3 Description of the Environment

3.1 Atmospheric Environment

3.1.1 Climate

3.1.1.1 Methods

Climate normals for a 30-year period (1981 to 2010) were obtained from the Winnipeg Richardson International Airport Environment and Climate Change Canada [ECCC] meteorological station located at 49° 55' 00" N and 97° 14' 00" W at an elevation of 239 metres above sea level [masl] (ECCC 2019a). The station meets the World Meteorological Organization standards for calculation of climate normals and is located five kilometres from the project site.

3.1.1.2 Results

The proposed processing facility is located within the Winnipeg Ecodistrict of the Lake Manitoba Plain Ecoregion in the Prairies Ecozone, which has short, warm summers and long, cold winters (Smith et al. 1998). The following climate normals are from the McCreary meteorological station (ECCC 2019a; **Figure 3.1; Table 3.1**):

- Daily mean temperature ranges from a low of -16.4 °C in January to a high of 19.7 °C in July;
- Average annual precipitation is 521.1 mm, with 20% occurring as snowfall;
- Average monthly precipitation is highest in June (90 mm) and lowest in February (13.8 mm);
- Mean annual lake evaporation is 708.3 mm; and
- Prevailing winds come from the south, with a mean annual wind speed of 17.1 km/h and maximum hourly speed of 89 km/h.

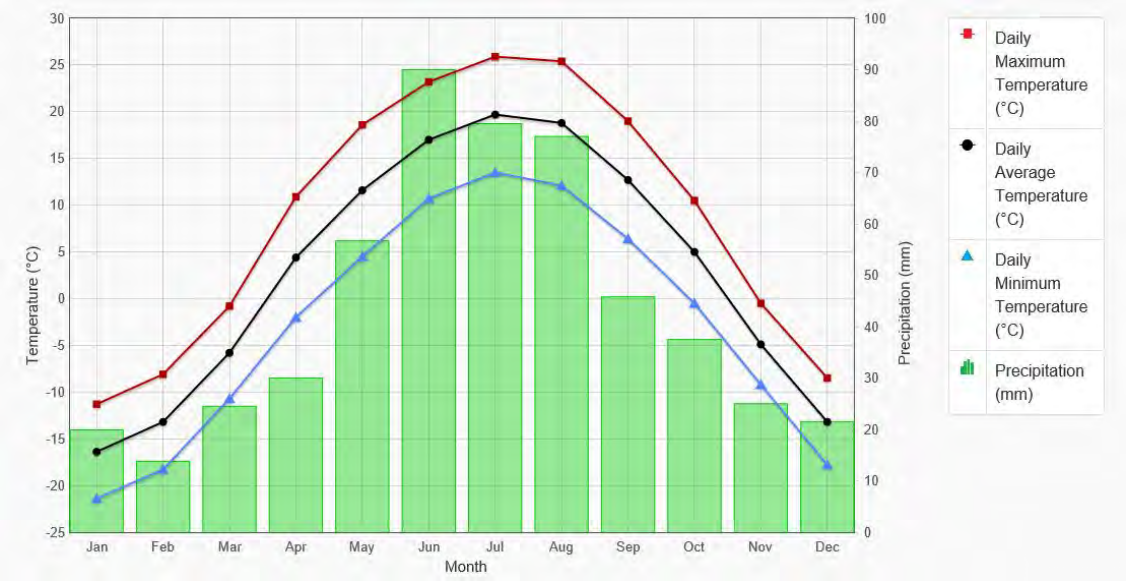


Figure 3.1 Temperature and precipitation normal (1981 to 2010) for the Winnipeg Richardson International Airport meteorological station (ECCC 2019a)

Table 3.1 1981 to 2010 monthly climate normals for Winnipeg Richardson International Airport meteorological station (ECCC 2019a)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Annual**	Code[1]
Temperature														
daily mean (°C)	-16.4	-13.2	-5.8	4.4	11.6	17.0	19.7	18.8	12.7	5.0	-4.9	-13.2	**3.0**	A
mean daily maximum (°C)	-11.3	-8.1	-0.8	10.9	18.6	23.2	25.9	25.4	19.0	10.5	-0.5	-8.5	**8.7**	A
mean daily minimum (°C)	-21.4	-18.3	-10.7	-2.0	4.5	10.7	13.5	12.1	6.4	-0.5	-9.2	-17.8	**-2.7**	A
extreme maximum (°C)	7.8	11.7	23.3	34.3	37.0	37.8	37.8	40.6	38.8	30.5	23.9	11.7	**40.6**	-
extreme minimum (°C)	-42.2	-45.0	-37.8	-26.3	-11.1	-3.3	1.1	0.0	-7.2	-17.2	-34.0	-37.8	**-45.0**	-
Precipitation														
total rainfall (mm)	0.2	2.7	9.7	19.2	54.1	90.0	79.5	77.0	45.5	32.7	6.9	1.5	**418.9**	A
total snowfall (cm)	23.7	12.5	16.5	10.6	2.6	0.0	0.0	0.0	0.3	4.8	19.9	23.0	**113.7**	A
total precipitation (mm)	19.9	13.8	24.5	30.0	56.7	90.0	79.5	77.0	45.8	37.5	25.0	21.5	**521.1**	A
mean snow depth (cm)	16	17	10	2	0	0	0	0	0	0	4	10	**5**	C
extreme daily rainfall (mm)	3.8	20.0	33.6	36.0	60.2	69.8	83.6	83.8	65.0	74.4	19.0	21.8	**83.8**	-
extreme daily snowfall (cm)	23.0	23.6	35.6	22.0	29.0	0.3	0.0	0.0	5.8	24.6	27.7	21.6	**35.6**	-
extreme daily precipitation (mm)	22.5	23.6	35.6	44.1	60.2	69.8	83.6	83.8	65.0	74.4	27.7	21.8	**83.8**	-
extreme snow depth (cm)	91	89	85	61	18	0	0	0	2	18	55	81	**91**	-
Wind														
mean speed (km/h)	17.4	16.9	18.0	18.5	18.4	16.3	14.6	15.4	16.9	18.0	17.9	17.4	**17.1**	A
most frequent direction	S	S	S	S	S	S	S	S	S	S	S	S	**S**	A
maximum hourly speed	80	80	81	80	72	80	89	74	71	77	87	78	**89**	-

[1]"A": WMO "3 and 5 rule" (i.e. no more than 3 consecutive and no more than 5 total missing for either temperature or precipitation) between 1981 and 2010.
"C": At least 20 years.

3.1.2 Air Quality

3.1.2.1 Methods

Background air quality data was obtained from the Ellen Street air quality station (MCC 2019b), the nearest air quality station with available data for the parameters of interest, including CO, NO_2, $PM_{2.5}$ and PM_{10}. Erroneous data (e.g. negative values) was removed from the data set. Data was not included for annual data sets that were less than 75% complete.

3.1.2.2 Results

Data for the Ellen Street air quality station is presented in **Table 3.1** (MCC 2019b). The $PM_{2.5}$ and PM_{10} background levels are considered high and may be affected by forest fire or other influences.

Table 3.2 Summary of Winnipeg Ellen Street air quality data

Species		2016		2017		2018		Average
		maximum	98th percentile	maximum	98th percentile	maximum	98th percentile	
CO (ppm)	1 hour	3.3	0.9	n/a	n/a	n/a	n/a	0.9
	8 hour	2.0	0.8	n/a	n/a	n/a	n/a	0.8
NO_2 ($\mu g/m^3$)	1 hr	n/a	59.2	n/a	51.7	n/a	50.0	53.6
	24 hour	n/a	43.6	n/a	35.2	n/a	37.6	38.8
	annual	15.0	n/a	14.0	n/a	13.9	n/a	14.3
$PM_{2.5}$ ($\mu g/m^3$)	24 hour	n/a	11.2	n/a	18.6	n/a	24.2	18.0
	annual	5.0	n/a	6.2	n/a	6.7	n/a	6.0
PM_{10} ($\mu g/m^3$)	24 hour	66.7	46.6	62.0	36.8	109.8	43.1	41.7

Notes: CO datasets for 2017 and 2018 are incomplete

3.1.3 Greenhouse Gases

3.1.3.1 Methods

Baseline GHG emissions data for provincial and federal emissions were compiled from publically available sources, including *The National Inventory Report 1990-2017: Greenhouse Gas Sources and Sinks in Canada* and *Reported Facility GHG Data* (ECCC 2019b and 2019c). GHG emissions are undergoing increased regulation: (i) federally through the proposed implementation of a carbon tax; and (ii) provincially through the province's Climate and Green Plan (MCC 2017) and *The Climate and Green Plan Act*. Federal GHG emission reporting is required for facilities which emit over 10 kt CO_2e/y through Notices under *The Canadian Environmental Protection Act, 1999*, as per the Greenhouse Gas Emissions Reporting Program (Canada Gazette 2017).

3.1.3.2 Results

In 2017, the Province of Manitoba emitted approximately 22,000 kt CO_2e, approximately 3% of Canada's emitted 716,000 kt CO_2e (ECCC 2019b). Emissions in Manitoba increased by 7.7% (4,000 kt) between 2005 and 2017. In 2017, there were 36 facilities in Manitoba with reported GHG emissions >10 kt CO_2e/y

(ECCC 2019b). The proposed facility GHG emissions would represent 0.08% and 0.14% of the 2017 Manitoba emissions for Phases 1 and 2, respectively.

3.1 Physical Environment

3.1.1 Hydrogeologic Environment

3.1.1.1 Methods

Data on the regional hydrogeology was compiled from available sources, including: Smith et al. (1998); the Surficial Geology Compilation Map Series (Matile and Keller 2004); and the Groundwater Information Network (2019). Data from the geotechnical investigation for the proposed facility was also compiled (Wood 2019).

