MANITOBA – MINNESOTA TRANSMISSION PROJECT
Environmental Impact Statement

CHAPTER 13
SEPTEMBER 2015

ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS ON INFRASTRUCTURE AND SERVICES

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ABBREVIATIONS AND ACRONYMS

AC	alternating current
AM	amplitude modulation
CEAA	*Canadian Environmental Assessment Act*, 2012
CN	Canadian National
CP	Canadian Pacific
dBµV/m	decibel micro volts per metre
EIS	environmental impact statement
ERP	Emergency Response Plan
FM	frequency modulation
GPS	global positioning system
KPI	key person interview
kHz	kilohertz
kV	kilovolt
LAA	local assessment area
LOS	level of service
MIT	Manitoba Infrastructure and Transportation
MMTP	Manitoba–Minnesota Transmission Project
MVK	million vehicle kilometres
NDGPS	nationwide differential global positioning system
NEB	National Energy Board
PDA	Project development area
PEP	public engagement process
PR	Provincial Road
PTH	Provincial Trunk Highway
RAA	regional assessment area
RCMP	Royal Canadian Mounted Police
RM	rural municipality

ROW	right-of-way
RVTC	Riel to Vivian Transmission Corridor
SLTC	Southern Loop Transmission Corridor
TDR	technical data report
VC	valued component
veh/day	vehicles per day

GLOSSARY OF TECHNICAL TERMS

Annual average daily traffic	Is defined by Manitoba Infrastructure and Transportation as the number of vehicles passing a count station on an average day of the year.
Corona discharge	An electrical discharge that occurs when the electric field at the transmission line surface exceeds the breakdown strength of air. When a corona discharge occurs, the air rapidly expands, causing audible noise that sounds like a hissing or crackling sound, or a 120 Hz hum. It also releases a small amount of current in to the air that produces radio noise.
Cumulative effect	The effect on the environment, which results when the effects of a project combine with those of the past, existing and future projects and activities (CEAA 2012). *OR* the incremental effects of an action on the environment when the effects are combined with those from other past, existing and future actions (cumulative effects assessment)
Level of service	Level of service (LOS) ratings describe how well a road is operating under its current volumes. The ratings are from A to F, with A being the best and F the worst. LOS E describes conditions when demand equals capacity.
Mitigation	A means of reducing adverse project effects. Under *CEAA 2012*, mitigation is "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."
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 the access road, temporary construction camp and wastewater treatment facility.

13 Assessment of Potential Environmental Effects on Infrastructure and Services

13.1 Introduction

Manitoba Hydro is proposing construction of the Manitoba–Minnesota Transmission Project (MMTP; the Project), which includes construction of a 500 kV alternating current (AC) transmission line in southeastern Manitoba. The Project would originate at the Dorsey Converter Station northwest of Winnipeg, then travel south around Winnipeg within the Existing Transmission Corridor, including the Southern Loop Transmission Corridor and the Riel–Vivian Transmission Corridor to just east of Provincial Trunk Highway (PTH) 12. The line then continues southward on a New Right-of-way (ROW) across the rural municipalities (RMs) of Springfield, Tache, Ste. Anne, La Broquerie, Stuartburn and Piney to the Manitoba–Minnesota border crossing south of the community of Piney. The Project also includes the construction of terminal equipment at the Dorsey Converter Station, electrical upgrades within the Dorsey and Riel converter stations, and electrical upgrades at the Glenboro South Station (Glenboro South), which also requires realignment of transmission lines entering the station.

For the purposes of this chapter, the Project is described in three general components: the additional transmission line constructed in the existing planned transmission corridors extending from Dorsey Converter Station to just east of PTH 12, the new transmission line extending south from the Anola area to the border by Piney, Manitoba, and the upgrade work to the three stations.

Infrastructure and services is a valued component (VC) because the Project could increase demand for, or interfere with, local and regional infrastructure and services. This VC has been identified as important to communities, governments, stakeholder groups, First Nations and Metis, and residents.

Project effects are driven by Project activities and the demand by Project workers on infrastructure and services throughout the construction and operation and maintenance phases. Project workers coming from outside the region will require temporary accommodations; transportation to, from, and within the region; and the use of community infrastructure and services similar to local residents. Project activities will require the use of regional or municipal utilities, and will generate waste that will have to be disposed of at local facilities. This increased demand for infrastructure and services may reduce available capacity for local residents, or result in a decreased quality of service.

Winnipeg and Brandon are Manitoba's two largest population centres, and serve as regional hubs for infrastructure and services. Both communities have a wide variety of temporary accommodations, community amenities and utilities, and regional infrastructure. Winnipeg will serve as the service hub for Project works on the Existing Transmission Corridor (Existing Corridor) and the northern portion of the New ROW, while Brandon is closest for works at the Glenboro South Station. Limited infrastructure and services are available in smaller communities in the central portion of the New ROW (*e.g.,* Ste. Anne, Steinbach).

The construction or presence of the Project may also interfere with existing transportation, utility or communication infrastructure. The Project may require underground infrastructure to be relocated, may cause temporary service interruptions during construction, may interfere with operation or maintenance activities of existing infrastructure, or may affect plans for future infrastructure expansion. The presence of towers also has the potential to interfere with or block communications signals. Once the transmission line is operational, Project radio noise could interfere with radio signals, or Project electric fields could cause induction effects on infrastructure such as pipelines or vehicles.

Potential issues or concerns associated with infrastructure and services that were identified during the engagement process included Project effects on:

- air navigation (including interference with aerial applicator landing strips)
- traffic on provincial highways and local and municipal roads
- water and wastewater facilities
- landfills
- existing utility infrastructure

The public engagement and First Nation and Metis engagement processes informed the transmission line routing process. The engagement processes helped identify issues of concern and informed routing and considered potential effects on infrastructure and services (Section 13.1.2).

Based on Manitoba Hydro's past experience with transmission lines, feedback received during the public and the First Nation and Metis Engagement Processes, and industry regulations, the Final Preferred Route considered interference with existing transportation, utility and communication infrastructure to the extent possible.

The effects on infrastructure and services are assessed for the following sub-components:

- accommodations: temporary accommodations;
- community infrastructure and services: fire and police services, recreation, potable water, wastewater and solid waste;
- transportation and utility infrastructure: roads, railways, aerodromes, transmission lines, pipelines and other infrastructure; and
- communications infrastructure: communications and radio signals.

The assessment of infrastructure and services is linked with the employment and economy and community health and well-being VCs. Similar to infrastructure and services, these VCs are affected by changes in population. Temporary population change associated with the Project workforce is addressed in Chapter 14 (Employment and Economy). The incremental demands of the Project workforce are a major driver of increased demand on temporary accommodations and community infrastructure and services. Chapter 19 (Community Health and Well-being) addresses effects on health services. The increased demand for such services is tied to the change in the population associated with the Project.

This chapter presents baseline conditions for infrastructure and services, and assesses the environmental effects of Project activities on infrastructure and services from construction, and operation and maintenance; it also addresses cumulative effects.

13.1.1 Regulatory and Policy Setting

13.1.1.1 Primary Regulatory Guidance

A list of the various regulatory requirements that were considered in developing this environmental impact statement (EIS) can be found in Section 2.3 (Regulatory Approvals) of Chapter 2 (Project Description). Particular consideration was given to the following federal and provincial legislation and guidelines in the preparation of this environmental assessment:

- The Project Final Scoping Document, issued on June 24 2015 by Manitoba Conservation and Water Stewardship's Environmental Approvals Branch, which represents the Guidelines for this EIS
- The relevant filing requirements under the *National Energy Board Act* (R.S.C., 1985, c. N-7), and guidance for environmental and socio-economic elements contained in the National Energy Board (NEB) Electricity Filing Manual, Chapter 6
- The *Canadian Environmental Assessment Act, 2012* (S.C. 2012, c. 19, s. 52) and its applicable regulations and guidelines.

13.1.1.2 Additional Federal Guidance

CANADA TRANSPORTATION ACT

Section 101 of the *Canada Transportation Act* (Government of Canada 2014a) regulates utility crossings of railways. Such crossings require a crossing agreement to be negotiated between the proponent (*i.e.,* Manitoba Hydro) and the railway which is filed with the Canada Transportation Agency.

***RADIOCOMMUNICATION ACT* AND REGULATIONS**

The Radiocommunication Regulations (Government of Canada 2014b) of the *Radiocommunication Act* (Government of Canada 2014c) addresses interference with radio signals. Specifically, it outlines technical requirements and standards for interference-causing equipment, such as transmission lines.

13.1.1.3 Additional Provincial Guidance

THE PUBLIC HEALTH ACT

The Public Health Act (Province of Manitoba 2009) and associated regulations outline standards and guidelines to protect the health and well-being of Manitoba residents through the delivery of public health services. The operation of a temporary workforce camp, if required, will be subject to applicable regulations (*e.g.*, Food and Food Handling Establishment Regulation [Province of Manitoba 1988a]; Water Works, Sewerage and Sewage Disposal Regulation [Province of Manitoba 1988b, 2003a]; and Water Supplies Regulation [Province of Manitoba 1988c]).

THE HIGHWAYS PROTECTION ACT

The Highways Protection Act (Province of Manitoba 2014a), administered by The Highway Traffic Board (Manitoba), protects highway infrastructure and the safety of the travelling public by controlling access, land use and erection of structures within a controlled area of certain highways. Permits are required under the Act for locating structures within controlled areas (*i.e.,* 76 m from the edge of rights-of-way) at crossing location along those provincial trunk highways as described in Schedule A to the Act (*e.g.,* PTH 1E/W, PTH 59).

THE HIGHWAY TRAFFIC ACT

Also administered by the Highway Traffic Board (Manitoba), *The Highway Traffic Act* (Province of Manitoba 2014a) and associated regulations (*e.g.*, Vehicle Weights and Dimensions on Classes of Highway Regulation [Province of Manitoba 1988d]) regulate traffic on highways. This includes vehicle and licensing requirements, traffic operations and the movement of oversized (overweight or wide) vehicles or loads on highways. Permits to move oversized vehicles or loads are anticipated to be required for the Project. These permits are utilized for occasional trips or limited time operations of overweight vehicles on highways subject to weight restrictions (*e.g.,* RTAC, A1 or B1 routes).

THE DANGEROUS GOODS HANDLING AND TRANSPORTATION ACT

The Dangerous Goods Handling and Transportation Act (Province of Manitoba 1997, 2003b) and associated regulations outline the conditions and standards pertaining to the generation, handling, storage, transport and disposal of dangerous goods or hazardous waste. This Act and regulations will be applicable to the transportation and disposal of Project hazardous wastes.

THE MANITOBA HYDRO ACT

Section 23(1) of *The Manitoba Hydro Act* (Province of Manitoba 2014b) allows Manitoba Hydro to construct, operate, and maintain its infrastructure anywhere on, under, over, across, or along public highways, streets, lanes, or other public places. This Act supercedes municipal level powers granted under legislation such as *The Planning Act* and *The Municipal Act.*

The purpose of the Act is to:

provide for the continuance of a supply of power adequate to the needs of the province and to engage in and to promote economy and efficiency in the development, generation, transmission, distribution, supply and end-use of power and, in addition, are (a) to provide and market products, services and expertise related to the development, generation, transmission, distribution, supply and end-use of power, within and outside the province; and (b) to market and supply power to persons outside the province on terms and conditions acceptable to the board (The Manitoba Hydro Act CCSM cH190).

THE SUSTAINABLE DEVELOPMENT ACT

Manitoba Hydro has adopted a sustainable development policy and 13 guiding principles that influence corporate decisions, actions and day-to-day operations to achieve environmentally sound and sustainable economic development (Manitoba Hydro 1993). Manitoba Hydro attempts to apply the principles of sustainable development in all aspects of its operations. Through corporate decisions and actions to provide electrical services, Manitoba Hydro endeavours to meet the needs of the present without compromising the ability of future generations to meet their needs (Manitoba Hydro 1993).

13.1.1.4 Additional Municipal Guidance

The Planning Act provides the legislative framework for municipalities and planning districts with respect to the development of infrastructure and delivery of services, inclusive of transportation and municipal utilities. Section 23 2 (1) of *The Municipal Act* establishes the jurisdiction of municipalities with respect to municipal roads, and public utilities. Manitoba Hydro is cognizant that neither *The Planning Act* or *The Municipal Act*, nor there Regulations, apply to the Crown or Crown agencies. However, it does seek to work cooperatively with the municipalities when planning, designing, constructing and operating and maintaining its Projects to limit the extent of possible interactions with their developments and plans.

13.1.2 Engagement and Key Issues

As part of Manitoba Hydro's Public Engagement Process (PEP) and First Nation and Metis Engagement Process, feedback was sought on the Project from First Nations, Metis, local municipalities, stakeholder groups, government departments, local landowners and the general public during the transmission line routing and environmental assessment processes. These processes were designed using guidance from the *NEB Electricity Filing Manual* (2015), *CEAA Public Participation Guide* (2008), an understanding of the International Association for Public

Participation spectrum of public participation, recent feedback and commentary from provincial regulators, and past project experience.

During the engagement processes, Manitoba Hydro received a number of comments related to infrastructure and services. Most comments pertained to the Project proximity to existing infrastructure and services, Project crossings with existing infrastructure and services, or paralleling opportunities with existing infrastructure and services. Comments included key issues, recommendations and preferences for routing, and suggested mitigation measures. The comment themes and how they were addressed are summarized in Table 13-1.

Table 13-1 Key Comments on Infrastructure and Services from the PEP

Comment Theme	How Comment was Addressed
The route should avoid landfills and lagoons.	Wastewater treatment areas (*e.g.,* lagoons) and waste disposal sites (*e.g.,* landfills) were identified and considered in the transmission line routing process. The Final Preferred Route does not overlap any landfills or lagoons. The Oak Bluff Wastewater Treatment Lagoon and the RM of La Broquerie Wastewater Lagoon are 290 m and 900 m away from the Final Preferred Route, respectively. The Brady Landfill is 2400 m away.
The route should avoid airstrips.	Locations of airstrips were identified in the early planning phases and were avoided during transmission line routing where possible. An alternate border crossing location was selected, which avoids interference with the Piney-Pinecreek Border Airport expansion plan.
The route should avoid paralleling oil and gas pipelines and reduce pipeline crossings.	The Final Preferred Route traverses and parallels existing pipelines and effects on pipeline infrastructure are included in the assessment (Section 13.5.5).
The route should avoid paralleling rail lines.	The Final Preferred Route parallels one rail line, though at a distance of nearly 1 km. Effects on rail infrastructure are included in the assessment (Section 13.5.5).
The route should reduce crossings of major highways and rail lines.	The Final Preferred Route includes 8 crossings of PTHs and 13 crossings of provincial roads.
The towers should be set back far enough from highways as not to interfere with plans for expansion or pose a safety hazard to road traffic	Tower location and design will take future plans for expansion and appropriate setbacks into account, where feasible.

Comment Theme	How Comment was Addressed
The route should be located adjacent to existing linear infrastructure to reduce land requirements.	Certain linear infrastructures are compatible with transmission lines; others are not. Preference was given to corridors with unused Manitoba Hydro ROWs, existing transmission line ROWs, and other compatible infrastructure ROWs. The Final Preferred Route parallels more than 150 km of existing transmission line.
The Project may cause damage to, or long-term effects on, municipal roads during construction.	Manitoba Hydro has committed to working with local municipalities to address construction effects on municipal roads.
Road closures at crossings could affect emergency services response.	Manitoba Hydro has committed to developing an Emergency Response Plan (ERP) and will work with local emergency responders to maintain appropriate emergency response times.
The transmission line operation may cause interference with radio, television, internet, cellphone devices and global positioning systems (GPS).	Interference with communications and radio signals was included in the assessment of infrastructure and services, and mitigation measures were developed to limit possible effects (Section 13.5.6).

The feedback received throughout the engagement processes also influenced the identification of potential effects and measurable parameters (Section 13.3.2.2), and the development of mitigation measures for potential effects. Further information related to the PEP and First Nation and Metis Engagement Process is provided in Chapters 3 and 4, respectively.

In addition to the engagement processes, key person interviews (KPIs) were conducted with representatives of government agencies, service and infrastructure providers, and other stakeholder groups to obtain information about existing conditions of infrastructure and services (Section 13.3.1.3).

13.2 Scope of Assessment

This section defines and describes the scope of the assessment of potential effects on infrastructure and services.

13.2.1 Spatial Boundaries

The following spatial boundaries are used as geographic parameters in assessing residual and cumulative environmental effects of the Project on infrastructure and services (Map 13-1 – Infrastructure and Services Assessment Areas).

- **Project development area (PDA):** The PDA encompasses the Project footprint and is the anticipated area of physical disturbance associated with the construction and operation and maintenance of the Project.

- **Local assessment area (LAA):** The LAA includes the PDA and the boundaries of all RMs traversed by the PDA (the RMs of Rosser, Headingley, Macdonald, Ritchot, Springfield, Tache, Ste. Anne, La Broquerie, Stuartburn, Piney and Glenboro-South Cypress[1]). Communities that have infrastructure and services that will likely be used by the Project are also considered (the City of Winnipeg, City of Brandon, City of Steinbach, and the Town of Ste. Anne). The LAA represents the area where direct and indirect effects on infrastructure and services are likely to be the most pronounced or identifiable, and encompasses the local affected communities and their infrastructure and services.
- **Regional assessment area (RAA):** The RAA is the same as the LAA. The RAA is the area that provides context for the assessment of Project effects, and the area in which cumulative effects are assessed.

13.2.2 Temporal Boundaries

Subject to the timing of regulatory approval, the following temporal boundaries are used to assess residual and cumulative environmental effects of the Project on infrastructure and services:

- **Construction:** Construction of the transmission lines along the Existing Transmission Corridor and New ROW will commence in summer 2017 and will be completed by winter 2020. Station upgrade work at the Dorsey Converter Station, Riel Converter Station and Glenboro South Station will span the period of Q2 2017 to Q4 2019. Effects on infrastructure and services by the construction workforces and Project construction activities will take place during these timeframes.
- **Operation (and maintenance):** The in-service date of the Project is expected in 2020, and it is expected to have a service life of about 100 years. Effects on infrastructure and services from the operation of the Project will take place during this time.

13.2.3 Learnings from Past Assessments

Manitoba Hydro's previous experience in transmission line and generation assessments and monitoring programs has informed the assessment of infrastructure and services. Through this experience, Manitoba Hydro is aware of concerns surrounding potential effects of major projects on infrastructure and services and recognizes that these concerns are a subject of interest to local communities and stakeholders. Prior to the finalization of the assessment scope, a review of previous Manitoba Hydro transmission line projects, and other large transmission line projects and linear developments was undertaken to confirm that the infrastructure and service elements

[1] The RM of South Cypress and the Village of Glenboro amalgamated January 1, 2015 to form the Municipality of Glenboro – South Cypress. Statistics and existing conditions information was obtained from sources published prior to this date, and therefore the RM of South Cypress and Village of Glenboro are hereby described separately.

included in this EIS were both comprehensive and appropriate. This included a review of previous environmental assessments in Manitoba and other provinces, including several that have undergone reviews by the National Energy Board:

- Bipole III Transmission Project (Manitoba Hydro 2011)
- Keeyask Generation Project (Keeyask Hydropower Limited Partnership 2012)
- Interior to Lower Mainland (ILM) Transmission Project (Golder Associates 2008)
- Northwest Transmission Line Project (Rescan 2010)
- North Montney Mainline Project (Stantec 2013)

Table 13-2 outlines the topics assessed in past assessments that are covered in this assessment.

Table 13-2 Topics Assessed in Past Assessments

Effect	Topic	Bipole III	Keeyask	ILM	Northwest Transmission Line	North Montney
Temporary Accommodations	Hotels, motels, inns			✓	✓	✓
Community Infrastructure and Services	Police	✓	✓	✓	✓	✓
	Fire	✓	✓	✓	✓	✓
	Recreation		✓			✓
	Potable Water		✓			✓
	Wastewater		✓			✓
	Solid Waste					✓
Road Traffic	Traffic volume	✓	✓		✓	✓
	Traffic safety					
	Inconvenience			✓		
Transportation and Utility Infrastructure	Transmission lines					
	Railways	✓				
	Roads and highways	✓				
	Pipelines	✓				
	Aqueducts					
	Floodways					
	Airports/airstrips	✓				
	Lagoons					
	Landfills					

Effect	Topic	Bipole III	Keeyask	ILM	Northwest Transmission Line	North Montney
Communications and Radio Signals	Radio interference	✓		✓	✓	
	Communication towers	✓				

SOURCES: Manitoba Hydro 2011; Keeyask Hydropower Limited Partnership 2012; Golder Associates 2008; Rescan 2010; Stantec 2013.

The most common topics covered are effects on accommodations, police and fire services, road traffic volume, and radio interference (applicable to transmission line projects only). Other projects also identified issues about road rutting, dust generated by the project, and effects on other infrastructures such as railways, pipelines, aqueducts, communication towers, and airports. These components were also included in the assessment of infrastructure and services in the Project. As well, these projects also identified similar issues and concerns to those identified in the public and First Nation and Metis engagement processes for the Project. From this review, it was concluded that the scope of assessment for the Project was appropriate.

13.3 Methods

13.3.1 Existing Conditions Methods

Information on existing conditions for infrastructure and services was obtained through primary and secondary research. Secondary research included a desktop review of statistical sources, previous studies, research findings, other environmental assessments, and a review of traditional knowledge, where applicable. Primary data was collected from records of public engagement activities undertaken as part of the PEP for the Project (*i.e.*, open houses, stakeholder meetings), KPIs with identified stakeholders, and data requests of government/ stakeholder groups/organizations as required. The following sections present additional information on the sources used to characterize baseline conditions and how the information was interpreted and analyzed.

13.3.1.1 Sources of Information

Existing conditions information for infrastructure and services was obtained from published reports, statistical information sources, website resources, data requests sent to key informants, and other qualitative and quantitative sources, including:

- Statistics Canada census information and other statistical reports. It also provides comparative statistics on other infrastructure and services indicators such as police strength.
- websites for infrastructure and service providers, including temporary accommodations, fire, police, recreation, and utility providers. These sources provided overview information about the services available for each region.
- Manitoba Infrastructure and Transportation (MIT) highway traffic count data. This is the most comprehensive source for traffic volume data on Manitoba's provincial road network.
- provincial and federal government databases of transportation and utility infrastructure. These databases provide geographical information about the location and identification of various transportation and utility infrastructures including roads, railways, pipelines, transmission lines, aerodromes, communication towers and other infrastructures.
- data requests sent to RMs and to individual water, wastewater and solid waste infrastructure providers to obtain information about the infrastructures available for each region, their capacity and usage details, and plans for future expansion
- data requests sent to temporary accommodations providers, Economic Development Offices and Chambers of Commerce to obtain information about temporary accommodations, including the number of units available, vacancy rates or busy seasons, and key capacity issues

Existing conditions information related to road traffic is based on the Manitoba-Minnesota Transmission Project Traffic Impact Study (Stantec 2015). Information on existing conditions related to communications, radio signals, and induction effects is based on the MMTP electric field, magnetic field, audible noise, and radio noise calculations (Exponent 2015).

