moderately impaired is defined as a reduction in species present due to the absence of pollution intolerant species while slightly impaired is defined as a community structure less than expected due to the absence of some intolerant species and an increase in tolerant species (Plafkin et al. 1989).

The Assiniboine River within the Study Area is a typical low-gradient, low-velocity, meandering, prairie river (Stewart and Watkinson 2004). The majority of the fish habitat in the study area consists of low-velocity runs with occasional snags of large woody debris (LWD). Channel substrate ranges from clay and silt to sand, gravel, cobble, boulders, and submerged LWD (Stewart and Watkinson 2004). The Assiniboine River channel within the study area has not been modified.

South of the Assiniboine River tributary watercourses include Barickman Coulee and agricultural drains (Map 5-4). The majority of the agricultural drains have been classified as indirect fish habitat (Table 5-5; Map 5-4). The lower reach of Barickman Coulee provides complex habitat for forage species while the upper reach has been realigned and provides only simple habitat (Map 5-4).

La Salle River System

The La Salle River is the principle watercourse in the Study Area south of the Assiniboine River. There are three major La Salle tributaries within the study area: Elm River, Scott Coulee, and Crooked Lake Channel (Map 5-4). The La Salle River mainstem provides complex habitat for indicator species (Type A). Habitat quality in the minor La Salle River tributaries declines with distance from the mainstem, the degree of modification into agricultural drains, and persistence of stream flow (Map 5-4). Smaller watercourses to the east of the La Salle River mainstem are generally classified as indirect fish habitat (Type E) while larger watercourses to the west support forage species within modified channels (Type D; Map 5-4).

The eight dams on the La Salle River between St. Norbert and Elie are comprised of three stop-log structures and five fixed-crest weirs constructed of sheet piling and rock fill. All dams are barriers to upstream fish passage, isolating fish communities in the upper reaches from the downstream reaches, and preventing stream use by the Red River fish community (Graveline and Larter 2006). The habitat in the impounded areas has been altered from riverine to a series of impoundments (Graveline and Larter 2006). The impoundments have filled with sediment and resulted in homogeneous habitat with similar velocities, depths, substrate, and shoreline conditions (Graveline and Larter 2006).

Elm River supports indicator species; however, extensive channel modifications in the lower reach has resulted in simple habitat (Type B) while the upstream reach has remained relatively unmodified and contains complex habitat (Type A; Map 5-4). The Scott Coulee channel within the study area remains relatively unmodified and supports forage species (Type C). Crooked Lake Channel receives surface drainage from the study area surrounding the Portage South station and supports fish species as far upstream as the D12P crossing. Within the Study Area, Crooked Lake Channel is comprised of equal sections of complex and simple habitat (Map 5-4).

Hughes (2001) conducted a rapid bioassessment study from 1995 through 1998 in the La Salle River at St. Norbert using benthic invertebrate species. The methods were based on Plafkin et al. (1989). The study found that the La Salle River was moderately impaired in 1995 and 1997 and by 1998 was considered moderately to severely impaired (Hughes 2001). Moderately impaired is defined as a reduction in species present due to the absence of intolerant species and severely impaired is defined as few species present and if high densities are observed they are dominated by one or two species (Plafkin et al. 1989). A survey conducted by Graveline and Larter (2006) at three locations along the La Salle River found primarily pollution tolerant and somewhat tolerant benthic invertebrate species. Even though Graveline and Larter (2006) did not replicate the methods of Hughes (2001), the dominance of pollution-tolerant species indicates the La Salle River remains biologically impaired.

5.2.3.3 Fish Communities

The Red River watershed in Manitoba supports a diverse fish community of 70 native and non-native species (Table 5-6; Stewart and Watkinson 2004). Fifty species are known to occur in the Assiniboine River within or near the Study Area (Table 5-6). Based on the occurrences and habitat requirements provided in Stewart and Watkinson (2004), 23 species would be expected to occur in the La Salle River watershed (Table 5-6). Most fish species expected to occur in the Study Area spawn in the spring or summer (Stewart and Watkinson 2004). The exception is Burbot (*Lota lota*) which spawns in midwinter, broadcasting semipelagic, non-adhesive eggs over sand or gravel substrates (Stewart and Watkinson 2004).

North of the Assiniboine River only the Sturgeon Creek mainstem is known to support large-body fish species within the Study Area (DFO unpubl data; Map 5-4). Species utilizing the creek include Northern Pike (*Esox lucius*) and White Sucker (*Catostomus commersoni*), both of which are commonly observed in the lower reaches (Penner 2005, 2007). Three watercourses, all tributaries of Sturgeon Creek are known to support small-body species (DFO unpubl data; Map 5-4). Based on sample records downstream of the Study Area it is likely the fish communities in these tributaries is almost entirely composed of Brook Stickleback (*Culea inconstans*; Penner 2005, 2007). The remaining watercourses do not provide direct fish habitat (DFO unpubl data; Map 5-4).

South of the Assiniboine River tributary watercourses are not known to support large-body species (DFO unpubl data; Map 5-4). Small-body species are known to occur in Barickman Coulee and an agricultural drain east of Dakotah and the remaining watercourses do not directly support fish communities (DFO unpubl data; Map 5-4).

Within the La Salle River watershed, the mainstems of the La Salle and Elm rivers support large-body species (DFO unpubl. data; Map 5-4). Larger tributaries and lower reaches of smaller tributaries support small-body fish species (DFO unpubl. data; Map 5-4). Fish community diversity declines from the mouth of the La Salle River to the upstream reaches (Graveline and Larter 2006). Twenty-three species occurring in the Red River could be expected to utilize the La Salle River; however, only thirteen species have been observed in the lower La Salle River, upstream of the first barrier (Table 5-6; Manitoba Water Stewardship – Fisheries Branch unpubl. data). The number of observed species declined to seven within the Study Area near Elie (Graveline and Larter 2006).

The fish community in the La Salle River mainstem was most recently surveyed during the spring and summer of 2005. During the spring the fish community at Elie was observed to be comprised of Black Bullhead (*Ameiurus melas*), White Sucker, Northern Pike, Black Crappie (*Pomoxis nigromaculatus*), and Common Carp (*Cyprinus carpio*; Graveline and Larter 2006). By summer only Central Mudminnow (*Umbra limi*) and Brook Stickleback were observed at the same location. Brook Stickleback and Central Mudminnow are both tolerant of low-oxygen environments and are known to colonize marshy areas of upper watersheds where low-oxygen conditions can occur frequently (Stewart and Watkinson 2004).

5.2.3.4 Species of Conservation Concern

For the purposes of this report, species of conservation concern were defined as listed species (i.e., listed under federal or provincial legislation).

Federal

Under Section 32 of the SARA, it is prohibited to kill, harm, harass, capture, take, possess, collect, buy, sell or trade an individual of a wildlife species (or any part of) an individual of a wildlife species that is listed as endangered, threatened, or extirpated. It is also prohibited under Section 33 to damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered species or a threatened species. SARA applies to all federal lands in Canada.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is responsible, under SARA, for assessing the status of each wildlife species considered by COSEWIC to be at risk as extinct, extirpated, endangered, threatened, or of special concern (or to indicate that there is insufficient data for a classification, or that the species is not currently at risk). Category definitions are listed below (GOC 2011):

- Endangered: a wildlife species that is facing imminent extirpation or extinction.
- Threatened: A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
- Special Concern: a wildlife species that is likely to become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

Species are assigned to a schedule under SARA through a Governor in Council order or by order of the Minister of Environment. The schedules are defined as follows (GOC 2011):

- Schedule 1: the official list of species that are classified as extirpated, endangered, threatened, and of special concern.
- Schedule 2: species that had been designated as endangered or threatened, by COSEWIC and have yet to be re-assessed using revised criteria.
- Schedule 3: species that had been designated as special concern, by COSEWIC and have yet to be re-assessed using revised criteria.