3.1.1.2 Results

The Lake Manitoba Plan ecoregion is underlain by low-relief, flat-lying Paleozoic limestone bedrock and covered by glacial till and silts and clays deposited by glacial Lake Agassiz (Smith et al. 1998). The surficial geology underlying the City of Winnipeg and surrounding area consists of offshore glaciolacustrine sediments deposited from suspension in offshore, deep water of glacial Lake Agassiz (Matile and Keller 2004). The sediments are 1 m to 20 m thick and composed of clay, silt, and minor sand with very low relief. The surficial sediments overlay Paleozoic carbonate bedrock.

A search of Groundwater Information Network (2019) identified 52 water wells within a two-kilometre radius of the proposed site, including 38 domestic wells, eight industrial wells, one livestock well, and five wells with unknown water use. Stratigraphy was primarily soil, glacial deposits, and carbonate bedrock with local interbeds of shale. **Table 3.3** presents a summary of the groundwater wells.

The stratigraphy identified from the geotechnical investigation is presented in **Table 3.4** (Wood 2019). Seepage and sloughing conditions were generally encountered in the silt till layer. Slough levels prior to backfill were approximately 6.0 m and 7.6 m, with water levels generally rising to 4.0 m and 7.0 m below grade, although were as shallow as 2.1 m in one hole.

Table 3.3 Summary of groundwater wells (Groundwater Information Network 2019)

	Well Depth (m)	Water Level (m)	Bedrock Depth (m)
Average	43.77	6.54	13.42
Minimum	15.85	0.00	1.37
Maximum	76.81	9.75	31.39

Table 3.4 Site stratigraphy (Wood 2019)

Strata	Average Depth	
	From (m)	To (m)
Organic clay	0.15	0.30
High plastic clay	0.30	4.0 - 5.8
Silt till	4.0 – 5.8	6.5 – 8.4
Limestone bedrock	7.3 – 8.2	-

3.1.2 Hydrologic Environment

3.1.2.1 Methods

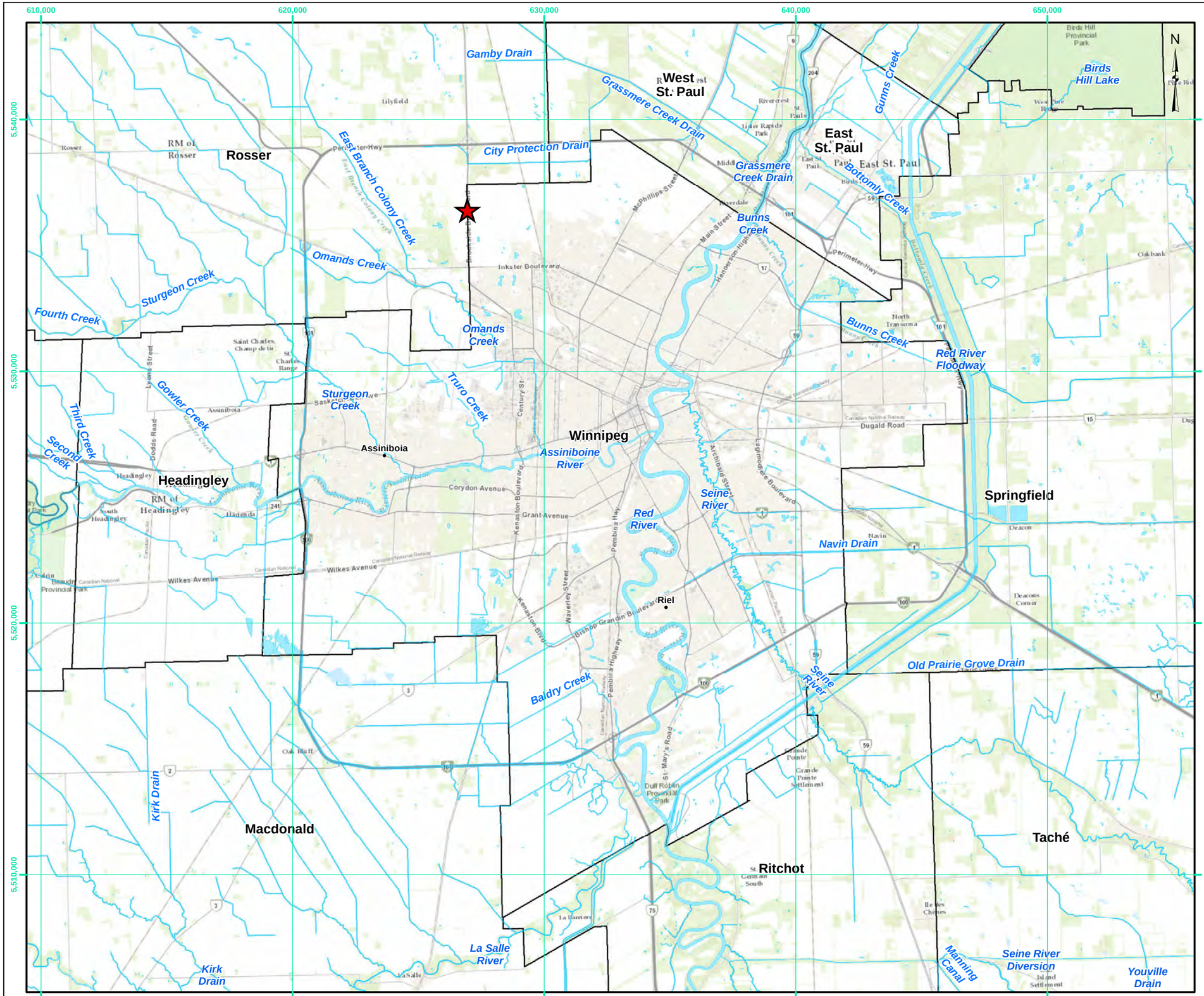
A desktop review of the hydrological environment was conducted using the following resources:

- Landscapes and Landforms of Western Canada (Slaymaker 2017) for information on the Red and Assiniboine Rivers; and
- Multi-year satellite imagery (Google Earth Pro) to identify wetlands, watercourses, and other water features.

3.1.2.2 Results

The City of Winnipeg is located along the boundary of the Red River and Assiniboine River watersheds (Slaymaker 2017). The approximately 500-km long Red River originates at the confluence of the Bois de Sioux and Otter Tail Rivers at the border between the states of Minnesota and North Dakota, USA, and flows north through Winnipeg and empties into Lake Winnipeg. The Assiniboine River is a 1,070 km river that originates in eastern Saskatchewan and flows southeast into Manitoba, and then east to Winnipeg where it joins the Red River. Several flood control structures operate along the rivers, including the Shellmouth Dam, the Portage Diversion, and the Red River Floodway. Other rivers / creeks that run through the city include Sturgeon Creek, Omand's Creek, and the Seine River (**Figure 3.2**).

The project is not located near any large waterbodies; Sturgeon Creek is approximately 3 km southwest of the facility and the Red River is over 9 km east of the facility. The site is graded with a site runoff / ditch system. Prior to site grading, several seasonal wetlands were present on the BrookPort Business Park site (**Figure 2.1**, Google Earth Pro).



LEGEND

- SITE LOCATION
- RAILWAY
- HIGHWAY
- WATERCOURSE
- WATERBODY
- MUNICIPAL BOUNDARY

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 14N.
2. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY.
3. TOPOGRAPHIC FEATURES OBTAINED FROM CANVEC DATASET, NATURAL RESOURCES CANADA EARTH AND SCIENCES SECTOR CENTRE FOR TOPOGRAPHIC INFORMATION, 2019-03-15.

REFERENCE DRAWINGS

DWG No.	DESCRIPTION

REVISIONS

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00	2020 02 07	ISSUED FOR INFORMATION	LM	KVG	LM	JP

0 1,250 2,500 5,000 METRES

SCALE: 1:150,000

SNC·LAVALIN

CLIENT	PROJECT LOCATION
MERIT FUNCTIONAL FOODS	RM OF ROSSER

TITLE WATERCOURSES

DATE	DWG No.	FIG No.	REV
2019 09 18	667646-0000-4GDD-0007	3.2	00

SIZE 11x17

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3.1.3 Terrain and Soils

3.1.3.1 Methods

A desktop review of the biological environment was conducted using the following resources:

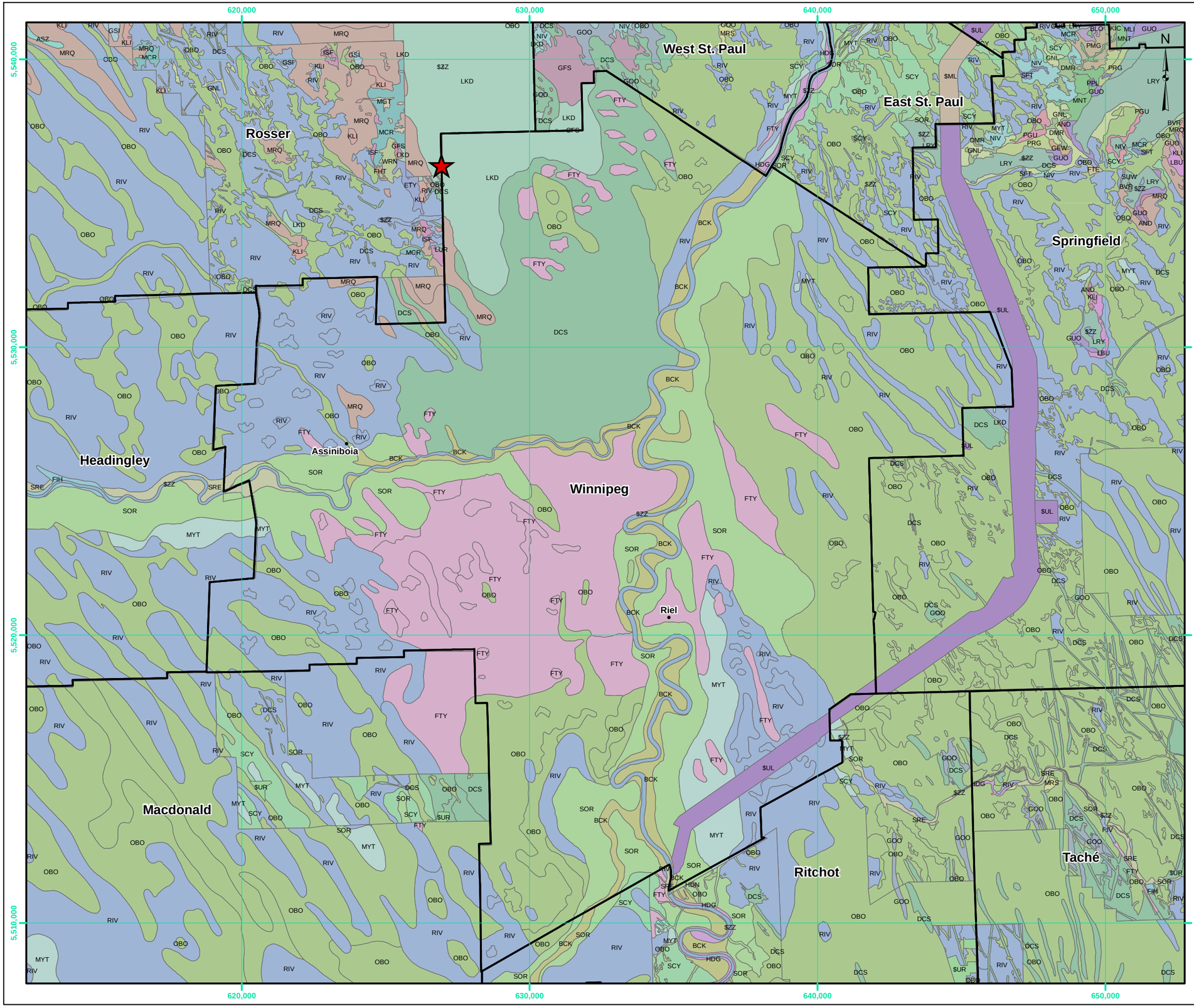
- Terrestrial Ecozones, Ecoregions, and Ecodistricts of Manitoba. (Smith et al. 1998); and
- Soils of the Winnipeg Region Study Area (Canada-Manitoba Soil Survey 1975).

3.1.3.2 Results

The proposed project is located within the Winnipeg Ecodistrict of the Lake Manitoba Plain Ecoregion in the Prairies Ecozone (Smith et al. 1998). The region's surficial geology and hydrology have been shaped by glaciers which covered the region more than 12,000 years ago and more recently by glacial Lake Agassiz. The ecodistrict occupies the central lowland of the Red River Plain. The area is a smooth, level to very gently sloping, clayey glaciolacustrine plain with a mean elevation of 236 masl. The Red River cuts through the center of the plain and drains into Lake Winnipeg at 218 masl. Relief occurs approximately 5 m to 10 m along the Red River and its major tributaries: Morris, La Salle, and Assiniboine rivers from the west and the Roseau, Rate, and Seine river from the east. The ecodistrict is part of the Nelson River drainage system, with the northwestern section of the ecodistrict being part of the Assiniboine River drainage division and the remainder being part of the Red River drainage division.

Soils in the ecodistrict are dominated by imperfectly drained Gleyed Humic Vertisols and Gleyed Vertic Black Chernozems, and poorly drained Gleysolic Humic Vertisols and Humic Gleysols developed on calcareous, clayey glaciolacustrine sediments (Smith et al. 1998). The sediments range in thickness from >60 m deep near the Canada-U.S. border to less than one metre locally in the northern part of the basin. Gleyed Rego Black Chernozemic and Gleysolic soils also occur on shallow, extremely to very strongly calcareous, loamy to silty sediments found northwest of Winnipeg and in southern and eastern sections of the basin.

Soils at the proposed site are Lakeland series soils which consist of imperfectly drained Gleyed Carbonated Rego Black soils developed on strongly to very strongly calcareous sediments (**Figure 3.3**; Canada-Manitoba Soil Survey 1975). Surface textures range from loam to clay loam and occasionally silty clay.



LEGEND

- SITE LOCATION
- RAILWAY
- HIGHWAY
- WATERCOURSE
- WATERBODY
- MUNICIPAL BOUNDARY

SOIL CLASSIFICATION

- $ML - MODIFIED LAND
- $UL - UNCLASSIFIED LAND
- $UR - URBAN LAND
- $ZZ - WATER
- AND - ANEDA
- ASZ - AGASSIZ
- BCK - BLACK LAKE
- BLO - BERLO
- BVR - BEAVERDAM LAKE
- BYD - BERRY ISLAND
- DCS - DENCROSS
- DMR - DELMAR
- ETY - EAST BAY
- FHT - FISHERTON
- FIH - FISHER
- FTE - FORTIER
- FTY - FORT GARRY
- GEW - GREENWALD
- GFS - GLENFIELDS
- GNL - GLENELLA
- GOO - GLENMOOR
- GSI - GROSSIL
- GUO - GUNTON
- HDG - HODGSON
- HDN - HODDINOTT
- ISF - ISAFOLD
- IWO - INWOOD
- KLI - KLINE
- LBU - LIBAU
- LKD - LAKELAND
- LRY - LEARY
- LUR - LUNDAR
- MCR - MCCREARY
- MGT - MAGNET
- MLI - MCKINLEY
- MNT - MALONTON
- MRQ - MARQUETTE
- MRS - MORRIS
- MYT - MYRTLE
- NIV - NIVERVILLE
- OBO - OSBORNE
- PGU - PEGUIS
- PMG - PLUM RIDGE
- PPL - POPPLETON
- PRG - PINE RIDGE
- RIV - RED RIVER
- SCY - SCANTERBURY
- SFT - SIFTON
- SOR - ST NORBERT
- SRE - SEINE RIVER
- SUW - SUNDOWN
- WRN - WARNER

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 14N.
2. MANITOBA DETAILED SOIL SURVEY DATA OBTAINED FROM CANSIS, AGRICULTURE AND AGRI-FOOD CULTURE, 2018-08-16.

DISCLAIMER

REFERENCE DRAWINGS

DWG No.	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
00	2020 02 07	ISSUED FOR INFORMATION	LM	KVG	LM	JP

0 1,250 2,500 5,000 METRES

SCALE: 1:130,000

SNC·LAVALIN

CLIENT	PROJECT LOCATION
MERIT FUNCTIONAL FOODS	RM OF ROSSER

TITLE

SOILS

DATE	DWG No.	FIG No.	REV
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SIZE 11x17

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3.2 Biological Environment

3.2.1 Methods

A desktop review of the biological environment was conducted using the following resources:

- The Manitoba Conservation Data Centre (2019a and 2019b); and
- Terrestrial Ecozones, Ecoregions, and Ecodistricts of Manitoba. (Smith et al. 1998).

3.2.2 Results

3.2.2.1 Vegetation and Wetlands

The native vegetation of the Winnipeg Ecodistrict originally consisted of tall prairie grass, meadow prairie grass and meadow grass communities depending on natural drainage conditions but cultivation and development of an extensive network of drainage ditches has caused natural vegetation to disappear (Smith et al. 1998). Only local pockets remain in some poorly drained locales, and as small portions of land that have not been broken due to their small size or limited access.

Tree cover has survived better than the grassland communities but is also significantly diminished (Smith et al. 1998). Trees in the ecodistrict mostly grow naturally as a fringe along stream channels. Bur oak and trembling aspen with an undergrowth of snow berry, hazelnut and red-osier dogwood commonly occur on well drained sites above and away from the stream channels. The alluvial floodplain deposits and lower river terraces consists of white elm, basswood, cottonwood, Manitoba maple and green ash with an undergrowth of willow, ferns and associated herbaceous plants. Shrubs such as saskatoon, high bush cranberry and nannyberry occur on floodplains and on the highest terraces.

The Manitoba Conservation Data Centre (MBCDC 2019a) list of plant species in the Lake Manitoba Plain Ecoregion and their conservation status ranks are presented in Appendix F.

3.2.2.2 Wildlife and Wildlife Habitat

The Lake Manitoba Plain Ecoregion includes habitat for many bird, mammal, and amphibian species, including white-tailed deer, coyote, rabbits, ground squirrels, and waterfowl (Smith et al. 1998). The Manitoba Conservation Data Centre (MBCDC 2019a) list of wildlife species in the Lake Manitoba Plain Ecoregion and their conservation status ranks are presented in Appendix F.

3.2.2.3 Species of Conservation Concern

A search of the MBCDC rare species database did not identify any previously recorded listed or tracked species within the proposed site, however, did identify two occurrences within a two-kilometre buffer of the proposed site (**Table 3.5;** Appendix G; MBCDC 2019b).

