

3. Scope of the Assessment

To assess the potential environmental impact of the proposed Project, spatial and temporal boundaries were defined as follows:

3.1 Temporal Boundaries

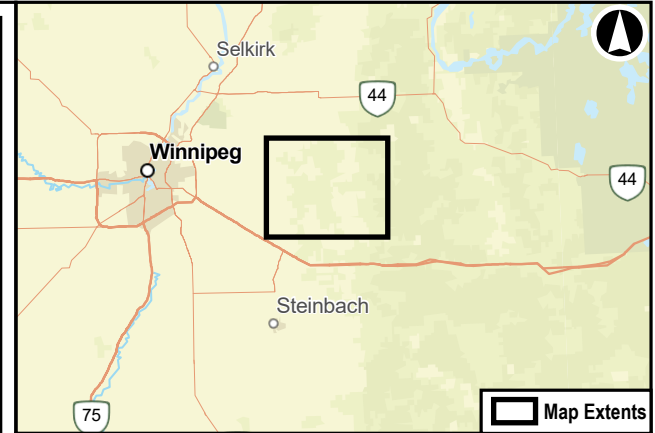
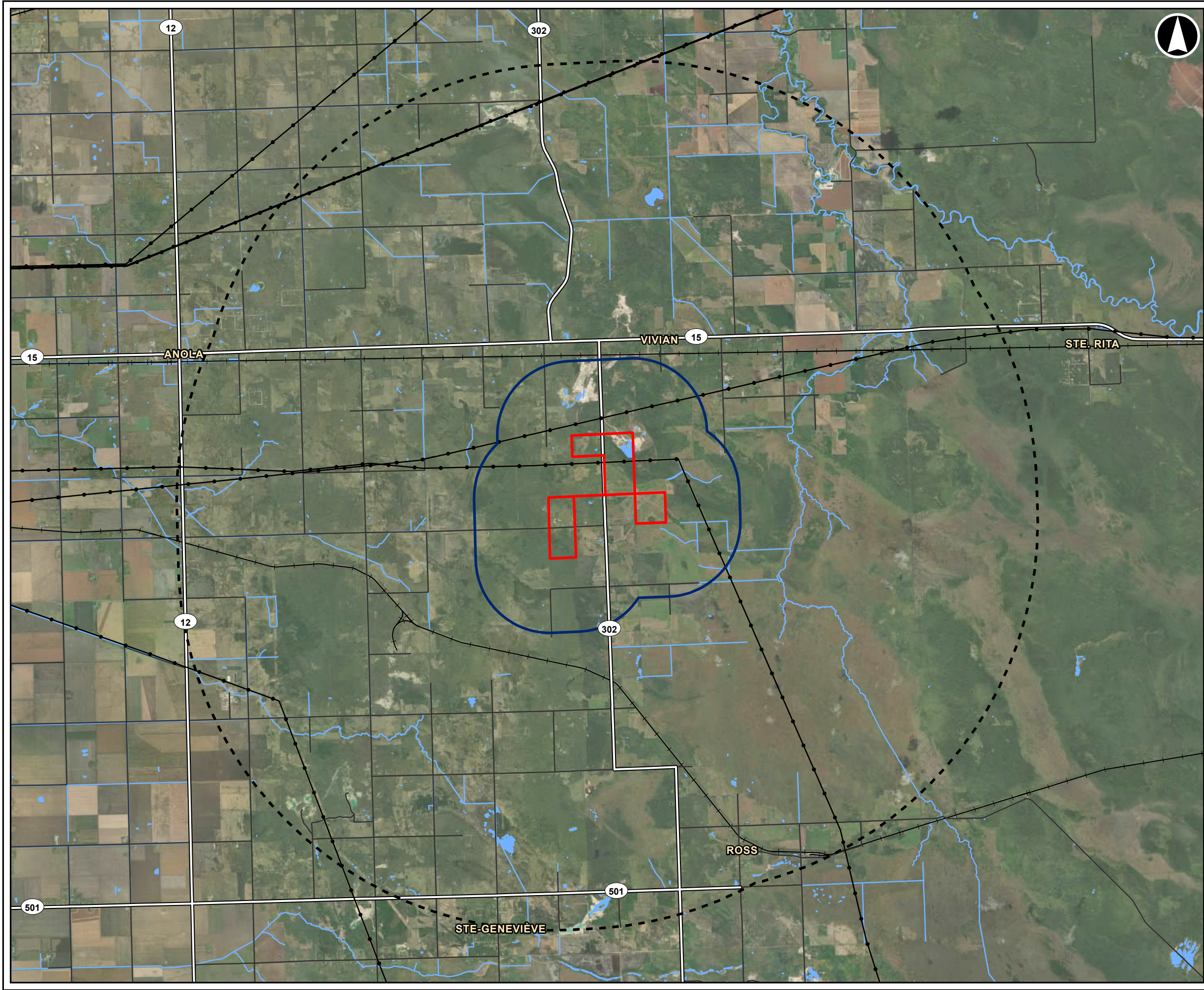
The temporal boundaries of the assessment are divided as follows:

- **Construction Phase:** Includes clearing for, and establishment of temporary drill rig access trails, well cluster areas, drilling of extraction wells, construction / placement of slurry lines and water return lines, and associated pumping stations.
 - Q1 2026 - 2030
- **Operation Phase** – Includes pumping of sand and water slurry via slurry lines to the sand Processing Facility and immediate return of UV treated groundwater to the aquifer at the extraction site.
 - Q2 2026 - 2030
- **Decommissioning and Closure Phase:**
 - Q4 2026 - 2030: Annual progressive (sequential) sealing of extraction wells (**Section 2.2.6**), decommissioning of slurry line and pumping stations, rehabilitation of well clusters and other temporarily disturbed areas (access trails, slurry line and water return line trails, pumping station areas). All Project components and disturbed areas will be decommissioned and rehabilitated in accordance with a regulator-approved Closure Plan (**Section 7.13**).

3.2 Spatial Boundaries

Spatial boundaries used for the assessment are described below and shown in **Figure 3-1**. However, where specifically noted, the boundaries may be adjusted to suit the Environmental Component (EC) or Social Component (SC) affected.

- **Project Site** – includes the Project footprint, which is the area that will encompass the land on which Project components are located, and immediate surrounding area that will be directly affected by the Project. For the purpose of this environmental assessment, the Project footprint has been determined for the operation years 2026 to 2030 as per the temporal scope of this Environment Act Proposal described in **Section 3.1**.
- **Local Project Area** – is comprised of an area 2 km beyond the Project Site, which is intended to take into account the majority of direct and indirect effects of the Project on ECs (such as wildlife habitat loss related to vegetation clearing and noise; temporary groundwater drawdown effects). The Local Project Area extent for project effects on SCs includes the RM of Springfield, within which Project related activities will occur.
- **Regional Project Area** – is comprised of an area up to 10 km beyond the Project Site which is intended to account for the maximum spatial extent of potential effects of the Project unless otherwise indicated.



Legend

- Project Site Boundary
- Local Project Area
- Regional Project Area

General Features

- Highway
- Road
- Railway
- Transmission Line
- Watercourse
- Waterbody

Notes:

- The spatial boundaries may be adjusted to suit the Environmental Component (EC) or Social Component (SC) affected.
- See Figure 4-8 for information on Local Project Area land use, and Figure 4-9 for the RM of Springfield Development Plan Designations.

**SIO SILICA CORPORATION
ENVIRONMENT ACT PROPOSAL**

**SPATIAL BOUNDARIES FOR THE
ENVIRONMENTAL IMPACT ASSESSMENT**

0 1 2 3 4
Kilometres

Datum: NAD 1983 UTM Zone 14N

May, 2024	PN#: 60730241	1:100,000 * when printed 11"x17"
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Figure 3-1

AECOM

Data Sources: MLI, Manitoba Forest Resource Inventory, NRCan - Canvec, Esri Canada, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NRCan, Parks Canada, Earthstar Geographics

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3.3 Biophysical and Socioeconomic Components

In accordance with the Manitoba Sustainable Development 'Information Bulletin – Environment Act Proposal Report Guidelines' (Manitoba Government 2023), the scope of the environmental assessment has included potential Project effects on the:

- Biophysical environment including:
 - Wildlife, fisheries, surface water, groundwater and forestry resources
- Impact of such effects on the socioeconomic environment including:
 - Human health and safety
 - Potential impacts on Indigenous communities such as resource use and cultural or traditional activities

Environmental assessment methods, including a specific list of the environmental components included within this assessment due to the potential for interactions with the Project, are described in **Section 6.1**.

4. Existing Environment

Baseline information regarding the Local and Regional Project Areas was gathered using:

- Available desktop information
- Environmental studies that overlapped with Project Local and Regional Areas from 2018 to 2020:
 - Spring auditory amphibian survey (May 2018) focused on wetland areas
 - Baseline noise data (May and August 2018)
 - Summer vegetation survey (June 2018) in representative vegetation communities
 - Fall vegetation survey (September and October 2018) with additional emphasis on wetland areas
 - Fish and fish habitat survey (Milani, 2013)

4.1 Physical Environment

4.1.1 Physical Setting

The physiographical location of the Project can be described using the Ecological Land Classification (ELC) system, used for overseeing ecological resources within Canada in a geographical representation. The Project is categorized as being within the following subsets of the ELC, which are also illustrated in **Figure 4-1**:

- **Boreal Plain Ecozone**, which encompasses the;
- **Interlake Plain Ecoregion**, which contains the;
- **Steinbach Ecodistrict** within which the Project is located.

The Steinbach Ecodistrict has an annual average temperature of 2.4°C and annual precipitation is approximately 510 mm, of which approximately 410mm as snow (Smith, et al., 1998). Summers are typically short and warm, with winters being long and cold. Vegetation within the Steinbach Ecodistrict is dominated primarily by trembling aspen and some balsam poplar, with willow and red-osier dogwood being typically understory shrub species (Smith, et al., 1998). A substantial area of the Ecodistrict is cultivated for agricultural use (Smith, et al., 1998).

4.1.2 Geology/Topography

The topography of the Steinbach Ecodistrict can be described as smooth relief with gentle slopes that range from level to 5% (Smith et al., 1998). These slopes are characteristic of glaciolacustrine plain and gently undulating glacial till and glaciofluvial terraced plain (Smith et al., 1998). The topography of this Ecodistrict slopes at approximately 1.0 m per km northwestward towards the Red River. Changes in topography have been noted in areas where sandy and ridged terraces occur (Smith et al., 1998).

Topography elevations in the Project Site and surrounding area are illustrated in **Figure 4-2** and in Figure 5-1 of **Appendix B**. Within the Project Site, elevations range from 269 masl in the east to 280 masl in the northwest.

Within the Project Site, the geological stratigraphy is consistent with major geologic units consisting of Quaternary sediments, carbonate and shale intervals of the Red River Formation, unconsolidated sand, sandstone and shale of the Winnipeg Formation and Archean-age granitoid basement (Figure 5-4 to Figure 5-8 of **Appendix B**). The unconsolidated sand interval of the Winnipeg Formation, which is known as the Carman Sand Member, is the target interval for this Project (Ferguson and Grasby, 2007).



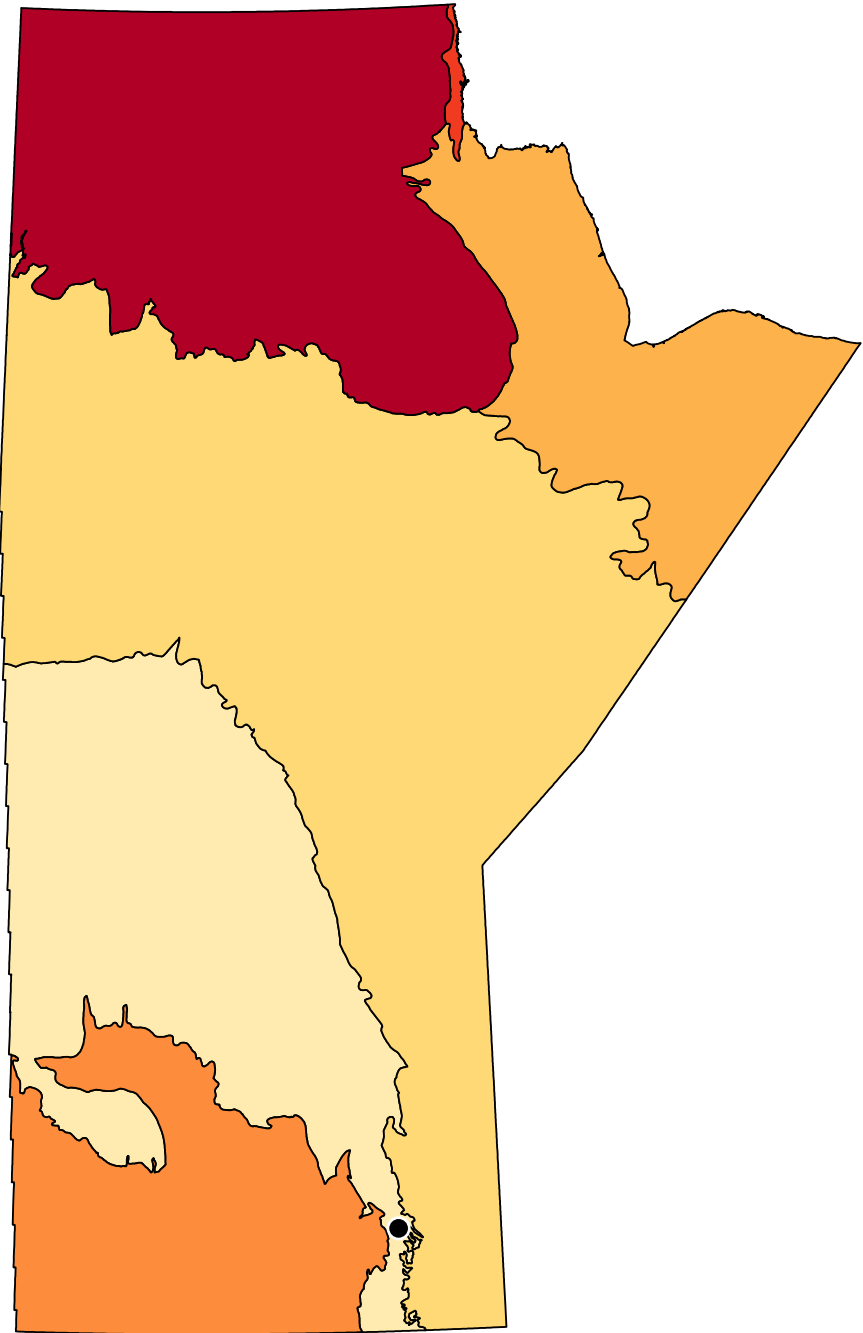
Legend

- Project Site Location
- Ecozone Name**
 - Boreal Plain
 - Boreal Shield
 - Hudson Plain
 - Prairie
 - Southern Arctic
 - Taiga Shield

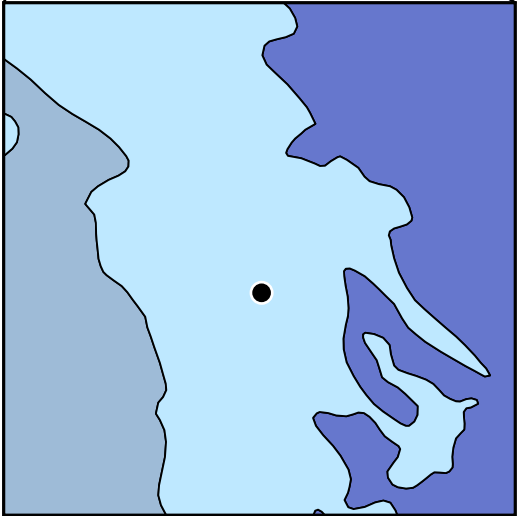
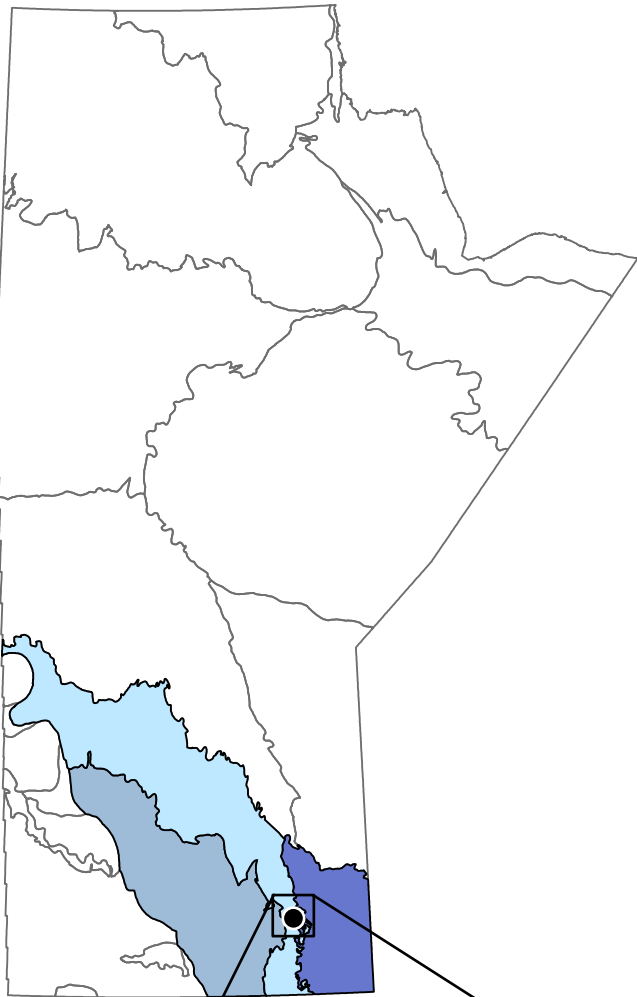
- Ecoregion Name**
 - Interlake Plain
 - Lake Manitoba Plain
 - Lake of the Woods
 - Other Ecoregions

- Ecodistrict Name**
 - Gimli
 - Stead
 - Steinbach
 - Winnipeg
 - Other Ecodistricts

