MANITOBA – MINNESOTA TRANSMISSION PROJECT
Environmental Impact Statement

ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS ON AGRICULTURE

CHAPTER 15
SEPTEMBER 2015

TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

Page

LIST OF MAPS

APPENDICES

ABBREVIATIONS AND ACRONYMS

AAFC	Agriculture and Agri-Food Canada
AC	alternating current
CEAA	*Canadian Environmental Assessment Act, 2012*
CEC	Clean Environment Commission
CFIA	Canadian Food Inspection Agency
DGPS	differential global positioning system
EMF	electric and magnetic fields
FEARO	Federal Environmental Assessment Review Office
ft	feet
GIS	geographical information system
GPS	global positioning system
ha	hectare
km	kilometre
KPI	key person interview
kV	kilovolt
LAA	local assessment area
m	metre
MAAA	Manitoba Aerial Applicators Association
MAFRD	Manitoba Agriculture, Food and Rural Development
MASC	Manitoba Agricultural Services Corporation
MCWS	Manitoba Conservation and Water Stewardship
MLI	Manitoba Land Initiative
MMTP	Manitoba–Minnesota Transmission Project
n.d.	no date
NEB	National Energy Board
OMAFRA	Ontario Ministry of Agriculture, Food and Rural Affairs
PAMI	Prairie Agricultural Machinery Institute

PDA	Project development area
PEP	public engagement process
PR	provincial road
PRA	Prairie Research Associates
PTH	provincial trunk highway
RAA	regional assessment area
RM	rural municipality
ROW	right-of-way
RVTC	Riel–Vivian Transmission Corridor
SLTC	Southern Loop Transmission Corridor
SOP	standard operating procedure
SVTC	St. Vital Transmission Complex Project
TDR	Technical Data Report
VC	valued component

GLOSSARY OF TECHNICAL TERMS

Admixing	The dilution of topsoil with subsoil, spoil or waste material, with the result that topsoil quality is reduced. Admixing can result in adverse changes in topsoil texture, poor soil aggregation and structure, loss of organic matter, and decrease in friability.
Agricultural biosecurity	The protection of crops and livestock systems against the threats to production from disease, pests and invasive species.
Agricultural capability	A rating that indicates the degree of limitation imposed by a soil in its use for mechanized agriculture. In the Canadian system, it is the grouping of lands with the same relative degree of limitation or hazard (nil in Class 1 and becomes progressively greater to Class 7 for which there is no capability for agriculture).
Agricultural operation	An agricultural, horticultural or silvicultural operation that is conducted in order to produce agricultural products on a commercial basis, and includes: a. the tillage of land; b. the production of agricultural crops, including grains, oil seeds, hay and forages; c. the production of horticultural crops, including vegetables, fruit, mushrooms, sod, trees, shrubs and greenhouse crops; d. the use of land for grazing livestock; e. the use of land for livestock operations; f. the production of eggs, milk and honey; g. the raising of game animals, fur-bearing animals, game birds, bees and fish; h. the operation of agricultural machinery and equipment; i. the processing necessary to prepare an agricultural product for distribution from the farm gate; j. the application of fertilizers, manure, soil amendments and pesticides, including ground and aerial application; and k. the storage, use or disposal of organic wastes for farm purposes.

Cropland biosecurity	Cropland biosecurity refers to a series of management practices and processes designed to limit or control the introduction, spread and release of pests, such as noxious weeds, soil-borne insects/invertebrates (*e.g.,* soybean cyst nematode) and plant diseases (*e.g.,* clubroot).
Hobby farm	An agricultural use incidental to the main residential use of a parcel, compatible with the density of development, and on which animals can be kept for personal use only, including limits on the total number of animal units and number of animal units per acre.
Livestock biosecurity	Livestock biosecurity is a set of risk management practices designed to assist producers in managing disease (*e.g.,* anthrax for beef cattle, avian influenza for poultry, and classical swine fever for pigs) in all types of livestock operations.
Pullet	A young female chicken that will grow into a hen.
Soil rutting	Rutting occurs when soil strength is not sufficient to support the applied load from vehicle traffic. It displaces soil, damages soil structure and can reduce productivity.
Tower spotting	The placement of transmission line towers to optimize design or avoid features on the landscape.

15 Assessment of Potential Environmental Effects on Agriculture

15.1 Introduction

Manitoba Hydro is proposing construction of the Manitoba–Minnesota Transmission Project (MMTP, or the Project), which involves the construction of a 500 kilovolt (kV) AC transmission line in southeastern Manitoba. The transmission line would originate at the Dorsey Converter Station northwest of Winnipeg, continue south around Winnipeg and within the Existing Transmission Corridor (Existing Corridor), the Southern Loop Transmission Corridor (SLTC) and the Riel–Vivian Transmission Corridor (RVTC), to just east of Provincial Trunk Highway (PTH) 12. The transmission line then continues southward on a New Right-of-way (New ROW) across the rural municipalities 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 modifications at the Glenboro South Station requiring realignment of transmission lines entering the station.

Based on the above description, the assessment of the Project is divided into three components:

- transmission line construction in the Existing Corridor, extending from Dorsey Converter Station to just east of PTH 12;
- transmission line construction in a New ROW, extending south from the Anola area to the border by Piney; and
- station upgrades—at Glenboro South Station, Dorsey Converter Station and Riel Converter Station—and transmission line realignment work at Glenboro South Station.

Agriculture is a valued component (VC) because unmitigated effects from Project activities during construction (*e.g.*, right-of-way (ROW) clearing, and tower construction) and the presence of the Project could reduce the amount of land available for agriculture, degrade the quality of land used to support agriculture, and interfere with agricultural activities.

Agriculture is a key driver of productivity and prosperity in Manitoba; in 2014, it directly accounted for 3.6% of the provincial gross domestic product (Donetz, pers. comm. 2015). The diversity of agriculture in the province plays an important role in maintaining economic strength and generating socio-economic stability, in part because of the many linkages agriculture has with other industries. Primary production of crop and livestock combined with related food-processing businesses represent over 25% of total provincial exports (Government of Manitoba 2014). Agriculture is an important industry in the Project area because of its contribution to the local and provincial economies. Agricultural land use within the Project area includes:

- production of agricultural crops (*i.e.,* row crops, other specialty crops, grains, oil seeds, hay and forages)
- application of fertilizers, manure, soil amendments and pesticides, including ground and aerial application
- raising of livestock (*i.e.*, hogs, dairy cattle, beef cattle, sheep, goats and poultry), and livestock grazing
- production of horticultural crops (*i.e.,* vegetables, fruit, mushrooms, sod, trees, shrubs and greenhouse crops)
- raising of game animals (*i.e.,* bison), fur-bearing animals (*i.e.,* alpaca, llama) and bees
- storage, use or disposal of organic wastes for farm purposes

Given the location of the Project and the wide range of agricultural land uses within the region, Project components and activities could affect agricultural land use and activities. During public engagement, which included discussions with landowners and stakeholder groups and through key person interviews, concerns were raised about the potential for Project effects on agriculture.

This chapter presents baseline conditions for agriculture, and assesses the environmental effects of Project construction, operation and maintenance activities on agriculture. An assessment of cumulative effects on agriculture is also presented.

Agriculture has linkages to other VCs as outlined in Table 15-1.

Table 15-1 Linkages between Agriculture and Other Valued Components

Valued Component	Description of Linkage
Vegetation and wetlands (Chapter 10)	Soil transport by equipment and people during Project activities can result in the introduction and spread of diseases, pests and invasive plant species in previously unaffected fields. While the potential effects associated with the introduction and spread of invasive plant species on vegetation and wetlands are reported primarily in vegetation and wetlands, this chapter focuses on the potential effects of noxious weeds in agricultural lands. Because agricultural land use is predominant in the Project region, the spread of noxious weeds and soil-borne diseases due to Project activities can compromise the biosecurity of agricultural lands.
Land and resource use (Chapter 16)	Agricultural shelterbelts are important features within the agricultural landscape in the Project area. Potential Project effects on these features are addressed in the land and resource use chapter. Similarly, effects on rural residences are assessed under land and resource use.
Employment and economy (Chapter 14)	Agriculture also has linkages to employment and economy because it is an important sector of the economy in the Project region and provides a means of livelihood for residents of the region.

15.1.1 Regulatory and Policy Setting

In preparing this assessment, consideration was given to federal and provincial laws, regulations, policies and guidelines as well as Manitoba Hydro's policies as outlined below.

15.1.1.1 Primary Regulatory Guidance

A list of the various regulatory requirements that were considered in developing this environmental impact statement (EIS) can be found in the Project description (Chapter 2, Section 2.2). 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; and
- the *Canadian Environmental Assessment Act, 2012* (S.C. 2012, c. 19, s. 52) and its applicable regulations and guidelines.

15.1.1.2 Additional Federal Guidance

The Canadian Aviation Regulations SOR/96-433 of the *Aeronautics Act* apply to the operation of aircraft, including for the use for aerial application. The Project is anticipated to interact with aerial application and aerial application operators must have regard to these regulations.

15.1.1.3 Additional Provincial Guidance

The Noxious Weeds Act , C.C.S.M. c. N110 categorizes a number of plant species as noxious, and specifies that they must be eradicated or controlled. The Act is relevant to this assessment of Project effects because noxious weeds could be introduced to previously unaffected agricultural lands as a result of Project activities. Manitoba Agriculture, Food and Rural Development (MAFRD) recently introduced proposed amendments to strengthen *The Noxious Weeds Act* and better protect agricultural lands and natural areas in Manitoba from the spread of noxious and invasive weeds (Manitoba News Release 2015). Through the proposed changes, the list of regulated weeds would be amended, and the weeds would be designated into one of three tiers based on prevalence, distribution and invasiveness. While the Act is under revision, MAFRD has created an interim list of controlled species, known as the *Declaration of Noxious Weeds in Manitoba* (MAFRD 2015a); this was used as the operational list for occurrences of invasive and non-native species for the Project (Appendix 15A).

While there is no legislation directly governing biosecurity with respect to clubroot and other soil-borne diseases, if passed, the proposed changes to *The Noxious Weeds Act* will require that equipment travelling through agricultural fields be cleaned (Kubinec 2015, pers. comm.). This will reduce the transfer of noxious weeds and soil-borne diseases. To protect crop production, MAFRD has developed biosecurity protocols for different end users, including landowners, agricultural service providers, utility companies and researchers (MAFRD n.d.(a)). Biosecurity Management on Agricultural Land for the Energy and Transportation Industries is the protocol that applies to transmission line projects. Its objective is to prevent the spread of soil-borne pests such as weeds, protists and nematodes in agricultural soils by limiting soil movement between fields and across ROWs (MAFRD n.d.(a)).

15.1.1.4 Additional Municipal Guidance

Land use planning in the rural municipalities traversed by the Project is guided under the Provincial Land Use Policies and governed under *The Planning Act*. Each of the rural municipalities traversed by the Project has a zoning by-law that regulates the development and use of the land, buildings and structures (including agricultural uses).

15.1.1.5 Manitoba Hydro Corporate Policies and Programs

Manitoba Hydro has corporate policies and programs in place to guide its activities. These policies relate to municipal zoning and subdivision process, environmental management, sustainable development, agricultural biosecurity and landowner compensation. The latter four are applicable to agriculture.

15.1.1.5.1 Environmental Management Policy

Manitoba Hydro is committed to protecting the environment by preventing or limiting adverse effects on the environment and enhancing positive effects (Manitoba Hydro 2014c). The corporation is also committed to the following:

- considering the interests and using the knowledge of its customers, employees, communities, and stakeholders who may be affected by the corporation's actions;
- meeting regulatory, contractual and voluntary requirements;
- continually improving its Environmental Management System;
- reviewing its environmental objectives and targets annually to improve its environmental performance; and
- documenting and reporting its activities and environmental performance.

15.1.1.5.2 Sustainable Development Policy

Manitoba Hydro has adopted a sustainable development policy and 13 guiding principles that influence corporate decisions, actions and day-to-day operations in order to achieve environmentally sound and sustainable economic development (Manitoba Hydro 1993) (Chapter 23 – Sustainable Development, Appendix A). Manitoba Hydro applies the principles of sustainable development in all aspects of its operations (Chapter 23– Sustainable Development). Through its corporate decisions and actions in providing 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).

15.1.1.5.3 Agricultural Biosecurity Policy

Manitoba Hydro understands that biosecurity is a growing concern in the agricultural sector globally. The company recognizes that its staff and contractors have the potential to affect agricultural biosecurity through construction and maintenance activities that require access to agricultural land. Manitoba Hydro's agricultural biosecurity policy addresses the need to prevent the introduction and spread of diseases, pests and invasive plant species on agricultural land and livestock operations. The policy was developed in consultation with government and industry (Manitoba Hydro 2015a).

Manitoba Hydro's Transmission Business Unit developed and maintains an agricultural biosecurity standard operating procedure (SOP) (Manitoba Hydro 2015a; Appendix 15B). The SOP includes the following:

- **Training of Staff and Contractors** - all individuals who conduct activities for the Transmission Business Unit and require access onto agricultural land are trained in Manitoba Hydro's agricultural biosecurity policy and the Transmission Business Unit's SOP (Manitoba Hydro 2015a).
- **Assessment of the potential biosecurity risk** - the Transmission Business Unit uses a risk matrix to identify potential biosecurity risk. The perceived level of risk to agricultural land from construction and maintenance activities is determined by multiplying the likelihood of a hazard occurring by the consequence or severity of the hazard. The following two levels of risk are identified from the matrix (*i.e.*, low risk and higher risk):
    - Low Risk - During the winter season when the ground is frozen and there is snow cover, it is not anticipated that activities conducted during this time will effectively transfer invasive organisms (diseases, pests, and invasive species) to other agricultural lands and therefore the risk can be considered low. When the ground is dry and undisturbed, the risk of transferring seeds is minimal, however, avoiding bare ground will also help to reduce the risk. Visible inspections will still be expected to occur and are described in the biosecurity procedures. The risk can be managed and further reduced by avoiding wet areas and cleaning equipment effectively when leaving the field.
    - Higher Risk - the higher risk will be located in areas where the ground conditions are very wet and the accumulation of heavy soils such as clay may occur on footwear and in the tracks of vehicles or heavy equipment. There are a number of ways this condition can be mitigated such as avoiding the excessively wet areas, additional cleaning procedures, or rescheduling the work until ground conditions are more favourable. Although rescheduling work until ground conditions are more favourable is preferred, it is not always possible because the activity may be dependent upon a specific timeline, seasonal changes, or an emergency where it is essential to return infrastructure to normal operating conditions.

Additional measures may be implemented when there is documented evidence of invasive organisms (diseases, pests, and invasive species) that are of concern to MAFRD.

For the majority of activities conducted within the Transmission Business Unit, the level of risk is anticipated to be low. With continual educational awareness and effective implementation of biosecurity procedures, the goal is to reduce the risk to agricultural lands as much as possible.

Additional mitigation measures for reducing the potential for biosecurity to be compromised through weed and pest transfer are provided in Section 15.5.3. Similar to MAFRD's Biosecurity Management on Agricultural Land for the Energy and Transportation Industries (MAFRD 2015), the Manitoba Hydro Transmission Business Unit SOP for biosecurity on agricultural land:

- seeks to prevent the spread of soil-borne in agricultural soils by limiting soil movement between fields and across ROWs; and
- provides mitigation measures that are focused on cleaning techniques and reducing exposure to biosecurity risk, *e.g.,* not working under very wet conditions.

However, the two differ in how they define or assign risk for biosecurity. Manitoba Agriculture, Food and Rural Development (MAFRD 2015) defines risk for biosecurity in terms of activities (*e.g.*, survey, grading, topsoil salvage and topsoil replacement are high risk activities). In contrast, Manitoba Hydro's SOP defines risk for biosecurity in terms of field ground conditions (*e.g.*, low risk under frozen ground conditions and high risk under wet field conditions in areas with clay soil). This difference reflects the multisector focus of the provincial guidance and the more focused nature of the Transmission Business Unit's SOP.

15.1.1.5.4 Landowner Compensation

Where property easements need to be acquired, Manitoba Hydro will seek to identify, contact and communicate with the landowner in a timely manner. Manitoba Hydro will mitigate Project effects on agriculture to the extent practical. However, residual Project effects due to construction and operation activities are anticipated and relate to the physical presence of Project structures and conductors. Effects may include temporary and permanent loss of land, damage to crops and property, ongoing nuisance to farmers, and direct and indirect effects on property use. Landowners and producers are compensated for these residual effects.

Manitoba Hydro's brochure entitled *Manitoba-Minnesota Transmission Project Landowner Compensation Information* (Manitoba Hydro n.d.; Appendix 15C) outlines aspects of the compensation program. Four types of compensation are available to affected landowners:

Land Compensation

Land Compensation is a one-time payment to landowners who grant an easement for a transmission line ROW. It is based on:

- the total land area (acres) of easement required;
- the current market value of the land (per acre); and
- the easement compensation factor, which is determined based on the size and type of the transmission line. For 500 kV transmission lines, Manitoba Hydro's compensation factor is 150% of current market value.

Construction Damage Compensation

Construction Damage Compensation is provided to landowners who experience damage to their property due to construction, operation and maintenance of the transmission line. A one-time payment for construction damage is negotiated on a case-by-case basis. Manitoba Hydro will:

- compensate or be responsible for repairing, to the satisfaction of the landowner, any damage to a landowner's property; and
- compensate a landowner for damages such as the reapplication of topsoil or rejuvenation of compacted topsoil where the remedial work requires farm machinery and the landowner's expertise.

If crops were in place prior to construction of the transmission line, the crop owner will be compensated for financial loss due to damage. This compensation generally considers the most recent average value of the harvested crop reported by Manitoba Agricultural Services Corporation [MASC].

Structure Impact Compensation

Structure Impact Compensation is a one-time payment to landowners for tower placement on land classified as agricultural. Manitoba Hydro prepares a compensation schedule semi-annually based on current data provided by MASC. Structure Impact Compensation considers:

- crop losses on lands permanently removed from production
- reduced productivity in an area of overlap around each tower structure
- additional time required to manoeuvre farm machinery around each structure
- double application of seed, fertilizer and weed control in the area of overlap around each tower structure

Structure Impact Compensation also takes into consideration:

- the four types of agricultural lands; *i.e.*, natural hayland, seeded hayland, cereal crop land and ROW crop land
- the type of tower structure constructed on the land
- the location of the tower structure in relation to property lines

Manitoba Hydro provides compensation for best use potential on structure-related payments as long as the best use potential can be demonstrated.

Ancillary Damage Compensation

Ancillary Damage Compensation is a one-time payment that applies where Manitoba Hydro's use of the ROW directly or indirectly affects property use. Ancillary damage compensation is negotiated. Landowners may be compensated for:

- agricultural effects (*e.g.,* effects on irrigation and aerial spraying activities)
- constraint effects, such as restricted access to adjacent lands

15.1.2 Engagement and Key Issues

The engagement processes (Chapters 3 and 4) actively sought to provide opportunities to provide Project feedback. Key person interviews were also conducted with producer representative groups to focus the review of the Project and its potential effects on agricultural land uses and operations in the Project region.

Many concerns raised during the PEP related directly to agriculture. Issues and questions regarding potential Project effects on agriculture were associated primarily with how construction-related activities and the presence of the transmission system may overlap physically with existing agricultural land uses. Identified issues included:

- temporary and permanent loss of agricultural land
- degradation of agricultural land
- compensation for loss of land or affected activities/operations
- potential effects on farm infrastructure, equipment operation and manure application
- interference of towers and conductors with aerial spray application
- proximity to, and interaction with, aerial applicator airstrips
- potential effects on livestock (*e.g.,* stray/tingle voltage on dairy cattle) and animal health due to compromised biosecurity and increased risk of disease transmission
- potential biosecurity issues for crops (*e.g.,* potential for noxious weed spread/growth)

During Project planning and design (Chapter 5 –Transmission Line Routing), Manitoba Hydro sought to anticipate and avoid potential adverse interactions between the Project and agriculture, and associated adverse biophysical and socio-economic interactions, to the extent practical. Efforts were made to reduce potential Project effects on agriculture through avoidance or mitigation. This was influenced by information received during the PEP, and through recent Manitoba Hydro project experience (*e.g.,* Bipole III Transmission Project [Bipole III] and Clean Environment Commission [CEC] recommendations [Manitoba CEC 2013]).

The following avoidance and design mitigation measures were considered to be particularly important:

- avoidance of agricultural buildings wherever feasible;
- alignment of segments in straight lines and avoidance of diagonal crossing of agricultural lands (Manitoba CEC 2013) wherever feasible.

Route-selection-based mitigation included the consideration of agriculture. The alternative route evaluation model (Chapter 5) took into account the following agricultural attributes in order to consider potential effects on agriculture:

- Land capability for agriculture (*i.e.,* land classes with higher capability and fewer limitations [Class 1-3] and land classes with lower capability and more limitations for agriculture [Class 4 and 5]).

- Current agricultural land use (*i.e.,* annual cropland versus hayland).
- Proximity to intensive hog operations, with a three-mile (4.8 km) buffer included for parcels of land that potentially receive manure applications. A three-mile buffer was selected to provide an estimate of the potential area over which liquid hog manure may be applied using surface pipeline and drag hose systems. Large-scale systems can pump up to 2 miles (3.2 km) (OMAFRA 2004), while pumping greater distances requires a booster pump (Halter 2003 [unpublished]), and/or higher energy and results in lower flow rates (Alberta Agriculture and Forestry 1997, Alberta Farm Machinery Research Centre and Prairie Agricultural Machinery Institute 1997). A drag line consists of flexible hose that connects to the surface pipeline and is pulled across the field behind an injector. The presence of a tower structure in a field may interfere with the drag line operation; for example, the field area that may be applied to, the direction of application, the maneuvering requirements, and time and labour requirements.
- Diagonal crossings of agricultural land with higher capability and fewer limitations for agriculture (*i.e.*, Class 1-3 lands).
- Proximity to buildings and structures, including buildings associated with agricultural operations.
- Crop production value per hectare (*i.e.,* estimated value of crop production by crop types grown areas traversed by the Project).

In the alternative route evaluation model that is used to guide the comparison and selection of routes, there are a number of criteria that relate the project route to agricultural land use and activities. When taken together, criteria for land capability for agriculture, current agricultural land use, proximity to hog operations and occurrence of diagonal crossings in lands with higher capability and fewer limitations for agriculture were assigned a combined weight of almost 20% of the total of criteria representing the built environment (Chapter 5).

In planning the Project, Manitoba Hydro placed an appreciable length of the transmission line within existing transmission line corridors (SLTC and RVTC), which reduces interference or conflict with agriculture (Chapter 2 – Project Description).

Other design-based mitigation included consideration and use of the following measures, to the extent practical:

- Self-supporting lattice steel tower structures versus guyed towers in agricultural areas to reduce the area of agricultural land affected by the Project. Further, the absence of guy wires within a field reduces the number of obstacles that have to be avoided by equipment during field operations. This design mitigation was well received for the comparable Bipole III (Manitoba CEC 2013).
- Scheduling construction activities so that their overlap with crop-growing season and associated activities is reduced and soil disturbance is limited. For example, peak construction activities are planned for late fall of 2017 to winter 2018 and winter 2019 for the SLTC and New ROW, respectively (Chapter 2).

Procedural-based mitigation includes the consideration of biosecurity, which was raised as an issue of concern by producer groups and individual landowners during the PEP. Manitoba Hydro has SOPs for protecting biosecurity on agricultural land; they focus on reducing the potential for the introduction and proliferation of invasive plant species and crop and livestock diseases (Manitoba Hydro 2015a).

Multiple rounds of engagement with potentially affected stakeholders and individuals (*e.g.,* agricultural landowners and representative groups) were conducted to allow them to provide input into the Project planning, route selection and design process. Engagement with agricultural landowners affected by the ROW was conducted during Round 3 PEP activities. The intent was to discuss specific sensitivities and tower placement that has the least conflict with existing and planned agricultural operations (*e.g.,* proximity to buildings, field access, ground operations and aerial application). Further discussions will occur during easement negotiations; hence, additional avoidance of specific features may be implemented prior to construction.

15.2 Scope of Assessment

The scope of the environmental assessment of Project effects on agriculture is presented in this section. The scoping defines the study boundaries for the assessment and includes lessons learned from recent, relevant assessments.

15.2.1 Spatial Boundaries

The following spatial boundaries are used to assess residual and cumulative environmental effects of the Project on agriculture (Map 15-1 and Map 15-2):

- **Project development area (PDA):** encompasses the Project footprint and is the anticipated area of physical disturbance associated with the construction and operation and maintenance of the Project (see Map Series 7-100 – Project Development Area). Three PDAs are described for agriculture:
    - Existing Corridor PDA (which is made up of the Southern Loop Transmission Corridor and the Riel to Vivian Transmission Corridor PDAs);
    - New Right-of-way (New ROW) PDA; and
    - Station upgrades (reported by individual station's PDA to provide additional detail for Dorsey Converter Station, Riel Converter Station and Glenboro South Station).
- **Local assessment area (LAA):** includes all components of the PDA and consists of a 1 km buffer from the ROW centreline for the transmission line and 1 km buffer around all station footprints. The LAA for each of the transmission line and station components covers an area that generally will encompass the basic field management unit most commonly used within the Project region – the quarter section, or an area of land 800 m × 800 m. The LAA represents the area where direct and indirect effects on agriculture are likely to be most pronounced or identifiable, and encompasses the locally affected agricultural land uses or

activities. Therefore, Project effects that are experienced across the entire field management unit will generally be considered within the boundary of the LAA. Three LAAs are described for agriculture:

  - Existing Corridor LAA;
  - New ROW LAA; and
  - Station upgrades (reported by individual station to provide additional detail for Dorsey Converter Station, Riel Converter Station and Glenboro South Station, resulting in the Dorsey LAA, Riel LAA and Glenboro LAA).

- **Regional assessment area (RAA):** includes the PDA and LAA, and is defined by the boundaries of the RMs that are traversed by the PDA. From north to south, the RMs that make up the Project RAA are Rosser, Headingley, Macdonald, Ritchot, Springfield, Tache, Ste. Anne, La Broquerie, Stuartburn, Piney and South Cypress. The area defined by the boundaries of the RMs traversed by the Project were chosen as the RAA because they represent the region that encompasses the communities within which changes in socio-economic parameters attributable to Project effects on agriculture might occur. The RAA is the area in which cumulative effects are assessed. It is anticipated that other projects or activities occurring within the same RM as the Project could act cumulatively with the Project.

15.2.2 Temporal Boundaries

The assessment addresses potential effects during Project construction, and operation and maintenance phases. The RAA underwent disturbance and development for agricultural conversion in the 1830s and as it has been in the past, agricultural land use is still substantive.

The Project construction schedule is provided in the Project description (Chapter 2). Subject to regulatory approval and the final construction schedule, transmission line construction for the SLTC will start in the summer of 2017 and will be completed by the spring of 2018. During this period, construction activities will peak in November and December of 2017 and winter of 2018. Construction of the transmission line from Riel to the U.S. border will commence in the spring of 2018 and will be completed by winter of 2020. During this time, activities will peak in winter of 2019.

Modifications to the Dorsey Converter Station are planned for the period from the second quarter in 2018 to the fourth quarter in 2019. Modifications to the Riel Converter Station are scheduled to begin in the third quarter of 2017 with a completion date of fourth quarter in 2019. Modifications to the Glenboro South Station will span the period between first quarter and fourth quarter of 2019. Transmission line re-alignment at Glenboro South Station will occur between spring and summer of 2019.

The Project is expected to have a service life of at least 100 years (Chapter 2).

15.2.3 Learnings from Past Assessments

Assessment experience and recommendations from regulators regarding agriculture on previous projects, including monitoring recommendations, have been reviewed and incorporated into this assessment, where applicable. This was done in order to reduce potential Project effects on agriculture and demonstrate Manitoba Hydro's commitment to continual improvement and sustainable development. Given the similarities in agricultural land use in the RAA of the Project and RAAs of the recent Bipole III and St. Vital Transmission Complex (SVTC) projects, lessons learned from these projects in particular have informed this assessment. The study team also drew from their recent experience in leading assessments for large linear projects, such as the Energy East Pipeline project.

The main agriculture-related issues that were raised for Bipole III were tower placement, diagonal crossings and effects on buildings. Given the similarity between the Project and Bipole III, Manitoba Hydro prioritized these issues and sought to mitigate them during the route selection process (Chapter 5 –Transmission Line Routing).

For Bipole III, a decision was made to place transmission towers 42 m into the field (Manitoba CEC 2013). However, at the public hearing many participants indicated a preference for placement of the towers on half-mile lines (Manitoba CEC 2013). Consequently, the CEC directed Manitoba Hydro to conduct a vote regarding the tower placement options for part of the southern portion (south of PTH 16) of Bipole III. The results of the vote indicated that preference for placement of structures on agricultural land at half-mile or mile options differed among different producers or landowners. Similarly, during key person interviews (KPIs) with agricultural stakeholder groups, preferences for placement of towers differed among different stakeholder groups and for reasons applicable to their industry. For example, Keystone Agricultural Producers indicated a preference for quarter section boundaries (*i.e.*, half-mile lines) placement of the transmission line. In contrast, the Manitoba Aerial Applicators Association prefers avoiding the half-mile placement of transmission line as far as possible and favouring closer to the road placement to reduce Project interference with aerial application activities (Alarie 2015, pers. comm.). Manitoba Beef Producers were also opposed to the CEC-recommended placement for towers and said that the half-mile or mile placement could be an issue for gate access at cattle operations, particularly feedlots with larger animal populations (German and Cousins 2015, pers. comm.). For the Project, design-mitigation included the decision to attempt to place towers at half-mile lines in agricultural lands as recommended by Manitoba CEC (2013) and as preferred by Keystone Agriculture Producers.

Diagonal crossings or angled-tower crossings were a concern for landowners during Bipole III. Manitoba Hydro went to considerable lengths to avoid them for this Project using a two-layered approach. First, when planning initial routes, diagonal crossings on agricultural lands were avoided as much as possible. Second, during route evaluation, the route evaluation model ranked routes with higher instances of diagonal crossing on agricultural lands with high agricultural capability (Classes 1-3) as less favourable than routes with fewer diagonal crossings (Chapter 5). In so doing, and similar to Bipole III, diagonal crossings or angled tower placing were reduced as

much as possible for the Project, to reduce the potential for conflict with agricultural activities (Manitoba Hydro 2011; Manitoba CEC 2013).

As a result of the routing process, land near the Seine River was avoided to prevent traversing long and narrow river lots in which farm operations (*e.g.,* aerial application) might be affected, even if the farms were outside the PDA or LAA of the transmission line. The planning of route alternatives also attempted to avoid or limit to the extent possible routing across parcels of land for which Project effects within a given agricultural field would be substantive relative to field sizes. Concern about effects on narrow river lots was also heard during Bipole III hearings (Manitoba CEC 2013).

With a wide range of agricultural operations in the Project area, biosecurity is a concern for both cropping and livestock operations. The concern for biosecurity was highlighted in the SVTC Technical Advisory Committee (Manitoba Conservation and Water Stewardship [MCWS] 2014) comment from MAFRD. *The Environment Act* Licence issued for Bipole III specified that Manitoba Hydro should prevent the introduction and spread of weeds and invasive species to agricultural lands, and implement mitigation to address this (MCWS 2013). The recent Energy East Pipeline assessment showed increased project effort to protect biosecurity of agricultural lands with focus on preventing the introduction and spread of Soybean Nematode Cyst and clubroot to previously non-affected fields in Ontario and the prairie provinces (Alberta, Saskatchewan and Manitoba), respectively. Similarly, Manitoba Hydro understands that adherence to biosecurity protection procedures during its transmission activities, including surveying, construction and line maintenance, is of importance to producers in the area. Manitoba Hydro will implement its standard operating procedures to protect the biosecurity of croplands and livestock operations. If existing farm level biosecurity measures exist, transmission staff and contractors will strive to meet the requirements of the agricultural operation when access is required.

Landowner engagement is an important means of gathering information to reduce potential adverse effects on agriculture as a result of transmission line projects (Serecon Evaluations Inc. 2010). In planning this Project, Manitoba Hydro undertook multiple rounds of engagement regarding potential routes for the transmission line. This was done to provide accurate Project-related information to participants and to obtain their feedback and input on presented transmission line routes. Further, Manitoba Hydro plans to conduct additional engagement with individual agricultural landowners affected by the Project prior to construction to reduce Project effects, as has been done for other recent transmission projects. This may include discussions with landowners on topics such as specific tower placement, specific biosecurity concerns and construction access timing. *The Environment Act* Licence issued for Bipole III (MCWS 2013) required Manitoba Hydro to consult with agricultural landowners to determine the tower placement that would have the least effect on agricultural operations, and incorporate those changes into the final design of the Development unless there was compelling rationale to depart. Manitoba Hydro intends to take this approach with this Project as well.