13.3.1.2 Desktop Analysis

Existing conditions regarding the supply and demand of temporary accommodations, emergency and protection services, water and wastewater infrastructure and services, and solid waste facilities and services are provided in Section 13.4.4; the reported capacities were compared with usage information to determine available capacity, or where applicable, exceedances for each infrastructure and service.

Geographical information about transportation and utility infrastructure, including communication towers, was compared with the alignment of the Final Preferred Route to determine the extent of potential effects due to proximity, crossings or paralleling.

13.3.1.3 Key Person Interviews

KPIs were conducted to identify key issues related to infrastructure and services and to supplement information obtained through secondary sources (Section 13.3.1.1), particularly where there were gaps or uncertainties in the data. Key informants were selected from appropriate local government departments and agencies and other organizations (*e.g.,* police, fire departments) through online public databases or websites. For infrastructure and services, KPIs consisted of structured and non-structured interviews with representatives including:

- RM and community representatives to obtain capacity and usage information on water and wastewater and solid waste infrastructure and services
- fire departments, municipal police and Royal Canadian Mounted Police (RCMP) detachments to obtain information on the number of members and typical call/case volumes; this information was used to determine demand on existing resources at each department/detachment and allowed for the identification of key capacity issues
- accommodation providers (*e.g.*, hotels, motels) to obtain information on the number of units available and on busy seasons, and to identify key capacity issues
- communication companies (*e.g.,* Rogers Communications) to identify possible interference issues

13.3.1.4 Addressing Uncertainty

Information on existing conditions was obtained through desktop review and primary research. Information obtained through desktop review was validated where possible, through KPIs. Validating information both increased confidence in the characterization of existing conditions and reduced uncertainty with respect to potentially out-dated or non-relevant information. KPIs also served to obtain information on existing conditions where publically available secondary information was not accessible. This reduced uncertainty related to missing information.

Where existing information on the capacity of infrastructure and services was not available, the assessment assumes that no additional capacity exists. That is, any added demand would result in an exceedance of supply without mitigation. This conservative approach may overestimate potential effects, reducing the risk of mischaracterizing the magnitude of adverse residual effects on infrastructure and service for which existing capacity information is unknown.

A conservative approach was also taken in assessing effects on infrastructure and services by using peak-population change during construction to characterize effects. The peak population change is assumed to occur during the month where the average workforce size is the highest. Because the three effects examined are predicted by assuming increased demand associated with the presence and movement of Project personnel in and near communities, using this peak figure represents a high estimate of potential effects. Similarly, where Project design calls for the use of local infrastructure and services, maximum demand (rather than average demand) is used.

This represents the highest conservative estimate of potential demand on infrastructure and services.

13.3.2 Assessment Methods

The overall effects assessment methods are presented in Chapter 7. The methods used to conduct the infrastructure and services assessment are outlined in the following sections:

- assessment approach
- potential environmental effects, effect pathways and measureable parameters
- environmental effects description criteria for the VC
- significance thresholds for residual environmental effects

13.3.2.1 Assessment Approach

Analytical methods differ among environmental effects. Methods specific to each effect are presented in each subsection in Section 13.5.

13.3.2.2 Potential Environmental Effects, Effect Pathways and Measurable Parameters

Potential environmental effects on Infrastructure and Services is based on NEB filing requirements as informed though the identification of pathways associated with anticipated Project activities and physical works and regulatory and policy settings. The selection of potential environmental effects was also informed through the public engagement process and First Nation and Metis Engagement Process (Section 13.1.2), and learnings from past assessments (Section 13.2.3).

Potential environmental effects and measureable parameters used in the assessment of effects on infrastructure and services, and the rationale for their selection, are provided in Table 13-3.

Figure 13-1 illustrates the effect pathways for infrastructure and services.

Table 13-3 Potential Environmental Effects, Effect Pathways and Measurable Parameters for Infrastructure and Services

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement	Notes or Rationale for Selection of the Measureable Parameter
Change in accommodations	The Project workforce may increase demand for temporary accommodations through patronage	• Workforce numbers (persons) • Available accommodation units (#)	Compares the Project demand with available capacity
Change in community infrastructure and services	The Project workforce and activities may increase demand for community infrastructure and services through usage	• Measurable parameters specific to the demand and capacity of each component (*e.g.,* police officers/100,000 persons; m^3/day of water)	Compares the Project demand with available capacity
Change in road traffic	Project activities will generate road traffic which may cause congestion on roads	• Traffic volumes (annual average daily traffic) • Traffic collision frequency (collisions/year) and rate (collisions/million vehicle kilometers [MVK])	Measurement for traffic volume; can be related to road level of service. Measurement for traffic safety
Interference with transportation and utility infrastructure	The construction or presence of the Project may interfere with transportation and utility infrastructure, or may cause induction effects	• Linear infrastructure crossed (count) or paralleled (km) by ROW • Proximity of ROW to infrastructure (m) • Induced current (mA)	Indicates how the Project may interact with existing infrastructure
Interference with communications and radio signals	The operation of the transmission line will generate radio noise which may interfere with radio signals. The presence of the Project may also block or interfere with communications signals.	• Radio noise frequency (kHz) • Radio noise levels (dBµV/m) • Number and type of communications facilities in proximity	Standard units of measure for radio signals Illustrates the potential for interference with communications signals

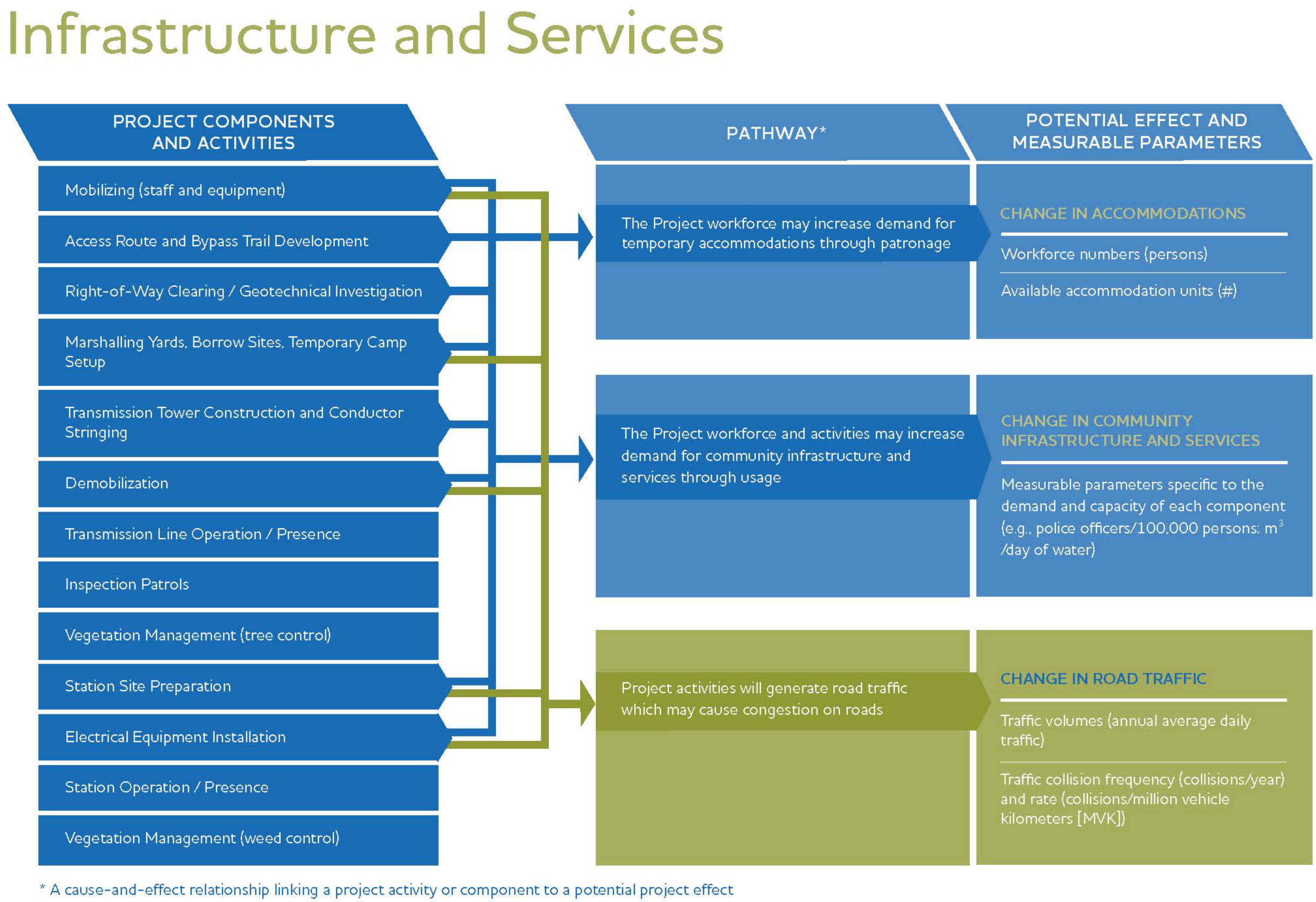


Figure 13-1 Effects Pathways for Infrastructure and Services

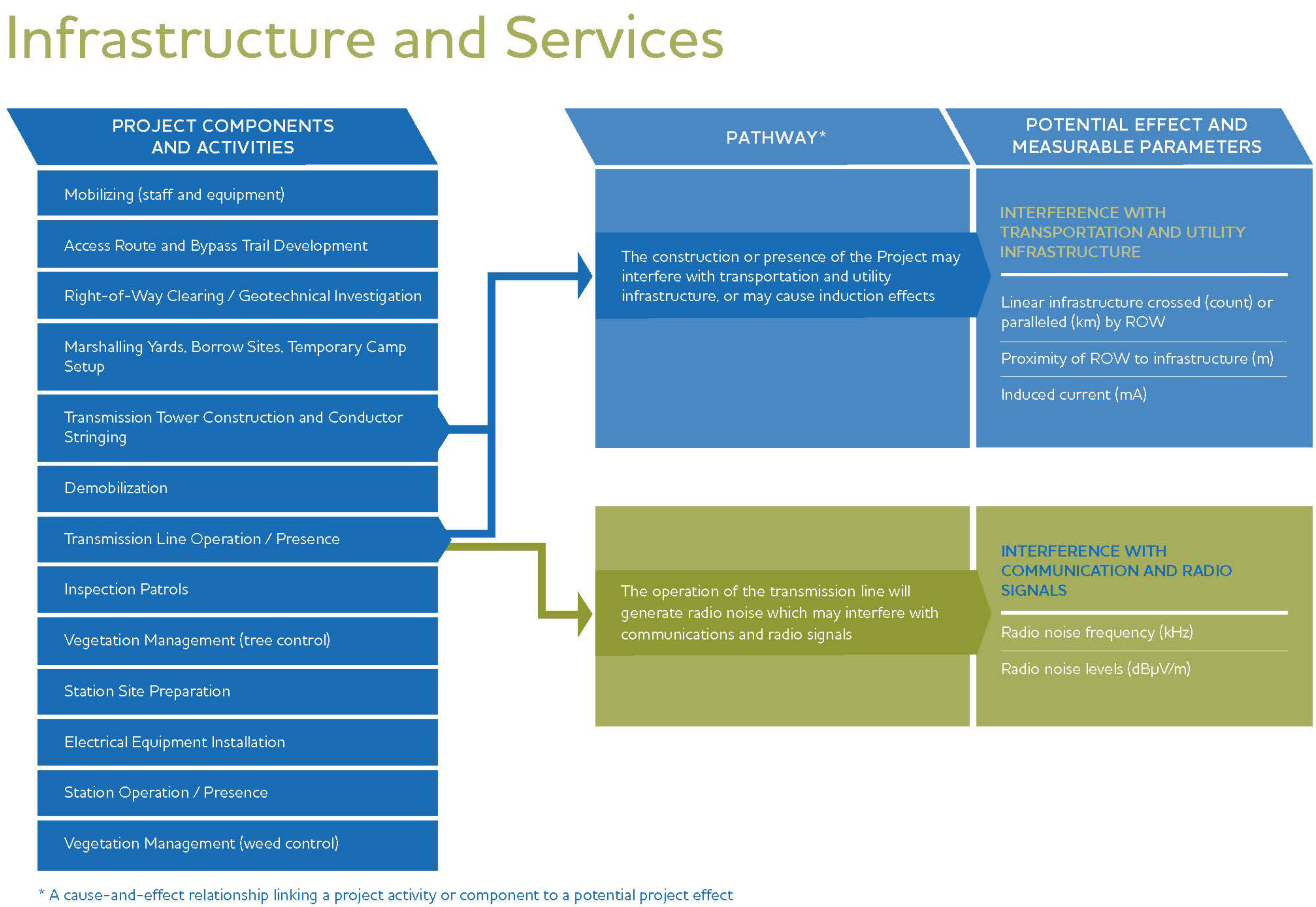


Figure 13-1 Effects Pathways for Infrastructure and Services (continued)

13.3.2.3 Residual Environmental Effects Description Criteria

Residual effects on infrastructure and services are those that remain after the application of mitigation measures. Characterization of residual effects is based on the criteria defined in Table 13-4.

Table 13-4 Characterization of Residual Environmental Effects on Infrastructure and Services

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The trend of the residual effect	**Positive**—an increase in the available capacity or quality of service delivered by infrastructure and services **Adverse**—a decrease in the available capacity or quality of service delivered by infrastructure and services **Neutral**—no net change in the available capacity or quality of service delivered by infrastructure and services
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**Negligible**—no measurable change in use of, access to, or interference with, infrastructure and services from the existing conditions **Low**—a measurable change in use of, access to, or interference with, infrastructure and services but on a scale that is within the current available capacity and will not affect the quality of service provided **Moderate**—measurable change in use of, access to, or interference with, infrastructure and services that nears the available capacity or may affect the quality of service provided **High**—measurable change in use of, access to, or interference with, infrastructure and services that meets or exceeds the available capacity or degrades the quality of service provided
Geographic Extent	The geographic area in which a social effect occurs	**PDA**—residual effects are restricted to the PDA **LAA**—residual effects extend into the LAA **RAA**—residual effects extend in to the RAA
Frequency	Identifies how often during the Project or in a specific phase	**Single event**—residual effect occurs once **Multiple irregular event (no set schedule)**—residual effect occur multiple times at irregular intervals **Multiple regular event**—residual effect occurs multiple times at regular intervals **Continuous**—residual effect occurs continuously

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Duration	The period of time required until the measurable parameter or the VC returns to its existing condition, or the effect can no longer be measured or otherwise perceived	**Short-term**—residual effect restricted to construction phase **Medium-term**—residual effect extends more than the construction phase **Permanent**—residual effect extends for the lifetime of the Project or more
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the Project activity ceases	**Reversible**—the effect is likely to be reversed after activity completion and reclamation **Irreversible**—the effect is unlikely to be reversed
Socio-economic Context	Refers primarily to the sensitivity and resilience of the VC. Consideration of context draws heavily on the description of existing conditions of the VC	**Low resilience**—system is unable to accommodate change **Moderate resilience**—system is able to accommodate some change **High resilience**—system is able to accommodate change

13.3.2.4 Significance Thresholds for Residual Environmental Effects

A social effect on infrastructure and services is considered significant if:

- the Project results in exceedance of available capacity or a substantial decrease in quality of service provided on a persistent and ongoing basis, and cannot be managed with current or anticipated programs, policies or mitigation measures; or
- the radio noise generated by the Project exceeds Industry Canada's ICES-004 limit for acceptable levels of radio noise of 60 dBμV/m at 15 m from the outer conductor of a 500-kV transmission line; or
- Short-circuited induced current within ROW exceeds 5.0 mA limit per CSA 2015

13.4 Existing Conditions for Infrastructure and Services

13.4.1 Overview

The Project is located in southern Manitoba. Winnipeg, the largest metropolitan area in the province and its capital, is home to about 60% of the province's population. Winnipeg is the hub of southern Manitoba, providing a full range of infrastructure and services. Brandon, located approximately one hour by car from the Glenboro South Station, is Manitoba's second largest metropolitan area, and provides a wide range of infrastructure and services. The Town of Ste. Anne and the City of Steinbach are also close to the transmission line, and the Village of Glenboro is near the Glenboro South Station. These communities have some community infrastructure and services to offer. Outside these communities, the Project traverses various rural municipalities, which encompass some small communities, agricultural areas, and other rural land uses. The following subsections provide an overview of the existing conditions related to infrastructure and services in these areas. More detailed existing conditions information on each of these topics can be found in the Socio-economic and Land Use Environment – Technical Data Report (TDR).

13.4.2 Population

Census populations from 1996 to 2011 for communities and RMs in the LAA are presented in Table 13-5. Winnipeg and Brandon are the largest population centres in the LAA; together they represent about 90% of the total LAA population. By contrast, the Village of Glenboro and the RM of South Cypress (now amalgamated to form the Municipality of Glenboro – South Cypress) have the smallest populations in the LAA.

Table 13-5 Population in the LAA, 1996 to 2011

RM/Community	1996 Population	2001 Population	2006 Population	2011 Population
City of Winnipeg	618,477	619,544	633,451	663,617
RM of Rosser	1,349	1,412	1,364	1,352
RM of Headingley	1,587	1,907	2,726	3,215
RM of Macdonald	4,900	5,320	5,653	6,280
RM of Ritchot	5,248[1]	4,958	5,051	5,478
RM of Springfield	12,162	12,602	12,990	14,069
RM of Tache	8,273	8,578	9,083	10,284
RM of Ste. Anne	4,213	4,427	4,509	4,686
Town of Ste. Anne	1,511	1,513	1,534	1,626
City of Steinbach	8,478	9,227	11,066	13,524
RM of La Broquerie	2,493	2,894	3,659	5,198
RM of Stuartburn	1,563	1,603	1,629	1,535
RM of Piney	1,604	1,688	1,755	1,720
RM of South Cypress	862	821	834	838
Village of Glenboro	663	656	633	645
City of Brandon	39,175	39,716	41,511	46,061
Total LAA	712,558	716,866	737,448	780,128
Province of Manitoba	1,113,898	1,119,583	1,148,401	1,208,268

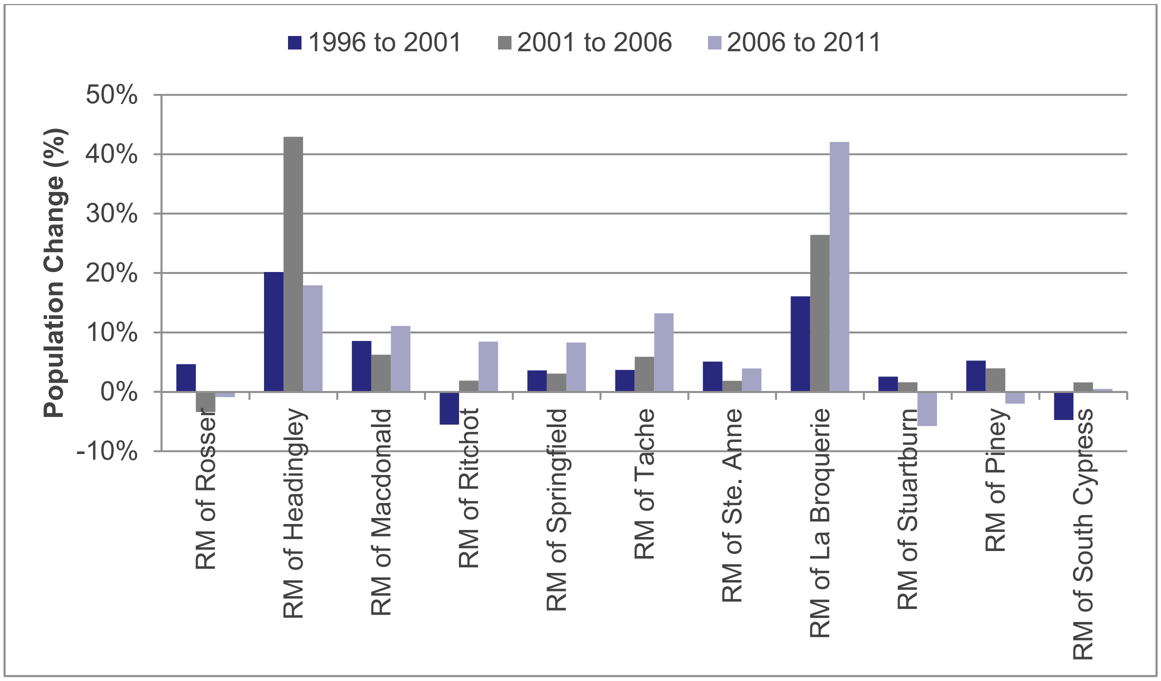
NOTES:
[1] Counts have been adjusted to reflect 2001 census boundaries
SOURCE: Statistics Canada 2002, 2012

13.4.2.1 Population Change

SOURCE: Statistics Canada 2002, 2012

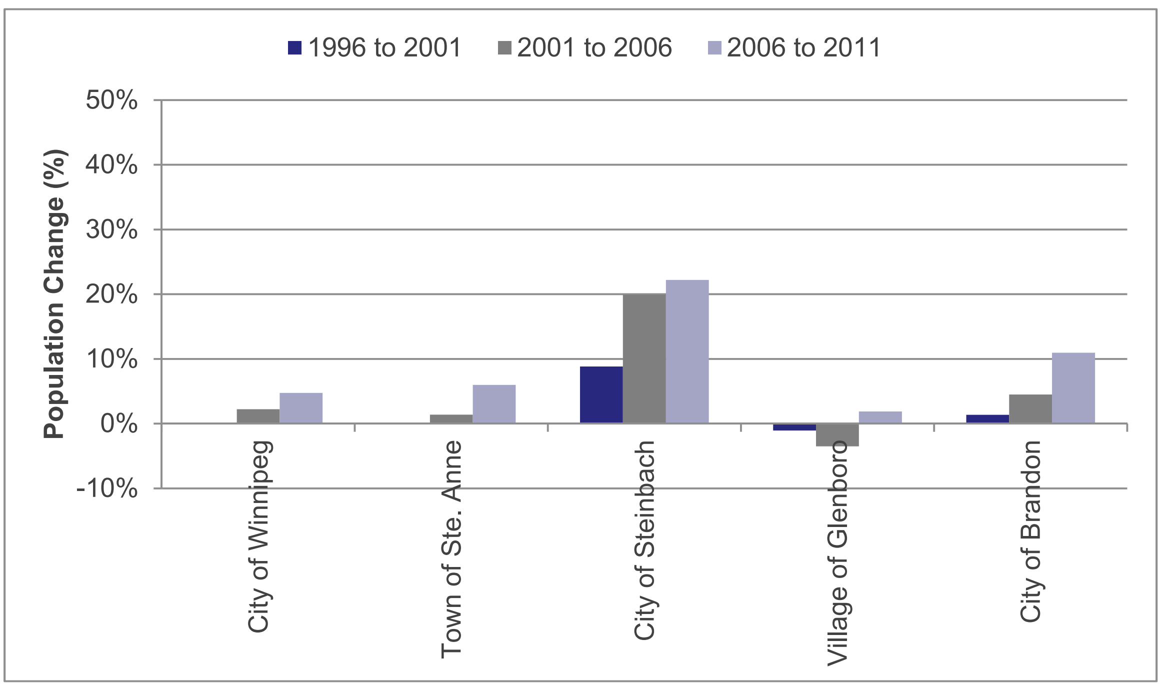
Figure 13-2 and SOURCE: Statistics Canada 2002, 2012

Figure 13-3 show the percentage population changes for municipalities and communities in the LAA between census years (1996 to 2001; 2001 to 2006; and 2006 to 2011). The RMs of Headingley and La Broquerie had the highest percentage population changes in the LAA, while the RMs of Stuartburn, Rosser and Piney have shown population declines in recent years.