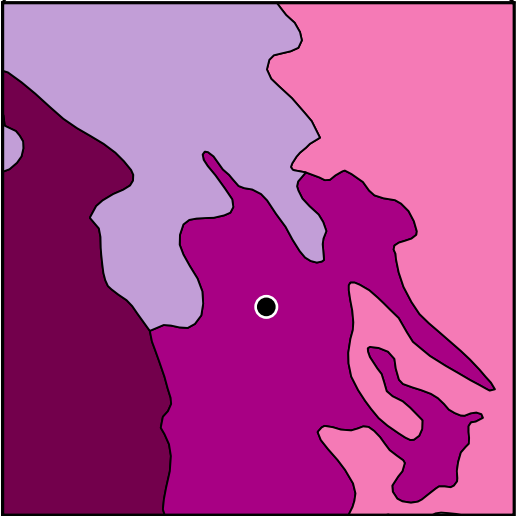
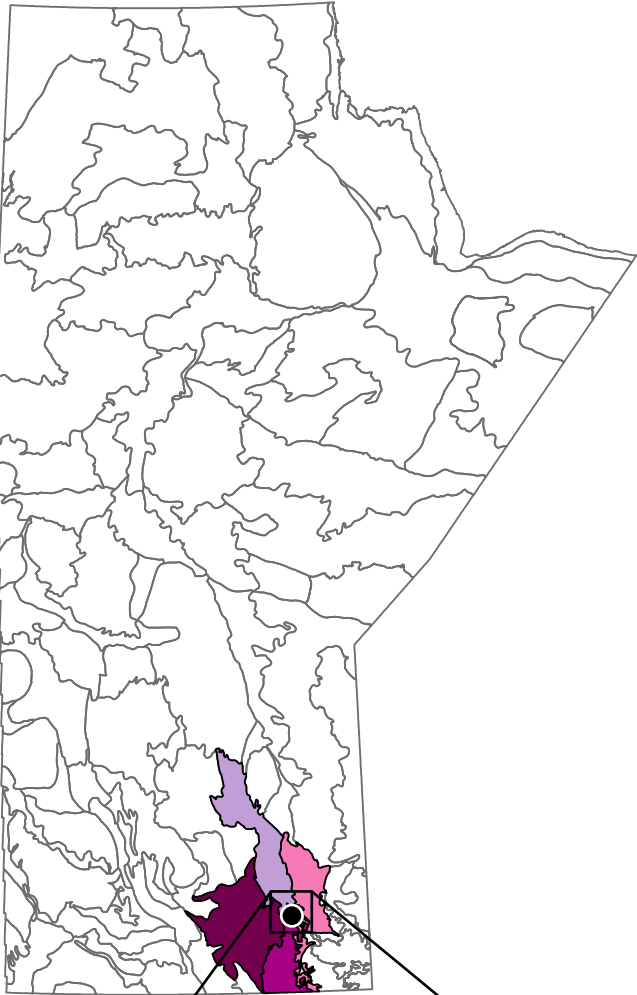
ECOZONES



ECOREGIONS



ECODISTRICTS



SIO SILICA CORPORATION
ENVIRONMENT ACT PROPOSAL

PHYSIOGRAPHIC SETTING

Datum: NAD 1983 UTM Zone 14N

May, 2024

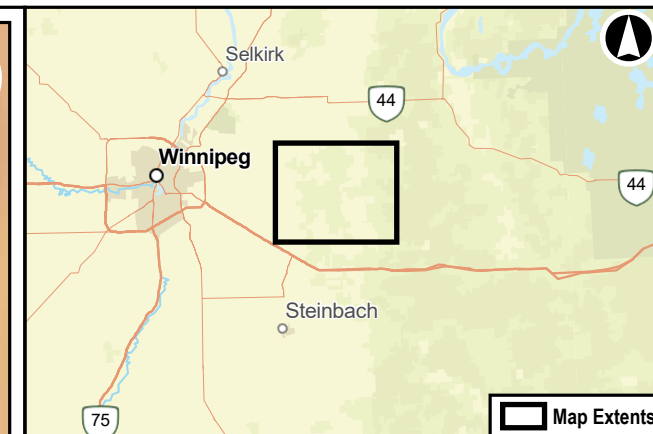
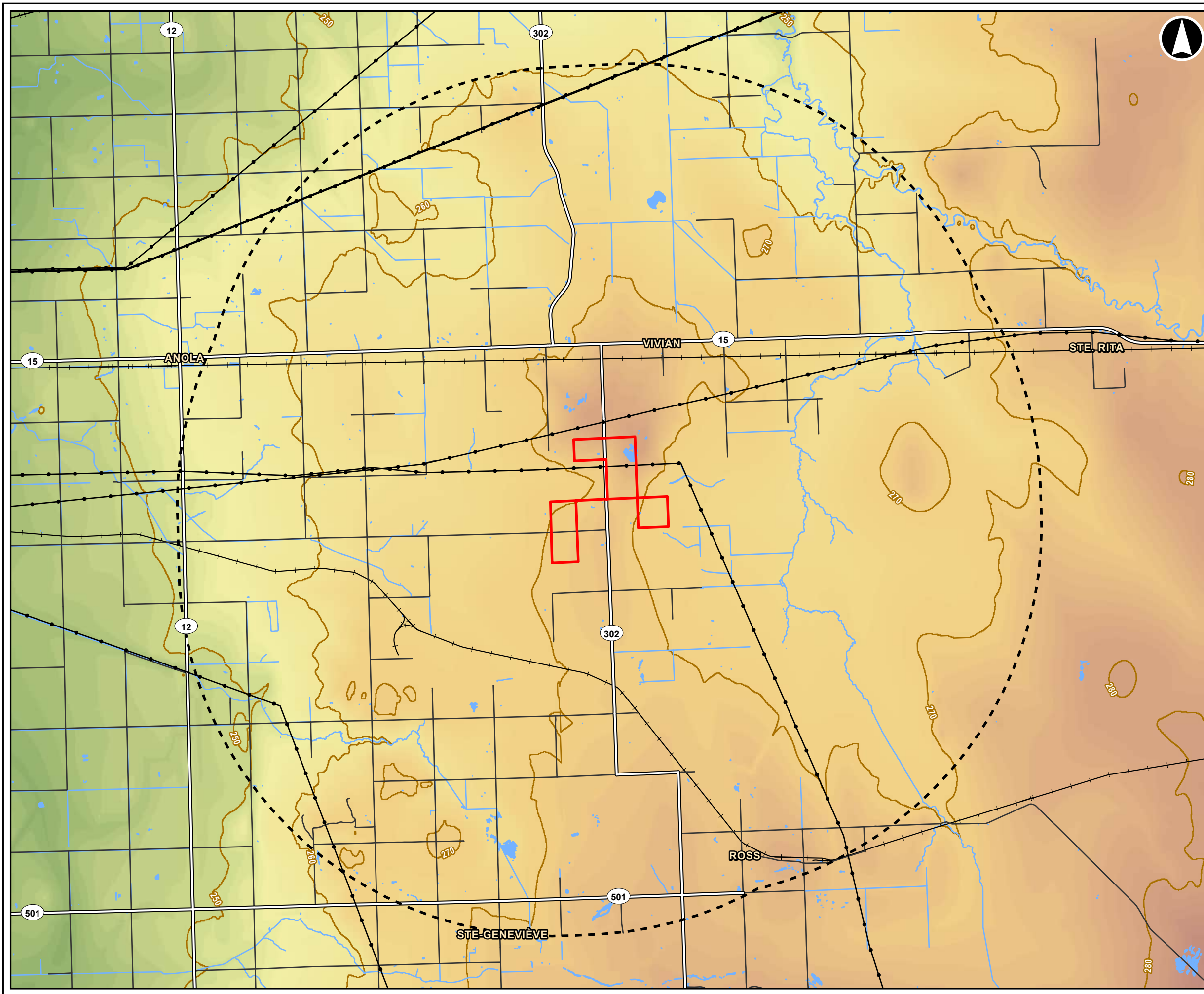
PN#: 60730241

Figure 4-1

AECOM

Data Sources: MLI

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Legend

- Project Site Boundary
- Regional Project Area
- Contours (10 m Interval)

Elevations (m)

327

228

General Features

- Highway
- Road
- Railway
- Transmission Line
- Watercourse
- Waterbody

**SIO SILICA CORPORATION
ENVIRONMENT ACT PROPOSAL**

TOPOGRAPHY

0 1 2 3 4
Kilometres

Datum: NAD 1983 UTM Zone 14N

May, 2024	PN#: 60730241	1:100,000 * when printed 11"x17"
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Figure 4-2

AECOM

Data Sources: MLI, NRCan - Canvec
Esri Canada, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NRCan, Parks Canada

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MAP LOCATION: C:\Users\STEPHANE\CLARK\DESKTOP\WORKING PROJECTS\60730241_SIO SILICA EXTRACT_REFUGES\GND\REPORTS\ENVIRONMENT ACT PROPOSAL\PAL_60730241_SIO SILICA EXTRACT_LEAP\APRX FIGURE MAP FIG-2_LEAP_TOPOGRAPHY
DATE SAVED: 3/6/2024 USERNAME: STEPHANE CLARK

4.1.3 Soils

The Steinbach Ecodistrict, within which the Project Site is located, consists of well to imperfectly drained Dark Gray and Black Chernozems that have developed atop thin, discontinuous glaciolacustrine veneers that overlay extremely calcareous, water-eroded glacial till (Smith et al. 1998). As a result of improved drainage capabilities within the lowland areas of this Ecodistrict, a significant percentage of soils are used for cultivation of agricultural crops such as wheat and other cereals, oil seeds, and hay crops (Smith et al. 1998).

Soils of the Project Site occur mostly within the Pelan Series of provincial soils (Manitoba Agriculture, Food and Rural Initiatives, 2010). The Pelan Series consists of imperfectly drained Gleyed Dark Gray Chernozem soils developed on thin moderately to strongly calcareous, coarse textured deltaic or lacustrine deposits overlying stony, extremely calcareous glacial till. The surface texture ranges from loamy fine sand to fine sand. A thin stone lime or pebble layer may be present at the contact of the overlay and the extremely calcareous till. Permeability is moderate in the surface layers and moderately slow in the subsoil; this results in impeded internal drainage and temporary saturation conditions following snow melt or above normal precipitation. Precipitation runoff is slow.

Additional information on the soil characteristics within the Project Site are provided in **Appendix E**.

4.1.4 Groundwater

Groundwater in the vicinity of the Project is typically sourced from one of two targeted aquifer zones, the Red River Carbonate Formation (limestone) or Winnipeg Sandstone Formation, with some wells in the overlying till. The main source of potable water within the RM of Springfield is groundwater from the Red River Carbonate aquifer which is known to be of variable quality (Friesen Drillers, 2019). It is also a significant source of ground water supply for municipal, industrial, rural residential and agricultural uses throughout a large portion of south-eastern and central Manitoba (Betcher, et al., 1995). A detailed description of the hydrogeology of the area is provided in **Appendix B**.

The Winnipeg Formation Sandstone underlies the Red River Carbonate (limestone) aquifer throughout the Project area. This aquifer is the target aquifer for Project operations. It is confined and hydraulically separated from the overlying carbonate rocks of the Red River Formation by the Winnipeg Shale that overlies the Winnipeg Sandstone aquifer (Ferguson and Grasby, 2007).

Both aquifers are recharged in the Sandilands area to the east of the RM of Springfield with groundwater flow from east to west. The Sandilands area is a major sand and gravel moraine series that lies directly on the bedrock sub crop of both Paleozoic sequences (Friesen Drillers, 2019). Recharge occurs from snow melt and rainfall in the Sandilands area and is supplemented by distributed recharge across the region.

Discharge from both aquifers occurs in the form of residential, agricultural and industrial use and natural discharge to surface water features. Natural discharge from the Red River Carbonate aquifer is primarily to the Red River, the Winnipeg Floodway and other streams and creeks. Discharge from the Winnipeg Sandstone aquifer is likely by slow seepage near or beneath Lake Winnipeg (Ferguson and Grasby, 2007).

Groundwater quality is very good in both the Red River Carbonate and Winnipeg Sandstone aquifers as well as within the Winnipeg Shale aquitard. However, naturally elevated concentrations of iron and manganese exceeded drinking water aesthetic criteria as is commonly found in natural systems and within these aquifers (**Appendix B**).

In January 2025, AECOM collected and tested groundwater from six (6) existing groundwater wells located at the Project site for various physical and chemical analysis. The samples were comprised of five (5) samples collected from wells situated in the Winnipeg Sandstone, and one (1) sample collected from the Winnipeg Shale. The overall objective of the monitoring program was to gather data on the groundwater

quality at each of the sampling locations and, where possible, compare the water quality data to water quality data obtained from historical sampling events at the same locations. The comparison was focused on evaluating any changes in groundwater quality from 2020 and 2024 and determine the magnitude of any changes that may be occurring.

In general, the data collected from monitoring wells during the 2025 Winter Groundwater Monitoring Study showed that the water quality has remained relatively unchanged in the Winnipeg Sandstone based on samples collected in 2025 when compared to samples collected between 2020-2022, with some exceptions:

- Slight increases in sulfide were noted in three of the four samples collected in 2025 compared to previous years, with all three samples exceeding the Manitoba Water Quality Standards, Objectives, and Guideline (MWQSOG, Tier III) Aesthetic Objective (AO) of 0.05 mg/L.
- Increases in dissolved sulfur were observed in three of the four samples collected in 2025 compared to previous years, with significant increase observed in one of the samples. It should be noted that there is no applicable federal or provincial guidelines and/or standard for total or dissolved sulfur in water.
- Increases in dissolved sodium were observed in samples collected from two locations in 2025 compared to samples collected in 2020, but remain well below the MWQSOG AO of 200 mg/L.

Although some increases in a small number of water quality parameters were observed in the 2025 samples, it should be noted that several decreases in water quality parameters were also observed when comparing results of the 2025 study to the previous study. The most notable decreasing trends occurred with pH, fluoride, chloride, sulphate, and iron.

None of the analyzed parameters in any of the tested samples exceeded the MWQSOG for the protection of Drinking Water or the Guidelines for Canadian Drinking Water Quality.

A description of the regional aquifers and groundwater wells that are known to occur within the Local Project Area and surrounding region are provided in **Appendix B**.

4.2 Atmospheric Environment

4.2.1 Air Quality

The closest regional influences of air quality are associated with adjacent agriculture and open-pit aggregate / quarry operations, and vehicle traffic on PR 302 and RM of Springfield gravel roads both within and adjacent to the Project Site. Air quality may also be influenced at the Project Site by traffic on PTH 15 (2.5 km north of the Project Site), the CN rail line 2.1 km north of the Project Site and Greater Winnipeg Water District (GWWD) rail line running diagonally through the regional area (**Figure 1-2**).

4.2.2 Noise and Vibration

The above-described influences on regional air quality (**Section 4.2.1**), would also contribute to noise levels at the Project Site. Based on the planned equipment use and activities, the Project is not expected to be a source of significant vibration considering there are many water wells that have been drilled throughout the Regional Project Area (**Appendix B**) and there are no available records of public complaints regarding vibrations from previous well drilling activities. Therefore, vibrations are not considered further in this report.

Noise has limited distance influence depending on the nature of the noise source (e.g., size, weight and type of machinery) and landscape features surrounding the sources of noise that may act to attenuate noise such as tree cover (e.g. Yip et al. 2017; Albert 2004) and surrounding geology (e.g. Kumar et al. 2016).

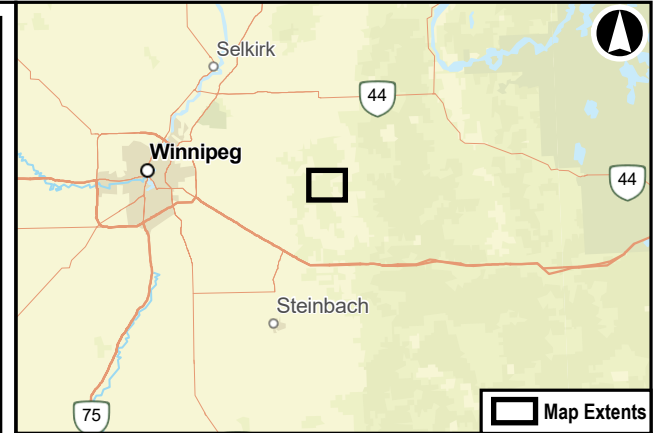
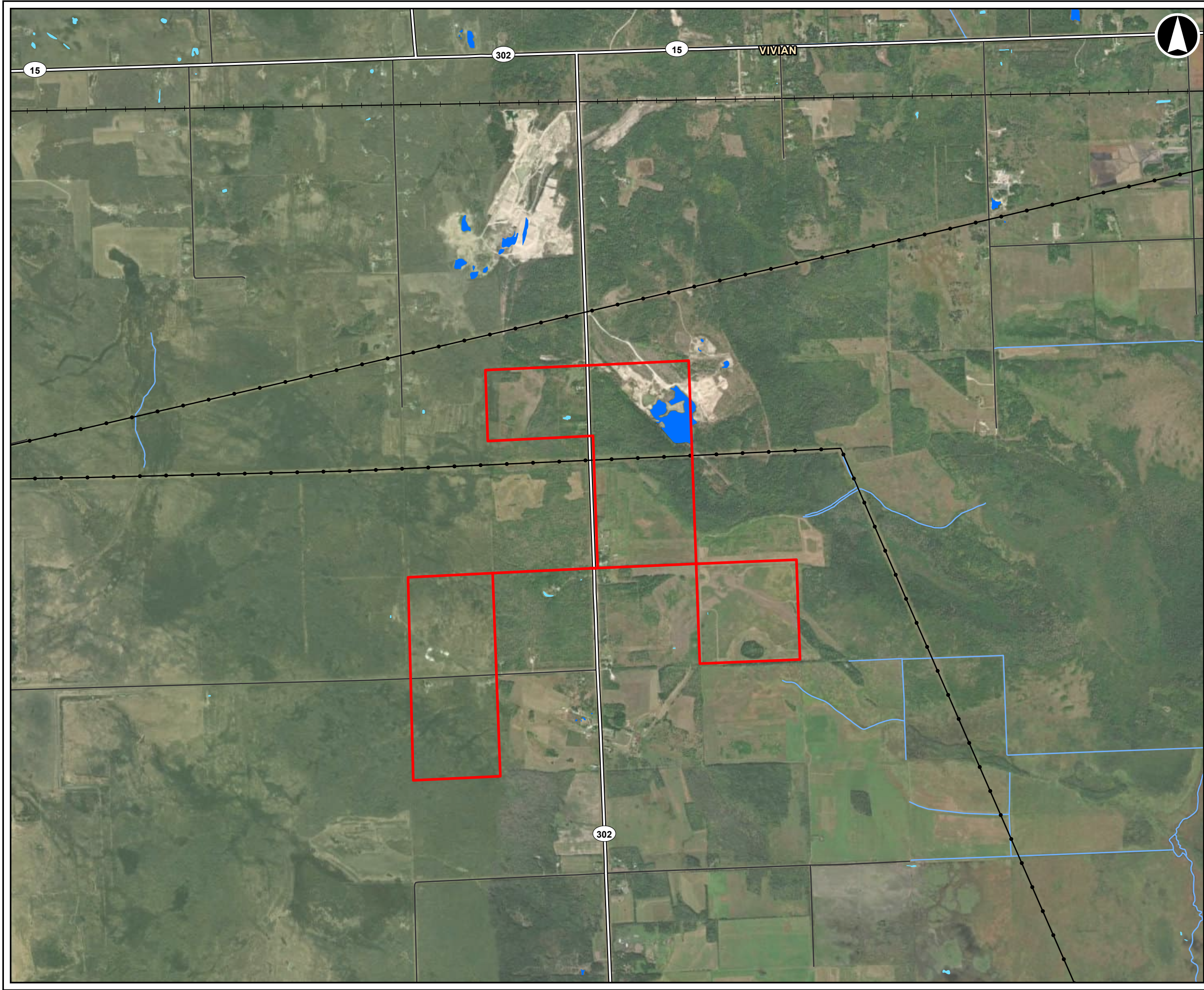
Existing noise at the Project Site is currently primarily influenced by the same human-generated that influence air quality as described above in **Section 4.2.1** (e.g. existing aggregate quarries; PR 302; PTH 15; CN and GWWD rail lines) and by natural sounds such as ambient weather (e.g. wind).