Compensation for effects on agricultural land use and activities was a contentious issue during hearings for Bipole III. The CEC heard many comments that the compensation offered by Manitoba Hydro was insufficient (Manitoba CEC 2013). However, CEC deemed the compensation offered was relatively generous now, but expressed concern that increased land values, commodity prices and operating costs in the future would make the then current compensation insufficient (Manitoba CEC 2013). During the hearings, many farmers also expressed preference for the option of annual compensation payments and the Commission considered it reasonable for Manitoba Hydro to handle annual payments (Manitoba CEC 2013). As per Clause 33 of the Bipole III *Environment Act* Licence No. 2055 (2013), prior to construction of Bipole III, Manitoba Hydro was required to develop a policy, for submission to the provincial regulators, to provide an option for disposition of payments in an annual format for agricultural areas. The total value of the payments would have been the same, but would have been paid in yearly installments. The policy developed by Manitoba Hydro and approved by MCWS relied on landowners approaching the corporation if they preferred annual payments versus a one-time payment, but no landowners pursued this option. As a result, Manitoba Hydro has not pursued this option further.

15.3 Methods

This section presents the methods and sources of information used to characterize existing conditions for agriculture and presents assessment methods for the effects assessment.

15.3.1 Existing Conditions Methods

This section describes the methods and sources of information used to characterize existing conditions, including field studies for agriculture for this assessment.

15.3.1.1 Sources of Information

Sources of information used to characterize the baseline conditions for agriculture included the following:

- Desktop data compiled using publicly available information:
    - Existing soil resource information was obtained from the Manitoba Agricultural Interpretation Database (SoilAID) (Manitoba Land Initiative [MLI] 2014), which is a digital repository for provincial soil survey data in Manitoba. The portion of the database used to provide soil resource information for the RAA is based on information contained in multiple soil survey reports that cover the RAA.
    - Land cover classification database (EOSD-NRCAN 2001).
    - Crop variety yield data for 2009 to 2014 (Manitoba Agricultural Services Corporation 2015)

  - Agriculture and Agri-Food Canada (AAFC) crop inventory for 2009 to 2014 (Government of Canada 2015).
  - Agriculture land use statistics by rural municipality (RM) from Census of Agriculture data for Manitoba (Statistics Canada 2011).
- Livestock operations location data obtained from agricultural representative groups:
  - Manitoba Pork Council hog operations location data (Thorlacius 2015, pers. comm.).
  - Dairy Farmers of Manitoba dairy farm operations location data (Achtemichuk 2015, pers. comm.).
  - Manitoba Chicken Producers chicken and broiler-breeder operations location data (Armstrong 2015, pers. comm.).
- Licensed irrigation projects (location data for points of diversion) within the Project RAA provided by MCWS (2015).
- Buildings inventory based on existing buildings data (Manitoba Hydro 2014a) combined with windshield surveys conducted by Manitoba Hydro, and visual analysis of 2014 Google Earth imagery.
- Aerial photo review (MLI 2009, 2010, 2011).

Statistics Canada's agricultural statistics data provided the context for agriculture's importance in the RAA relative to the province.

The MLI (2014) soils database provided soil and landscape information, including the Canada Land Inventory (1969) agricultural capability classifications for the RAA. Agricultural capability classification is an indicator of the inherent capability of the soil-landscape to support agricultural production. Together with the federal land cover classification database, MASC crop values and federal spatial distribution of crops database, it was used to determine areas of high-value crop production versus more marginal lands, and provided the areal basis for calculations of crop production values within the assessment areas. The compaction risk data generated by the study team using soil texture and drainage ratings showed the extent of identified areas that might be at a high risk of compaction during Project construction and operation and maintenance. The compaction risk data can form part of the basis for compensation to landowner/producer where the rehabilitation work for soil compaction requires farm machinery and the expertise of the landowner (construction damage compensation (Manitoba Hydro n.d.).

Location data (*i.e.,* GPS coordinates or legal land location) were provided for hog, dairy and broiler chicken and broiler-breeder operations by the respective industry associations. Industry associations representing beef, egg and turkey producers did not provide livestock operation location data, citing member confidentiality reasons. Manitoba Egg Farmers and Manitoba Turkey Producers provided number of operations by RM or town while MAFRD provided number of beekeeping operations by RM. Other livestock operations (*e.g.,* cattle farms, cattle feedlots and equine operations) were identified, to the extent possible, based on a review the building inventory layer (Manitoba Hydro 2014a) and aerial photos (MLI 2009, 2010, 2011). Information

from the PEP and KPIs was used to further strengthen the confidence in the livestock operation location database. Following their review of the Final Preferred Route, Manitoba Beef Producers broadly indicated that the New ROW might traverse or be close to some cattle producers' operations (Cousins 2015, pers. comm.). The occurrence of cattle operations in the Project LAA was confirmed through the above-mentioned building inventory layer and aerial photo reviews.

15.3.1.2 Desktop Analysis

Baseline data sources and secondary sources available from various sources were used to describe existing conditions for agriculture. Geospatial data were plotted using geographical information system (GIS) software to determine the spatial distribution, nature, and intensity of overlapping land-uses along alternative routes, and the converter stations and Glenboro South Station. Metrics generated during the route selection process (Chapter 5) informed the ranking of preferred routes, from the built-environment perspective. By using GIS overlay mapping, the following Project effects on agriculture could be quantified:

- temporary loss of agricultural land and soil degradation during construction;
- permanent loss of agricultural land and soil degradation during operation and maintenance; and
- conflict with agricultural activities and livestock operations.

Information from the public and First Nation and Metis engagement processes, including information obtained during open houses and traditional knowledge information, was also reviewed for issues pertinent to agriculture.

15.3.1.3 Key Person Interviews

Key person interviews were conducted in 2015 and focused on the collection of information related to current and future agricultural activities and information required to define and evaluate Project effects on agriculture and supplement other baseline information. Agricultural KPIs were undertaken with the following organizations selected by the study team to represent the broad agricultural industry interests within the RAA:

- Dairy Farmers of Manitoba
- Keystone Agricultural Producers
- Manitoba Aerial Applicators Association (MAAA)
- Manitoba Bee Keepers Association
- Manitoba Beef Producers
- Manitoba Chicken Producers
- Manitoba Egg Farmers
- Manitoba Pork Council

- Manitoba Turkey Producers
- Organic Producers Association of Manitoba
- Prairie Fruit Growers Association

During agricultural KPIs, participants were asked questions pertaining to:

- their concerns regarding transmission line development in the area
- their awareness of health concerns associated with a new transmission line
- land uses they consider best suited to be in proximity to a new transmission line
- Project effects on future land development
- current economic state of agriculture in the RAA and how they anticipated it changing in the future
- land uses that should be avoided or favoured if the transmission line were routed in an agricultural area
- their opinion on placement of tower structures (*e.g.,* section or quarter section boundaries)
- effects of transmission lines on agricultural practices (*e.g.,* organic farming, aerial spraying, manure spreading and GPS/navigation tools) and other concerns associated with the ROW from construction and operation and maintenance activities
- effects of transmission lines on property values
- environmental features considered important to producers/operators

15.3.1.4 Field Studies

The following field studies were conducted to complement the available information on existing conditions:

- Systematic observations were made by Stantec staff (windshield surveys) in the RAA for preliminary alternative routes evaluation.
- Systematic observations were made by Manitoba Hydro staff (windshield surveys) in the RAA to confirm the locations of agricultural buildings.

15.3.1.5 Addressing Uncertainty

In order to appropriately address uncertainty in the assessment, a conservative approach was taken:

- Estimates of permanent land loss areas around Project structures and permanent footprints were based on conservative buffer estimates. Buffers used to estimate areas of permanent land loss were determined following a literature review, and compared against a recent study conducted by PAMI (2015).

- Crop type categories were used to assess crop distribution and crop value estimates, and were developed to align with Manitoba Hydro's compensation program. For this assessment, soybeans, corn and sunflowers were included in the row crop category even though they might be solid-seeded and not require row crop management.
- Estimates for areas of temporary land losses during the construction phase assume the entire ROW will be unavailable to agricultural activities during the construction period. This includes an assumed temporary loss of the ROW for agriculture for one growing season for the SLTC and for up to two growing seasons for the remainder of the ROW (Riel to Vivian Transmission Corridor and New ROW).
- Information provided through discussions with stakeholder groups with respect to potential agricultural interactions and effects is considered accurate unless contradicted by strong evidence.

It has been assumed that mitigation of effects for loss or degradation of agricultural land and conflict with agricultural activities will be effective and implemented as outlined in this EIS. The residual environmental effects on agriculture are assessed following consideration of the implementation of proposed mitigation measures. The effects on agricultural land from transmission line construction and operation and maintenance are generally well understood, and the implementation of standard mitigation is effective at reducing effects on soil capability, soil productivity and crop performance.

15.3.2 Assessment Methods

The overall environmental effects assessment methods are presented in Chapter 7. The techniques used for the agriculture assessment included:

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

15.3.2.1 Assessment Approach

15.3.2.1.1 Permanent Land Loss Estimation

Permanent land loss refers to the area that will be occupied by Project structures or permanently disturbed footprints (*e.g.,* station footprints) and that will unavailable for continued agricultural land use through the operation and maintenance phase of the Project. Permanent land loss was estimated by determining the sum of the area under Project structures and permanently disturbed footprints as given in the Project description (Chapter 2). For transmission tower structures, the estimated number of towers within each transmission line component was determined based on

average tower intervals and component length. Reasonable buffer areas around structures and other footprints were included in the estimates for permanent land loss. The buffer areas were determined based on a review of literature (Serecon Valuations Inc. 2010; J. and V. Nielsen and Associates Ltd. 2011). The resultant estimated loss areas were compared against Manitoba Hydro's Landowner Compensation Information (Appendix 15C) and the information provided in the typical crop loss sketches presented and discussed in Section 15.5.2. Land loss estimate areas were also compared against study findings presented by PAMI (2015).

15.3.2.1.2 Crop and Production Value Estimation

The value of crop production within the RAA was estimated as follows:

- Production values were calculated per acre for crop using MASC data (MASC 2015):
  - Crop data were taken from MASC for the 2009–2014 period for the RMs that make up the RAA. The period of 2009 to 2014 was selected to represent two cycles of a 3-year crop rotation, which is typical within the RAA.
  - The data were summarized to provide a summary table of crop type by RM, with a sum of acres by crop type, and an average of yield (tonnes).
  - MASC crop insurance values from 2011 to 2015 were used to generate an average crop price for the reported crops ($/tonnes).
  - The average value on a per acre basis for each crop within each RM was calculated by multiplying the tonnes/ac by $/tonnes.
- Crop areas were calculated based on AAFC remotely sensed data (Government of Canada 2014):
  - Crop mapping data were acquired from the AAFC crop inventory for RMs in the RAA for the 2009–2014 period.
  - A crop type correlation table was created to correlate AAFC crop types to MASC crop types.
  - AAFC crop types were converted to the appropriate MASC crop type.
- Final production value estimates:
  - Crop values per acre were assigned to the AAFC spatial crop data.
  - Crop acres from AAFC spatial crop data were multiplied by crop values ($/acre) to obtain production value estimates ($) within the RAA for the 2009-2014 period.

15.3.2.1.3 Compaction Risk Ratings

Compaction risk for soils within the PDA and LAA was determined based on soil texture and drainage properties provided in the MLI (2014) soils database (Table 15-2). A generalized rating system for compaction risk was developed using professional judgment and review of two compaction systems that had been designed for forestry applications; specifically the Soil Compaction and Puddling Hazard Key (British Columbia Ministry of Forests 1999) and the table of Compaction and Rutting Hazard for Soils in Ontario (Archibald *et al.* 1997). While the MLI soils database covers the whole RAA, the availability of the data at different scales, ranging from detailed (large scale; typically 1:20,000; local land planning) to reconnaissance (small scale; typically 1:126,000; regional land planning) (Coen 1987), was a limitation to this assessment. Small-scale maps provide less detail in terms of the spatial distribution of soils. However, they provide information on the dominant soil types and their physical properties, enabling interpretation and calculation of a compaction risk rating that is representative of the dominant conditions on the ground. Therefore, despite larger polygon delineations (areas) in the areas with small-scale data, the confidence in the estimate of compaction risk is still high.

Table 15-2 Compaction Risk Matrix

Drainage	Textural Class					
	Very Coarse (S, LS, LFS)	**Moderately Coarse (SL, FSL)**	**Medium (VFSL, L, SiL)**	**Moderately Fine (SCL, CL, SiCL, Si)**	**Fine/Very Fine (SC, SiC, C, HC)**	**Organic**
Rapid	Low	Low	-	-	-	-
Well	Low	Low	Low	Moderate	Moderate	-
Imperfect	Low	Low	Moderate	High	High	-
Poor	Moderate	Moderate	High	High	High	-
Very Poor	-	-	-	-	-	High

NOTES:

S = sand	LS = loamy sand	LFS = loamy fine sand	SL = sandy loamy
FSL = fine sandy loam	VFSL = very fine sandy loam	L = loam	SiL = silt loam
SCL = sandy clay loam	CL = clay loam	SiCL = silty clay loam	Si = silt
SC = sandy clay	SiC = silty clay	C = clay	HC = heavy clay

SOURCE: Matrix developed using professional judgment and review of two compaction systems (Archibald *et al.* 1997; British Columbia Ministry of Forests 1999)

15.3.2.1.4 Potential for Conflict with Agricultural Operations

Specific location data on livestock operations (GPS coordinates or legal land location) were provided by industry associations representing hog, dairy, and chicken and broiler-breeder producers. A review and interpretation of the buildings inventory layer (Manitoba Hydro 2014a) and aerial photos (MLI 2009, 2010, 2011) was conducted to identify livestock operations for which location data were not available (*e.g.,* cattle feedlots, and cattle and equine operations, and other agricultural buildings/structures). Industry associations for beef (Manitoba Beef Producers), egg (Manitoba Egg Farmers) and turkey producers (Manitoba Turkey Producers) did not provide livestock operation location data for confidentiality reasons. The latter two associations along with MAFRD provided the number of egg and turkey farms, and beekeeping operations by RM or nearest community, respectively.

Information drawn from KPIs and other forms of PEP (*e.g.*, information received during public open houses) was used to supplement the available livestock operations data, and identify and confirm potential for conflict between the Project and agricultural operations and activities.

Agricultural shelterbelts have been identified and are assessed under land and resource use (Chapter 16).

15.3.2.2 Potential Environmental Effects, Effect Pathways and Measurable Parameters

The selection of effects included in the assessment of environmental effects on agriculture was based on NEB filing and CEAA requirements (Section 15.1.1), key issues and concerns identified during engagement (Section 15.1.2), and learnings from past assessments (Section 15.2.3).

The potential environmental effects and measureable parameters used in the assessment of effects on agriculture, and the rationale for their selection are provided in Table 15-3.

Effects pathways for agriculture are presented in Figure 15-1.

Table 15-3 Potential Environmental Effects and Measurable Parameters for Agriculture

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement	Notes or Rationale for Selection of the Measureable Parameter
Loss or degradation of agricultural land	Clearing of the ROW; creation of access routes; and set-up of marshalling yards, borrow sites and temporary camp sites may result in losses of agricultural production due to temporary agricultural land loss and degradation through soil disturbance and compaction. The presence of Project structures and permanently disturbed footprints during operation will result in permanent loss of agricultural land. Traffic movement during Project maintenance activities might cause soil degradation through compaction.	Extent of agricultural land loss (ha) – permanent and temporary Land capability class for agriculture Extent of lands with high compaction risk within the LAA	Where the PDA (and specific project footprints within the PDA) traverses areas of agricultural land uses, temporary losses through the construction phase and permanent losses through the operation and maintenance phase can be determined. Land Capability Class for Agriculture provides a measure of the inherent capability of the soil-landscape to support agricultural land uses, such as crop production. A reduction in capability class due to soil degradation from construction (*e.g.,* compaction, erosion) will result in a reduced ability for the land to support crop production at pre-construction levels. The area of land associated with high risk for soil compaction and disturbed by Project activities can be determined.

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement	Notes or Rationale for Selection of the Measureable Parameter
Conflict with agricultural activities	Clearing of the ROW; creation of access routes; and set-up of marshalling yards, borrow sites and temporary camp sites might cause conflict with agricultural activities (*e.g.,* disrupted ground field operations, aerial application, and manure application); increased potential for crop and livestock biosecurity risk, and removal of agricultural buildings/structures. The presence of the Project can cause conflict with agricultural activities (*e.g.,* disrupted ground field operations, aerial application, and manure application), increase the potential for electric and magnetic field (EMF) and stray voltage effects on livestock, and hinder the capacity for future operation expansion or other changes.	Interference with agricultural activities (*e.g.,* lost aerial application areas, relocation of livestock facilities, increased access distances)	Assessment takes into account effects on agricultural activities. Project-related disturbances to agricultural activities will be important if they result in a change in those activities (affecting revenues / income, or increasing the management effort required).

Agriculture

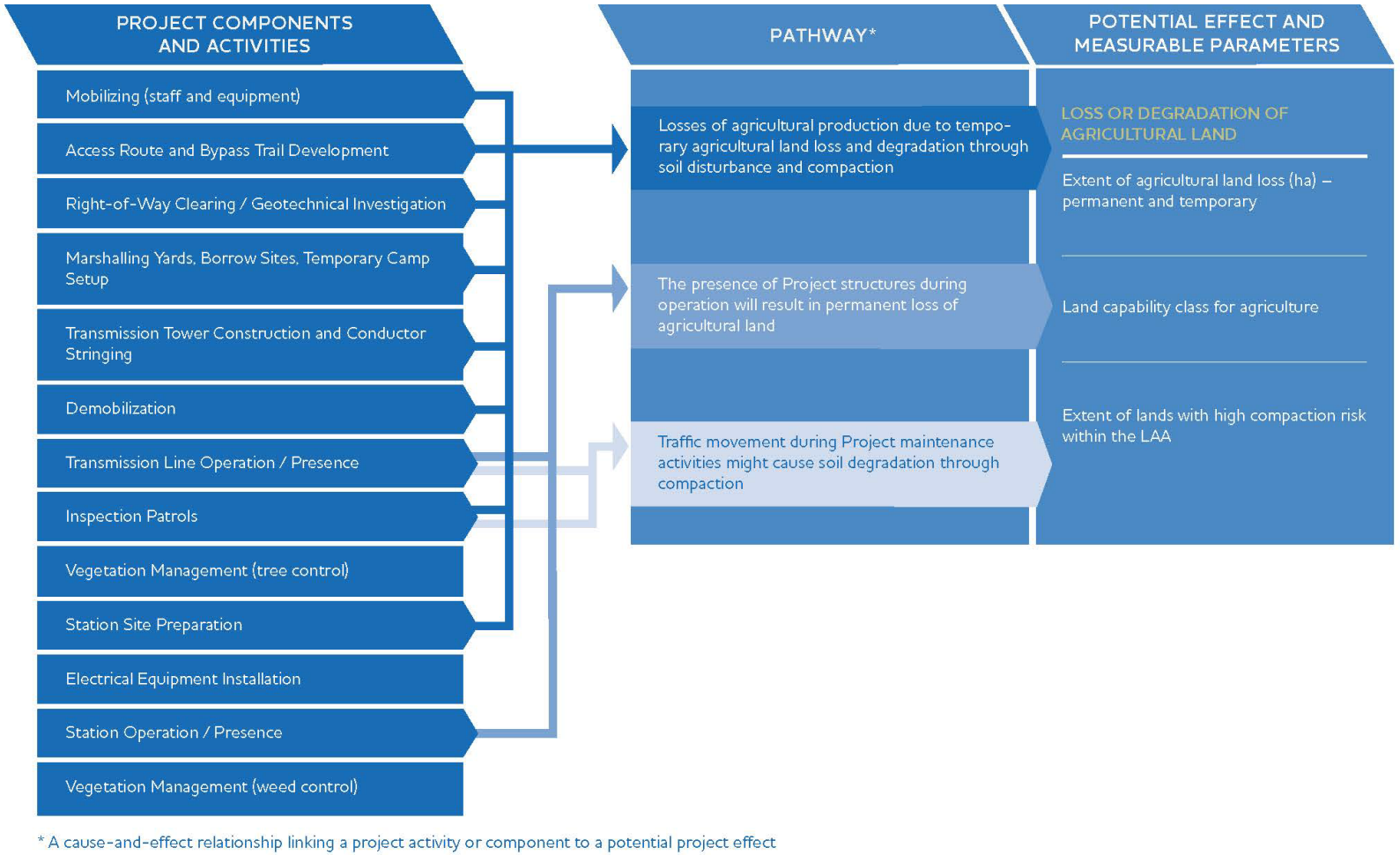


Figure 15-1 Effects Pathways for Agriculture

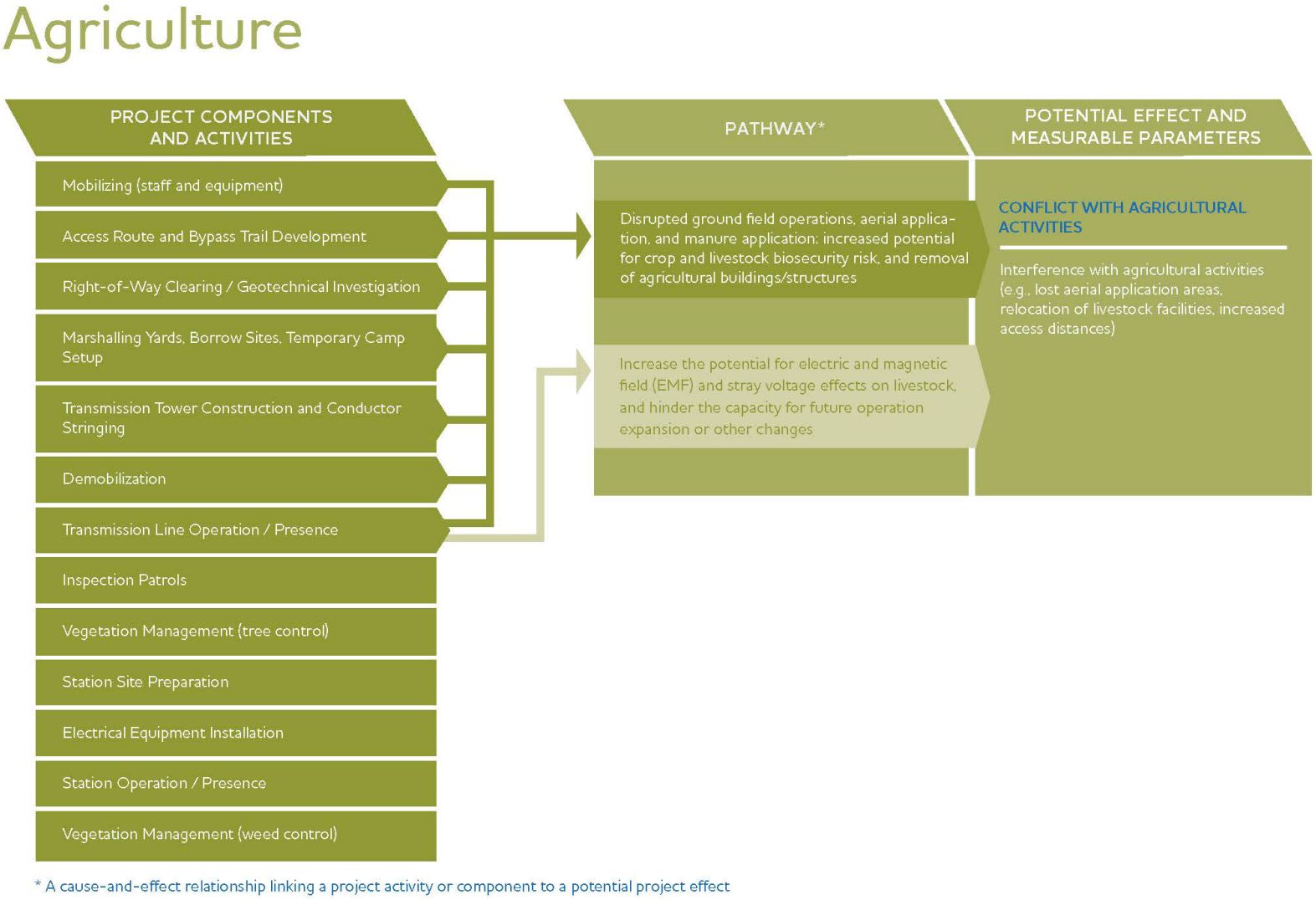


Figure 15-1 Effects Pathways for Agriculture (continued)

15.3.2.3 Residual Environmental Effects Description Criteria

The definitions of terms used to characterize residual environmental effects on agriculture are summarized in Table 15-4.

Table 15-4 Characterization of Residual Environmental Effects on Agriculture

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The trend of the residual effect	**Positive**—condition of the VC is improving in comparison to baseline conditions **Adverse**—condition of the VC is worsening in comparison to baseline conditions **Neutral**—condition of the VC is unchanged in comparison to baseline conditions
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**Negligible**—no measurable change in the capacity for agriculture **Low**—small but measurable change in the capacity for agriculture. Land loss, land degradation or conflict with activities has a measurable effect on production levels, however production can continue at or near pre-disturbance levels **Moderate**—a change that is greater than low but will not result in an impairment of agricultural capacity. Land loss, land degradation or conflict with activities has a measurable effect on production levels, however production can continue near pre-disturbance levels **High**—a change that can result in an impairment of agricultural capacity. Land loss, land degradation or conflict with activities has an effect on production such that production cannot continue at or near pre-disturbance levels
Geographic Extent	The geographic area in which an environmental effect occurs	**PDA**—residual effects are restricted to the PDA **LAA**—residual effects extend into the LAA **RAA**—residual effects interact with those of other projects in the RAA
Duration	The period of time required until the measurable parameter or the VC is expected to return 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 beyond the construction phase **Permanent**—residual effect extends for the lifetime of the Project or more

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Frequency	Identifies when the residual effect occurs and how often during the Project or in a specific phase	**Single event**—residual effect occurs once **Irregular event (no set schedule)**—residual effect occurs multiple times at irregular intervals **Multiple regular event**—residual effect occurs multiple times at regular intervals **Continuous**—residual effect occurs continuously
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	Existing condition and trends in the area where environmental effects occur	**Low resilience**—low capacity of agriculture to accommodate or recover from change with a resultant effect on the capacity for agriculture **Moderate resilience**—moderate capacity of agriculture to accommodate or recover from change that is less than high but will not affect the capacity for agriculture and production can return to near pre-disturbance levels **High resilience**—high capacity of agriculture to accommodate or recover from change and production can return to pre-disturbance levels

15.3.2.4 Significance Thresholds for Residual Environmental Effects

A determination of significance is made for the Project residual effects on agriculture after the implementation of mitigation measures has been considered. There are no specific provincial or federal regulations that set thresholds for determining the significance of environmental effects on agriculture. As such, the study team developed appropriate thresholds to evaluate the capacity for agriculture to continue for extended periods of time following construction of the Project.

It is acknowledged that effects on agriculture differ depending on the scale at which and the perspective from which they are evaluated. The “significance” of Project effects from the perspective of an individual landowner or producer, considered at a local scale of an individual agricultural operation or agricultural field, is different than that from the perspective of the agricultural industry considered at a broader, regional scale. The assessment considers the local scale, including the LAA and individual agricultural operations and fields within the LAA. Mitigation aims to reduce the Project effects on individual agricultural operations and compensation is provided to individual and affected landowners where adverse residual effects (*i.e.*, following the implementation of mitigation) are anticipated. To assess significance of the

Project overall, following the implementation of mitigation, residual effects are evaluated against thresholds defined below in relation to the LAA and RAA.

For this assessment, environmental effects on agriculture are considered to be significant if the proposed use of the land for the Project:

- results in a loss of agricultural land or degradation of soil quality such that existing agricultural production cannot continue at current levels for extended periods of time (beyond the construction phase) or cannot be adequately compensated; or,
- results in interference with or disruption that restricts agricultural operations and activities such that existing agricultural operations and activities cannot continue at current levels for extended periods of time (beyond construction phase) or cannot be adequately compensated.

15.4 Existing Conditions for Agriculture

Information for this assessment was gathered through a detailed review of available and collected agricultural land use data (Section 15.3). Existing conditions described in this section include:

- agricultural capability
- soil compaction risk
- agricultural land use
- livestock operations
- specialty agricultural operations (*e.g.*, aerial application, irrigation, mushroom farms and sod farms)

15.4.1 Overview

The RAA underwent disturbance and development for agricultural conversion in the 1830s when river lots were created south of the City of Winnipeg (SLTC area). Development of other agricultural-based settlements followed in the 1850s (Lorette and Ste. Anne), mid-1870s (Mennonite farm settlements), and early 1900s (southeastern portion of the RAA).

Today, agricultural land use is part of the residents' way of life and contributes substantively to the local and provincial economy. According to Statistics Canada (2011), there were 1456 farms within the RAA in 2011, approximately 9% of all the farms in the province. Based on existing land cover data, the RAA is comprised largely of land under annual crop production (Map 15-200, Map 15-4). However, the eastern RMs particularly La Broquerie, Stuartburn and Piney have appreciable occurrences of lands with lower capability. These RMs are characterized by more variable agricultural land cover classes, including range and grassland, and perennial cropland and pasture. Livestock operations (*e.g.,* hog, dairy, and chicken and broiler-breeder and egg farms) are located throughout the RAA but are more concentrated in the above-named RMs with relatively less productive lands for annual cropping. Both the SLTC and RVTC are leased and

owned by Manitoba Hydro and where possible, remain under agricultural production through lease back agreements.

Highly productive lands within the RAA occur predominantly in the western and northern RMs of Rosser, Headingley, Macdonald, Ritchot, Tache and Springfield with the respective reported crop-insured areas mainly under annual cropping. Using cropping data from the 6-year period (2009 to 2014, inclusive) to represent two cycles of a 3-year crop rotation, which is typical within the RAA, the highest reported cropping areas are associated with relatively high-value soybeans, wheat and canola crops. Agricultural activities in the RMs of Macdonald, Ritchot, Tache, and Springfield are relatively intense and highly mechanized, with large pieces of equipment typically used in field operations (seeding, fertilizer application and harvesting). Producers in these areas are also generally more reliant on aerial application for crop protection products, especially under wet field conditions (Alarie 2015, pers. comm.).

Agricultural productivity in the RAA has been affected by drought, flooding, fire, disease and global market trends. During KPIs, agricultural representative groups were asked to describe the current economic state of agriculture from their groups' perspectives and how they anticipate it will change in the future.

- Keystone Agricultural Producers described the RAA as vibrant for agriculture with potential for expansion, especially for cropping (Chorney 2015, pers. comm.).
- Manitoba Pork Council described hog production as stable or in decline, and indicated that due to the current moratorium on new operations as producers retire or operations reach the end of their lifespan the number of operators in the area is expected to slowly decrease (Thorlacius 2015b, pers. comm.).
- Manitoba Beef Producers indicated that expansion of beef production was likely following the decline in the last decade, especially as younger producers take over operations from retiring older producers (German and Cousins 2015, pers. comm.).
- Dairy Farmers of Manitoba described the economic state of dairy farming as quite strong with increased production observed in the RM of La Broquerie in the last 10 years (Wiens 2015, pers. comm.).
- Manitoba Egg Farmers described current state of egg farming as stable with modest growth and anticipated future expansion and increased use of technology (Rybuck 2015, pers. comm.).
- Manitoba Bee Keepers Association described the RAA as a very productive area for beekeeping and did not anticipate considerable changes in the future (Campbell 2015, pers. comm.).
- Manitoba Aerial Applicators Association indicated that the number of acres under aerial spraying is increasing due to more intensive farming practices (Alarie 2015, pers. comm.).

The anticipated future growth in agriculture might increase interaction between the Project activities and agricultural activities or operations in the future.

15.4.2 Agricultural Capability

Agricultural land capability is a function of climatic, topographic and soil conditions for a given parcel of land. Assignment of land to agricultural capability classes provides insight into the ability of the soils to support cropping and the extent of limitations affecting the soils. The definitions of agricultural capability classes are given in Table 15-5.

Table 15-5 Agricultural Capability Classification

Agricultural Capability Class	Degree of Limitation
1	Soils in this class have no significant limitations in use for crops
2	Soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices
3	Soils in this class have moderately severe limitations that restrict the range of crops or require special conservation practices
4	Soils in this class have severe limitations that restrict the range of crops or require special conservation practices or both
5	Soils in this class have very severe limitations that restrict their capability to producing perennial forage crops, and improvement practices are feasible
6	Soils in this class are capable only of producing perennial forage crops, and improvement practices are not feasible
7	Soils in this class have no capability for arable culture or permanent pasture
O	Organic soils, which are not rated for agricultural capability

SOURCE: Canada Land Inventory 1969

At the RAA level, the main agricultural capability classes for the Existing Corridor and New ROW are Class 3 (26.8%), Class 2 (21.4%) and Class 5 (18.3%) (Table 15-6). The main limitations to agricultural capability in the Existing Corridor, New ROW, Dorsey Converter Station and Riel Converter Station RAA are excess water (subclass W, 68.9%) and moisture limitation (subclass M, 20.5%). Map Series 15-100 shows agricultural capability classes for the Existing Corridor and New ROW.