SOURCE: Statistics Canada 2002, 2012

Figure 13-2 Population Change in RMs in the LAA, 1996 to 2011

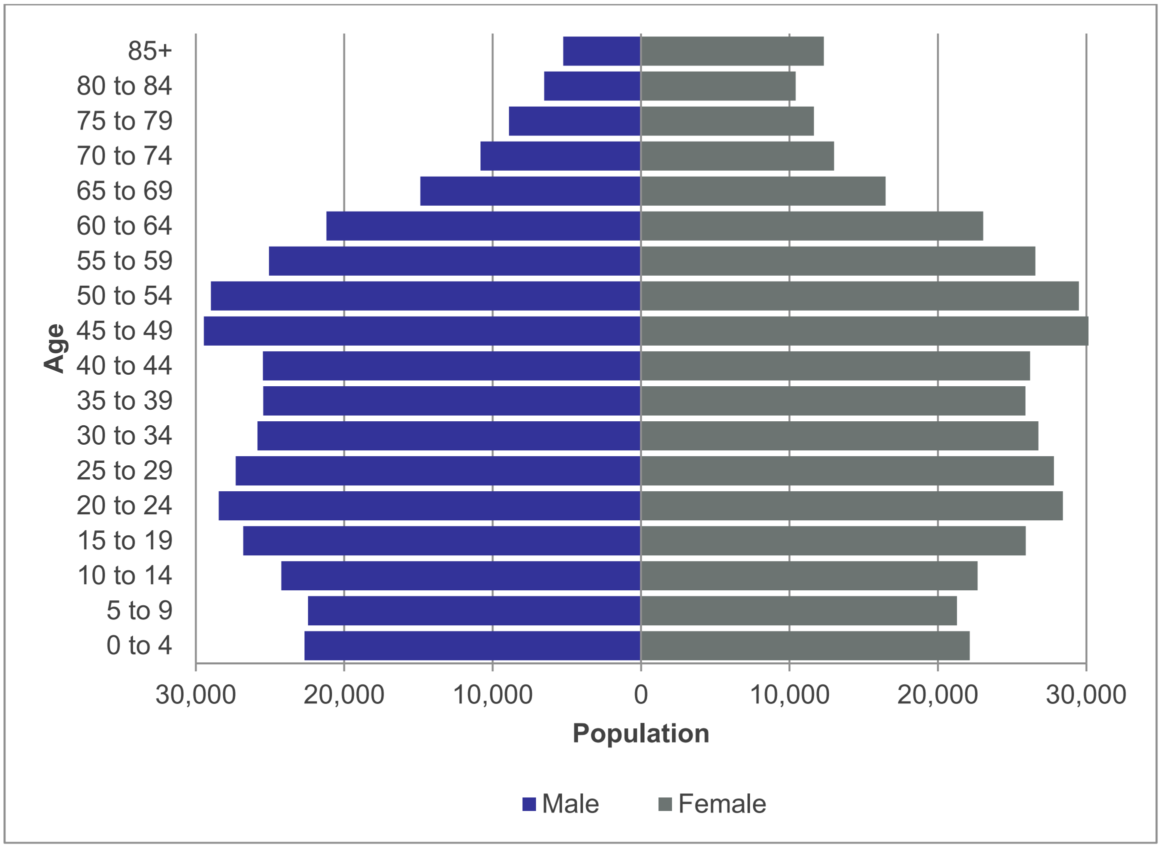


SOURCE: Statistics Canada 2002, 2012

Figure 13-3 Population Change in Communities in the LAA, 1996 to 2011

13.4.2.2 Population by Age and Sex

Figure 13-4 presents a population pyramid, which shows population by age and sex in the LAA. The pyramid is characterized by two bulges, one due to the “baby boom generation” (roughly coinciding with ages 45 to 64), and the second due to the “echo boom generation” (roughly coinciding with ages 15 to 29). As is typical, the population pyramid shows more women than men above the age 70, characteristic of women’s higher average life expectancy.



SOURCE: Statistics Canada 2012

Figure 13-4 Population Pyramid for the LAA

Figure 13-5 shows the population pyramid limited to only the RMs within the LAA. In this figure, there is a noticeable decline in the population for ages 20 to 35. This indicates an out-migration of persons in this age range, perhaps for education, employment or lifestyle opportunities in larger communities, such as the City of Winnipeg.

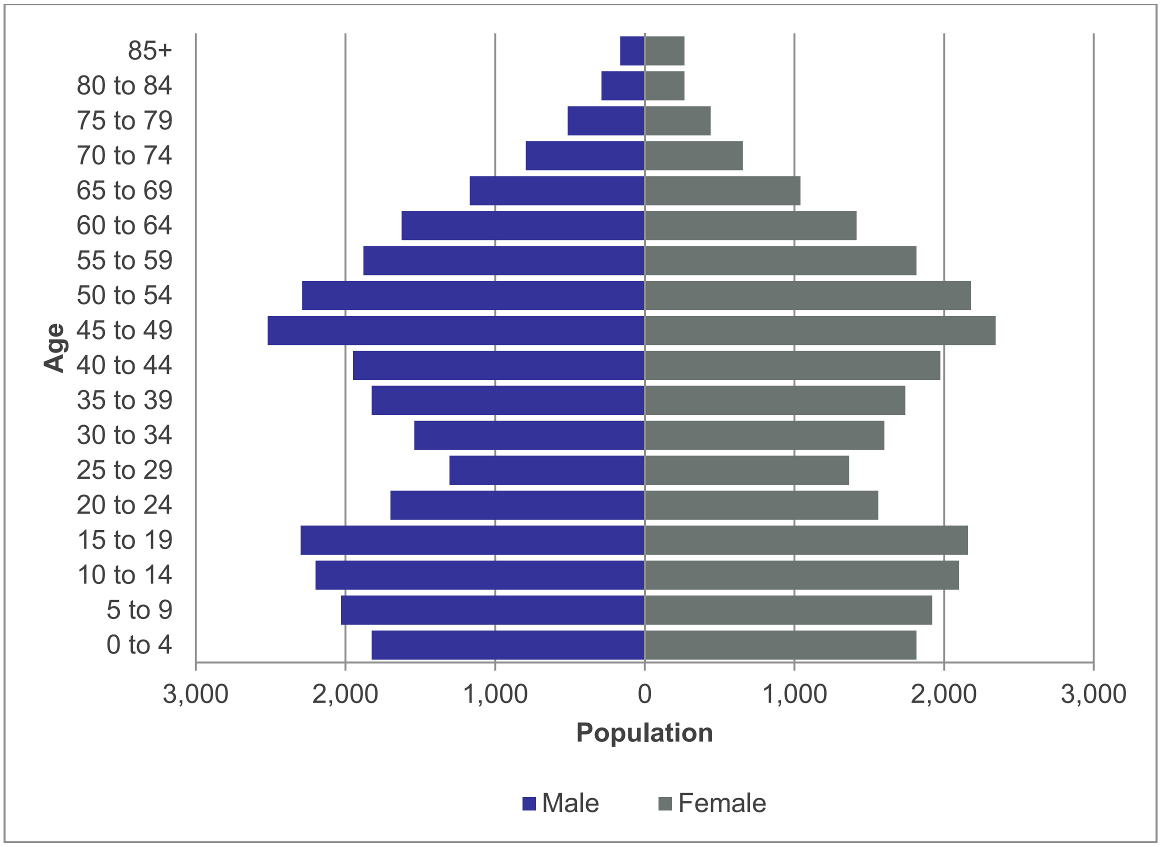


Figure 13-5 Population Pyramid for RMs in the LAA

13.4.2.3 First Nation and Metis Population

Table 13-6 outlines the First Nation and Metis population in the LAA from 2001 to 2011. The RMs of Ritchot, La Broquerie, and Piney and the Town of Ste. Anne had higher percentages of First Nation and Metis people than the provincial average. The City of Steinbach and RM of Springfield had the lowest reported percentages in the LAA.

Table 13-6 First Nation and Metis Population in the LAA, 2001 to 2011

RM/Community	2001 Population	2006 Population	2011 Population	% of Total Pop. (2011)
City of Winnipeg	52,415	63,745	76,055	11.5
RM of Rosser	–	–	–	–
RM of Headingley	–	–	–	–
RM of Macdonald	–	290	485	7.7
RM of Ritchot	440	595	980	17.9
RM of Springfield	600	740	890	6.3
RM of Tache	680	1,025	1,595	15.5
RM of Ste. Anne	430	575	–	12.8*
Town of Ste. Anne	270	–	330	20.3
City of Steinbach	360	530	795	5.9
RM of La Broquerie	315	350	850	16.4
RM of Stuartburn	–	–	–	–
RM of Piney	–	350	–	19.9*
RM of South Cypress	–	–	–	–
Village of Glenboro	–	–	–	–
City of Brandon	3,725	3,995	5,185	11.3
Province of Manitoba	150,040	175,395	195,895	16.2

NOTES:
– Indicates that information is not available for this area. Possible reasons include:
(1) the area does not meet the threshold for 250 or more First Nation and Metis
(2) the area has been suppressed for data quality or confidentiality reasons
(3) the area is comprised of or contains incompletely enumerated Indian reserves or Indian settlements
* 2006 data were used instead because 2011 data were not available
SOURCES: Statistics Canada 2003, 2008, 2013

13.4.3 Temporary Accommodations

Temporary accommodations in the LAA include hotels,[2] resorts, campgrounds, and bed and breakfasts. Based on learnings from past assessments, hotels are the most common temporary accommodation type used by projects like MMTP, and are therefore the focus of this section. Additional existing conditions information about other types of temporary accommodations can be found in the Socio-economics TDR.

Within the LAA, the cities of Winnipeg, Brandon, and Steinbach have numerous hotels and motels. There are approximately 6450 rooms available in Winnipeg, 1400 rooms in Brandon, and about 100 rooms in Steinbach. The RM of Headingley also has about 80 rooms, and other hotels with approximately a few dozen rooms are scattered throughout the rest of the LAA. Vacancy rates are typically low during the summer (June through September), with several hotels fully booked during this period. Vacancy rates are typically higher during the winter and on weekdays (except around holiday breaks). Demand is also high when each of these cities hosts major events. It is noteworthy that the City of Winnipeg will be hosting the 2017 Canada Summer Games in July and August 2017 (Travel Manitoba 2014; Doerksen 2015, pers. comm.; Howdle 2015, pers. comm.; Moir 2015, pers. comm.).

13.4.4 Community Infrastructure and Services

13.4.4.1 Emergency and Protection Services

13.4.4.1.1 Police

Table 13-7 presents information about the Royal Canadian Mounted Police (RCMP) and local police stations in the LAA. The RCMP is the primary provider of police service in the RMs, while the Town of Ste. Anne and the cities of Winnipeg and Brandon are served by municipal police.

RCMP detachments in the LAA serve between 1140 and 2080 population per officer, and have caseloads ranging from 44 to 63 criminal code incidents per police officer. The municipal police detachments in Brandon, Winnipeg, and Ste. Anne have much higher police strengths (*i.e.*, lower populations per police officer), which is common in urban areas. The police strengths in these communities are some of the highest in Canada, surpassing the national average of 518 population per officer.

[2] Includes hotels, motels, inns and other similar accommodation types

However, police strength is only one indicator of community security. Crime statistics are also an important indicator; they are also shown in Table 13-7. Manitoba has higher *Criminal Code* crime rates than the national average, including notably higher violent and property crimes. Urban areas served by municipal police also show consistently higher violent and property crime statistics. By contrast, the RMs served by RCMP detachments have consistently lower violent and property crimes than urban areas, with rates below both the provincial and national averages. Figure 13-6 illustrates these crime rates for each municipal police department and RCMP detachment, compared to Manitoba and Canada.

13.4.4.1.2 Fire

Firefighting services in the LAA are provided by a combination of professional and volunteer firefighters based out of various fire departments (Table 13-8). Fire departments serving RMs typically have 20-30 members, and take between 25 and 100 calls per year. The 25-member Headingley Fire Hall serving the RM of Headingley, and the 60-member Springfield Fire and Rescue Service serving the RM of Springfield, are the two busiest RMs in the LAA, taking 300 and 500 calls per year, respectively. KPIs with fire department representatives, including Headingley and Springfield representatives, indicate that the services available are sufficient to meet the current demand, and that they have capacity available to respond to more calls. The most common Project-related concern was that road works or road closures could affect response times (RM of Headingley 2011b; GCDC 2012; Town of Ste. Anne 2013b; MOFC 2014; RM Macdonald 2014b; RM of Piney 2014; Ash 2014, pers. comm.; Dayment 2014, pers. comm.; Nadeau 2014, pers. comm.; Palmer 2014, pers. comm.; Thompson Ruttle 2014, pers. comm.; Van Osch 2014, pers. comm.).

Many fire departments in the LAA are members of mutual aid fire districts, which are groups of fire departments that have agreements to help each other as needed.

The fire services in Winnipeg and Brandon take on a substantially higher call volume than the smaller fire departments serving the RMs, characteristic of the larger populations they serve. No issues with respect to service capacity were identified during personal communications with these communities' representatives (Dyck 2015, pers. comm.; Bruce-Smith 2015, pers. comm.).

Table 13-7 Police and RCMP for Areas Served in the LAA, 2013

	Winnipeg Police Service	Stonewall RCMP	Headingley RCMP	St. Pierre-Jolys RCMP	Oakbank RCMP	Ste. Anne Police Department	Steinbach RCMP (Urban)	Steinbach RCMP (Rural)	Morris RCMP	Blue Hills RCMP	Brandon Police Service	Manitoba (general)	Canada (general)
Area Served (within the LAA[1])	City of Winnipeg	Rosser (north)	Rosser (south); Macdonald	Ritchot Tache	Springfield	Town of Ste. Anne	City of Steinbach	La Broquerie Ste. Anne Piney	Stuartburn	Village of Glenboro South Cypress	City of Brandon		
Crime Statistics (rate per 100,000 population)													
Violent Criminal Code Violations	1,170	–	617	791	564	1,144	1,150	699	683	454	1,205	1,836	1,092
Property Crime Violations	3,737	–	2,119	1,506	3,078	4,174	3,729	1,419	1,951	1,830	4,380	4,298	3,146
Other Criminal Code Violations	716	–	476	316	401	858	958	370	858	393	1,472	1,833	952
Criminal Code Traffic Violations	95	–	590	210	361	686	274	187	468	565	316	349	388
Drug Violations	140	–	194	110	198	686	479	130	371	215	123	285	310
Other Federal Statutes	9	–	7	34	20	0	48	28	332	25	10	123	80
All Violations[3]	5,909	–	4,003	2,971	4,622	7,547	6,679	2,834	4,663	3,482	7,784	8,725	5,968
Police Strength Statistics													
Population per Police Officer	469	1,168	1,657	2.077	1,132	325	–	2,050	1,139	1,357	513	472	507
Caseload[2] per Police Officer	45	30.7	63.0	58.6	57.8	30.7	–	54.8	45.1	44.0	50.8	15.1	26.3

NOTES:
– Indicates that information is not available
[1] Detachments may also serve communities or RMs outside the LAA; population per police officer accounts for entire area served
[2] Caseload is measured in criminal code incidents per police officer
[3] All Violations is not a summation of the statistics listed above.
SOURCES: RCMP 2014; RM of Headingley 2011a; Town of Stonewall 2012; Town of Ste. Anne 2013a; WPS 2013, 2014; RM of Macdonald 2014a; Van Osch 2014, pers. comm.; RM of Rosser 2014, pers. comm.; RM of Tache 2014, pers. comm., Sainte-Anne Police Department 2014; Statistics Canada 2014a; Statistics Canada 2014b; Brandon Police Service 2015; Ashton 2015, pers. comm.

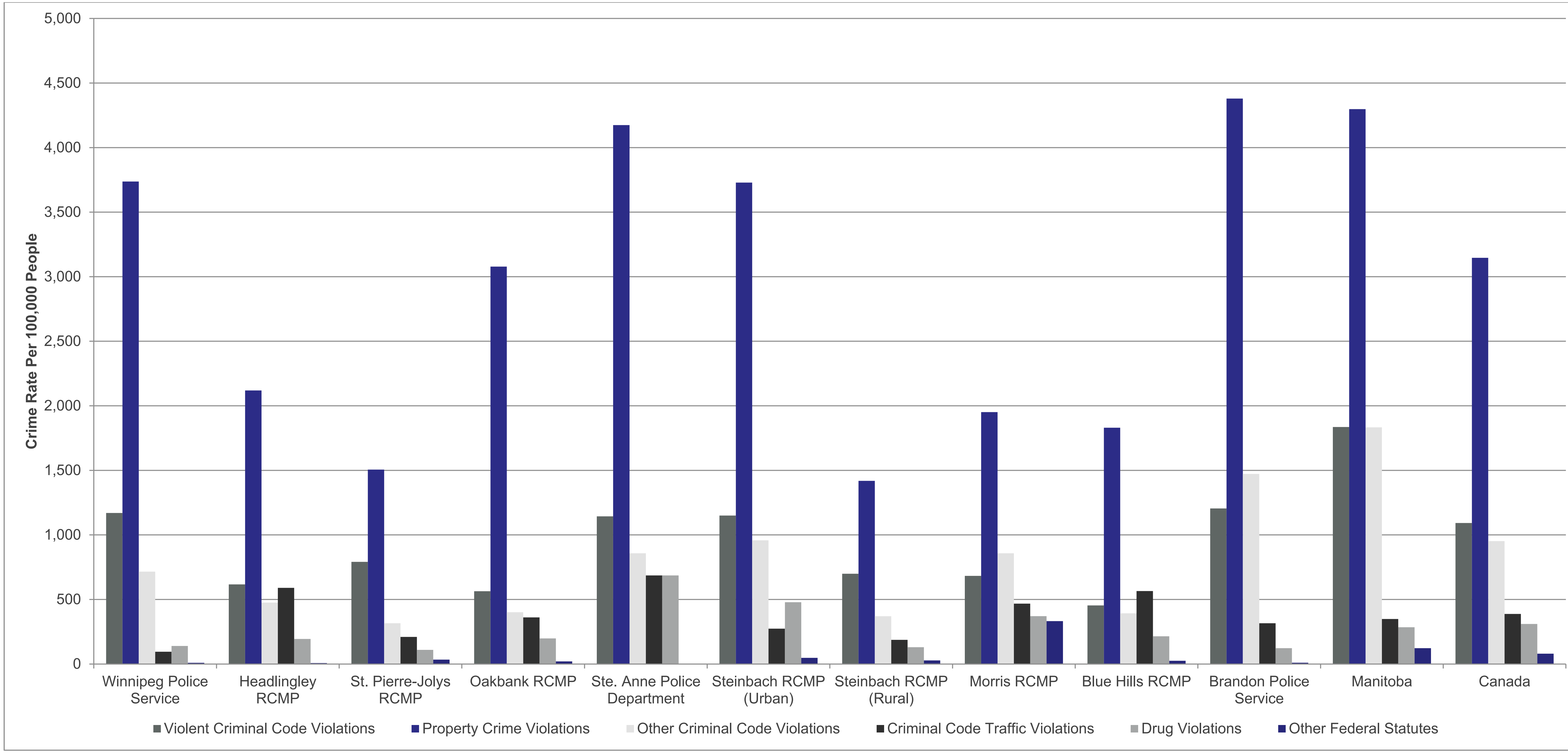


Figure 13-6 Crime Statistics for Police and RCMP in the LAA, 2013

Table 13-8 Fire Services in the LAA

Fire Department	Areas Served (within the LAA[1])	Members	Approx. Calls per Year
Winnipeg Fire Department	City of Winnipeg	916 firefighters	> 100,000
RM of Rosser Fire Department	RM of Rosser	26 members	90-100
Headingley Fire Hall	RM of Headingley	25 volunteers	300
Macdonald Fire Department	RM of Macdonald	23 members	NA
RM of Ritchot Fire Department	RM of Ritchot	28 members	110
Springfield Fire and Rescue Service	RM of Springfield	60 members	500
RM of Tache Fire Department	RM of Tache	36 members	170
Town of Ste. Anne Fire Department	Town of Ste. Anne	26 members	110
La Broquerie Fire Department	RM of La Broquerie RM of Ste. Anne	25 members	80-100
RM of Stuartburn	Included in the Eastman Mutual Aid District, served by Springfield, Ritchot, Piney, La Broquerie		
RM of Piney Fire Department	RM of Piney	40 members	60
Glenboro Fire Department	Village of Glenboro RM of South Cypress	21–25 volunteers	25
Brandon Fire and Emergency Services	City of Brandon	60 members	5,000

NOTES:

1 Departments may also serve communities or RMs outside the LAA; number of members accounts for the entire department

SOURCES: RM Macdonald 2014b; RM of Headingley 2011b; GCDC 2012; BFES 2013; Town of Ste. Anne 2013b; MOFC 2014; RM of Piney 2014; Ash 2014, pers. comm.; Dayment 2014, pers. comm.; Nadeau 2014, pers. comm.; Palmer 2014, pers. comm.; Thompson Ruttle 2014, pers. comm.; Van Osch 2014, pers. comm.; WFPS 2015, Bruce-Smith 2015, pers. comm.; Dyck 2015, pers. comm.; Skjaerlund 2015, pers. comm.

13.4.4.2 Recreation

There are a number of indoor and outdoor recreation facilities within the LAA, including aquatic centres, arenas, golf courses and sports fields. The cities of Winnipeg and Brandon have the widest variety of recreation facilities, including fitness and leisure centres, arenas, numerous ball fields, and other outdoor fitness and recreation facilities (City of Brandon 2007, 2014, 2015a, 2015b; City of Winnipeg 2015a, 2015b; Keystone Centre 2015). The City of Steinbach (2015) also has an aquatic centre and arena, and a number of outdoor recreation facilities. Smaller communities in the LAA have limited indoor or outdoor recreation facilities. Chapter 16: Land and Resource Use provides more detail on outdoor recreation in the LAA, including an assessment of potential effects.

13.4.4.3 Potable Water

RMs and communities in the LAA are served by public drinking water systems, regional water supply systems, and private wells (Table 13-9). Sources of water vary throughout the LAA and include Shoal Lake, Assiniboine River, La Salle River and groundwater sources. Source water is generally processed to remove sludge and impurities. Capacity and usage information was not available for all RMs and communities in the LAA, but those that had information available had capacity to meet the average demand.