There are six aquatic species potentially occurring in the Study Area that have status under COSEWIC, SARA, or both (Table 5-7). COSEWIC assigned the Red-Assiniboine Rivers – Lake Winnipeg populations of Lake Sturgeon the status Endangered in 2006 (COSEWIC 2006a); however, this species has not been assigned to a SARA schedule and, therefore, has no status or protection under SARA. Two fish species have been assigned Special Concern by COSEWIC: Silver Chub and Bigmouth Buffalo. Silver Chub was assigned Special Concern by COSEWIC in 1985 and added to Schedule 1 as Special Concern when SARA was enacted in 2002. A management plan has been developed but critical habitat has not been identified (Boyko and Staton 2010). Bigmouth Buffalo was assigned Special Concern in 2009 by COSEWIC (2009) and added to Schedule 1 of SARA under Special Concern in 2011. Chestnut Lamprey was assigned Special Concern by COSEWIC in 1991 but was reassigned as Data Deficient in 2010 following an evaluation of existing data (COSEWIC 2010). However, Chestnut Lamprey remains in Schedule 3 under SARA as the species had already been assigned Special Concern by COSEWIC at the time when SARA was enacted. Bigmouth Shiner was originally designated as Special Concern by COSEWIC in 1985 but was reevaluated in 2003 and downgraded to Not at Risk (COSEWIC 2003); however, this species remains on Schedule 3 under SARA with the status of Special Concern. Schedule 3 does not provide official protection under SARA but provides a holding area until species are reassessed. The Mapleleaf Mussel is known to occur in the Assiniboine River upstream and downstream of the Study Area; however, a field survey within the study area did not result in any observations (COSEWIC 2006b). COSEWIC assigned the Saskatchewan – Nelson River population of Mapleleaf Mussel a status of Endangered in 2006 (COSEWIC 2006b); however, this species has not been scheduled and therefore has no status or protection under SARA.

Table 5-6 Fish species known to occur in the Red, Assiniboine, and La Salle rivers

English Name	Scientific Name	Red	Assiniboine	LaSalle
Petromyzontidae				
Chestnut Lamprey	*Ichthyomyzon castaneus*	N	N	
Silver Lamprey	*Ichthyomyzon unicuspis*	N	N	N
Acipenseridae				
Lake Sturgeon	*Acipenser fulvescens*	N-R	NE-RI	
Hiodontidae				
Goldeye	*Hiodon alosoides*	N	N	N
Mooneye	*Hiodon tergisus*	N	N	N
Cyprinidae				
Goldfish	*Carassius auratus*	I	I	
Lake Chub	*Couesius plumbeus*	N-R		
Spotfin Shiner	*Cyprinella spiloptera*	N	N	
Common Carp	*Cyprinus carpio*	I	I	I
Brassy Minnow	*Hybognathus hankinsoni*	N-T		
Common Shiner	*Luxilus cornutus*	N-T	N-T	N
Silver Chub	*Macrhybopsis storeriana*	N	N	N
Pearl Dace	*Margariscus margarita*	N-T	N-T	
Hornyhead chub	*Nocomis biguttatus*	N-E	N-E	
Golden Shiner	*Notemigonus crysoleucas*	N-R		
Emerald Shiner	*Notropis atherinoides*	N	N	
River Shiner	*Notropis blennius*	N	N	N
Bigmouth Shiner	*Notropis dorsalis*	N-T		
Spottail Shiner	*Notropis hudsonius*	N	N	
Sand Shiner	*Notropis stramineus*	N-U	N-U	N-U
Northern Redbelly Dace	*Phoxinus eos*	N-T		
Finescale Dace	*Phoxinus neogaeus*	N-T		
Bluntnose Minnow	*Pimephales notatus*	N-1R		
Fathead Minnow	*Pimephales promelas*	N	N	N
Flathead Chub	*Platygobio gracilis*	N	N	
Longnose Dace	*Rhinichthys cataractae*	N	N	N
Western Blacknose Dace	*Rhinichthys obtusus*	N		
Creek Chub	*Semotilus atromaculatus*	N-U	N-U	N-U
Catostomidae				
Quillback	*Carpiodes cyprinus*	N	N	
White Sucker	*Catostomus commersoni*	N	N	N
Bigmouth Buffalo	*Ictiobus cyprinellus*	N	N	N
Silver Redhorse	*Moxostoma anisurum*	N	N	
Golden Redhorse	*Moxostoma erythrurum*	N	N	
Shorthead Redhorse	*Moxostoma macrolepidotum*	N	N	N

English Name	Scientific Name	Red	Assiniboine	LaSalle
Ictaluridae				
Black Bullhead	*Ameiurus melas*	N	N	N
Brown Bullhead	*Ameiurus nebulosus*	N	N	N
Channel Catfish	*Ictalurus punctatus*	N	N	
Stonecat	*Noturus flavus*	N	N	
Tadpole Madtom	*Noturus gyrinus*	N	N	N
Esocidae				
Northern Pike	*Esox lucius*	N	N	N
Umbridae				
Central Mudminnow	*Umbra limi*	N	N	N
Osmeridae				
Rainbow Smelt	*Osmerus mordax*	I-1R		
Salmonidae				
Cisco	*Coregonus artedi*	N		
Lake Whitefish	*Coregonus clupeaformis*	N		
Cutthroat Trout	*Oncorhynchus clarki*	I-T		
Rainbow Trout	*Oncorhynchus mykiss*	I-T		
Brown Trout	*Salmo trutta*	I-T		
Brook Trout	*Salvelinus fontinalis*	I-Tr		
Percopsidae				
Trout-perch	*Percopsis omiscomaycus*	N	N	
Gadidae				
Burbot	*Lota lota*	N	N	
Fundulidae				
Banded Killifish	*Fundulus diaphanus*	N-1R		
Gasterosteidae				
Brook Stickleback	*Culea inconstans*	N	N	N
Ninespine Stickleback	*Pungitius pungitius*	N	N	
Moronidae				
White Bass	*Morone crysops*	I		
Centrarchidae				
Rock Bass	*Amboplites rupestris*	N	N	
Pumpkinseed	*Lepomis gibbosus*	Tr-T	Tr-T	
Bluegill	*Lepomis macrochirus*	N	N	
Smallmouth Bass	*Micropterus dolomieu*	I	I	
Largemouth Bass	*Micropterus salmoides*	I	I	
White Crappie	*Pomoxis annularis*	N-R		
Black Crappie	*Pomoxis nigromaculatus*	N		
Percidae				
Iowa Darter	*Ethiostoma exile*	N	N	
Johnny Darter	*Ethiostoma nigrum*	N	N	

English Name	Scientific Name	Red	Assiniboine	LaSalle
Yellow Perch	*Perca flavescens*	N	N	N
Logperch	*Percina caprodes*	N		
Blackside Darter	*Percina maculata*	N	N	
River Darter	*Percina shumardi*	N	N	
Sauger	*Sander canadensis*	N	N	N
Walleye	*Sander vitreus*	N	N	N
Sciaenidae				
Freshwater Drum	*Aplodinotus grunniens*	N	N	
Total		70	50	23

N - native; I - introduced; Tr - transfer
1R - 1 record; E - erroneous?; R - rare; T - tributaries only; U - uncommon

Table 5-7 COSEWIC and SARA status of aquatic fauna in the Red, Assiniboine, and La Salle rivers.

English Name	Scientific Name	COSEWIC Status	SARA Schedule	SARA Status
Mapleleaf Mussel	*Quadrula quadrula*	Endangered	None	None
Chestnut Lamprey	*Ichthyomyzon castaneus*	Data Deficient	3	Special Concern
Lake Sturgeon	*Acipenser fulvescens*	Endangered	None	None
Silver Chub	*Macrhybopsis storeriana*	Special Concern	1	Special Concern
Bigmouth Shiner	*Notropis dorsalis*	Not at Risk	3	Special Concern
Bigmouth Buffalo	*Ictiobus cyprinellus*	Special Concern	1	Special Concern

Provincial

There are no aquatic species listed under Manitoba's Endangered Species Act (MBESA).

5.3 TERRESTRIAL ENVIRONMENT

5.3.1 Vegetation

The Project is located in the flat and rural Prairies Ecozone of southwestern Manitoba. This Ecozone contains the majority of Canada's productive agricultural cropland, pasture, and rangeland. As such, agriculture dominates this ecozone, covering approximately 94% of the landbase and making this one of the most altered landscapes in Canada (Environment Canada 1996).

Within the Prairies Ecozone, the study area is located within the Lake Manitoba Plain Ecoregion. This ecoregion is transitional between the northern boreal forests and the south aspen parkland. The region is a mosaic of trembling aspen / oak groves and rough fescue grasslands. Moist sites are often characterized by trembling aspen and shrubs, with bur oak and grass species occurring on drier sites, and willow and sedge communities occurring on poorly drained Gleysolic soils (Environment Canada 1996).