Table 3.5 Previously recorded listed or tracked species occurrences within a 2 km buffer of the proposed site (Appendix G; MBCDC 2019b)

Scientific Name	Common Name	Taxonomic Group	Subnational Rank	ESEA Status	SARA Status
Asclepias verticillata	whorled milkweed	vascular plant	S3	n/a	n/a
Nassella viridula	green needle grass	vascular plant	S3S4	n/a	n/a

ESEA: Endangered Species and Ecosystems Act

3.3 Human Environment

3.3.1 Socio-economic

3.3.1.1 Methods

A desktop review of the socio-economic environment was conducted using the following resources:

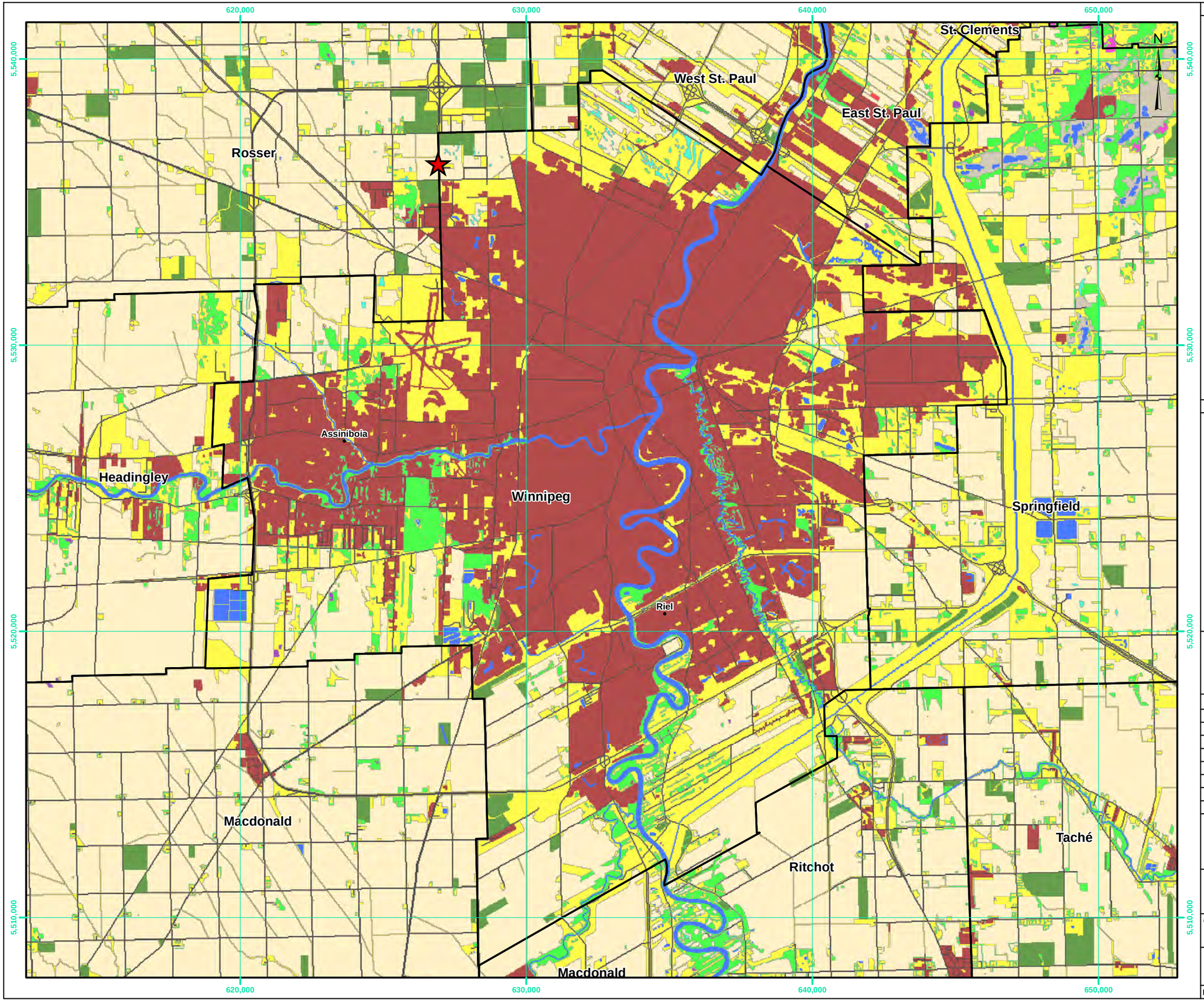
- Census Profile, 2016 Census (Statistics Canada 2017 and 2019);
- Terrestrial Ecozones, Ecoregions, and Ecodistricts of Manitoba. (Smith et al. 1998);
- Government of Manitoba (2019a) website;
- CentrePort Canada (2019) website; and
- Land use / cover from the Manitoba Land Initiative (2005 – 2006).

3.3.1.2 Results

Land Use

The proposed project is located within the Winnipeg Ecodistrict of the Lake Manitoba Plain Ecoregion in the Prairies Ecozone (Smith et al. 1998). Agriculture is the dominant land use in the Prairies ecozone (Smith et al. 1998). Almost all soils in the ecodistrict are cultivated and used for spring wheat, other cereal grains and oil seeds under dryland production methods (**Figure 3.4**). Production of potatoes, corn and other variety garden crops are grown and supplied to a seasonal market in Winnipeg and for export.

The proposed facility is located within the $26 million BrookPort Business Park, which includes 80 acres of industrial land. The proposed facility land was cultivated prior to development of the BrookPort Business Park. The business park surrounds the proposed facility to the north, west, and south, and Route 90 borders the site to the east; Route 90 is a major north-south arterial route in the City of Winnipeg and is designated the city's airport route as it passes by the Winnipeg James Armstrong Richardson International Airport.



LEGEND

- SITE LOCATION
- MUNICIPAL BOUNDARY

LANDUSE

- AGRICULTURAL - FORAGE FIELD
- AGRICULTURAL FIELD
- CONIFEROUS FOREST
- CULTURAL FEATURES
- DECIDIOUS FOREST
- FOREST CUT BLOCKS
- FOREST FIRE BURNT AREAS
- MIXEDWOOD FOREST
- OPEN DECIDIOUS FOREST
- RANGE AND GRASSLAND
- ROADS TRAILS RAIL LINES
- SAND AND GRAVEL
- WATER BODY
- WETLAND - MARSH

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 14N.
2. LAND USE/ LAND COVER OBTAINED FROM MANITOBA LAND INITIATIVE. MANITOBA CONSERVATION DEPARTMENT, MANITOBA REMOTE SENSING CENTER. EDITION 2005 AND 2006.

REFERENCE DRAWINGS

DWG No.	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
00	2020 02 07	ISSUED FOR INFORMATION	LM	KVG	LM	JP

0 1,250 2,500 5,000 METRES

SCALE: 1:130,000

SNC·LAVALIN

CLIENT	PROJECT LOCATION
MERIT FUNCTIONAL FOODS	RM OF ROSSER

TITLE: LAND USE

DATE	2019 09 18	DWG No.	667646-0000-4GDD-0007	FIG No. 3.4	REV	00

SIZE 11x17

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Infrastructure, Communities, and Services

The proposed project is located in the RM of Rosser, just northwest of the City of Winnipeg. Winnipeg is the capital and largest city in Manitoba, located approximately 110 km north of the Canada-United States border. In 2016, Winnipeg had a population of 705,244, representing 55% of Manitoba's population of 1,278,365 (Statistics Canada 2017). The 2016 population of the RM of Rosser was 1,372 and is considered part of the Winnipeg Census Metropolitan area. Emergency services in Winnipeg include: two tertiary and four community hospitals; the Winnipeg Police Service; and the Winnipeg Fire Paramedic Service.

The project is located within CentrePort Canada, North America's largest inland port (CentrePort Canada 2019). CentrePort Canada offers 20,000 acres of high-quality, affordable industrial land and unique access to tri-modal transportation, including three Class I railways (Canadian National, Canadian Pacific, and BNSF Railway), a 24/7 global air cargo airport, and an international trucking hub. It was created in 2008 by the *CentrePort Canada Act*. A 10 km expressway was developed to better connect the inland port to key gateways and corridors, and development of a new 665-acre rail park is underway. More than 1,200 acres of land has been sold / conditionally sold within CentrePort Canada and includes the following business sectors: agriculture, air cargo, associations, business services, construction, customs broker, education & training, fire protection, government, hotels & hospitality, landscape architecture, legal services, manufacturing, media, planning, project management, promotional products & corporate wear, publishing, rail, real estate, recreation, security, social innovation, staffing, trade services, and trucking.