Within the RM of South Cypress (RAA for Glenboro), the most common agricultural capability classes are Class 6 (34.5%), Class 4 (16.6%) and Class 5 (13.6%) with moisture deficit (61.2.%) and excess water (15.5%) as the primary limitations. Map 15-3 shows agricultural capability classes for Glenboro South Station.

Table 15-6 Agricultural Capability in the RAA

Agricultural Capability	RAA	
	Extent (ha)	Proportional Extent (%)
Existing Corridor and New ROW		
1	2,096	0.2
2	181,087	21.4
3	227,054	26.8
4	82,527	9.7
5	154,841	18.3
6	53,019	6.3
7	118	<0.1
Organic	133,449	15.8
Unclassified[1]	9,118	1.1
Open Water[2]	3,876	0.5
Total[3]	**847,188**	**100**
Glenboro South Station		
1	8,720	7.8
2	12,575	11.3
3	8,225	7.4
4	18,473	16.6
5	15,067	13.6
6	38,453	34.6
7	4,458	4.0
Organic	3,510	3.2
Open Water[2]	1,653	1.5
Total[3]	**111,134**	**100.0**

NOTES:
[1] Developed lands (disturbed, urban, etc.) are not assigned an agricultural capability class.
[2] Open water = surface water features such as rivers and lakes.
[3] Values might not sum to totals shown because of rounding.

Within the LAA of the Existing Corridor, the most common agricultural capability classes are Class 3 (48.5%) and Class 2 (28.1%) (Table 15-7). Compared to the Existing Corridor, the New ROW LAA traverses lands with lower agricultural capability. The land within the New ROW LAA is classified predominantly as Organic (25.1%), Class 5 (22.7%) and Class 4 (17.3%) for agricultural capability. Only 19.9% of the New ROW LAA falls under Class 3 and Class 2.

The RM of South Cypress contains predominantly lands with extremely severe limitations for sustained production (*i.e.,* Class 6 agricultural capability); the land in the immediate vicinity of the Glenboro South Station has high capability for agriculture. Within the Glenboro LAA, 41% and 40.3% of the land fall under Class 1 and Class 2 agricultural capability classes, with none and slight limitations for crop production, respectively.

Table 15-7 Agricultural Capability in the LAA by Project Component

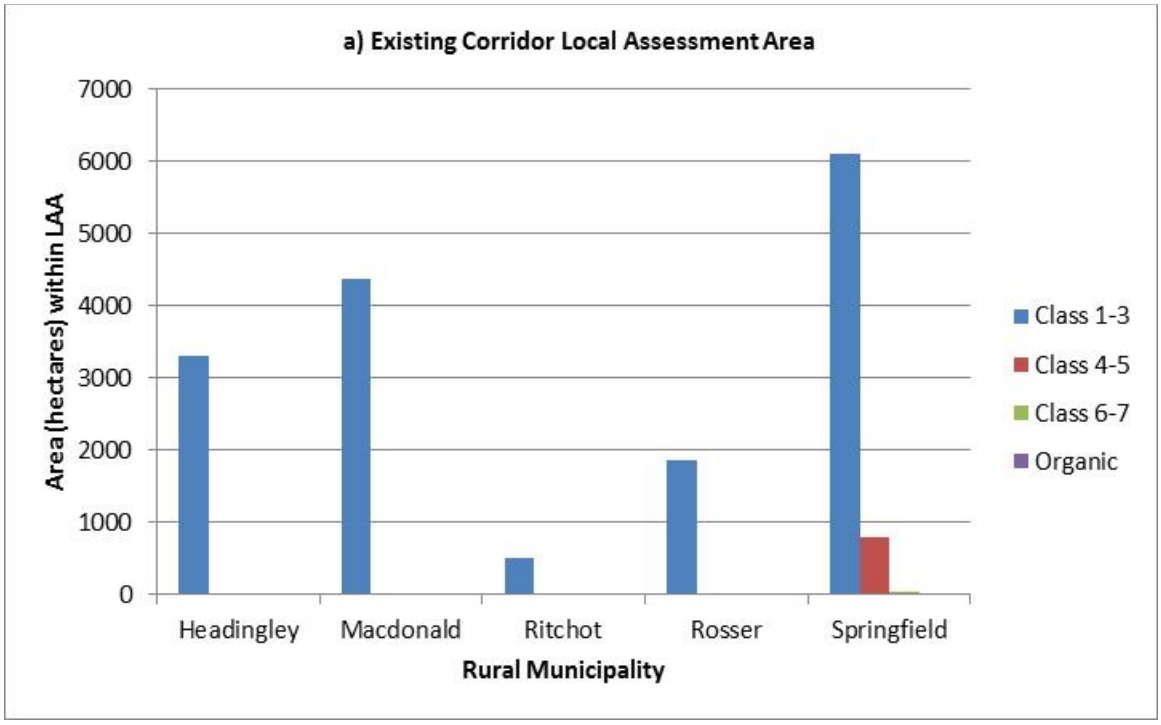
Agricultural Capability[1]	LAA	
	Extent (ha)	Proportional Extent (%)
Existing Corridor		
1	92	0.4
2	5,901	28.1
3	10,182	48.5
4	1	<0.1
5	797	3.8
6	34	0.2
7		
Organic	8	<0.1
Unclassified[1]	3,692	18.9
Open Water[2]	30	0.1
Total[3]	**21,007**	**100.0**
New ROW		
1		
2	881	3.4
3	4,221	16.5
4	4,421	17.3
5	5,788	22.7
6	3,577	14.0
7		
Organic	6,399	25.1

Agricultural Capability[1]	LAA	
	Extent (ha)	Proportional Extent (%)
Unclassified[1]	212	0.8
Open Water[2]	43	0.2
Total[3]	**25,541**	**100.0**
Glenboro South Station		
1	206	41.0
2	203	40.3
3		
4	11	2.2
5	46	9.1
6		
7		
Organic		
Open Water[2]	37	7.4
Total[3]	**502**	**100.0**

NOTES:
[1] Developed lands (disturbed, urban, etc.) are not assigned an agricultural capability class.
[2] Open water = surface water features such as rivers and lakes.
[3] Values might not sum to totals shown because of rounding.

As shown in Figure 15-2a, the Existing Corridor LAA traverses mainly land that has few limitations for dryland agricultural production (*i.e.*, land within agricultural capability Classes 1, 2 and 3) with a small fraction of the LAA classified as Class 4 in the RM of Springfield. Given the extent predominant occurrence of agricultural lands with higher capability and fewer limitations (*i.e.,* Classes 1 to 3) in the RMs of Headingley, Macdonald, Ritchot, Rosser and Springfield, the routing of a substantive portion of the Project in an existing corridor as part of design mitigation reduced interactions with agriculture.

Compared to the Existing Corridor LAA, the New ROW LAA traverses lands that are characterized by variable and generally higher agricultural capability classes with greater limitations for dryland agricultural production (Figure 15-2). Large portions of the New ROW LAA in the RMs of La Broquerie and Piney are mainly comprised of Class 4 to Class 5 lands and organic soils, respectively. Because the New ROW LAA traverses primarily areas with greater limitations for dryland agriculture and more variable agricultural capability the potential for interactions between the Project and agricultural lands belonging to agricultural capability classes 1 to 3 has been reduced.



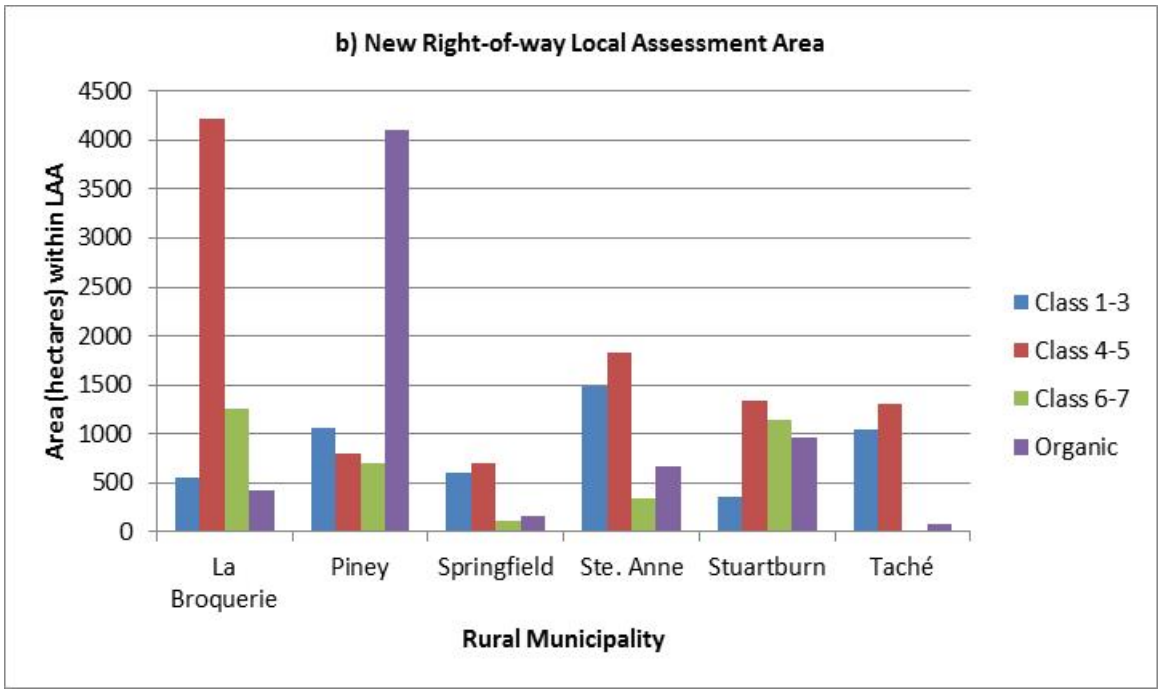


Figure 15-2 Agricultural Capability Class within the Local Assessment Area by Project Component and Rural Municipality

15.4.2.1 Soil Compaction Risk

Compaction risk ratings for the PDAs are shown in Table 15-8, Map Series 4-300 – Final Preferred Route, and Map 4-4 – Glenboro in the Soil and Terrain Technical Data Report (TDR).

Table 15-8 Compaction Risk in the PDA

Soil Compaction Risk	Extent (ha)	Proportional Extent (%)
Existing Corridor		
Low	0.7	<0.1
Moderate	56.6	2.8
High	1,471.1	74.0
Unclassified[1]	458.5	23.1
Open Water[2]	2.2	0.1
Total[3]	**1,989.1**	**100.0**
New ROW		
Low	274.3	25.2
Moderate	217.9	20.0
High	595.8	54.6
Open Water[2]	2.4	0.2
Total[3]	**1090.4**	**100.0**
Glenboro South Station		
Low		
Moderate	2.2	40.0
High	3.3	60.0
Total[3]	**5.6**	**100.0**

NOTES:
[1] Developed lands (disturbed, urban, etc.) are not assigned an agricultural capability class.
[2] Open water = surface water features such as rivers and lakes.
[3] Values might not sum to totals shown because of rounding.

The dominant compaction risk in the Existing Corridor PDA is high (74%). This is mainly due to the combination of very fine soil textures with imperfect drainage. In the New ROW PDA, compaction risk is predominantly high (54.6%) with an appreciable portions of the New ROW PDA rated low (25.2%) and moderate (20%) for compaction risk. The high compaction in the New ROW PDA is due to the combination of fine-textured and organic soils and imperfect to poor drainage. The percentages of the PDA with high compaction risk within RMs in the Existing Corridor are higher than those in the New ROW, with the exception of Springfield, which occurs in both components and Piney, which has high compaction due largely to the occurrence of organic soils (Figure 15-3).

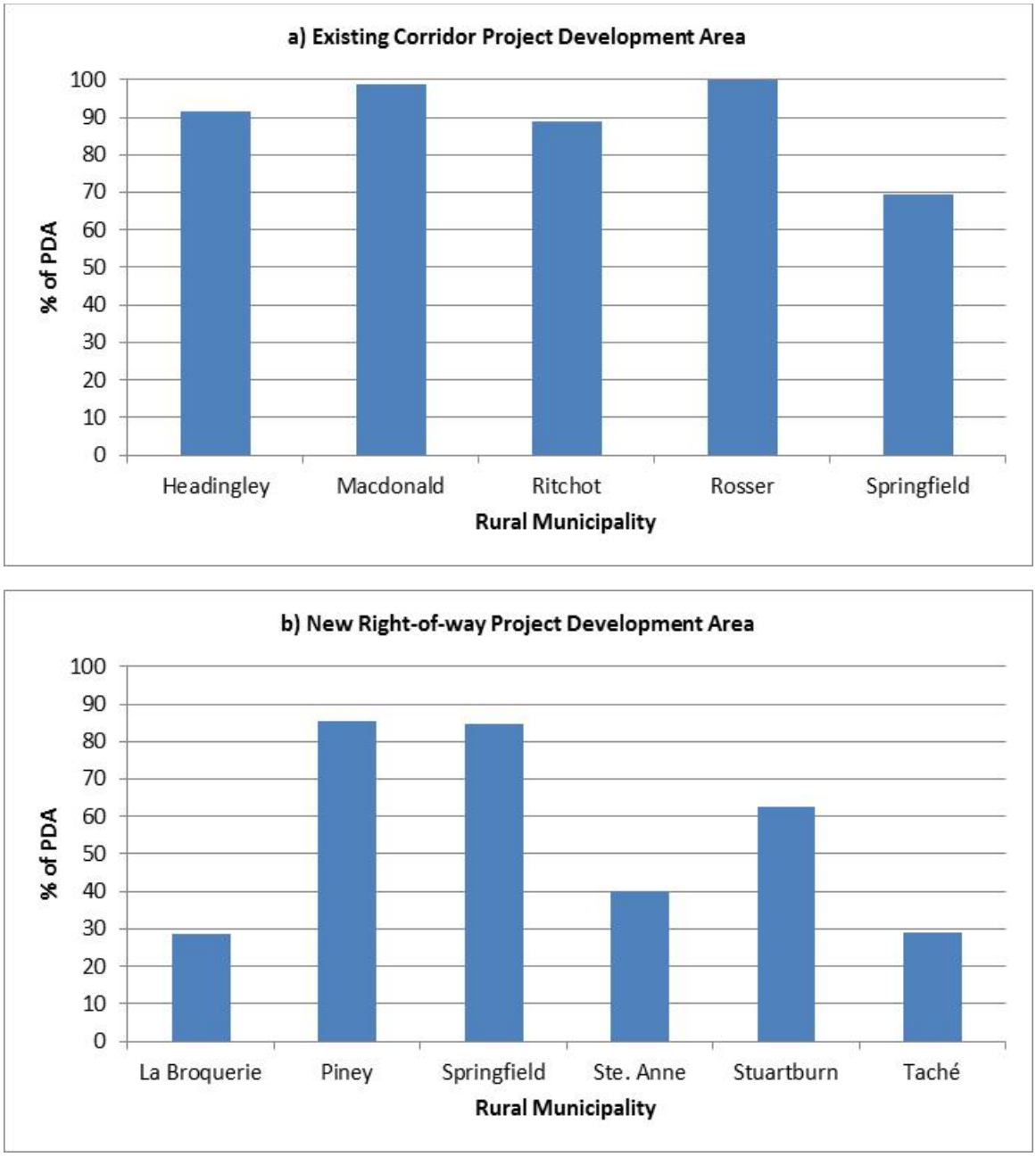


Figure 15-3 Percentage of Project Development Area with High Soil Compaction Risk by Project Component and Rural Municipality

Compaction risk in the Glenboro PDA is predominantly high (60%) with an appreciable portion of the PDA rated as moderate (40%). The high compaction risk in the station PDA is due to the combination of moderately fine soil texture and imperfect drainage.

15.4.3 Agricultural Crop Types and Productivity

The RAA is comprised largely of land under annual crop production, according to existing land cover classification (EOSD-NRCAN 2001). However, the central and southern RMs of La Broquerie, Stuartburn and Piney have appreciable occurrences of less productive lands and are characterized by more variable agricultural land cover classes, including range and grassland, and perennial cropland and pasture (Map 15-200, Map 15-4).

Based on federal spatial distribution of crops data averaged for 2009–2014 (Government of Canada 2015) (Table 15-9 and Map 15-5), at the RAA level for the Existing Corridor and New ROW:

- cereal/oilseed cropland covers 47% of the area under agriculture
- row cropland covers 22% of the area under agriculture
- natural hayland covers 20% of the area under agriculture
- seeded hayland covers 10% of the area under agriculture

For the RM of South Cypress, most of the agricultural land is under natural hayland (50%). Appreciable portions for the RM are under cereal cropland (31%) and seeded hayland (10%) with a minor portion under row cropland (4%).

Table 15-9 Crop Types Grown (Average 2009–2014) in the RAA

Rural Municipality	Row Crops[1]	Cereal/ Oilseed Crops[2]	Seeded Hayland[3]	Natural Hayland[4]	Other Crop Types[5]	Totals
	ha					
Existing Corridor and New ROW						
Headingly	1,675	6,217	622	719	92	9,324
La Broquerie	3,855	6,387	7,980	9,489	145	27,855
MacDonald	25,652	76,638	2,935	1,412	668	107,305
Piney	1,571	5,794	4,159	17,395	116	29,034
Ritchot	9,927	15,517	2,062	2,253	93	29,852
Rosser	8,752	24,689	3,915	1,971	1,028	40,355
Springfield	18,558	24,701	6,975	18,417	2,856	71,507
St. Anne	7,053	7,919	3,258	5,269	88	23,588
Stuartburn	1,552	8,159	8,922	25,842	207	44,683

Rural Municipality	Row Crops[1]	Cereal/ Oilseed Crops[2]	Seeded Hayland[3]	Natural Hayland[4]	Other Crop Types[5]	Totals
	ha					
Tache	15,966	28,298	3,693	5,094	210	53,260
Totals	**94,561**	**204,317**	**44,521**	**87,861**	**5,504**	**436,764**
% of area under agriculture	**22**	**47**	**10**	**20**	**1**	**100**
% of RAA	**11**	**24**	**5**	**10**	**0.6**	**52**
Glenboro South Station						
South Cypress	3,179	22,561	7,550	35,913	2,832	72,035
% of area under agriculture	**4**	**31**	**10**	**50**	**4**	**100**
% of RAA	**3**	**20**	**7**	**32**	**3**	**65**

NOTES:

[1] Row crop – includes corn, potatoes, soybeans, sunflower

[2] Cereal/oilseeds – include cereals, canola, flaxseed, peas, fallow buckwheat, canary seed, millet

[3] Seed hayland – includes forage crops and greenfeed

[4] Natural hayland – includes grasslands

[5] Other crop types – include beans, hemp, lentils, mustard, safflower and vegetables, and are included in this category due to low reported acreages

Of the agricultural land within the Existing Corridor LAA (Table 15-9):

- 53% is under cereal/oilseed cropland
- 25% is under row cropland
- 11% is under seeded hayland
- 11% is under natural hayland

The larger agricultural area under annual crops (row crops, cereals and oilseeds) than perennial crops (seeded and natural hayland) in the Existing Corridor LAA reflects the higher agricultural capability of this portion of the Project area (Section 15.4.2). The RMs of Macdonald and Springfield account for the largest areas under row, cereal and oilseed crops in the Existing Corridor LAA.

Of the agricultural land within the New ROW LAA (Table 15-9):

- 46% is under natural hayland
- 22% is under seeded hayland

- 21% is under cereal/oilseed cropland
- 11% is under row cropland

Compared to the Existing Corridor LAA, a larger portion of the agricultural area in the New ROW LAA is under natural and seeded hayland. The larger perennial cropping area and smaller areas under cereal, oilseed and row crops reflect the more variable and generally lower agricultural capability of the area traversed by the New ROW (Section 15.4.2). As a result of the routing process and the use of existing transmission corridors to the extent practical, the Final Preferred Route has fewer interactions with relatively high capability agricultural lands with fewer limitations.

Of the agricultural land within the Glenboro South Station LAA (Table 15-10):

- 63% is under cereal/oilseed cropland
- 19% is under seeded hayland
- 14% is under natural hayland
- 4% is under row crops

Compared to the RAA, the Glenboro LAA has higher proportions of land under annual than perennial cropland with cereals and oilseed as the most commonly grown crops.

Table 15-10 Crop Types Grown (Average 2009–2014) in the LAA by Project Component

Rural Municipality	Row Cropland[1]	Cereal/ Oilseed Cropland[2]	Seeded Hayland[3]	Natural Hayland[4]	Other Crop Type[5]	Totals
	ha					
Existing Corridor						
Headingly	752	2,045	170	116	0	3,083
MacDonald	1,046	2,960	155	32	0	4,193
Ritchot	62	195	66	168	1	492
Rosser	474	982	223	78	2	1,760
Springfield	1,739	2,542	1,110	1,429	16	6,836
Totals	**4,073**	**8,725**	**1,724**	**1,823**	**19**	**16,364**
% of area under agriculture	**25**	**53**	**11**	**11**	**0**	**100**
% of LAA	**19**	**42**	**8**	**9**	**0**	**78**

Rural Municipality	Row Cropland[1]	Cereal/ Oilseed Cropland[2]	Seeded Hayland[3]	Natural Hayland[4]	Other Crop Type[5]	Totals
	ha					
New ROW						
LaBroquerie	452	900	1,301	1,400	2	4,055
Piney	140	652	132	718	0	1,643
Springfield	24	116	142	477	6	765
Ste. Anne	400	176	314	634	3	1,526
Stuartburn	13	83	76	622	-	793
Tache	26	83	118	531	1	759
Totals	**1,055**	**2,011**	**2,082**	**4,381**	**13**	**9,542**
% of area under agriculture	**11**	**21**	**22**	**46**	**0**	**100**
% of LAA	**4**	**8**	**8**	**17**	**0**	**37**
Glenboro South Station						
Argyle	5	61	28	19	0	113
South Cypress	12	212	53	45	0	322
Totals	**18**	**273**	**81**	**64**	**0**	**435**
% of area under agriculture	**4**	**63**	**19**	**14**	**0**	**100**
% of LAA	**1**	**13**	**4**	**3**	**0**	**20**

NOTES:

[1] Row Crop – includes corn, potatoes, soybeans, sunflower

[2] Cereal/oilseeds – include cereals, canola, flaxseed, peas, fallow buckwheat, canary seed, millet

[3] Seed hayland – includes forage crops and greenfeed

[4] Natural hayland – includes grasslands

[5] Other crop types – include beans, hemp, lentils, mustard, safflower and vegetables, and are included in this category due to low reported acreages

Averaged for the period 2009–2014, within the RAA segments of the Existing Corridor and New ROW (Table 15-11):

- the RM of Macdonald has the highest annual production value ($785/ha)
- the RMs of Piney and Stuartburn have the lowest annual production values ($362/ha and $281/ha, respectively)

The average annual crop production value of the RM of South Cypress is $532/ha, compared to the RAA average of $593/ha.

Table 15-11 Annual Production Values (Average 2009–2014) for Crops Grown in the RAA

Rural Municipality	Production Value ($)	Value $/ha	Value $/ac
Existing Corridor and New ROW			
Headingly	$6,312,871	$677	$274
La Broquerie	$11,544,189	$414	$168
MacDonald	$84,274,955	$785	$318
Piney	$10,518,920	$362	$147
Ritchot	$21,876,324	$733	$297
Rosser	$26,164,847	$648	$262
Springfield	$35,801,926	$501	$203
Ste. Anne	$13,686,215	$580	$235
Stuartburn	$12,539,080	$281	$114
Tache	$36,076,992	$677	$274
Glenboro South Station			
South Cypress	$38,353,705	$532	$215
Total	**$337,250,422**	**$593**	**$240**

Within the Existing Corridor LAA, average crop production values among the RMs range from $475/ha for the RM of Ritchot to $799/ha for the RM of Macdonald (Table 15-12). Compared to the Existing Corridor LAA, crop production values among RMs are generally lower for the New ROW LAA. They range from $236/ha for RM of Stuartburn to $455/ha for the RM of Piney.

The Glenboro LAA has higher average annual crop production values than the Existing Corridor and New ROW LAAs.

Table 15-12 Annual Production Values (Average 2009–2014) for Crops Grown in the LAA by Project Component

Rural Municipality	Production Value ($)	Value $/ha	Value $/ac
Existing Corridor			
Headingly	$2,238,837	$726	$294
MacDonald	$3,349,015	$799	$323
Ritchot	$233,752	$475	$192
Rosser	$1,148,250	$652	$264
Springfield	$3,585,724	$525	$212
Total	**$10,555,578**	**$645**	**$261**
New ROW			
LaBroquerie	$1,622,798	$400	$162
Piney	$747,402	$455	$184
Springfield	$210,920	$276	$112
Ste. Anne	$670,377	$439	$178
Stuartburn	$186,993	$236	$95
Tache	$264,913	$349	$220
Total	**$3,703,403**	**$388**	**$157**
Glenboro South Station			
Argyle	$68,092	$604	$245
South Cypress	$223,416	$694	$281
Total	**$291,508**	**$671**	**$271**

For the Existing Corridor LAA, similar to the size of RM areas under relatively high capability (*i.e.*, Class 1 to 3 lands) agricultural land (Figure 15-2), average production values decrease from the RM of Springfield to Macdonald, Headingley, Rosser and Ritchot (Figure 15-4a). This indicates that the area of land under annual and row cropping is an important driver of differences in average production values in the Existing Corridor LAA.

Unlike the Existing Corridor LAA, the average annual production values for the New ROW LAA are influenced by both hayland and annual cropping. This reflects the more variable agricultural capability in the area (Section 15.4.2). Average annual production is highest for the RM of La Broquerie, similar and intermediate for the RMs of Piney, Tache and Ste. Anne, and lowest for the RMs of Stuartburn and Springfield (Figure 15-4).

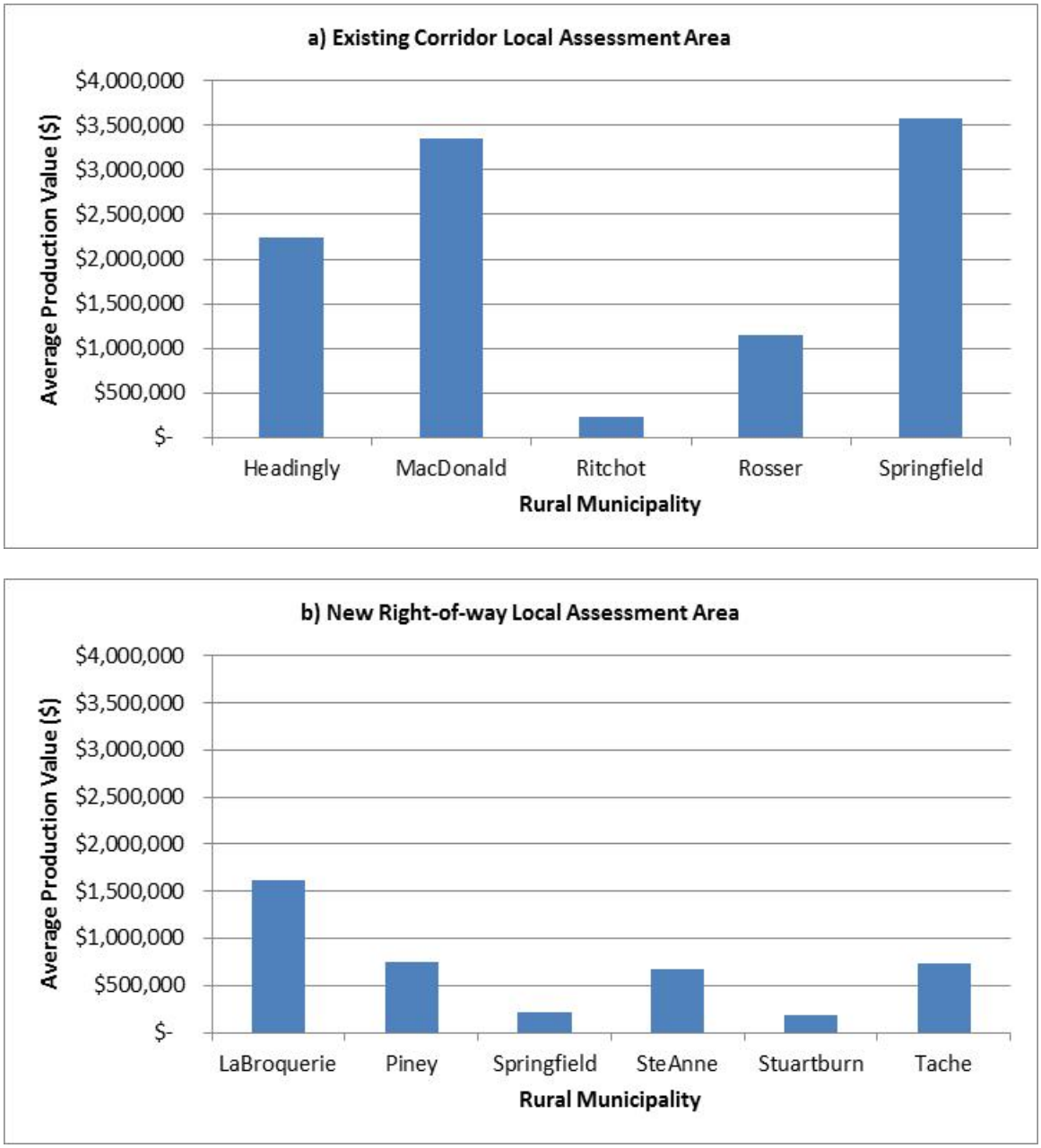


Figure 15-4 Average Crop Production Value (2009–2014) within the LAA by Project Component and RM

When calculated based on a unit area basis, average production value in the Existing Corridor LAA is highest for the RM of Macdonald and lowest for the RM of Ritchot (Figure 15-5). Compared to the average production values (Figure 15-4), the average crop production values per hectare are less variable among the RMs that are traversed by the Existing Corridor.

Similar to the Existing Corridor LAA, for the New ROW LAA, calculating the average crop production values at a unit area level reduces the variability among RMs (Figure 15-5). However, unlike the average RM production values (15-4), determining the value at a unit area basis reflects the role of Class 1 to 3 agricultural lands. Average production values per hectare are highest for the RM of Tache and lowest for the RM of Stuartburn.