Over 96% of the land in the 1,062 km^2 Study Area has been disturbed (cultivated agricultural land - 66.7%, developed land - 27.2%, and annual cropland - 2.2%; Appendix 11.1). Water drainage is most often channelized into roadside ditches and creeks, and few areas of semi-native habitat such as grassland, wetland or forest remain. Most of the semi-native wildlife habitat in the Study Area are found next to these two systems and consist of river bottom forest, riparian forest, and shrubland and wetland vegetation associations.

No federally or provincially listed species were identified during the 2011 field investigations (Map 5-6). Three MBCDC species of conservation concern were identified during the 2011 field investigations: blunt broom sedge (*Carex tribuloides*), stiff sunflower (*Helianthus pauciflorus pauciflorus*), and Bird's-foot trefoil (*Lotus unifoliolatus*). Blunt broom sedge was found in a field that had been grazed by cattle earlier in the year, and was partially flooded during the summer. Stiff sunflower was observed along ditches surrounded by cultivated fields. Bird's-foot trefoil was observed in a roadside ditch and at the edge of the Elm River (Appendix 11.1).

Tentative observations of two additional species of conservation concern - lopseed (*Phryma leptostachya*) and Enchanter's nightshade (*Circaea lutetiana* ssp. *canadensis*) - were recorded along the La Salle River during the July 2011 surveys; however, at that time the plants were not developed enough to make a positive identification (Appendix 11.1). During a return visit to the location, it was discovered that the vegetation in the vicinity had been cleared.

5.3.2 Wildlife and Habitat

The wildlife and habitat Study Area is approximately 1,062 km^2 in size, and encompasses several conceptual transmission route options in order to initiate preliminary planning. The area is dominated by cropland and development, where anthropogenic disturbances cover about 96% of the Study Area.

Ninety-two species of birds were identified in the Study Area during the 2011 sampling season, many of which are common in agricultural landscapes in Manitoba (Appendix 11.2). Two species of conservation concern were identified during the surveys and found to be widely distributed throughout the Study Area: Barn Swallow (*Hirundo rustica*) and Bobolink (*Dolichonyx oryzivorus*) (Map 3 in Appendix 11.2). Both species are listed as Threatened by COSEWIC. Approximately 3.5% of the Study Area is considered to have high quality habitat for non-waterfowl avian species (Map 4 in Appendix 11.2). This habitat is found west of the town of Elie and consists of forest, grasslands, wetlands and riparian areas. The Assiniboine River also provided high quality habitat for songbirds, birds of prey and waterfowl. This area presents approximately 1.0% of the study area. Habitat for other species at risk, such as Yellow Rail (*Coturnicops noveboracensis*; wetlands) and Short-eared Owl (*Asio flammeus*; grasslands) is present in the Study Area; however, the species were not detected in the Study Area during avian survey efforts (Appendix 11.2).

Site-specific studies were not conducted for mammals. Seven species of mammals were reported from incidental observations: Red Squirrel (*Sciurus vulgaris*), Muskrat (*Ondatra zibethicus*), White-tailed Deer (*Odocoileus virginianus*), Beaver (*Castor canadensis*), Raccoon (*Procyon lotor*), Coyote (*Canis latrans*), and Red Fox (*Vulpes vulpes*). No mammalian species at risk were observed, or are expected, in the Study Area. Approximately 3.5% of the Study Area is considered to provide high quality habitat for most mammal species. Approximately 2% of the Study Area is considered high quality habitat for ungulates. These areas are located in the western portion of the Study Area near the La Salle River, or along the Assiniboine River (Map 5 in Appendix 11.2). The Study Area overlaps with two species of bat (Northern Myotis, *Myotis septentrionalis*; Little Brown Myotis, *Myotis lucifigus*) that were recently recommended for emergency listing as Endangered in Canada (COSEWIC press release; February 2010; Available at: www.cosewic.gc.ca/eng/sct7/Bat_Emergency_Assessment_Press_Release_e.cfm). Both species roost in forested habitats and forage in forest canopies and over water.

Site-specific studies were not conducted for amphibians. Six species of amphibians were reported from incidental observations: Boreal Chorus Frog, Northern Leopard Frog, Gray Tree Frog, Wood Frog, American Toad and Canadian Toad. The Northern Leopard Frog is listed as Special Concern by the SARA. Site-specific studies were not conducted for reptiles. One reptile was reported from incidental observations: Red-sided Garter Snake. Approximately 3.8% of the Study Area is considered to have high quality habitat for amphibians and reptiles and is located along the La Salle River, Assiniboine River and western portion of the Study Area, where there are streams, creeks and water bodies (Map 6 in Appendix 11.2).

Four environmentally sensitive areas were identified: three at potential Assiniboine River crossing locations and one La Salle River crossing (Map 5-7; Appendix 11.2).

5.4 SOCIO-ECONOMIC ENVIRONMENT

5.4.1 Land Use

This section provides an overview of land and resource use in the Study Area. Further details can be found in the Socio-economic Baseline Technical Report (Appendix 11.3). The following topics are addressed here:

- Land tenure and residential development (including municipal jurisdictional authority and development controls);
- Designated protected areas;
- Aboriginal lands; and
- Conservation Districts.

Within the Study Area, land is typically divided up using a section-township-range system. The vast majority of this land consists of agricultural, privately-owned parcels. There are publicly-owned parcels of land located throughout the Study Area as well. These may be allocated for a range of purposes, including landfills, cemeteries, municipal infrastructure and other purposes.

Local government jurisdiction in the study area resides with the relevant rural municipalities (RMs), of which there are four, including (from west to east) the RM of Portage la Prairie, the RM of Cartier, the RM of St. Francois Xavier and the RM of Rosser. Each of these is governed by a Reeve or Mayor and an elected council. The RM is responsible for a range of infrastructure and services as well as land use planning within their jurisdiction.

There are three Planning Districts in the Study Area including the Portage la Prairie Planning District (PPPD), the White Horse Plains Planning District (WHPD), and the South Interlake Planning District (SIPD). The majority of lands in the Study Area are zoned either Agricultural or Rural. In these cases, the development plans note that utilities are permitted in any land use designation, subject to requirements in their respective municipal zoning by-law and should be developed in a manner that minimizes potential incompatibilities with neighbouring land uses. Manitoba Hydro is not formally subject to municipal land use and development controls (because of its status as a Crown Corporation) but typically abides by them when developing new projects.

With respect to residential development, most of the land in the Study Area consists of rural farmsteads. The more substantial urban areas include Rosser, St. Francois Xavier, Dacotah, Elie, Benard, Fortier, Oakville and Newton. Seventeen Hutterite colonies are either located or operate within the Study Area. Land use on colony lands is typically agricultural (e.g., grain or livestock) and infrastructure usually includes residences, grain storage and livestock facilities.

Manitoba's Protected Areas Initiative (PAI) is administered by Manitoba Conservation and Water Stewardship. The intent of the program is to protect Manitoba's biological diversity by setting aside a network of Crown lands for purposes of ecological reserves, provincial parks, wildlife management areas and provincial forests. Resource development and agricultural activities are prohibited in these areas although hunting, trapping and fishing are permitted. First Nations members can also utilize the areas for specific purposes. There is one Protected Areas Initiative Priority area located in the extreme southwest corner of the Study Area.

There are three First Nation reserves located in the vicinity (but well outside) of the Study Area. This includes Dakota Plains First Nation, Dakota Tipi First Nation and Long Plain First Nation. None of them have outstanding Treaty Land Entitlements. The Study Area does not include any reserve lands or resource management areas. There is a Peguis Community Interest Zone (CIZ) that overlaps with the eastern portion of the Study Area (Manitoba Treaty Land Entitlement ND).

One Conversation District is located in the Study Area - the La Salle Redboine Conservation District (Manitoba Water Stewardship 2006). This encompasses the area of land that contributes water to the La Salle River, including the Elm River and Elm Creek. The plan for this conservation district is called the La Salle River Integrated Watershed Management Plan. The RMs of Portage la Prairie and Cartier are two of the six partner-RMs associated with this watershed management plan (La Salle River Watershed Planning Authority 2010).