Economy

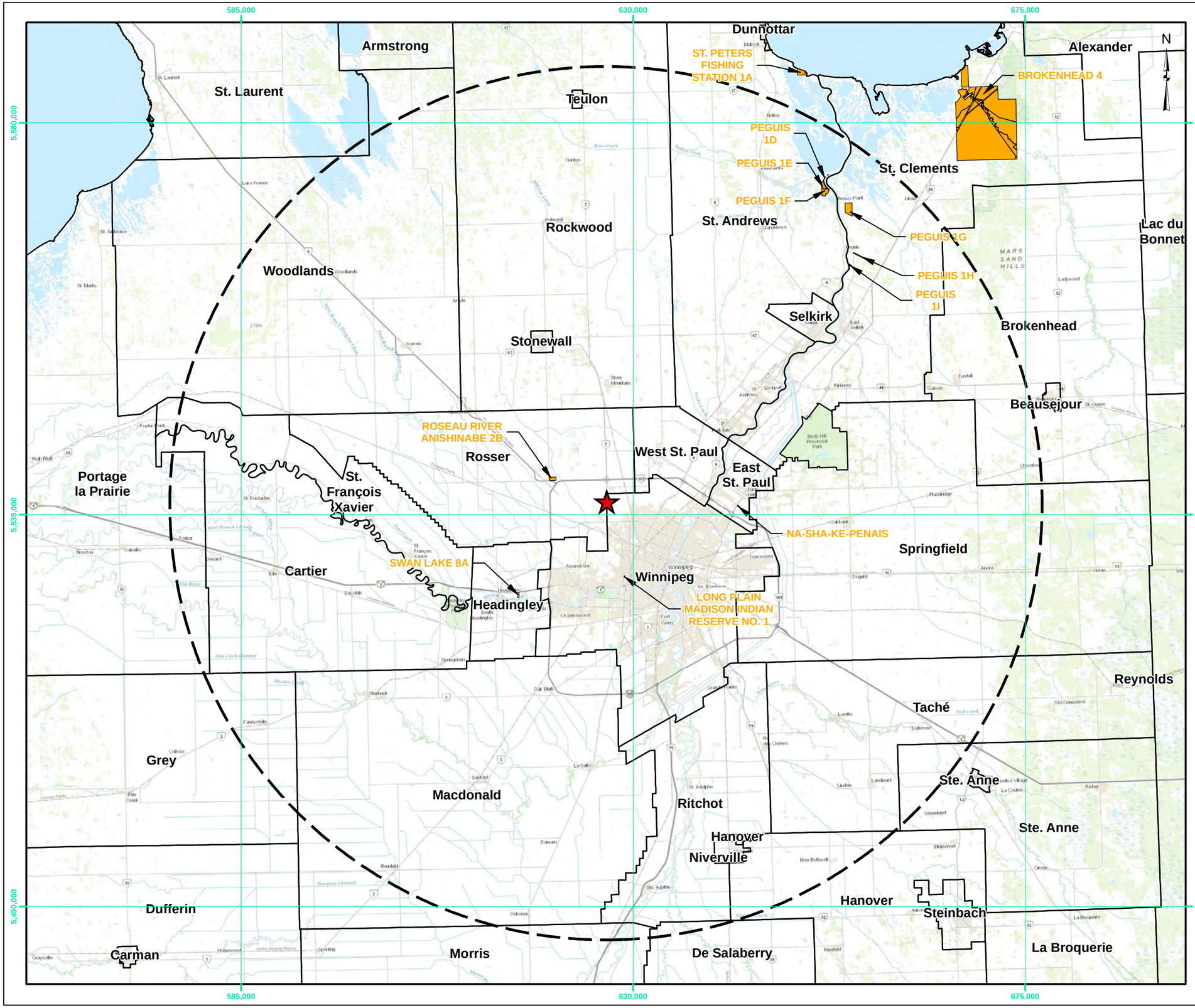
Manitoba has one of Canada's most diverse urban economies and key industries include: advanced manufacturing, aerospace, agribusiness, creative industries, education, energy and environment, financial services, information and communication technologies, life sciences, mining and minerals, tourism, and transportation and distribution (Government of Manitoba 2019a). Manufacturing, the largest industry, accounts for about 10% of the province's Gross Domestic Product (GDP), and together mining, agriculture and forestry account for about 8.4%. Manitoba has a thriving service sector, with head offices for Canada's largest insurance company, largest mutual fund distributor, and largest integrated media company. Canada's only agricultural commodity exchange is located in Winnipeg, making the city the centre of Canada's grain trade. The province is also a major North American transportation hub. Manitoba's GDP for the past five years was obtained from Statistics Canada (2019) (**Table 3.4**).

Table 3.6 Manitoba Gross Domestic Product (GDP), 2014 to 2018 (Statistics Canada 2019)

Year	GDP
2014	$58,276,300,000
2015	$59,082,500,000
2016	$60,066,200,000
2017	$61,941,200,000
2018	$62,732,100,000

Indigenous Lands

The project is located in Treaty 1 Territory, which covers Winnipeg and the surrounding area. Treaty 1 was signed at Lower Fort Garry on 3 August 1871 between Her Majesty the Queen and the Anishinabe and Swampy Cree First Nation groups. The closest First Nations community to the site is the Roseau River Anishinabe First Nation to the northwest. Other first nations within 50 km of the site include the Swan Lake, Long Plain Madison, Na-sha-ke-penais and Peguis First Nations (**Figure 3.5**).



LEGEND

- SITE LOCATION
- FIRST NATIONS RESERVES
- MUNICIPAL BOUNDARY
- 50 Km BUFFER

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 14N.
2. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
3. FIRST NATIONS OBTAINED FROM GEOBASE, NATURAL RESOURCES CANADA, LANDS AND MINERALSSECTOR, SURVEY GENERAL BRANCH EIDTION 2.110, 2019-07-08.

REFERENCE DRAWINGS

DWG No.	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DES	DRN	CHK	APP
00	2020 02 07	ISSUED FOR INFORMATION	LM	KVG	LM	JP

0 5,000 10,000 20,000 METRES

SCALE: 1:430,000

SNC·LAVALIN

CLIENT	PROJECT LOCATION
MERIT FUNCTIONAL FOODS	RM OF ROSSER

TITLE: FIRST NATIONS

DATE	DWG No.	FIG No.	REV
2019 09 18	667646-0000-4GDD-0010	3.5	00

SIZE 11x17

Path: \\SLI1653\Projects QMS\Merit Functional Foods\667646_EA Proposal\ Merit Pea Canola Protein Proc. Plant\40_Execution\45_GIS_Dwgs\4.5.1 GIS\667646-0000-4GDD-0010 First Nations_.mxd

3.3.2 Heritage Resources

3.3.2.1 Methods

A request for a heritage screening of the proposed project was submitted to The Historic Resources Branch (HRB) on 14 August 2019.

3.3.2.2 Results

The Manitoba Historic Resources Branch (HRB) examined the proposed area of disturbance in conjunction with their records and did not have any concerns (Appendix G).

4 Effects Assessment Approach

The effects assessment is focused on Valued Components (VCs), which are aspects of the natural and socio-economic environment that are valued because of their ecological, scientific, resource, socio-economic, cultural, health, or aesthetic importance and which have a potential to be adversely affected by the project. Effects were evaluated using a stepwise approach:

1. Characterization of the project;
2. Identification and characterization of VCs;
3. Characterization of potential interactions between the project and the VCs;
4. Design of mitigation measures to remove an interaction or limit effects. First and foremost, avoidance is the preferred mitigation measure. Where interactions cannot be avoided, mitigation measures focus on reducing potential effects. Compensation measures are considered where mitigation is not feasible;
5. Significance assessment of residual effects, which are effects that remain after implementation of mitigation measures. The significance of residual effects were evaluated by identifying each effect's direction, magnitude, spatial extent, duration, frequency, reversibility and likelihood of occurrence for the construction, operation, and decommissioning phases of the project; and
6. Monitoring of effects.

4.1 Characterization of the Project

A comprehensive project description is provided in **Section 2** to support the assessment of project effects. Based on the project description, the following list of project activities was compiled for the assessment of effects:

- Vegetation clearing, topsoil stripping, and earthworks;
- Construction, operation, and decommissioning of the processing plant;
- Use of water and power resources;
- Air emissions (e.g. noise, particulate matter, GHG); and
- Unplanned events / upset conditions.

4.2 Identification and Characterization of the VCs

Table 4.1 presents the VCs that were identified and considered during the effects assessment. A desktop review of existing data and data analysis was conducted for each VC (**Section 3**). Data collected can be used to compare future data from the site to estimate the level of project effects. Geographical Information System (GIS) technology plays a critical role in the environmental assessment process, hence, all spatial data was assessed using ESRI's ArcGIS Desktop software.

Table 4.1 Valued Components

Valued Component Category	Valued Component
Atmospheric environment	- Air quality - Sound quality - Climate (greenhouse gases)
Physical environment	- Groundwater quality - Water quality - Existing topography and drainage patterns - Soil capability to support agriculture / plant communities - Soil quality
Biological environment	- Wildlife and breeding birds - Native habitat - Species of Conservation Concern and Species at Risk
Human environment	- Land and resource use - Employment and economy - Heritage sites

4.3 Characterization of Interactions / Effects

Potential effects have been identified through technical expertise and professional judgement, review of literature and other publicly available environmental assessments, and stakeholder / regulatory engagement. The majority of project effects are likely to decrease as geographic distance from the disturbance increases.

4.4 Design of Mitigation Measures

Mitigation measures have been identified through technical expertise and professional judgement, review of literature and other publicly available environmental assessments, and stakeholder / regulatory engagement. Mitigation measures to avoid or reduce effects of the project were developed using a hierarchy of strategies: avoid, minimize, and offset / reclaim.

4.4.1 Avoid

The first and most effective mitigation strategy to circumvent effects is through avoidance. Spatial avoidance is achieved through project siting and temporal avoidance is achieved by limiting development during a particular time period to avoid impacts to certain ecosystems or species (e.g. bird nesting). Siting of the facility was the primary avoidance measure, where the site is located within previously cultivated land within an industrial business park.

4.4.2 Minimize

Several mitigation strategies aim to reduce the direction, magnitude, spatial extent, duration, frequency, reversibility and likelihood of project effects. As much as possible, mitigation will be built into project design.

4.4.3 Offset / Reclaim

Some residual effects may remain after implementation of avoidance and minimization measures. Offset and reclamation would aim to restore land use conditions similar to the surrounding environment after the project is complete. Reclamation strategies would include monitoring programs to ensure reclamation success.

4.5 Residual Effects

Residual effects are project effects that are predicted to remain after the implementation of mitigation measures. The significance of residual effects were evaluated by identifying a number of factors / criteria (i.e. direction, magnitude, spatial extent, duration, frequency, reversibility, and likelihood) for the construction, operation, and decommissioning phases of the project. Each criterion has a relative ranking scheme associated with it, as described in **Table 4.2**.

Table 4.2 Criterion for characterization of residual effects

Characterization	Description	Description of Categories
Direction	The nature of the effect on the environment	Positive Neutral Adverse
Magnitude	The magnitude or severity of change (varies depending on the VC)	Low Moderate High
Spatial Extent	The spatial extent in which the effect may occur	Immediate: limited to the project footprint Local: extends into the study area Regional: extends beyond the study area
Duration	The time until the residual effect can no longer be measured or otherwise perceived	Short-term: limited to construction Medium-term: occurs throughout operation Long-term: extends into decommissioning Permanent: continues beyond decommissioning and reclamation
Frequency	How often the residual effect occurs during the life of the project	Infrequent: occurs once Frequent: occurs periodically, either irregularly or regularly, over the duration of the project Continuous: occurs continuously over the duration of the project
Reversibility	The degree to which the effect is reversible after the project is complete	Reversible: will return to baseline conditions Irreversible: unlikely to return to baseline conditions
Likelihood	The likelihood that an adverse effect will occur	None Unlikely Likely Very likely

Based on the combination of the factor / criteria characterizing each residual effect, the residual effects were assigned a significance rating of Level 1, 2, or 3, where Levels 1 and 2 are considered not significant, and Level 3 effects are considered significant.