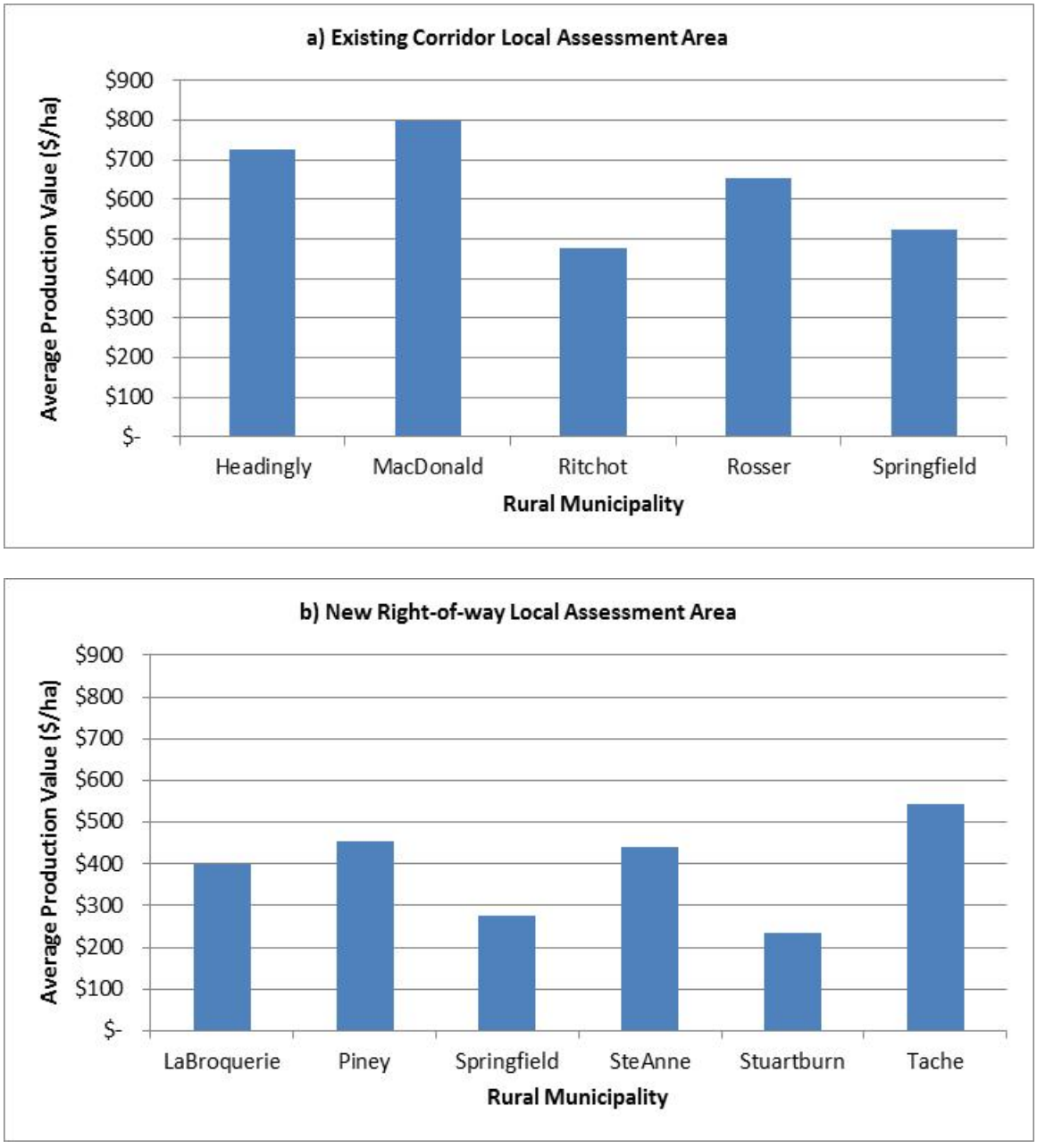


Figure 15-5 Average Crop Production Value (2009–2014) Per Unit Area within the LAA by Project Component and RM

15.4.3.1.1 Cropland Biosecurity

The disease of primary concern for field crops within the RAA and LAA is clubroot, which affects canola (Chorney 2015, pers. comm.) and is caused by *Plasmodiophora brassicae,* a soil-borne pathogen (Howard 2013; MAFRD n.d.(b)). Resting spore numbers will decline over time when non-host crops are grown, but a proportion of the spores can survive in the soil for up to 20 years. While the disease is more common in Alberta, there have been increasing reported cases in Manitoba in the last few years (Strelkov *et al.* 2014). Currently, there are no economical control measures that can remove the disease from a canola field once it has been infested. However, it is possible to curtail the spread and reduce the incidence and severity of infection (Canola Council of Canada 2015).

Movement of infested soil on machinery is the most important mechanism for the spread of clubroot (Strelkov *et al.* 2014). Of the 11 RMs traversed by the Project, the RM of Macdonald has the highest concentration of *Plasmodiophora brassicae* spores per gram of soil (Table 15-13). The RMs of Headingley, La Broquerie, Stuartburn and South Cypress have not been tested for soil-borne pathogens.

Table 15-13 Clubroot Distribution in the RAA

Rural Municipality	Spores per gram of Soil
Rosser	0–1,000
Headingley	Not tested
Macdonald	10,001–80,000
Ritchot	0–1,000
Tache	0–1,000
Springfield	1,001–10,000
Ste. Anne	0–1,000
La Broquerie	Not tested
Stuartburn	Not tested
Piney	Not tested
South Cypress	0–1,000

NOTES:
Clubroot symptoms are typically observe d in canola growing in soil with >80,000 spores per gram of soil.
The tabulated data are based on soil and canola plant tissue analysis from 2009 to 2014.
SOURCE: MAFRD available from http://www.gov.mb.ca/agriculture/crops/pubs/manitoba_clubroot_2015.pdf (accessed 10 June 2015).

In 2014, Verticillium wilt in canola caused by *Verticillium longisporum* was detected in Manitoba and this was the first case of this disease on an oilseed crop in North America (MAFRD n.d.(c)). The complete host range of *Verticillium longisporum* is still unknown, but many other brassica crops like broccoli, cabbage, mustard, and cauliflower are also hosts (MAFRD n.d.(c)). *Verticillium longisporum* overwinters in soil as microsclerotia, which are small masses of fungal cells that are hard and compact, and capable of surviving in the soil for up to 15 years (MAFRD n.d.(c)). While the current spread of Verticillium wilt is considered small, more information will come from a spring 2015 survey by the Canadian Food Inspection Agency (MAFRD n.d.(c)).

Since both clubroot and Verticillium wilt are caused by soil-borne pathogens, biosecurity practices can help mitigate the spread of these diseases on- and off-farm. Producer biosecurity practices typically include equipment and tool sanitation, controlling off-farm traffic, monitoring seed/feed/fertilizer sources, and developing an on-farm biosecurity plan.

15.4.3.1.2 Aerial Application

Interference of transmission line construction and operation activities with aerial spraying was one of the key issues brought up during the recent Manitoba Hydro Bipole III hearings (Manitoba Clean Environment Commission 2013). Given the predominance of agricultural land use in the Project area, and the input received from stakeholders (*e.g.,* during KPIs), aerial spraying is important for the Project.

Aerial application of crop-protection products is necessary when the ground is too soft and wet to support ground sprayers that can also leave deep ruts behind causing soil degradation. Aerial application is important for application of crop protection products in the RMs of Rosser, Headingley, Macdonald, Ritchot, Tache, Springfield and Ste. Anne where soils are of fine to moderately fine soil texture, topography is relatively level and soil moisture content is typically high. During the KPI with MAAA, it was noted that it is common in these RMs to aerially apply up to one or two fungicide applications per year on wheat and one application per year on canola, while it is less common for beans and corn, but the trend is for increased aerial application on crops. Insecticides are applied less often. While aerial applicators are concerned about potential loss of revenue due to Project-induced reduced aerial application area, they are glad that an appreciable portion of the Project will be routed in an existing transmission line corridor, reducing the extent of disrupted aerial application (Alarie 2015, pers. comm.).

At least seven airstrips, which are used by aerial applicators for aerial spraying, are located within the RAA. However, none of these strips are close enough to the Project footprint to have their take-off or landing operations interfered with or hindered by the presence of the Project. The northern portion of the Project in the RMs of Macdonald, Ritchot, Tache and Springfield is associated with extensive aerial application of crop protection products. However, as previously mentioned, the paralleling of the Project to existing transmission lines within this area reduces the potential for additional disruptions to aerial spraying activities (Alarie 2015, pers. comm.).

15.4.3.1.3 Irrigation and Tile Drainage

Multiple surface water and groundwater licences in the RAA have been issued for agricultural purposes, including livestock and sod production. Forty groundwater wells in the RAA are also used for livestock production (MCWS, Water Stewardship Division 2015). One surface water withdrawal licence is associated with a sod operation, which is located south of the City of Winnipeg, near PTH 75 but outside the LAA. According to MCWS (2015), no licences have been issued for irrigated crop production in the RAA. However, based on an irrigation survey completed for the province of Manitoba by Gaia Consulting Limited (2007), in 2006 there were 35 ha (87 acres) and 805 ha (1990 acres) of land under irrigation in the RMs of Macdonald and South Cypress, respectively. The irrigated area is primarily under potato production with a smaller portion under cereal production (Gaia 2007).

There are five groundwater well licences issued for agricultural purposes in the LAA. In the Existing Corridor, there is one licenced groundwater withdrawal for livestock production at Sturgeon Creek Hutterite colony within the SLTC LAA in the RM of Rosser. In the new ROW LAA, there are four operations in the RM of La Broquerie licenced for use of groundwater in livestock production. There is one licenced surface water withdrawal in the SLTC LAA, south of the City of Winnipeg, near PTH 75. While usage category for this surface withdrawal licence is irrigation, the usage does not appear to be agricultural based on aerial imagery review. There are no known licences issued for crop irrigation within the LAA. A review of imagery for the Existing Corridor, New ROW and Station LAAs did not indicate the presence of irrigation pivot footprints, which are typically associated with irrigated potato and cereal production. However, during the PEP, four landowners indicated that they irrigated their lands for production of corn, hay, soybean, canola, barley and pasture, likely in the vicinity of La Broquerie and Ste. Anne as information was received at those public meetings. Specific locations of these operations or other details (*e.g.*, type of irrigation, land area irrigated) were not provided through PEP. It is assumed these irrigation operations are relatively small and crops are not irrigated using centre-pivot or lateral-move systems, that would be most affected by the presence of the Project.

There is no publicly-available information about tile drainage project locations within the RAA. Information for permitted tile drainage projects was requested from MCWS's Drainage and Water Control Licensing but no feedback was received from the requests made (Reimer 2015, pers. comm.). During engagement, a landowner in Ste. Anne indicated that in addition to irrigating their land for pasture production their land was also tile-drained.

15.4.4 Livestock Operations

The RAA contains several types of livestock operations. Specific livestock operation location-data were obtained from industry associations representing hog, dairy and broiler chicken and broiler-breeder operations. However, industry associations representing beef, egg and turkey producers did not provide livestock operation location data for member confidentiality reasons. Manitoba Beef Producers and Manitoba Turkey Producers provided numbers of operations by RM or town while MAFRD provided numbers of beekeeping operations by RM. Following their review of the

Final Preferred Route, Manitoba Beef Producers broadly indicated that the New ROW will traverse some cattle producers' operations (Cousins 2015, pers. comm.).

Additional information on livestock operation locations was gathered through PEP and KPIs to further strengthen the confidence in the identification of livestock operations. During the PEP, some landowners provided the legal land locations of their livestock operations. Land parcels that are used for hobby farms as well as those planned for future livestock production (*e.g.*, cattle planned for SE-10-05-08 in the RM of La Broquerie) were also identified.

The data sources described above were supplemented with a review and interpretation of the buildings inventory layer (Manitoba Hydro 2014a) and aerial photos to identify livestock operations, particularly for those operation types for which location data were not available.

Fifty-five operations for horses, beef cattle, dairy, goats, chickens and trout were identified within the LAA (Table 15-14; Map 15-300). Fewer operations were identified within the Existing Corridor LAA (12) than in the New ROW LAA (43). While activities associated with livestock operations will occur within the PDA, major infrastructure (*e.g.*, barns) was not found within the PDA with the exception of lagoons at the Sturgeon Creek Hutterite colony in the RM of Rosser (Existing Corridor).

Table 15-14 Livestock Operations in the LAA

Location	Livestock Type	No. of Operations
Existing Corridor	Hog	2
	Dairy	1
	Hutterite Colony Mixed Operation	1
	Unclassified[1]	8
	Total operations in Existing Corridor LAA	12
New ROW	Hog	10
	Dairy	4
	Cattle	9
	Equine	1
	Trout	1
	Hutterite colony (multiple barns and out-buildings)	2
	Unclassified[1]	16
	Total operations in New ROW LAA	43
Total No. of Operations in the Existing Corridor and New ROW LAA		**55**

NOTES:
[1] Unclassified = livestock operation for which livestock type could not be determined from desktop review and for which information was not provided through PEP.

15.4.4.1 Hog Operations

Two hog operations are located within the SLTC LAA. One operation is along PTH 2, west of the Town of Oak Bluff in the RM of Macdonald. The southern portion of another operation is within the LAA of the Riel–Vivian portion of the Existing Corridor.

Of the 10 hog operations in the New ROW LAA, one is northwest of Richer in the RM of Ste. Anne, three are northeast and southeast of the community of La Broquerie in the RM of La Broquerie. two are northwest of the community of Marchand and four are southwest of the community of Marchand in the RM of La Broquerie. One is located immediately south of PTH 12 in the RM of Stuartburn.

Associated with hog operations is the land application of manure to agricultural fields. This is typically in the form of liquid manure and may involve the use of temporary or permanent surface or underground pipelines connected to sprinkler/irrigation or drag-line (known as an umbilical) applicators. Centre-pivot irrigation units were not found within the LAA. However, the Manitoba Pork Council is concerned about restricted field accessibility for manure spreading equipment due to Project activities implying the presence of drag hoses or similar infrastructure (Thorlacius 2015b, pers. comm.). Manitoba Pork Council is also concerned about the increased potential for biosecurity risk due to Project activities (Thorlacius 2015b, pers. comm.).

15.4.4.2 Dairy Farms

One dairy farm is located in the Existing Corridor LAA. The dairy farm is in the RVTC and is located west of PTH 12 in the RM of Springfield.

Of the four dairy farms in the New ROW LAA, one is located south of the community of Richer, west of PR 302 in the RM of Ste. Anne (about 600 m east of the ROW). Another is located northeast of the community of La Broquerie (about 140 m west of the ROW), while the remaining two are to the southeast of the community of La Broquerie in the RM of La Broquerie (about 590 m and 580 m east of the ROW). Dairy Farmers of Manitoba is concerned about the relatively close proximity of the Project to one dairy farm northeast of the community of La Broquerie and the potential for stray voltage affecting this operation (Wiens, pers. comm. 2015). This farm is located approximately 140 m away from the ROW. Similar to hog operations, dairy operations in the RAA typically land apply their liquid manure by surface drag hoses or other liquid manure spreading equipment (Wiens, pers. comm. 2015).

15.4.4.3 Cattle Farms and Feedlots

There are no cattle farms or feedlots in the Existing Corridor LAA.

There are nine cattle operations in the New ROW LAA. Two cattle operations are located in the RM of Tache, one in the RM of Ste. Anne, three in the RM of La Broquerie, two in the RM of Stuartburn and one in the RM of Piney.

Cattle operations, particularly feedlots, typically have permanently installed water supply infrastructure, fences, temporary housing areas, and mobile corrals, which can be damaged by Project activities (German and Cousins 2015, pers. comm. 2015). Based on information gathered during the PEP, manure disposal is primarily conducted via solid manure spreading.

15.4.4.4 Equine Operations

One equine facility was identified within the New ROW LAA and is located southeast of Ste. Genevieve in the RM of Tache.

15.4.4.5 Unclassified

Livestock operations that were identified through desktop review of imagery and/or interpretation of buildings layers, and whose specific nature of operation were not determined, were considered unclassified operations. Manitoba Hydro will continue communicating with affected landowners to identify types of operations as necessary throughout the planning process.

There are five unclassified operations in the SLTC LAA, west and south of the Town of Oak Bluff in the RM of Macdonald. Of the two operations northwest of the Town of Oak Bluff, one appears to have grain bins and other outbuildings while the other has a few barns, two lagoons and might be a hog operation. The operation west of Oak Bluff appears to have a small barn and lagoon. Of the two operations south of the Town of Oak Bluff, one appears to have a lagoon and the other has two barns behind a house and no sign of other livestock-related structures. Of the three unclassified operations in the eastern portion of the Vivian–Riel portion of the Existing Corridor; one has no apparent manure storage and might not be a livestock operation, another has a small building with apparent solid manure storage, and the other appears to be a small feedlot.

In the New ROW there are 16 unclassified operations. The first unclassified operation is west of Monominto in the RM of Tache and appears to be a cattle operation. A second potential small cattle operation is located southwest of the community of Ste. Genevieve, also in the RM of Tache. An operation that looks like a possible equine facility is located northwest of Ste. Genevieve. An unclassified operation northwest of the community of Richer in the RM of Ste. Anne is located beside what appears to be a large pond or lagoon. Two other operations are located slightly southwest of Richer in the RM of Ste. Anne, one of which appears to be an old feedlot; the other appears to have multiple barns and solid manure storage. Directly south of Richer is an operation that appears to be an equine operation. There are three unclassified operations northeast of La Broquerie in the RM of Ste. Anne: two potential cattle operations and one potential chicken operation. Three unclassified operations east and southeast of the community of La Broquerie in the RM of La Broquerie might be cattle operations. An unclassified operation southwest of the community of Marchand in the RM of La Broquerie appears to have a small barn and could be a small hog operation; a second operation southwest of Marchand might be an equine operation. Slightly northwest of Marchand is a small operation that could be a small hog barn.

15.4.4.6 Beekeeping Operations (Apiaries)

Based on the data provided by the MAFRD Provincial Apiarist (Lafreniere 2014, pers. comm.), there are beekeeping operations in most of the RMs making up the RAA. However, their locations are unknown. The Manitoba Bee Keepers Association does not have registered members in the RAA (Campbell 2015, pers. comm.). For a honey producer to become a member of the Association, they should have 50 or more honeybee colonies for production of honey, queens, hive splits and nuclear colonies within a given calendar year (Campbell 2015, pers. comm.). The documented presence of honey producers within the RAA, but absence of Manitoba Bee Keepers Association members, suggests that beekeepers in the RAA have fewer than 50 honeybee colonies.

15.4.4.7 Hutterite Colonies

There is one Hutterite colony in the Existing Corridor LAA; the Sturgeon Creek Colony located in the northern portion of the SLTC LAA in the RM of Rosser. There are two colonies in the New ROW LAA; the Springfield Hutterite colony near Anola in the RM of Springfield in the northern portion of the New ROW and the Pineland Colony located near the southeastern end of the New ROW LAA in the RM of Piney. On average, fifteen families live and work communally on a typical Hutterite colony, where they farm, raise livestock and produce manufactured goods for sustenance (Hutterian Brethren 2012). The colony in the RM of Rosser is associated with poultry, hog and dairy operations. At Springfield Hutterite colony, there are multiple livestock types grown, including fish and bees. At Pineland Colony, there are laying hens and broilers, primarily for the colony's use (Gross 2015, pers. comm.).

15.4.5 Specialty Agricultural Operations

15.4.5.1.1 Organic Operations

While the Organic Producers Association of Manitoba does not have registered organic producers within the RAA, there might be operations in the RAA who are producing organically. During PEP, there were no lands identified as actively under organic production by landowners. However, at meetings in La Broquerie one landowner indicated organic orchid development as a potential land use, while another landowner expressed a desire to render their land organic (Chapter 3). Location information was not provided for these two potential land uses.

15.4.5.1.2 Other Specialty Operations

Other specialty operations in the RAA include a mushroom farm in the RM of Springfield; three fruit farms in the RM of Macdonald and two in the RM of South Cypress; two sod farms, one just south of the City of Winnipeg near PTH 75 and the one in RM of Headingley; and one aquafarm found east of PTH 12 in the RM of Springfield. While the major portion of this aquafarm lies outside the New ROW LAA, the eastern portion of the operation, which appears to include three ponds, occurs within the LAA, west of the ROW. One operation in the RM of Ste. Anne, located

within the LAA and west of the PDA, was identified during the PEP as producing trout (aquafarm) and fruit and vegetables. Another fruit farm producing berries was identified during PEP as being located 100 to 400 m away from an alternative route segment within the RM of La Broquerie (Chapter 3), however the specific location is unknown. There are no other known specialty operations within the LAA.

15.4.6 Summary of Existing Conditions

The RAA of the Project encompasses an agricultural region of a portion of south-central and southeastern Manitoba. The RAA is largely under annual crop production. The northwestern RMs of Rosser, Headingley, Macdonald and Ritchot are primarily under annual cropping with small areas under range and grassland and perennial cropland and pasture. While the northeastern RMs of Springfield and Tache are predominantly under annual cropland, their proportions of range and grassland are appreciable, especially in the eastern portions of these RMs. The southeastern RMs of La Broquerie, Stuartburn and Piney can be characterized as having less productive lands and more perennial cropland (hayland) and pasture. The agricultural areas within the Existing Corridor LAA are best characterized as being predominantly under relatively high-value annual crop production while agricultural production with the New ROW LAA is best characterized as mixed farming comprised of annual cropping, perennial cropping and livestock production.

The most common agricultural capability classes in the Existing Corridor are Class 2 (28%) and Class 3 (49%). The primary limitation to agricultural production in the Existing Corridor is excess water. Due to the predominant presence of fine to very fine textured soils and imperfect drainage, compaction risk in the Existing Corridor is predominantly high. Due to these soil properties and poor trafficability, aerial application is in high demand for the application of crop protection products in this area of the Project, particularly during periods of wet field conditions.

The predominant agricultural capability in the New ROW LAA is Class O (organic soils), which covers 25% of the New ROW LAA and Class 5 (23%). The primary limitation to agricultural production in the New ROW is excess water. Compaction risk in the New ROW is predominantly high but to a lesser extent than in the Existing Corridor.

Livestock operations (*e.g.,* hog, dairy, cattle and chicken and broiler-breeder and egg farms) are found throughout the RAA. There are 55 operations within the LAA. The RM of La Broquerie has the highest number of livestock operations in the LAA, including hog, dairy, cattle and equine operations. While the type of livestock operation for 19 livestock operations could not be determined through review of available data sources, some of these unclassified operations do not appear to be active.

There are two Hutterite colonies in the LAA, one in the RM of Rosser (Sturgeon Creek Hutterite colony) and the other in the RM of Piney (Pineland Hutterite colony). There are beekeeping operations in most of the RMs that make up the RAA; however, their locations are unknown. Because the Manitoba Bee Keepers Association does not have registered members in the RAA

(Campbell 2015, pers. comm.), it appears that honey producers in the RAA are operating less than 50 bee colonies or are hobbyists.

Multiple surface water and groundwater licences were issued in the RAA for agricultural purposes. In the New ROW LAA, four operations use groundwater for livestock production. No licences have been issued for irrigated crop production in the RAA; however, through PEP it was indicated that four landowners irrigate annual and hay crops within the RMs of La Broquerie and Ste. Anne. There were no centre pivot irrigation units found through aerial photo review.

The Organic Producers Association of Manitoba does not have registered organic producers within the RAA. None of the groups representing agricultural producers or operators identified organic specific operations as organic. During PEP, there were no lands identified as actively under organic production by landowners.

Several specialty operations were identified in the RAA for mushroom, fruit, sod, and fish (aquafarm) production. Of these specialty operations, the operation producing trout, fruit trees and vegetables in the RM of Ste. Anne and the fruit farm in La Broquerie are within the LAA.

15.5 Assessment of Project Environmental Effects on Agriculture

As a primarily linear development that will traverse a predominantly agricultural landscape, the Project will interact with agriculture and have the potential to cause effects on it. This section assesses and evaluates the potential Project effects on current agricultural land use, resulting from construction, operation and maintenance activities, within the assessment areas.

Project activities have the potential to result in temporary and permanent loss of land during construction and operation and maintenance, respectively. Degradation of soil quality could occur during construction and operation and maintenance, which could lead to a reduction in land capability for agriculture. Project activities also have the potential to conflict with agricultural activities during the construction and operation and maintenance phases of the Project. Conflict with agricultural activities could occur as a result of multiple pathways (*e.g.,* disruption to aerial and ground application of crop protection products, effects on farm equipment operation and manure application, effects on livestock and animal health and compromised bio-security for crops and livestock).

Temporary land loss is anticipated to occur during construction, after which most of the affected land will be returned to previous agricultural land use. Permanent land loss will occur for the lifetime of the Project under and immediately around tower structures and under station footprints. Standard mitigation measures will be followed to reduce soil degradation during construction. While conflict with agricultural activities will occur during both construction and operation and maintenance, route selection considerations such as design mitigation and landowner/producer engagement will help reduce the extent and severity of such conflicts. Manitoba Hydro will pay

compensation for lost land and productivity as outlined in the Manitoba-Minnesota Transmission Project Landowner Compensation Information.

15.5.1 Project Interactions with Agriculture

Table 15-15 identifies physical components and activities that might interact with agriculture and result in the identified potential effects. These interactions are indicated by check marks and are discussed in detail in Section 15.5.2 and Section 15.5.3 in the context of effects interactions, standard and Project-specific mitigation, and residual effects.

Table 15-15 Potential Project-Environment Interactions and Effects on Agriculture

Project Components and Physical Activities	Potential Environmental Effects	
	Loss or Degradation of Agricultural Land	Conflict with Agricultural Activities
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 Operation and Maintenance		
Station Operation/Presence	✓	—
Vegetation Management (weed control)	—	—

NOTES:
"☐" = Potential interactions that might cause an effect

During transmission line operation and maintenance, inspection patrols are not anticipated to conflict with agricultural activities because these routine and planned inspections are expected to occur outside the growing season. Vegetation management (tree control) is not anticipated to result in loss or degradation of land or conflict with agricultural activities; as these activities will be scheduled to accommodate farming schedules, as outlined in the Project description (Chapter 2). The presence of the transmission line structures and conductors will interact with the effects of loss of land and degradation and conflict with agricultural activities.

Interaction between the stations and agriculture is anticipated only for Glenboro South Station. The station will be expanded beyond the existing station footprint area but within Manitoba Hydro owned property, and transmission line realignments of portions of the transmission line near the station will occur on private land (Chapter 2). No interaction will occur between the Riel Converter Station and agriculture because station modifications will occur within the existing station footprint. The expansion of the Dorsey Converter Station footprint is within an area not currently under agricultural land use; therefore, no interaction will occur between this expansion and agriculture.

During station site preparation at Glenboro South Station construction, conflict with agricultural activities is not anticipated because of the nature and small-scale of modifications and additional equipment required (Chapter 2) in relation to the existing station and associated structures. Loss or degradation of agricultural land and conflict with agricultural activities are not anticipated to result from electrical equipment installation.

During operation and maintenance of Glenboro South Station, there is not anticipated to be a change in interactions between station operation/presence and conflict with agricultural activities. The station and associated transmission lines already exist in this area of agricultural land use, are being realigned and are anticipated to have a similar interaction with agriculture post-construction as per the baseline condition. Vegetation management is also not anticipated to interact with agriculture during station operation and maintenance, as these activities will be confined to station boundaries.

15.5.2 Assessment of Loss or Degradation of Agricultural Land

The Project has the potential to result in temporary and permanent loss of agricultural land and degradation of agricultural land. While temporary loss of land and degradation of land are primarily associated with construction, permanent loss of land and a smaller extend of land degradation are associated with operation and maintenance activities. The pathways, mitigation measures and characterization of these potential effects are described below.

15.5.2.1 Pathways for Loss or Degradation of Agricultural Land

15.5.2.1.1 Construction

This section summarizes the pathways of effects on the agricultural land base that could occur during construction. As indicated in Section 15.5.1 for the transmission lines, these effects could occur through the following Project activities:

- mobilization
- 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

As indicated in Section 15.5.1 for Glenboro South Station, Project effects would potentially occur through station site preparation.

TEMPORARY LOSS OF LAND

Establishment of site access, site preparation, establishment of marshalling yards, tower construction, conductor stringing, mobilization and demobilization within the transmission line ROW will result in temporary loss of land available for agricultural use (*e.g.*, cropland and grazing lands) during the construction phase. The timing and duration of construction activities will determine the degree to which these temporary losses are realized. Transmission line construction within the SLTC is scheduled for summer of 2017 to spring of 2018 and within the remainder of the Final Preferred Route (RVTC and New ROW) for spring of 2018 to winter of 2019 (Chapter 2). Based on this schedule, temporary loss of land during construction are anticipated to affect not more than one growing season for the SLTC and not more than two growing seasons for the remainder of the ROW. Construction activities during the growing season, or spring and fall periods when agricultural producers are conducting field operations such as field preparation, nutrient application and field cleanup will result in the temporary loss of use of affected lands. It is assumed that these temporary losses will extend to the entire ROW within fields where construction activities are occurring. Though the effect will be primarily within the ROW, the timing and duration of construction activities may preclude areas outside of the ROW from being used for crop production. For example, construction within the ROW may preclude access across the ROW and to a portion of a field outside of it. However, these situations will be restricted to the construction period, and access to the affected areas will be restored following construction.

At Glenboro South Station, agricultural land will be lost due to the Project. While the loss of land under the expanded station footprint is considered temporary during the construction phase, it is more appropriately addressed as a permanent land loss under the operation and maintenance phase because the affected land will be lost for the lifetime of the Project. A temporary loss of land will occur within the Glenboro South Station PDA associated with the transmission line realignments in close proximity to the station.

DEGRADATION OF AGRICULTURAL LAND

Construction activities within the ROW (*e.g.,* establishment of site access, clearing, tower foundation construction, conductor stringing, mobilization and demobilization) have the potential to affect land capability and soil productivity due to compaction (and rutting and admixing), and, to a lesser degree, increasing vulnerability of soils to erosion. Compaction will occur, particularly on lands with imperfectly or poorly drained fine-textured soils which, when compared to medium- or coarse-textured soils, are more susceptible to compaction from traffic under high soil moisture conditions (Hillel 1982; Serecon Valuations Inc. 2010). Physical land degradation in affected areas of the ROW may result in reduced crop productivity and increased costs associated with additional fieldwork activities (*e.g.,* additional tillage and leveling) to return land capability to pre-construction conditions. Compacted soil can cut crop yields by as much as 50% due to reduced aeration, increased resistance to root penetration, poor internal drainage, and limited availability of plant nutrients (Wolkowski and Lowery 2008).

The timing of construction will also influence the degree of effects on agricultural capability within the ROW (Serecon Valuations Inc. 2010). Construction in the winter when soils are frozen, during the summer if soils are dry, or in the late fall after harvest if soils are dry, will reduce the effects from compaction (Hillel 1982). Conducting construction activities when the soil is wet will increase the potential for soil degradation from compaction and enhance the potential for yield reduction in subsequent growing seasons from reduced land capability. For the SLTC and the remainder of the ROW, construction activities are scheduled to peak in the fall of 2017 to winter of 2018 and winter of 2019, respectively (Chapter 2). Based on this schedule, peak periods of construction activities will coincide with periods of late fall to winter that are favourable for reduced Project effects on agriculture.

Soil degradation might also occur if the soils stripped during construction (*e.g.,* around tower structures) are not adequately protected from increased levels of erosion, from either wind or water. Spring-melt and dry fall periods are generally the times when soils are most susceptible to losses from water erosion and wind erosion, respectively. However, erosion may occur whenever soils are not frozen or adequately protected by cover, but would be less of a concern during winter construction. There were no soils identified within the PDA as having high risk of water erosion (Soil and Terrain TDR). For wind erosion, a large portion of the transmission line PDA is characterized as having high to severe wind erosion risk, with over 74% and 55% classed as such in the Existing Corridor and New ROW, respectively. However, vegetation and soil disturbance resulting in increased soil exposure to wind erosion is anticipated in small, localized

areas within agricultural portions of the ROW and will be primarily limited to areas of Project structures.

Effects of land loss and soil degradation on crop productivity and production values are crop type dependent. Row crops typically have higher production value than oilseeds and cereals, and oilseeds and cereals generally have higher production values than haylands and pastures (Section 15.4.2). The monetary effects of temporary loss of land are expected to be higher for row crops and cereal/oilseeds than for hayland. However, the individual nature of agricultural operations makes the areal extent of effect a better tool for assessing Project effects than dollar value of crops. For example, a 100% effect on hayland would still be a 100% effect on the affected producer in spite of the lower hayland crop value.

Interaction between the temporary loss of agricultural land at Glenboro South Station is anticipated and associated with the realignment of transmission lines near the station. The permanent land loss associated with the expansion of the station footprint is addressed under operation and maintenance. Soil erosion risk at Glenboro is predominantly low (wind) and moderate (water).

15.5.2.1.2 Operation and Maintenance

This section summarizes the pathways of effects on the agricultural land base that would occur during operation and maintenance. As indicated in Section 15.5.1 for the transmission line, these effects would occur through transmission line operation or presence and inspection patrols.

For Glenboro South Station, Project effects during operation and maintenance would occur through station operation or presence.

PERMANENT LOSS OF LAND

Potential effects during the operation and maintenance phase of the Project are primarily related to Project presence resulting in permanent land loss (*i.e.,* for the duration of the operation and maintenance phase of the Project) for agricultural land uses.

Crop production or grazing land will be lost on lands that are permanently removed from production by tower structures. However, because the total area removed from production is small relative to the average farm size, the corresponding effect on land loss from having transmission lines in fields will be small (Webb 1982, cited by J. and V. Nielsen and Associates Ltd. 2011).