Table 13-9 Water Utilities in the LAA

RM/Community	Water Source	Usage (million litres/day)	Capacity (million litres/day)
City of Winnipeg	Shoal Lake	Avg: 173.4	225
RM of Rosser	Cartier Regional Water Cooperative; water treatment	–	–
RM of Headingley	Cartier Regional Water Cooperative	Avg: 0.95 Max: 1.0	2.2
RM of Macdonald	La Salle River	Avg: 1.7 Max: 2.4	–
RM of Ritchot	Groundwater, water treatment	Avg: 1.1–1.2	2.74
RM of Springfield	Groundwater	(a) 0.03 (b) 0.45	(a) 0.107 (b) 0.80
RM of Tache	Groundwater	(a) Avg: 0.41 Max 1.03 (b) Avg: 0.66 Max: 1.48	(a) 0.38 (b) 0.81
RM of Ste. Anne	Private wells	–	–
Town of Ste. Anne	Private wells	–	–
City of Steinbach	Groundwater	Avg: 3.64 Max: 7.27	5.46
RM of La Broquerie	Private wells	–	–
RM of Stuartburn	Private wells	–	–
RM of Piney	Private wells	–	–
RM of South Cypress	Private wells	–	–
Village of Glenboro	Private wells	–	–
City of Brandon	Assiniboine River; groundwater as emergency backup	Avg: 23.15	54

NOTES:
– indicates that information is not available. Note also that private wells are not metered.
(a) and (b) indicate two separately monitored systems
SOURCES: RM of Headingley 2011c; RM of Springfield 2011; MCR 2012a, 2012b, 2012c, 2012d, 2012e, 2012f; RM of Macdonald 2014a, Penn-Co Construction n.d.; Blatz 2015, pers. comm.; Darker 2015, pers. comm.; Elson 2015, pers. comm.; Maynard 2015, pers. comm.; McIntosh 2015, pers. comm.; Muller 2015, pers. comm.; Poersch 2015, pers. comm.; Remillard 2015, pers. comm.; Wells 2015, pers. comm.

13.4.4.4 Wastewater

RMs and communities in the LAA use a variety of wastewater facilities, including treatment plants, lagoons, low-pressure sewage systems or septic tanks (Table 13-10). Capacity and usage information was not available for all RMs and communities in the LAA, but those that had information available had capacity to meet the average demand.

Table 13-10 Wastewater Utilities in the LAA

RM/Community	Facilities	Usage (million litres/day)	Capacity (million litres/day)
City of Winnipeg	Wastewater treatment facility	245	–
RM of Rosser	Sewage lagoon	–	–
RM of Headingley	Low-pressure sewage system and septic tanks; septic tank waste is trucked to Winnipeg wastewater treatment facility	0.83	–
RM of Macdonald	Low-pressure sewage system and septic tanks	–	–
RM of Ritchot	Wastewater stabilization pond	1.15	–
RM of Springfield	Sewage treatment facility; sewage lagoon	1.4	3.0
RM of Tache	Sewage lagoons, septic fields	0.91	1.51
RM of Ste. Anne	Sewage lagoon	–	–
Town of Ste. Anne	Sewage lagoon	–	–
City of Steinbach	Sewage lagoon	5.46	29.5
RM of La Broquerie	Sewage lagoons	0.73	–
RM of Stuartburn	Low-pressure sewage system, sewage lagoon, septic fields	–	39.6
RM of Piney	–	–	–
RM of South Cypress	Septic tanks and fields	–	–
Village of Glenboro	Low-pressure sewage system	0.17	0.38
City of Brandon	–	–	–

NOTES:

– indicates that information is not available.

SOURCES: RM of Headingley 2011c; RM of Springfield 2011; MCR 2012a, 2012b, 2012c, 2012d, 2012e, 2012f; City of Brandon 2014; RM of Macdonald 2014a, 2014b; Penn-Co Construction n.d.; Blatz 2015, pers. comm.; Darker 2015, pers. comm.; Elson 2015, pers. comm.; Maynard 2015, pers. comm.; McIntosh 2015, pers. comm.; Muller 2015, pers. comm.; Poersch 2015, pers. comm.; Remillard 2015, pers. comm.; Wells 2015, pers. comm.

13.4.4.5 Solid Waste

Table 13-11 provides an overview of solid waste facilities available in the LAA. Most household waste, as well as construction, renovation, demolition waste, and industrial non-hazardous waste is disposed of in landfills throughout the region. Hazardous wastes such as pesticide containers, oil and antifreeze, and paint are disposed of at specialized facilities. Household hazardous wastes can be brought to “eco-depots” established throughout the region under Green Manitoba’s Recycling Programs Initiative (Green Manitoba 2015; Province of Manitoba 2015b), while commercial hazardous waste is transported and processed at the Miller Environmental facility located in southern Manitoba.

Many solid waste facilities in the LAA have ample capacity to accept waste. The Brady Road Resource Management Facility, servicing Winnipeg and surrounding areas, has approximately 100 years of available capacity. South of Winnipeg, the Steinbach Landfill and the De Salaberry landfill also have more than 20 and 40 years of available capacity, respectively.

Table 13-11 Waste Disposal Facilities in the LAA

RM/Community	Facility(ies)	Accepts	Current Usage (tonnes/year)	Capacity Notes
City of Winnipeg	Brady Road Resource Management Facility	Household, construction, renovation, demolition, industrial non-hazardous	400,000	100+ years
RM of Rosser	Transfer Station	–	N/A	N/A
RM of Headingley	See City of Winnipeg			
RM of Macdonald	Sanford Starbuck	Household, construction, renovation, demolition, industrial non-hazardous	–	–
RM of Ritchot	RM of Ritchot Disposal Site	Household, construction, renovation, demolition, industrial non-hazardous	70,000	20+ years
RM of Springfield	Transfer Station	Household waste	N/A	N/A
RM of Tache	Monominto Lorette	–	–	–
RM of Ste. Anne	See City of Steinbach			
Town of Ste. Anne	See City of Steinbach			

RM/Community	Facility(ies)	Accepts	Current Usage (tonnes/year)	Capacity Notes
City of Steinbach	Steinbach Landfill	Household, construction, renovation, demolition, industrial non-hazardous	37,775	20+ years
RM of La Broquerie	See City of Steinbach			
RM of Stuartburn	Transfer Station	Household waste	N/A	N/A
RM of Piney	De Salaberry Landfill	Household, construction, renovation, demolition, industrial non-hazardous	–	40+ years
RM of South Cypress	Glenboro Waste Disposal Ground	Household, construction, renovation, demolition, industrial non-hazardous	–	Large site, no plans for expansion, indicates available capacity
Village of Glenboro	See RM of South Cypress			
City of Brandon	–	–	–	–

NOTES:

– indicates that information is not available

N/A indicates that information is not applicable

SOURCES: RM of Headingley 2011c; MCR 2012d, 2012e,2012f; Steinbach 2013; Forrestal 2014; RM of Ste. Anne 2014; MCWR 2014, 2015; Emterra Group 2015; Green Manitoba 2015; Province of Manitoba 2015b; Kalyata 2015, pers. comm.; Maynard 2015, pers. comm.; McKay 2015, pers. comm.; Muller 2015, pers. comm.; Nault 2015, pers. comm.; Tanasichuk 2015, pers. comm.

13.4.5 Road Traffic

The road network in the LAA is owned and maintained by two jurisdictions: Manitoba Infrastructure and Transportation (MIT), operating the provincial highway network; and municipal governments, operating the municipal road network.

13.4.5.1 Provincial Road Network

The provincial highway network in the LAA includes primary routes called Provincial Trunk Highways (PTHs), and secondary routes called Provincial Roads (PRs). PTHs in the province are numbered 1 through 199, and PRs are numbered 199 through 632 (Map 13-2 – Road Network Overview). In general, higher volume roads have four lanes, while lower volume roads have two lanes.

Level of service (LOS) ratings describe how well a road is operating under its current volumes. The ratings are from A to F, with A being the best and F the worst. LOS E describes conditions when demand equals capacity. Table 13-12 describes what each LOS means for two lane or multi-lane highways, as described in the *Transportation Research Board's Highway Capacity Manual*.

Table 13-12 Level of Service Descriptions

LOS	Multi-Lane Highways		Two-Lane Highways	
	Operating Speed (mph)	**Description**	**Operating Speed (mph)**	**Description**
A	60 (no delays)	Highest level of service. Traffic flows freely with little or no restrictions on maneuverability	55+ (no delays)	Highest level of service. Free traffic flow with few restrictions on maneuverability or speed
B	60 (no delays)	Traffic flows freely, but drivers have slightly less freedom to maneuver	50 (no delays)	Stable traffic flow. Speed becoming slightly restricted. Low restriction on maneuverability
C	60 (minimal delays)	Density becomes noticeable with ability to maneuver limited by other vehicles	45 (minimal delays)	Stable traffic flow, but less freedom to select speed or pass
D	57 (minimal delays)	Speed and ability to maneuver is severely restricted by increasing density of vehicles	40 (minimal delays)	Traffic flow becoming unstable. Speeds subject to sudden change. Passing difficult
E	55 (minimal delays)	Unstable traffic flow. Speeds vary greatly and are unpredictable	35 (substantial delays)	Unstable traffic flow. Speeds change quickly and maneuverability is low
F	<55 (substantial delays)	Traffic flow is unstable with brief periods of movement followed by forced stops	- (substantial delays)	Heavily congested traffic. Demand exceeds capacity and speeds vary greatly.

SOURCE: adapted from TRB 2000

Table 13-13 provides a summary of key road segments that are likely to be used by the Project, their estimated current traffic volumes, and levels of service. Most highways in the LAA operate below capacity and at an acceptable LOS (C or better), with the exception of PTH15 which operates at LOS D. Most roads with higher volumes (*e.g.,* PTH 1) are already four lane expressways, while a few (*e.g.,* PTH 15) have undergone intersection improvements. MIT has made intersection improvements at PTH 15/PR 207 and at PTH 15/PTH 101 to alleviate some of the concerns.

Table 13-13 Key Provincial Roads and Traffic Volumes in the LAA

Road or Highway	Highway Control Section	Road Type[1]	Existing Traffic Volume[2] (veh/day)	Existing LOS
PTH1	01001250HA	4 lane divided expressway	11,620	B
PTH1	01001240HA	4 lane divided expressway	18,410	C
PTH2	03002100HU	2 lane arterial	1,420	A
PTH12	01012055HA	4 lane expressway	5,580	C
PTH12	01012030HU	2 lane arterial	680	A
PTH15	01015010HU	2 lane arterial	10,430	D
PR207	01207040HU	2 lane collector (A)	2,120	A
PR221	01221020HU	2 lane collector (A)	1,210	A

NOTES:

[1] According to MIT Policy TP1/98 (MIT 1998), provincial highway classification include:

Expressways – generally multi-lane, divided highways that carry large traffic volumes at high speed limits; connect cities and larger towns; serve industrial, recreational, international, and inter-provincial traffic

Arterials – either two lane or multi-lane highways that carry large volumes at high speed limits; connect major economic regions and centres within the province, industrial concentrations, agricultural areas, major recreation facilities; can be primary or secondary arterials

Collectors – feed traffic from the local road system to the arterials; typically two lane with direct access provided to agricultural land; can be classified as A, B or C depending on volumes

[2] Based on 2012 data

SOURCE: University of Manitoba Transport Information Group 2015

13.4.5.2 Municipal Road Network

Most municipal roads in the RMs are two-lane, gravel surfaced, public roads, with the numbering scheme based on the mile grid system. Most roads are in fair to good condition,. Municipal roads within communities are often paved and named. Most municipalities have limited records of traffic volumes, mainly due to the low volumes (< 200 vehicles per day). Intersection operations are generally not a priority concern at low volume levels. Delays are typically minor (2–3 seconds) which is approximately the time needed to come to a stop. Most municipalities have limited demand or resources for major capital projects. Road construction programs generally include gravel maintenance and drainage structure repair or replacements on an as-needed basis.

13.4.5.3 Road Safety

Collision records for the provincial road network are available through MIT. Collision rate is expressed as collisions per MVK, which is calculated by multiplying the road segment length by the traffic volume. Table 13-14 outlines the collision records for key road segments that are likely to be used by the Project.

Table 13-14 Traffic Collisions on Key Provincial Roads in the LAA

Road or Highway	Highway Control Section	Start (km)	End (km)	Average Collisions/ Year	Collisions/ MVK
PTH1	01001250HA	0.0	7.8	5	0.111
PTH1	01001250HA	7.8	9.9	2	0.155
PTH1	01001250HA	9.9	13.8	2	0.113
PTH1	01001250HA	13.8	17.8	2	0.095
PTH1	01001250HA	17.8	24.8	4	0.141
PTH1	01001240HA	0.0	2.6	8	0.465
PTH2	03002100HU	0.0	17.3	5	0.558
PTH12	01012055HA	0.0	2.1	21	4.749
PTH12	01012030HU	0.0	13.8	7	2.044
PTH12	01012030HU	13.8	36.0	13	2.421
PTH15	01015010HU	0.0	2.0	9	1.234
PR207	01207040HU	0.0	7.4	3	0.597
PR221	01221020HU	2.5	9.5	3	0.970

NOTES:
PTH = Provincial Trunk Highway
PR = Provincial Road
MVK = million vehicle kilometers
SOURCE: Manitoba Infrastructure and Transportation 2015.

Three sections of PTH 12 have the highest collisions rates. Section 01012055 HA has a high volume urban intersection, while all of the historical collisions on the sections of 01012030 HU being collisions with wild animals.

Collision records for the municipal road network are not easily obtained because Manitoba Public Insurance does not keep detailed records of collision location. However, due to the low volumes on most of the municipal roads, the incidence of collisions at any one location is likely low. Based on current trends, wildlife collisions and “run off road” incidents are likely to be the most prevalent collision type.

13.4.6 Transportation and Utility Infrastructure

Manitoba Hydro undertook an extensive transmission line routing process that incorporated feedback from the public and First Nation and Metis engagement processes (Section 13.1.2). The final preferred route avoids many existing transportation and utility infrastructures, thereby minimizing adverse effects, while favouring paralleling opportunities with compatible infrastructure. For example:

- no PTHs or PRs are paralleled
- only one railway (the Greater Winnipeg Water District) is paralleled in two areas, at a distance of about 950 m (average) and 100 m (approx.)
- more than 150 km of existing transmission line corridors are paralleled
- the Piney-Pinecreek Border Airport and Zhoda Airport are 4.0 and 5.1 km away, respectively
- no lagoons or landfills are crossed

Table 13-15 provides a summary of the existing transportation and utility infrastructures crossed or paralleled by the Project, as well as the proximity of nearby aerodromes, lagoons, and landfills. These infrastructures are illustrated in Map 13-3 – Transportation and Utility Infrastructure.

Table 13-15 Transportation and Utility Infrastructure Crossed or Paralleled

Infrastructure	Crossings (number)	Length Paralleled (km)	Average Distance (m)
Transmission Lines			
D12P (Dorsey to Portage South)	1	0	N/A
D14S (Dorsey to St. Leon)	1	21.3	120
D55Y (Dorsey to La Verendrye)	2	26.1	120
D15Y (Dorsey to La Verendrye)	2	26.1	95
D11Y (Dorsey to La Verendrye)	2	26.1	95
Y51L (La Verendrye to Letellier)	1	6.2	85

Infrastructure	Crossings (number)	Length Paralleled (km)	Average Distance (m)
R49R (Ridgeway to Richer South)	1	15.1	930
	2	4.2	50
	0	7.9	80
M602F (Riel to Forbes)[1]	0	23.6	50
Railways			
Canadian National (CN) – Sprague	1	0	N/A
Greater Winnipeg Water District	2	13.2	950
		0.5	100
Canadian Pacific (CP) – Emerson	1	0	N/A
CN – Letellier	1	1.0	300
CP – La Riviere	1	0	N/A
Central Manitoba Railways Inc. Carman	1	0	N/A
CP – Glenboro	1	0	N/A
CN – Rivers	1	0	N/A
CP – Carberry	1	0	N/A
Roads and Highways			
Major[2] PTHs (1, 12, 59, 75)	5[4]	0	N/A
Minor[3] PTHs (2, 3, 89)	3	0	N/A
PRs (200, 201, 206, 207, 210, 221, 241, 300, 302, 330, 334, 427, 501)	13	0	N/A
Pipelines			
Enbridge	2	0	N/A
TransCanada	3	3.0	100
Aqueducts			
Winnipeg Water Aqueduct	2	13.0	900
Floodways			
Red River Floodway	1	17.7	150
Airports/ Airstrips			
Winnipeg/Lyncrest Airport	None	N/A	1,800
Unnamed clearing (E-671271, N-5526000)	None	N/A	420

Infrastructure	Crossings (number)	Length Paralleled (km)	Average Distance (m)
Unnamed clearing (E-683444, N-5495630)	None	N/A	800
Unnamed clearing (E-683780, N-5484608)	None	N/A	1,100
Zhoda Airport	None	N/A	5,100
Piney-Pinecreek Border Airport	None	N/A	4,000
Lagoons			
Oak Bluff Wastewater Treatment Lagoon	None	N/A	290
RM of La Broquerie Wastewater Lagoon	None	N/A	900
Landfills			
Brady Road Resource Management Facility	None	N/A	2,400

NOTES:
1 M602F is currently being realigned to the north of its current position. Paralleling distance is estimated.
2 In this context, Major PTHs are those that have more than 2 lanes or have volumes that may exceed 10,000 vehicles per day.
3 In this context, Minor PTHs are those that have 2 lanes and volumes less than 10,000 vehicles per day.
4 PTH12 is crossed twice.
5 From transmission line
SOURCE: Province of Manitoba 2014c

13.4.6.1 Induced Currents

The Final Preferred Route follows existing transmission lines corridors for approximately 150 km, and new ROWs for the remainder. The Final Preferred Route was modelled as eight unique representative sections, each with different combinations of the Project transmission line and other existing transmission lines as follows:

- Section A (Dorsey to Laverendrye Corner). This existing ROW contains four 230 kV transmission lines (D55Y, D14S, D15Y and D11Y) constructed on two separate structures.
- Section B (Laverendrye Corner to Laverendrye). This existing ROW contains three 230 kV transmission lines (D55Y, D15Y, D11Y) constructed on two separate structures.
- Section C (Laverendrye to South Loop). This existing ROW contains one existing 230 kV transmission lines (Y51L) and a second structure with one 115 kV line and one 66 kV line on it. It will also contain the proposed St. Vital Transmission Complex, consisting of a 230 kV line (Y36V) with its own structure.
- Section D (South Loop). This existing ROW will contain a proposed 230 kV transmission line (Y36V).

- Section E (Proposed D604I Line Only). There are no existing transmission lines on this section.
- Section F (East of Riel Station). This section contains a single existing 500 kV transmission line (M602F). In the future, a second 500 kV transmission line (Bipole III) will be constructed along this section.
- Section G (East of Riel Station, Beyond Bipole III). This section is the same as Section F but will not contain Bipole III.
- Section H (Alongside R49R). For much of this section, there are no existing transmission lines. Approximately 8 km of this section, near the Cottonwood and Oakwood Golf Courses, contains an existing 230 kV transmission line (R49R). There are no existing transmission lines for the remainder of this section.

The existing maximum induced current values (mA) were modeled for each of the eight representative sections, for both roadway conductor heights and farmland conductor heights (Table 13-16).

Table 13-16 Existing Maximum Induced Current Values (mA) on ROW

Section[1]	Induced Currents on Roadways[2] (mA)	Induced Currents on Farmland[3] (mA)
A	2.4	1.7
B	1.9	1.7
C	0.7[4]	0.6[4]
D	0.6[4]	0.5[4]
E	N/A	N/A
F	3.1	5.6
G	3.1	5.6
H	0.6	0.5

NOTES:
1 Sections are the same as those described in Section 13.4.7.2
2 Induced currents on roadway crossings are computed for roadway conductor height specifications and a tractor-trailer (23.0 m long, 2.6 m wide, 4.15 m tall) oriented perpendicular to the transmission lines
3 Induced currents on farmland equipment are computed or farmland conductor height specifications and a John Deere S680 (8.5 m long, 3.7 m wide, 3.8 m tall) oriented parallel to the transmission lines
4 Sections C and D were modeled with line Y36V (the future St. Vital Transmission Complex) included. Actual induced currents with only existing transmission lines and the Project will likely be slightly lower
SOURCE: Exponent 2015

13.4.7 Communications and Radio Signals

13.4.7.1 Communications Infrastructure

There are approximately 81 communication and two radio telescope (parabolic antenna) towers located throughout the LAA, particularly within the City of Winnipeg and the RMs of Rosser, Headingley, Macdonald, Ritchot, Springfield, and Piney (see Table 13-17, Map 13-4 – Communications Infrastructure). No communication or radio telescope towers are located within the PDA.

Table 13-17 Communication and Radio Towers within the LAA

Rural Municipality or Community	Communication Tower	Radio Telescope (Parabolic Antenna)
City Winnipeg	31	0
Rosser	14	1
Headingley	4	0
Macdonald	11	0
Ritchot	7	0
Springfield	4	1
Tache	1	0
Ste. Anne	1	0
City of Steinbach	2	0
Stuartburn	1	0
Piney	5	0
TOTAL	81	2

SOURCE: Government of Canada, Natural Resources Canada, Earth Sciences Sector, Canada Centre for Mapping and Earth Observation, 1969-1996 (CanVec+ version 2015/07/29).

13.4.7.2 Radio Noise

Table 13-18 outlines the existing levels of radio noise modeled for each of the eight representative sections of the Final Preferred Route (see Section 13.4.6.1 for a description of each). The acceptable level of radio noise (Section 13.3.2.4) is 60 dBµV/m at a distance of 15 m beyond the conductor. The existing radio noise does not exceed this threshold along any of the eight representative sections.

Table 13-18 Existing Radio Noise (dBµV/m) along the Final Preferred Route

Section	ROW edge (-)	15 m beyond conductor (-)	Max on ROW	15 m beyond conductor (+)	ROW edge (+)
A	28	41	47	41	16
B	37	41	48	40	22
C	32	30	51	36	25
D	25	36	44	36	15
E	*	*	*	*	*
F	17	48	60	48	38
G	17	48	60	48	38
H	21	44	53	44	46

NOTES:
-/+ indicates either side of the conductor
* indicates a negligible level of existing radio noise
SOURCE: Exponent 2015

13.5 Assessment of Project Effects on Infrastructure and Services

The Project has the potential to increase demand for, or interfere with, infrastructure and services. The Project activities and workforce will require the use of temporary accommodations, emergency[3] and protection services, municipal utilities, and roads. This use may reduce the available capacity for local residents, or result in a decreased quality of service provided. The construction of the Project and its presence during operation may interfere with existing or future transportation, utility or communication infrastructure. The Project may require the relocation of underground infrastructure, temporary service interruptions during construction, or other effects related to radio noise or induction.

13.5.1 Project Interactions with Infrastructure and Services

Table 13-19 identifies physical activities and components that might interact with infrastructure and services, for each potential effect.

[3] Ambulance and emergency health services are discussed in Chapter 19 Community Health and Well-being.