4.3 Aquatic Environment

4.3.1 Surface Water and Drainage

There are no natural lakes, rivers or streams within the Project Site. A 9.3 ha permanent pond associated with previous quarry operations occurs mostly within the Project Site (**Figure 4-3**).

The on-line Atlas of Canada Toporama mapping tool (Natural Resources Canada, n.d.) indicates surface water drainage at the Project Site occurs primarily within ditches and low drainage areas. Drainage in the eastern portion of the Project Site is generally northeast, eventually draining outside the Project Site into the Brokenhead River which flows north for approximately 65 km until connecting to Lake Winnipeg. Surface drainage in the western and southern portions of the Project Site generally flows northwest through ditches and low drainage areas to Cooks Creek, or to Edie Creek which connects with Cooks Creek. Cooks Creek then flows northeast for approximately 42 km to connect with the Red River near Selkirk, Manitoba.



Legend

Project Site Boundary

Hydrography

Permanent Waterbody

Intermittent Waterbody

Watercourse

General Features

Highway

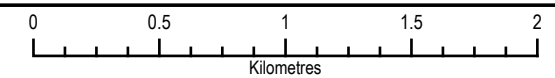
Road

Railway

Transmission Line

**SIO SILICA CORPORATION
ENVIRONMENT ACT PROPOSAL**

WATERBODIES IN THE PROJECT SITE AREA



Datum: NAD 1983 UTM Zone 14N

May, 2024	PN#: 60730241	1:30,000 * when printed 11"x17"
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Figure 4-3

AECOM

Data Sources: MLI, NRCan - Canvec
Esri Canada, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NRCan, Parks Canada, Maxar

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MAP LOCATION: C:\USERS\STEPHANE.CLARK\DESKTOP\WORKING PROJECTS\60730241_SIO SILICA\EXTRACT_REFUGES\GNDI_REPORT\ENVIRONMENT ACT PROPOSAL\PAL_00730241_SIO SILICA\EXTRACT_LEAP\APRX FIGURE MAP_TIG-3_LEAP_WATERBODIES DATE SAVED: 3/6/2024 USERNAME: STEPHANE.CLARK

4.3.2 Fish and Fish Habitat

The only waterbody occurring within the Project Site is a pond that is associated with previous quarry operations (**Section 4.3.1**), which would have a low likelihood of providing suitable fish habitat.

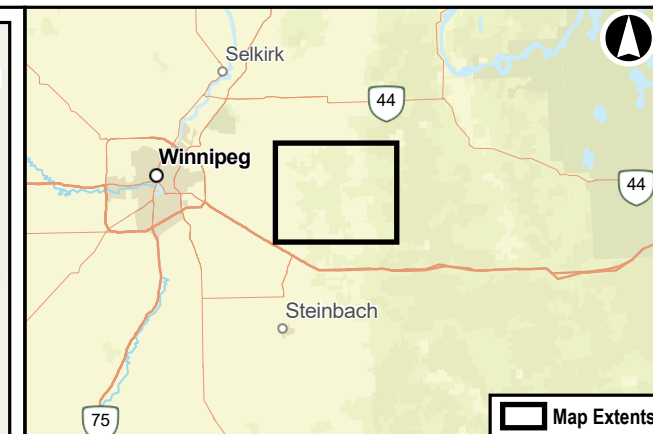
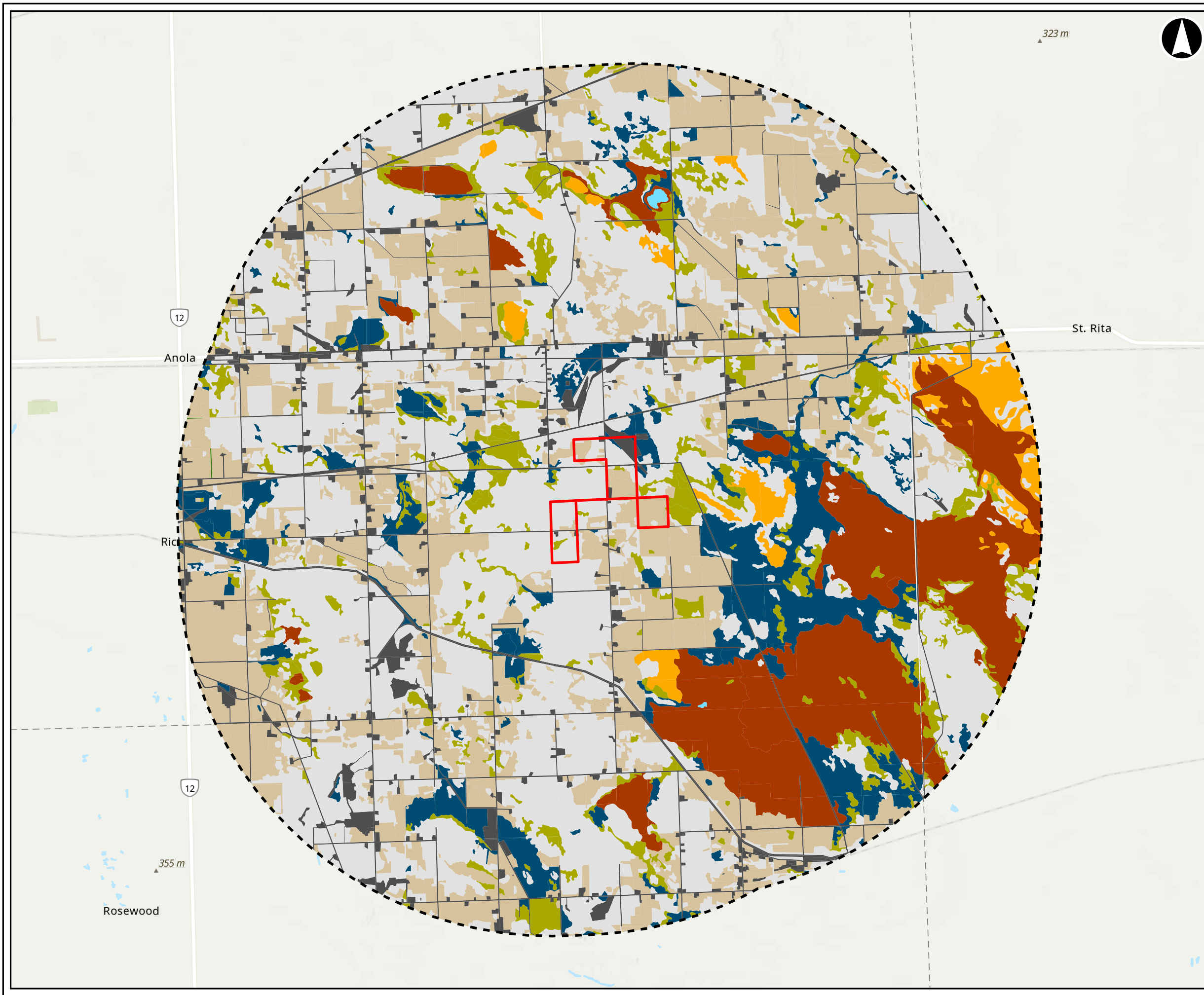
4.4 Terrestrial Environment

4.4.1 Vegetation

Information from the Manitoba Forest Resource Inventory, and on-site general reconnaissance in select locations within the Project Site area indicate that less than half (46%) of the Project Site is forested with agriculture fields being the next most common cover type (39%; **Table 4-1**). Approximately 50% of the Project Site is previously disturbed landcover due to human development such as agriculture, roads and aggregate quarries (**Table 4-1**).

Forested areas within the Project Site consist primarily of trembling aspen (*Populus tremuloides*; 43%), with occasional black spruce (*Picea mariana*) and tamarack (*Larix Laricina*) stands (**Table 4-2**). The forested areas in the Project Site are primarily young (67%) with approximately 19% of the forested area classified as mature (**Table 4-3**). Common understory shrub species include American hazel (*Corylus Americana*), red-osier dogwood (*Cornus sericea*), wild rose (*Rosa* spp.) and willow (*Salix* spp.). The naturally vegetated non-forested areas include meadows (1%) and wet willow and alder (*Alnus glutinosa*) dominated areas (2%; **Table 4-1**). No land cover considered uncommon for the regional area was observed in the Project Site during terrestrial reconnaissance of the Project Site.

The areas and percentages of land cover types, dominant tree species and forest age classes within the Project Site as compared to the Regional Project Area are provided in **Table 4-1**, **Table 4-2** and **Table 4-3** and are illustrated in **Figure 4-4**, **Figure 4-5** and **Figure 4-6**.



Legend

- Project Site Boundary
- Regional Project Area

Cover Type

- Fields (Agriculture)
- Marsh - Muskeg
- Meadow
- Shelter Belts
- Treed Muskeg
- Willow / Alder
- Developed
- Forested
- Water

**SIO SILICA CORPORATION
ENVIRONMENT ACT PROPOSAL**

COVER TYPES IN THE REGIONAL PROJECT AREA

0 1 2 3 4
Kilometres

Datum: NAD 1983 UTM Zone 14N

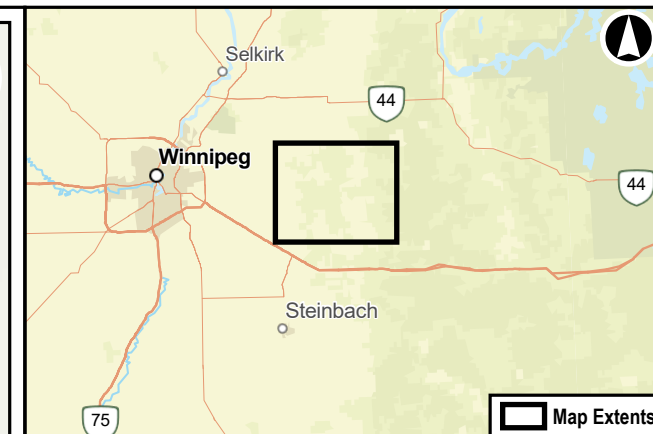
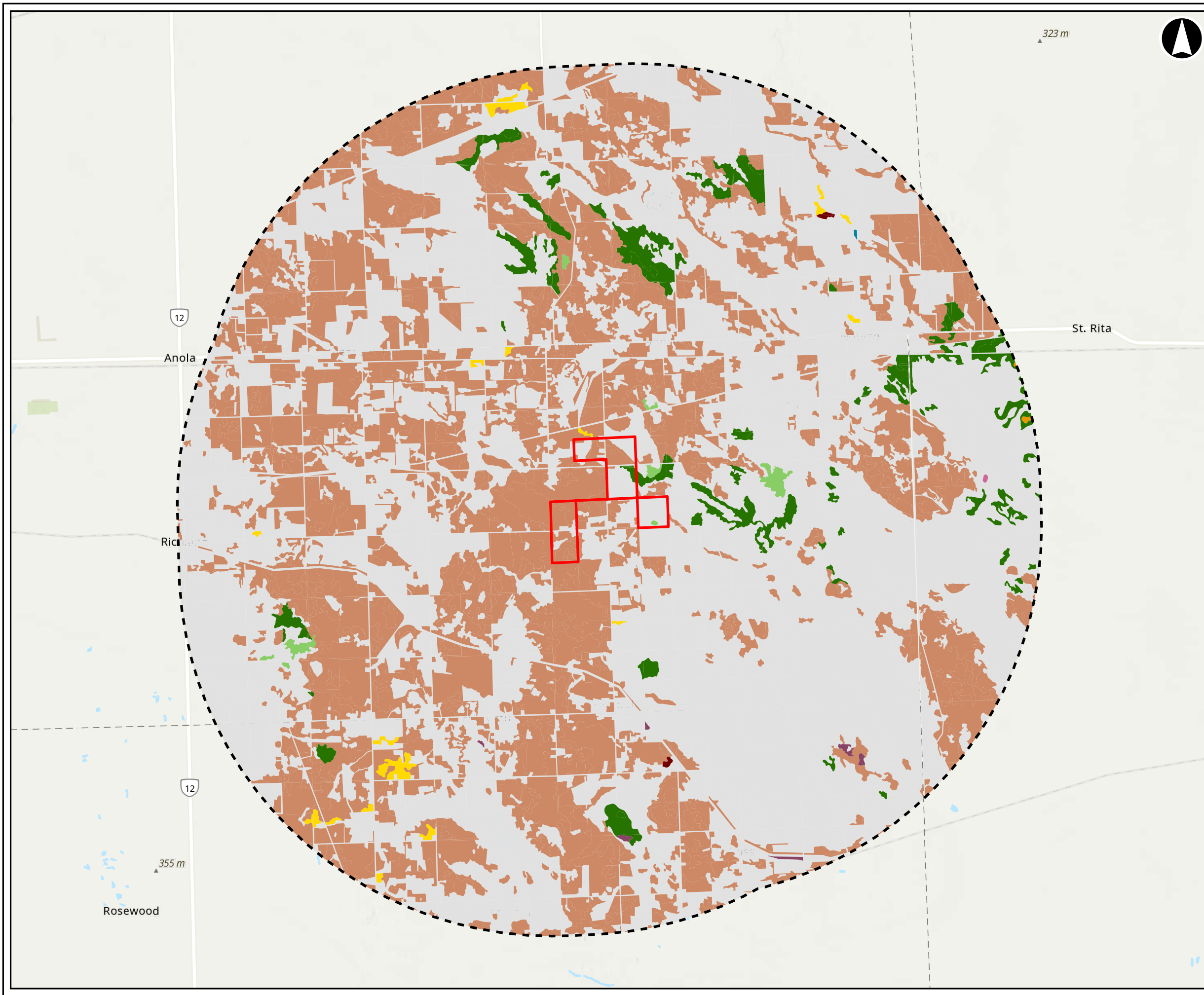
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Figure 4-4

AECOM

Data Sources: MLI, Manitoba Forest Resource Inventory, NRCan - Canvec
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Legend

- Project Site Boundary
- Regional Project Area

Dominant Tree Species

- Ash
- Balsam Fir
- Balsam Poplar
- Black Spruce
- Eastern Cedar
- Manitoba Maple
- Oak
- Tamarack Larch
- Trembling Aspen
- Non-Forested

**SIO SILICA CORPORATION
ENVIRONMENT ACT PROPOSAL**

**DOMINANT TREE SPECIES IN THE
REGIONAL PROJECT AREA**

0 1 2 3 4
Kilometres

Datum: NAD 1983 UTM Zone 14N

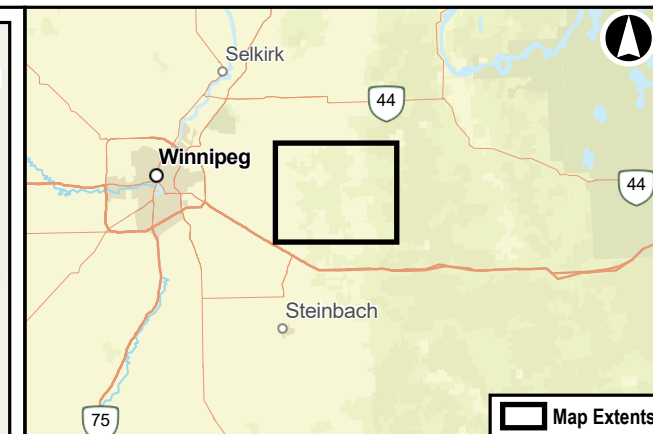
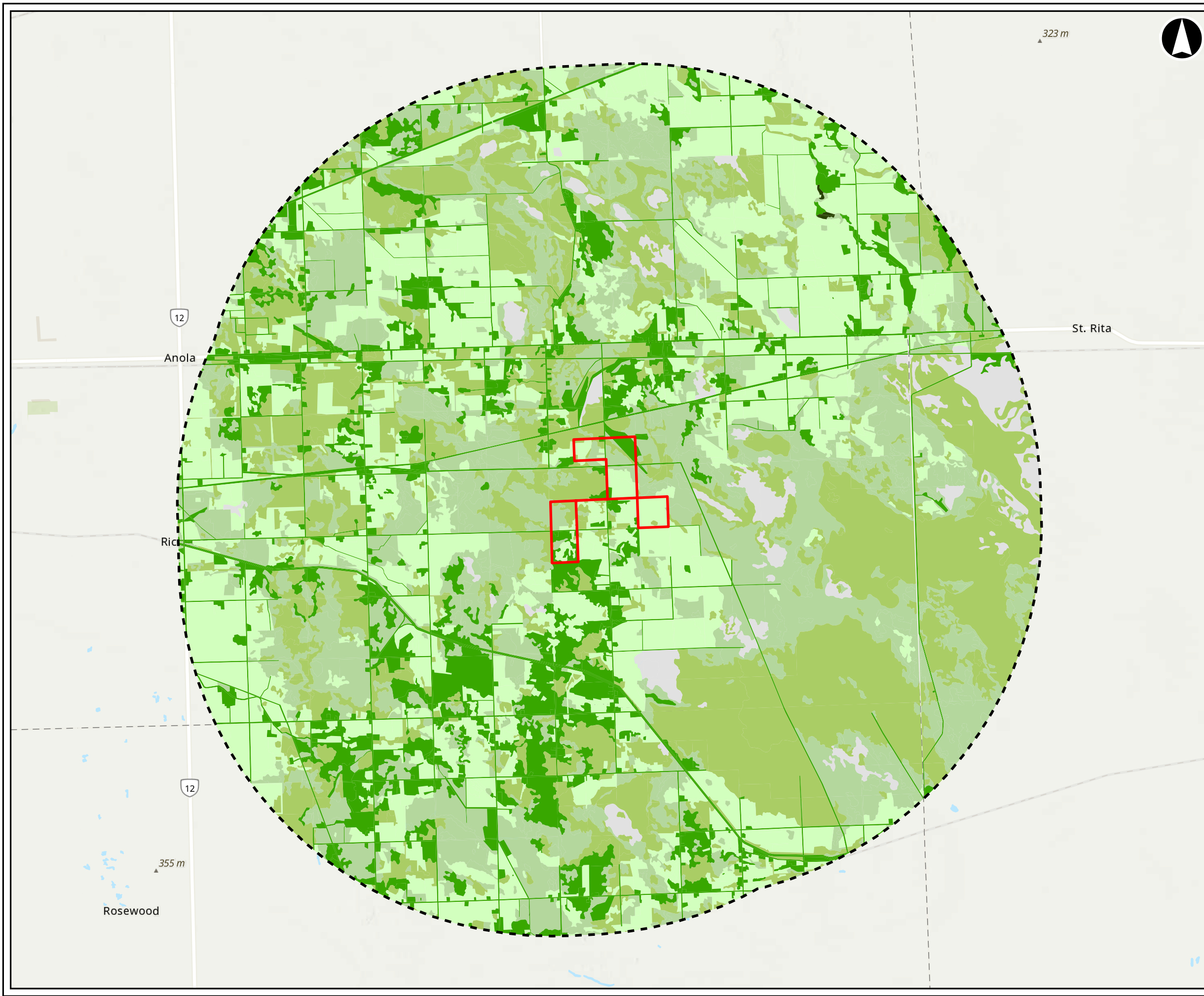
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Figure 4-5

AECOM

Data Sources: MLI, Manitoba Forest Resource Inventory, NRCan - Canvec
Esri Canada, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, MET/NASA, USGS, EPA, USDA, NRCan, Parks Canada, Esri Canada, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NRCan, Parks Canada, Esri, NASA, NGA, USGS

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Legend

- Project Site Boundary
- Regional Project Area

Forest Age Class *

- Not Forested
- Young (< 3 m)
- Young (> 3 m)
- Immature
- Mature
- Overmature

* Forest age information is based on the Manitoba Forest Resource Inventory data for 'Cutting Class' which is based on size, vigour, state of development and maturity of a stand for harvesting purposes.