While the total footprint lost from agricultural production will be small relative to the total area in the LAA, Manitoba Hydro realizes that permanent land loss effects could be of relative importance to individual landowners and producers at the individual operation level. In planning the Project, and as part of design mitigation, Manitoba Hydro chose two types of steel lattice structures (*i.e.,* self-supporting steel lattice towers for agricultural areas and guyed steel lattice towers for non-agricultural lands) (Chapter 2). Steel lattice towers allow for longer span lengths, thereby reducing the number of towers that landowners may need to avoid when operating

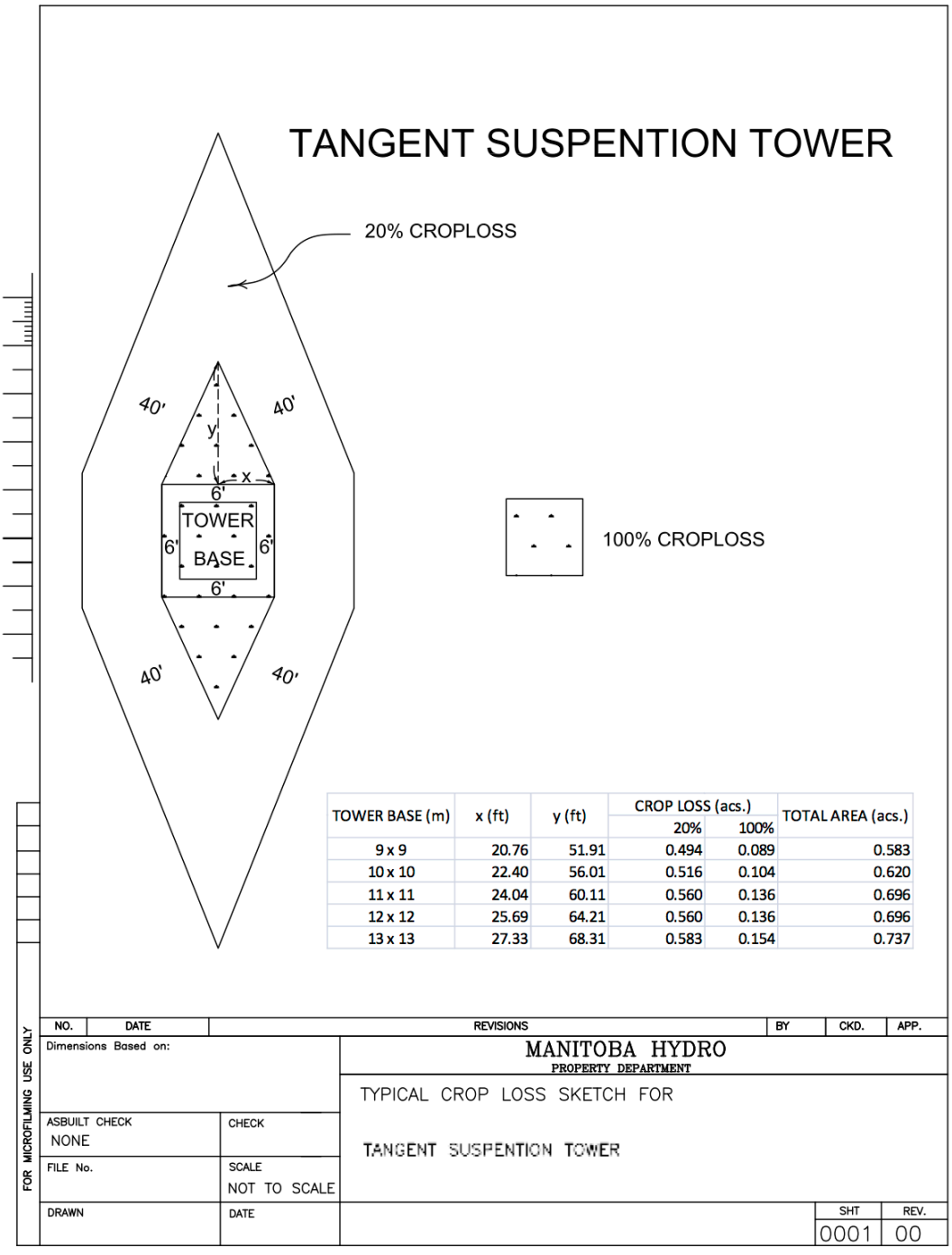
agricultural equipment. Self-supporting towers occupy a smaller area than a guyed tower, and were chosen for agricultural lands to reduce the extent of permanent land loss. Figures 15-6 and 15-7 show typical crop loss sketches for two types of towers proposed for the Project – a tangent suspension tower and a medium angle dead-end tower.

In Manitoba, farming activities generally persist close to the immediate base of structures (Appendix 15D, Photos 1 to 4). However, some farmers are not able to farm right up to the tower edge due to the large size of equipment, the nature of field operations and/or the location of towers in relation to field edges and other obstructions. Others noted that buffers around square-based tower footprints in the range of 1 to 2 m (J. and V. Nielsen and Associates Ltd. 2011) and 3 m (Serecon Valuations Inc. 2010) should be considered. While J. and V. Nielsen and Associates Ltd. (2011) demonstrated the appropriateness of the smaller buffer for typical grain production systems in Manitoba, a larger buffer is likely more reasonable when considering row crops (*e.g.,* soybean, corn, and sunflower) due to limitations in approach distances resulting from the nature of the field equipment and operations.

At Glenboro South Station, the only areas where there would be permanent loss of agricultural land would be at the foundations for tower realignments and the area of the station expansion. The existing footprint will be expanded beyond the current station boundaries, but within Manitoba Hydro property.

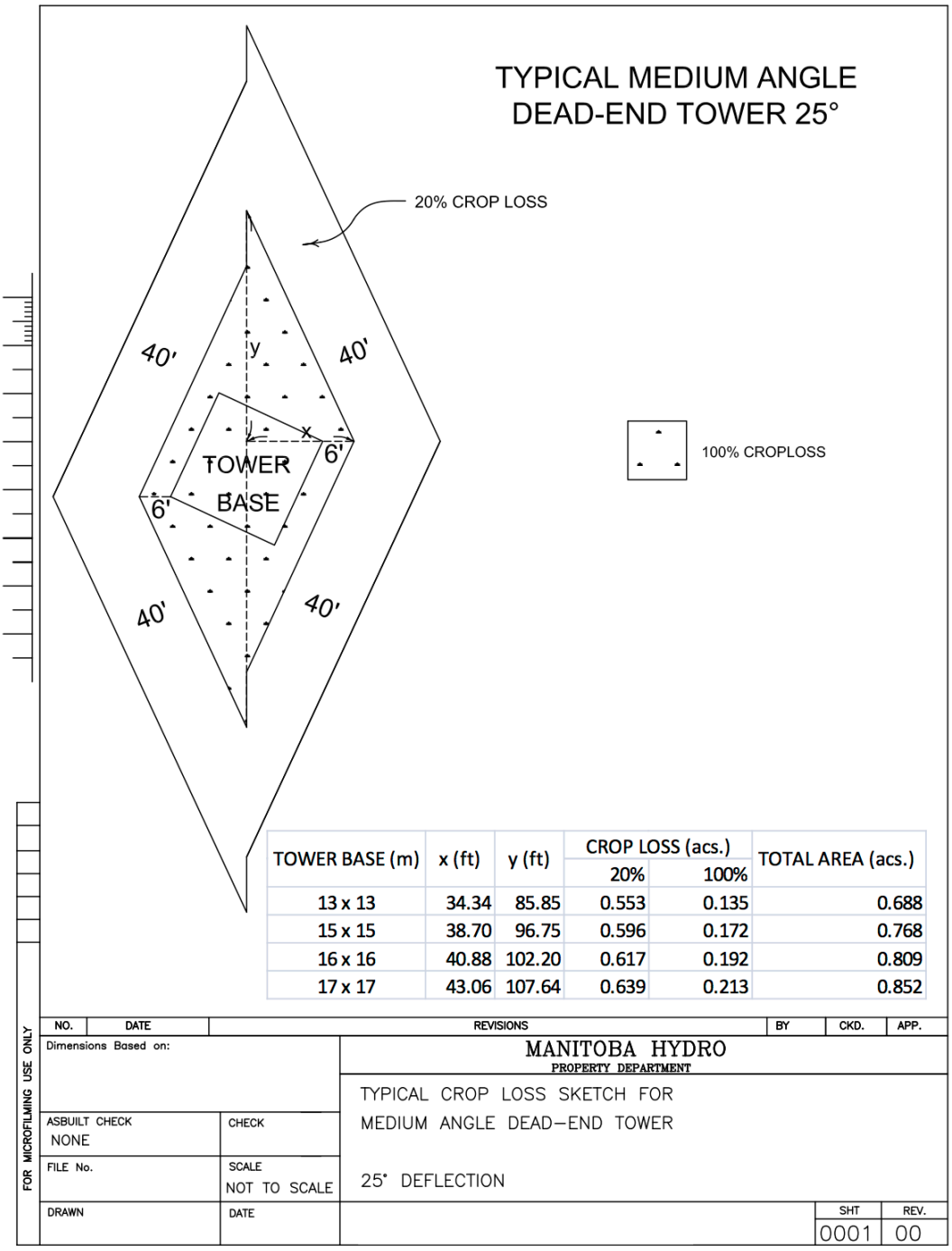
DEGRADATION OF AGRICULTURAL LAND

Soil degradation through compaction could occur during operation and maintenance activities as described in Section 15.5.2.1.1. However, the extent and frequency of these interactions will be substantially less compared with the construction phase due to much fewer occurrences of equipment traffic on the ROW, particularly during spring, summer and fall, when soils are prone to compaction.



TOWER BASE (m)	x (ft)	y (ft)	CROP LOSS (acs.)		TOTAL AREA (acs.)
			20%	100%	
9 x 9	20.76	51.91	0.494	0.089	0.583
10 x 10	22.40	56.01	0.516	0.104	0.620
11 x 11	24.04	60.11	0.560	0.136	0.696
12 x 12	25.69	64.21	0.560	0.136	0.696
13 x 13	27.33	68.31	0.583	0.154	0.737

Figure 15-6 Typical Crop Loss Sketch for a Tangent Suspension Tower



TOWER BASE (m)	x (ft)	y (ft)	CROP LOSS (acs.)		TOTAL AREA (acs.)
			20%	100%	
13 x 13	34.34	85.85	0.553	0.135	0.688
15 x 15	38.70	96.75	0.596	0.172	0.768
16 x 16	40.88	102.20	0.617	0.192	0.809
17 x 17	43.06	107.64	0.639	0.213	0.852

NO.	DATE	REVISIONS	BY	CKD.	APP.

FOR MICROFILMING USE ONLY

Dimensions Based on:

MANITOBA HYDRO
PROPERTY DEPARTMENT

TYPICAL CROP LOSS SKETCH FOR
MEDIUM ANGLE DEAD–END TOWER

25° DEFLECTION

ASBUILT CHECK	CHECK
NONE	
FILE No.	SCALE
	NOT TO SCALE
DRAWN	DATE

SHT	REV.
0001	00

Figure 15-7 Typical Crop Loss Sketches for a Medium Angle Dead-end Tower

15.5.2.2 Mitigation for Loss or Degradation of Agricultural Land

Standard industry practices and avoidance measures, along with Project-specific mitigation measures, will be implemented during construction and operation and maintenance, as listed in Chapter 22 – Environmental Protection, Follow-up and Monitoring.

This section focuses on key mitigation measures that are planned for implementation to avoid or reduce potential Project effects on the loss or degradation of agricultural land during the construction and operation and maintenance phases of the Project, where applicable.

15.5.2.2.1 Temporary Loss of Agricultural Land

Mitigation for temporary loss of agricultural land includes the following:

- Manitoba Hydro will pay compensation pursuant to the Landowner Compensation Program for damage to infrastructure/crops from construction or maintenance activities. Where possible, construction schedules will take into consideration the timing of agricultural activities.
- Compensation will be provided according to the Manitoba Hydro Land Compensation Program for:
    - damage to property, any relocation of incompatible agricultural buildings (*e.g.*, grain bins and livestock overwintering shelter)
    - temporary loss of agricultural land
- Areas of temporary soil disturbance on agricultural lands will be rehabilitated in accordance with the Rehabilitation and Weed Management Plan. This plan will be developed before construction, and would be part of the overall Environmental Protection Program, as described in Chapter 22.
- Manitoba Hydro will contact directly affected landowners to discuss how to reduce effects on their agriculture activities.

An example of how landowner compensation will be determined for the Project is shown in Figure 15-8.

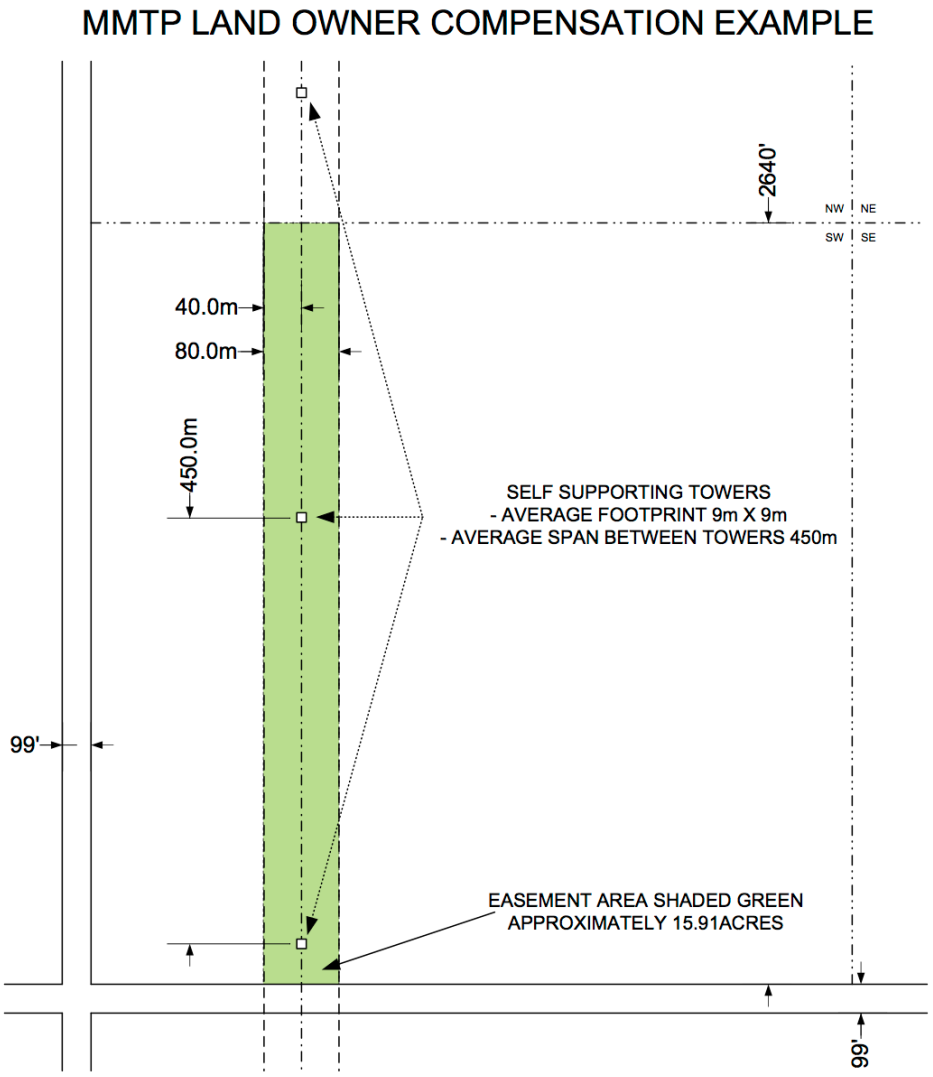


Figure 15-8 Landowner Compensation Example for the Project

15.5.2.2.2 Degradation of Agricultural Land

Mitigation for degradation of agricultural land includes the following:

- Effects of soil compaction and rutting will be mitigated by managing equipment traffic routes and activities for access route and bypass trail development, temporary sites' setup, clearing of the transmission ROW, installation of the transmission structures, and station site preparation. In accordance with the Access Management Plan, the Contractor will be restricted to established roads and trails and cleared construction areas.
- The transmission line will be constructed in agricultural areas when soils are not saturated to limit compaction, rutting and admixing, particularly in areas of high compaction risk. If this is not possible, other mitigation or rehabilitation measures will be conducted to reverse effects.
- If working on saturated soils during non-frozen ground conditions, equipment and techniques that distribute ground pressure (*e.g.,* swamp mats, geofabric and padding and corduroy) will be used to avoid compaction and admixing.
- Contractor-specific Erosion Protection and Sediment Control Plans will be prepared by the Contractor, accepted by Manitoba Hydro prior to construction and updated annually.

15.5.2.2.3 Permanent loss of agricultural land

Mitigation for permanent loss of agricultural land primarily involves reducing area of loss through design mitigation and compensation for land permanently removed from agriculture due to structure presence.

- As part of design mitigation:
  - Manitoba Hydro used existing transmission line corridors for routing of 43% of the transmission line, which reduces the extent of permanent loss of agricultural land.
  - Manitoba Hydro chose self-supporting steel lattice towers for use in agricultural land to reduce the extent of permanent land loss since they have a smaller footprint than guyed towers, which were used in non-agricultural areas.
  - Manitoba Hydro has provided opportunities to discuss and identify areas of concern and potential tower spotting preferences with potentially affected landowners.
- Compensation will be provided according to Manitoba Hydro Land Compensation Program for land permanently removed from agriculture due to structure presence.

An example of how landowner compensation will be determined for the Project is shown in Figure 15-8.

15.5.2.3 Characterization of Residual Environmental Effect for Loss or Degradation of Agricultural Land

15.5.2.3.1 Construction

TEMPORARY LAND LOSS AND DEGRADATION OF AGRICULTURAL LAND

It is assumed that temporary loss of agricultural land will affect the entire agricultural portion of the PDA for the duration of construction. Areas of temporary land loss include a larger proportion of land with agriculture capability classes 1 to 3 in the Existing Corridor than in the New ROW. In the Existing Corridor, 74% of the 1989 ha of land that will be lost temporarily belongs to agricultural capability classes 1 to 3 (Table 15-16). In contrast, in the New ROW only 17% of the 1090 ha of land that will be lost temporarily falls under classes 1 to 3. For the Existing Corridor and New ROW, the total area of temporary land loss makes up 9.5% and 4.3% LAA, respectively (Table 15-16).

For Glenboro South Station, most of the land area that will be temporarily lost is in agricultural capability classes 1 and 2 (Table 15-16). However, the area of temporary land loss is small (6 ha) and makes up 1.2% of the Glenboro LAA.

Table 15-16 Area of Temporary Land Loss in the PDA

Project Component	Area under Agricultural Land Capability Class (ha)									Total Area (ha)	% LAA
	1	2	3	4	5	6	7	O	N/A		
Existing Corridor	10	563	906		50				461[1]	1,989	9.5
New ROW		12	171	182	221	225		277	2	1,090	4.3
Glenboro South Station	2	3			1					6	1.2

NOTES:
[1] Area associated with City of Winnipeg for which soil inventory information is not available.

In the Existing Corridor, temporary land loss due to Project construction will affect a larger area of land under row and cereal/oilseed crop production than land under hayland (Table 15-17). In the New ROW, temporary land loss will affect a larger proportion of hayland than annual cropland (row and cereal/oilseed crops). This contrast is consistent with the distribution of agricultural capability classes in the Project area, (*i.e.*, larger proportion of agricultural capability classes 1 to 3 lands in Existing Corridor than the New ROW).

Temporary land loss will affect crop production in minor portions of the Existing Corridor, New ROW and Glenboro LAAs (Table 15-17).

Temporary land loss is anticipated to affect a small proportion of the LAA (assumed to be the entire ROW) for not more than one growing season for the SLTC LAA and not more than two growing seasons for the RVTC and New ROW LAAs, and Manitoba Hydro will provide compensation for affected crop production or activities to further reduce residual effects due to temporary land loss. Temporary losses associated with the PDA represent less than 1% of the RAA.

Table 15-17 Crop Types Grown (Average 2009–2014) in the PDA

Crop Type	Average Area		
	ha	% PDA	% LAA
Existing Corridor			
Row Crop	374	19	–
Cereal/Oilseed	851	43	–
Seeded Hayland	194	10	–
Natural Hayland	218	11	–
Other Crop Types	0	0	–
Totals	**1,637**	**82**	**7.8**
New ROW			
Row Crop	38	3	–
Cereal/Oilseed	77	7	–
Seeded Hayland	66	6	–
Natural Hayland	150	14	–
Other Crop Types	1	0	–
Totals	**331**	**30**	**13.0**
Glenboro South Station			
Row Crop	0	0	–
Cereal/Oilseed	3	50	–
Seeded Hayland	2	33	–
Natural Hayland	0	0	–
Other Crop Types	0	0	–
Totals	**6**	**100**	**1.2**

Approximately 67% of the total PDA has a high risk of soil compaction (Table 15-18). A reduction in agricultural capability class due to soil degradation from construction (*e.g.*, compaction and erosion) could result in a reduced ability for the land to support crop production relative to pre-disturbance (*i.e.,* before the Project is built) conditions. It is anticipated that effects of soil degradation resulting in a reduction in land capability will be minimal following mitigation that includes restricting equipment traffic routes and activities to established roads, trails and cleared construction areas as outlined in Section 15.5.2.2.2. If a residual effect does occur, it is anticipated to be limited to localized areas within the PDA. Further, it would be most likely to occur in areas of high compaction risk (Map Series 4-400, Soil and Terrain TDR) where construction activities occurred during spring, summer, or fall and during periods of wet soil conditions.

Table 15-18 Areas of High Compaction Risk in the PDA

Project Component	Area	
	ha	%
Existing Corridor	1,471	74
New ROW	596	55
Glenboro South Station	3	60
Totals	**2,070**	**67**

15.5.2.3.2 Operation and Maintenance

PERMANENT LAND LOSS AND DEGRADATION OF AGRICULTURAL LAND

The self-supporting steel-lattice tower, which will be used in agricultural areas, will have a footprint ranging from 10 m × 10 m for tangent self-supporting lattice steel structures in straight sections of the line to 15 m × 15 m for angle self-supporting lattice steel structures (Chapter 2). Areas of permanent land loss were estimated using the transmission line length, tower numbers presented in the Project description (Chapter 2) and buffered tower footprint areas (Table 15-19). Using the most conservative buffer of 3 m, tower footprint and buffer areas of 7.2 ha and 4.5 ha are estimated in the Existing Corridor and New ROW, respectively, and include all land uses (Table 15-19). Based on proportional analysis using agricultural land use areas relative to total transmission line length, the buffered footprint areas under agricultural land use are estimated to be 5.8 ha and 1.5 ha for the Existing Corridor and the New ROW, respectively. Additional to this, based on the assumption of 4 additional self-supporting tangent towers with base dimensions of 10 m × 10 m, there will be permanent land loss under the Glenboro South Station footprint expansion of approximately 0.1 ha. Photo 3 in Appendix 15D shows structures and footprint dimensions for comparable transmission lines in agricultural Manitoba.

Table 15-19 Estimated Areas of Permanent Land Loss under Structures in the PDA

Component	Tower Type[1]	Approximate No. of Structures[1] (#)	Structure Footprint (ha)	Total Structure Footprint with 1-m Buffer[2] (ha)	Total Structure Footprint with 3-m Buffer[3] (ha)
Existing Corridor[4]	tangent, self-supporting, 10 m × 10 m	225	2.3	3.2	5.8
	anti-cascading, self-supporting, 12 m × 12 m	15	0.2	0.3	0.5
	angle, self-supporting, 15 m × 15 m	21	0.5	0.6	0.9
	Totals		2.9	4.1	7.2
New ROW	tangent, self-supporting, 10 m × 10 m	117	1.2	1.7	3.0
	anti-cascading, self-supporting, 12 m × 12 m	0	0.0	0.0	0.0
	angle, self-supporting, 15 m × 15 m	33	0.7	1.0	1.5
	Totals		1.9	2.6	4.5
Glenboro South Station[5]	n/a	4	0.04	0.06	0.10
Totals			**4.9**	**6.8**	**11.7**

NOTES:

[1] Based on Project description (Chapter 2)

[2] Buffer of 1–2 m around tower used by Nielsen (2012)

[3] Buffer of 3 m around tower by Serecon Valuations Inc. (2010)

[4] Assumes area under new towers, including those required for M602F within the Riel–Vivian Transmission Corridor.

[5] Assumed four additional towers with base dimensions of 10 m × 10 m.

A study undertaken by PAMI (2015) confirms the estimated areas of land loss based on tower footprint-areas with 3 m buffers applied are conservative. The study assumed a straight-line transmission line routed parallel to field edges, an 80 m easement width, and steel towers at 400 m intervals with 9 m × 9 m base dimensions. While the PAMI study base dimensions are slightly smaller than the 10 m × 10 m tangent towers proposed for the Project; PAMI applied a 1 m safety buffer to tower base dimensions effectively resulting in a 10 m × 10 m base dimension equivalent to that used for the Project. Under this scenario, the study estimated the proportion of unused easement to be 0.37% for equipment widths of 50, 60 and 100 ft. Seeding equipment widths would typically be in the range of 40 to 60 feet, so it is reasonable to assume that these estimates would apply to the area of land that could not be seeded within the easement as a result of the presence of tower structures. These proportions of unused easement areas equate to 0.0237 ha of unused areas within a typical quarter section easement, or 0.0118 ha of area unused around an individual tower. This compares to 0.0256 ha estimated for permanent land loss for the tangent towers with 10 m × 10 m base dimensions with the applied 3 m buffer. PAMI (2015) also estimated areas of the easement that would receive overlapping input application and that would have additional equipment transport requirements as a result of the presence of tower structures. These issues are addressed under conflict with agricultural activities (Section 15.5.3), and landowners will be compensated for these increased production costs through Structure Impact Compensation.

Manitoba Hydro Structure Impact Compensation assumes areas of 100% crop loss and 20% crop loss around each tower structure. For a tangent tower with base dimensions of 10 m × 10 m, areas of 0.104 ac (0.042 ha) of 100% crop loss and 0.516 ac (0.209 ha) of 20% crop loss are assumed (Figure 15-6). The area used to estimate 100% crop loss is greater than the estimated 0.063 acres (0.026 hectares) based on the application of a 3 m buffer applied to the area of the 10 m × 10 m tower base, as used in this assessment to assess permanent land loss under these tower structures. Further, the equivalent total crop loss used in the compensation formula would be 0.21 ac (0.084 hectares) when the area of 20% crop loss is also considered (*i.e.*, 0.104 ac 100% crop loss + 0.516 ac 20% crop loss/5). However, the crop loss associated with the 20% crop loss area is related to productivity losses resulting from input overlap; an issue addressed in Section 15.5.3.

Similarly, for a medium angle tower with a 15 m × 15 m base, Manitoba Hydro assumes areas of 0.172 ac (0.070 ha) of 100% crop loss and 0.596 ac (0.241 ha) of 20% crop loss (Figure 15-7). The area used to estimate 100% crop loss is greater than the estimated 0.109 ac (0.044 ha) based on the application of a 3 m buffer applied to the area of the 15 m × 15 m tower base, as used in this assessment to assess permanent land loss under these tower structures. Further, the equivalent total crop loss used in the compensation formula would be 0.291 ac (0.118 ha) when the area of 20% crop loss is also considered (*i.e.*, 0.172 ac 100% crop loss + 0.596 ac 20% crop loss/5). Again, the crop loss associated with the 20% crop loss area is related to productivity losses resulting from input overlap, an issue addressed in Section 15.5.3.

When compared to the area contained within the PDA and LAA (Table 15-20), the areas of permanent loss are considered small. However, to individual landowners or producers with relatively small parcels of land, these areas are of relative importance.

It is anticipated that effects of soil degradation resulting in a reduction in land capability will be minimal following the implementation of mitigation as outlined in Section 15.5.2.2.2. Based on the frequency, timing and intensity of operation and maintenance activities along the ROW, residual effects are not anticipated. These routine activities are not anticipated to occur during the growing season or during spring and fall periods when soil conditions are more favourable for compaction. In events of emergency, ROW access may be required when soil conditions are favourable for compaction. However, these would be the result of unplanned events and would occur due to accidents or malfunctions (Chapter 21 – Accidents, Malfunctions and Unplanned Events). Remedial actions would be developed to address soil degradation as a result of these events on a site-specific basis.

Table 15-20 Extent of Permanent Land Loss By Crop Type (2014) within the PDA and LAA

Crop Type	Total Footprint including 3 m buffer[1,2]	PDA		% of LAA
		Extent ha	Proportional Extent %	
Existing Corridor				
Row Crop	2.1	374	0.57	
Cereal/Oilseed Crop	2.7	851	0.31	
Seeded Hayland	0.1	194	0.08	
Natural Hayland	0.9	218	0.41	
Other Crop Types	0.0	0	0.0	
Totals	**5.8**	**1,637**	**0.44**	**0.03**
New Right-of-way				
Row Crop	0.3	38	0.92	
Cereal/Oilseed Crop	0.2	77	0.28	
Seeded Hayland	0.1	66	0.12	
Natural Hayland	0.8	150	0.53	
Other Crop Types	0.0	1	1.2	
Totals	**1.5**	**331**	**0.44**	**0.01**

Crop Type	Total Footprint including 3 m buffer[1,2]	PDA		% of LAA
		Extent ha	Proportional Extent %	
Glenboro South Station				
Row Crop	0.00	0	0.00	
Cereal/Oilseed Crop	0.04	3	1.46	
Seeded Hayland	0.03	2	1.64	
Natural Hayland	0.00	0	0.00	
Other Crop Types	0.00	0	0.00	
Totals	**0.08**	**6**	**1.27**	**0.02**
Grand Totals	**11.7**	**1,974**	**0.59**	**0.02**

NOTES:

[1] Based on Project description (Chapter 2) using a Buffer of 3 m around tower by Serecon Valuations Inc. (2010)

[2] Total footprint for each crop type determined using proportional analysis. Proportion of each crop type within the 3 project components determined using federal spatial distribution of crops data averaged for 2009–2014 (Government of Canada 2015)

15.5.2.4 Summary

With the implementation of mitigation measures, including compensation, residual effects from the Project due to temporary loss and degradation of land are anticipated to be adverse and confined to the PDA (*i.e.,* site of construction or maintenance activities). Within the PDA, the temporary loss of agricultural land during construction would result in a small but measurable change in the capacity for agriculture (*i.e.*, low magnitude). The change in land capability class for agriculture and extent of lands affected by compaction will result in a change that is greater than that for temporary land loss but one that will not affect the sustainability of the capacity for agriculture (*i.e.,* moderate magnitude) within the PDA. Residual effects from temporary land loss will be limited to the construction phase (short-term) while those for degradation of land due to compaction will extend beyond the construction phase (medium term) because if compaction effects occur, they could persist for a few years following remedial action. Temporary land loss will occur once during construction. In contrast, the frequency of events leading to degradation of soil is considered irregular because there could be multiple construction activities occurring at irregular intervals during construction and operation that could trigger a compaction effect. Because land removed from agricultural use within the ROW and temporary footprints during construction will be returned to agricultural use after construction, the residual effects due to temporary land loss and degradation of land are considered reversible. The socio-economic context for agriculture with respect to temporary land loss is high resilience since there is high capacity for agriculture to accommodate change.

With the implementation of mitigation measures (primarily through design mitigation and landowner compensation), the residual effects from the Project due to permanent loss of land during operation and maintenance are anticipated to be adverse and confined to the PDA (*i.e.,* site of tower strictures and station footprint). The residual effects of soil degradation are not anticipated during normal operation and maintenance. Within the PDA, the permanent loss of agricultural land will result in a small but measurable change in the capacity for agriculture *(i.e.,* low magnitude). The land area affected by the presence of the Project will be small compared to that currently used for agriculture in the PDA and LAA. However, while the overall effect of permanent land loss is small, permanent land loss is an important consideration at the individual farm level. Residual effects due to permanent land loss are considered to be a one-time event and permanent because the loss will persist for the lifetime of the Project. Permanent loss of agricultural land is deemed reversible because the affected land can be returned to agricultural use following decommissioning. The socio-economic context for agriculture with respect to permanent land loss is high resilience since there is high capacity for agriculture to accommodate change.

15.5.3 Assessment of Conflict with Agricultural Activities

The Project has the potential to result in conflict with agricultural activities during both construction and operation and maintenance. Conflict with agricultural activities could occur due to:

- damage to, or interference with, agricultural infrastructure (*e.g.,* buildings, barns, grain bins, manure application and water-supply systems)
- interference with the use of field equipment
- restricted potential for future expansion for livestock operations
- increased potential for stray voltage and electric and magnetic field (EMF) effects on livestock
- effects on animal health following intake of remnants of construction materials
- increased management effort due to:
    - additional operational costs and inconveniences associated with increased management effort due to presence of Project structures, including:
        - overlap of farm input application (*e.g.*, seed, fertilizer, pesticides) in proximity to Project structures resulting in inefficiencies and excess input usage
        - inefficiencies of field operations due to working around Project structures resulting in excess fuel usage and equipment depreciation
    - A split farm management units (*e.g.,* due to in-field placement of towers, diagonal crossings or angled placement of tower)

- restricted aerial and ground application areas for crop protection products
- increased biosecurity risk for crops and livestock
- changes in access routes to farm properties and to areas of agricultural activities (*e.g.,* rotational paddocks, watering facilities, wintering sites, cropping fields)
- restricted field accessibility for manure spreading equipment

- removal of vegetation that provides pollen for bees

The pathways, mitigation measures and characterization of these potential effects are described below.

15.5.3.1 Pathways for Conflict with Agricultural Activities

Most interactions are similar between construction and operation and maintenance phases. However, the nature, degree and extent of interactions differ between the phases in some cases.