5.4.2 Infrastructure

Various types of infrastructure facilities and systems are found throughout the Study Area. Key highways and roads within the Study Area include:

- PTH 1 (Trans-Canada Highway) - This road is the primary east-west transportation corridor in southern Manitoba. Within the Study Area, this is a four lane divided and paved route.
- PTH 13 runs north-south through the central region of the Study Area.
- PTH 26 runs east-west, following the northern edge of the Assiniboine River, beginning and ending at PTH 1. It starts in the RM of St. François Xavier and ending just before Portage la Prairie. The highway carries mostly light residential and farm traffic and is often used by cyclists in the summer months.
- Other key roads through the Study Area include PR 221, PR 236, PR 248, PR 332 and PR 424.

PTH 1 and PTH 13 are classified as RTAC routes which have a maximum prescribed gross vehicle weight of 62,500kg. PTH 26 is classified as a Class A1 highway, which has a maximum prescribed gross vehicle weight of 56,500kg. The other roads noted above are classified as Class B1, with maximum prescribed gross vehicle weights of

47,630kg (The Highway Traffic Act). In addition to the above highways and roads, the majority of the rural areas within the Study Area are also connected by a square mile grid of gravel or dirt roads which are maintained by the municipalities.

Other infrastructure includes:

- Rail lines - Canadian Pacific and the Canadian National railway lines can also be found in the Study Area.
- Hydroelectric transmission and distribution lines.
- Natural gas pipeline - crosses through the central region of the Study Area
- Aerodromes/airports - two airstrips are located in, or in proximity to, the Study Area: one is located outside the Study Area just west of St. Francois Xavier, and the other is located on the western end of the Study Area in the RM of Portage la Prairie.
- Communication facilities/towers, including microwave and cellular towers can be found across the Study Area. These are maintained by telephone/communication companies, broadcast companies and radio stations and corporations, the Government of Canada, Provincial and municipal governments and utility companies.

Water treatment, waste water facilities (including lagoons) and landfills maintained by the RMs are also located in the Study Area.

5.4.3 Agriculture and Landowners

Agricultural land use in the Study Area consists of intensive cropping on cultivated lands with cereal crops, canola, corn, soybeans and alfalfa being produced. Based on soil type, present and potential agricultural use, and the intensity of present agricultural use, there are two major agricultural categories that exist in the Study Area. The first category includes cereal, special and row crop areas; these lands consist of high value row crops, such as soybeans, sunflowers and corn, and include areas where there is more potential for expansion in the future. These areas are found in the Study Area between Rosser and Elie and consist of Red River and Osborne lacustrine clay soils. These soils are intensively farmed but do not have any irrigation potential. The second agricultural category includes existing and potential irrigation areas: these lands consist of silty and sandy soils from Elie to Portage South Station. Pivot irrigation systems are generally used for potato production. There is potential to grow more irrigated row crops in this area. There is potential to grow more irrigated row crops in this area.

5.4.4 Economy

Summaries of participation, employment, and unemployment statistics for each of the RMs in the Study Area are provided in Appendix 11.3. The 2006 participation rates for the RMs were all higher than that for the Province of Manitoba as a whole ranging between about 76% and 83%. The corresponding Manitoba participation rate was 67%. Employment rates for the Study Area RMs were between about 71% and 83%, much higher than the corresponding Manitoba rate of about 64%. Unemployment rates for the RMs in this time period were lower than the province as a whole. The RM of St. Francois Xavier had the lowest rate of the four RMs at 1.4%. Taken as a whole, the RMs experienced marked improvements in their participation, employment and unemployment rates (Statistics Canada 2002; Statistics Canada 2007).

In 2006, occupational classifications were most pronounced in the areas of primary industry (e.g., agriculture), sales and service and trades, and transport and equipment operators. The proportion of occupations falling within the primary industry classification was highest for the RMs of Cartier and Rosser (33% and 23% respectively) from 2001 to 2006, for the total for the Study Area RMs combined, the proportion of occupations related to primary industry decreased from 27% to 24%. While this proportion for the RM of St. Francois Xavier increased by about 4%, the rest of the RMs experienced an average decrease of 4% (Statistics Canada 2002; Statistics Canada 2007).

5.4.5 Heritage Resources

5.4.5.1 Historical Summary

The study area may have been deglaciated as early as 13 ka (1 ka = 1000 years), and the area was inundated by the development of glacial Lake Agassiz; much of the Study Area was covered by water as late as 7.8 ka. The post-inundation landscape changed dramatically. The Assiniboine River currently occupies a new channel that cut across deltaic sediments some 3 ka and the LaSalle River occupies an abandoned channel of the Assiniboine. Although parts of Manitoba may have been occupied as early as 13 ka, the Winnipeg region was not habitable until the latter parts of the Early Pre-Contact period (11.5 to 7 ka). It is more likely that the first sustained human occupation dates to the Middle Pre-Contact Period (7 to 2 ka.).

Over time, the Study Area was used by different First Nations (e.g., Ojibwe and Sioux) as part of their home, secondary or tertiary territories. Today, the closest First Nations to the Project are from Dakota Tipi and Dakota Plains (both affiliated with the Nakota). The Study Area is also located within general region known as the birthplace of the Métis as a nation.

The Study Area also was used by participants in the hide trade using the Fort Gary-Fort Edmonton trail (The Carlton Trail/Portage Trail) as a transporting route. Most of the fur trade establishments were in proximity to the Red and Assiniboine Rivers and are well outside of the Study Area.

The first farmers were in fact First Nations and there is evidence of early corn horticulture at Lockport some 600 years ago (Buchner 1983). European agricultural settlement began 400 years later with the arrival of the first of the Selkirk settlers in 1812. In 1874, Mennonite settlers began to arrive (primarily settling further to the west), followed by the Hutterites who moved north from the United States in 1918. The Rosser area in the east end of the study area was settled in the 1890s and most of the area from there to Portage South station was initially settled between the late 1880s to the late 1890s.

5.4.5.2 Previously Recorded and Existing Sites

Several existing sites are recorded in the vicinity of but not within the ROW of any route alternative (Table 5-8). A full summary can be found in Appendix 11.4.

5.4.5.3 Route Alternative Assessment

As part of the Alternative A explorations, the Assiniboine River Crossing was examined and one new site (DlLj-8) was recorded (Table 5-9). A variety of structural, agricultural and household artifacts were recovered suggesting this is the former location of a homestead. The site is positioned approximately 100 m east of the proposed alignment.

As part of the Alternative B explorations, the Assiniboine River crossing was examined and four new archaeological sites were recorded (Table 5-9). All four sites are historic homesteads. DlLj-3 is the closest, located 30 m north of Alternative B. The LaSalle River Crossing was also examined; no new archaeological sites were recorded.

As part of the Alternative C explorations, the Assiniboine River crossing was examined and four new archaeological sites were recorded: DlLj-6, 9, 10 and 11 (Table 5-9). Two of the sites contain historic homestead remains and three contact pre-contact artifacts. All of these sites appear to be located outside of the proposed alignment of Alternative C. The LaSalle River Crossing was examined and two archaeological sites were recorded (DlLk-2 and DlLk-3). Both sites are in close proximity to the Alternative C alignment.

Table 5-8 Existing Heritage Locales Along Alternative A

Type	Name	Location
Centennial Farm	Butler Family	South of Alternative A
Plaque	Glengarry School #77	South of Alternative A
Municipal Heritage Site		South of Alternative A
Plaque	Rosser	North of Alternative A
Centennial Farm	Dufresne Family Farm	North of Alternative B
Archaeological Site	DiLk-1	North of Alternative B
Plaque	Salem School	West of Alternative C
Centennial Farm	Tidsbury Family Farm	North of Alternative C
Centennial Farm	Blight Family Farm	South of Alternative C
Centennial Farm	Beaudry Place Farm	South of Alternative C
Centennial Farm	Beaudry Family Farm	South of Alternative C
Plaque	Pigeon Lake School	West of Alternative C

Table 5-9 Summary of Sites Recorded during 2011 Heritage Surveys.

Route Alternative	Borden Number	Affiliation
Alternative A	DlLj-8	Historic
Alternative B	DlLj-3	Historic / Pre-Contact
Alternative B	DlLj-4	Historic
Alternative B	DlLj-5	Historic
Alternative B	DlLj-7	Historic
Alternative C	DlLj-9	Pre-Contact
Alternative C	DlLj-10	Pre-Contact
Alternative C	DlLj-11	Historic
Alternative C	DlLj-6	Historic / Pre-Contact
Alternative C	DlLk-3	Pre-Contact
Alternative C	DlLk-2	Historic

5.4.6 Generic Concerns and Issues

5.4.6.1 Resource Use

Resource use in the area is limited due to the preponderance of agricultural use. However, several activities are noteworthy, including private woodlots, recreation and tourism.