**SIO SILICA CORPORATION
ENVIRONMENT ACT PROPOSAL**

**FOREST AGE CLASSES IN THE
REGIONAL PROJECT AREA**

0 1 2 3 4
Kilometres

Datum: NAD 1983 UTM Zone 14N

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Figure 4-6

AECOM

Data Sources: MLI, Manitoba Forest Resource Inventory, NRCan - Canvec
Esri Canada, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, MET/NASA, USGS, EPA, USDA, NRCan, Parks Canada, Esri Canada, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NRCan, Parks Canada, Esri, NASA, NGA, USGS

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Table 4-1: Land Cover in the Project Site and Regional Project Area

Cover Type	Project Site (2026 to 2030)		Regional Project Area		25-year Life of Project Area*	
	Hectares (ha)	Percent (± 1%)	Hectares (ha)	Percent (± 1%)	Hectares (ha)	Percent (± 1%)
Developed	38	11	2,904	7	165	6
Fields (Agriculture)	141	39	11,490	27	665	24
Forested	166	46	16,988	39	1,588	57
Marsh - Muskeg	0	0	4,796	11	0	0
Meadow	5	1	3,346	8	104	4
Protection Forest	0	0	3	0	0	0
Treed Muskeg	0	0	900	2	0	0
Water	0	0	21	0	0	0
Willow / Alder	8	2	2,699	6	242	9
Other (Gaps in Forest Inventory Mapping)	0	0	37	0	0	0

Project Site = 358 ha; Regional Project Area = 43,184 ha; 25-year Life of Project Area = 2,764 ha

*Refer to **Figure 1-2** for the 25-year Life of Project Area

Source: Manitoba Land Initiative (2017)

Table 4-2: Dominant Tree Species in the Project Site and Regional Project Area

Tree Species	Project Site (2026 to 2030)		Regional Project Area		25-year Life of Project Area*	
	Hectares (ha)	Percent (± 1%)	Hectares (ha)	Percent (± 1%)	Hectares (ha)	Percent (± 1%)
Ash	0	0	10	0	0	0
Balsam Fir	0	0	4	0	0	0
Balsam Poplar	0	0	25	0	0	0
Black Spruce	9	3	1,057	2	27	1
Eastern Cedar	0	0	2	0	0	0
Manitoba Maple	0	0	2	0	0	0
Non-Forested	192	54	26,158	61	1,176	43
Oak	0	0	142	0	4	0
Tamarack Larch	2	1	89	0	11	0
Trembling Aspen	155	43	15,657	36	1,546	56
Other (Gaps in Forest Inventory Mapping)	0	0	38	0	0	0

Project Site = 358 ha; Regional Project Area = 43,184 ha; 25-year Life of Project Area = 2,764 ha

*Refer to **Figure 1-2** for the 25-year Life of Project Area

Source: Manitoba Land Initiative (2017)

Table 4-3: Forest Age Classes in the Project Site and Regional Project Area

Forest Age Class**	Project Site (2026 to 2030)		Regional Project Area		25-year Life of Project Area*	
	Hectares (ha)	Percent (± 1%)	Hectares (ha)	Percent (± 1%)	Hectares (ha)	Percent (± 1%)
Not Forested	0	0	1,308	3	15	1
Young (< 3 m)	158	44	12,526	29	742	27
Young (> 3 m)	83	23	11,214	26	981	35
Immature	47	13	11,661	27	627	23
Mature	68	19	6,429	15	399	14
Overmature	0	0	9	0	0	0
Other (Gaps in Forest Inventory Mapping)	2	1	37	0	0	0

Project Site = 358 ha; Regional Project Area = 43,184 ha; 25-year Life of Project Area = 2,764 ha

*Refer to **Figure 1-2** for the 25-year Life of Project Area

Source: Manitoba Land Initiative (2017)

** Forest age information is based on the Manitoba Forest Resource Inventory data for 'Cutting Class' which is based on size, vigour, state of development and maturity of a stand for harvesting purposes.

4.4.2 Wildlife

Wildlife species expected to occur within the Project Site and throughout the Local and Regional Project Areas are those species that typically occur within the Steinbach Ecodistrict (Smith et al., 1998). Ungulate species include white-tailed deer and occasionally moose. A variety of furbearer species would occur within the landcover types within the Project Site with the most common likely being grey squirrel, red squirrel, smaller rodent species, snowshoe hare, red fox, coyote, American woodchuck and striped skunk. The occasional presence of black bears would also be expected.

According to the Manitoba Breeding Bird Atlas (2018), at least 60 bird species are likely to breed within the landcover types that occur within the Project Site, the majority of which are migratory birds protected under the federal *Migratory Birds Convention Act, 1994*.

Amphibian surveys were conducted within the Regional Project Area during May 14 to 18, 2018. Boreal Chorus Frogs were consistently heard in marshes with open water centres and extensive emergent plant growth along the margins. This type of wetland does not occur within the Project Site. The Project Site has some very limited areas of dense willow and alder wet meadows. Few frogs were heard calling in this type of wetland during the May 2018 surveys in the Regional Project Area. Other common amphibians expected to occur within the Project Site where suitable habitat occurs include wood frog, Northern leopard frog, spring peeper, Canadian toad and American toad. The red-sided garter snake is the reptile species most likely to occur in the Project Site (iNaturalist, n.d.).

4.4.3 Species of Conservation Concern

Manitoba Conservation Data Centre has compiled a list of Species of Conservation Concern for plant and animal species that are “rare, disjunct, or at risk throughout their range or in Manitoba and in need of further research” (Manitoba Conservation Data Centre, 2017). A full list of Species of Conservation Concern for the Interlake Plain Ecoregion, within which the Project Site is located, is included in **Appendix F**.

Plant ‘Species at Risk¹¹’ that may occur within which the Project Site include those listed in **Table 4-4**.

Table 4-4: Plant Species at Risk in the Interlake Plain Ecoregion that may occur in the Project Site

Common Name	Scientific Name	MBESEA Status	SARA Status	Probability of Occurrence within the Project Site
Rough Agalinis	<i>Agalinis aspera</i>	Endangered	Endangered	Low - Within Manitoba, this species occurs mainly in moist, sparsely vegetated areas with calcareous soils^a. - A limited amount of habitat occurs at the Project Site. - This species is known to occur only in small populations in Manitoba south of Brandon, in the southern Interlake, and south of Birds Hill Provincial Park^a. - As of 2012, only 15 extant known populations occur in Manitoba, the closest of which being a population south of Birds Hill Provincial Park, approximately 40 km north-west of the Project Site^a.
Gattinger's Agalinis	<i>Agalinis gattingeri</i>	Endangered	Endangered	Very Low to Negligible - Within Manitoba, this species occurs mainly in moist, sparsely vegetated prairie areas with calcareous soils, and can also occur along the upper banks of roadside ditches^b. - Existing prairie habitat is uncommon in the Project Site; a limited amount of habitat occurs at the Project Site^b. - Within Manitoba, there are only 5 extant populations; total abundance estimate is greater than 500 individuals^b. - Known locations for this species occurs in the southern portion of the Interlake Region, over 100 km north-west of the Project Site^b; however, may occur elsewhere in suitable locations not yet surveyed. - Can occur in association with Rough Agalinis^b

¹¹ ‘Species at Risk’ are defined for the purpose of this report as those species listed in [The Endangered Species and Ecosystems Act](#) of Manitoba (ESEA) and/or those listed as ‘Endangered’ or ‘Threatened’ in Schedule 1 of the federal [Species at Risk Act](#) (SARA).

Common Name	Scientific Name	MBESEA Status	SARA Status	Probability of Occurrence within the Project Site
Western Silvery Aster	<i>Aster sericeus</i>	Threatened	Threatened	Low - Moderate - Western silvery aster occurs in dry open environments such as prairies and fields, as well as openings in oak and trembling aspen woodlands. - This species grows in coarse calcareous, gravelly and sandy soil. They are generally found in undisturbed sites but can be found along roadside ditches and gravel pits^c. - In Manitoba, this species occurs in patchy populations ranging from north-east of Winnipeg south to the US border^c. - 20 extant populations occur in Manitoba, with the closest population occurring near the Town of Beausejour, approximately 20 km north of the Project Site. Other populations exist in the Birds Hill gravel esker complex, south of Birds Hill Provincial Park.

^a Environment Canada 2015^b Environment and Climate Change Canada (ECCC) 2019a^c ECCC 2017

Wildlife Species at Risk that may occur in the Interlake Plain Ecoregion and which also may occur within the Regional Project Area are listed in **Table 4-5**.

Table 4-5: Wildlife Species at Risk List

Common Name	Scientific Name	MBESEA Status	SARA Status	Probability of Occurrence within the Project Site
Little Brown Bat/Myotis and Northern Long-eared Bat/Myotis	<i>Myotis lucifugus</i> and <i>Myotis septentrionalis</i>	Endangered	Endangered	Moderate (maternity roosting) to High (foraging) - Summer maternity colonies are established in buildings or cavities of large diameter trees^a. The Project Site has approximately 19% mature tree forest cover that may contain some trees of suitable diameter for potential maternity cavity roost sites. - Foraging occurs over water, along waterways, forest edges, and forest gaps, in areas where insects are present^a. - Both species of bats require limestone/karst caves as winter hibernacula. There are non known hibernacula in the Project Site. - The probability of hibernacula occurring in the Project Site is unlikely as there are no recorded limestone/karst caves found the Project Region^b.
Eastern Whip-poor-will	<i>Caprimulgus vociferus</i>	Threatened	Threatened (under consideration for status change to Special Concern)	Low to Moderate - A limited amount of potentially suitable habitat occurs at the Project Site for this ground-nesting species, i.e., semi-open forests or patchy forests with clearings such as forests that are regenerating following major disturbances^d. - Probability of observation of this species in the Regional Project Area has been determined by the

Common Name	Scientific Name	MBESEA Status	SARA Status	Probability of Occurrence within the Project Site
				Atlas of the Breeding Birds of Manitoba to be approximately 10% to 20%
Barn Swallow	<i>Hirundo rustica</i>	Not Listed	Threatened (under consideration for status change to Special Concern)	Moderate to High - This species builds a mud cup nest which adheres to vertical surfaces under overhangs ^e - No natural nesting habitat (e.g. cliff overhang) in the Project Site. However, man-made structures such as buildings that are preferred nesting habitat occur within the Project Site. Buildings or structures with nesting Barn Swallows will not be removed within the Project footprint area
Bank Swallow	<i>Riparia</i>	Not Listed	Threatened	Unlikely - No steep riparian bank habitat occurs in the Project Site area that would be suitable nesting habitat for this species which burrows into banks for nesting ^f
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	Threatened	Threatened	Low to Moderate - A limited amount of potentially suitable habitat occurs at the Project Site for this species, i.e., mature forest where canopy gaps create a patchy shrub layer that is comparable to the understorey of early successional sites, or the shrubby edge of wetlands ^g - Probability of observation of this species in the Regional Project Area has been determined by the Atlas of the Breeding Birds of Manitoba to be approximately 10% to 20%
Canada Warbler	<i>Cardellina canadensis</i>	Endangered	Threatened (under consideration for status change to Special Concern)	Low - This species uses a wide range of forest types (deciduous, coniferous, and mixed) with well developed shrub and forest floor, as well as in post disturbance and old-growth riparian shrub forests ^h . - Probability of observation of this species in the Regional Project Area has been determined by the Atlas of the Breeding Birds of Manitoba to be approximately 0% to 10% and is more likely found further east of the Regional Project Area
Olive-sided Flycatcher	<i>Contopus virens</i>	Threatened	Special Concern	Low - This species occurs primarily in coniferous or mixed forest with tall trees and tall snags for perching along open areas such as burns, wet areas such as bogs, and post-clearcut forest harvesting areas ⁱ . There is little potentially suitable nesting habitat within the Project Site for this species. - Probability of observation of this species in the Regional Project Area has been determined by the Atlas of the Breeding Birds of Manitoba to be approximately 10%.
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	Threatened	Endangered	Low to Moderate - This species occurs in a variety of habitat, including grasslands, forest edges, orchards, pastures,

Common Name	Scientific Name	MBESEA Status	SARA Status	Probability of Occurrence within the Project Site
				riparian forests, roadsides, and vegetated urban areas. In Manitoba, this species is strongly associated with trembling aspen forest with snags or trees with dead limbs in grazed cattle lots ^j . - Probability of observation of this species in the Regional Project Area has been determined by the Atlas of the Breeding Birds of Manitoba to be approximately 20% to 40%
Short-eared Owl	<i>Asio flammeus</i>	Threatened	Special Concern (under consideration for status change to Threatened)	Low - This species nests on the ground in larger open grassland areas including marsh/bog and fen habitat and rarely in agriculture fields ^k , therefore optimal nesting habitat does not occur in the Project Site but this species may forage in the Project Site. - Probability of observation of this species in the Regional Project Area has been determined by the Atlas of the Breeding Birds of Manitoba to be approximately 20%
Eastern Tiger Salamander	<i>Ambystoma tigrinum</i>	Not Listed	Endangered	Low - This species inhabits areas where sandy or friable soils surround fishless, semi-permanent to permanent water bodies. All known occurrences in Manitoba are from six locations in the Steinbach Ecodistrict within which the Project is located, but approximately 50 km or more south of the Project Site ^l .
Monarch (butterfly)	<i>Danaus plexippus</i>	Not Listed	Endangered	Moderate to High - Although monarchs will nectar (i.e., feed) on a variety of flower species, the breeding habitat of this butterfly species is restricted to sites where milkweed grows. Milkweed is the sole food source for caterpillars of this species ^m . Seven milkweed species grow in Manitoba ¹² , two of which (common milkweed [<i>Asclepias syriaca</i>] and showy milkweed [<i>A. syriaca</i>]) are not uncommon in southern Manitoba along roadsides, disturbed areas, open fields, and open woodland areas, and are also designated as Tier 3 Noxious Weeds in Manitoba ¹³ .

^a COSEWIC 2013a^e COSEWIC 2011ⁱ Environment Canada 2016^b Bilecki 2003^f COSEWIC 2013b^j ECCC 2019b^c COSEWIC 2018a^g ECCC 2016a^k COSEWIC 2008^d Environment and Climate Change Canada (ECCC) 2018^h ECCC 2016b^l COSEWIC 2013c^m COSEWIC 2010¹² Prairie Originals Wildflowers Native Grasses. Article by Shirley Froehlich (no date) titled Milkweeds & Monarchs: <https://www.prairieoriginals.com/MILKWEEDS.pdf>¹³ Declaration of Noxious Weeds in Manitoba: <https://www.gov.mb.ca/agriculture/crops/weeds/declaration-of-noxious-weeds-in-mb.html>. Under The Noxious Weeds Act (C.C.M.C. c.N110) section 3(1), a person must control a tier 3 noxious weed that is on land that the person owns or occupies if the weed's uncontrolled growth or spread is likely to negatively affect an aspect of Manitoba's economy or environment in the area of the land or the well-being of residents in proximity to the land.