Residual effects are considered **not significant** if:

- **Level 1**: effects may be low in magnitude, immediate to local in extent, short-term to permanent in duration, infrequent to continuous in occurrence, reversible to irreversible in nature, and unlikely to very likely to occur.
- **Level 2**: effects may be low to moderate in magnitude, immediate to regional in extent, short-term to permanent in duration, infrequent to continuous in occurrence, reversible to irreversible in nature, and unlikely to very likely to occur.

Residual effects are considered **significant** if the effect is:

- **Level 3**: effects may be moderate to high in magnitude, regional in extent, long-term to permanent in duration, frequent to continuous in occurrence, likely irreversible in nature, and likely or very likely to occur.

Significant effects are those of sufficient magnitude, spatial extent, duration, frequency, irreversibility and likelihood to cause a change in the environment beyond an acceptable standard.

5 Potential Effects and Mitigation Measures

This chapter identifies potential environmental effects of the proposed project and mitigative measures to eliminate or reduce these effects.

5.1.1 Atmospheric Environment

5.1.1.1 Effects

Project activities associated with construction and operation have the potential to affect the atmospheric environment, including (**Section 2.7.4** and Appendix E):

- Dust, vehicle exhaust, and noise from heavy equipment and earthworks during construction.
- Emissions of particulate matter ($PM_{2.5}$, PM_{10}), CO, and NO_2 from boilers, dryers, heaters, and other processing equipment during operation, and potential exceedances of $PM_{2.5}$, PM_{10}, and NO_2.
- Fugitive emissions of dust during operation (i.e. unloading / loading).
- Vehicle exhaust emissions during operation.
- Water vapour emissions, which have the potential to cause surface fogging and icing.
- Emissions of greenhouse gases (16.8 kt/y for Phase 1 and 29.8 kt/y for Phase 2).
- Noise emissions during operation from vehicles, heavy equipment, unloading / loading or raw materials and products, and other general equipment use.

5.1.1.2 Mitigation

The following are mitigation and environmental design measures to minimize effects to the atmospheric environment (**Section 2.7.4** and Appendix E):

- The facility is located in an industrial park >1 km away from any sensitive receptors (e.g. residences, schools, etc.).
- Continue to implement best management practices (BMPs) during construction and operation to minimize air and noise emissions, which may include: the use of dust suppression (e.g. spraying roads with water); limiting speeds on unpaved roads; keeping vehicles / equipment properly maintained; keeping idling to a minimum; controlling fugitive dust emissions from stockpiled and exposed soils; and re-vegetation of disturbed areas as soon as practical where required.
- Continue to implement BMPs during construction and operation to protect workers and the public from noise emissions which may include: worker use of hearing protection as required; informing nearby residents of any significant noise-causing activities; and conducting high noise construction activities during daytime hours as much as possible.
- Activities will comply with the RM of Rosser Nuisance Noise By Law No. 7-14
- Air dispersion modelling was conducted to predict potential emissions, with a focus on emissions of particulate matter (PM, as PM_{10} and $PM_{2.5}$) and plume visibility (including potential surface fogging and icing). The modelling was conducted based on conservative assumptions (e.g. all PM is $PM_{2.5}$, particulates released at maximum levels, all NO is released as NO_2).
- The facility has been designed with numerous emission controls. With the exception of the boilers, baghouses will be used on all sources. The dryers will additionally use a cyclone paired with a baghouse (termed cyclofilter) to minimize PM emissions. The cyclones are effective at removing larger particulate from the exhaust stream. The baghouses that follow the cyclones will be effective at removing much of the remaining PM. All dryers are characterized with a maximum PM concentration in the exhaust of 5 mg/m^3 based on expectations provided by the equipment manufacturers. The baghouses in the milling room are also characterized with a 5 mg/m^3 limit. The boilers, including the dryer burners have

low NO_x burners and do not require further exhaust treatment as PM emissions are very low. Both the NO_x and the CO emission rates for the boilers and dryer burners were calculated using the United States Environmental Protection Agency (EPA) AP-42 Compilation of Emission Factors (US EPA 2006). The PM controls are considered to be best practice treatment for sources of this nature and the actual performance of the cyclofilters is expected to be better than 5 mg/m^3.

- The loadout area will be a covered structure open on either end for trucks to enter and exit. Raw peas and canola will be unloaded within a closed garage. The loading of by-products will also take place in a closed garage, where material will flow through a red wing nozzle to minimize dust. For these reasons, the loadout area is not expected to be a significant source of dust. Fugitive dust emissions from the movement of trucks throughout the property are also not expected to be significant, as a recycled asphalt material is planned to be used for the traffic areas.
- The majority if the processing equipment will be contained within a building which will minimize noise emissions from the process plant.
- Merit Foods will consult with the City of Winnipeg, who has jurisdiction over Brookside Blvd., to identify and implement any mitigation measures required with respect to surface icing (e.g. warning signage).
- A monitoring program will be developed to validate the model and will include (Section 6): stack sampling, monitoring of PM concentrations at the facility fenceline, visual monitoring of fog plumes, and monitoring of surface icing. Based on the results of the monitoring program, further mitigation measures will be implemented if required.

5.1.1.3 Residual effects

Potential effects will still exist after mitigation, hence residual effects include:

- Dust, vehicle exhaust, and noise from heavy equipment and earthworks during construction.
- Emissions of particulate matter ($PM_{2.5}$, PM_{10}), CO, and NO_2 from boilers, dryers, heaters, and other processing equipment during operation, and potential exceedances of $PM_{2.5}$, PM_{10}, and NO_2.
- Fugitive emissions of dust during operation (i.e. unloading / loading).
- Water vapour emissions, which have the potential to cause surface fogging and icing.
- Emissions of greenhouse gases (16.8 kt/y for Phase 1 and 29.8 kt/y for Phase 2).

5.1.2 Physical Environment

5.1.2.1 Hydrogeological Environment

5.1.2.1.1 Effects

Project activities associated with construction and operation have the potential to affect the hydrogeological environment, including:

- An unplanned release / spill during construction or operation has the potential to affect groundwater.

5.1.2.1.2 Mitigation

Mitigation and environmental design measures for an unplanned release / spill are described in **Section 4.1.8.2**.

5.1.2.1.3 Residual effects

No residual effects to the hydrogeological environment are anticipated.

5.1.2.2 Hydrological Environment

5.1.2.2.1 Effects

Project activities associated with construction and operation have the potential to affect the hydrologic environment, including:

Water requirements will be approximately 350,000 L/day of water for Phase 1 and approximately 800,000 L/day for Phase 2. The water will be obtained from the Cartier Regional Water Co-op. Water recycle is included in the process design

- Grading of the site may affect local runoff.
- Potential sedimentation and contaminants in site runoff.
- Use and production of approximately 350,000 L/day of water / wastewater for Phase 1 and approximately 800,000 L/day water / wastewater for Phase 2.

5.1.2.2.2 Mitigation

The following are mitigation and environmental design measures to minimize effects to the hydrological environment:

- During construction, BMPs will continue to be implemented to prevent contaminants in site runoff. During dewatering, any water discharged to the drainage ditch was pumped through filter fabric. Washout bins are being used during construction for concrete trucks and pumps to ensure wash out water does not contaminate the surrounding land / water, and wash water will be disposed at an approved location.
- The site is graded with a site runoff / ditch system that complies with RM of Rosser By-law No. 2-17 for the protection of the surface water drainage system for CentrePort Canada lands.
- Water recycle is included in the process design to reduce water usage and wastewater discharge.
- The Cartier Regional Water Co-op has capacity to supply water to the project, and the RM of Rosser and North End Plant have the capacity to receive the wastewater.
- During operation no wastewater will be discharged to the environment. Merit Foods has an agreement in place with the RM of Rosser to discharge water to their wastewater distribution system, which will ultimately be discharged to the City of Winnipeg's wastewater treatment system.

5.1.2.2.3 Residual effects

Residual effects to the hydrological environment include use of water, production of wastewater, and effects to local runoff from site grading.

5.1.2.3 Terrain and Soils

5.1.2.3.1 Effects

Project activities associated with construction and operation have the potential to affect terrain and soils, including:

- The disturbance to approximately 3.43 ha of land, which may include the following effects to soils: grading and removal of topsoil; soil compaction / mixing from heavy equipment traffic; and soil loss from erosion due to wind and precipitation / runoff during construction.

5.1.2.3.2 Mitigation

The following are mitigation and environmental design measures to minimize effects to terrain and soils:

- The project was sited on previously cultivated land to minimize effects to terrain and soils.
- Continue to implement BMPs for construction during preparation, stripping, storage, backfill and reclamation of soils including: topsoil management, limiting disturbed areas, limiting construction during extensive precipitation, erosion and sediment control and re-vegetation of disturbed areas as soon as practical.

5.1.2.3.3 Residual effects

Residual effects include removal and / or compaction of topsoil and grading of up to 3.43 ha of land.