15.5.3.1.1 Construction

Construction activities may interfere with agricultural activities, including operation of ground-equipment for both livestock and cropping operations and aerial application of crop protection products. Such interference might result in inconvenience, increased time and increased monetary costs to farming. The degree and extent of construction interactions will depend highly on timing of construction, with less interaction during the winter than during the spring, summer and fall. Construction activities may be a concern in terms of biosecurity of crop and livestock operations, and may result in interference with, or damage to, infrastructure. The following issues regarding conflicts with agricultural activities during construction were confirmed as being of importance to participants during PEP and KPI discussions:

INTERFERENCE WITH OR DAMAGE TO AGRICULTURAL INFRASTRUCTURE

Right-of-way preparation, including clearing for the Project, has the potential to effect agricultural buildings and structures (*e.g.,* grain bins, storage sheds, barns, and livestock corrals). Interactions will be limited to the ROW, and buildings and structures within the PDA will have to be removed or relocated. Six agricultural buildings are located within the Existing Corridor PDA, in the RVTC northeast of Deacon, Manitoba. There are no agricultural buildings within the New ROW PDA.

Construction activities might also interfere with up to 55 identified livestock operations located within the LAA (Table 15-14). These consist of hog, dairy, poultry, beef cattle, cow and calf, goats, equine and trout operations. Interference with livestock operations could be more severe for those where land application of liquid manure to agricultural fields involves the use of surface drag hoses or where there are other permanently installed infrastructure (*e.g.,* water-supply infrastructure). Such infrastructure can be disturbed or damaged by the establishment of a ROW or other construction activities (*e.g.,* tower foundation installation).

In the New ROW LAA, four operations use groundwater for livestock production. Construction activities might interfere with the infrastructure associated with these licensed water withdrawals, for example, if above ground watering systems (*e.g.*, pipes, watering station) are located within the PDA. If these situations occur, this minor infrastructure will likely have to be re-located.

If present in the PDA, tile drainage infrastructure can be damaged by construction activities through heavy equipment movement or during tower foundation installation and could affect the effectiveness of the system within the field unit within the LAA.

INCREASED BIOSECURITY RISK

Croplands

Soil transport is an important mechanism for the spread of weeds and soil-borne diseases from one field or region to another. Movement of equipment and workers along ROW in croplands provides a potential pathway for disease and weed transmission to previously non-affected soils, compromising biosecurity for affected lands. There is potential for soil to be transferred from field to field or from another region to the PDA during the construction phase as a result of construction equipment, other vehicles and people moving between fields.

The introduction of pests can have lasting adverse production value (reductions in yield) and production cost (increased input and management costs) effects. They can negatively affect yield, quality, value and sale of raw and processed commodities into domestic and international markets (Howard 2013). Diseases can spread quickly within and between fields by natural means (*e.g.,* wind, rain, water and soil erosion and insects) or human-related means through transport of infested seed, soil and crop residues.

In areas of clay soils, which comprise an appreciable portion of the LAA (77% of the Existing Corridor; 6% of the New ROW), typical procedures for reducing soil transport, and disease and weed transmission, include:

- scheduling activities when ground conditions are favourable
- pressure washing equipment to remove soil
- cleaning and disinfecting safety footwear
- record keeping for filled-out agricultural biosecurity checklists, vehicle and equipment cleaning records, and equipment cleaning inspection

Livestock Operations

Right-of-way clearance might reduce natural shelter for livestock, particularly on range and grassland, which cover large areas in the southeastern RMs of La Broquerie, Stuartburn and Piney. According to the Manitoba Beef Producers (German and Cousins, pers. Comm. 2015), this reduction in natural shelter can increase the potential for predation of livestock by wildlife, and increased interaction between livestock and wildlife can present a pathway for disease transmission to livestock from wildlife resulting in compromised livestock biosecurity. However,

such an effect would likely be short-lived since wildlife populations would likely decrease with reduced natural shelter. Further, generally there is already good access to areas of the livestock production and it is not anticipated that the Project will create much new access to livestock by wildlife. Manitoba Beef Producers' KPI participants indicated that ROW clearance near the U.S. border could increase potential for disease transmission to cattle by wildlife crossing the border (*e.g.*, bovine tuberculosis from elk; German and Cousins 2015, pers. comm.). However, no sign of elk was identified in the LAA during the wildlife assessment for this Project (Chapter 9). No elk in southeastern Manitoba or Minnesota have been found to have tuberculosis and this disease has not been found in deer in northwestern Minnesota since 2009. Anthrax is another disease of concern for cattle, which could be spread due to compromised biosecurity attributable to Project activities, particularly in the southeastern RMs of La Broquerie, Stuartburn and Piney because of the presence of large wildlife (German and Cousins 2015, pers. comm.). Anthrax is a disease that quickly kills cattle, sheep and other grazing livestock (Canadian Food Inspection Agency (CFIA) 2013). It appears regularly in Manitoba and it is important to vaccinate for the disease every year (MAFRD n.d.(d)). Anthrax is caused by the bacteria *Bacillus anthracis* (CFIA 2013). The bacteria form spores that are released into the environment and remain in the soil for decades. Conditions such as flooding, drought and recent digging can bring spores into close contact with grazing animals (MAFRD n.d.(d)).

The introduction or spread of diseases can be very devastating for livestock operations. This is especially the case for livestock operations with large numbers of animals contained in close proximity within common spaces (*e.g.,* cattle feedlots, intensive poultry and hog operations).

AERIAL APPLICATION OF CROP PROTECTION PRODUCTS

During the KPIs, MAAA reported an upward trend in the areas of land under aerial application within high-value crop production areas of the RAA (Alarie 2015, pers. comm.). Depending on the timing of construction, the Project might have no (where winter or fall construction occurs) or appreciable (where spring to summer construction occurs) interference with aerial spraying operations, particularly in the RMs of Macdonald, Ritchot, Tache and Springfield where aerial application is a relatively important for crop management activity. Aerial spraying is often the preferred application approach, especially as the crops mature and grow higher, and where yields would be reduced if the crop were driven on (Serecon Valuations Inc. 2010). Field access by ground might be impossible under very wet field conditions, particularly in areas of fine-textured soils, leaving aerial spraying as the only feasible application method for crop protection products. Ground application might also be disrupted by construction activities where the ROW traverses a field.

15.5.3.1.2 Operation and Maintenance

Effects associated with this phase of the Project are related primarily to Project presence. They include nuisance, inconvenience and increased production costs associated with farming around structures (*e.g.,* overlapping seed, fertilizer and pesticide application), farm management unit splits, interference with aerial spraying of crops, biosecurity concerns for livestock and croplands,

interference with infrastructure and specific operations, and restricted future expansion of agricultural operations.

INCREASED MANAGEMENT EFFORT

Farmers will face challenges related to nuisance, inconvenience and increased production costs associated with navigating around the tower structures (*e.g.,* around towers in field, and in between the Project ROW and other boundaries, including property boundaries) with farm equipment during various agricultural field operations. Previous studies have found that approximately 70% of the costs of structures to farmers were the result of the non-productive area or area lost for production around the tower (Gustafson *et al.* 1980 and Scott 1981 in Wisconsin DATCP 2009); the other 30% of the costs were the result of lost time, crop damage and increased input costs from double coverage (Scott 1981; Wisconsin DATCP 2009).

J. and V. Nielsen and Associates Ltd. (2011) summarized estimated costs associated with farming around obstacles; these costs were determined by Accutrak Systems Ltd. (1991) to be $21.76 around small or very small obstacles, and no more than $45.69 around larger obstacles (*e.g.,* a slough several acres in size)[1].

A summary of additional cost estimates as reported in Wisconsin DATCP (2009) for working around structures is as follows:

- Cost estimates of farming around structures in Montana, including pesticide and fertilizer application, planning, crop spraying, harvesting and post-harvest harrowing, based on 2007 prices were USD $13-16/structure for mono-poles at the edge of the field [$19-24 per structure in 2015 Cdn dollars], $40/structure for H-frames at the field edge [$60 per structure in 2015 Cdn dollars], $177/structure for H-frames in the field interior [$264 per structure in 2015 Cdn dollars], and $150/structure for mono-poles in the field interior [$223 per structure in 2015 Cdn dollars] (Hydro Solutions Inc. and Fehringer Agricultural Consulting Inc. 2007).
- Thornton (2007) found the cost for a field in spring wheat in 2007 for an H-frame at the field edge would be USD $14.99 [$22.35 per structure in 2015 Cdn dollars].
- A study conducted in Ontario in 1974-75 crop prices and considering yield losses for wheat, soybean, grain corn and silage corn, found costs to work around twin poles in a field to be in the order of $14-$18 per year [estimated to be $69-$88 per year in 2015 dollars] (Scott 1981).
- Average costs per structure in 1982 Canadian dollars were found to be approximately $50 for dryland grain production [$116 per structure in 2015 dollars], which was estimated to equate to a reduced market value of $2,500 per quarter section [$5,772 in 2015 dollars], considering loss in perpetuity from altered land use and considering 2.5 structures per quarter section (Thompson and Phillips 1983).

[1] Note: these figures were adjusted for inflation to 2015 dollars for this assessment.

While the information from previous studies presented above provides some contextual information to the additional costs of farming around transmission structures, the variability of tower types and spacing intervals preclude a direct comparison to the Project.

A study undertaken by PAMI (2015) estimated total lost crop production value by easement acre and total easement within a quarter section field based on different scenarios using transmission line configuration, crop and equipment width variables. Based on a straight line transmission line configuration paralleling a road (40 m from road edge), with self-supporting steel towers with base dimensions of 9 m × 9 m (with an applied 1 m safety buffer), a tower interval of 400 m, an easement width of 80 m, and equipment widths of 50 ft (seeder) and 100 ft (sprayer), the value of production loss for a wheat crop was estimated to be $16.06 per easement acre or $255.52 per quarter section easement. The breakdown of these costs were $15.87/ac for overlapping input (seed, fertilizer, pesticides, fuel, farm labour, machinery operating) costs and $0.19/ac for tower land use. This represents 8.3% of total lost value relative to total easement production costs and 0.83% of total lost value relative to total field production costs. Costs were found to be lower (*i.e.*, $10.05 per easement acre and $159.89 per quarter section easement) under this scenario when a 60 ft seeder and 120 ft sprayer were considered.

Extra management effort is required to work around structures and there are risks inherent with operating farm machinery in proximity to the structures. The presence of structures has to be considered when planning and executing field operations. Since the responsibility is on farmers and operators to avoid structures while operating wide equipment, working around structures requires more attention.

The growth of weeds around tower bases is a concern to agricultural producers. Because of the presence of towers, some areas may not be sprayed during typical field operations (*i.e.* immediately adjacent to and directly under tower footprint, areas between towers and other features that preclude a sprayer pass), and weeds may grow, allowing weed seeds to disperse into adjacent field areas and creating a nuisance for producers.

Farm management units, or field areas managed as a single management unit, may be split by the Project PDA. An example of where this may occur is if the PDA is not located along the edge of the field or along the half mile line for quarter section field management units, or if it is located along a half mile line and it dissects a half section field management unit. These situations may result in different management being required within a field that was previously managed as a single unit. In these situations, an example of effects on management could occur where only a portion of a field previously managed as one unit is available for aerial spraying, with the split area having to be sprayed with a ground rig. These situations would increase management effort and likely increase production costs. However, it is unknown if the Project will result in field management unit splits and it is anticipated that these situations would only occur in rare circumstances.

INTERFERENCE WITH AERIAL APPLICATION

As previously discussed, aerial application of pesticides is an important practice within the intensive annual-cropping RMs of Macdonald, Ritchot, Tache, and Springfield due to due to the difficulty of moving equipment through fine to very-fine textured and imperfectly to poorly drained soils, and the relatively high-value of crops grown.

Transmission towers and conductors can interfere with aerial application of crop protection products and operators must carry out their activities as required by the Canadian Aviation Regulations SOR/96-433 of the *Aeronautics Act*. If possible, alternative field management must be conducted within these areas. If ground spraying can occur in these areas, it can be conducted at additional cost (*i.e.,* equipment, time, custom applicator cost) and nuisance to the producer. In some cases, ground spraying may not be possible in these areas, for example due to unsuitable soil conditions during wet periods. In these cases, these areas will go unsprayed, resulting in increased pest pressures in these areas in the given and subsequent years, and associated production losses. In some cases, producers may have to consider alternative cropping in these areas (*e.g.,* field unit split or change in management of the quarter section field); however, this anticipated to be required only in rare circumstances.

Avoiding diagonal crossings in fields and keeping the line as straight as possible reduces Project effects on aerial application operations. Table 15-21 shows the anticipated occurrences of diagonal crossings of the Project transmission line in agricultural lands.

Table 15-21 Approximate Length of Diagonal Crossings in Agricultural Lands

Agricultural Land Use	Length of Diagonal Crossing (km)
Existing Corridor	
Annual Cropland	8.1
Perennial Cropland and Pasture	0.1
Range and Grassland	0.8
Total Length in the Existing Corridor	**9.0**
New Right-of-Way	
Annual Cropland	4.6
Perennial Cropland and Pasture	4.2
Range and Grassland	17.5
Total Length in the New Right-of-Way	**26.3**

Within the Existing Corridor, an approximate stretch of 9.0 km of the Project will traverse agricultural lands diagonally, with most of the diagonal crossing on annual croplands. A diagonal crossing (approximately 1.5 km) affects agricultural land where the Project crosses the Floodway. Such diagonal crossing of annual cropland is not anticipated to interact with aerial application because aerial application activities in this area are already restricted by the close proximity of the area to the City of Winnipeg and the presence of transmission lines in the shared existing transmission corridor.

Within the New ROW, an approximate stretch of 26.3 km will consist of diagonal crossings, which are found primarily on range and grassland (Table 15-21). Since the area traversed by the New ROW is characterized by small portions of Class 2 to 3 agricultural lands with mixed agricultural land use, interaction between Project presence and aerial application is not anticipated. There is a diagonal crossing placement of towers for approximately 4 km in the Pineland Hutterite Colony area in the RM of Piney. However, this placement was at the request of the landowner during the PEP and it occurs near the edge of fields. Similarly, a short diagonal crossing in NW 20-06-08E1 just south-east of La Broquerie was preferred by the landowner.

Consistent with learnings from previous projects, particularly the comparable Bipole III, and as discussed above, Manitoba Hydro considered diagonal crossings as an important aspect during the route planning and evaluation process for the Project and sought to reduce their occurrence as much as possible.

INCREASED BIOSECURITY RISK

Croplands

There is potential for soil to be transferred from field to field during the operation and maintenance phase of the Project when maintenance vehicles and people are moving between fields. Through these situations, pests can be introduced and spread in previously non-affected areas.

The introduction and spread of pests would largely be of concern during spring, summer and fall, which are associated with the growing season and cropping activities. However, because routine transmission line maintenance in agricultural areas is typically completed during winter periods (Chapter 22 – Environmental Protection, Follow-up and Monitoring) and under frozen soil conditions there is a low risk for biosecurity (Manitoba Hydro 2015a), and the potential for compromised biosecurity will be reduced.

Livestock Operations

For livestock operations, especially on pasture/grazing lands or free-range poultry operations, there is potential for the introduction of disease during maintenance and repair activities. This potential for biosecurity risk would be greater where transmission line maintenance intersect areas of multiple operations with different livestock types.

Pests and diseases have lasting adverse production value (reductions in yield and livestock health) and production cost (increased input and management costs) effects. The effect of compromised biosecurity would be greater in the case of livestock operations with large numbers of animals contained in close proximity within common spaces (*e.g.,* cattle feedlots, intensive poultry and hog operations).

INTERFERENCE WITH FARM INFRASTRUCTURE AND OPERATIONS

The presence of Project structures has the potential to interfere with farm infrastructure and farm operations for the lifetime of the Project.

The presence of Project structures will affect the use of equipment during field operations (*e.g.,* tillage, fertilizer application, seeding, ground application of crop protection and harvesting). Project structures will also create problems for turning field machinery and maintaining efficient fieldwork patterns (Public Service Commission of Wisconsin [PSCW] n.d.). As part of design mitigation, Manitoba Hydro chose to use self-supporting towers, which have a relatively smaller footprint in agricultural areas, to limit the effect on agricultural structures and operations and reduce inconvenience and increased cost to producers (Chapter 2 – Project Description).

Given the presence of up to 20 hog and dairy operations within the LAA that produce liquid manure waste that may be applied by draglines on surrounding fields, the presence of Project towers may interfere with manure spreading. The presence of Project structures could limit the area to which manure can be applied to, the direction of application, the maneuvering requirements and time and labour requirements. However, a study being undertaken by PAMI (2015) indicates that there would likely be no changes in dragline practices with straight-line transmission line configurations other than reduced footprints associated with the tower footprints. For diagonal transmission line configurations, two different starting points would be required as well as additional time and labour to maneuver around towers (PAMI 2015).

Interference with other farm infrastructure such as corrals, rotational grazing and access to gates may cause inconvenience to livestock producers managing and moving livestock. However, these situations are anticipated to be rare and effects may be reduced through tower spotting following discussions with landowners during easement negotiations.

A review of the Project did not indicate the presence of crop irrigation system-footprints. However, during PEP meetings at La Broquerie and Ste. Anne, four landowners indicated that they irrigated their lands for production of annual crops, hay and pasture. Locations of these operations and additional details (*e.g.,* type of irrigation, land area irrigated) were not provided through PEP. Based on absence of apparent irrigation footprints during imagery review, these irrigation operations are assumed to be relatively small and not using centre-pivot or lateral-move systems that would be most affected by the presence of the Project. As a result, interference of Project structures or maintenance activities with irrigation equipment and operations is not anticipated. The licensed water withdrawal projects within the LAA include a sod operation in the SLTC LAA, near PTH 75, and four livestock operations in the New ROW LAA, which use groundwater. The

presence of the Project could interfere with the infrastructure of these water supply systems and potential for changes in the distribution network.

TRANSMISSION LINE INTERFERENCE WITH GPS SIGNAL RECEPTION

Potential interference by transmission lines with the reception of global positioning satellite (GPS) signals that are used on farm tractors to monitor location and steer units is a concern expressed by some producers. Farmers increasingly rely on GPS receivers to provide guidance to field operations as well as supporting “auto-steer” functionality. In precision agriculture, farmers can apply inputs (*e.g.,* fertilizer, seed and pesticides) at variable rates in different parts of a field to reflect the variable soil and landscape properties within the field. As a result, precise calibration of field equipment according to in-field soil and landscape variability has the potential to enhance the economical application of inputs, optimizing returns from an individual field. Auto-steer functionality consists of GPS-guided equipment used during field operations, allowing operators to pay closer attention to monitors and equipment. Since precision agriculture requires continuous reception of GPS signals from satellites as well as reference stations on the ground in order to determine the precise location within the field, interference of the GPS or reference signals by external electromagnetic sources could theoretically affect the location precision of field operations (Wisconsin DATCP 2009). However, studies examining the use of high-precision GPS receivers under or near transmission facilities in stationary or mobile modes have shown that interference with the reception of GPS signals sufficient to affect accurate detection of location is non-existent to unlikely (Lachapelle *et al.*, 2011; Pollock and Wright 2011, Wisconsin DATCP 2009).

Unlike recreational GPS receivers, receivers used in farming and other high precision applications require error-correcting signals from differential GPS (DGPS) receivers on the ground. Real-time kinematic (RTK) technology is an example of a DGPS technology in common use today to determine locations of farm vehicles with high precision. Research has shown that there is potential for a DGPS receiver to be affected if all of the following conditions exist:

- the receiver is located close to an electrical facility
- the DGPS signals are being transmitted in the hundreds of kilohertz (kHz) frequency range
- interference produced by the transmission facility is in the same frequency range used by the DGPS receiver

In 2011, studies were conducted by researchers at the University of Calgary and by a team of land surveyors/geospatial engineers to analyze the performance of DGPS receivers with the capabilities typically used for precision farming under two Manitoba Hydro high voltage direct current power lines and an AC transmission line (Lachapelle *et al*., 2011; Pollock and Wright,

2011)[2]. Lachapelle *et al*. (2011) concluded that while minor effects on GPS reception could be detected, that, "[n]o power line effect on GNSS measurement was found to affect the quality of the navigation solutions. In addition, the test results showed normal operation of an RTK system and its radio link (450 MHz) for static and perpendicular test segments perpendicular to the power lines.". Lachapelle et al. (2011) also has noted that GPS receivers process signals at frequencies from satellites (1200-1600 GHz) and RTK systems (450 MHz). These frequencies are so much higher in frequency than electromagnetic interference from transmission lines, primarily < 1 MHz, that there should be no interference with satellite-based GPS systems. Both Lachapelle *et al*. (2011) and Pollock and Wright (2011) studies confirmed that GPS data collected by the receivers had not been compromised by physical or electrical interference from transmission lines.

Since real-time kinematic correction signals are transmitted from antennas that are typically only a few metres high, the Project towers are not expected to produce much blocking of the line of sight signals from these sources (Exponent 2013), which is consistent with the reports by Pollock and Wright (2011) and Lachapelle *et al*. (2011). If any line of sight effect on error-correcting signals from ground transmitters were to occur, repositioning of the real-time kinematic base station antenna should resolve any issues.(Exponent 2013).

CONCERNS OF LIVESTOCK OPERATORS REGARDING EMF, TINGLE VOLTAGE, AND CORONA NOISE

Dairy Farmers of Manitoba expressed concerns about stray voltage due to the close proximity of the New ROW to some dairy operations, particularly two dairy operations northeast and southeast of the community of La Broquerie in the RM of La Broquerie, which are about 70 m and 220 m away from the New ROW, respectively (Wiens 2015, pers. comm.). Since stray voltage can be caused by on-farm (*e.g.*, poor wiring in the farm's electrical system) or off-farm sources (*e.g.*, transmission lines), identification of the source can be difficult (Manitoba Hydro 2006). If required, Manitoba Hydro will conduct an investigation using controlled, standard test procedures to determine to what extent electrical distribution or other off-farm sources contribute to stray voltage levels (Manitoba Hydro 2006). If an abnormal contribution is found, Manitoba Hydro will take action to help reduce the level of voltage on the affected farm (Manitoba Hydro 2006).

Available literature reports EMF effects as being non-substantive and unlikely to occur during the operation and maintenance phase of the transmission line (Ganskopp *et al.* 1991; Burchard *et al.* 2006; Serecon Valuations Inc. 2010; Exponent Inc. 2011; Exponent 2015). Recent findings indicate:

"…the available research results to date do not suggest that magnetic or electric fields (or any other aspect of high-voltage transmission lines, such as audible noise) result in adverse effects

[2] Note, the frequency spectrums of corona-generated interference from high voltage direct current (DC) transmission lines and AC transmission lines are very similar, hence studies of both DC and AC transmission lines are relevant to the assessment of potential interference to DGPS receiver performance from AC transmission lines.

on the health, behavior, or productivity of fauna, including livestock such as dairy cows, sheep, pigs, and a variety of other species, including small mammals, deer, elk, birds, and bees. Studies were also conducted to evaluate whether EMF could affect crops or plants, but did not suggest any adverse effects on growth or viability." (Exponent 2015).

At the request of the government of Québec, Hydro-Québec funded researchers at McGill University to conduct a series of experiments to better understand the possible effects of EMF generated by transmission lines in rural areas on dairy cattle production (Exponent Inc. 2008). Overall, the researchers were cautious in their interpretation of the data from these experiments, stating that while biological responses were observed, no health hazards had been indicated (Exponent Inc. 2008). For example, Burchard *et al.* (2006) conducted an experiment to monitor dairy cows' thyroxine plasma concentrations as a means of determining the effects of EMF on dairy cows on pasture if standing continuously under a 735 kV AC power line. They found exposure of dairy cattle to EMF to influence the blood levels of thyroxine. However, they concluded that in light of worst-case scenario conditions, the variation in thyroxine levels did not represent a health hazard for dairy cows.

RESTRICTIONS FOR FUTURE EXPANSION OR CONSOLIDATION

The presence of the Project can impose land use restrictions for the lifetime of the Project, including limited capacity for future expansion of operations or future consolidation of farm fields. This will be a greater concern where Project structures are located in-field or where there are diagonal crossings (PSCW n.d.), and where these occur in close proximity to existing farm infrastructure.

Future expansion of farm buildings/operations (*e.g.,* livestock barn expansion, creation of new rotational paddocks, and increasing the area of high-value crops that need aerial application) near the transmission line might be hindered during the lifetime of the Project, to maintain separation distances between the associated structures or operations and the transmission line. During the PEP, landowners identified land parcels for which hobby farming could be taken up (SW36-08-07 E) or where future cattle production is planned (SE-10-05-08 E) within the New ROW LAA in the RM of La Broquerie. The presence of the Project also precludes full centre pivot development within quarter section fields traversed by the ROW.

15.5.3.2 Mitigation for Conflict with Agricultural Activities

Measures and strategies to mitigate potential for conflict with agricultural operations during construction and operation of the Project are described and discussed below. Standard industry practices and avoidance measures, along with Project-specific mitigation measures, will be implemented during construction and operation, as listed in Chapter 22 – Environmental Protection, Follow-up and Monitoring.

15.5.3.2.1 Interference with Farm Operations or Damage to Infrastructure

Mitigation for interference with farm operations or damage to infrastructure includes the following:

- Transmission line routing considered effects on existing agricultural buildings *(e.g.,* barns). In the alternative route evaluation model, proximity to buildings and structures was one of the criteria for route evaluation under the built environment perspective, which was concerned with limiting socio-economic effects (Chapter 5).
- The transmission line has been routed to parallel field boundaries (*e.g.,* edge of road rights of way, half-mile lines) and avoid/reduce diagonal crossings.
- Manitoba Hydro will pay compensation pursuant to the Landowner Compensation Program for damage to infrastructure/crops from construction or maintenance activities. Where possible, construction schedules will take into consideration the timing of agricultural activities.

Ancillary damage compensation could be provided for:

- damage to infrastructure, including that for hog manure application, irrigation and livestock watering;
- yield reduction due to limited access for aerial and ground application of crop protection products or other important field operations during construction activities; and
- Prior to construction, if producers indicate the presence of manure application draglines, irrigation networks and watering infrastructure, they will be considered when tower siting, where possible, to reduce local effects. Manitoba Hydro understands that even though overall Project effects will affect a small proportion of the RAA, local effects can have a large effect on individual operations, particularly where there are multiple transmission lines in one field (Photos 5 to 9, Appendix 15D).

15.5.3.2.2 Increased Biosecurity Risk

Biosecurity is a concern for croplands and livestock during construction and operation and maintenance phases of the Project. Manitoba Hydro understands the importance of upholding cropland biosecurity, and sought to reduce the potential interaction between the Project and croplands and livestock operations during route selection. Mitigation for increase biosecurity risk included the following during route selection:

- During transmission line routing, Manitoba Hydro considered the interaction between the Project and agricultural lands, to mitigate potential for increased biosecurity risk to livestock operations and croplands.
- Manitoba Hydro staff and contractors will follow and implement the Manitoba Hydro corporate policy on biosecurity and biosecurity SOP, respectively, during construction and operation and maintenance activities. Measures to be implemented in line with general considerations of the Transmission Line Business Unit biosecurity SOP (Manitoba Hydro 2015a) include:

  - completion of a risk assessment to identify the perceived risk to agricultural land from maintenance and construction activities using frequency of activities and consequence levels (field conditions; *e.g.*, wet or frozen);
  - if existing farm level biosecurity measures exist, Transmission staff and contractors will strive to meet the requirements of the agricultural operation when access is required;
  - regular maintenance activities (including patrols) on agricultural lands will typically be scheduled after crops have been harvested and conducted primarily after freeze-up; and
  - avoiding access through areas that may contain manure.
- Where construction or maintenance activities have the potential to interfere with field activities, discussions with the landowner or producers will be held to move livestock/equipment during those activities.
- Asking producers or landowners to avoid spreading manure or pasturing livestock in the transmission line ROW prior to construction. This is the most cost-effective method to prevent the spread of animal disease (PCSW n.d.).
- All equipment will arrive at the ROW or Project site clean and free of soil or vegetative debris (including weed seeds).
- Where construction or maintenance activities have the potential to interfere with field activities discussions with the landowner or producers will be held to move livestock/equipment during those activities.
- As per the Transmission Line Business Unit biosecurity SOP (Manitoba Hydro 2015a), in areas of high biosecurity risk, Manitoba Hydro staff or contractors will:
  - schedule activities to occur when ground conditions are more favourable, if possible;
  - make sure that proper care and attention is paid to cleaning equipment and footwear prior to leaving the site, if activities cannot be rescheduled;
  - fine clean equipment to remove remaining soil using pressure washing to rinse off remaining soil or manure. Such fine cleaning should be done at the field approach, preferably, but can be completed offsite. Vehicles must be cleaned before being taken to a different area. Use safety footwear that can be easily cleaned. Use a brush to remove visible soil or manure and disinfect footwear when leaving the field:
    - disinfectants such as 1% Virkon may be carried in a household spray bottle or a larger container if required
    - if washing footwear with disinfectant in the field, make sure wastewater is contained and appropriately disposed of offsite
  - fill out the Vehicle and Equipment Cleaning Record and submit with the Biosecurity Checklist.

15.5.3.2.3 Interference with Aerial Application of Crop Protection Products

Mitigation for interference with aerial application of crop protection products includes the following:

- Through design mitigation, Manitoba Hydro chose to route an appreciable portion of the Project within an existing corridor, which resulted in reduced effects of the Project on aerial application. The Project will share the SLTC with multiple transmission lines, including a portion of the SVTC project transmission line. Photos 5 to 9 (Appendix 15D) show the use of a shared corridor by multiple transmission lines.
- Compensation will be provided for yield reduction due to limited access for aerial and ground application of crop protection products during construction activities.
- Communication with landowners/producers regarding interruption of field operations (*e.g.*, aerial or ground spraying and manure application) will be conducted prior to construction and prior to maintenance activities.

15.5.3.2.4 Increased Need for Management Effort

Mitigation for increased need for management effort includes the following:

- Manitoba Hydro applied design mitigation to reduce Project effects on the increased need for management effort due to Project presence. Transmission lines were aligned in straight lines and diagonal crossing of agricultural lands was avoided, wherever feasible, as recommended by Manitoba CEC (2013).
- Construction will be timed to reduce overlap with growing season, or activities will be limited during the growing season to avoid damage to crops. Where this is not feasible, Manitoba Hydro will pay compensation pursuant to the Landowner Compensation Program.
- Construction damage compensation is offered to landowners who experience damage to their property due to the construction, operations and maintenance of the transmission line. It will be provided to compensate a landowner for damages such as the reapplication or rejuvenation of compacted top soil where the remedial work requires farm machinery and the expertise of the landowner.
- Structure Impact Compensation is a one-time payment to landowners for each transmission tower placed on land classed as agricultural. Structure Impact Compensation will cover:
    - reduced productivity in an area of overlap around each tower structure
    - additional time required to maneuver farm machinery around each structure
    - double application of seed, fertilizer and weed control in the area of overlap around each tower structure

- Ancillary damage compensation is a one-time payment when Manitoba Hydro's use of the right-of-way directly or indirectly affects the use of the property. It will be provided for:
  - agricultural effects such as irrigation and drainage
  - constraint effects such as restricted access to adjacent lands
  - traditional effects such as highest and best use of land

15.5.3.2.5 Concerns of Livestock Operations to EMF, Stray Voltage and Corona Noise

Despite multiple research studies' indicating no adverse health effects on livestock attributable to a transmission line's electrical and magnetic fields or corona noise, Manitoba Hydro has attempted to alleviate landowner and producer concerns by introducing the following mitigation to limit exposure of livestock to perceived EMF and tingle voltage (stray voltage) and corona noise:

- Through routing, Manitoba Hydro considered the interaction between the Project and livestock operations.
- Manitoba Hydro will work with dairy producers affected by the development to address concerns with respect to EMF and tingle voltage.

15.5.3.2.6 Restrictions for Future Expansion of Operations

Mitigation for restrictions to future expansion or consolidation of farm units includes the following:

- As part of design mitigation, routing was done to avoid buildings as much as practical.
- Corridor sharing for multiple transmission lines (Photos 5 to 9, Appendix 15D) reduces ROW requirements (PSCW n.d.). Manitoba Hydro routed an appreciable portion of the transmission line in the SLTC and RVTC, reducing the potential for restricted future expansion of agricultural operations or consolidation of land parcels.
- The transmission line has been routed to parallel field boundaries (*e.g.,* edge of road rights of way, half-mile lines) and avoid/reduce diagonal crossings. Such design mitigation reduces the potential for restricted future expansion of operations or consolidation of land parcels.