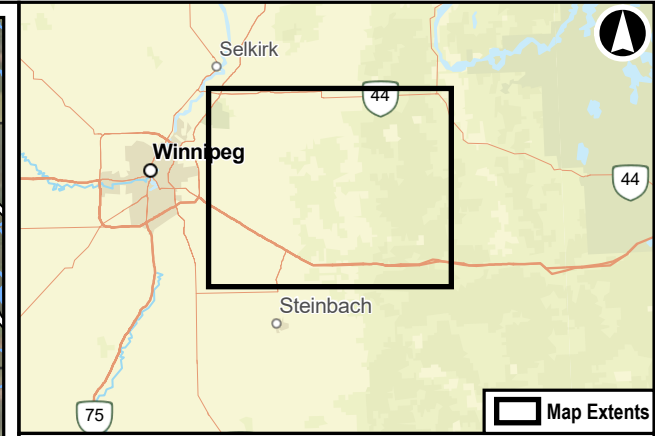
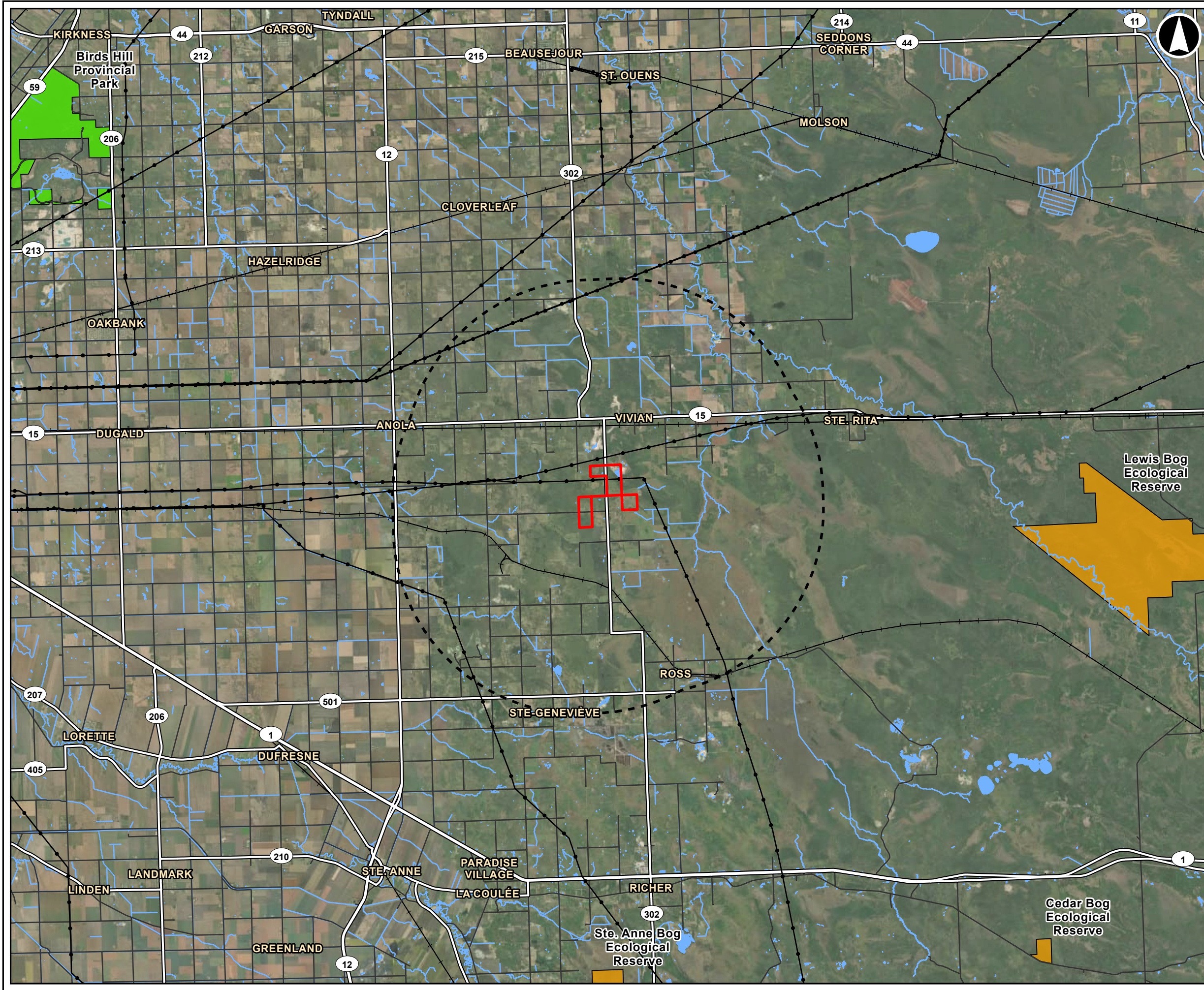
4.4.4 Parks and Protected Areas

The nearest designated park to the Project Site is Birds Hill Provincial Park located approximately 30 km northwest of the Project Site (**Figure 4-7**). The park provides year-round recreational activities such as hiking, cycling, skiing, horseback riding along a network of established trails (Manitoba Conservation and Climate, n.d.).

The following are the closest ecological reserves to the Project Site (distance in parentheses);

- Lewis Bog Ecological Reserve (20 km east)
- Ste. Anne Bog Ecological Reserve (24 km south)
- Brokenhead River Ecological Reserve (35 km north)
- Cedar Bog Ecological Reserve (32 km southeast)

The closest Wildlife Management Areas (WMA) to the Project Site are the Mars Hill WMA located approximately 37 km north, and the Whitemouth Bog WMA located approximately 39 km northeast of the Project Site. Mars Hill WMA protects important wintering habitat for deer, moose and black bear, and is well-known as a top birding site in Manitoba (Manitoba Conservation and Climate, 2020). The Whitemouth Bog WMA was established in 2007 around the Whitemouth Bog Ecological Reserve to protect a calcareous fen which is a rare wetland type. The Whitemouth Bog WMA is a peatland dominated by black spruce and tamarack with a wide variety of wetland vegetation including several species of conservation concern (Manitoba Conservation and Climate, 2020).



Legend

- Project Site Boundary
- Regional Project Area
- Parks and Protected Areas**
 - Ecological Reserve
 - Provincial Park
- General Features**
 - Highway
 - Road
 - Railway
 - Transmission Line
 - Watercourse
 - Waterbody

**SIO SILICA CORPORATION
ENVIRONMENT ACT PROPOSAL**

PARKS AND PROTECTED AREAS

0 1 2 3 4
Kilometres

Datum: NAD 1983 UTM Zone 14N

May, 2024	PN#: 60730241	1:200,000 * when printed 11"x17"
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Figure 4-7

AECOM

Data Sources: MLI, Manitoba Forest Resource Inventory, NRCan - Canvec, Esri Canada, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NRCan, Parks Canada, Earthstar Geographics

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MAP LOCATION: C:\GIS\ST-STEPHANE\CLARK\DESKTOP\WORKING PROJECTS\60730241_SIO SILICA\EXTRACT_REFUGES\GNDI_REPORT\ENVIRONMENT ACT PROPOSAL\PAL_60730241_SIO SILICA\EXTRACT_LEF\APR\FIGURE MAP_TIGHT_LEAF_PARKS\PROTECTED AREAS DATE SAVED: 16/02/24 USERNAME: STEPHANE CLARK

4.5 Indigenous Peoples

The Project Site is located within Treaty No. 1 area (Indigenous and Northern Affairs Canada, 2017). There are no First Nation reserve lands within the Local or Regional Project Area. The closest First Nation reserve lands to the Project Site is the Brokenhead Ojibway Nation's Na-Sha-Ke-Penais Indian Reserve (3 ha) surrounded by East St. Paul and located approximately 38 km northwest of the Project Site.

The Regional Project Area is within an area recognized by the Manitoba Metis Federation as an area for Metis Natural Resource Harvesting (The Metis Economic Development Organization, 2018) which corresponds with the Manitoba Conservation and Climate Game Hunting Areas (GHAs) numbers 34A, 35 and 35A within which the Project Site is located (Manitoba Sustainable Development 2019).

The Project Site is comprised of private land covered under private surface rights and/or land used for municipal and public purposes and is currently designated as 'Aggregate', 'Agriculture Preserve Area' and 'Mixed Rural and Agriculture Area' in the RM of Springfield Development Plan (**Section 4.6.4**). Therefore, use of the Project Site for the exercise of Indigenous or Treaty rights would be restricted or limited.

4.6 Socioeconomic Environment

The proposed Project Site is located in the RM of Springfield. Considering the close proximity of Winnipeg (35 km west) and other surrounding rural municipalities in addition to the RM of Springfield, there are expected to be sufficient worker skills, trades and services available to support Project construction and operation within a reasonable commuting distance.

The demographic profile, labour force and employment related statistics for the surrounding rural municipalities and the City of Winnipeg are described below in **Sections 4.6.1** and **4.6.2** to demonstrate the workforce potential availability within reasonable commute time from the proposed Project Site. Therefore, the Regional Study Area represents the population regions that would be a potential source of employees, trades and services located within a reasonable commute time from the proposed Project.

4.6.1 Demographic Profile

The statistical data presented in this section reflects the most recent Statistics Canada information available. **Table 4-6** shows the Regional Project Area is increasing in population, with a range in population increase from 0.4% in the RM of Reynolds, to 14.2% in the RM of Lac du Bonnet.

Table 4-6: Population of Regional Project Area Communities

Regional Project Area - Populations								Province
Population	RM of Springfield	RM of Taché	RM of Reynolds	RM of Broken-head	RM of White-mouth	RM of Lac du Bonnet	City of Winnipeg	Manitoba
2021 Census	16,142	11,916	1,344	5,414	1,630	3,563	749,607	1,342,153
2016 Census	15,342	11,568	1,338	5,122	1,557	3,121	705,244	1,278,365
Population Change (+%)	5.2	3.0	0.4	5.7	4.7	14.2	6.3	5.0

Source: Statistics Canada 2023

Table 4-7 provides the population of the regional communities by age groups. The Regional Project Area has a higher average age (42.2 years) and median age (44.1 years) in comparison to the Province (39.7 years and 38.4 years respectively).

Table 4-7: Distribution of Regional Project Area Communities by Age Groups

Regional Project Area – Population Percentages								Province
Population – Age (years)	RM of Springfield	RM of Taché	RM of Reynolds	RM of Broken-head	RM of White-mouth	RM of Lac du Bonnet	City of Winnipeg	Manitoba
0 – 14	19.1	23.6	17.1	19.7	16.3	9.4	16.6	18.8
15 – 64	64.4	65.7	60.6	64.5	59.2	62.4	66.4	64.1
65 and over	16.5	10.8	22.3	15.8	24.5	28.2	17	17.1
Average age of population	40.7	35.8	44.3	39.8	44.9	49.3	40.3	39.7
Median age of population	42.4	35.6	48.4	40.0	48.0	55.6	38.8	38.4

Source: Statistics Canada 2023

4.6.2 Labour Force and Employment

The statistical data presented in this section reflect the most recent Statistics Canada information available. **Table 4-8** presents the 2021 education levels for the Regional Project Area and the Province of Manitoba. The region had a higher percentage of the population that had completed an apprenticeship, trades, or completed a college or non-university certificate of diploma in comparison to the Province.

Table 4-8: Education Attainment of Regional Project Area Communities

Regional Project Area - Populations								Province
Education (aged 25 – 64)	RM of Springfield	RM of Taché	RM of Reynolds	RM of Broken-head	RM of White-mouth	RM of Lac du Bonnet	City of Winnipeg	Manitoba
Total population aged 25-64	8,425	6,195	785	2,925	765	1,535	395,650	675,695
No certificate, diploma or degree (%)	7.4	9.3	27.0	12.3	25.0	13.7	8.7	12.3
Secondary (high) school diploma or equivalency (%)	29	32	37	33	27	32	26	28
Apprenticeship or Trades certificate, diploma or degree (%)	10.8	10.7	10.1	11.6	12.5	12.7	6.0	7.2
College or non-university certificate or diploma (%)	24	26	18	29	24	25	20	20
University certificate or diploma below bachelor level (%)	3.2	3.7	1.9	3.1	2.6	3.6	3.3	3.2
University certificate, diploma or degree at bachelor level or above (%)	25	19	6	11	9	13	37	29

Source: Statistics Canada 2023

The statistical data presented in this section reflects the most recent Statistics Canada information available. **Table 4-9** presents labour force indicators including the total population aged 15 years and over, population in the labour force and participation, employment and unemployment rates for the Regional Project Area and the Province of Manitoba. The 2021 participation rates in the Regional Project Area ranged from 50.3% in the RM of Lac du Bonnet to 72.8% in the RM of Taché. Employment rates were higher in the RM of Taché (68.4%), Springfield (64.0), and Brokenhead (61.8%) while unemployment rates were lower (6.1%, 5.3%, and 7.8% respectively) compared to the Province. The RM of Lac du Bonnet had the lowest employment rate (45.7%) while the RM of Reynolds had the lowest unemployment rate (10.7%).

Table 4-9: Labour Force Indicators of Regional Project Area Communities

Regional Project Area - Populations								Province
Labour Force	RM of Springfield	RM of Taché	RM of Reynolds	RM of Broken-head	RM of White-mouth	RM of Lac du Bonnet	City of Winnipeg	Manitoba
Total Population aged 15 and over	12,760	9,085	1,195	4,315	1,220	2,755	612,550	1,058,415
In the Labour Force	8,625	6,615	745	2,890	725	1,385	402,365	681,505
Participation Rate (%)	67.6	72.8	62.3	67.0	59.4	50.3	65.7	64.4
Employment Rate (%)	64.0	68.4	55.6	61.8	54.1	45.7	59.8	59.1
Unemployment Rate (%)	5.3	6.1	10.7	7.8	9.7	9.4	8.9	8.3

Source: Statistics Canada 2023

4.6.3 Infrastructure and Services

4.6.3.1 Transportation

Road

The Project Site can be accessed from the PTH 15 near Vivian by turning south on PR 302 or turning south on Queens Valley municipal road 42E from PTH 15 (**Figure 1-3**). The proposed Project design includes the construction of temporary access trails to extraction sites (**Section 2.4**).

Air

There are no airports / aerodromes in the Regional Project Area. The closest aerodrome is the Beausejour / AV-Ranch Airpark located 20 km north-northwest of the Project Site and 4 km southwest of the town of Beausejour. The largest regional airport is the Winnipeg James Armstrong Richardson International Airport located in Winnipeg MB, approximately 50 km west of the Project Site.

Rail

An existing CN railway line located 1.3 km north of the Project Site which will accommodate transportation of the sand product by rail to out of province markets from Sio's Processing Facility to be constructed near Vivian (**Figure 1-3**).

4.6.3.2 Emergency Services

Fire

The closest fire halls to the Project Site servicing the RM of Springfield include the following (RM of Springfield, 2020; driving distance and direction from the Project Site in parentheses):

- Anola Fire Station #2 (12 km west)
- Oakbank Fire Station #1 (34 km northwest)
- Springfield Industrial Area Fire Station #3 (40 km west)

Medical Services, Ambulance and Hospital

Medical Responder Programs are run out of each of the above-described fire halls to support medical emergencies in the RM of Springfield. Each station has two to three personnel who respond directly to the incident in private vehicles and are equipped with medical bags, automated external defibrillators (AEDs) and communication equipment (RM of Springfield, 2020).

Ambulance services are available through calling 911. The nearest hospitals to the Project Site include the Beausejour Hospital located 24 km north and the Ste. Anne Hospital located 38 km south. The nearest full-care 24-hour hospital is the St. Boniface Hospital in Winnipeg located 49 km west of the Project Site.

Police

Police services in the vicinity of the Project Site include the Springfield Police Service at 686 Main Street in Oakbank and RCMP services at 625 Balsam Crescent in Oakbank, both of which are located approximately 34 km northwest of the Project Site (RM of Springfield, 2020).

4.6.3.3 Community Services

Communications

The nearest cellular service tower is located adjacent to the town of Anola approximately 14 km west of the Project Site. Available cellular service providers include Bell MTS, Telus and Rogers.

Electricity

Manitoba Hydro provides electric power to industries and residents in the Regional Project Area (Manitoba Hydro, n.d.).

Water and Wastewater

The RM of Springfield provides potable water services sourced from municipal groundwater wells to a total population of approximately 1,300 within the communities of Anola, Oakbank and Dugald which are the closest communities to the Project Site supplied with municipal water services (Manitoba Sustainable Development, n.d.; RM of Springfield, 2019). The majority of the Regional Project Area is individually serviced by private groundwater wells. The locations of groundwater wells in the vicinity of the Project Site are provided in the Hydrogeological Assessment Report provided in **Appendix B**.

The nearest wastewater treatment facility to the Project Site is the RM of Springfield wastewater treatment lagoon system located in NE 11-11-5 EPM. (Manitoba Conservation, 2010).

Solid and Hazardous Waste Disposal

The RM of Springfield contracts BFI Canada to manage its waste and recycling programs at the local transfer stations (RM of Springfield, 2020).

The nearest waste transfer stations to the Project Site are the Oakwood Transfer Station located 12.5 km north of the Project Site and the Hillside Transfer Station located 40 km northwest of the Project Site. The nearest landfill is the Brady Road Resource Management Facility in Winnipeg located 63 km southwest from the Project Site.

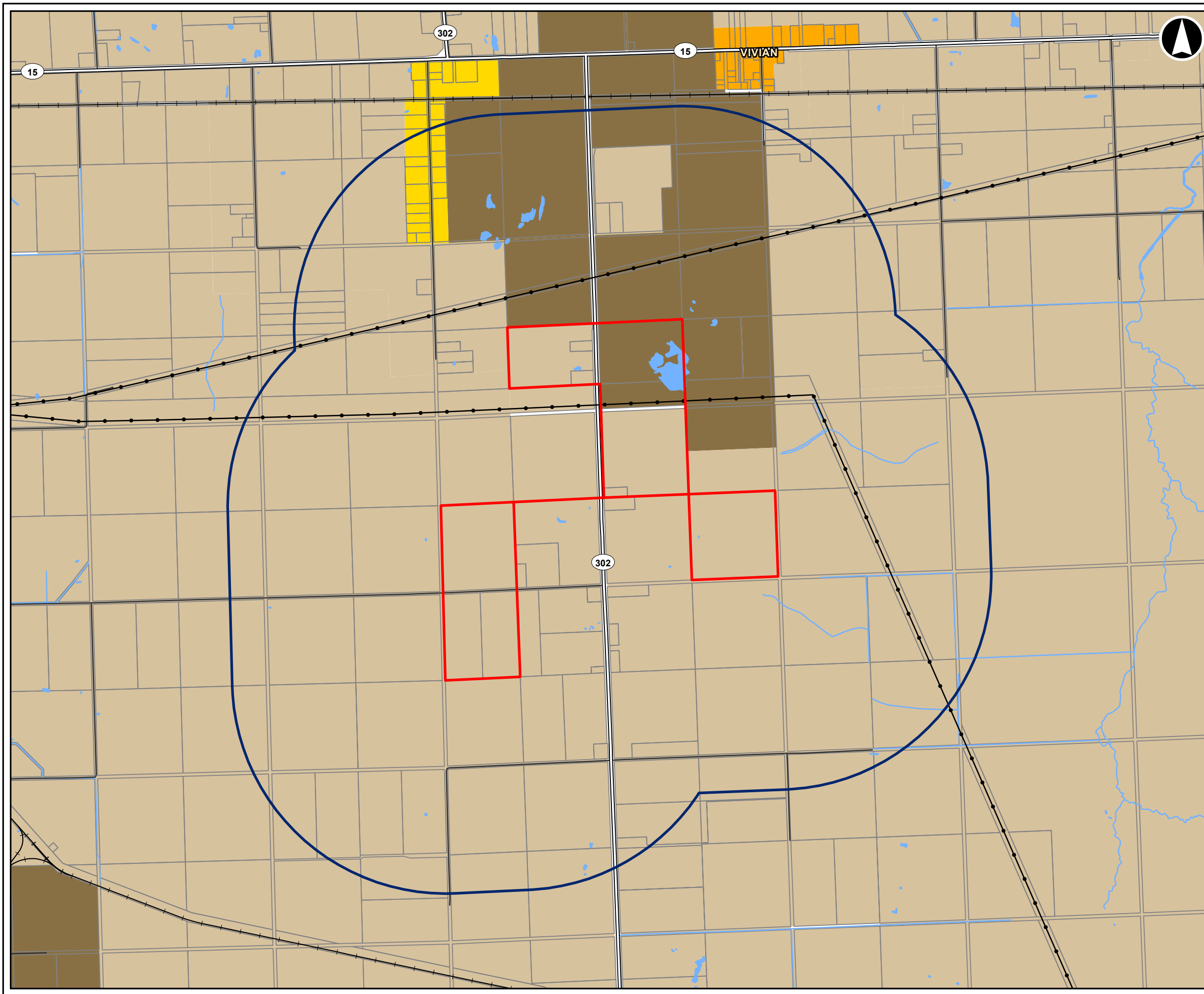
The nearest commercial hazardous waste facility, which also accepts household hazardous waste (e.g., oils and other petroleum products), is the Miller Environmental facility located at 1451 Saskatchewan Ave. in northwestern Winnipeg approximately 57 km west of the Project Site.