There are no forestry management licenses issued for areas within the Study Area. However, landowners may privately manage their own woodlots with the help of several programs (e.g., Manitoba Forestry Association). A complete inventory of private woodlots in the Study Area was not available. Any instances of private woodlots will be determined through the SSEA and engagement process.

Recreation and tourism activities in the Study Area include hunting, fishing, snowmobiling and skiing. Hunting is regulated by Manitoba Conservation and Water Stewardship. Commonly hunted game includes white-tail deer, waterfowl and upland birds. The Assiniboine River is home to nine popular species of game fish and the fishing season is open for most of the year except during spawning (April 1 to May 13; Manitoba Water Stewardship 2005).

Snowmobilers of Manitoba Inc. (Snoman) develop and maintain a network of snowmobiling trails with the help of local clubs with the goal of promoting organized, safe and environmentally responsible snowmobiling. According to the Snowman map for the 2011 trail system, there are trails that run through the Study Area in an east-west orientation along the south side of the TransCanada Highway from approximately Beaudry Provincial Park to Elie in the RM of Cartier. There is another snowmobile trail that crosses the Study Area in a north-south orientation through Elie.

There is potential future development in proximity to the transmission line: namely, the Dakotah Wind Energy (DWE) project. A proposal to develop this was filed in 2006 by Sequoia Energy Inc. The project description includes installation of between 35 and 70 wind-turbine-generators, approximately 29 km of road access, one collector substation, an interconnecting transmission line from an existing Manitoba Hydro transmission line to Manitoba Hydro substation, and an operations and maintenance building. Although the specific location of the turbines is not publicly available, the DWE study area overlaps with the study area between Dacotah and Elie as well as to the south.

5.4.6.2 Services

The following gives a general description of the various community services available in the four rural municipalities (RMS), including Portage la Prairie, Rosser, Cartier and St. Francois Xavier through which the Study Area runs. These services include:

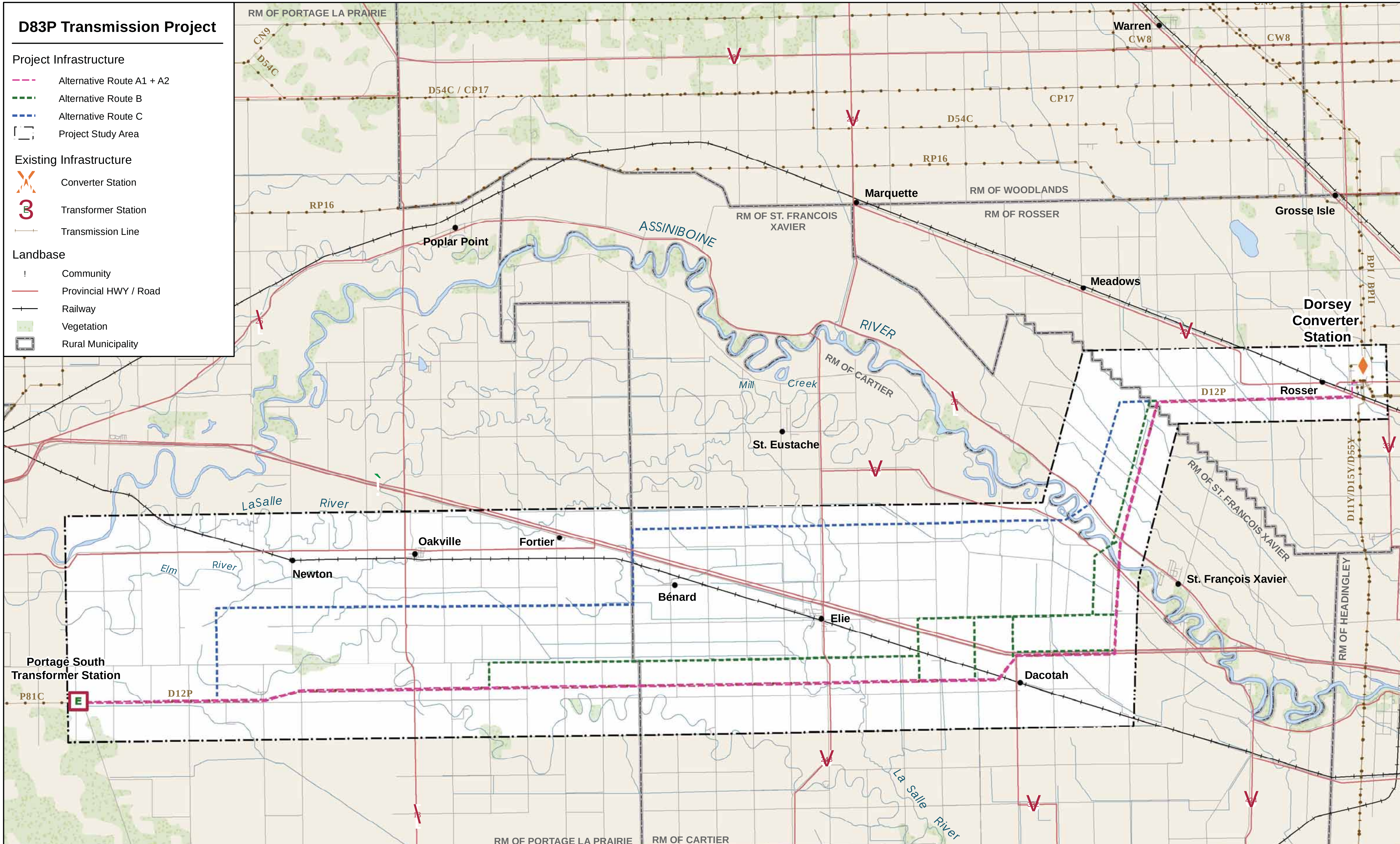
- Fire services;
- Ambulance services;
- Police service; and
- Health and social services.

All four of the RMs in the Study Area provide fire services to their respective RMs (Rural Municipality of Portage la Prairie ND; Rural Municipality of Rosser 2007; Rural Municipality of Cartier 2011; Rural Municipality of St. Francois Xavier NDa). With regard to ambulance services, the RM of Portage la Prairie provides its own services (Rural Municipality of Portage la Prairie ND), the RM of Rosser is provided service by the neighbouring RM of Rockwood (Interlake Regional Health Authority personal communication), and the RM of Cartier provides this service to its own RM as well as the RM of St. Francois Xavier (C. Debreuil, Central Health Authority, pers. comm.). In terms of police service, the Portage la Prairie RCMP detachment serves the RM of Portage la Prairie (RCMP 2011a). The RMs of St. Francois and Cariter are provided service by the Headingly RCMP detachment (RCMP 2011b), and the RM of Rosser is provided police service by the East Interlake RCMP detachment (RCMP 2011c).

With regard to Health and Social Services, two Regional Health Authorities (RHAs) - the Central RHA and the Interlake RHA - provide health services in the Study Area. The Central RHA serves the RMs of Portage la Prairie, Cartier, and St. Francois Xavier. The Interlake RHA services the RM of Rosser (Manitoba Health 2010). Further, although the RM of Portage la Prairie is served by facilities in the city of Portage la Prairie such as the General Hospital, walk-in clinic, full service clinic, personal care homes and other services (RM of Portage la Prairie ND), the residents of St. Francois Xavier must travel outside their RM to access hospitals in either the City of Winnipeg or the City of Portage la Prairie (RM St. Francois Xavier NDb). Similarly, in the RM of Rosser, residents attend facilities located either in the City of Winnipeg or in Stonewall in the RM of Rockwood (Interlake Regional Health Authority personal communication). As well, the RM of Cartier does not have its own hospital although it does have a Health Centre located in Elie (Cartier Health Centre).

5.4.6.3 Aesthetics

The Study Area consists primarily of agricultural properties interspersed by rural residences. The land is flat with some trees. Woodland cover is sparse through most of the Study Area with occasional small woodlots and shrub patches as well as planted hedgerows and shelter belts. Hedgerows and shelter belts are typically found around isolated farms and residential properties. Areas of mixed woodland are also present along the margins of the Assiniboine River, La Salle River and other streams in the Study Area. Various communication towers, hydroelectric transmission and distribution lines are visible throughout the Study Area.