Table 13-19 Potential Project-Environmental Interactions and Effects on Infrastructure and Services

Project Components and Physical Activities	Potential Effects: Change in accommodations	Change in community infrastructure and services	Change in road traffic	Interference with transportation and utility infrastructure	Interference with communication and radio signals
Transmission Line Construction Activities					
Mobilizing (staff and equipment)	✓	✓	✓	—	—
Access Route and Bypass Trail Development	✓	✓	—	—	—
Right-of-way Clearing/Geotechnical Investigation	✓	✓	—	—	—
Marshalling Yards, Borrow Sites, Temporary Camp Setup	✓	✓	✓	—	—
Transmission Tower Construction and Conductor Stringing	✓	✓	—	✓	—
Demobilization	✓	✓	✓	—	—
Transmission Line Operations/Maintenance					
Transmission Line Operation/Presence	—	—	—	✓	✓
Inspection Patrols	—	—	—	—	—
Vegetation Management (tree control)	—	—	—	—	—
Station Construction					
Station Site Preparation	✓	✓	✓	—	—
Electrical Equipment Installation	✓	✓	✓	—	—
Station Operations/Maintenance					
Station Operation/Presence	—	—	—	—	—
Vegetation Management (weed control)	—	—	—	—	—

NOTES:
✓ = Potential interactions that might cause an effect.
– = Interactions between the Project and the VC are not expected.

Construction activities have an associated workforce, and therefore can contribute to the two identified population-driven effects: change in accommodations and change in community infrastructure and services. Project construction activities may also use municipal services such as water and solid waste disposal; therefore, they have been identified as having a potential interaction with community infrastructure and services.

Because the operations/maintenance workforce will be small (about 3-5 workers) and likely residing in the LAA, population-driven demands on accommodations, transportation infrastructure or other community infrastructure and services will be minimal during this phase. Therefore, these interactions are not assessed further.

For the purposes of this assessment, the movement of equipment, materials, workers and wastes during the construction phase is assumed to be included under the following components and physical activities for transmission line construction: mobilization (staff and equipment); marshalling yards, borrow sites, temporary camp setup; and demobilization. Similarly, these movements are assumed to be included under the following components and physical activities for station construction: station site preparation and electrical equipment installation. These activities will result in a change in road traffic, and may cause congestion. Road traffic associated with any other activities is assumed to be included in the activities listed above.

Interference with transportation and utility infrastructure may result during transmission tower construction and conductor stringing in the construction phase, or due to the transmission line operation/presence in the operation phase. No interactions are expected between transportation and utility infrastructure and any other construction or operation activities.

Potential Interference with communications and radio signals would only occur when the transmission line is in operation, and therefore only the transmission line operation/presence activities has been identified as having a potential interaction.

13.5.2 Assessment of Change in Accommodations

13.5.2.1 Analytical Methods

The Project workforce may increase demand for temporary accommodations, which may result in a reduction in accommodations available for others (*e.g.*, tourists) staying in the area. The assessment of change in accommodations compares the availability of temporary accommodations (*i.e.,* hotels/motel rooms) within a reasonable driving distance of the Project (approximately one hour by car) with the potential demands of the workforce.

13.5.2.2 Pathways for Change in Accommodations

13.5.2.2.1 Construction

The Project workforce will be spread across the various components, working on the Existing Corridor, the New ROW, Riel Converter Station, Dorsey Converter Station and Glenboro South Station. The peak combined number of workers is expected to be approximately 175, occurring in Q2 2018, during the construction of the Existing Transmission Corridor, and upgrades to Dorsey and Riel. The peak average monthly number of workers is for the New ROW is expected to be approximately 100, occurring in 2019, while the peak workforce for the Glenboro South Station upgrades will be approximately 30, occurring in 2Q 2019.

While there is a wide range of temporary accommodations available in the urban centres of Winnipeg and Brandon, there are limited accommodations available in smaller communities such as Steinbach and Glenboro, and even fewer south of Steinbach to the Minnesota border. Depending on the number of workers requiring temporary accommodations, and timing such demand, there is the potential that the accommodations available for others staying in the area (*e.g.*, tourists) will be reduced.

13.5.2.3 Mitigation for Change in Accommodations

The following mitigation measures will be implemented to reduce demands on temporary accommodations:

- Workers will be hired locally or regionally, whenever possible.
- Mobile construction camp(s) will be used to house workers where temporary accommodations within communities are not available.
- As part of its Public Engagement Process and First Nation and Metis Engagement Process, Manitoba Hydro will continue to engage with and share Project information with local governments, service providers, and/or businesses.

13.5.2.4 Characterization of Residual Change in Accommodations

13.5.2.4.1 Construction

While efforts will be made to hire workers locally or regionally, it is expected that most construction workers will be recruited from outside the LAA. Locally hired workers will likely reside at their homes during construction, where commute times are reasonable and practical. Workers coming from outside the LAA or local and regional workers residing far from the Project site will stay in temporary accommodations (*i.e.,* hotels/motels) in local communities or in a mobile construction camp established for the Project.

The Existing Transmission Corridor, the Riel Converter Station and the Dorsey Converter Station are within commuter distance (about one hour by car) of Winnipeg, as are sections of the New ROW north of Steinbach. Therefore, non-residents working on those Project components will likely be lodged within the accommodations available in Winnipeg. Non-resident workers working on the Glenboro South Station will most likely be accommodated in Brandon, approximately 80 km away (one hour by car). As described in Section 13.4.3, Winnipeg and Brandon have ample capacity to accommodate this demand, and therefore residual effects on temporary accommodations within these communities will be negligible.

For the portion of the New ROW adjacent to and south of Steinbach (*i.e.*, through the RMs of La Broquerie, Stuartburn and Piney), there could be up to 100 workers during the peak construction period requiring temporary accommodations. However, there are only about 100 rooms available in Steinbach and at most a few dozen rooms elsewhere in the southern RMs. A few workers may be housed in these accommodations for short periods, but most of the non-resident workforce for this portion of the New ROW could be housed in a temporary mobile construction camp. Therefore, the magnitude of residual effects on temporary accommodations in Steinbach, and the RMs of La Broquerie, Stuartburn, and Piney will be low.

The residual change in temporary accommodations is anticipated to be adverse because the Project may reduce the number of units available for other users. However, the use of such facilities is also an economic benefit to the hospitality industry (see also Chapter 14 Employment and Economy). The peak demands are anticipated to occur in the “off-season when there are higher overall vacancy rates to accommodate workers. Because extensive temporary accommodations in the larger population centres (*e.g.,* Winnipeg, Brandon) will absorb much of the Project demand, the socio-economic context is considered moderate to high resilience for these areas but low resilience for Steinbach and the southern RMs. Effects extend throughout the LAA, will be continuous, short-term and reversible, and will extend only throughout the construction phase.

13.5.3 Assessment of Change in Community Infrastructure and Services

13.5.3.1 Analytical Methods

The Project workforce and activities may increase the demand for community infrastructure and services, which may result in a reduction in available capacity or quality of service for local residents. Change in community infrastructure and services is assessed by estimating the anticipated incremental demand and use of these infrastructure and services beyond existing levels and comparing with available capacity.

13.5.3.2 Pathways for Change in Community Infrastructure and Services

13.5.3.2.1 Construction

EMERGENCY AND PROTECTION SERVICES

The Project may increase the demand for emergency and protection services. This demand could be generated by motor vehicle collisions due to increased traffic on the roads (Section 13.5.4 provides more detail on road traffic), fire, or incidents requiring police enforcement. This demand may reduce the available capacity of the local emergency and protection service providers to respond to other cases.

RECREATION

If the Project workforce has access to community recreation facilities while staying in local communities, then there could be an increased demand for such facilities. However, due to the relatively small size of the workforce and the anticipated work schedules, adverse effects on recreation facilities are anticipated to be negligible even in the absence of mitigation measures. Effects of the Project on recreation facilities are therefore not assessed further.

WATER, WASTEWATER, SOLID WASTE

Various construction activities will generate steel, aluminum, copper, and ceramic waste, which will be recycled at approved local facilities. The mobile construction camp will also require the use of water, wastewater, and solid waste services, which will also be trucked in and out, to and from local facilities. This Project demand may reduce the available capacity of local water, wastewater, and solid waste facilities for local users.

13.5.3.3 Mitigation for Change in Community Infrastructure and Services

The following mitigation measures will be implemented to reduce adverse effects on community infrastructure and services:

- As part of its Public and First Nation and Metis engagement processes, Manitoba Hydro will continue to engage with and share Project information with local governments, service providers, and/or businesses.
- An Emergency Response Plan (ERP) will be developed. As part of the development and implementation of the ERP, Manitoba Hydro will work with local emergency responders to maintain appropriate emergency response times.

- Project personnel will be made aware of the ERP and designated staff will receive ERP training. Among other elements, the plan will address handling and storage of materials, driving safety, animal encounters, emergency response communications, spill response, personnel injury response, and vehicle collisions.
- Potable water will typically be transported to site and/or camp(s) by truck, and will come from an approved water source.
- Subject to suitable soil conditions and drainage, and compliance with *The Public Health Act* and/or *The Environment Act* (Province of Manitoba 1996; 2015a), wastewater will be transported to an appropriate wastewater facility.
- Manitoba Hydro and its contractors will utilize Waste and Recycling Management Plans to manage waste and recycling in accordance with *The Public Health Act* and *The Dangerous Goods Handling and Transportation Act.* This plan will outline policies related to reducing the amount of soild waste generated; facilitating recycling wherever possible; and storing, transporting, and disposing of solid wastes at appropriate facilities.

13.5.3.4 Characterization of Residual Change in Community Infrastructure and Services

13.5.3.4.1 Construction

EMERGENCY AND PROTECTION SERVICES

While workers are staying in Winnipeg and Brandon, there will only be small incremental demands on the local fire and police services because of the relatively small workforce sizes. Compliance with the Worker Code of Conduct will help mitigate the demands on local fire and police services while the New ROW workers (at most 100) are staying in camp in the RMs of Ste. Anne, Stuartburn or Piney.

Potential Project demands on emergency and protection services will be reduced with the implementation of on-site emergency and fire services and the ERP. On-site services will be able to deal with typical day-to-day needs, and because of the relatively small workforce size, incidents that require a higher level of response (*i.e.,* those that would require use of community emergency and protection services) are expected to be infrequent. Table 13-20 provides an overview of the police/RCMP detachments and fire departments that would most likely service each Project component. Other police/RCMP detachments and fire departments may be used if there are incidents outside the jurisdictions listed in Table 13-20 (*e.g.*, on the road between the Glenboro South Station and Brandon), but such incidents are expected to be much less likely and less frequent.

Table 13-20 Fire and Police Services by Project Component

Project Component	Police/RCMP Detachment	Fire Department
Existing Corridor	Headingley RCMP Oakbank RCMP St. Pierre-Jolys RCMP Winnipeg Police Service	Headingley Fire Hall Macdonald Fire Department Winnipeg Fire Department RM of Ritchot Fire Department Springfield Fire and Rescue Service
New ROW	Oakbank RCMP St. Pierre-Jolys RCMP Steinbach RCMP Morris RCMP Sprague RCMP	Springfield Fire and Rescue Service RM of Tache Fire Department La Broquerie Fire Department Eastman Mutual Aid District RM of Piney Fire Department
Dorsey Converter Station	Stonewall RCMP	RM of Rosser Fire Department
Riel Converter Station	Oakbank RCMP	Springfield Fire and Rescue
Glenboro South Station	Blue Hills RCMP	Glenboro Fire Department

There were no existing capacity issues for fire or police services in any of the detachments or departments; each reported to be functioning well under existing demands (Section 13.4.4.1). Given the small workforce sizes, mitigation measures applied, and short-term duration of each Project component, the available capacity is sufficient to meet the additional Project demands.

WATER, WASTEWATER, SOLID WASTE

Demand for potable water at the mobile construction camp is anticipated to be 200–250 L/day per person (PRGT 2014). As a conservative estimate, if it was assumed that the entire 100-person peak New ROW workforce resides in camp at the same time, this is equivalent to 25,000 L/day.

While the final water sources will be determined by the construction contractor, it is known that water will be sourced from utilities where capacity is available. As outlined in Section 13.4.4.3, ample available capacity exists in communities in the LAA. Comparing the average existing demand with the total capacity, this amounts to 51, 1.8, and 30 million L/day of available capacity in Winnipeg, Steinbach, and Brandon, respectively, in addition to a few million L/day of combined known[4] available capacity in the RMs. This available capacity is more than enough to meet the peak Project demand for water.

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[4] As stated in Section 13.3.1.4, where existing information on the capacity of water utilities was not available, it is assumed that no additional capacity exists.

In the cases where wastewater will be disposed of onsite, no additional demands will be placed on wastewater infrastructure. Should wastewater be transported offsite to an approved wastewater disposal facility, demand for wastewater disposal from the camp could be up to 25,000 L/day (PRGT 2014). Similar to the water sources, the final wastewater disposal sites will be determined by the construction contractor based on available capacity. As outlined in Section 13.4.4.4, ample available capacity exists in the LAA. Comparing the current use with the total capacity, there are more than 2 million L/day of available wastewater capacity in the RMs and 0.21 L/day in the Village of Glenboro[5]. This available capacity is more than enough to meet the peak Project demand for wastewater treatment.

Project activities are expected to generate the following volumes of waste for recycling (The Pembina Institute 2015):

- 6,363 tonnes of steel
- 3,838 tonnes of aluminum
- 149 tonnes of copper

Project activities are also anticipated to generate 550 tonnes of ceramics which will be disposed of at approved facilities. The peak 100-person workforce staying at the mobile construction camp would also generate an estimated additional 15–20 m^3 of non-compacted, bagged general waste, cardboard and other packaging materials; about 500 recyclable cans and bottles; and about 40–50 kg of hazardous waste per week (PRGT 2014).

As outlined in Section 13.4.4.5, ample capacity exists in the LAA, including 100+ years of available capacity at the Brady Road Resource Management Facility near Winnipeg, 20+ years at the Steinbach Landfill, and 40+ years at the De Salaberry Landfill serving the RM of Piney. These facilities have sufficient capacity to easily handle this estimated volume of waste.

SUMMARY

While the Project will place additional demands on community infrastructure and services, with the implementation of mitigation measures, residual effects are anticipated to be of low magnitude overall. Incremental demands placed on emergency and protection services by the Project workforce will be small because workforce sizes will be comparatively small. Demands related to Project activities are expected to be infrequent as a result of implementation of mitigation measures. Existing services have more than enough available capacity to meet Project demands. Similarly, Project demands on water, wastewater and solid waste infrastructure are well within available capacities in the LAA. Quality of service provided to local residents is not

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[5] It is also expected that there is additional capacity available in other RMs, and in the communities of Winnipeg and Brandon. However, this information was not available at the time of writing and, as a conservative assumption, it is assumed that no capacity exists.

expected to be affected by the Project. Residual effects will generally occur in a medium to high resilience socio-economic context depending on location within the LAA because the community infrastructure and services are able to accommodate some change in demand. Larger population centres (*e.g.*, Winnipeg) have higher resilience due to the size and total capacity of their fire and police departments and utility infrastructures. Residual effects are anticipated to occur throughout the LAA, and will move with the workforce and Project activities. Adverse effects will be continuous, short-term and reversible, and will occur only during the construction phase.

13.5.4 Assessment of Change in Road Traffic

13.5.4.1 Analytical Methods

The assessment of change in road traffic is based largely on the Manitoba-Minnesota Transmission Project Traffic Impact Study (Stantec 2015). The analysis compares the existing road traffic and available capacity with the potential road traffic generated by the Project. Road safety is analyzed by predicting the number of collisions that could result from Project traffic based on historical collision rates.

13.5.4.2 Pathways for Change in Road Traffic

13.5.4.2.1 Construction

Project construction activities will involve the movement of workers, materials, and equipment to and from the Project site. Materials such as steel, copper, concrete, and aluminum will be required for the Dorsey and Riel converter stations and the Glenboro South Station. Materials such as concrete, steel, conductors, insulators, and shield wire will be required for the transmission line construction, as well as fuel (diesel) for heavy equipment. Depending on the point of origin, materials could be shipped from sources within Canada or overseas, then transported by rail to southern Manitoba. From there, materials will be transported by truck to a marshalling yard near the Riel Converter Station, and on to their final destinations along the Final Preferred Route. Some materials may also come directly from suppliers and manufacturers within Manitoba or neighbouring provinces.

Traffic volumes will also be generated by workers travelling to and from the Project site, and by other construction support services. It is anticipated that most of the workforce for the Existing Corridor and the Riel and Dorsey converter stations will reside in and around Winnipeg, while the Glenboro South workforce will reside in and around Brandon (Section 13.5.2). For portions of the New ROW adjacent to and south of Steinbach (*i.e.*, through the RMs of La Broquerie, Stuartburn and Piney), workers will likely reside in either Steinbach or in temporary accommodations somewhere between Piney and Zhoda.

This increase in traffic due to the Project may result in congestion on roads, with a decreased level of service for users or road safety implications. Heavy truck traffic may also increase wear-and-tear on roads, potentially resulting in the need for additional road maintenance.

13.5.4.3 Mitigation for Change in Road Traffic

The following mitigation measures will be implemented to reduce adverse road traffic effects:

- Group transportation (*e.g.,* buses, crew vans) will be utilized to transport workers between camp(s) and the worksites, and between temporary accommodations in nearby communities and the worksites.
- Manitoba Hydro will work with local authorities to address any damages to roads that occur as a result of the Project.
- All materials transported by truck will be compliant with any weight restrictions or permits, Spring Road Restrictions (SRRs), or geometric constraints set out by MIT or municipal governments.
- Vehicles transporting dangerous goods or hazardous products will display required placards and labeling in accordance with provincial legislation and Manitoba Hydro guidelines.

13.5.4.4 Characterization of Residual Change in Road Traffic

13.5.4.4.1 Construction

Table 13-21 shows the anticipated increase in traffic volumes on the highway segments most likely to be used for each Project component (also see Map 13-2 – Road Network Overview).

The estimated increase in traffic volumes due to the Project is of low magnitude because the predicted increase in traffic volume is within the available capacity and will not affect the level of service provided. With the exception of PTH15, each of the highway sections operates at an acceptable level of service (C or better), and while users of lower volume roads may notice an increase in activity, Project traffic volumes are small and not expected to affect the level of service provided. PTH15 near the Red River Floodway crossing between PTH 101 and PR 207, already operates at LOS D before the addition of Project traffic. However, Project traffic is expected to increase the volume on this section by only 1.2%, and is not likely to exacerbate existing conditions. In addition, MIT has made intersection improvements at PTH 15/PR 207 and at PTH 15/PTH 101 in an effort to alleviate capacity concerns to some degree.

Table 13-21 Anticipated Change in Traffic Volumes Due to the Project

Road or Highway	Highway Control Section	Existing Traffic Volume[1] (LOS[2])	Future Traffic Volume[3]	Project Traffic Volume (veh/day)	Future + Project Traffic Volume	% Change due to the Project
Dorsey Converter Station						
PR221	01221020HU	1,210 (A)	1,271	80	1,356	6.0
Riel Converter Station						
PR207	01207040HU	2,120 (A)	2,226	130	2,356	5.5
PTH15	01015010HU	10,430 (D)	10,952	130	11,082	1.2
PTH1	01001240HA/HB	18,410 (C)	19,330	130	19,460	0.7
Glenboro South Station						
PTH2	03002100HU	1,420 (A)	1,491	62	1,553	4.0
Transmission Line						
PTH1	01001250HA/HB	11,620 (B)	12,200	175	12,375	1.4
PTH12	01012055HU	5,580 (C)	5,859	175	6,034	2.8
PTH12	01012030HU	680 (A)	714	175	889	19.6

NOTES:
[1] 2012 traffic volumes
[2] See Section 13.4.5 for explanation
[3] Based on an assumed 1% growth rate for 5 years

Table 13-22 shows the anticipated number of collisions that could be caused by the increase in Project traffic, based on historical collision rates[6].

[6] The number of collisions due to the Project is calculated by multiplying the existing average number of collisions per year times % increase in traffic volume. This calculation assumes that Project traffic drives the entire length of the control section.

Table 13-22 Anticipated Change in Traffic Collisions Due to the Project

Road or Highway	Highway Control Section	Existing Traffic Volume[1]	Future + Project Traffic Volume	% Change in Volume due to the Project	Existing Average Collisions / Year	Predicted Project-related collisions / Year
Dorsey Converter Station						
PR221	01221020HU	1,210	1,356	6.0	3	0.18
Riel Converter Station						
PR207	01207040HU	2,120	2,356	5.5	3	0.16
PTH15	01015010HU	10,430	11,082	1.2	9	0.11
PTH1	01001240HA	18,410	19,460	0.7	8	0.05
Glenboro South Station						
PTH2	03002100HU	1,420)	1,553	4.0	5	0.20
Transmission Line						
PTH1	01001250HA	11,620	12,375	1.4	5[2]	0.07
PTH12	01012055HA	5,580	6,034	2.8	21	0.59
PTH12	01012030HU	680	889	19.6	13[3]	2.55

NOTES:
1 2012 traffic volumes
2 The 0 to 7.8 km segment of 01001250 HA was used as a conservative assumption since it has the highest collision frequency (see Table 13-14)
3 Similarly to Note 2, the 13.8 to 36.0 km segment of 01012030 HU was used
MVK = million vehicle kilometers

The anticipated number of collisions due to the Project represents a worst case scenario based on the following conservative assumptions:

- The Project-related increase in traffic volume lasts the entire year. This will not be the case since the peak traffic volume is anticipated to last at most a few months in each location
- Collisions are linearly related to exposure (million vehicle kilometers traveled). Recent research in traffic safety (de Leur and Sayed 2008) suggests that this relationship is non-linear and the collision rate (collisions / MVK) decreases as exposure (MVK) increases. This means that the estimated number of collisions due to the Project is likely overestimated.
- The above prediction does not take in to account mitigation measures discussed in the sub-section above to reduce the likelihood of vehicle collisions.

It is therefore likely that the actual number of Project-related collisions will be less than the calculated numbers in Table 13-22 above. Because of the short-term nature of Project traffic, it is likely that there will be no Project-related collisions on any of the road sections for the stations or the transmission line. Section 01012030 HU of PTH 12 had a high historical collision rate, all of which were collisions with wild animals. Most commercial trucking firms have safety programs that identify inherent risks and train drivers to mitigate them. This will reduce the risk of delivery vehicles being in this type of collision.

Project-related damage to provincial or municipal roads will be mitigated by working with provincial and local authorities.

Residual effects will occur as multiple irregular events, and will be limited to the LAA, short-term in duration, and reversible after construction is complete. Adverse effects occur in a moderate to high resilience context because the road network has available capacity to accommodate the increased volume, except PTH 15 and PTH 12, which are characterized as having low resilience due to a poor LOS and high collision rate, respectively.

13.5.5 Assessment of Interference with Transportation and Utility Infrastructure

13.5.5.1 Analytical Methods

The construction or presence of the transmission line and towers has the potential to interfere with overlapping or nearby transportation and utility infrastructure. This potential interference is assessed by examining the proximity, number of crossings or length paralleled by the Project.

Electric fields generated by the Project also have the potential to cause induction effects on pipelines, road vehicles, or farm equipment paralleling in close proximity. The assessment of potential induction effects is based largely on the Manitoba-Minnesota Transmission Project Electric Field, Magnetic Field, Audible Noise, and Radio Noise Calculations (Exponent 2015). The potential induction effects are assessed by modeling the induced currents, and comparing the results to CSA standards.