4.6.4 Land and Resource Use

Information from the Manitoba Lands Initiative geodatabase indicates that land use within the Project Site is designated as either rural/agricultural use or quarry / mine use (**Figure 4-8**).

The RM of Springfield Development Plan (RM of Springfield, 2018) has designated most of the Project Site as "Agriculture Preserve Area" (68%), with other designated land uses including "Aggregate" (19%) and "Mixed Rural and Agriculture Area" (13%) (**Figure 4-9**).

As indicated in **Section 4.4.1**, approximately 39% of the Project Site has been developed for agriculture purposes. An additional 11% of the Project Site includes other types of land development such as quarry pits, residential lots, transmission line corridor and municipal and provincial roads.



Legend

- Project Site Boundary
- Local Project Area

Land Use

- Quarry / Mine
- Rural Residential
- Rural/Agricultural
- Settlement Centre

General Features

- Highway
- Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Assessment Parcel

**SIO SILICA CORPORATION
ENVIRONMENT ACT PROPOSAL**

**LAND USE
WITHIN THE LOCAL PROJECT AREA**

00.511.52

Kilometres

Datum: NAD 1983 UTM Zone 14N

May, 2024

PN#: 60730241

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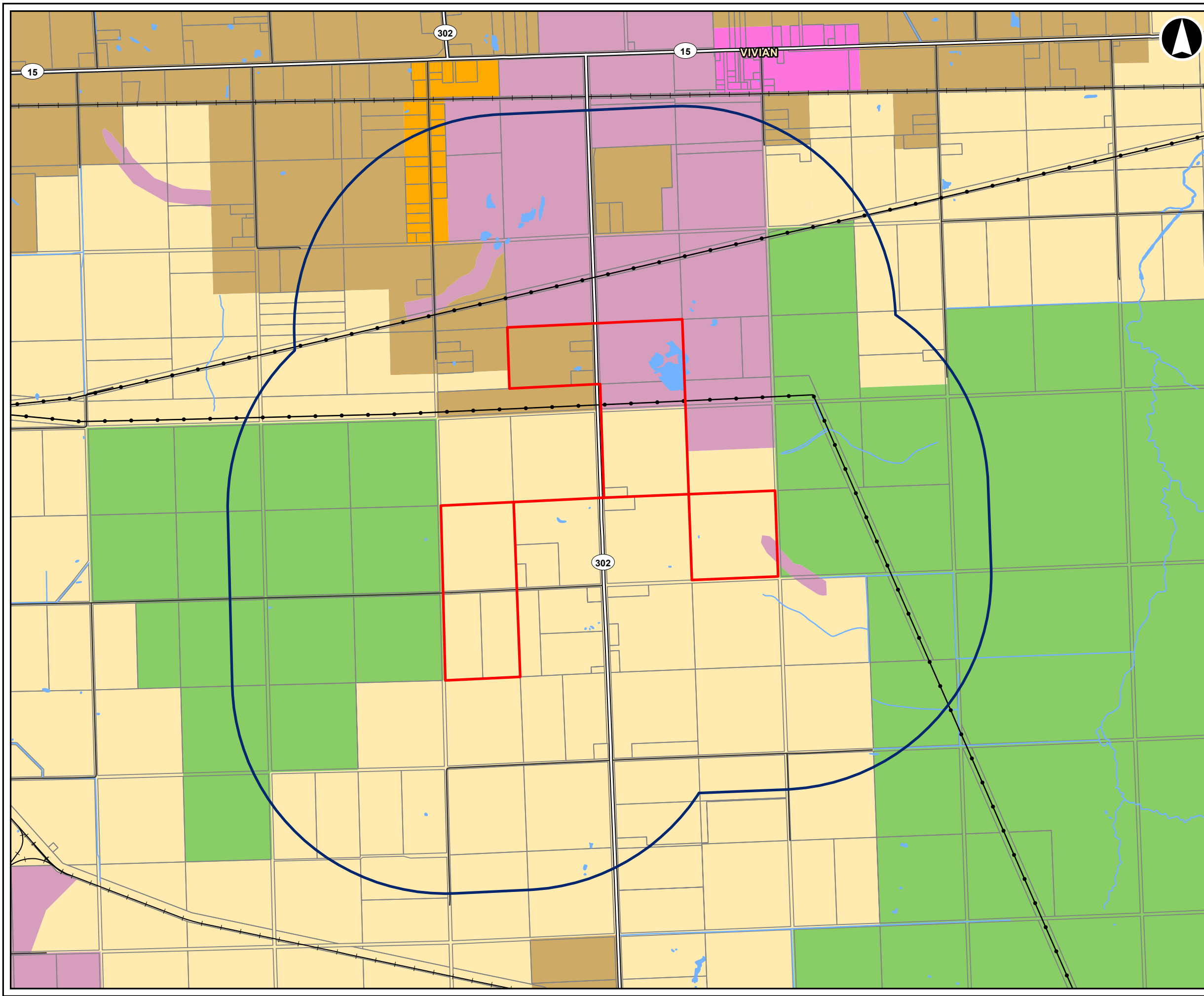
Figure 4-8

AECOM

Data Sources: MLI, Manitoba Government, NRCan - Canvec
Esri Canada, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NRCan, Parks Canada

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Legend

- Project Site Boundary
- Local Project Area

*** Development Plan Designations**

- Aggregate
- Agricultural Preserve Area
- General Development
- Mixed Rural and Agricultural Area
- Natural Resource Area
- Rural Residential

General Features

- Highway
- Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Assessment Parcel

*** Development Plan References:**

- RM of Springfield. 2018. Rural Municipality of Springfield Development Plan. May 17, 2018

**SIO SILICA CORPORATION
ENVIRONMENT ACT PROPOSAL**

**DEVELOPMENT PLAN DESIGNATIONS
WITHIN THE LOCAL PROJECT AREA**

0

0.5

1

1.5

2

Kilometres

Datum: NAD 1983 UTM Zone 14N

May, 2024

PN#: 60730241

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Figure 4-9

Data Sources: MLI, Manitoba Government, NRCan - Canvec
Esri Canada, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NRCan, Parks Canada

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MAP LOCATION: C:\Users\STEPHANIE.CLARK\Desktop\WORKING PROJECTS\60730241_SIO SILICA\EXTRACT_REF\FIGURES\FIGURE 4-9_DEVELOPMENT PLAN
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4.6.5 Heritage Resources

On May 7 and 8, 2021, a qualified archaeologist (Western Heritage) conducted an HRIA of the Project Site in accordance with Historic Resources Branch requirements and under Heritage Permit A11-21, with the exception of one quarter section of land included within the southern-most area of the current Project Site boundary. No archaeological artifacts or features were identified during the HRIA (AECOM 2021). The on-site archaeological investigation found the Project Site to have substantial previous disturbances and concluded that there were no heritage concerns regarding development of the Project at the Project Site (AECOM 2021).

An additional screening request to Manitoba Historic Resources Branch was submitted on April 30, 2024, for the additional quarter section of land now included within the southern-most area of the current Project Site boundary, and not previously screened by Manitoba Historic Resources Branch. Historic Resources Branch responded on May 7, 2024, that the potential for Project impacts on heritage resources is believed to be low, and that they had no further concerns at that time (**Appendix G**).

Sio will submit additional screening requests to Historic Resources Branch for each of the subsequent extraction block areas during the 25-year life of the Project and will have a qualified archaeologist conduct a HRIA, if required, prior to initiating Project construction activities.

5. Public and Indigenous Engagement

Sio has had, and will continue to have, discussions with residents, businesses, local stakeholders, all levels of government and local Indigenous communities in the Project area. Between April and December 2024, Sio engaged extensively with First Nations, particularly the Brokenhead Ojibway Nation (BON), to foster partnerships and build trust. Key milestones included initiating discussions on potential agreements, addressing environmental concerns, and signing a Memorandum of Understanding (MOU) emphasizing mutual respect and economic opportunities. The company also demonstrated its commitment to transparency and reconciliation through public engagement sessions, Treaty Days sponsorship, and question and answer (Q/A) sessions with community members. Sio extended its outreach to other First Nations and participated in cultural and national events, showcasing a dedication to meaningful collaboration and advancing true economic reconciliation.

As indicated in **Section 1.1**, a CEC hearing was held over 12 days from February 27 to March 15, 2023, in Steinbach, Anola and Beausejour for Sio's previously submitted Vivian Sand Extraction Project EAP (CEC 2023). Sio has heard the questions and concerns raised by the public and the TAC on their review of the EAP for the original Vivian Sand Extraction Project and has considered the CEC's recommendations (CEC 2023). A concordance table that summarizes Sio's responses to the CEC's recommendations (CEC 2023) is provided in **Appendix A**, which is intended to address concerns and questions raised regarding the original Vivian Sand Extraction Project, that are reflected in this current EAP for the revised Project.

A key concern was the potential for Sio's sand extraction method to adversely affect groundwater. An updated hydrogeological assessment report (**Appendix B**) provides the outstanding information required to address comments and questions from the public and regulators regarding the potential effects of the Project on local groundwater wells and the regional aquifers (also summarized in **Section 6.2.3**).

To communicate information regarding the SiMBA Project in 2024 and 2025, Sio's on-going engagement efforts have included events as summarized in **Table 5-1**:

Table 5-1: Sio Engagement Events (2024-2025)

Date	Event
July 2024	Open House with Brokenhead Ojibway Nation (BON) - Approximately 150 attendees - Brokenhead Private Tom Chief Memorial Hall, Scantbury, MB
November 2024	Small Group Sessions with BON members - Members signed up to attend - South Beach Casino, 1 Ocean Dr, Scantbury, MB - Each session had approximately 15 to 12 participants
November 2024	Roseau River Anishinabe First Nation meeting and presentation - Three attendees - Sio Silica office, 1800-201 Portage Ave. Winnipeg, MB
December 2024	Meeting with Treaty One Nations representatives Sio provided a Project presentation at Treaty One Office, 103-1075 Portage Ave, Winnipeg
January 2025	Meeting with RM of St. Clements Council to discuss the Project
January 2025	Manitoba Métis Federation (MMF) Presentation Sio met with MMF to provide a Project presentation at MMF Office, 200 Main St., Winnipeg
January 2025	Career Fair - University of Manitoba Sio spoke with students and professors regarding the SiMBA Project
March 2025	Meeting with the Arctic Gateway Group (AGG) to discuss Port of Churchill access

Date	Event
March 2025	Meeting with City of Winnipeg Mayor Gillingham to discuss the Project
March 2025	Meeting with RM of Rockwood, Mayor and Chief Administrative Officer (CAO) to discuss the Project
March and May 2025	Meetings with Steinbach Mayor and CAO to discuss the Project
July 7, 2025	Open House with BON • Approximately 40 attendees • Canad Inn Club Regent Casino, 415 Regent Ave W, Winnipeg, MB

The opportunity for public review of the proposed Project, including the hydrogeological impact assessment study report, will occur during the public review period for this EAP. Once the Environment Act Licence application, including EAP, is submitted to the Manitoba Environmental Approvals Branch, Sio intends to hold a Public Information Session to provide Project information and respond to public comments and questions on the proposed Project.

6. Environmental Assessment and Mitigation Measures

This section identifies the potential Project effects on the biophysical and socioeconomic environmental components, describes mitigation measures included in the design of the Project to avoid or minimize potential Project effects and determines the residual adverse impacts remaining after the application of mitigation measures.

The scope of this environmental assessment regarding spatial and temporal boundaries and the environmental components to be assessed has been described in **Section 3**.

6.1 Effects Assessment Methods

Table 6-1 identifies the biophysical and socioeconomic components that may be potentially affected by the Project due to the potential for interactions with the Project activities and components. Potential interactions were identified based on:

- Professional judgement;
- An understanding of Project components, construction methods, operation processes and the assumption that standard environmentally responsible construction techniques and operating procedures will be applied during Project construction, operation and decommissioning/closure.

Table 6-1: Environmental Component Potential Interactions with the Project

Activity	Biophysical components										Socio-economic components				
	Physical			Atmospheric		Terrestrial			Aquatic						
	Geology/ topography	Soil	Groundwater	Air quality (dust, noise)	Climate / greenhouse gases	Vegetation	Wildlife	Species of conservation concern	Surface water quality	Fish and fish habitat*	Land and resource use	Human health	Indigenous and treaty rights**	Heritage resources	Aesthetics
CONSTRUCTION															
Mobilizing construction equipment, materials and crew to and from Project Site		X		X	X	X	X	X	X		X	X		X	X
Vegetation clearing, grubbing and leveling as needed, for well clusters, temporary access trails and slurry line / water return line trails	X	X		X	X	X	X	X	X		X	X		X	X
Stockpiling cleared woody debris / organics / soil	X	X		X	X	X	X	X	X		X	X		X	X
Disposing of large woody debris (trees)		X		X	X	X	X	X			X	X		X	X
Drilling extraction wells	X	X	X	X	X	X	X	X	X		X	X		X	X
Establishment/laydown of slurry and return water line and associated pumping stations		X		X	X	X	X	X	X		X	X		X	X
Disposing and recycling of miscellaneous construction wastes (e.g. lubricant containers; parts packaging)		X		X	X		X	X				X			X
OPERATION and MAINTENANCE															
Mobilizing drill rigs and crew to and from Project site		X		X	X		X	X				X			X
Operation of air compressors, pumping stations and other equipment.	X	X	X	X	X		X	X			X	X			X
Disposing and recycling of miscellaneous operation and maintenance wastes (e.g. lubricant containers; parts packaging)		X		X	X		X	X				X			X
DECOMMISSIONING / CLOSURE															
Mobilizing decommissioning/closure equipment, materials and crew to and from Project site		X		X	X		X	X				X			X
Dismantling slurry lines, water return lines and associated pumping stations		X		X	X		X	X				X			X
Progressive annual closure of extraction wells (well sealing)	X	X	X	X	X		X	X				X			X
Spreading organics/soil and revegetating previously disturbed areas	X	X		X	X	X	X	X				X			X
Disposing and recycling of miscellaneous construction wastes (e.g. lubricant containers; parts packaging)		X		X	X		X	X				X			X

* There is a low probability of fish habitat existing within the waterbodies (i.e. quarry ponds) occurring within the Project Site. Project activities will avoid waterbodies and will apply appropriate erosion and sedimentation mitigation practices. Therefore, Project related activities are not anticipated to interact with surface waterbodies.

** Project activities are not anticipated to adversely impact Indigenous and Treaty Rights (**Section 6.6.5**).

The framework for determining environmental impacts of the Project on environmental components includes the following:

- Determine potential adverse effects of the Project on environmental components;
- Apply mitigation measures to avoid or minimize potential adverse effects;
- Determine the residual environmental impacts, which are those adverse environmental effects that remain after the application of mitigation measures; and
- Evaluate the residual environmental impacts based on defined effects evaluation criteria.

The criteria used to evaluate residual environmental impacts are defined in **Table 6-2**, noting that the defined criteria is used as a general guide and may be modified to more appropriately evaluate impacts to specific environmental components.

Table 6-2: Environmental Effects Assessment Criteria

Criteria term	Definition			
Magnitude of Effect:	Refers to the estimated percentage of population or resource that may be affected by activities associated with the construction, operation and decommissioning/closure of the Project. Where possible and practical, the population or resource base has been defined in quantitative or ordinal terms (e.g., hectares of soil types, units of habitat). Magnitude of effect has been classified as less than (<) 1%, 1% to 10%, or greater than (>) 10% of the population or resource base.			
	Where the magnitude of an effect was determined as virtually immeasurable or represented a potential change that was within the natural variation of population or resource levels, the effect was considered Negligible. An exception to this is regarding human health effects where, for example adverse health issues due to the Project and affecting 1% of the population would still be considered major.			
	Negligible (immeasurable)	Minor (<1%)	Moderate (1 to 10%)	Major (>10%)
Direction of Effect:	Refers to whether an effect on a population or a resource is considered to have a positive, adverse or neutral effect.			
	Positive	Adverse	Neutral	
Duration of Effect:	Refers to the time it takes a population or resource to recover from the effect. If quantitative information was lacking, duration was identified as short term (<1 year), Moderate term (1 to 10 years) and long term (>10 years).			
	Short term (<1 year)	Moderate (1 to 10 years)	Long term (>10 years)	
Frequency:	Refers to the number of times an activity occurs over the Project phase and is identified as once, rare, intermittent or continuous.			
	Once	Rare	Intermittent	Continuous
Scope of Effect:	Refers to the spatial area potentially affected by the effect and categorized as Project Site, Local Project Area or Regional Project Area as defined in Section 3.2 . Where possible, quantitative estimates of the resource affected are provided.			
	Project Site	Local Project Area	Regional Project Area	
Reversibility:	Refers to if an adverse effect is likely to be reversed after completion of the activity or Project decommissioning/closure.			
	Reversible		Irreversible	

The significance of residual environmental impacts is commented on where applicable regulatory criteria exist such as a regulatory threshold (e.g. air quality guidelines are exceeded due to Project activities). In the absence of such regulatory thresholds, an overall characterization of the impact is provided, taking into consideration the assessment criteria as described above in **Table 6-2**.