5.1.3 Biological Environment

5.1.3.1 Effects

Project activities associated with construction and operation have the potential to affect the biological environment, including:

- Construction has the potential to facilitate the spread of weedy and / or invasive plant species.
- Clearing of the site has the potential to affect wildlife and wildlife habitat and vegetation, including rare species.
- Potential destruction / damage to migratory bird nests during construction. Migratory birds and their eggs are protected under the *Migratory Birds Convention Act, 1994* and *The [Manitoba] Wildlife Act*. ECCC (2019d) and the Manitoba Conservation Data Centre (MBCDC 2015) recommend scheduling disruptive activities outside of the migratory bird nesting period. This period occurs between mid-April and late-August within the project area.
- Injury to wildlife and birds accessing the site during operation.

5.1.3.2 Mitigation

The following are mitigation and environmental design measures to minimize effects to the biological environment:

- The project was sited on previously cultivated land to minimize effects to the biological environment.
- Implement BMPs to minimize the spread of weedy and / or invasive species, which may include requiring equipment to arrive at site clean and clear of soil, and management of weeds on-site.
- A search of the Manitoba Conservation Data Centre did not identify any rare species within the project footprint (Appendix G).
- Implement BMPs to manage wildlife as required which may include: speed limits, management of attractants, fencing, documentation of wildlife sightings, etc.
- Construction activity commenced in September 2019, outside of the general nesting season for migratory birds. If bird nesting becomes problematic during ongoing construction and / or operation, Merit Foods will implement BMPs to minimize effects to birds which may include: installation of bird deterrent equipment, setbacks around active nests, and removal of inactive nests outside of bird season. Any bird deterrent and management measures would be conducted in accordance with the *Migratory Birds Convention Act, 1994.*

5.1.3.3 Residual effects

Residual effects to the biological environment are expected to include the potential for the spread of weedy and / or invasive species.

5.1.4 Human Environment

5.1.4.1 Socio-economic

5.1.4.1.1 Effects

Project activities associated with construction and operation have the potential to affect the socio-economic environment, including:

- The project is expected to provide economic benefits, through the creation of jobs and generation of financial revenue for the RM and province through various types of taxes.
- The project will contribute to increased traffic along Brookside Blvd. and Farmer Rd.
- Air emissions, including fog, have the potential to affect quality of life in the vicinity of the plant.

5.1.4.1.2 Mitigation

The following are mitigation and environmental design measures to minimize effects to the socio-economic environment:

- Ongoing engagement with stakeholders will continue to identify their project concerns and allow Merit Foods to resolve concerns effectively.
- Scheduling of two to three shifts per day and including overlapping shifts several days per week such that traffic is not all concentrated at peak traffic times.
- Implementation of mitigations for air emissions as described in **Section 5.1.2**.

5.1.4.1.3 Residual effects

Adverse residual effects to the socio-economic environment may include increased traffic and air emissions.

5.1.4.2 Heritage Resources

5.1.4.2.1 Effects

Project activities associated with construction and operation have the potential to affect heritage resources, where:

- Unknown heritage resources could be affected during construction.

5.1.4.2.2 Mitigation

Mitigation and environmental design measures to minimize effects to heritage resources include:

- The HRB examined the proposed area of disturbance in conjunction with their records and did not have any concerns with the project at its proposed location (Appendix G).
- In the event that archaeological, historical or paleontological resources are discovered during construction, work that could affect the potential resource will cease until a heritage resource management strategy is developed.

5.1.4.2.3 Residual effects

No residual effects to heritage resources are anticipated.

5.1.5 Unplanned Events and Upset Conditions

5.1.5.1 Effects

Project activities associated with construction and operation have the potential to result in unplanned events and upset conditions that could affect the environment, including:

- An unplanned release / spill during construction or operation has the potential to affect soils, near surface groundwater, surface water, biological resources, and human health.
- An unplanned fire / explosion / vehicular accident has the potential to harm workers, cause equipment damage, and lead to a release / spill.
- Severe weather, including high winds, heavy precipitation and storm events, has the potential to affect the project during construction and operation. It may affect material placement / compaction, grading, re-vegetation, result in erosion and / or dust, and / or damage site infrastructure.
- There is potential for health and safety accidents during construction or operation.

5.1.5.2 Mitigation

The following are mitigation and environmental design measures to minimize effects from unplanned events and upset conditions:

- Develop an Emergency Response Plan to respond to all emergencies on site, including spill prevention and response. Workers will be trained in the plan and there will be adequately sized onsite spill kits to manage any spills that may occur. Any reportable spills of a hazardous substance will be cleaned up and reported to the Manitoba Conservation and Climate (MCC) Environmental Emergency line at 204-944-4888.
- There will be a materials storage, handling, and waste management plan during operation to ensure fuels, oils, and hazardous materials are stored, handled, and disposed of in a safe manner that is compliant with applicable legislation.
- Health and safety measures will be developed in accordance with applicable legislation and industry standards, including , including *The Workplace Safety and Health Act* and the Workplace Safety and Health Regulation (**Section 2.8**).
- The facility will be designed in accordance with applicable codes and regulations.

5.1.5.3 Residual effects

No residual effects from unplanned events and upset conditions are anticipated.

5.1.6 Summary of Effects, Mitigation Measures, Residual Effects, and Commitments

A summary of the potential environmental effects and mitigation and environmental design measures to minimize or eliminate effects, as well as identification of residual effects, is included as **Table 5.1**. A commitments register was developed that summarizes the commitments by Merit Foods to execute the project in accordance with the proposed mitigation measures (**Table 5.2**).

5.2 Significance of Residual Effects

All residual effects are assessed for significance in **Table 5.3**. No significance has been established for neutral or positive effects. The assessment indicates the project is anticipated to have no significant residual effects.

Table 5.1 Potential project effects, mitigation measures, and residual effects

Phase: Construction	Phase: Operation	Phase: Decommissioning	Project Activity / Component	Potential Environmental Effects	Environmental Design and Mitigation Measures	Residual Effects
X			Vegetation clearing, topsoil stripping, and earthworks	› Grading of the site may affect local runoff. › Potential sedimentation and contaminants in site runoff. › The disturbance to approximately 3.43 ha of land, which may include the following effects to soils: grading and removal of topsoil; soil compaction / mixing from heavy equipment traffic; and soil loss from erosion due to wind and precipitation / runoff during construction. › Spread of weedy and / or invasive plant species, › Clearing of the site has the potential to affect wildlife and wildlife habitat and vegetation, including rare species. › Potential destruction / damage to migratory bird nests during construction. › Unknown heritage resources could be affected during construction.	› During construction, BMPs will continue to be implemented to prevent contaminants in site runoff. During dewatering, any water discharged to the drainage ditch was pumped through filter fabric. Washout bins are being used during construction for concrete trucks and pumps to ensure wash out water does not contaminate the surrounding land / water, and wash water will be disposed at an approved location. › The site is graded with a site runoff / ditch system that complies with RM of Rosser By-law No. 2-17. › The project was sited on previously cultivated land to minimize effects to the biophysical environment. › Continue to implement BMPs for construction during preparation, stripping, storage, backfill and reclamation of soils including: topsoil management, limiting disturbed areas, limiting construction during extensive precipitation, erosion and sediment control and re-vegetation of disturbed areas as soon as practical. › Implement BMPs to minimize the spread of weedy and / or invasive species, which may include requiring equipment to arrive at site clean and clear of soil, and management of weeds on-site. › Implement BMPs to manage wildlife as required which may include: speed limits, management of attractants, fencing, documentation of wildlife sightings, etc. › Construction activity commenced in September 2019, outside of the general nesting season for migratory birds. If bird nesting becomes problematic during ongoing construction and / or operation, Merit Foods will implement BMPs to minimize effects to birds which may include: installation of bird deterrent equipment, setbacks around active nests, and removal of inactive nests outside of bird season. Any bird deterrent and management measures would be conducted in accordance with the *Migratory Birds Convention Act, 1994*. › In the event that archaeological, historical or paleontological resources are discovered during construction, work that could affect the potential resource will cease until a heritage resource management strategy is developed.	› Affects to local runoff from site grading. › Removal and / or compaction of topsoil and grading of up to 3.43 ha of land.
X	X	X	Construction, operation, and decommissioning of the processing plant	› Injury to wildlife and birds accessing the site during operation. › The project will contribute to increased traffic along Brookside Blvd. and Farmer Rd.	› Implement BMPs to manage wildlife as required which may include: speed limits, management of attractants, fencing, documentation of wildlife sightings, etc. › Implement BMPs to minimize effects to birds which may include: installation of bird deterrent equipment, setbacks around active nests, and removal of inactive nests outside of bird season. › Ongoing engagement with stakeholders will continue to identify their project concerns and allow Merit Foods to resolve concerns effectively. › Scheduling of two to three shifts per day and including overlapping shifts several days per week such that traffic is not all concentrated at peak traffic times.	› Increased traffic.
X	X	X	Use of water and power resources	› Use and production of approximately 350,000 L/day of water / wastewater for Phase 1 and approximately 800,000 L/day water / wastewater for Phase 2.	› Water recycle is included in the process design to reduce water usage and effluent discharge › The Cartier Regional Water Co-op has capacity to supply water to the project, and the RM of Rosser and North End Plant have the capacity to receive the wastewater. Merit Foods has an agreement in place with the RM of Rosser to discharge water to their wastewater distribution system › During operation no wastewater will be discharged to the environment.	› Use of water and production of wastewater.
X	X	X	Air emissions (noise, particulate matter, GHG)	› Dust, vehicle exhaust, and noise from heavy equipment and earthworks during construction. › Emissions of particulate matter ($PM_{2.5}$, PM_{10}), CO, and NO_2 from boilers, dryers, heaters, and other processing	› The facility is located in an industrial park >1 km away from any sensitive receptors (e.g. residences, schools, etc.). › Continue to implement best management practices (BMPs) during construction and operation to minimize air and noise emissions, which may include: the use of dust suppression (e.g. spraying roads with water); limiting speeds on unpaved roads; keeping vehicles / equipment properly maintained; keeping idling to a minimum; controlling fugitive dust emissions from stockpiled and exposed soils; and re-vegetation of disturbed areas as soon as practical where required.	› Emissions of particulate matter during operation.