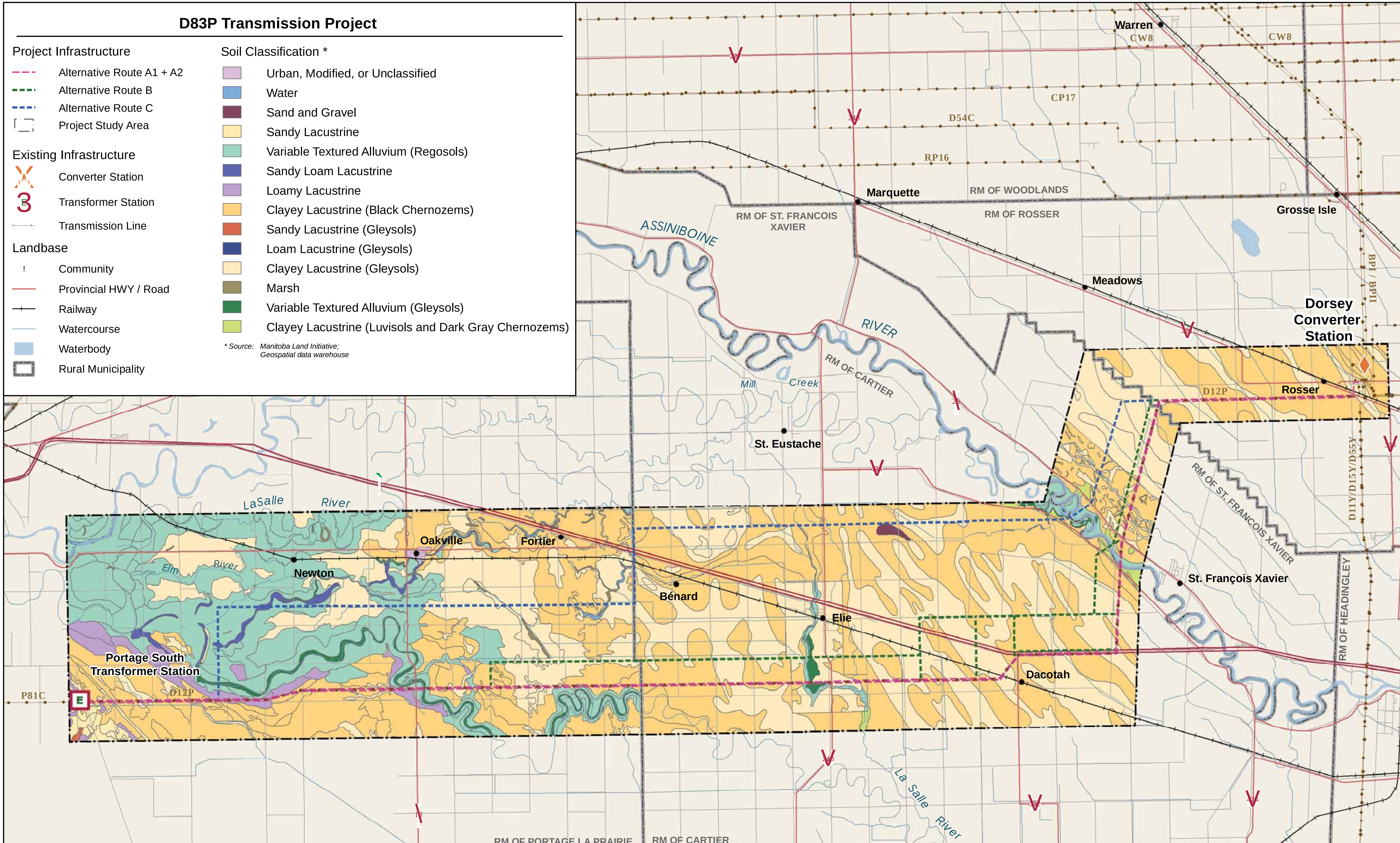
Manitoba Hydro

Coordinate System: UTM Zone 14 NAD 83
Data Source: MBHydro, ProvMB, NRCan
Date Created: September 5, 2012

0 2.5 5 Kilometres
0 2.5 5 Miles
1:150,000

Study Area with Alternative Routes

Map 5-1



Manitoba Hydro

Coordinate System: UTM Zone 14 NAD 83
Data Source: MBHydro, ProvMB, NRCan
Date Created: September 5, 2012

0 2.5 5 Kilometres
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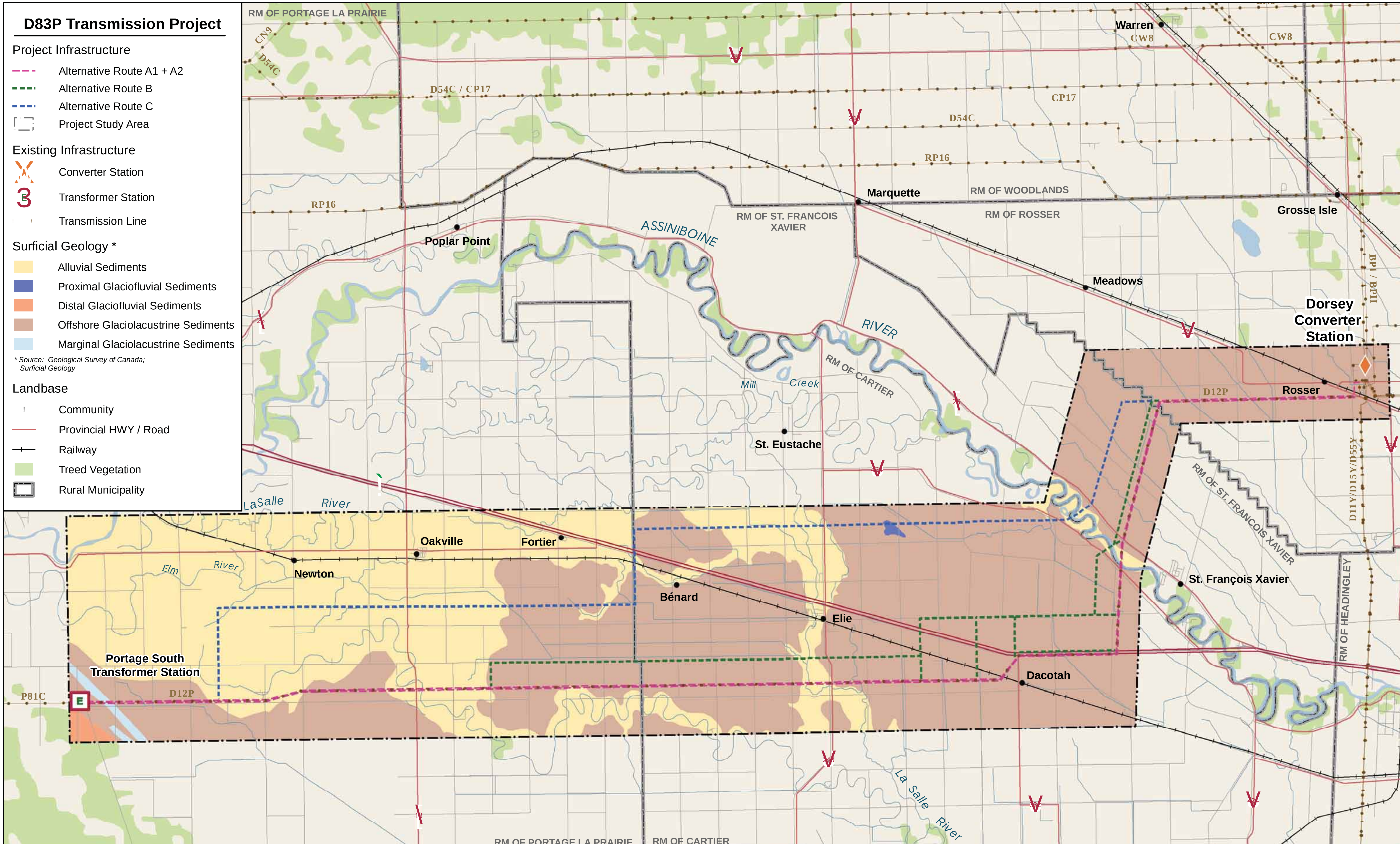
Soils