Environmental effects that may be caused due to accidents and malfunctions are discussed separately in **Section 6.9**.

6.2 Physical Environment

6.2.1 Geology/Topography

Magnitude of Effect: Minor (Topography and Geology)

Direction of Effect: Adverse

Duration of Effect: Long term

Frequency: Intermittent

Scope of Effect: Project Site

Reversibility: Reversible (Topography); Irreversible (Geology)

The geology and topography of the Project Site will be affected by Project activities including:

- Clearing and levelling as needed at the sand extraction well locations;
- Clearing for temporary laydown areas in well cluster areas;
- Development of temporary access trails for drilling equipment access and temporary trails for slurry line and return water line and associated pumping stations; and
- Drilling of sand extraction wells.

Extraction of the sand resource will result in a permanent change to the underground geology in the form of horizontal arrays of rooms and pillars in the sandstone geological layer (between 52 m to 76 m), in the Carman Sand member of the Winnipeg Formation aquifer within the Project Site.

Results of a geotechnical assessment based on preliminary exploratory drilling associated with this Project from 2017 to 2022 indicated that the overlying carbonate (limestone) geological layer needs to be at least 15 m thick to minimize the possibility of surface subsidence during sand extraction activities (Stantec, 2019; 2020; 2021, and **Appendix C**). The design was completed to operate with no subsidence. With this design criteria, Stantec has provided the following recommendations and parameters that Sio will adhere to for the Project commencing in Phase 1 with the first few wells utilized to confirm extraction conditions in a scaled scenario:

- Design the borehole arrangement and depth to limit the extraction disturbance geometry to the design extraction geometry presented in Table 9 of the geotechnical analysis report provided in **Appendix C**. Extraction well voids are based on the allowable geometry of the void not the total tonnage removed. This will vary from location to location.
- Limit extraction to areas with competent limestone thicker than 15 m.
- Locate extraction group wells with at least 60 m edge to edge distance between their expected long-term cavity disturbance zone (approximately 70 m for short-term cavity disturbance zones).
- Complete a full-scale extraction test to confirm conditions with pre-extraction measurement and monitoring requirements listed in this report.
- Update the FLAC model (i.e. the computer modeling software used for specific geotechnical modeling) as more data becomes available for the extraction boreholes and surface settlement data.
- Measure the overburden, caprock, competent limestone, and sand thickness at each extraction location before the start of extraction. Apply the relevant extraction design based on the recommendations or the refined design as needed based upon full-scale extraction testing results.

- Develop a Trigger Action Response Plan (TARP) for extraction locations. This includes surface, caprock and piezometric monitoring and review during and after extraction.

Furthermore, based on the CEC hearings, Sio is proposing to add the following additional measures as a part of its stepwise approach:

- Advancement / logging of inclined boreholes and acoustic televiewer and optical televiewer (ATV/OTV) surveys prior to extraction activity in a new area to characterize sub-vertical discontinuities.
- Confirmation and monitoring of void space using sonar after extraction including long-term monitoring (after 1 year).
- Installation of subsidence monitoring network including underground extensometer anchored to the caprock top surface, and piezometers within the overburden and at the top of the caprock surface.
- Confirmation of competent limestone thickness and ongoing core sampling to confirm strength.

The Stantec model is considered to be conservative and is designed to achieve little to no subsidence in the immediate extraction area and no subsidence beyond the immediate extraction area. It should be noted that the geotechnical design was conducted with Stability Factors of Safety of 2.0 which is more conservative than many extreme consequence dams.

The following measures will be implemented to avoid or minimize Project adverse effects on geology and topography, including potential for underground and surface subsidence due to the sand and groundwater extraction activities:

- Where applicable, existing roads and trails and other previously disturbed areas will be utilized to minimize disturbance to the natural topography.
- The locations of annual extraction wells will be determined in consideration of the results of geotechnical modeling used to predict thresholds of extraction amounts to mitigate adverse effects related to the potential for underground and surface subsidence (**Appendix C**).
- Additional testing will be conducted to further assess and confirm the limestone and overburden thickness and structure as the Project progresses geographically.
- Progressive annual decommissioning of extraction wells will be done using a concrete cap, bentonite and permeable backfill in accordance with applicable guidance documents such as 'Constructing and Sealing Wells in Manitoba' (Province of Manitoba, 2018).
- Levelling and grading will occur during progressive annual decommissioning of extraction wells to return the landscape to elevations typical to the surrounding area.

Additionally, a Complaint Handling Plan will be developed prior to Project construction that will describe the procedure for handling complaints that are brought to the attention of Sio (e.g., Project related complaints regarding geology/topography effects), and will describe how complaints are managed and addressed (**Section 7.10**).

With the application of the above described mitigation measures, impacts on topography have been assessed as being minor because disturbed land will be leveled, graded and progressively rehabilitated. Impacts to geology are assessed as being minor due to the abundance of remaining sand resource with approximately 0.0125% of sand removed in the first five years of the Project, and approximately 0.082% over the 25-year mine life of the known 15,252,000,000 tonnes of sand as defined by Stantec's resource estimate (Stantec 2024a,b). The extracted sand will not be replaced; therefore, impacts to the geology will be irreversible/permanent.

6.2.2 Soils

Magnitude of Effect: Minor
Direction of Effect: Adverse
Duration of Effect: Long term
Frequency: Intermittent
Scope of Effect: Project Site
Reversibility: Reversible

Construction / operation activities including clearing, levelling, and construction of temporary access trails, well clusters and slurry line and water return line routes, and the progressive annual decommissioning of extraction wells and disturbed areas have the potential to cause soil erosion. Soil erosion can potentially increase during high wind and precipitation events, which are expected to be most frequent during the extraction activities when soils are exposed and not frozen/snow covered (i.e. April through November). Soil erosion may affect other environmental components, such as air quality (e.g. dust from soil disturbance), water quality and vegetation.

To mitigate the effects of soil erosion, the following measures will be incorporated:

- An Erosion and Sediment Control Plan will be implemented for all phases of the Project.
- Access matting will be used to prevent excessive ground disturbance where needed (e.g., low, wet areas).
- During the progressive annual decommissioning activities, after Project components have been removed, the landscape will be leveled and graded, and disturbed areas will be revegetated as quickly as feasible to stabilize the soil and minimize soil erosion.

With the application of the above mitigation measures, the potential for soil erosion and associated adverse impacts to the surrounding environment are anticipated to be minor and restricted to the Project Site.

6.2.3 Groundwater

Magnitude of Effect: Minor
Direction of Effect: Adverse (quantity); Adverse to Positive (quality)
Duration of Effect: Long term
Frequency: Intermittent (i.e. seasonal)
Scope of Effect: Project Region
Reversibility: Reversible (aquifer will recharge over time)

A comprehensive hydrogeological and geochemical assessment was undertaken involving field investigation, data analysis, numerical groundwater modelling and geochemical modelling, with the results described in an extensive, hydrogeology and geochemistry assessment updated report (**Appendix B**). The scope of the hydrogeology and geochemistry assessment provided in **Appendix B** is based on modeled predictions of the Project on the Local Study Area, with the expected magnitude of effects in the Regional Project Area to decrease with distance from the Project Site. The model used to predict the effects of the Project on groundwater included information on existing groundwater well locations, mapped aquifers and use of groundwater (e.g. domestic, municipal, commercial, industrial, agricultural, irrigation) in proximity to the Project Site, Local Project Area and Regional Project Area.

Based on information in the hydrogeology and geochemistry assessment updated report (**Appendix B**), and as summarized below in **Section 6.2.3.1**, the impacts to groundwater quantity are assessed to be minor, seasonal in duration and reversible. Although the quantity of water within the aquifers will be preserved, water levels may decrease slightly (**Section 6.2.3.1**). With the application of mitigation measures described below (**Sections 6.2.3.2 and 6.2.3.3**) for the protection of groundwater quality, risks to groundwater quality are considered to be sufficiently mitigated.

6.2.3.1 Groundwater Quantity

As indicated in **Section 2.2.1**, the slurry loop system for transporting sand to the Processing Facility is designed to not require any additional water which allows for the majority of the water that comes from each extraction well to be returned to the aquifer within a short period of time. Therefore, very little groundwater from the aquifer will be permanently withdrawn.

Based on groundwater model simulations (**Appendix B**), most of the wells within the Project Area are not likely to be affected by operations because they fall outside the estimated 0.5 m drawdown cone. However, several licensed wells fall between the estimated 0.5 m and 5 m drawdown cones and pumps installed a short distance below the water table may experience diminished well yield during operations. Appropriate mitigations may include conducting a survey in advance of operations to determine the location, depth, use and configuration of each well, lowering of pumps in advance of sand extraction or providing treated makeup water during periods of time when drawdown impacts may occur.

Consistent with the results of field testing, water levels were simulated to recover relatively rapidly, with approximately 80% recovery approximately two days following the end of production at each well cluster (**Appendix B**). Water levels in the Winnipeg Sandstone and Red River Carbonate aquifers are anticipated to return to near static water groundwater levels within approximately 60 days after production ceases each year (**Appendix B**).

Removal of sand at each extraction well will change the aquifer properties within the void created by sand removal and complete recovery may take longer in proximity to sand extraction wells. Although minor changes in groundwater levels may occur, the overall quantity of groundwater is anticipated to be similar to, or greater than present. The volume of groundwater recharge and discharge are assumed to be relatively unaffected by Project operations. Only the local aquifer properties will change, but the increase in porosity will allow for more groundwater to occupy the pore space within the voids created by sand removal (**Appendix B**). These simulation results are consistent with the results of the 2020 field investigation that observed relatively minor drawdown in residential water supply wells, but well yield was not impacted, and impact mitigation was not required (**Appendix B**). The majority of domestic water supply wells are completed in the Red River Carbonate and will be impacted to a much lesser degree by sand extraction from the underlying Winnipeg Sandstone (**Appendix B**).

A Water Management Plan (**Section 7.2**) will be developed and a Groundwater Monitoring and Impact Mitigation Plan (**Section 7.4**) will be implemented to monitor groundwater extraction/injection and water levels within the aquifer surrounding the Project Area and mitigate any impacts to surrounding wells.

6.2.3.2 Groundwater Quality

Overall, material impacts to groundwater quality within the Project Area are unlikely because both the Red River Carbonate and Winnipeg Sandstone host fresh and relatively dilute groundwater. Based on the results of geochemical assessment and modelling, the activities associated with Project operations and post-closure phases of the Project were determined to have no material impact on groundwater quality. In many cases, the impact was simulated to be positive due to reduction of concentrations of iron and manganese when oxygen is introduced into the aquifer which in turn favor the co-precipitation of metals / metalloids¹⁴. Should Project operations result in a more interconnected aquifer system comprising the Red River Carbonate aquifer and the underlying Winnipeg Sandstone aquifer in extraction areas, groundwater quality would tend to reflect conservative mixing of the two water types with a trend generally towards the water quality of the Winnipeg Sandstone aquifer (**Appendix B**).

¹⁴ Precipitation and co-precipitation of metals and metalloids refers to the process where soluble metals and metalloids in a solution transform into insoluble solid precipitates.

In addition, the collapse of a section of the Winnipeg Shale and Red River Carbonate in the cavity formed in the Winnipeg Sandstone following the sand extraction is likely to occur. Water quality within the void may temporarily exhibit slightly elevated concentrations of selenium and manganese caused by dissolution of minerals and following the physical collapse of the overlying Winnipeg Shale and a small portion of the Red River Carbonate. The assessment and modelling of the impact of the collapse of the overlying materials on the water quality of the Winnipeg Sandstone aquifer show that the modeled concentrations of arsenic, selenium, and uranium will decrease and remain below the Manitoba and Canadian Drinking Water Quality Guidelines. While arsenic and uranium concentrations will remain below these guidelines in the void as well, modeled selenium concentrations (i.e., 0.015 mg/L) will remain slightly above Manitoba water quality guidelines (i.e., 0.01 mg/L) in the void for an estimated seven years after the collapse, until they decline below the Manitoba water quality guidelines. Due to the very minor potential temporary increase in selenium concentrations above Manitoba water quality guidelines (i.e., 0.005 mg/L) the risk of adverse human health effects is negligible considering that water quality guidelines for selenium in most other jurisdictions are higher (e.g., Alberta and Saskatchewan drinking water guideline for selenium is 0.05 mg/L; Kosnett, 2020). The lateral migration of the water quality temporarily impacted by the collapse in the void is very slow and it will take several years to decades to stabilize (re-equilibrate) which will minimize the effect on the water quality in adjacent and downstream portions of the aquifer (**Appendix B**).

Although the injection of water containing residual dissolved oxygen will reduce concentrations of iron and manganese in the vicinity of extraction wells, it is not anticipated to induce metal leaching or acid rock drainage (ML/ARD) reactions due to the very low to absent concentrations of minerals prone to oxidation (i.e. pyrite and pyrrhotite) coupled with low and finite concentrations of dissolved oxygen in subsurface groundwater and re-injected water. This is supported by the presence of very good water quality in both aquifers today. The vertical gradients between the two aquifers are downward and near neutral such that the magnitude of any inter-aquifer exchange during and following project operations is likely to be small (**Appendix B**).

A Waste Characterization and Management Plan (**Section 7.1**) and Groundwater Monitoring and Impact Mitigation Plan (**Section 7.4**) will be implemented to protect groundwater quality and guide responses to any potential impacts. It is noteworthy that the deep Winnipeg Sandstone aquifer will remain protected by thick and low permeability glacial sediments and separated from ground surface by the Red River Carbonate aquifer and residual intact portions of the Winnipeg Shale (**Appendix B**). As such, a Progressive Well Abandonment Plan (**Section 7.3**) will limit hydraulic communication between the Red River Carbonate and the Winnipeg Sandstone by plugging boreholes upon completion of sand extraction from each well.

6.2.3.3 Groundwater Mitigation Measures and Assessment Summary

The following measures are expected to mitigate groundwater withdrawal effects and potential for groundwater contamination:

- Process water will be recycled in a loop system for reuse, which reduces the quantity of water required from groundwater.
- When each well is drilled, a casing will be installed and grouted in place to isolate the Red River Carbonate and Winnipeg Sandstone aquifers from one another to mitigate vertical mixing of the aquifers.
- Extraction wells will be progressively (sequentially) established and sealed (decommissioned) during the ongoing sand and groundwater extraction activities in accordance with applicable guidance documents such as 'Constructing and Sealing Wells in Manitoba' (Province of Manitoba, 2018) and Environment Act Licence requirements.
- Geochemical modelling (**Appendix B**) has indicated that reinjection of groundwater (which will be UV-treated) back to the sandstone aquifer will not adversely affect groundwater quality in either the Winnipeg Sandstone or Red River Carbonate aquifers.

- A Waste Characterization and Management Plan, Water Management Plan, Trigger Action Response Plan, Groundwater Monitoring and Impact Mitigation Plan and Progressive Well Abandonment Plan (**Section 7**) will be developed and implemented to protect groundwater quality and guide responses to any potential impacts to groundwater quantity and quality. Measures will be developed to avoid and/or mitigate any well interference issues as required by *The Water Rights Act* of Manitoba. The plans will outline follow-up adaptive management measures that will be implemented in consultation with Manitoba Environmental Approvals Branch should there be any unforeseen adverse impacts on groundwater (i.e. beyond an acceptable threshold or regulatory guidelines).
- A Complaint Handling Plan will be developed prior to Project construction that will describe the procedure for handling complaints that are brought to the attention of Sio (e.g., Project related groundwater complaints), and will describe how complaints are managed and addressed (**Section 7.10**).
- Groundwater quality will be maintained in accordance with requirements in an Environment Act Licence.

With the application of the above mitigation measures and utilization of groundwater at sustainable rates as determined by ongoing hydrogeological testing and monitoring, impacts to groundwater are anticipated to be minor, seasonal in duration and reversible. Considering there will not be a continuous and unsustainable drawdown on the regional groundwater aquifer for Project processes and that the majority of the water that comes from the extraction well will be returned to the aquifer within a short period of time, effects on groundwater quantity in the regional aquifer can be managed by adhering to a Water Management Plan and by implementing a Groundwater Monitoring and Impact Mitigation Plan. The aquifer will also continue to be recharged through natural groundwater recharge processes (i.e. rain and snow melt) and lateral groundwater flow. Effects on groundwater quality will be minor and, in some cases, positive. Risks to groundwater quality will be mitigated through application of a Waste Characterization and Management Plan, Progressive Well Abandonment Plan, Trigger Action Response Plan, and Groundwater Monitoring and Impact Mitigation Plan.

6.3 Atmospheric Environment

6.3.1 Air Quality

Magnitude of Effect: Minor to Negligible

Direction of Effect: Adverse

Duration of Effect: Long term

Frequency: Intermittent

Scope of Effect: Project Regional Area

Reversibility: Reversible

Project activities are expected to affect air quality due to dust generated by movement of drill rigs and other mobile equipment, and due to exhaust emissions including nitrogen dioxide (NO₂), carbon monoxide (CO) and sulfur dioxide (SO₂). The exhaust emissions and dust generated from mobile equipment can have adverse effects on human health, wildlife and vegetation.

The number of vehicles and equipment used for Project activities listed in **Section 2.8** would not all be operating simultaneously. Therefore, adverse effects on air quality beyond Manitoba's air quality guidelines at nearest residences¹⁵ from vehicles and mobile equipment use are not anticipated.

As indicated in **Section 1.1**, at no time will dry sand be left exposed at the Project Site. Sand will be wet and will either be contained within the extraction well lines or the slurry lines, or material that is too large ('overs'), such as concretions (calcified sand), will be stored in appropriate containment prior to removal

¹⁵ Nearest residence is approximal 109 m west of proposed well cluster areas.

from site and disposal at a licenced facility, or for use in annual progressive closure and decommissioning (i.e. sealing) of extraction wells. Therefore, the risk of silica sand dust dispersal is eliminated.

Measures that will be applied to minimize potential Project effects to air quality include the following:

- Idling of motorized equipment will be minimized to the extent feasible;
- Water will be applied on gravel roads to control dust, as required; and
- Equipment and vehicles will be properly maintained.

Additionally, a Complaint Handling Plan will be developed prior to Project construction that will describe the procedure for handling complaints that are brought to the attention of Sio (e.g., Project related air quality complaints), and will describe how complaints are managed and addressed (**Section 7.10**).

With the application of the above measures, impacts on air quality are expected minor to negligible, and sufficiently mitigated.

Impact assessment information for greenhouse gas (GHG) emissions is provided in **Section 6.3.2**.