15.5.3.3 Characterization of Residual Environmental Effect for Conflict with Agricultural Activities

15.5.3.3.1 Construction

Following the application of mitigation, while the potential for conflict with agricultural activities remain, the magnitude of these effects and the extent over which they are experienced will be reduced. Additionally, communications with landowners prior to construction may result in additional site-specific mitigation further reducing the potential conflict with agricultural activities. Compensation will be provided according to the *Manitoba-Minnesota Transmission Project*

Landowner Compensation Information brochure to address the residual effects of potential conflict (*i.e.,* with agricultural activities and damages that may be caused during construction).

15.5.3.3.2 Operation and Maintenance

Following the application of mitigation, while the potential for conflict with agricultural activities remain, the magnitude of these effects and the extent over which they are experienced will be reduced. Additionally, communications with landowners prior to land access for operation and maintenance may result in reduced potential for conflict with agricultural activities. Compensation will be provided according to the *Manitoba-Minnesota Transmission Project Landowner Compensation Information* brochure to address the residual potential conflict during operation and maintenance.

15.5.3.4 Summary

The Project will result in conflict with agricultural activities. Compensation to individual landowners is an important mitigation that recognizes that while other mitigation measures will reduce effects on agricultural activities, adverse effects will not be eliminated and production activities and associated costs will be adversely affected. The Manitoba Hydro Landowner Compensation Program is designed to mitigate the effects that remain following the implementation of other mitigation measures. With the implementation of mitigation measures, including compensation, Project residual effects due to conflict with agricultural activities during construction and operation and maintenance are anticipated to be adverse and confined to the LAA. The LAA generally encompasses the typical quarter section field management unit within which conflicts resulting from the Project will be experienced (*e.g.*, pesticide application method used within a field). Residual effects due to conflict with agricultural activities are expected to occur during construction with effects lasting through the construction phase and beyond (*i.e.,* short to medium duration). Most effects caused during construction will be of short duration and conflict with agricultural activities will cease when construction activities are completed. However, if residual effects occur to biosecurity (*e.g.*, spread of invasive species), effects may last beyond the construction phase. The duration of residual effects during operation and maintenance as a result of interference with ground operations, aerial application, manure application or restricted operation expansion is considered permanent because the effects will last the lifetime of the Project. Effects are considered reversible because agricultural activities are not anticipated to be affected following decommissioning. Frequency is expected to be regular for residual effects associated with seasonal activities, such as aerial application; irregular for residual effects associated with manure application, livestock operation expansion and biosecurity; and continuous for residual effects associated with ground application and management effort. The socio-economic context for agriculture with respect to conflict with agricultural activities is anticipated to be moderate to high resilience since there is capacity for agriculture to accommodate change and return to pre-disturbance levels, particularly considering compensation mitigation.

15.5.4 Summary of Environmental Effects on Agriculture

Residual effects of the Project on agriculture are predicted to be adverse, of low to moderate magnitude, restricted to the PDA and LAA, variable in frequency, reversible, and to occur in a system that can accommodate change (Table 15-22).

Table 15-22 Summary of Residual Environmental Effects on Agriculture

Project Phase	Residual Environmental Effects Characterization						
	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Socio-economic Context
Loss or Degradation of Agricultural Land							
Construction	A	L-M	PDA	ST-MT	S-IR	R	HR
Operation and Maintenance	A	L	PDA	MT-P	S-IR	R	HR
Conflict with Agricultural Activities							
Construction	A	L-M	LAA	ST-MT	IR	R	MR-HR
Operation and Maintenance	A	L-M	LAA	MT-P	R-C	R	MR-HR

KEY

See Table 15-4 for detailed definitions

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

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

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

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

15.6 Assessment of Cumulative Environmental Effects on Agriculture

The Project residual effects in Section 15.5 describe the effects of the Project after implementation of mitigation measures and in the context of the current conditions on the landscape. This section identifies and assesses the cumulative effect of those residual effects likely to overlap in time and space with residual environmental effects of other projects and physical activities. This is followed by an analysis of the Project contribution to residual cumulative effects.

15.6.1 Identification of Project Residual Effects Likely to Interact Cumulatively

Residual Project effects on agriculture (*i.e.*, loss or degradation of agricultural land and/or conflict with agricultural activities) have the potential to act cumulatively with the effects from past, present and reasonably foreseeable future projects. These potential interactions are listed in Table 15-23. Where residual environmental effects from the Project act cumulatively with those from other projects and physical activities, a cumulative effects assessment is undertaken to determine their significance.

Since the 1800s, the RAA has undergone substantive development for agriculture, first with the development of river lots south of the City of Winnipeg (SLTC area) in the 1830s, followed by the development of other agricultural-based settlements from the mid-1850s on. Today, the area contains a broad range of agricultural land uses that contribute appreciably to the local and provincial economy. The development of the agricultural landscape has occurred in conjunction with other developments, such as the communities that served agricultural areas, highways and roads to access these communities and agricultural areas, and other supporting infrastructure required. Currently, approximately 52% of the RAA is under agricultural cropping, including annual cropping, hayland and pasture, while 2.5% is considered developed.

Past projects identified in Table 15-23, including residential and existing linear developments (*i.e.*, transmission lines, pipelines, roads, railways), have resulted in ongoing agricultural land loss through the conversion of land to these other land uses. As well, they have resulted in conflicts with agricultural activities necessitating changes in how some agricultural activities are conducted (*e.g.*, ground operations and aerial application of pesticides) and the efficiency of these operations. The Project's residual effects might act cumulatively with these past residential developments and linear developments within the RAA.

As described in the Project description (Chapter 2), transmission line construction within the SLTC will start in summer of 2017 and will be completed by spring of 2018. Construction within the RVTC and the New ROW will commence in spring of 2018 and be completed by winter of 2020. There might also be cumulative effects between the Project's residual effects and those of the following planned projects in the RAA:

- transmission projects, including Bipole III Transmission Project, St. Vital Transmission Project, Dorsey to Portage South Transmission Project, and Richer South Station to Spruce Station Transmission Project;
- Energy East Pipeline Project;
- residential development; and
- transportation projects, including the Headingly and St. Norbert Bypass projects.

Environmental effects identified in Table 15-23 as not likely to interact cumulatively with residual effects of other projects and physical activities (no check mark) are those that are not anticipated to have effects on agriculture or those with effects that don't overlap spatially or temporally with those from the Project.

The Northwest Winnipeg Natural Gas Pipeline Project and Natural Gas Upgrades are not anticipated to result in appreciable amounts of permanent loss of agricultural land. Conflicts with agricultural activities would occur primarily during construction, if construction occurs during the growing season. However, due to the small scale of these projects it is anticipated construction is likely to occur in a manner to avoid this conflict. These projects are not anticipated to have effects that overlap in time or space with the Project.

The Southend Water Pollution Control Centre Upgrade Project and MIT Capital Projects (Highway Renewal) are not expected to have effects that have spatial and temporal overlap with the Project's residual effects for loss or degradation of agricultural land or conflict with agricultural activities. These projects are not anticipated to result in additional permanent loss of agricultural land or changes in conflict with agricultural activities.

The Piney Airport Expansion is not expected to have effects that have spatial and temporal overlap with the Project's residual effects for loss or degradation of agricultural land or conflict with agricultural activities. This project does not pose conflict with agricultural activities. The extent and timing of the expansion is unknown but is unlikely to result in appreciable amounts of permanent land loss (based on the small size of the current airport and the likely future use). If there is a small land loss, it will not overlap spatially with the area where residual effects from the Project may occur (*i.e.,* the LAA).

Residual effects from the St. Norbert Bypass, Headingly Bypass and Oakbank Corridor are not expected to have spatial and temporal overlap with the Project's residual effects for conflict with agricultural activities. The residual effects of these other projects on conflict with agricultural activities are expected to be primarily associated with the construction phases of these projects and will be localized, and are not likely to overlap in time or space in a meaningful way with the effects of the Project.

Table 15-23 Potential Cumulative Environmental Effects on Agriculture

Other Projects and Physical Activities with Potential for Cumulative Environmental Effects	Potential Cumulative Environmental Effects	
	Loss or Degradation of Agricultural Land	Conflict with Agricultural Activities
Past and Present Physical Activities and Resource Use		
Agriculture (Conversion, Livestock Operations, Cropping and Land Drainage)	—	—
Residential Developments	✓	✓
Existing Linear Developments	✓	✓
Other Resource Activities (Forestry, Mining, Hunting, Trapping, Fishing)	—	—
Recreational Activities	—	—
Project-Related Physical Activities	✓	✓
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 environmental effects.

"–" = Interactions between the residual effects of other projects and those of the Project residual effects are not expected.

15.6.2 Cumulative Effects Assessment for Cumulative Loss or Degradation of Agricultural Land

15.6.2.1 Cumulative Effect Pathways for Loss or Degradation of Agricultural Land

Past projects identified as having potential cumulative effects with the effects of this Project include residential developments and existing linear infrastructure within the RAA. Numerous residential developments of varying sizes have been developed throughout the RAA, including residential subdivisions around the City of Winnipeg and in more rural locales, as well as numerous towns and villages, and individual rural residential developments scattered throughout. These developments have contributed to agricultural land loss throughout the RAA. Existing linear developments that include aboveground infrastructure that preclude all or portions of the development footprints to be returned to agricultural production following construction, such as transmission lines and highways, have also contributed to land losses in the RAA.

Besides the Project, three major transmission lines that will be built by Manitoba Hydro will traverse the Project RAA: Bipole III (construction planned for 2014-2018; in-service planned for 2018), St. Vital Transmission Complex (SVTC) projects (construction planned 2016-2017; in-service planned for 2017) and Dorsey to Portage South Transmission Project (construction planned 2018-2019; in-service planned for 2019) (Map Series 7-300 – Reasonably Foreseeable Future Physical Activities). Bipole III will traverse the RMs of Macdonald, Ritchot, Tache, Ste. Anne and Springfield and will parallel the Project as it exits the Riel Converter Station. It will traverse approximately 105 km of the RAA, in areas of predominantly agricultural land use. The SVTC project will traverse the RMs of Macdonald, Ritchot, and Tache. It will share the SLTC with the Project after it exits La Verendrye Station and then traverse through the south of the City of Winnipeg, crossing the Floodway east of Provincial Trunk Highway 59. The St. Vital to Letellier portion of the project will traverse the Floodway east of Provincial Trunk Highway 59 and will traverse the RAA west of Ile des Chenes prior to exiting the RAA east of Niverville. SVTC will traverse approximately 59 km of the RAA, in areas of predominantly agricultural land use. The Dorsey to Portage South Transmission Project exits Dorsey Converter Station and extends west towards Portage la Prairie; it traverses the RAA for only a short distance (< 10 km). Another potential future transmission line within the RAA is the Richer South Station to Spruce Station Transmission Project (construction planned for 2016–2019), which will have a transmission line originating from Richer South Station and terminating at a proposed pipeline pump station to be located east of the intersection of the existing TransCanada Pipeline (TransCanada) ROW and the Riel-Forbes 500 kV transmission line. The route for this project is unknown; however, it is expected to traverse very little agricultural land because land use between the Richer South Station and the area of the termination point is predominantly developed land (*i.e.*, Town of Richer) and native vegetation and wetlands. Cumulative effects arising from these future transmission projects will have similar effects mechanisms as effects arising from the Project,

including temporary and permanent losses of land for agricultural crop production and soil degradation that may result in reduced land capability and productivity.

TransCanada's proposed Energy East Pipeline Project (construction planned for 2016–2018, in-service planned for 2018) will involve gas pipeline conversion to oil transport and compressor station additions at select locations. This project is anticipated to act cumulatively with the Project as it traverses a portion of the RAA (RMs of Macdonald, Ritchot, Tache, and Ste. Anne). An addition to the compressor station in the vicinity of Ile des Chenes in the RM of Ritchot will be required for the project, and will have a new footprint of approximately 9 ha. Temporary land losses during project construction at specific facilities are anticipated; however, permanent land losses are not anticipated to be substantive because the line is largely conversion of an existing line and land use is not anticipated to change substantively following project completion.

The Headingley Bypass Project and St. Norbert Bypass Project are planned road projects that will traverse the Project immediately north of TransCanada Highway East and north of intersection of SLTC by PTH 75, respectively. The expansion of the Headingley and St. Norbert bypasses will occur within an area of agricultural land use and as a result, these projects are likely to contribute towards reduction of available agricultural land. Similarly, the Oakbank Corridor is anticipated to result in the loss of agricultural land. Each of these transportation projects are anticipated to affect less than 10 km (or less than 30 km when the three projects are considered in aggregate) of agricultural land within the RAA. The agricultural land loss associated with these projects are considered to be permanent in nature and may be in the order of approximately 450 ha on the assumption that ROW widths will be 150 m.

Plans for residential development in the RAA include additional housing in the Oak Bluff area (Oak Bluff West), southwest of the City of Winnipeg and east of the SLTC, and in Sage Creek within the City of Winnipeg north of the south Perimeter Highway in the South St. Boniface area of the city (Qualico Communities 2015). In addition to these developments, there are numerous other existing residential subdivisions across the landscape, as well as several active (or pending) residential subdivision applications across the RAA, particularly in the RMs of Headingley, Macdonald, Ritchot, Springfield, Tache, Ste. Anne and La Broquerie.

15.6.2.2 Mitigation for Cumulative Effects for Loss or Degradation of Agricultural Land

Implementation of the mitigation measures described in Section 15.5 will reduce the effects on agriculture from the Project and the Project's contribution to cumulative effects on agriculture.

Additional mitigation measures proposed to reduce the cumulative environmental effects on loss or degradation of agricultural land include the following:

- For Manitoba Hydro projects occurring in the same geographic area, Manitoba Hydro will consider agricultural land use as important route selection criteria.
- Manitoba Hydro will continue to evaluate design mitigation, including tower types, tower spacing, and tower placement to reduce agricultural land loss as much as feasible.

- Manitoba Hydro will continue to engage the agricultural community and stakeholders in project planning and identification of issues of concern, route selection, and the identification of mitigation measures.
- Manitoba Hydro will continue to support studies to understand the effects of its projects on agricultural land use and use study outcomes to reduce effects of future projects on conflict with agricultural activities. For example, Manitoba Hydro engaged Prairie Research Associates and PAMI to further evaluate the effects of transmission projects on agriculture in southern Manitoba for which results are expected close to the time of filing of this EIS.

15.6.2.3 Residual Cumulative Effects for Loss or Degradation of Agricultural Land

A portion of land capable of supporting agriculture in the RAA has already been disturbed due to residential development and industrial development (previous linear projects). However, the RAA remains predominantly under agricultural land use. Approximately 445,249 ha (53%) of the RAA is occupied by land under agricultural land use, while 2.5% is considered developed. Based on residual characterizations defined in Table 15-24, existing non-agricultural land uses have collectively had a low magnitude effect on loss or degradation of agricultural land in the RAA, as there has been a measurable loss or degradation but production has continued at or near pre-disturbance levels. This development has reduced agricultural land use area or degraded the quality of agricultural land since agricultural conversion within the RAA while not impairing the capacity of agriculture to continue in the RAA at or near pre-disturbance levels.

The future projects proposed within the RAA will result in additional permanent losses of agricultural land. The proposed transmission projects, including Bipole III, SVTC, Dorsey to Portage South Transmission Project, and Richer South Station to Spruce Station Transmission Project, the Energy East Pipeline Project, residential development; and transportation projects, including the Headingly and St. Norbert bypasses and the Oakbank Corridor, have the potential to interact cumulatively with the Project because their plans include permanent structures located in areas currently under agricultural land use. The effects of these projects are anticipated to act cumulatively with Project residual effects primarily through permanent land loss. It is anticipated that the proposed transmission projects will result in more agricultural land loss than the Project as they will collectively traverse in the order of 170 km of agricultural land within the RAA while the Project will traverse approximately 115 km of agricultural land. The permanent agricultural land loss from the Project is estimated to be less than 12 ha. Proportionally and based on land loss assumptions similar to the Project, the permanent land loss of the three future transmission projects would be anticipated to be less than 20 ha.

The Headingley Bypass Project, St. Norbert Bypass Project and Oakbank Corridor are anticipated to result in relatively more permanent land loss than the Project and may represent a loss of agricultural land in the order of 450 ha.

The amount of agricultural land loss anticipated from ongoing residential development is unknown. However, residential development, including subdivisions and other residential development, will continue to result in measurable levels of agricultural land losses.

With the addition of Project effects and those of other projects, cumulative effects on loss of agricultural land are anticipated to be low in magnitude. While the Project will result in land loss that is considered permanent, it will be reversible upon the decommissioning of the Project at some future date. The Project's contribution to land loss will be small relative to losses from other past and future projects and is not expected to measurably affect the capacity for agriculture in the RAA. The combined cumulative environmental effect will be measurable but is not anticipated to result in an impairment to the capacity of agriculture in the RAA and agriculture is anticipated to continue at or near pre-disturbance levels. Based on the estimated extents, less than 500 ha of agricultural land within the RAA will be lost to future planned projects, including the Project. This loss of agricultural land would be less than 0.2% of the 445,249 ha of agricultural land in the RAA.

15.6.3 Cumulative Effects Assessment for Conflict with Agricultural Activities

15.6.3.1 Cumulative Effect Pathways for Conflict with Agricultural Activities

Past, present and future projects in the RAA (Table 15-23) have the potential to interact cumulatively with the Project if their plans include the development of facilities in areas under agriculture. Cumulative effects arising from future activities have similar effects mechanisms as effects arising from the Project, including conflict with crop production operations, conflict with livestock operations, additional management effort requirements and reduced opportunity for expansion of existing operations in close proximity to projects.

Four major proposed transmission lines will traverse the Project RAA: Bipole III, SVTC, Dorsey to Portage South Transmission Project and Richer South Station to Spruce Station Transmission Project (Map Series 7-300 – Reasonably Foreseeable Future Physical Activities). These projects will have similar effects mechanisms as effects arising from the Project because their plans include building permanent structures in areas of agricultural land use.

Other future projects anticipated to act cumulatively with the Project's effects on conflict with agricultural activities include the Energy East Pipeline Project and residential development. The former project will create conflict with agricultural activities, however will have fewer associated structures. However, pipeline projects are more intrusive in the soil environment and large scale soil excavations create more opportunity for crop biosecurity concerns through the spread of soil-borne diseases and weed seeds.

Residential development will continue to create conflict with agriculture within the RAA, from the physical presence of residential buildings as well as through other conflict that is common where agricultural and residential land uses occur adjacent to one another.

15.6.3.2 Mitigation for Cumulative Effects for Conflict with Agricultural Activities

Implementation of the mitigation measures described in Section 15.5 will reduce the effects on agriculture from the Project and the Project's contribution to cumulative effects on agriculture.

Additional mitigation measures proposed to reduce the cumulative environmental effects on conflict with agricultural activities include the following:

- For Manitoba Hydro projects occurring in the same geographic area, consider agricultural land use as important route selection criteria.
- Manitoba Hydro will continue to evaluate design mitigation, including tower types, tower spacing, and tower placement to reduce conflict with agricultural activities.
- Manitoba Hydro will continue to engage the agricultural community and stakeholders in project planning and identification of issues of concern, route selection, and the identification of mitigation measures.
- Manitoba Hydro will continue to support studies to understand the effects of its projects on agricultural land use and use study outcomes to reduce effects of future projects on conflict with agricultural activities. For example:
    - Manitoba Hydro has engaged Prairie Research Associates and PAMI (PAMI 2015) to further evaluate the effects of transmission projects on agriculture in southern Manitoba for which results are expected close to the time of filing of this EIS.
    - Manitoba Hydro is funding pest surveillance activities (Pest Surveillance Initiative) on clubroot in the agricultural areas of Bipole III.

15.6.3.3 Residual Cumulative Effects for Conflict with Agricultural Activities

Portions of the land in the RAA have already been disturbed due to industrial and residential development; however, the RAA remains predominantly under agricultural land use. Based on residual characterizations defined in Table 15-24 existing land use activities have had a moderate magnitude effect on conflict with agricultural activities, as they have resulted in interference/nuisance with agricultural activities in the RAA since agricultural conversion of land use there.

The future projects proposed within the RAA (Table 15-23) will result in additional conflict with agricultural activities. Bipole III, SVTC, Dorsey to Portage South Transmission Project and Richer South Station to Spruce Station Transmission Project, Energy East Pipeline Project and proposed residential developments have the potential to interact cumulatively with the Project because their plans include permanent structures located in areas of agricultural land use. The effects of these projects could act cumulatively with Project residual effects through conflicts of similar nature as they are anticipated to overlap in time and space. For example, where transmission lines will be located in close proximity to one another or intersect, the cumulative conflict with aerial

application activities may preclude fields or assemblages of fields from receiving pesticide application via these means.

The proposed transmission projects would be expected to have effects of similar magnitude to and will be additive with those from the Project, although the other projects are anticipated to traverse a greater length within the RAA. While the effects pathways associated with the Energy East Pipeline Project will be somewhat different then the Project, the magnitude of conflict with agricultural activities are anticipated to be similar.

With the addition of Project effects and those of other projects, cumulative effects on conflict with agricultural activities will be moderate in magnitude, and will not result in an impairment of the capacity of agriculture in the RAA and production is anticipated to continue at near pre-disturbance levels. It is anticipated that much of the Project's contribution to this cumulative effect will be permanent, but reversible upon the decommissioning of the Project at some future date. Agriculture is considered to have a moderate capacity to accommodate or recover from changes anticipated from the cumulative effects of past, current and reasonably foreseeable future projects. While these projects will act cumulatively and increase the level of conflict with agricultural activities, agricultural production is anticipated to return and continue near pre-disturbance levels. The Project's contribution to cumulative environmental effects is not expected to measurably affect the capacity for agriculture within the RAA.

15.6.4 Summary of Cumulative Effects

Table 15-24 summarizes cumulative environmental effects on agriculture.

Table 15-24 Summary of Cumulative Environmental Effects on Agriculture

Cumulative Effect	Residual Cumulative Environmental Effects Characterization						
	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Socio-economic Context
Cumulative Effect on Loss or Degradation of Agricultural Land							
Cumulative environmental effect with the Project	A	L	RAA	P	IR	R	HR
Contribution from the Project to the overall cumulative environmental effect	The Project will result in temporary and permanent land losses for agricultural land uses throughout the life of the Project. Permanent land losses will be limited in extent to a small portion of the PDA.						
Cumulative Effect on Conflict with Agricultural Activities							
Cumulative environmental effect with the Project	A	M	RAA	P	C	R	MR
Contribution from the Project to the cumulative environmental effect	The Project will result in conflict with agricultural activities throughout the life of the Project. These effects will be limited in extent to the PDA for some types of conflicts (*e.g.*, ground operations for seeding, harvesting, pesticide application) and to the LAA for others (*e.g.*, aerial application of pesticides, drag hose manure application).						

KEY

See Table 15-4 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

15.7 Determination of Significance

15.7.1 Significance of Environmental Effects from the Project

The area of land that will be removed from agriculture will be a small proportion of the total land available for agriculture in both the LAA and RAA. While temporary losses during the construction period are assumed to consist of the entire PDA, these losses are anticipated to affect landowners for no more than one growing season in the area of the SLTC and no more than two growing seasons in the area of the RVTC and the New ROW. The presence of Project tower structures along the transmission line and the expansion of the Glenboro South Station footprint will result in the removal of land from agricultural use for the lifetime of the Project. The area of these losses will be limited to Project structure footprints and will represent a very small proportion of the LAA and a negligible proportion of the RAA.

The Project will result in conflict with agricultural activities within the LAA during the construction and the operation and maintenance phases of the Project. These will include conflicts with crop production operations (*e.g.*, ground operations, aerial application, biosecurity) and livestock operations (*e.g.*, manure application, access, biosecurity), and will result in the removal of a limited number of agricultural buildings and possible interference with expansion opportunities for a limited number of operations. These conflicts will result in increased costs, inconvenience, nuisance and need for management effort by landowners.

The Project is not anticipated to result in a loss of agricultural land or degradation of soil quality such that existing agricultural production cannot continue at current levels for extended periods of time (beyond the construction phase) or cannot be adequately compensated. Mitigation, including design to reduce the extent of agricultural land loss (*i.e.*, routing, tower type), discussions with landowners regarding tower spotting, consideration of construction timing in agricultural areas to avoid agricultural activities and limit compaction, and soil rehabilitation following construction activities, will reduce Project effects of land loss and degradation of soil quality. Compensation will be provided to landowners because the other mitigation measures will not eliminate residual adverse effects of the Project. The threshold for a significant effect on land loss or degradation of soil quality is not anticipated to be exceeded as a result of the Project.

The Project is not anticipated to result in interference with or disruption that restricts agricultural operations and activities such that existing agricultural operations and activities cannot continue at current levels for extended periods (beyond construction phase) or cannot be adequately compensated. Mitigation, including routing of the transmission line to avoid agricultural buildings as much as practical, paralleling field boundaries and considering interactions with livestock operations, routing within an existing transmission corridor for an appreciable portion of the transmission line, implementation of Manitoba Hydro's Agricultural Biosecurity SOP, and holding discussions with landowners about potential Project interference with field activities, will reduce conflicts between Project effects and agricultural activities. Compensation will be provided to

landowners because the other mitigation measures will not eliminate residual adverse effects from the Project. The threshold for a significant effect interference with or disruption of agricultural operations and activities is not anticipated to be exceeded as a result of the Project. With the implementation of mitigation and environmental protection measures, and compensation, residual environmental effects on agriculture are anticipated to be not significant.

15.7.2 Significance of Cumulative Environmental Effects

The existing landbase in the RAA has been modified through agricultural conversion and, to a lesser extent, industrial and residential development over more than the past 200 years. Cumulative effects on agriculture are compared to existing conditions. The cumulative effects on loss or degradation of agricultural land and conflicts with agricultural activities are not anticipated to occur at levels that widely disrupt or restrict agricultural operations such that existing agricultural production cannot continue within the RAA at current levels for extended periods. The cumulative effects on agriculture are assessed as not significant.

15.7.3 Project Contribution to Cumulative Environmental Effects

It is anticipated that much of the Project's contribution to the cumulative effects, including permanent land loss and conflict with agricultural activities, will be permanent in duration and will reversible upon the completion of construction. The effects of permanent land loss will occur only at the tower and station footprints and will represent a very small proportion of the LAA and RAA. The permanent agricultural land loss from the Project is estimated to be less than 12 ha. Therefore, the Project's contribution to cumulative effects is not expected to measurably affect the land available for agricultural land use and agricultural activities in the RAA. The Project is not anticipated to impair the capacity of agriculture within the RAA.

15.7.4 Sensitivity of Prediction to Future Climate Change

According to the climate change scenarios presented in the Manitoba-Minnesota Transmission Project Historic and Future Climate Study (Manitoba Hydro 2015b), growing season (May to September) temperature and precipitation are expected to increase in the future. Predicted monthly mean temperatures for the growing season are projected to increase by 1.3°C, 2.5°C and 3.5°C in the 2020s, 2050s and 2080s, respectively. Predicted total growing season precipitation amounts are projected to increase by 2.5%, 1.5% and 2.8% in the 2020s, 2050s and 2080s, respectively. However, precipitation amounts are projected to be lower in July based on the 2050s and 2080s scenarios, and lower in August based on the three scenarios.

While additional precipitation is anticipated when the growing season is considered, decreases in precipitation coupled with higher temperatures in July and August would be expected to result in increased water deficits for crops in these summer months. Considering the crops currently grown in the Project area and the moisture limitations due to current environmental conditions, it follows that conditions would become more limiting for those crop types and varieties that are currently grown. Given the timelines associated with the predicted precipitation and temperature changes, crop type or variety selection and new variety options (*i.e.*, continued advances in breeding and genetics) will likely be able to overcome these challenges. Crop irrigation may be an option for managing increased water deficits; however, it is uncertain whether irrigation water sources would be available to provide large-scale irrigation development in the RAA. While the Project may reduce the amount of land available for quarter section irrigation units (*e.g.*, centre-pivots) within the RAA, the area of reduction is negligible relative to the land available in the RAA. Therefore, while the Project may affect the ability of individuals to develop full field irrigation in quarter sections traversed by the Project ROW, it is highly unlikely that the Project would preclude future irrigation development in the RAA to a measurable degree.

The predicted climate change scenarios would not change the significance determinations for agriculture because they are not anticipated to measurably increase the magnitude of Project effects on land loss, degradation of soil quality or conflict with agricultural activities.

15.8 Prediction Confidence

The prediction confidence is based on the information compiled during desktop-based data compilation, data analyses and understanding Project activities, location, and schedule as well as information gathered from KPIs and other public engagement. Windshield surveys were conducted to provide additional information on the buildings inventory. There is a moderate to high degree of confidence in assessment predictions. While some of the available desktop data are limited in scale (*e.g.,* soil resource inventory to support compaction risk evaluation), reliability (*e.g.,* AAFC crop inventory data are based on remote sensing and are not field-validated), and completeness (*e.g.,* agricultural operation type and location information was not provided by all industry association groups), the environmental effects mechanisms are well understood.

15.9 Follow-up and Monitoring

Environmental inspectors will conduct monitoring during transmission line construction and station modification or expansion. Inspectors will monitor activities for compliance with regulatory commitments and mitigation measures as outlined in the Environmental Monitoring Plan (Chapter 22 – Environmental Protection, Follow-up and Monitoring). Select construction activities conducted during certain periods (*e.g.,* during wet soil conditions in soils that are at high risk to compaction) may be monitored by resource specialists (*e.g.,* soil scientists, Professional Agrologists).

The objectives of the monitoring plan are to:

- confirm the nature and magnitude of predicted environmental effects;
- evaluate the success of mitigation implemented;
- identify unexpected environmental effects of the Project, if they occur, and identify mitigation measures to address unexpected environmental effects, where required;
- confirm compliance with regulatory requirements, including approval terms and conditions; and
- provide baseline information to evaluate long-term changes or trends.

The monitoring plan evaluates land rehabilitation success against baseline and adjacent representative site conditions, recommends corrective actions, and allows for adaptive management where deficiencies are identified. This monitoring will occur as part of the post-construction monitoring and include monitoring the success of site-specific mitigation measures or other specific requirements that may be identified through the assessment process and reporting.

Specifically, rehabilitation success will be confirmed as follows:

- Post-construction inspection will confirm that agricultural fields are left in an acceptable condition and are free of visual evidence of compaction and rutting.
- Manitoba Hydro anticipates crop performance monitoring on agricultural land as part of post-construction monitoring to evaluate and confirm reclamation success. The primary mechanism of land degradation for the Project is soil compaction during construction, and to a lesser degree, during operation and maintenance. Soil compaction can result in loss of soil structure and tilth, effects manifested in reduced crop growth and productivity. Crop performance within the portions of the ROW returned to agricultural production may be compared to areas of similar capability outside of the ROW, or relative to previous years' productivity (*e.g.,* through historic yield records or remotely sensed crop data). Such monitoring will focus on areas identified as having a high risk for soil compaction.
- Landowners will confirm the success of any tile drainage system reclamation conducted, should fields with tile drainage be encountered during construction.
- The Erosion Protection and Sediment Control Plan will describe evaluation mechanisms pertaining to soil erosion (Chapter 22).

Additional follow-up and monitoring may be warranted occasionally on a site-specific basis if issues related to crop performance or biosecurity (*e.g.,* weed spread) arise within the ROW. Due to the site-specific nature of these issues, the follow-up and monitoring program needs to be developed following identification of the issue and tailored to the specific issue.

15.10 Summary

Agriculture is an important industry within the Project area, and it makes substantive contributions to the local and provincial economies. Agriculture was selected as a VC because unmitigated effects from Project activities during construction and the presence of the Project could reduce the amount of land available for agriculture, degrade the quality of land used to support agriculture, and cause conflict or interfere with agricultural activities.

The Project RAA is largely under annual crop production with smaller areas under perennial cropland and pasture. The agricultural areas within the Existing Corridor LAA are primarily under relatively high-value annual crop production while agricultural production within the New ROW LAA is best characterized as mixed farming with various combinations of annual cropping, perennial cropping and livestock production. Livestock operations (*e.g.,* hog, dairy, cattle, chicken and broiler-breeder and egg farms) are found throughout the RAA. There are 55 livestock operations within the LAA. The RM of La Broquerie contains the highest number of livestock operations within the LAA, including hog, dairy, cattle and equine operations.

During the PEP, participants raised a number of key issues and concerns pertaining to agriculture. The following issues and concerns were raised:

- temporary and permanent loss of agricultural land;
- degradation of agricultural land;
- compensation for loss of land or affected activities/operations;
- potential effects on farm infrastructure, equipment operation and manure application;
- interference of towers and conductors with aerial spray application;
- proximity to, and interaction with, aerial applicator airstrips;
- potential effects on livestock (*e.g.,* stray/tingle voltage on dairy cattle) and animal health due to compromised biosecurity and increased risk of disease transmission; and
- potential biosecurity issues for crops (*e.g.,* potential for noxious weed spread/growth).