Phase			Project Activity / Component	Potential Environmental Effects	Environmental Design and Mitigation Measures	Residual Effects
				equipment during operation, and potential exceedances of $PM_{2.5}$, PM_{10}, and NO_2. › Fugitive emissions of dust during operation (i.e. unloading / loading). › Vehicle exhaust emissions during operation. › Water vapour emissions, which have the potential to cause surface fogging and icing. › Emissions of greenhouse gases. › Noise emissions during operation from vehicles, heavy equipment, unloading / loading or raw materials and products, and other general equipment use.	› Continue to implement best management practices (BMPs) during construction and operation to protect workers and the public from noise emissions which may include: worker use of hearing protection as required; informing nearby residents of any significant noise-causing activities; and conducting high noise construction activities during daytime hours as much as possible. › Activities will comply with the RM of Rosser Nuisance Noise By Law No. 7-14 › Air dispersion modelling was conducted to predict potential emissions, with a focus on emissions of particulate matter and plume visibility. The modelling was conducted based on conservative assumptions. › The facility has been designed with numerous emission controls. With the exception of the boilers, baghouses will be used on all sources. The dryers will additionally use a cyclone paired with a baghouse (termed cyclofilter) to minimize PM emissions. The cyclones are effective at removing larger particulate from the exhaust stream. The baghouses that follow the cyclones will be effective at removing much of the remaining PM. All dryers are characterized with a maximum PM concentration in the exhaust of 5 mg/m^3 based on expectations provided by the equipment manufacturers. The baghouses in the milling room are also characterized with a 5 mg/m^3 limit. The boilers, including the dryer burners have low NOx burners and do not require further exhaust treatment as PM emissions are very low. Both the NOx and the CO emission rates for the boilers and dryer burners were calculated using US EPA (2006). The PM controls are considered to be best practice treatment for sources of this nature and the actual performance of the cyclofilters is expected to be better than 5 mg/m^3. › The loadout area will be a covered structure open on either end for trucks to enter and exit. Raw peas and canola will be unloaded within a closed garage. The loading of by-products will also take place in a closed garage, where material will flow through a red wing nozzle to minimize dust. For these reasons, the loadout area is not expected to be a significant source of dust. Fugitive dust emissions from the movement of trucks throughout the property are also not expected to be significant, as a recycled asphalt material is planned to be used for the traffic areas. › The majority if the processing equipment will be contained within a building which will minimize noise emissions from the process plant. › Consult with the City of Winnipeg, who has jurisdiction over Brookside Blvd., to identify and implement any mitigation measures required with respect to surface icing (e.g. warning signage). › A monitoring program will be developed to validate the model and will include: stack sampling, monitoring of PM concentrations at the facility fenceline, visual monitoring of fog plumes, and monitoring of surface icing. Based on the results of the monitoring program, further mitigation measures will be implemented if required. › Ongoing engagement with stakeholders will continue to identify their project concerns and allow Merit Foods to resolve concerns effectively.	› Surface fogging / icing during operation.
X	X	X	Unplanned events / upset conditions	› An unplanned release / spill during construction or operation has the potential to affect soils, near surface groundwater, surface water, biological resources, and human health. › An unplanned fire / explosion / vehicular accident has the potential to harm workers, cause equipment damage, and lead to a release / spill. › Severe weather, including high winds, heavy precipitation and storm events, has the potential to affect the project during construction and operation. It may affect material placement / compaction, grading, re-vegetation, result in erosion and / or dust, and / or damage site infrastructure. › There is potential for health and safety accidents during construction or operation.	› Develop an Emergency Response Plan to respond to all emergencies on site, including spill prevention and response. Workers will be trained in the plan and there will be adequately-sized onsite spill kits to manage any spills that may occur. Any reportable spills of a hazardous substance will be cleaned up and reported to the Manitoba Conservation and Climate (MCC) Environmental Emergency line at 204-944-4888. › There will be a materials storage, handling, and waste management plan during operation to ensure fuels, oils, and hazardous materials are stored, handled, and disposed of in a safe manner that is compliant with applicable legislation. › Health and safety measures will be developed in accordance with applicable legislation and industry standards, including , including The Workplace Safety and Health Act and the Workplace Safety and Health Regulation (Section 2.8). › The facility will be designed in accordance with applicable codes and regulations.	› n/a

Table 5.2 Commitments register for monitoring and mitigation measures

Phase					
Planning / Design	Construction	Operation	Decommissioning	Description	Reference Section
X	X	X	X	Obtain all federal, provincial, and municipal permits required for construction, operation, and decommissioning of the project	1.3
X	X	X	X	Continue to engage with the RM of Rosser and affected stakeholders throughout the life of the project	1.4, 5.1.4
X	X			Design and construct the facility in accordance with applicable codes and regulations	2, 5.1.5
	X	X		Utilize spill containment for storage tanks containing hazardous materials	2.5.1
		X		Operate a pre-treatment process to ensure pH requirements are met prior to wastewater discharge and monitor the wastewater stream	2.7.1
	X	X		Develop a site runoff / ditch system that compiles with RM of Rosser By-law No. 2-17	2.7.2, 5.1.2.2
	X	X	X	Manage solid waste in accordance with applicable legislation	2.7.3
		X		Develop a monitoring system to validate the air emission modelling and implement additional mitigation measures if required. Due to the phased nature of the project, monitoring during Phase 1 of the project can support any necessary changes to Phase 2	2.7.4, 5.1.1, 5.1.4, 6
X	X	X	X	Conduct all work in accordance with provincial health & safety legislation	2.8, 5.1.5
X	X	X	X	Develop an Emergency Response Plan to respond to all emergencies on site, including spill prevention and response. Workers will be oriented in the procedure.	2.8, 5.1.5
		X	X	Conduct decommissioning and reclamation in accordance with applicable legislation	2.11
	X	X		Implement BMPs during construction and operation to mitigate air and noise emissions	5.1.1, 5.1.4
	X	X		Comply with the RM of Rosser Nuisance Noise By-Law No. 7-14	5.1.1
X	X	X		Design, construct, and operate the facility with air emission controls	5.1.1
X	X	X		Consult with the City of Winnipeg to identify and implement any mitigation measures required with respect to surface icing	5.1.1
	X			Implement BMPs during construction to prevent contaminants in site runoff	5.1.2.2
	X		X	Continue to implement BMPs for construction during preparation, stripping, storage, backfill and reclamation of soils	5.1.2.3
				Implement BMPs to minimize the spread of weedy and / or invasive specie	5.1.3
				Implement BMPs to manage wildlife as required	5.1.3
	X	X		If bird nesting becomes problematic during ongoing construction and / or operation, implement BMPs to minimize effects to birds	5.1.3
	X			In the event that archaeological, historical or paleontological resources are discovered during construction, work that could affect the potential resource will cease until a heritage resource management strategy is developed	5.1.4.2
	X	X	X	Any reportable spills of a hazardous substance will be cleaned up and reported to the Manitoba Conservation and Climate (MCC) Environmental Emergency line at 204-944-4888	5.1.5

Phase					
Planning / Design	Construction	Operation	Decommissioning	Description	Reference Section
	X	X	X	There will be a materials storage, handling, and waste management plan to ensure fuels, oils, and hazardous materials are stored, handled, and disposed of in a safe manner that is compliant with applicable legislation	5.1.5

Table 5.3 Residual effects significance characterization

Project Activity	Residual Effect	Direction	Magnitude	Spatial Extent	Duration	Frequency	Reversibility	Likelihood	Significance Level	Significant (Y/N)
Vegetation clearing, topsoil stripping, and earthworks	Removal of topsoil and / or compaction of up to of 3.4.3 ha of land	adverse	low	immediate	long-term	continuous	reversible	very likely	1	N
	Changes to local runoff	adverse	low	local	long-term	continuous	reversible	very likely	1	N
	Spread of weedy and / or invasive species	adverse	low	local	long-term	frequent	reversible	likely	1	N
Construction, operation, and decommissioning of the processing plant	Increased traffic	adverse	low	local	long-term	frequent	reversible	very likely	1	N
Use of water and power resources	Use of water	adverse	moderate	regional	long-term	continuous	irreversible	very likely	2	N
	Production of wastewater	adverse	moderate	regional	long-term	continuous	irreversible	very likely	2	N
Air emissions (e.g. noise, particulate matter, GHG)	Air and noise emissions during construction	adverse	low	local	short-term	infrequent	irreversible	very likely	1	N
	Emissions of particulate matter during operation	adverse	low	local	long-term	frequent	irreversible	very likely	1	N
	Surface fogging / icing during operation	adverse	low	regional	long-term	frequent	irreversible	very likely	2	N
	Greenhouse gas emissions	adverse	low	regional	long-term	frequent	irreversible	very likely	2	N

6 Environmental Monitoring

An environmental monitoring plan for the Merit Pea Canola Processing Plant will be developed. Monitoring will include:

- Stack sampling in accordance with MCC's (1996) Interim Stack Sampling Performance Protocol or other methodology approved by MCC. The sampling will confirm the maximum flow rates and the concentrations of contaminants;
- $PM_{2.5}$ monitoring at the facility fenceline;
- Visual monitoring of fog plumes; and
- Monitoring of surface ice on Brookside Blvd. during the winter months.

Due to the phased nature of the project, monitoring during Phase 1 of the project can support any necessary changes to Phase 2.

7 Closure

This Environment Act Proposal has been prepared by SNC-Lavalin Inc. on behalf of the Merit Functional Foods Corporation for submission to the Environmental Approvals Branch of Manitoba Conservation and Climate

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