13.5.5.2 Pathways for Interference with Transportation and Utility Infrastructure

As outlined in Chapter 5: Transmission Line Routing and Section 13.1.2, transmission line routing considered a number of factors, including existing land uses, feedback provided by stakeholder groups, and the presence of existing infrastructure. Based on these considerations, the Final Preferred Route has the following characteristics:

- It does not parallel any PTHs or PRs
- One railway (Greater Winnipeg Water District) is paralleled, but separated by a distance of about 950 m for an approximate length of 13.2 km and separated by an approximate distance of100 m for a length of approximately 500 m.
- More than 150 km of existing transmission line corridors are paralleled.

- It is located 4.0 and 5.1 km away from the Piney-Pinecreek Border Airport and the Zhoda Airport, respectively.
- It does not directly overlap with any lagoons or landfills.

The Final Preferred Route pathways for interference with transportation and utility infrastructure (Section 13.4.6) have been limited to the following:

- 10 railway crossings and 2 close parallelings (0.5 km at an approximate separate distance of 100 m; 1.0 km at an approximate separation distance of 300 m)
- 8 PTH crossings and 13 PR crossings
- 5 pipeline crossings and 1 close paralleling (3.0 km at an approximate separation distance of 100 m)
- 1 crossing and 1 close paralleling (17.7 km at an approximate distance of 150 m) of the Red River Floodway
- 2 crossings of the Winnipeg Water Aqueduct

It is also located 1.4 km from the Winnipeg/Lyncrest Airport (1400 m away), and three unnamed clearings that may be used as airstrips (420 m, 800 m and 1100 m away).

The pathways for effects during each Project phase are discussed in the following subsections.

13.5.5.2.1 Construction

During the construction phase, transmission tower construction and conductor stringing has the potential to disrupt the operation of existing roads (PTHs and PRs) and railways; traffic interruptions or detours maybe required while conductors are strung across infrastructures at crossings. The tower construction may also require modifications to or relocation of underground structures such as pipelines if they are overlapped.

13.5.5.2.2 Operation and Maintenance

During the operation phase, the presence of the transmission line and towers adjacent to or above roads, railways or the Red River Floodway may interfere with operation or maintenance activities, or with future plans for expansion. The presence of Project transmission lines and towers in proximity to the airports or airstrips may interfere with or become a hazard to air traffic.

Paralleling of pipelines or railways could cause induced currents of concern on this infrastructure. These induced currents may need to be evaluated for:

- impairment of the operation of signaling or protection systems of the railway
- erosion of coatings or cathodic protection on pipelines
- a potential electric discharge if a person or object were to come in contact with the pipeline or railway

The Project also crosses roads and farmland areas, resulting in the potential for induced currents to be generated on vehicles or farming equipment.

13.5.5.3 Mitigation for Interference with Transportation and Utility Infrastructure

In addition to mitigation through transmission line routing, the following mitigation measures will be implemented to reduce interference with transportation and utility infrastructure:

- The Project design will meet or exceed standards for setbacks and overhead clearance, including:
  - CAN/CSA-C22.3 No. 1-10 “Overhead Systems” which outlines electrical and safety clearances including road, pipeline, and rail crossing clearances
  - CAN/CSA 22.3 No. 60826-10 “Design Criteria for Overhead Transmission Lines” for structural and mechanical design
  - CAN/CSA-22.3 No. 6-M9I “Principles and Practices of Electrical Coordination between Pipelines and Electrical Supply Lines”
- Manitoba Hydro will obtain the following permits, as required, from the following entities:
  - **MIT:** Permits are required for any construction above or below ground that falls within 250 feet of a PTH or 150 feet of a PR, including but not necessarily limited to those crossings listed in Table 13‑15
  - **Pipeline and railway companies:** Crossing agreements are required for transmission line crossings of pipelines and railways
- Manitoba Hydro will continue to engage with the entities responsible for underground infrastructures, roads, railways, and floodways (*e.g.,* municipal governments, CN Rail) to identify areas where tower placement could interfere with underground infrastructures, maintenance activities, or future plans for expansion. This information will be used to inform the selection of final tower locations during the engineering analysis and design phases (see also Chapter 2, Section 2.9.6 Tower Location)
- Manitoba Hydro will provide information for conducting aeronautical assessments, as required by Transport Canada/NAV Canada regulations, to identify potential interferences with airports/airstrips. Such assessments are typically required for structures/lines greater than 90 m high or within 4 km of a known airport/airstrip location
- Manitoba Hydro will manage and monitor farm vehicle use within segments F and G and, where necessary, will work with operators/farmers to mitigate risks associated with induced current in these areas

13.5.5.4 Characterization of Residual Interference with Transportation and Utility Infrastructure

With the implementation of the mitigation measures, interference with transportation and utility infrastructure is anticipated to be minimal.

13.5.5.4.1 Construction

Potential interference with road and rail infrastructure during the construction phase will be managed by and regular notification of and communication with infrastructure providers and regulatory agencies. Required modifications or relocations of infrastructures (*e.g.,* pipelines) will be negotiated with the infrastructure operators. Manitoba Hydro will also engage with nearby airports and airstrips to collaborate on mitigation measures to avoid interference with air traffic, such as marking the transmission lines and towers as per applicable standards. With the implementation of these mitigation measures, interference with transportation and utility infrastructure during the construction phase will be avoided or managed to acceptable levels.

Residual effects on transportation and utility infrastructure are anticipated to be of low to moderate magnitude during the construction phase due to interruption of road or rail operations or relocation of utility infrastructure. Residual effects are considered short-term and reversible, and will occur in multiple irregular events within the PDA. Adverse residual effects occur in a moderate to high resilience context since the infrastructure is able to accommodate change with minimal effects on quality of service provided.

13.5.5.4.2 Operation and Maintenance

Many of the potential effects on transportation and utility infrastructure due to the presence of the Project during the operation and maintenance phase were avoided through careful transmission line routing, and will be further avoided during the detailed design phase by employing standards for clearance around infrastructure. Potential induction effects on pipeline or railway infrastructure will be mitigated, if required, based on the results of discussions with pipeline or railway companies, and any further detailed studies that may be required. These induction effects are therefore expected to be mitigated such that residual effects within the PDA will be negligible.

The modeled induced currents on roadway vehicles and farmland equipment are presented in Table 13-23. Potential induced currents on roadway vehicles are below the CSA guidelines for all sections of the Final Preferred Route. Potential induced currents on farm vehicles are below CSA guidelines for sections A – E, and H. Potential induced currents on farm vehicles in sections F and G slightly exceed CSA guidelines. However, based on modeling results, these exceedances are present in current conditions (Table 13-23) and the Project will not result in a higher level of inducted current than which is already occurring. Manitoba Hydro will manage and monitor farm vehicle use within these segments, and, where necessary, will work with operators/farmers to mitigate risks associated with induced current in these areas.

Table 13-23 Potential Induced Currents on Roadway Vehicles and Farmland Equipment

Section[1]	Induced Currents on Roadways[2] (mA)		Induced Currents on Farmland[3] (mA)	
	Existing	With Project	Existing	With Project
A	2.4	3.2	1.7	3.2
B	1.9	3.2	1.7	3.3
C	0.7	3.2[4]	0.6	3.3[4]
D	0.6	3.2[4]	0.5	3.3[4]
E	N/A	3.3	N/A	3.3
F	3.1	3.3	5.6	5.6[5]
G	3.1	3.3	5.6	5.6[5]
H	0.6	3.3	0.5	3.2

NOTES:

1 Sections are the same as those described in Section 13.4.7.2

2 Induced currents on roadway crossings were computed for roadway conductor height specifications and a tractor-trailer (23.0 m long, 2.6 m wide, 4.15 m tall) oriented perpendicular to the transmission lines

3 Induced currents on farmland equipment are computed for farmland conductor height specifications and a John Deere S680 (8.5 m long, 3.7 m wide, 3.8 m tall) oriented parallel to the transmission lines

4 Sections C and D were modeled with line Y36V (the future St. Vital Transmission Complex) included. Actual induced currents with only existing transmission lines and the Project will likely be slightly lower

5 In the RVTC (Sections F and G) the induction level associated with the transmission lines is just above the CSA recommended limit of 5 milliamperes for the largest farm combine in the Province. While the RVTC is owned 100% by Manitoba, the land is, in some instances, being used for farming activities. In order to mitigate any potential issues associated with induction to such a large vehicle, Manitoba Hydro will reinforce standard electrical safety messages and educate farmers in the RVTC about appropriate safety measures associated with induced currents. As construction of infrastructure in the RVTC continues, Manitoba Hydro will manage and monitor the use of the corridor

13.5.6 Assessment of Interference with Communications and Radio Signals

The operation of the transmission line generates radio noise, which may interfere with radio signals. The presence of transmission towers also has the theoretical potential to block other electromagnetic communications signals (*e.g.,* radiofrequency signals) if they are in the line of sight. These potential effects are discussed further in the subsections below.

13.5.6.1 Analytical Methods

This potential interference with radio signals is assessed by modelling the radio noise levels, using computer algorithms, along eight representative sections of the Final Preferred Route (E^{x}ponent 2015). These modelled radio noise levels are then compared to industry standard design guidelines for radio interference. Existing radio noise levels due to existing transmission lines or other sources are considered in this analysis. A more detailed description of this analysis is provided in the E^{x}ponent Study.

There are two design guidelines for transmission lines in Canada relevant to radio interference:

- Industry Canada (2013) provides recommendations for acceptable levels of radio noise applicable to AC high voltage power systems, under the *Radiocommunication Act* described in Section 13.1.1.2. For 500 kV transmission lines, the maximum recommended radio noise level[7] in fair weather conditions is 60 decibels relative to 1 microvolt per metre (dBµV/m).
- The Institute of Electrical and Electronics Engineers has also published a *Radio Noise Design Guide for High Voltage Transmission Lines* (Janischewskyj and Taylor 1971), which recommends a maximum of 61 dBµV/m.

As part of this assessment's conservative approach, 60 dBµV/m will be used. If the Project radio noise exceeds this threshold, then amplitude modulation (AM) radio signals may be adversely affected.

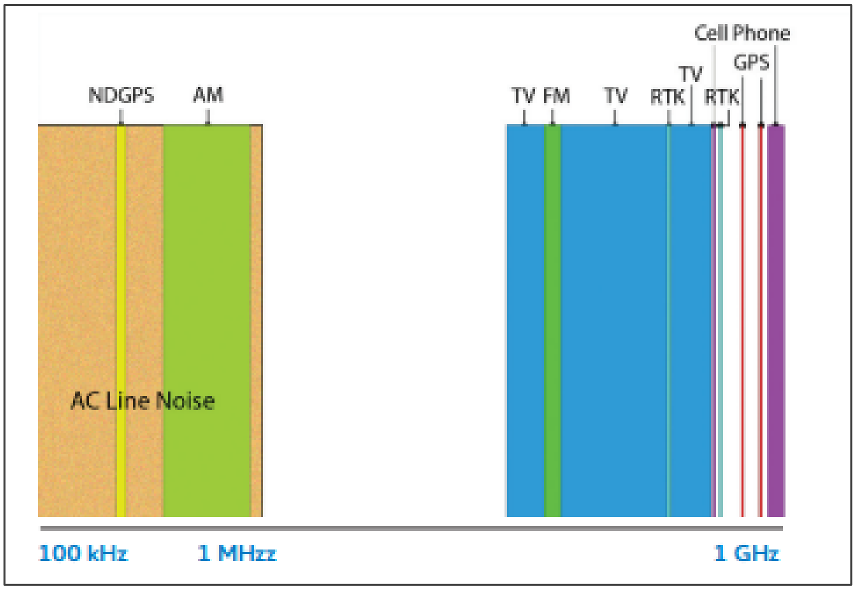
Interference with other electromagnetic communications signals are assessed by examining the proximity and potential for the Project to block or interfere with these signals.

13.5.6.2 Pathways for Interference with Communications and Radio Signals

The Project's 500 kV transmission line will transmit electricity as AC at a frequency of 60 Hz. Radio noise can be produced by corona discharges[8] during the operation of the transmission line. Electronic devices such as GPS receivers, radios, televisions, wireless internet, and cell phones receive radio frequency signals. Figure 13-7 shows the frequency bands of radio signals received by various devices compared to the radio noise produced by the transmission line.

[7] Radio noise level is assessed at a distance of 15 m from the outermost transmission line. The strength of radio noise at this location is measured in units of dBµV/m. The higher the radio noise level, the more it could interfere with radio signals from other sources.

[8] Corona discharges occur when the electric fields near the transmission line exceeds the breakdown strength of air. When a corona discharge occurs, the air rapidly expands, causing audible noise that sounds like a hissing or crackling sound or a 120 Hz hum. It also releases a small amount of current in to the air that produces radio noise.



SOURCE: E[x]ponent 2013

Figure 13-7 AC Transmission Line Radio Noise Compared to Radio Frequency Bands for Various Electronic Devices

The frequencies of radio noise produced by AC transmission lines does not overlap with the frequencies received by television, frequency modulation (FM) radio, GPS, including real-time kinematic GPS or cell phones. There is therefore no interaction anticipated with these devices. The transmission line radio noise does, however, overlap with Nationwide Differential GPS (NDGPS) and AM radio frequencies. When corona discharge from the Project generates radio noise that overlaps with AM radio frequencies, the radio noise can result in poor AM radio reception nearby, particularly if AM radio signals are weak. Potential interference with GPS is addressed in Chapter 15 Agriculture, and is not discussed further here.

The presence of the Project (particularly the towers) may interfere with or block other communications signals such as radiofrequency signals where the Project lies in the line of sight between communication towers.

13.5.6.3 Mitigation for Interference with Communications and Radio Signals

Apart from the transmission line routing process (Chapter 5 and Section 13.1.2) the application of the following design standards and guidelines for transmission lines are proposed as criteria for assessing impacts and the need for mitigation measures to address potential interference with communications and radio signals:

- Industry Canada (2013) provides recommendations for acceptable levels of radio noise applicable to AC high voltage power systems, under the *Radiocommunication Act* described in Section 13.1.1.2. For 500 kV transmission lines, the maximum recommended radio noise level in fair weather conditions is 60 decibels relative to 1 microvolt per metre (dBμV/m).

- Prior to final design, Manitoba Hydro will identify any potential for signal blockage or interference with communication providers (including radar and radio-telescopes) due to the Project, and will incorporate additional measures to avoid signal interference (*e.g.,* through tower placement).

13.5.6.4 Characterization of Residual Interference with Communications and Radio Signals

In fair weather conditions, the maximum calculated value of radio noise generated by the Project is approximately 48 dBμV/m. The maximum Project-related increase in radio noise occurs in the Southern Loop portion of the Existing Transmission Corridor, increasing from 36 dBμV/m to 48 dBμV/m. The predicted levels of radio noise in fair weather do not exceed the Industry Canada threshold anywhere along the Final Preferred Route.

In foul weather when there is precipitation, radio noise levels can increase because water droplets on the conductor surface can result in increased corona discharge. In foul weather, radio noise levels are predicted to be approximately 17 dB higher in all locations, resulting in exceedances of the 60 dBμV/m threshold in a few locations (up to 65 dBμV/m). However, this standard is relevant only to fair weather conditions. Users of AM radio are also not anticipated to be affected often since there are likely few receptors within the immediate transmission line ROW at any given time. As discussed in Chapter 16 Land and Resource Use, there is currently one residence within the ROW (which will be relocated) and 40 residences within 100 m of the ROW. Because the level of radio noise drops off rapidly with distance, only those residences in very close proximity may experience radio interference. Cars using their AM radios may experience some radio interference when driving under the transmission lines at road crossings, but the level of radio noise drops off rapidly with distance. Driving at highway speeds, at most a few seconds of interference will be experienced by passing motorists. Residual effects on radio signals are negligible for all electronic devices except AM radio because their radio frequencies do not overlap with the frequencies of radio noise that will be generated by the Project. For AM radio, adverse residual effects will be of low to moderate magnitude within the PDA, and of negligible to low magnitude outside the PDA. These effects will occur continuously throughout the operation and maintenance phase, and are reversible after the lifetime of the Project. The context is considered high resilience because there are likely few AM radio users in close enough proximity to be affected.

Interference with other communications will be mitigated through final Project design and tower placement. Residual effects on communications are therefore expected to be negligible.

13.5.7 Summary of Environmental Effects on Infrastructure and Services

Table 13-24 summarizes the residual effects on infrastructure and services.

Table 13-24 Summary of Residual Environmental Effects on Infrastructure and Services

Project Components and Physical Activities	Residual Environmental Effects Characterization						
	Direction	**Magnitude**	**Geographic Extent**	**Duration**	**Frequency**	**Reversibility**	**Socio-economic Context**
Change in Accommodations							
Construction	A	L	LAA	ST	C	R	LR-HR
Change in Community Infrastructure and Services							
Construction	A	L	LAA	ST	C	R	MR-HR
Change in Road Traffic							
Construction	A	L	LAA	ST	IR	R	LR-HR
Interference with Transportation and Utility Infrastructure							
Construction	A	L-M	PDA	ST	IR	R	MR-HR
Operation and Maintenance	A	N	PDA	N/A	N/A	N/A	N/A
Interference with Communications and Radio Signals							
Operation and Maintenance	A	N/L-M	PDA/ LAA	MT	C	R	HR

KEY

See Table 13-4 for detailed definitions

Direction: *A: Adverse; N: Neutral; P: Positive*

Magnitude: *N: Negligible; L: Low; M: Moderate; H: High*

Geographic Extent: *PDA: ROW/Site; LAA: Local; RAA: Regional*

Duration: *ST: Short-term; MT: Medium-term; P: Permanent*

Frequency: *S: Single event; IR: Irregular event; R: Regular event; C: Continuous*

Reversibility: *R: Reversible; I: Irreversible*

Socio-Economic Context: *LR: Low resilience, MR: Moderate resilience, HR: High resilience*

N/A = Not applicable

13.6 Assessment of Cumulative Environmental Effects on Infrastructure and Services

This section identifies the Project residual effects that are likely to interact cumulatively with residual effects of other physical activities, and the resulting cumulative effects are assessed. This is followed by an analysis of the Project contribution to residual cumulative effects.

13.6.1 Identification of Project Effects Likely to Interact Cumulatively

Table 7-3 in Chapter 7: Assessment Methods presents the Project and physical activities inclusion list, which identifies other projects and physical activities that might act cumulatively with the Project. Where residual effects from the Project act cumulatively with those from other projects and physical activities (Table 13-25), a cumulative effects assessment is undertaken to determine their significance.

Table 13-25 Potential Cumulative Effects on Infrastructure and Services

Other Projects and Physical Activities with Potential for Cumulative Effects	Potential Cumulative Effects				
	Change in accommodations	Change in community infrastructure and services	Change in road traffic	Interference with transportation and utility infrastructure	Interference with communications and radio signals
Past and Present Physical Activities and Resource Use					
Agriculture (Conversion, Livestock Operations, Cropping and Land Drainage)	–	–	–	–	–
Residential Development	–	–	–	–	–
Existing Linear Infrastructure	–	–	–	–	–
Other Resource Activities (Forestry, Mining)	–	–	–	–	–

Other Projects and Physical Activities with Potential for Cumulative Effects	Potential Cumulative Effects: Change in accommodations	Change in community infrastructure and services	Change in road traffic	Interference with transportation and utility infrastructure	Interference with communications and radio signals
Future Physical Activities					
Bipole III Transmission Project	✓	✓	✓	✓	✓
St. Vital Transmission Complex	✓	✓	✓	✓	✓
Dorsey to Portage South Transmission Project	✓	✓	✓	✓	✓
Northwest Winnipeg Natural Gas Pipeline Project	–	–	–	–	–
Richer South Station to Spruce Station Transmission Project	✓	✓	✓	–	–
Energy East Pipeline Project	✓	✓	✓	–	–
Southend Water Pollution Control Centre Upgrade Project	–	–	–	–	–
St. Norbert Bypass	–	–	–	–	–
Headingley Bypass	–	–	–	–	–
Oakbank Corridor	–	–	–	–	–
Residential Development	–	–	–	–	–
Natural Gas Upgrade Projects	–	–	–	–	–
MIT Capital Projects (Highway Renewal)	–	–	–	–	–
Piney-Pinecreek Border Airport Expansion	–	–	–	–	–

NOTES:
✓ = Other projects and physical activities whose residual effects are likely to interact cumulatively with Project residual effects
– = Interactions between the residual effects of other projects and those of the Project residual effects are not expected.

The assessment of the cumulative effects that are likely to result from the Project in combination with other projects and physical activities follows. Residual effects identified in Table 13-25 that are not likely to interact cumulatively with residual effects of other projects and physical activities (no check mark) are not discussed further.

Past and present physical activities and resource uses are captured in the existing conditions for infrastructure and services, and provide the basis for the assessment of Project residual effects. It is not anticipated that these activities or uses will result in additional effects on infrastructure and services in the future that are not already present, and they are therefore not considered further in the assessment of cumulative effects.

The St. Norbert Bypass and Headingley Bypass projects are anticipated to have relatively small workforces, much of which will likely be sourced from the local workforce, and associated demands on infrastructure and services will be minimal. These projects are also not expected to interfere with communications and radio signals. The potential for interference with transportation or utility infrastructure is not anticipated to overlap spatially with the interference due to the Project. Because cumulative effects on infrastructure and services due to these two projects are not expected, and these projects are not assessed further.

The Northwest Winnipeg Natural Gas Pipeline Project's construction phase is scheduled for 2015-2016, and its operations from 2016 onward. Therefore, there is no temporal overlap between the construction phase of this project and the construction phase of the Project, and no cumulative effects are anticipated. Because it is a gas pipeline, no interference with communications or radio signals is expected.

Three future projects proposed for southern Manitoba could have residual effects that overlap temporally and spatially with the Project residual effects (Table 13-26).

Table 13-26 Future Projects with the Potential to Act Cumulatively

Project	Type	Status	Construction	Operation
Bipole III Transmission Project	Transmission Line	Proposed	2016–2018 200 workers	2018+
St. Vital Transmission Complex	Transmission Line	Ongoing	2017–2018 100 workers	2018+
Dorsey to Portage South Transmission Project	Transmission Line	Ongoing/ Proposed	2018-2019 NA	2019+
Energy East Pipeline Project	Oil Pipeline Conversion	Proposed	2017–2022 360[1] workers	2022+

NOTE:
[1] Approximate number of workers per spread; assumed one spread to overlap with the residual effects of the Project
SOURCES: Manitoba Hydro 2011, 2014; Energy East Pipeline Ltd. 2014.

The workforces and transportation demands for these projects, particularly during the construction phase, have the potential to act cumulatively with the Project workforce with respect to change in accommodations, change in community infrastructure and services, and change in road traffic since the same infrastructure and services are likely to be used. Similar to the Project, the operation workforces and activity-related demands for these projects are likely to be small, and should not act cumulatively. The potential cumulative effects on accommodations, community infrastructure and services, and road traffic during the construction phase are discussed in Sections 13.6.2, 13.6.3 and 13.6.4, respectively.