Within Project Study Area

Map 5-2



Manitoba Hydro

Coordinate System: UTM Zone 14 NAD 83
Data Source: MBHydro, ProvMB, NRCan
Date Created: September 5, 2012

0 2.5 5 Kilometres
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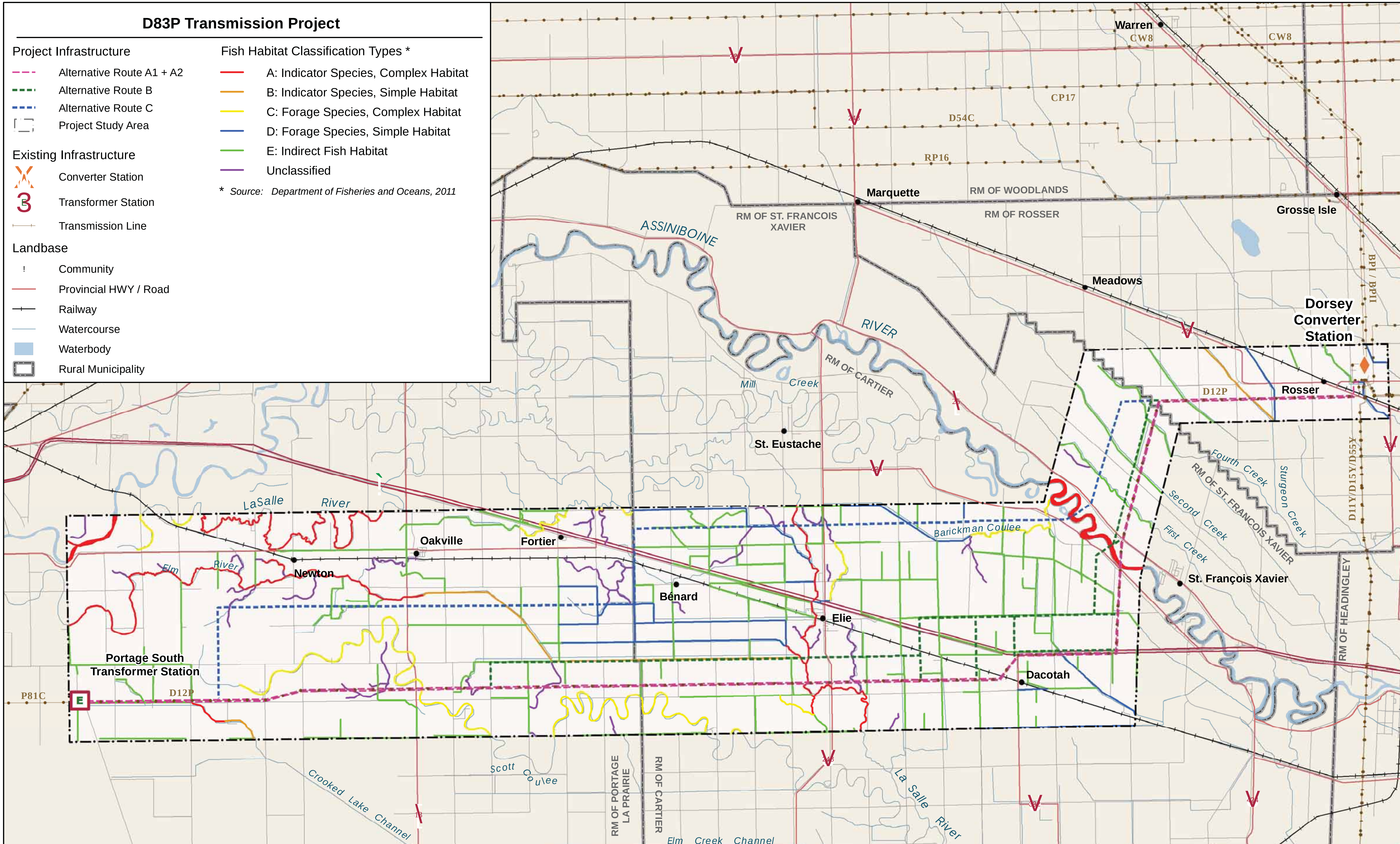
Surficial Geology

Within Project Study Area

Map 5-3



Manitoba Hydro

Coordinate System: UTM Zone 14 NAD 83
Data Source: MBHydro, ProvMB, NRCan, DFO
Date Created: September 5, 2012

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0 2.5 5 Miles

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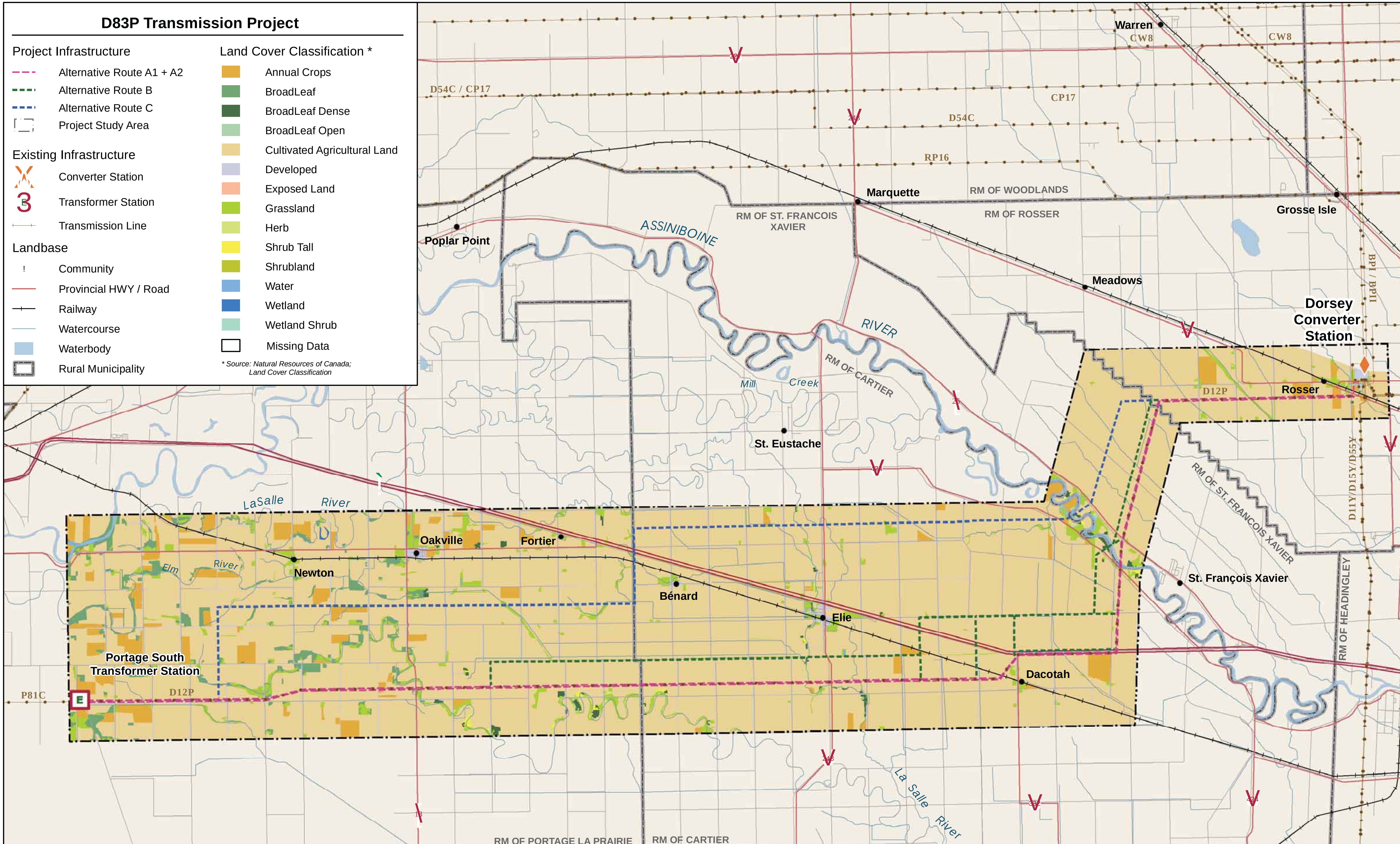
Fish Habitat Classification for Waterbodies

Within Project Study Area

Map 5-4



Manitoba Hydro

Coordinate System: UTM Zone 14 NAD 83
Data Source: MBHydro, ProvMB, NRCan
Date Created: September 5, 2012