The following effects were selected for the assessment of agriculture:

- temporary and permanent loss of agricultural land;
- degradation of agricultural land; and
- conflict with agricultural activities.

The area of land that will be permanently removed from agriculture will be a small proportion of the total land available for agriculture in both the LAA and RAA (*i.e.,* <1% for both). While temporary losses during the construction period are assumed to consist of the entire ROW, these losses are anticipated to affect landowners for a single growing season. The presence of Project tower structures within the ROW and the expansion of the Glenboro South Station footprint will result in the removal of land from agricultural use for the lifetime of the Project. The area of these losses will be limited to Project structure footprints and the small Glenboro South Station footprint

expansion, and will represent a very small proportion of the LAA and a negligible proportion of the RAA. However, it is understood that permanent land loss at an individual operation level will be of relative importance to individual landowners than consideration of these losses at a broader, regional scale (*i.e.*, agricultural industry within the RAA).

The Project will result in conflict with agricultural activities within the LAA during construction and operation and maintenance phases of the Project. This will include conflict with crop production operations (*e.g.*, ground operations, aerial application, biosecurity) and livestock operations (*e.g.*, manure application, access to livestock facilities, biosecurity), and will result in the removal of a limited number of agricultural buildings and possible interference with expansion opportunities for a limited number of operations. Such conflicts will result in increased costs, inconvenience, nuisance and need for management effort by landowners. Loss or degradation of agricultural land and interference/disruption of agricultural activities are not anticipated to occur at levels that restrict agricultural operations such that existing agricultural production cannot continue within the area traversed by the Project at current levels for extended periods (beyond construction). In addition to design mitigation, the mitigation measures that will be implemented to reduce effects on agriculture include:

- rehabilitation of areas of temporary soil disturbance;
- additional discussions with landowners regarding avoidance of specific features (*e.g.*, manure application drag hose infrastructure, irrigation infrastructure, and tile drainage systems), including tower spotting preferences;
- ongoing consideration will be given by Manitoba Hydro to limiting construction in agricultural areas during the growing season to reduce interference with agricultural operations; and
- compensation to adequately compensate producers for disruption and land loss.

With the implementation of mitigation measures, including compensation, the residual environmental effects on agriculture are assessed as not significant.

The existing landbase in the Project RAA has been modified through agricultural conversion and, to a lesser extent, industrial and residential development over more than the past 200 years. Compared to the present status, the cumulative effects on loss or degradation of agricultural land and conflict with agricultural activities are not anticipated to occur at levels that will widely disrupt or restrict agricultural operations such that existing agricultural production cannot continue within the RAA at current levels for extended periods. As a result, the cumulative effects on agriculture are assessed as not significant.

15.11 References

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Appendix 15A
Plant Species Listed under the Declaration of Noxious Weeds in Manitoba

15A Plant Species Listed under the Declaration of Noxious Weeds in Manitoba

Common Name	ITIS Accepted Scientific Name
Absinth	*Artemisia absinthium*
Baby's Breath	*Gypsophila paniculata*
Barberry, all deciduous varieties	*Berberis vulgaris*
Bartsia, red	*Odontites serotina*
Beggarticks, devil's	*Bidens frondosa*
Bindweed, field	*Convolvulus arvensis*
Bluebur	*Lappula echinata*
Buckthorn, common	*Rhamnus cathartica*
Buckthorn, alder	*Rhamnus frangula*
Buckwheat, tartary	*Fagopyrum tataricum*
Buckwheat, wild	*Polygonum convolvulus*
Bugloss, viper's	*Echium vulgare*
Burdock, great	*Arctium lappa*
Burdock, common	*Arctium minus*
Burdock, woolly	*Arctium tomentosum*
Camas, death	*Zygadenus gramineus*
Campion, bladder	*Silene cucubalus*
Campion, biennial	*Silene cserei*
Catchfly, night-flowering	*Silene noctiflora*
Chamomile, scentless	*Matricaria maritima var. agrestis*
Chickweed, common	*Stellaria media*
Chickweed, field	*Cerastium arvense*
Chickweed, long-stalked	*Cerastium nutans*
Chickweed, mouse-eared	*Cerastium vulgatum*
Cleavers	*Galium aparine*
Cockle, cow	*Saponaria vaccaria*
Cockle, white	*Lychnis alba*

Common Name	ITIS Accepted Scientific Name
Cocklebur	*Xanthium strumarium*
Daisy, ox-eye	*Chrysanthemum leucanthemum*
Dandelion	*Taraxacum officinale*
Darnel, Persian	*Lolium persicum*
Dodder, species	*Cuscuta spp.*
Dogbane, spreading	*Apocynum androsaemifolium*
Dragonhead, American	*Dracocephalum parviflorum*
Flixweed	*Descurainia sophia*
Foxtail, green	*Setaria viridis*
Foxtail, yellow	*Setaria glauca*
Foxtail barley	*Hordeum jubatum*
Goat's beard, meadow	*Tragopogon pratensis*
Grass, barnyard	*Echinochloa crusgalli*
Grass, downy brome	*Bromus tectorum*
Groundsel, common	*Senecio vulgaris*
Gumweed	*Grindelia squarrosa*
Henbit	*Lamium amplexicaule*
Hawk's Beard, narrow-leaved	*Crepis tectorum*
Hemp-nettle	*Galeopsis tetrahit*
Jimsonweed	*Datura stramonium*
Knapweed, diffuse	*Centaurea diffusa*
Knapweed, Russian	*Centaurea repens*
Knapweed, spotted	*Centaurea maculosa*
Kochia (summer cypress)	*Kochia scoparia*
Lady's-thumb	*Polygonum persicaria*
Lamb's-quarters	*Chenopodium album*
Lettuce, blue	*Lactuca pulchella*
Lettuce, prickly	*Lactuca serriola*
Locoweed, early yellow	*Oxytropis sericea*
Locoweed, late yellow	*Oxytropis campestris*
Locoweed, showy	*Oxytropis splendens*
Loosestrife species	*Lythrum spp.*
Mallow, round leaved	*Malva pusilla*

Common Name	ITIS Accepted Scientific Name
Milkweed, common	*Asclepias syriaca*
Milkweed, showy	*Asclepias speciosa*
Mustard, ball	*Neslia paniculata*
Mustard, dog	*Erucastrum gallicum*
Mustard, gray tansy	*Descurainia richardsonii*
Mustard, tumble	*Sisymbrium altissimum*
Mustard, wild	*Sinapis arvensis*
Nettle, stinging	*Urtica dioica*
Nightshade species	*Solanum spp.*
Oats, wild	*Avena fatua*
Pigweed, redroot	*Amaranthus retroflexus*
Pigweed, tumble	*Amaranthus albus*
Pigweed, Russian	*Axyris amaranthoides*
Poison-ivy	*Rhus radicans*
Quackgrass	*Agropyron repens*
Ragweed, common	*Ambrosia artemisiifolia*
Ragweed, false	*Iva xanthifolia*
Ragweed, giant	*Ambrosia trifida*
Russian thistle	*Salsola kali*
Sage, pasture	*Artemisia frigida*
St. John's Wort	*Hypericum perforatum*
Shepherd's purse	*Capsella bursa-pastoris*
Skeletonweed	*Lygodesmia juncea*
Smartweed, green	*Polygonum scabrum*
Smartweed, pale	*Polygonum lapathifolium*
Sow-thistle, annual	*Sonchus oleraceus*
Sow-thistle, smooth perennial	*Sonchus glabrescens*
Spurge, cypress	*Euphorbia cyparissias*
Spurge, leafy	*Euphorbia esula*
Stinkweed	*Thlaspi arvense*
Stork's bill	*Erodium cicutarium*
Tansy	*Tanacetum vulgare*
Thistle, bull	*Cirsium vulgare*

Common Name	ITIS Accepted Scientific Name
Thistle, Canada	*Cirsium arvense*
Thistle, Flodman's	*Cirsium flodmanii*
Thistle, nodding	*Carduus nutans*
Thistle, wavy-leaved	*Cirsium undulatum*
Toadflax, Dalmatian	*Linaria dalmatica*
Toadflax, yellow	*Linaria vulgaris*
Tomato, wild	*Solanum triflorum*
Water-hemlock species	*Cicuta spp.*
Wormwood, biennial	*Artemisia biennis*
Wormwood, common	*Artemisia vulgaris*
Nutsedge, yellow	*Cyperus esculentus*

SOURCE:
http://www.gov.mb.ca/agriculture/crops/weeds/declaration-of-noxious-weeds-in-mb.html (accessed 4 June 2015).

Appendix 15B
Agricultural Biosecurity
Standard Operating Procedures
Transmission Business Unit

Agricultural Biosecurity Standard Operating Procedures
Transmission Business Unit

1. PURPOSE OF THE PROCEDURE

This Standard Operating Procedure (SOP) provides guidance and direction to individuals who may be required to enter agricultural land and the levels of cleaning necessary to reduce the likelihood of soil and manure transport of invasive organisms (diseases, pests, and invasive species).

2. SCOPE

This SOP describes the risk, techniques, record, and document controls for activities related to transmission construction and maintenance and its associated infrastructure, on agricultural land in Manitoba.

3. APPLICABILITY

This SOP applies to the following:

- Land zoned as agricultural (e.g. pasture, cropland, livestock areas).
- All employees of Manitoba Hydro as well as external individuals such as contractors or consultants who conduct work on behalf of the Transmission Business Unit.
- Additional measures may be prescribed in a project's Environment Act Licence or in the project's Environmental Protection Plan. These measures will be project specific and will not apply to all departments within the Business Unit.
- Additional measures may be implemented for agricultural areas where there is documented evidence of invasive organisms (diseases, pests, and invasive species).

This SOP **does not** apply to the following:

- Government road allowances.
- Gravel or paved driveways or roadways.

4. GENERAL INFORMATION

Agricultural biosecurity is the protection of crops and livestock systems against the threats to production from invasive organisms (diseases, pests, and invasive species). Human activity is one of the factors in the spread of invasive organisms, and the responsibility for agricultural biosecurity rests with all stakeholders.

Agricultural land is land zoned for agricultural use by the provincial government, a municipality, planning commission or planning district.

5. GENERAL CONSIDERATIONS

1. If existing farm level biosecurity measures exist, Transmission staff and contractors will strive to meet the requirements of the agricultural operation when access is required.
2. Activities will try to avoid access through areas that may contain manure.
3. Regular maintenance activities (including patrols) on agricultural lands will typically be scheduled after crops have been harvested and conducted primarily after freeze up.
4. Staff from other Business Units carrying out work for Transmission will be required to follow these procedures during the course of their work.

6. RESPONSIBILITY

All Transmission staff and contractors who carry out work on agricultural land will:

- Refer to and comply with the requirements of the SOP and the Agricultural Biosecurity Policy.
- If requested, be able to provide a copy of this SOP to the landowner or producer leasing the land.
- Be able to inform a landowner or producer leasing the land about the SOP, if asked.

It is expected that all individuals who require access onto agricultural land and are conducting activities for the Transmission Business Unit, including contractors, will be trained on the Agricultural Biosecurity Policy and this SOP.

Internal Training

A computer based training (CBT) course will be made available for training purposes. All individuals required to undergo training will complete the CBT and will have fulfilled the training requirement.

External Training

The Agricultural Biosecurity Policy and the SOP will be incorporated into the safety and environmental orientation prior to the start of work. Training records will be stored with the individual projects files.

7. ASSESSMENT OF RISK

The Transmission Business Unit elected to use a risk matrix to identify the potential biosecurity risk. The matrix identified the perceived risk to agricultural land from maintenance and construction activities by taking the frequency a hazard may occur and multiplying it by the consequence or severity of the hazard to determine the level of acceptable risk. The following two levels of risk were identified from the matrix; low risk and higher risk.

Low Risk

During the winter season when the ground is frozen and there is snow cover, it is not anticipated that activities conducted during this time will effectively transfer invasive organisms (diseases, pests, and invasive species) to other agricultural lands and therefore the risk can be considered low. When the ground is dry and undisturbed the risk of transferring seeds is minimal, however, avoiding bare ground will also help to reduce the risk. Visible inspections will still be expected to occur and are described in the biosecurity procedures. The risk can be managed and further minimized by avoiding wet areas and cleaning equipment effectively when leaving the field.

Higher Risk

The higher risk will be located in areas where the ground conditions are very wet and the accumulation of heavy soils such as clay may occur on footwear and in the tracks of vehicles or heavy equipment. There are a number of ways this condition can be mitigated such as avoiding the excessively wet areas, additional cleaning procedures, or rescheduling the work until ground conditions are more favourable.

Although the last method is preferred, it is not always possible because the activity may be dependent upon a specific timeline, seasonal changes, or an emergency situation where it is essential to return infrastructure to normal operating conditions.

Additional measures may be implemented when there is documented evidence of invasive organisms (diseases, pests, and invasive species) that are of concern to Manitoba Agriculture, Food and Rural Development.

For the majority of activities conducted within the Transmission Business Unit, the level of risk is anticipated to be low risk. With continual educational awareness and effective implementation of biosecurity procedures, the goal is to further minimize the risk to agricultural lands.

8. PRESCRIBED ACTIONS

Emergency

In emergency situations the Manitoba Hydro Act will prevail in order to return services to normal operating conditions. All efforts will be made to assess the risks to agricultural land and personal safety to determine the most appropriate measures to be taken.

Low Risk

Low Risk Activities are those that are typically completed in frozen conditions, or on dry ground with little soil disturbance.

1. Ensure all equipment and clothing is clean prior to entering onto agricultural land.

2. When leaving the field, check clothing, footwear, and equipment for seeds, soil, or manure and if required, brush off prior to leaving the field. The use of a brush will remove most surface soil, plant material, and foreign matter from clothing and equipment.

Higher Risk

This type of risk will involve activities on wet or heavy soils, such as clay, with the potential for large soil accumulations on equipment and footwear.

1. If possible, schedule activities to occur when ground conditions are more favourable.

2. If activities cannot be rescheduled, ensure that proper care and attention is paid to cleaning equipment and footwear prior to leaving the site.

3. Equipment may require fine cleaning to remove remaining soil. This may include pressure washing to rinse off remaining soil or manure. It is preferable at the field approach, but can be completed off site.

4. Use safety footwear that can be easily cleaned. Use a brush to remove visible soil or manure and disinfect or change footwear when leaving the field.
   - Disinfectants such as 1% Virkon may be carried in a household spray bottle or a larger container if required.
   - If washing footwear in the field with disinfectant, ensure wastewater is contained and appropriately disposed of offsite.

5. Fill out the Vehicle and Equipment Cleaning Record and submit with the Biosecurity Checklist.

9. PERSONAL PROTECTIVE EQUIPMENT

Safety of the individual will always be of the highest importance at Manitoba Hydro. Corporate safe work procedures and protocols are in place to protect not only the individual(s) directly involved in the activity or work, but also as it relates to public safety.

Personal protective equipment (PPE) will be worn as per the manufacturer's specifications and as directed by Manitoba Workplace Health and Safety Regulation 217/2006, Part 6 Workplace Safety and Health Regulations.

10. CONTACT INFORMATION

If there are any questions or concerns from the public related to biosecurity at Manitoba Hydro, contact the Customer Contact Centre at 1-MB-HYDRO (1-888-624-9376) or via email at environment@hydro.mb.ca.

11. APPROVAL

(Original signed by)

Shane Mailey
Vice President
Transmission

Date

NOTE: This procedure will be reviewed annually by management. As conditions change or new information becomes available, this document may be revised prior to the annual review date. Printed copies are not controlled, so check with management for the latest version.

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v1.0

Manitoba Hydro

AGRICULTURAL BIOSECURITY CHECKLIST
TRANSMISSION LINE CONSTRUCTION

INSTRUCTIONS

1. Complete Agricultural Biosecurity Checklist (page 1). Required fields indicated with ' * '.
2. If Higher Risk, complete Equipment Cleaning Record (page 2). Required fields indicated with ' * '.
3. Once complete, click 'Email' icon and send to TLC.Agricultural.Biosecurity@hydro.mb.ca (default email address).

   If the form cannot be accessed electronically, print and complete the form by hand, then scan the form into an email with the subject line as 'Agricultural Biosecurity Checklist - TLC' and send to TLC.Agricultural.Biosecurity@hydro.mb.ca.

DATE OF FIELD VISIT *	yyyy mm dd

Name of recorder *	Company *(If different from Mantioba Hydro)*

Fill in one of the location identifiers. *

1. Legal land location			
2. GPS (start)		GPS (end)	
3. Transmission line: _____	Structure # (start): _____	Structure # (end): _____	
_____	Structure # (start): _____	Structure # (end): _____	
_____	Structure # (start): _____	Structure # (end): _____	

Determine your risk and fill out one of the applicable sections below. *

Emergency ☐ *(Please check)*

Low Risk ☐ *(Please check)*

If applicable, the following may apply:

Brush all visible soil, manure, and seeds from clothing.
Rough cleaning of vehicle and equipment.
Disinfect footwear when leaving field.

Higher Risk ☐ *(Please check)*

1. Ensure the Biosecurity Procedures are followed for Higher Risk situations.
2. Complete Equipment Cleaning Record (page 2).

Did the landowner have a biosecurity procedure in place? *	☐ Yes	☐ No
Did the landowner request a copy of the Standard Operating Procedures? *	☐ Yes	☐ No

Manitoba Hydro

EQUIPMENT CLEANING RECORD
TRANSMISSION LINE CONSTRUCTION

Project *	Section *

Complete at cleaning area.

Unit number *		
Equipment type *	DATE OF CLEANING *	yyyy mm dd
Cleaned by *		
Location of cleaning *	Free of oil leaks? * ☐ Yes ☐ No	
Inspected by *	Signed by *	yyyy mm dd
Remarks		

Complete at destination site.

Destination		
Delivered to site by		
Inspected for cleanliness at site? ☐ Yes ☐ No	Free of oil leaks? ☐ Yes ☐ No	
Inspected by	Signed by	yyyy mm dd
Remarks		

Appendix 15C
Manitoba-Minnesota Transmission Project
Landowner Compensation Information

Frequently asked questions

How is compensation determined?

For the granting of an easement, landowners are eligible to receive one-time payments for up to four types of compensation:

- Land compensation for the transmission line right-of-way;
- Construction damage compensation for damages caused by construction, operation and maintenance of the transmission line;
- Structure impact compensation for each tower located on agricultural lands;
- Ancillary damage compensation where Manitoba Hydro's use of the right-of-way directly or indirectly impacts the use of the property.

Are landowners eligible for a buyout?

Easements are preferred to allow landowners the ability to continue farm operations. However, in special circumstances, a buyout can be offered to provide compensation to landowners for all related and reasonable relocation costs where the proximity of the transmission line is within 75 m of the landowner's residence.

What are the benefits of a one-time compensation payment?/How was this method of payment arrived at?

The benefits to landowners for one-time compensation payments are:

- Allows the landowner the opportunity to leverage the investment;
- Payment is made regardless of weather or production limitations;
- Payment maximizes exceptional crop management practices;
- Calculation maximizes the one-time payment.

A one-time compensation payment was chosen based on feedback obtained from the following:

- Feedback from previous transmission line projects;
- Public engagement activities;
- Comparisons with other public electric utilities.

As a tenant, what can I expect for compensation from the transmission line?

Tenants may be eligible for construction damage compensation for damages caused by construction of the transmission line.

When can landowners expect to receive payments?

Land compensation will be paid based on the current land values and escalated to 150 per cent of fair market value. A $225 advance payment will be made at the time of signing the easement with the balance being paid at the time of easement registration at the appropriate Land Titles office.

Structure impact compensation, for towers located on lands classed as agriculture, will be paid once towers are installed and construction is complete.

Ancillary damage compensation will be paid at the time of easement registration at the appropriate Land Titles office, if such damage has occurred.

Construction damage compensation will be identified, negotiated and paid during and/or after towers are installed and construction is complete, if such damage has occurred.

Does Manitoba Hydro have an agricultural biosecurity program?

Manitoba Hydro developed a biosecurity policy in consultation with government and industry. The policy outlines the requirements of employees and contractors who carry out work on cultivated agricultural lands.

For more information, please contact:

Manitoba Hydro Property Department

P.O. Box 7950, Station Main
Winnipeg, Manitoba
R3C 0J1
Phone: (In Winnipeg) 204-360-7888;
(toll-free) 1-877-343-1631

Email: mmtp@hydro.mb.ca

For information on the Manitoba-Minnesota Transmission Project, please visit **www.hydro.mb.ca/mmtp**

Manitoba Hydro

Manitoba-Minnesota Transmission Project Landowner Compensation Information

Manitoba Hydro

Manitoba-Minnesota Transmission Project Landowner Compensation

Landowners whose properties have the Manitoba Minnesota Transmission line located on or crossing their properties will be compensated. Four types of compensation are available:

- Land Compensation: to landowners granting an easement for the right-of-way;
- Construction Damage Compensation: to landowners for damages caused by construction activities;
- Structure Impact Compensation: to landowners for each tower located on agricultural lands;
- Ancillary Damage Compensation: to landowners where Manitoba Hydro's use of the right-of-way directly or indirectly impacts the use of the property.

Land Compensation

In Manitoba, rights-of-way for transmission lines are normally obtained by way of easement. Land compensation is a one-time payment to landowners for granting of an easement for a transmission line right-of-way.

The following factors are used to determine land compensation:

- Total area (acres) of easement required by Manitoba Hydro for the transmission line right-of-way;
- The current market value of the land (per acre);
- The easement compensation factor, which is determined based on the size and type of the transmission line. For the 500-kilovolt (kV) Manitoba-Minnesota Transmission Line, the easement compensation factor is 150 per cent of the current market value that will be certified by the Land Value Appraisal Commission of Manitoba.

For example, if the easement area required for the 500-kV transmission line is 1,609 metres (m) long and 80 m wide, the total area of the easement is approximately 31.81 acres. If the land is assessed at $2,300 per acre, the following compensation formula will apply:

$2,300 (current market value per acre) x 150 per cent (easement compensation factor) x 31.81 (acres) = $109,745.

Construction Damage Compensation

Construction damage compensation is provided to landowners who experience damage to their property due to the construction, operations and maintenance of the transmission line. A one-time payment for construction damage is negotiated on a case-by-case basis. Manitoba Hydro will:

- Compensate or be responsible for repairing, to the satisfaction of the landowner, any damage to a landowner's property;
- Compensate a landowner for damages such as the reapplication or rejuvenation of compacted top soil where the remedial work requires farm machinery and the expertise of the landowner.

In the instance of damage to cultivated agricultural lands, a landowner would be compensated as follows:

If crops were in place prior to the construction of the transmission line, the crop owner will be compensated for the amount of loss due to damage. This compensation is based on the current value of the harvested crop (Manitoba Agricultural Services Corporation [MASC] insured value in dollars per bushel), multiplied by the acres of damaged area and multiplied by the crop owner's yield of that same crop (based on MASC Area bushels per acre yield).

The following compensation formula will apply:

$7.48 per bushel for 2013: Red Spring Wheat x 4.25 (acres damaged) x 55.7 (bushels per acre yield) = $1,771.

Structure Impact Compensation

Structure impact compensation is a one-time payment to landowners for each transmission tower placed on land classed as agricultural. Structure impact compensation covers:

- Crop losses on lands permanently removed from production;
- Reduced productivity in an area of overlap around each tower structure;
- Additional time required to manoeuvre farm machinery around each structure;
- Double application of seed, fertilizer and weed control in the area of overlap around each tower structure.

Structure impact compensation takes into consideration:

- the four types of agricultural lands;
- the type of tower structure constructed on the land;
- the location of the tower structure in relation to property lines.

Manitoba Hydro prepares a compensation schedule semi-annually based on current data provided by MASC. For example, for a tower structure with a base size of approximately 10 m x 10 m (in accordance with the current (June 2013) compensation schedule) the compensation rates are:

- Natural hay land/$6,640 each;
- Seeded hay land/$12,730 each;
- Cereal crop land (wheat, canola)/ $17,930 each;
- Row crop land (corn and potatoes)/ $25,520 each.

Assuming the land is classed as cereal crop land and one mile of transmission line with four towers is to be located on the property (the average space between towers is 400 m), the compensation would be:

$17,930 (structure payment) x 4 (number of structures) = $71,720.

Ancillary Damage Compensation

Ancillary damage compensation is a one-time payment when Manitoba Hydro's use of the right-of-way directly or indirectly impacts the use of the property. Ancillary damage compensation is negotiated. Landowners may be compensated for the following:

- Agricultural impacts such as irrigation and drainage;
- Constraint impacts such as restricted access to adjacent lands;
- Traditional impacts such as highest and best use of land.

Appendix 15D
Photos

Photo 1 **Cropping activities being conducted around tower footprints**

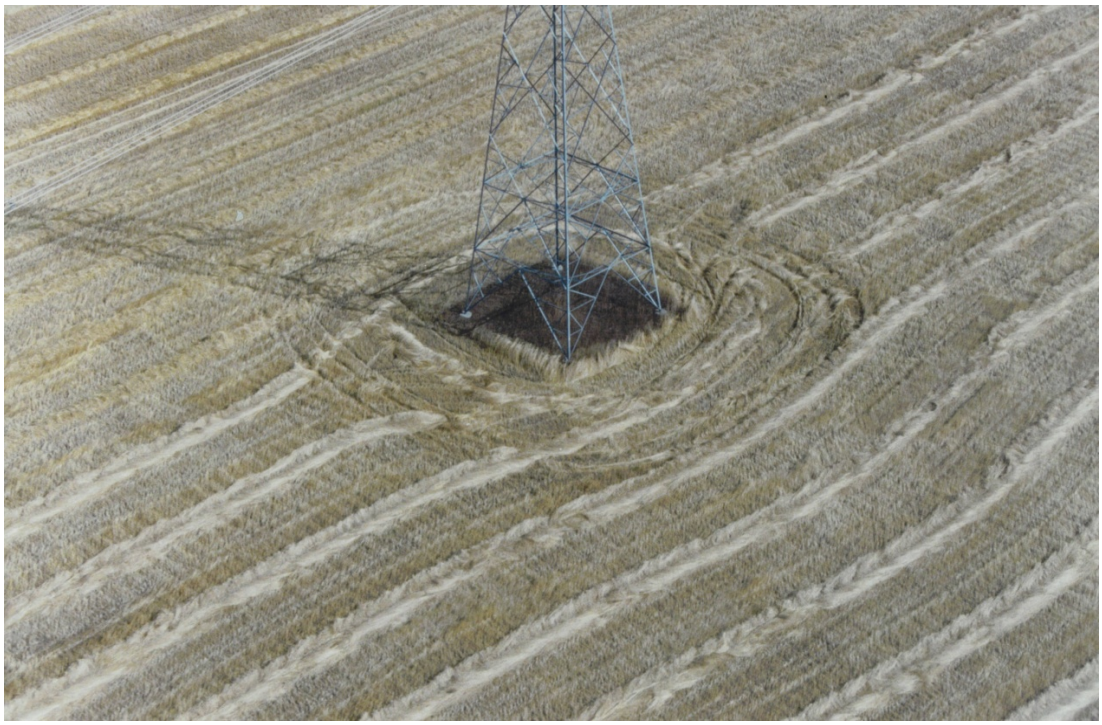

Photo 2 **Cropping activities being conducted around tower footprints**

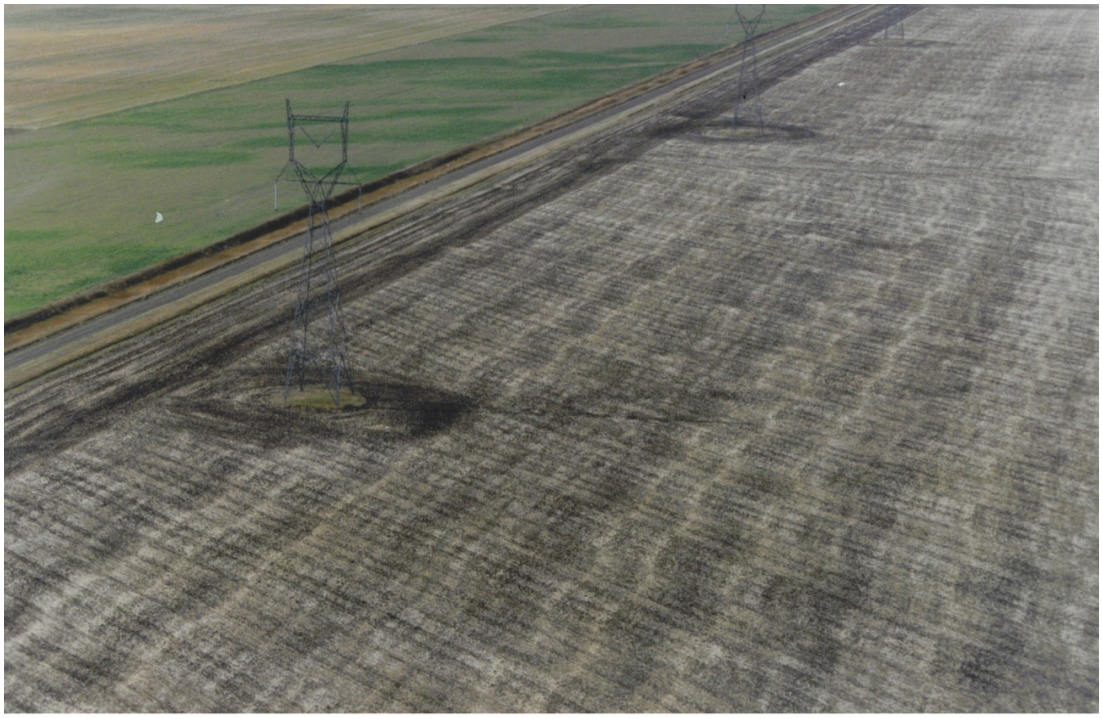

Photo 3 **Cropping activities being conducted around tower footprints**

Photo 4 **Cropping activities being conducted around tower footprints**

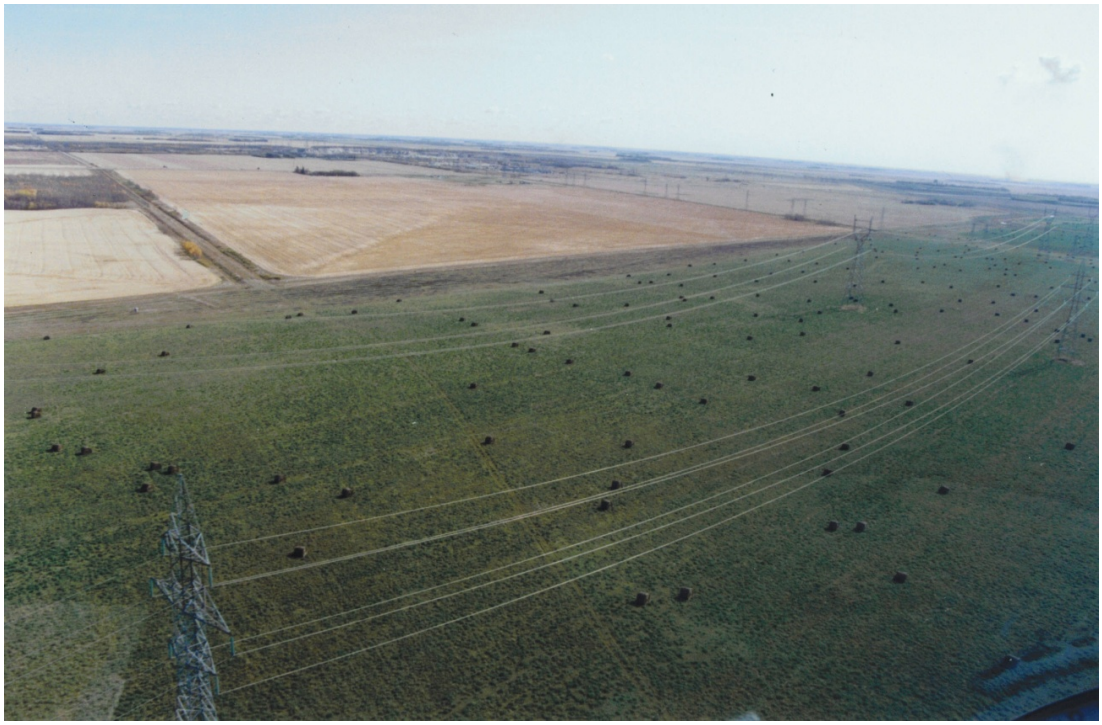

Photo 5 **Shared corridor use by multiple transmission lines**

Photo 6 **Shared corridor use by multiple transmission lines**

Photo 7 **Shared corridor use by multiple transmission lines**

Photo 8 **Shared corridor use by multiple transmission lines.**

Photo 9 Shared corridor use by multiple transmission lines