Cumulative interference with transportation and utility infrastructure during construction is unlikely since the other projects would have to cross the same infrastructure at the same time in the same proximity in order to act cumulatively. None of the projects listed in Table 13-26 meet these criteria, and therefore no cumulative interference with transportation and utility infrastructure is anticipated during the construction phase. However, the Bipole III Transmission Project, the St. Vital Transmission Complex and the Dorsey-Portage South Transmission Project (albeit for a short distance) parallel the Project and could contribute to cumulative induction effects during their operations phases. Potential cumulative effects are discussed in Section 13.6.5.

The three transmission line projects, the Bipole III Transmission Project, the St. Vital Transmission Complex and the Dorsey to Portage South Transmission Project, have the potential to cause cumulative interference with radio signals through cumulative levels of radio noise while in proximity. The Richer South Station to Spruce Station Transmission Project routes have not yet been confirmed, but it is unlikely that they will contribute to cumulative effects on radio signals due to proximity. Potential cumulative radio noise effects are discussed in Section 13.6.5. Residual interference with communications was negligible, and therefore no cumulative effects are anticipated.

13.6.2 Cumulative Effects Assessment for Change in Accommodations

13.6.2.1 Cumulative Effect Pathways for Change in Accommodations

The workforces for the three projects identified in Table 13-26 have the potential to create cumulative demand for temporary accommodations during their respective construction phases if workers stay in the same communities at the same time.

13.6.2.2 Mitigation for Cumulative Effects for Change in Accommodations

It is anticipated that each of the three projects will use camps, to some degree, to house their temporary workforces, alleviating the demand on temporary accommodations. Manitoba Hydro will communicate with accommodations providers regarding its projects to help them plan for and coordinate demand. It is expected that other project proponents will do the same for their projects.

13.6.2.3 Residual Cumulative Effects

The use of camps by other projects will substantially alleviate demands on temporary accommodations. Winnipeg and Brandon have extensive temporary accommodations, and are expected to accommodate cumulative demand.

If the small remaining workforces choose to stay in temporary accommodations in the same communities at the same time, the cumulative change in accommodation is still anticipated to be of only moderate magnitude due to the cumulative workforce size and the availability of accommodations throughout the region, particularly in the larger urban centres (more than 6000 rooms in Winnipeg and 1400 in Brandon). The geographic extent of cumulative effects will be spread throughout the RAA, and will effectively occur continuously throughout the time of overlap. Adverse cumulative effects on temporary accommodations will be short-term, likely only lasting a few months or less, and reversible at the end of the construction phase. Cumulative effects occur in a low to high resilience context since while many temporary accommodations available in the region with vacancies overall, there are areas within the RAA with limited temporary accommodations.

13.6.3 Cumulative Effects Assessment for Change in Community Infrastructure and Services

13.6.3.1 Cumulative Effect Pathways for Cumulative Change in Community Infrastructure and Services

The workforces and project activities for the three projects identified in Table 13-26 have the potential to create cumulative demand for community infrastructure and services during their respective construction phases since the same community infrastructure and services (*e.g.,* emergency and protection services, municipal utilities) are likely to be used.

13.6.3.2 Mitigation for Cumulative Effects for Change in Community Infrastructure and Services

It is anticipated that each of the project proponents will also engage and share project information with local governments, service providers, and/or businesses so they are aware of the anticipated demands, allowing them to identify potential service gaps or issues.

13.6.3.3 Residual Cumulative Effects

As described in Section 13.4.4.1, emergency and protection services are sufficient to meet the current demands, and that there is available capacity to provide service to a greater population if needed. Communication with fire departments and police/RCMP detachments ahead of time will help them plan for potential increases in demand for their services. Overall, the cumulative demand for emergency and protection services is anticipated to be of low to moderate magnitude; that is, there will be a measurable change in the use of such services but on a scale that is within the available capacity, and will have limited effects on the quality of service provided.

Existing water, wastewater, and solid waste infrastructures can also meet the current demands, with available capacity to meet additional demands. Cumulative demand for water, wastewater and solid waste infrastructures is not anticipated to exceed the available capacities of these infrastructures or affect the quality of service provided. Therefore, residual cumulative effects will also be of low to moderate magnitude.

Residual adverse cumulative effects will be distributed throughout the RAA, which will reduce the effects infrastructure or service elements. Cumulative effects will be short-term, likely only overlapping for a few months at a time, and reversible after the projects' construction phases.

13.6.4 Cumulative Effects Assessment for Change in Road Traffic

13.6.4.1 Cumulative Effect Pathways for Change in Road Traffic

The three projects identified in Table 13-26 have the potential to create cumulative road traffic during their respective construction phases because the same road network is likely to be used.

13.6.4.2 Mitigation for Cumulative Effects for Change in Road Traffic

It is anticipated that each of the three projects will also engage and share project information with government agencies and infrastructure operators (*e.g.,* MIT, Municipal governments) so they are aware of the anticipated demands, allowing them to identify potential service gaps or issues.

13.6.4.3 Residual Cumulative Effects

Most roads in the RAA operate at an acceptable level of service, indicating that the network has capacity to accommodate additional traffic volumes associated with reasonably foreseeable projects; the road network is characterized as having moderate to high resilience. The exception is PTH15 near the Red River Floodway crossing, which currently operates at LOS D and is characterized as having low resilience. MIT has made intersection improvements at PTH 15/PR 207 and at PTH 15/PTH 101 in an effort to alleviate capacity concerns on PTH 15 to some degree. The Project would increase traffic volume on this segment by approximately 1.2%, and it can be expected that a similar magnitude of traffic volumes could be generated by the other projects. This cumulative road traffic volume is unlikely to decrease the level of service of this segment on an ongoing basis.

Overall, the cumulative change in road traffic will be of low to moderate magnitude. Residual cumulative effects will be distributed throughout the RAA, which will reduce the effects on roads or highways. Cumulative effects will be irregular, short-term, likely only overlapping for at most a few months at a time, and reversible after the projects’ construction phases.

13.6.5 Cumulative Effects Assessment for Interference with Transportation and Utility Infrastructure

13.6.5.1 Cumulative Effect Pathways for Interference with Transportation and Utility Infrastructure

The Dorsey-Portage South Transmission Project and the St. Vital Transmission Complex parallel the Project, and have the potential to cause additive cumulative induction effects in combination with the Project on roadway vehicles or farmland equipment through cumulative electric fields.

13.6.5.2 Mitigation for Cumulative Effects for Interference with Transportation and Utility Infrastructure

In addition to mitigation through transmission line routing, the Project design will meet or exceed standards for setbacks and overhead clearance distances and induction including those outlined in Section 13.5.5.3. It is expected that other projects will adhere to the same standards.

13.6.5.3 Residual Cumulative Effects

The Bipole III Transmission Project is a direct current transmission line and therefore does not generate electric fields that can act cumulatively with the Project electric fields to produce cumulative induced currents. The Dorsey to Portage South Transmission Project parallels the Project near the Dorsey Converter Station, but at a distance of about 180 m. This distance is too far away to create cumulative electric fields of concern. The St. Vital Transmission Complex, however, parallels the Project closely along the Southern Loop Transmission Corridor from the La Verendrye Station to approximately the intersection with Highway 59 just outside the south boundary of Winnipeg. Table 13-27 shows the resulting cumulative induced currents.

Potential induced currents on farm vehicles is below CSA guidelines for sections A – E, and H. Potential induced currents on farm vehicles in sections F and G slightly exceed CSA guidelines; these exceedances were present in the existing case (Table 13-27). Manitoba Hydro will monitor farm vehicle use within these segments, and, where necessary, will work with operators/farmers to mitigate risks associated with induced current in these areas.

Table 13-27 Potential Cumulative Induced Currents on Roadway Vehicles and Farmland Equipment

Section[1]	Induced Currents on Roadways[2] (mA)		Induced Currents on Farmland[3] (mA)	
	Existing	With Project	Existing	With Project
A	2.4	3.2	1.7	3.2
B	1.9	3.2	1.7	3.3
C	0.7	3.2[4]	0.6	3.3[4]
D	0.6	3.2[4]	0.5	3.3[4]
E	N/A	3.3	N/A	3.3
F	3.1	3.3	5.6	5.6 [4]
G	3.1	3.3	5.6	5.6 [4]
H	0.6	3.3	0.5	3.2

NOTES:
1 Sections are the same as those described in Section 13.4.7.2
2 Induced currents on roadway crossings are computed for roadway conductor height specifications and a tractor-trailer (23.0 m long, 2.6 m wide, 4.15 m tall) oriented perpendicular to the transmission lines
3 Induced currents on farmland equipment are computed or farmland conductor height specifications and a John Deere S680 (8.5 m long, 3.7 m wide, 3.8 m tall) oriented parallel to the transmission lines
4 In the RVTC the induction level associated with the transmission lines is just above the CSA recommended limit of 5 milliamperes for the largest farm combine in the Province. While the RVTC is owned 100% by Manitoba, the land is, in some instances, being used for farming activities. In order to mitigate any potential issues associated with induction to such a large vehicle, Manitoba Hydro will reinforce standard electrical safety messages and educate farmers in the RVTC about appropriate safety measures associated with induced currents. As construction of infrastructure in the RVTC continues, Manitoba Hydro will manage and monitor the use of the corridor.

The cumulative interference with transportation and utility infrastructure are anticipated to be of low to moderate magnitude. Residual cumulative effects are distributed within the PDA and throughout the RAA, Cumulative effects will be medium-term, continuous and reversible. Cumulative residual effects occur in a moderate to high resilience context as the infrastructure is able to accommodate change with minimal effects on quality of service provided.

13.6.6 Cumulative Effects Assessment for Interference with Communications and Radio Signals

13.6.6.1 Cumulative Effect Pathways for Interference with Communications and Radio Signals

The Bipole III Transmission Project, St. Vital Transmission Complex, and Dorsey to Portage South Transmission Project parallel the Project, and have the potential to cause additive cumulative interference with radio signals through cumulative levels of radio noise in combination with the Project.

13.6.6.2 Mitigation for Cumulative Effects for Interference with Communications and Radio Signals

Apart from the transmission line routing process (Chapter 5 and Section 13.1.2) and adherence to design standards and guidelines, no other mitigation measures are proposed for interference with radio signals.

13.6.6.3 Residual Cumulative Effects

The Bipole III Transmission Project parallels the Project along the Riel–Vivian Transmission Corridor. Along this section, the existing radio noise generated by the M602F line is approximately 48 dBμV/m, and Project radio noise would not exceed this existing noise. The addition of the Bipole III Transmission Project along this corridor is anticipated to increase the level of radio noise by less than 0.1 dBμV/m, which is negligible.

The St. Vital Transmission Complex parallels the Project along the Southern Loop Transmission Corridor from the La Verendrye Station to approximately the intersection with Highway 59 just outside the south boundary of Winnipeg. Along this section, the radio noise generated by the existing transmission lines (D11Y, D15Y, D55Y) is approximately 36 dBμV/m. With the Project, this would increase to 48 dBμV/m in the east-west portion of this corridor. The addition of the St. Vital Transmission Complex along this corridor is not anticipated to increase the level of radio noise along this corridor because the peak levels are masked by the Project.

The Dorsey to Portage South Transmission Project parallels the Project south of the Dorsey Converter Station, though at a distance of about 180 m. This distance is too far away to meaningfully add to cumulative levels of radio noise, and peak levels are also masked by the Project.

For all three of these projects, the cumulative level of radio noise will remain below Industry Canada's 60 dBμV/m standard. In addition, there are likely few receptors who would be located precisely where the peak levels of radio noise overlap between the Project and other projects.

Cumulative residual effects on radio signals are negligible for electronic devices except those that depend upon the reception of radio signals in the same frequency range as those generated by the projects. For AM radio, cumulative residual effects will be of low to moderate magnitude within the PDA and RAA. These effects will be medium term, occur continuously and are reversible. The context is considered one of high resilience as there are likely few AM radio users in close enough proximity to be affected.

13.6.7 Summary of Cumulative Effects

Table 13-28 summarizes cumulative effects on infrastructure and services.

Table 13-28 Summary of Cumulative Environmental Effects on Infrastructure and Services

Cumulative Effect	Residual Cumulative Effects Characterization						
	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Socio-economic Context
Cumulative Change in Accommodations							
Cumulative effect with the Project	A	M	RAA	ST	C	R	LR-HR
Contribution from the Project to the overall cumulative effect	The Project will increase demand on temporary accommodations within communities in the RAA during the construction phase.						
Cumulative Change in Community Infrastructure and Services							
Cumulative effect with the Project	A	L-M	RAA	ST	C	R	MR-HR
Contribution from the Project to the overall cumulative effect	The Project will increase demand on community infrastructure and services within the RAA during the construction phase.						
Cumulative Change in Road Traffic							
Cumulative effect with the Project	A	L-M	RAA	ST	IR	R	LR-HR
Contribution from the Project to the overall cumulative effect	The Project will increase road traffic in the RAA during the construction phase.						
Cumulative Interference with Transportation and Utility Infrastructure							
Cumulative effect with the Project	A	L-M	PDA/ RAA	MT	C	R	MR-HR
Contribution from the Project to the cumulative effect	The Project will result in induced currents along portions of the Existing Transmission Corridor.						

Cumulative Effect	Residual Cumulative Effects Characterization						
	Direction	**Magnitude**	**Geographic Extent**	**Duration**	**Frequency**	**Reversibility**	**Socio-economic Context**
Cumulative Interference with Communications and Radio Signals							
Cumulative effect with the Project	A	L-M	PDA/ RAA	MT	C	R	HR
Contribution from the Project to the cumulative effect	The Project will increase radio noise in part of the Southern Loop Transmission Corridor from 36 dBμV/m to 48 dBμV/m.						

KEY
See Table 13-4 for detailed definitions
Direction: *A: Adverse; N: Neutral; P: Positive*
Magnitude: *N: Negligible; L: Low; M: Moderate; H: High*
Geographic Extent: *PDA: ROW/Site; LAA: Local; RAA: Regional*
Duration: *ST: Short-term; MT: Medium-term; P: Permanent*
Frequency: *S: Single event; IR: Irregular event; R: Regular event; C: Continuous*
Reversibility: *R: Reversible: I: Irreversible*
Socio-Economic Context: *LR: Low resilience, MR: Moderate resilience, HR: High resilience*

N/A Not applicable

13.7 Determination of Significance

13.7.1 Significance of Environmental Effects from the Project

ACCOMMODATIONS

Large urban centres such as Winnipeg and Brandon have extensive temporary accommodations available, which will be able to absorb much of the Project demand. The construction camp established for the Project will help alleviate demand on temporary accommodations in Steinbach and the RMs of La Broquerie, Stuartburn, and Piney. Overall, Project demands are not anticipated to result in a substantial decrease in the temporary accommodations available in the region, and therefore residual effects are not significant.

COMMUNITY INFRASTRUCTURE AND SERVICES

Due to the relatively small workforce the Project will result in low magnitude demands on community infrastructure and services. Fire and police services, as well as water, wastewater, and solid waste facilities have available capacity to meet Project demands. Project demands are not anticipated to exceed the available capacity of community infrastructure and services nor decrease the quality of service available. Therefore, residual effects are not significant.

ROAD TRAFFIC

The increase in traffic due to the Project will be at most 174 vehicles per day. For most road segments, this represents less than 6% of the existing road traffic. Most roads currently operate at an acceptable level of service (LOS C or better) and therefore have available capacity to meet this increase in volume. PTH15 near the Red River Floodway currently operates at LOS D, but Project traffic will only increase the total volume by 1.1% on this segment. The addition of Project road traffic is not anticipated to exceed the capacity of any roads or reduce the level of service on an ongoing basis. Residual effects are therefore not significant.

TRANSPORTATION AND UTILITY INFRASTRUCTURE

Interference with transportation and utility infrastructure was primarily mitigated during the transmission line routing process. The Project is not anticipated to decrease in the quality of service provided by transportation and utility infrastructure, and therefore residual effects are not significant.

The Project parallels two railways and one pipeline in close proximity. Further detailed studies or mitigation measures may need to be applied, in consultation with the railways and pipeline companies, to ensure that potential for induction effects on these infrastructures is reduced to a negligible level.

Large roadway vehicles may experience induced currents of up to 3.3 mA at road crossing throughout the length of the transmission line. This is below the significance threshold of 5.0 mA for all Transmission Corridor sections. With the exception of sections F and G, potential induced current in farmyard vehicles is also below the 5.0 mA significance threshold. Within sections F and G, there is risk of a small exceedance of this threshold due to the existing M602F transmission line. Manitoba Hydro will manage and monitor farm vehicle use within these segments, and where necessary, will work with operators and farmers to mitigate risks associated with inducted current. In consideration of these measures, the residual effects on transportation and utility infrastructure are not significant.

COMMUNICATIONS AND RADIO SIGNALS

Residual effects on communications and radio signals are negligible for all electronic devices except AM radio because their radio frequencies do not overlap with the frequencies of radio noise that will be generated by the Project. Cars using their AM radios may experience some radio interference while driving under the transmission lines at road crossings, but the level of interference will drop off rapidly with distance. In all cases, the predicted levels of radio noise with the Project do not exceed Industry Canada's threshold of 60 dBμV/m. Therefore, interference with communications and radio signals is not significant.

13.7.2 Significance of Cumulative Environmental Effects

Cumulative effects from past and present projects and physical activities are captured in the existing conditions.

Existing accommodations and community infrastructure and services are sufficient to meet the current demands and there is available capacity to handle increased demand and growth in the region. Cumulative demands on temporary accommodations and community infrastructure and services will be short-term, lasting at most a few months, and are reversible at the end of Project construction. Cumulative demands are not anticipated to exceed the available capacity or result in a substantial decrease in the quality of service on a persistent and ongoing basis. Cumulative effects on temporary accommodations and community infrastructure and services are therefore considered not significant.

Cumulative road traffic volumes will be of low to moderate magnitude, and distributed throughout the RAA. Volumes will likely overlap for at most a few months at a time, and are not anticipated to substantially reduce the level of service of any segment on an ongoing basis. Cumulative change in road traffic is therefore considered not significant.

The St. Vital Transmission Complex will parallel the Project along the Existing Transmission Corridor sections C and D. However, this will not result in a significant cumulative effect on transportation and utility infrastructure. With the exception of farm vehicle use in sections F and G, the cumulative induced current is predicted to be less than the 5.0 mA CSA guidance. Within sections F and G, there is risk of a small exceedance of this threshold due to the presence of the existing M602F transmission line. Manitoba Hydro will manage and monitor farm vehicle use within these segments, and where necessary, will work with operators and farmers to mitigate risks associated with inducted current. In consideration of these measures, the cumulative effects on transportation and utility infrastructure are not significant.

The Bipole III Transmission Project and the St. Vital Transmission Complex parallel the Project along sections of the Existing Transmission Corridor. In both cases, the cumulative radio noise by these projects and the Project will be below Industry Canada's 60 dBμV/m standard. Cumulative interference with communications and radio signals would not decrease the quality of service provided on an ongoing basis, and is therefore considered not significant.

13.7.3 Project Contribution to Cumulative Environmental Effects

The contribution of the Project residual effects on overall cumulative effects on accommodations, community infrastructure and services, and road traffic is relatively small. The workforce and Project activity demands account for a modest portion (10–20%) of the overall cumulative demand for such infrastructure and services.

The Project's radio noise will have a negligible effect on cumulative radio noise along the Riel–Vivian Transmission Corridor. The Project's radio noise increases the total radio noise along the Southern Loop Transmission Corridor by about 10 dB.

The Project will result in an increase in potential short-circuited induced current of between 0 mA and 2.7 mA for both roadway and farmland vehicles. For sections A-E and H, this increase will not result in an exceedance of CSA's 5.0 mA threshold. Sections F and G currently exceed the CSA guidance for induced current values for farmland vehicles but the Project does not increase this exceedance.

13.7.4 Sensitivity of Prediction to Future Climate Change

Based on the climate change scenarios presented in the Hydroclimatic Study for the Project (Manitoba Hydro 2015), some increase in temperatures and precipitation are projected for the future within the RAA. In addition, more extreme events are projected; though patterns are likely to be variable according to the season (i.e. most temperature and precipitation increases are anticipated to correspond to winter and spring months).

Temperature changes are not anticipated to interact with any of the potential residual or cumulative effects. However, increased precipitation may have the following effects:

- Changes in the operation of the Red River Floodway. However, there is only one crossing of the floodway by the Project, and some paralleling at a distance of 150 m.
- Slightly increased foul-weather radio noise, due to increased frequency of rainfall events. The standards and significance threshold for radio noise levels apply to fair-weather only. In addition, the slight increase in precipitation is unlikely to result in a measurable increase in radio noise.

Neither of these potential interactions is anticipated to result in a change to the determination of significance for residual or cumulative effects.

13.8 Prediction Confidence

Prediction confidence for residual effects on infrastructure and services is moderate to high based on the quality of existing conditions information, the understanding of effects pathways, past experience with the effectiveness of mitigation measures, and the conservative approach taken throughout the assessment.

Prediction confidence for cumulative effects is moderate based on some uncertainty of future projects (*e.g.,* how many and which of the projects will be developed, their timing and details). However, regular communication with regulatory agencies and service providers will allow for adaptation of both Manitoba Hydro and the regulatory agencies and service providers to changing or uncertain conditions.

13.9 Follow-up and Monitoring

Ongoing communication and engagement will facilitate feedback and collaboration throughout the Project lifetime. In addition, the following is recommended to monitor potential change in road traffic:

- It is recommended that monitoring and recording of collisions and near misses be undertaken throughout the construction period to identify potential relationships between traffic incidents and increased Project construction traffic.
- Monitoring of road conditions at all access points off the provincial and local road network, including a base inventory of existing conditions, is also recommended to ensure that all public roadways are maintained to an acceptable level and to ensure that all damaged road pavement, where relevant, is restored to its original condition.

13.10 Summary

Infrastructure and services is a VC because the Project could increase the demand for, or interfere with, local and regional infrastructure and services. Some of this demand is associated with the temporary workforce, which will need to be accommodated and will require the use of municipal and provincial services during the construction phase. The construction or presence of the Project may also interfere with existing transportation, utility or communication infrastructure.

Temporary accommodations, community infrastructure and services, and roads have available capacity to meet Project demands and cumulative demands, and no decrease in the quality of service provided is anticipated. Transmission line routing (Chapter 5 and Section 13.1.2) avoided many of the potential interference with transportation and utility infrastructure, and communications and radio signals. The remaining interference will be managed to acceptable levels by implementing Project-specific mitigation measures. Overall, Project effects and cumulative effects are not anticipated to exceed the capacity of infrastructure and services or result in a decrease in the quality of service provided on an ongoing basis. Therefore, both Project residual effects and cumulative effects are considered not significant.

13.11 References

13.11.1 Literature Cited

Brandon Police Service. 2015. 2014 Annual Report. Available from http://police.brandon.ca/images/pdf/annualReports/report_2014.pdf [accessed May 2015].

BFES (Brandon Fire and Emergency Services). 2013. 2013 Annual Report. Available from http://issuu.com/citybrandon/docs/2013annualreport [accessed May 2015].

CSA (Canadian Standards Association). 2015. Overhead Systems. C22.3 No. 1-15

CEAA (Canadian Environmental Assessment Agency). 2008. Public Participation Guide. Available from https://www.ceaa-acee.gc.ca/default.asp?lang=En&n=46425CAF-1 [accessed July 2015].