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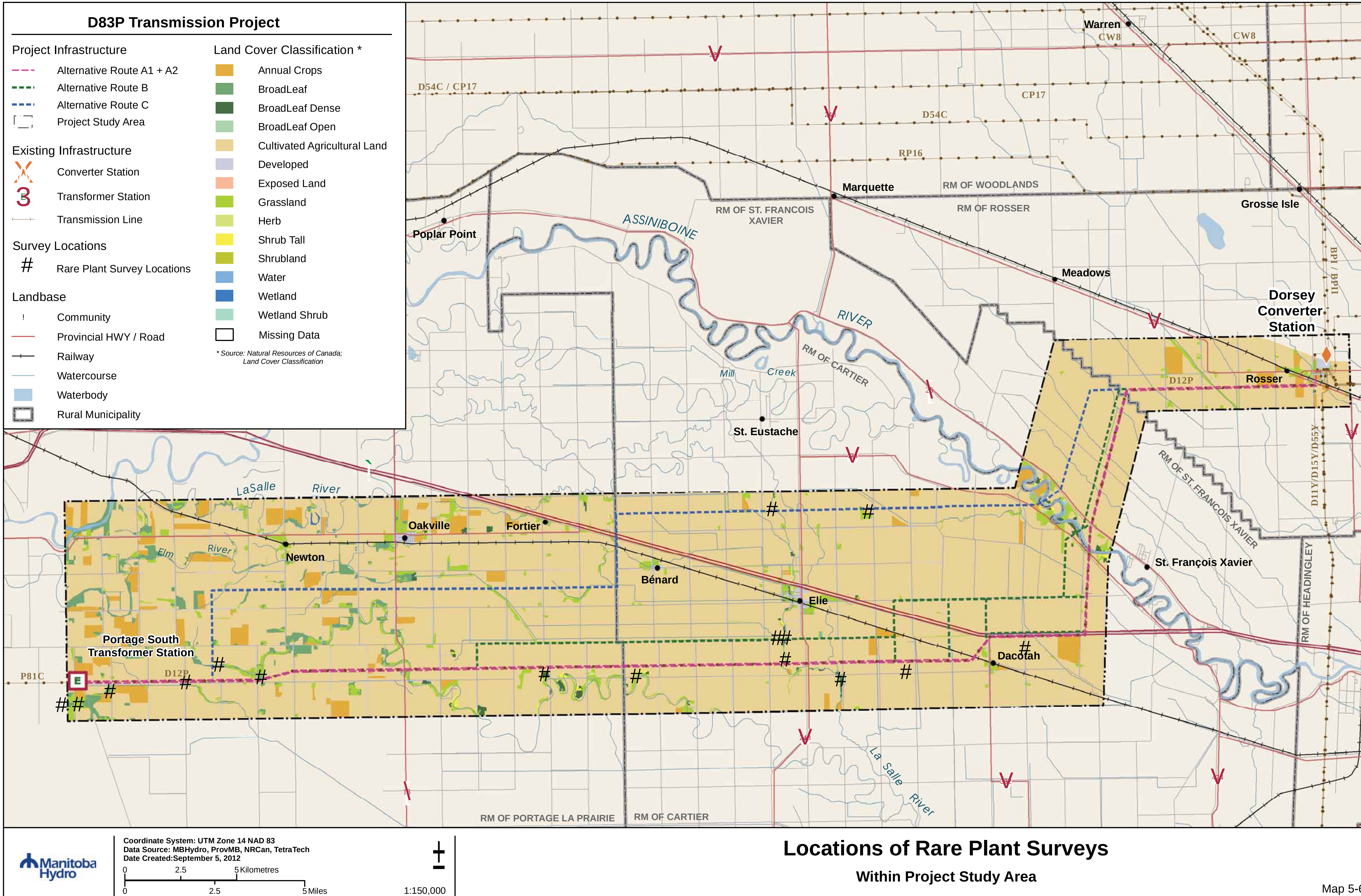
0 2.5 5 Miles

1:150,000

Land Cover Classification

Within Project Study Area

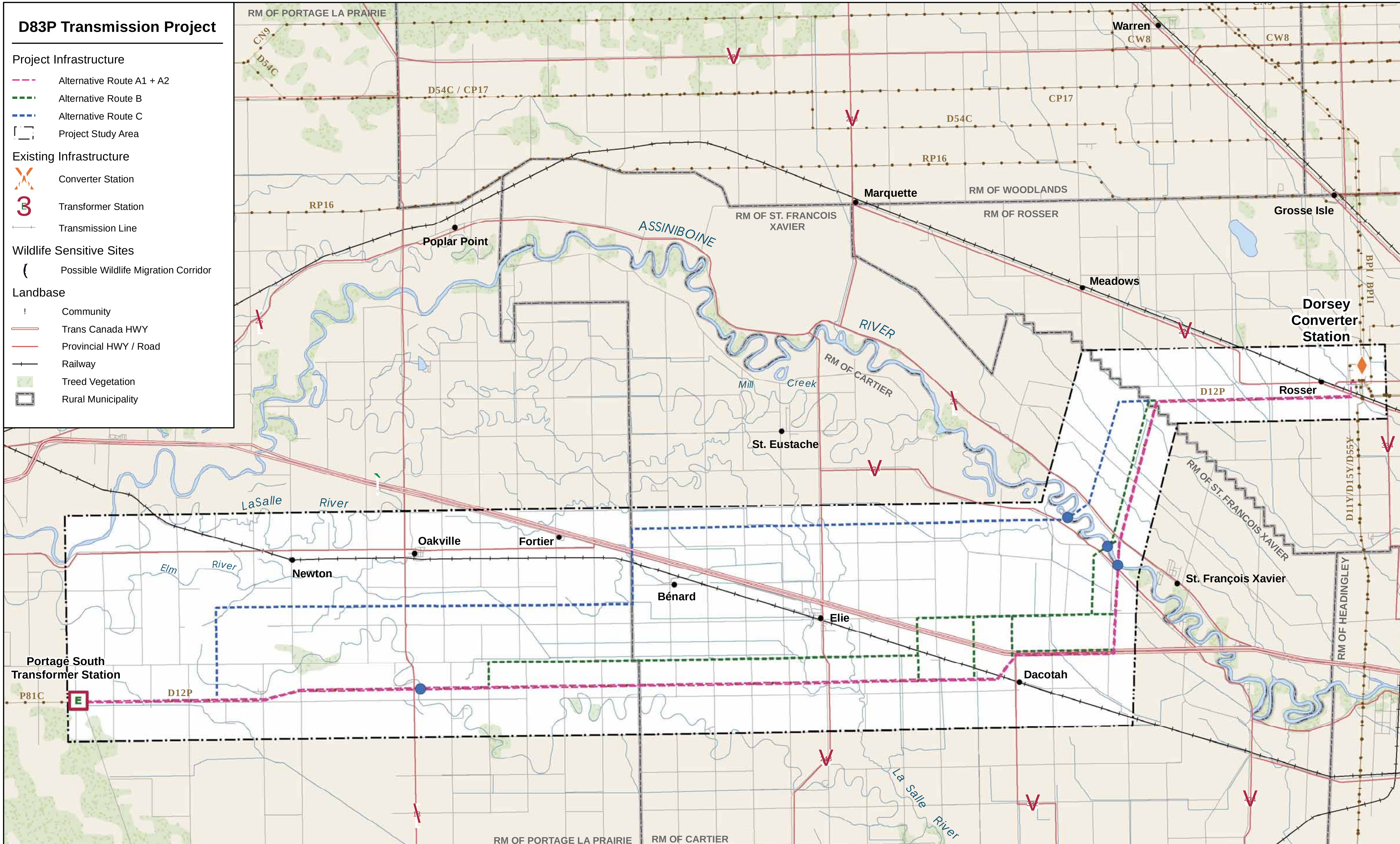
Map 5-5



Locations of Rare Plant Surveys

Within Project Study Area

Map 5-6



Manitoba Hydro

Coordinate System: UTM Zone 14 NAD 83
Data Source: MBHydro, ProvMB, NRCan, WRCS
Date Created: September 5, 2012

0 2.5 5 Kilometres
0 2.5 5 Miles

1:150,000

Wildlife Sensitive Sites
Within Project Study Area

Map 5-7