City of Brandon. 2007. The City of Brandon Recreation Facilities Master Plan (2007). Available at: http://brandon.ca/recreation/master-plan. Accessed: March 2015.

City of Brandon. 2014. City of Brandon Greenspace Master Plan (Draft, November 2014). Available at: http://brandon.ca/images/pdf/Recreation/GSMP/MPdraft_Nov13.pdf. Accessed: March 2015.

City of Brandon. 2015a. Recreation. Available at: http://brandon.ca . Accessed: March 2015.

City of Brandon. 2015b. Brandon's Community Sportsplex. Available at: http://thesportsplex.ca/. Accessed: March 2015.

City of Steinbach. 2015. Parks and Recreation. Available at: http://www.steinbach.ca/city_services/parks_and_recreation/. Accessed: March 2015.

City of Winnipeg. 2015a. Recreation and Leisure Services. Available at: http://winnipeg.ca/cms/recreation/. Accessed: March 2015.

City of Winnipeg. 2015b. Athletic Field Locations. Available at: http://winnipeg.ca/publicworks/ParksandFields/AthleticFields/athleticfieldlocations.asp. Accessed: March 2015.

De Leur, P. and Sayed, T. 2008. Collision Prediction Models for British Columbia. Prepared for: Engineering Branch, BC Ministry of Transportation & Infrastructure.

Energy East Pipeline Ltd. 2014. *Volume 3M Part B-Socioeconomic Effects Assessment Saskatchewan - Manitoba. ESA V3 PB SKMB S7 Infrastructure and Services – A4E0j0*. Available at: https://docs.neb-one.gc.ca/ll-eng/llisapi.dll?func=ll&objId=2543739&objAction=browse&viewType. Accessed: June 22, 2014.

Exponent. 2013. *AC Lines and Electronic Devices.* Information brochure prepared for Manitoba Hydro. Available at: https://www.hydro.mb.ca/projects/mb_mn_transmission/AC_lines_electronic_devices_brochure.pdf. Accessed: June 2015.

Exponent. 2015. Manitoba-Minnesota Transmission Project: Electric Field, Magnetic Field, Audible Noise, and Radio Noise Calculations. Exponent, Inc. Bowie, MD. 77 pp. [DN to be checked against final version]

GCDC (Glenboro Community Development Corporation). 2012. Emergency Services/Utilities. Available at: http://glenboro.com/to-do/securityutilities. Accessed: December 2014.

Golder Associates. 2008. BCTC Interior Lower Mainland Transmission Project – EAC Application [online]. Available from http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_doc_list_290_r_app.html [accessed June 2015].

Government of Canada. 2014a. Canada Transportation Act [online]. Available from http://laws-lois.justice.gc.ca/PDF/C-10.4.pdf [accessed February 2015].

Government of Canada. 2014b. Radiocommunication Regulation [online]. Available from http://laws-lois.justice.gc.ca/PDF/SOR-96-484.pdf [accessed: February 2015].

Government of Canada. 2014c. Radiocommunication Act [online]. Available from http://laws.justice.gc.ca/PDF/R-2.pdf [accessed: February 2015].

Green Manitoba. 2015. *Recycling in Manitoba*. Available at: http://greenmanitoba.ca/manitoba-recycles/. Accessed: March 2015.

Industry Canada. 2013. *Spectrum Management and Telecommunications Interference-Causing Equipment Standard: Alternating Current High Voltage Power Systems (ICES-004)*. Available at: https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/ICES-004_4.pdf/$file/ICES-004_4.pdf. Accessed: June 2015.

Janischewskyj, W., and E.R. Taylor. 1971. *Radio Noise Design Guide for High-Voltage Transmission Lines*. Power Apparatus and Systems 90 (2): 833-842pp. doi:10.1109/TPAS.1971.293115.

Keeyask Hydropower Limited Partnership. 2012. Keeyask Generation Project Environmental Impact Statement [online]. Available from http://keeyask.com/wp/executive-summary [accessed June 2015].

Keystone Centre. 2015. The Keystone Centre. Available at: http://www.keystonecentre.com/. Accessed: March 2015.

Manitoba Hydro. 1993. Sustainable Development Policy [online]. Available from https://www.hydro.mb.ca/environment/env_management/sdp.shtml [accessed 23 June 2015].

Manitoba Hydro. 2011. Bipole III Environmental Impact Statement [online]. Available from https://www.hydro.mb.ca/projects/bipoleIII/regulatory_filings.shtml#eis [accessed June 2015].

Manitoba Hydro. 2014. St. Vital Transmission Complex Environmental Assessment: Chapter 3 – Project Description, Section 3.4.1.9 - Workforce Requirements. Available at: https://www.hydro.mb.ca/projects/expansion/stvital/environment/ea_report/stvital_ea_report_part3.pdf. Accessed: June 22, 2015.

Manitoba Hydro. 2015. Manitoba-Minnesota Transmission Project – Historic and Future Climate Study. Prepared by Water Resources Engineering Department, Power Planning Division. Winnipeg, MB.

MCR (Manitoba Capital Region). 2012a. Regional Profiles – Community Profiles – RM of Headingley. Accessed January 15, 2015 from http://www.manitobacapitalregion.ca/main.asp?fxoid=FXMenu,1&cat_ID=3&sub_ID=28&sub2_ID=32.

MCR (Manitoba Capital Region). 2012b. Regional Profiles – Community Profiles – RM of Macdonald. Accessed December 22, 2014 from http://www.manitobacapitalregion.ca/main.asp?fxoid=FXMenu,1&cat_ID=3&sub_ID=28&sub2_ID=33.

MCR (Manitoba Capital Region). 2012c. Regional Profiles – Community Profiles – RM of Ritchot. Accessed January 15, 2015 from http://www.manitobacapitalregion.ca/main.asp?fxoid=FXMenu,1&cat_ID=3&sub_ID=28&sub2_ID=34.

MCR (Manitoba Capital Region). 2012d. Regional Profiles – Community Profiles – RM of Rosser. Accessed January 15, 2015 from http://www.manitobacapitalregion.ca/main.asp?fxoid=FXMenu,1&cat_ID=3&sub_ID=28&sub2_ID=36.

MCR (Manitoba Capital Region). 2012e. Regional Profiles – Community Profiles – RM of Springfield. Accessed December 22, 2014 from http://www.manitobacapitalregion.ca/main.asp?fxoid=FXMenu,1&cat_ID=3&sub_ID=28&sub2_ID=37.

MCR (Manitoba Capital Region). 2012f. Regional Profiles – Community Profiles – RM of Tache. Accessed January 15, 2015 from http://www.manitobacapitalregion.ca/main.asp?fxoid=FXMenu,1&cat_ID=3&sub_ID=28&sub2_ID=41.

MIT (Manitoba Department of Infrastructure and Transportation. 1998.Transportation Planning – Rural Highways Functional Classification. Available at: http://www.gov.mb.ca/mit/tspd/pdf/tp1-98.pdf. Accessed: February 2015.

MIT (Manitoba Department of Infrastructure and Transportation. 2015. Summary of Roadway Collision Data. Traffic Engineering Division. Winnipeg, MB.

MOFC (Manitoba Office of the Fire Commissioner). 2014. Municipal Support – Mutual Aid System Districts Map. Available at: http://www.firecomm.gov.mb.ca/support_districts_map.html. Accessed: December 2014.

Manitoba Telecom Services Inc. 2015. The 4G HSPA Wireless Network. Available at: https://www.mts.ca/mts/personal/wireless/coverage+and+roaming/canada.

National Energy Board. 2015. Electricity Filing Manual. National Energy Board. Calgary, AB.

Ouadah, M and Zergoug, M. 2013. Conference Internationale des Energies Renouvelables (CTER'13). ISSN: 2356-5608 (Vol. 2).

Penn-Co Construction. No date (n.d.). Headingley Waste Water Treatment Plant. Available at: http://www.penn-co.com/headingleywwtp.html. Accessed: December 2014.

PRGT (Prince Rupert Gas Transmission Ltd.). 2014. *Application for an Environmental Assessment Certificate*. Available at: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_403_37577.html. Accessed: February 2015.

Province of Manitoba. 1988a. Food and Food Handling Establishments Regulation [online]. Available from http://web2.gov.mb.ca/laws/regs/current/_pdf-regs.php?reg=339/88%20R [accessed February 2015].

Province of Manitoba. 1988b. Water Works, Sewerage and Sewage Disposal Regulation [online]. Available from http://web2.gov.mb.ca/laws/regs/current/_pdf-regs.php?reg=331/88%20R [accessed February 2015].

Province of Manitoba. 1988c. Water Supplies Regulation [online]. Available from http://web2.gov.mb.ca/laws/regs/current/_pdf-regs.php?reg=330/88%20R [accessed February 2015].

Province of Manitoba. 1988d. Vehicle Weights and Dimensions on Classes of Highways Regulation [online]. Available from http://web2.gov.mb.ca/laws/regs/current/_pdf-regs.php?reg=575/88 [accessed February 2015].

Province of Manitoba. 1996. *Environment Act Fees Regulation*. Available at: http://web2.gov.mb.ca/laws/regs/current/_pdf-regs.php?reg=168/96. Accessed: February 2015.

Province of Manitoba. 1997. Dangerous Goods Handling and Transportation Act [online]. Available from http://web2.gov.mb.ca/laws/statutes/ccsm/_pdf.php?cap=D12 [accessed: February 2015].

Province of Manitoba. 2003a. Onsite Wastewater Management Systems Regulation [online]. Available from http://www.gov.mb.ca/conservation/envprograms/pdf/e125-083.03.pdf [accessed February 2015].

Province of Manitoba. 2003b. Dangerous Goods Handling and Transportation Regulation [online]. Available from http://web2.gov.mb.ca/laws/regs/current/_pdf-regs.php?reg=55/2003 [accessed February 2015].

Province of Manitoba. 2009. Public Health Act [online]. Available from http://web2.gov.mb.ca/laws/statutes/ccsm/_pdf.php?cap=P210 [accessed February 2015].

Province of Manitoba. 2014a. Highway Traffic Act [online]. Available from http://web2.gov.mb.ca/laws/statutes/ccsm/_pdf.php?cap=H60 [accessed February 2015].

Province of Manitoba. 2014b. The Manitoba Hydro Act [online]. Available from https://web2.gov.mb.ca/laws/statutes/ccsm/h190e.php [accessed July 2015].

Province of Manitoba. 2014c. *Manitoba Land Initiative*. Available at: http://mli2.gov.mb.ca/index.html. Accessed: February 2015.

Province of Manitoba. 2015a. *Environment Act*. Available at: http://web2.gov.mb.ca/laws/statutes/ccsm/_pdf.php?cap=E125. Accessed: February 2015.

Province of Manitoba. 2015b. Green Manitoba – Recycling in Manitoba. Available at: http://greenmanitoba.ca/manitoba-recycles/. Accessed: February 2015.

RCMP (Royal Canadian Mounted Police). 2014. Detachment Profiles [online]. Available from http://www.rcmp-grc.gc.ca/mb/detach/morris-eng.htm [accessed December 2014].

Rescan (Rescan Environmental Services Ltd.) 2010. Northwest Transmission Line: Application for an Environmental Assessment Certificate [online]. Available from http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_doc_list_299_r_app.html [accessed June 2015].

RM of Headingley. 2011a. Protective Services – Police [online]. Available from http://www.rmofheadingley.ca/main.asp?cat_ID=13&sub_ID=225&fxoid=menu,3_2 [accessed December 2014].

RM of Headingley. 2011b. Protective Services – Fire Department/First Responders. Available at: http://www.rmofheadingley.ca/main.asp?cat_ID=13&sub_ID=224&fxoid=menu,3_1. Accessed: December 2014.

RM of Headingley. 2011c. Municipal Services – Sewer & Water. Available at: http://www.rmofheadingley.ca/main.asp?cat_ID=5&sub_ID=171&fxoid=menu,2_2. Accessed: December 2014.

RM of Macdonald. 2014a. Municipal Services. Available at: http://www.rmofmacdonald.com/index.asp?ID=2&Sub_ID=167&Sub2_ID=0. Accessed: December 2014.

RM of Macdonald. 2014b. Fire Department. Available at: http://www.rmofmacdonald.com/fire/index.html. Accessed: December 2014.

RM of Piney. 2014. Fire Department Completed Questionnaire for Insurance Companies. (received by email).

RM of Springfield. 2011. Public Water System Annual Report 2011. Available at: http://www.rmofspringfield.ca/files/2011publicwatersystemannualreport.pdf. Accessed: December 2014.

Rogers Communications. 2015. Network Coverage Map (Manitoba). Available at: http://www.rogers.com/business/mb/en/smallbusiness/shop/wireless/networkcoverage/.

Sainte-Anne Police Department. 2014. *Sainte-Anne Police Department 2013 Year End Review.* Available at: http://ste-anne-police-department.ci-site.net/pages/view/About-Us/2013-In-Review/. Accessed: May 2015.

Stantec (Stantec Consulting Ltd.). 2013. North Montney Project Environmental and Socio-economic Assessment [online]. Available from https://docs.neb-one.gc.ca/ll-eng/llisapi.dll?func=ll&objId=1060040&objAction=browse&viewType=1 [accessed June 2015].

Stantec (Stantec Consulting Ltd.). 2015. Manitoba-Minnesota Transmission Project Traffic Impact Assessment

Statistics Canada. 2002. 2001 Community Profiles (Archived) [online]. Available from http://www12.statcan.ca/english/profil01/CP01/Index.cfm?Lang=E [accessed April 2015].

Statistics Canada. 2003. 2001 Census Aboriginal Population Profiles. Available from http://www12.statcan.ca/english/profil01/AP01/Index.cfm?Lang=E [accessed April 2015].

Statistics Canada 2008. 2006 Aboriginal Population Profile. Available from http://www12.statcan.gc.ca/census-recensement/2006/dp-pd/prof/92-594/Index.cfm?Lang=E [accessed April 2015].

Statistics Canada. 2012. 2011 Census Profile. Statistics Canada Catalogue no. 98-316-XWE [online]. Available from http://www12.statcan.gc.ca/census-recensement/2011/dp-pd/prof/index.cfm?Lang=E [accessed February 2015].

Statistics Canada. 2013. 2011 National Household Survey Aboriginal Population Profile. Statistics Canada Catalogue no. 99-011-XWE2011007. Available from https://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/aprof/index.cfm?Lang=E [accessed April 2015].

Statistics Canada. 2002. *2001 Community Profiles*. Available at: http://www12.statcan.ca/english/profil01/CP01/Index.cfm?Lang=E. Accessed: April 2015.

Statistics Canada. 2003. *2001 Census Aboriginal Population Profiles*. Available at: http://www12.statcan.ca/english/profil01/AP01/Index.cfm?Lang=E. Accessed: April 2015.

Statistics Canada 2008. *2006 Aboriginal Population Profile*. Available at: http://www12.statcan.gc.ca/census-recensement/2006/dp-pd/prof/92-594/Index.cfm?Lang=E. Accessed: April 2015.

Statistics Canada. 2013. 2011 National Household Survey. Available at: https://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/aprof/index.cfm?Lang=E. Accessed: April 2015.

Statistics Canada. 2014a. *Police Resources in Canada, 2013*. Available at: http://www.statcan.gc.ca/pub/85-002-x/2014001/article/11914-eng.htm#a4. Accessed: February 2015.

Statistics Canada. 2014b. Crimes, by type of violation, and by province and territory (Manitoba, Saskatchewan, Alberta, British Columbia. Available at: http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/legal50c-eng.htm. Accessed: May 2015.

TELUS Communications Company. 2015. Coverage Map (4G HSPA & LTE). Available at: http://www.telus.com/en/ab/mobility/network/coverage-map.jsp.

Transportation Research Board. 2000. Highway Capacity Manual. 3rd Edition. TRB Special Report 209. The National Academies. Washington, DC.

Town of Ste. Anne. 2013a. Police Department [online]. Available from http://www.steannemb.ca/page.php?id=25 [accessed December 2014].

Town of Ste. Anne. 2013b. Fire Department. Available at: http://www.steannemb.ca/page.php?id=24. Accessed: December 2014.

Town of Stonewall. 2012. Local Government – Government Services – Emergency Services [online]. Available from http://www.stonewall.ca/main.asp?fxoid=FXMenu,5&cat_ID=1&sub_ID=251&sub2_ID=170 [accessed December 2014].

Travel Manitoba. 2014. Where to Stay [online]. Available from http://www.travelmanitoba.com/where-to-stay/ [accessed February 2015].

University of Manitoba Transport Information Group. 2015. MHTIS Webmap [online]. Available from http://umtig.eng.umanitoba.ca/mhtis/WebMap.htm [accessed July 2015].

WFPS (Winnipeg Fire Paramedic Service). March 18, 2015. Winnipeg Fire Paramedic Service Letter to the Winnipeg Free Press Editor. Accessed May 4, 2015 from http://winnipeg.ca/fps/pdfs/WFPS-letter_to_WFP_Editor-Mar_18_2015.pdf.

WPS (Winnipeg Police Service). 2013. About the Service – Winnipeg Police Districts and Service Centres [online]. Available from http://www.winnipeg.ca/police/AboutTheService/districts.stm [accessed May 5, 2015].

WPS (Winnipeg Police Service). 2014. Winnipeg Police Service – 2013 Annual Statistical Report. Available from http://winnipeg.ca/fps/pdfs/WFPS-letter_to_WFP_Editor-Mar_18_2015.pdf [accessed May 2015].

13.11.2 Personal Communications

Ash, Troy. 2014. Fire Chief. Phone conversation between Troy Ash, Fire Chief of the RM of Ritchot Fire Department in the RM of Richot, MB and Crista Gladstone, Socio-Economic Analyst, Stantec Consulting Ltd. on December 16, 2014.

Ashton, Doug. 2015. RCMP Sr. Planning Analyst. E-mail correspondence with Stantec Consulting Ltd. May 11, 2015.

Blatz, Jennifer. 2015. CAO RM of Ste. Anne. E-mail correspondence with Stantec Consulting Ltd. May 6, 2015.

Bruce-Smith, Chris. 2015. Assistant Chief QI/Strategic Initiatives and Planning. E-mail correspondence with Stantec Consulting. May 14, 2014.

Darker, Marc. Operations Manager – Town of Ste. Anne. E-mail correspondence with Stantec Consulting Ltd. May 8, 2015.

Dayment, Ken. 2014. Fire Chief. Phone conversation between Ken Dayment, Fire Chief of the Ste. Anne Fire Department, Ste. Anne, MB and Crista Gladstone, Socio-Economic Analyst, Stantec Consulting Ltd. on December 17, 2014.

Doerksen, D. 2015. Executive Assistant, Steinbach Chamber of Commerce. Telephone correspondence with Stantec Consulting Ltd. April 22, 2015.

Dyck, Roxanne. 2015. Administrative Assistant at Brandon Fire and Emergency Services (BFES). E-mail correspondence with Stantec Consulting Ltd. May 5, 2015.

Elson, Greg. 2015. Director of Water and Waste – RM of Springfield. E-mail and telephone correspondence with Stantec Consulting Ltd. April 28, 2015.

Howdle, L. 2015. Administrative Assistant, Economic Development Winnipeg. Telephone correspondence with Stantec Consulting Ltd. April 22, 2015.

Kalyata, P. April 22, 2015. Personal communication with P. Kalyata, City Engineer with the City of Steinbach and L. McDonald, Interviewer, Stantec Consulting Ltd. on April 22, 2015.

Maynard, Lucy. CAO, RM of Stuartburn. Phone conversation with Stantec Consulting Ltd. April 27, 2015.

McIntosh, Brad. Manger of Water Treatment Facility – Engineering Services and Water Resources Development Services Division – Brandon. Email conversation between Brad McIntosh, Manager of Water Treatment Facility – Brandon and Stephen Roberts, Socio-economic Analyst, Stantec Consulting Ltd. on May 7, 2015.

Moir, Whitney. 2015. Program Coordinator, Brandon Riverbank Inc. Telephone and email correspondence with Stantec Consulting Ltd. May 14, 2015.

Muller, Ray. April 24, 2015. Phone conversation with Ray Muller, Development Officer, RM of Headingley and L. McDonald, Interviewer, Stantec Consulting Ltd. on April 24, 2015.

Nadeau, Alain. 2014. Fire Chief. Phone conversation between Alain Nadea, Fire Chief of the RM of La Broquerie Fire Department in La Broquerie, MB and Crista Gladstone, Socio-Economic Analyst, Stantec Consulting Ltd. on December 16, 2014.

Nault, Mike. April 22, 2015. Personal communication with Mike Nault, Employee at the De Salaberry Landfill Site, RM of Piney and L. McDonald, Interviewer, Stantec Consulting Ltd. on April 22, 2015.

Palmer, Mike. 2014. Fire Chief. Phone conversation between Mike Palmer, Fire Chief of the RM of Rosser, RM of Rosser, MB and Crista Gladstone, Socio-Economic Analyst, Stantec Consulting Ltd. on December 17, 2014.

Poersch, Dan. 2015. CAO RM of Tache. Email conversation between Dan Poersch, CAO RM of Tache and Stephen Roberts, Socio-economic Analyst, Stantec Consulting Ltd. on May 7, 2015.

Remillard, Trish. 2015. Administrative Office Assistant. Email conversation between Trish Remillard, Administrative Office Assistant of the Municipality of Glenboro South Cypress and Stephen Roberts, Socio-economic Analyst, Stantec Consulting Ltd. on May 6, 2015.

RM of Rosser. 2014. Administrative Assistant. Phone conversation between the Administrative Assistant at the RM of Rosser, RM of Rosser, MB and Crista Gladstone, Socio-Economic Analyst, Stantec Consulting Ltd. on December 17, 2014.

RM of Tache. 2014. Receptionist. Phone conversation between the Receptionist at the RM of Tache, RM of Tache MB, and Crista Gladstone, Socio-Economic Analyst, Stantec Consulting Ltd. on December 17, 2014.

Skjaerlund, Pete. 2015. Fire Chief. Phone conversation between Pete Skjaerlund of the RM of Tache Fire Department in the RM of Tache, MB and Crista Gladstone, Socio-Economic Analyst, Stantec Consulting Ltd. on June 10, 2015.

Tanasichuk, Chris. April 27, 2015. Phone conversation between Chris Tanasichuk, Glenboro Community Development and L. McDonald, Interviewer, Stantec Consulting Ltd. on April 27, 2015.

Thompson Ruttle, Ina. 2014. Fire Chief. Phone conversation between Ina Thompson Ruttle, Fire Chief of the RM of Piney Fire Department in Piney, MB and Crista Gladstone, Socio-Economic Analyst, Stantec Consulting Ltd. on December 16, 2014.

Van Osch, Martin. 2014. RM of Piney. Phone Conversation between Martin Van Osch, Chief Administrative Officer, RM of Piney, MB and Crista Gladstone, Socio-Economic Analyst, Stantec Consulting Ltd. on December 16, 2014.

Wells, Bev. 2015. CAO RM of Rosser. Email conversation between Bev Wells, CAO RM of Rosser and Stephen Roberts, Socio-economic Analyst, Stantec Consulting Ltd. on May 7, 2015.