6.3.2 Climate/Greenhouse Gases

Magnitude of Effect: Negligible

Direction of Effect: Adverse

Duration of Effect: Long term

Frequency: Intermittent

Scope of Effect: Beyond the Project Regional Area

Reversibility: Irreversible

To estimate the annual emissions of greenhouse gases (GHG), emissions of carbon dioxide (CO₂), methane (CH₄) and Nitrous Oxide (N₂O) were estimated from onsite activities associated with the Project operation. Estimated GHG emissions associated with Project equipment are summarized in **Table 6-3**.

Table 6-3: Greenhouse Gas Annual Emissions (CO₂e)

Emission Sources	Total Utilization (hours/year)	CO ₂ GHG Emission (kg CO ₂ / year)	CH ₄ GHG Emission (kg CH ₄ / year)	N ₂ O GHG Emission (kg N ₂ O / year)	CO ₂ eq GHG Emission (kg CO ₂ eq / year)
EXTRACTION					
Extraction Rig	15,000	1,882,062	54.76	15.44	1,887,811
Compressor trailer for extraction OFD1550 Tier 4 Final Oil Free Rotary Screw Air Compressor	15,000	1,138,085	33.11	9.34	1,141,561
Excavator (if required)	1,250	64,679	1.88	0.53	64,877
Light Plant (if required)	0	0	0	0	0
Flat Deck Truck (2015 F650 XLT Super Duty w/ 17' bed) (if required)	1,250	61,629	1.79	0.51	61,818
Zoom Boom / Manitou MT 5519 Telescopic Handler	875	34,015	0.99	0.28	34,119
80 kW Diesel Generator	1,250	63,674	1.85	0.52	63,868
DRILLING					
DR24 for Drilling	6,000	479,363	13.95	3.93	480,827
Water Truck 2022 FORD F750 WATER TRUCK	500	17,292	0.50	0.14	17,345
Grouting System	500	8,043	0.23	0.07	8,068
SEALING					
DR24 for Abandonment	250	20,349	0.59	0.17	20,411
Picker Truck (if required)	250	17,768	0.52	0.15	17,823
SUPPORT					
Welding Truck F350	150	9,032	0.26	0.07	9,060
Mechanical Service Truck F350	150	9,032	0.26	0.07	9,060
Waste hauling trucks	500	17,292	0.50	0.14	17,345
SLURRY HANDLING					
Pipe Welding Machine	N/A	N/A	N/A	N/A	N/A
Vac Truck	N/A	N/A	N/A	N/A	N/A
ELECTRICITY CONSUMPTION					
Pump Station	8,760	19,074	-	-	19,074
Total		3,841,391	111.21	31.37	3,853,067

The following measures to minimize the production of GHG emissions will be applied:

- Emissions will be minimized by regularly maintaining equipment and vehicles and minimizing idling of vehicles
- Vehicles and equipment will meet required emission standards.

Overall, the Project is estimated to generate 0.003853 Mt of CO₂e annually with the application of the above mitigation measures, which is approximately 0.0183% of the reported Manitoba emissions in 2023 which were 21 Mt CO₂e (ECCC, 2025), and approximately 0.0006% of the reported 694 Mt CO₂e from Canada in 2023 (ECCC, 2025). Therefore, the impact of the Project on GHG contributions to the atmosphere is assessed as negligible.

6.3.3 Noise

Magnitude of Effect: Minor to Moderate

Direction of Effect: Adverse

Duration of Effect: Short-term

Frequency: Intermittent

Scope of Effect: Variable due to changing annual locations of Project activities within the Project Site

Reversibility: Reversible

Noise generated by Project activities (e.g. extraction well drilling; operation of vehicles and machinery such as pumping stations) has the potential to adversely affect wildlife (**Section 6.5.2**) and could result in nuisance noise to people living within the Local Project Area. Project components expected to generate noise that may contribute to noise levels at the nearest points of reception (e.g. nearest residence, i.e. 109 m from a well cluster area) are listed in **Section 2.8**. Example noise sources associated with Project activities include mobilization of extraction well drilling equipment, drilling of wells and operation of pump stations.

The following measures will be implemented to reduce noise generated from Project activities:

- Vegetation clearing will be minimized to the extent feasible.
- Project activities will setback a minimum of 100 m from nearest residences.
- Mobile equipment and vehicles will be kept well maintained and will be fitted with mufflers, and other noise mitigation equipment as required.
- Unnecessary idling and revving of engines will be avoided.
- A Noise Mitigation Plan will be prepared that will describe additional noise mitigation measures to be applied (e.g. portable noise barriers) as required (**Section 7.9**).

Additionally, a Complaint Handling Plan will be developed prior to Project construction that will describe the procedure for handling complaints that are brought to the attention of Sio (e.g., Project related noise complaints), and will describe how complaints are managed and addressed (**Section 7.10**).

In consideration of the above measures to minimize noise levels due to Project activities, it is anticipated that potential noise levels at the nearest residences will be adequately attenuated. Noise disturbances to wildlife are expected to be moderate in the vicinity of Project activities but are not expected to measurably affect wildlife populations within the Interlake Plain Ecoregion within which the Project is located.

6.4 Aquatic Environment

6.4.1 Surface Water

Magnitude of Effect: Negligible

Direction of Effect: Adverse

Duration of Effect: Short term

Frequency: Intermediate

Scope of Effect: Local Project Area

Reversibility: Reversible

Project operations do not involve the use of, or discharge of, any surface water of any kind. Residual effects from temporary extraction-related activities including clearing, levelling, compacting, and establishment of well clusters, extraction wells, temporary access trails and slurry and water return line trails has the potential to increase surface water runoff within the Project Site and Local Project Area and potentially affect surface water quality and quantity. Removal of existing vegetation can potentially pose a risk to surface water quality as more sediment will be exposed to surface water drainage, potentially resulting in sediment laden runoff water. However, considering the Project Site does not have natural waterbodies potentially affected by vegetation removal, adverse effects to surface water from vegetation removal are not anticipated.

Due to the absence of natural waterbodies such as wetlands in the Project Site and immediately adjacent Local Project Area that may be potentially affected due to a temporary drawdown effect¹⁶ from sand extraction activities, Project operations are not expected to affect surface water quantity.

The following mitigation measures will be implemented to avoid or minimize potential effects on surface water quality:

- Drainage ditching will be constructed along Project access trails and at disturbed areas, as required, to assist in directing runoff flow from rain and snow and maintaining natural drainage pathways through low areas.
- As per **Section 2.3.1**, portable toilets will be located at active well cluster sites which will be regularly pumped out by a licensed local contractor for proper disposal to prevent potential contamination of local waterbodies with potentially harmful substances.
- As per **Section 6.2.2**, an Erosion and Sediment Control Plan will be implemented for all phases of the Project.

With the application of the above described mitigation measures, the impacts on surface water are assessed as negligible.

6.4.2 Fish and Fish Habitat

Project related impacts on fish and fish habitats are not anticipated due to the lack of potential fish habitat within the Project Site (**Section 4.3.2**) and application of an Erosion and Sediment Control Plan as indicated in **Section 6.2.2**.

The CEC report for the previous (larger) Vivian Sand Extraction Project had also concluded “*Since there are no permanent water bodies on the project site and assuming application of the erosion and sediment control plan, not impact on fish and fish habitat is expected.*” (CEC 2023). The additional section of land included in the south end of the Project Site boundary for this current Project, and not included in the previous Vivian Sand Extraction Project, does not contain waterbodies (**Sections 4.3.1 and 4.3.2**).

¹⁶ Drawdown effect is the lowering of the water table related to the zone of influence that groundwater extraction activities would have in the vicinity of extraction sites (refer to **Appendix B** for a description of the predicted drawdown effect distance for Project operations).

6.5 Terrestrial Environment

6.5.1 Vegetation

Magnitude of Effect: Minor (Project Site) to Negligible (Local Project Area)

Direction of Effect: Adverse

Duration of Effect: Long term

Frequency: Intermittent

Scope of Effect: Project Site (vegetation clearing) to Local Project Area (dust deposition)

Reversibility: Reversible

The total amount of naturally vegetated area requiring clearing for annual Project operations will vary considering the variable amounts of natural vegetation present within each annual block of Project development lands within the Project Site (which consists of 39% “agriculture lands” and 11% “developed land”; **Section 4.4.1**). There will be no permanent components associated with the extraction Project. Therefore, progressive annual rehabilitation / revegetation of Project activity sites will minimize the long-term effects on vegetation within the Project Site. Direct impacts on vegetation through annual clearing activities will be restricted to the Project Site in consideration of setback distances as described in **Section 1.5.1**.

The annual footprint area requiring clearing to accommodate Project components will be minor and temporary. The footprint area of each well cluster will be minor (i.e. 0.20 ha to 0.28 ha), with a maximum only seven wells active at any one time, with other well clusters being progressively rehabilitated and revegetated. The pathway required to accommodate the parallel slurry and water return line will be very narrow (2 m wide), with temporary access trails limited to approximately four m in width and up to approximately eight m in width at turning points to accommodate required drill rig turning areas. Routing of these lines and the temporary access trails will be located within previously disturbed / cleared areas to the extent feasible. Therefore, these annual pathway routes will not represent a substantial annual footprint area where natural vegetation will need to be cleared. The number and locations of pumping stations required along the slurry line routes will also vary annually with increasing distance from the Processing Facility. The footprint area of the pumping stations will also be minor; approximately 63 m² each.

Project activities and temporary components will be located on previously disturbed land to the extent feasible within a Project Site that consists of approximately 50% natural vegetation cover. Therefore, the amount of naturally vegetated area requiring clearing each year is expected to be minor.

The types of naturally vegetated land cover that will be cleared (i.e., forest, willow/alder and meadow) are common within the Regional Project Area (**Section 4.4.1**).

Considering progressive closure, rehabilitation and revegetation of extraction activity areas will be done each year, it is expected that most natural vegetation will be very well established after approximately four years, with reestablishment of trees and shrubs expecting to be evident within five to 10 years following closure.

The following mitigation measures will be implemented to avoid or minimize potential effects of clearing on vegetation:

- Areas to be cleared of vegetation will be minimized to the extent feasible and will be clearly marked to avoid clearing more than required.
- Access matting will be used to prevent excessive ground disturbance where needed (e.g., low, wet areas).
- Usable trees / wood will be cut and stacked at the Project Site for local use as firewood for no longer than one year or disposed of in accordance with applicable regulations.

- Disturbed areas will be allowed to revegetate naturally and will be augmented using an approved native seed mixture and native plantings if required.
- A Revegetation Monitoring Program (**Section 7.7**) will be implemented annually after the first year of Project operations to determine the success of the revegetation program and determine if follow-up reseeding or replanting is required. The monitoring program will include monitoring during the growing season until the seedlings appear to be established.
- Mitigation measures to control dust (**Section 6.3.1**) will be applied.

Clearing impacts on vegetation are limited to the Project Site and are assessed as minor due to:

- The limited amount of clearing required for annual Project operations; and
- The progressive annual site reclamation and revegetation procedures that will occur to return the landscape to pre-construction conditions to the extent feasible.

Vegetation within the Project Site and Local Project Area can also be harmed due to dust deposition on the surface of plants, which may prevent adequate photosynthesis and other life functions of vegetation (Farmer, 1993). Dust will be generated during Project activities as follows:

- Due to vegetation clearing and ground levelling activities, as needed;
- During use of existing gravel roads and temporary access trails which will contribute to dust emissions, to mobilize employees and equipment to the Project Site; and
- During the progressive annual closure/reclamation activities, dust deposition will be generated from cleanup and removal of Project components.

Effects of dust deposition are assessed to be minor due to the application of the mitigation measures listed in the air quality **Section 6.3.1** to control dust.

With the application of the above mitigation measures, overall Project impacts to vegetation are assessed as minor within the Project Site and negligible within the Local Project Area.

6.5.2 Wildlife

Magnitude of Effect: Negligible

Direction of Effect: Adverse

Duration of Effect: Long term

Frequency: Intermittent

Scope of Effect: Regional Project Area

Reversibility: Reversible

Project activities that disrupt the natural environment (e.g. vegetation clearing, noise) are the primary contributors to potential effects on wildlife. Wildlife management focuses on regional wildlife populations because wildlife populations (e.g. deer) are typically not measurably affected if only an individual or small number of individuals are affected within a relatively small spatial area (e.g. the home range of a deer). Therefore, the spatial scope of the assessment of the Project impacts on wildlife has been conducted in consideration of the Regional Project Area. The availability of nearby alternative habitat for wildlife is also taken into consideration when assessing the potential effects of a development on wildlife.

The limited average annual amount of natural vegetation clearing within the Project Site that is required for Project activities (**Section 6.5.1**) is unlikely to substantially affect wildlife populations within the Regional Project Area because:

- The Project Site currently provides sub-optimal wildlife habitat (generally) due to existing disturbances and resulting fragmented habitat from existing development (e.g. agriculture fields; existing roads; quarries; residential lots; **Section 4.6.4**);

- The types of landcover used by wildlife that will be cleared during Project activities are not uncommon in the Regional Project Area (**Section 4.4.1**); and
- The amount of naturally vegetated area that will need to be cleared for the Project during each year of operation is minor considering approximately 50% of the Project site is previously disturbed landcover due to human development such as agriculture, roads and aggregate quarries.

Noise generated during Project activities is expected to influence wildlife behaviour (e.g. area avoidance) to varying degrees within the Project Site and Local Project Area depending on the type of wildlife (U.S. National Parks Service, 2018). Noise generated within the Project Site is not expected to be of a magnitude that would substantially affect wildlife populations within the Regional Project Area because:

- Project-generated noise is not expected to be substantial beyond the Project Site and adjacent Local Project Area (**Section 6.3.2**); and
- Wildlife species present in the vicinity of the Project are anticipated to be accustomed (habituated) to some level of noise (U.S. National Parks Service, 2018) due to the presence of existing developments (e.g. agriculture activities, residential areas, roads and aggregate quarries).

Additional potential effects of the Project on wildlife include the following:

- Light pollution emanating from the well cluster / work areas within the Project Site can also disturb wildlife and alter natural wildlife behaviour for wildlife that may be present within the zone of influence of site lighting (e.g. Dominoni, 2017).
- The minor increase in vehicle traffic in the Regional Project Area as a result of Project activities (**Section 6.7**) is anticipated to result in a minor increase the risk of vehicle collisions with wildlife.

The following measures will be applied to minimize potential adverse effects to wildlife resulting from Project activities:

- Areas to be cleared of vegetation will be minimized to the extent feasible and will be clearly marked to avoid clearing more than required.
- Vegetation clearing will take place outside of the spring and summer months to the maximum extent feasible to avoid disturbance to breeding birds and other spring breeding wildlife species.
- Vegetation clearing will not take place during the breeding bird season for this '[Zone B4](#)' area (April 14 – August 24; Government of Canada, 2018).
- Areas disturbed during annual Project activities will be allowed to revegetate naturally after each Project operation year and will be augmented using an approved native seed mixture and native plantings if required.
- Noise mitigation as proposed in **Section 6.3.2** will be applied.
- Measures to control dust generation will be applied as described in **Section 6.3.1**.
- Fully shielded directional lighting fixtures will be used to focus light specifically to work areas to minimize the dispersal of light to the surrounding Project Site.
- Workers using the temporary access trails to access the Project Site (e.g. well cluster sites) will be required to limit vehicle speed to a maximum of 30 km/hr.
- Employees and contractors will be required not to feed or harass wildlife.

With the application of the above mitigation measures, Project impacts to the Regional Project Area wildlife populations are assessed as negligible. The Project is also not anticipated to have a measurable effect on wildlife populations within the Interlake Plain Ecoregion.

6.5.3 Species of Conservation Concern

Magnitude of Effect: Minor to Negligible

Direction of Effect: Adverse

Duration of Effect: Long term

Frequency: Intermittent

Scope of Effect: Regional Project Area

Reversibility: Reversible

Species of conservation concern that potentially occur in the Regional Project Area (**Section 4.4.3; Appendix F**) are not expected to experience a substantial decrease in regional populations as a result of Project activities due to:

- The limited amount of cleared vegetation/habitat that will be required for the Project (**Section 6.5.1**).
- Prevalence of similar cover types within the Regional Project Area, and the application of measures indicated in **Sections 6.5.1** and **6.5.2** to mitigate adverse effects of the Project on vegetation and wildlife in general.

Therefore, the Project impacts to regional populations of species of conservation concerns are assessed as minor to negligible, depending on the species of conservation concern and their habitat preferences.

6.6 Socioeconomic Environment

6.6.1 Labour Force and Employment

Magnitude of Effect: Minor

Direction of Effect: Positive

Duration of Effect: Long term

Frequency: Intermittent

Scope of Effect: Regional Project Area

Reversibility: Reversible

According to the labour force and education / training statistics provided in **Section 4.6.2**, there will be potentially employable people in the Local and Regional Project Areas having the skills, training and experience required for Project employment positions. There may also be other supply and services contracts associated with the operation of the Project that will provide additional long-term economic opportunities.

As indicated in **Section 2.5**, approximately 30 to 40 staff and third-party contractors will be employed for Project activities such as annual site clearing, extraction well drilling, extraction activities and relocation and assembly of temporary Project components. The need for local suppliers and other business to support Project activities is likely to provide an additional 90 to 110 indirect employment opportunities. Employment opportunities associated with the Project will be advertised as needed within the Regional Project Area and will be a positive, long-term and continuous benefit for the Regional Project Area.

6.6.2 Infrastructure and Services

Emergency Services

Magnitude of Effect: Minor

Direction of Effect: Neutral/Adverse

Duration of Effect: Long term

Frequency: Intermittent

Scope of Effect: Regional Project Area

Reversibility: Reversible

Emergency services (i.e., fire, policing and ambulance) in the Regional Project Area have the potential to be utilized more often potentially resulting in limitations to the current availability and response times for these regional services. To mitigate potential adverse effects of the Project on Regional Project Area emergency services, Sio will incorporate the following measures:

- An Environmental Emergency Response Contingency Plan will be available on-site during all Project phases that will clearly outline appropriate emergency response protocols (**Section 7.6**).
- Sio will notify the RM of Springfield emergency services regarding the annual Project activities schedule.
- Measures to avoid accidents and malfunctions as described in **Section 6.9** will be applied.

With the application of the above measures, the Project impacts on regional emergency services are anticipated to be minor.

Community Services

Magnitude of Effect: Minor (benefit)

Direction of Effect: Neutral to Positive

Duration of Effect: Long term

Frequency: Intermittent

Scope of Effect: Local and Regional Project Area

Reversibility: Reversible

Although Project activities (well drilling) will occur year-round, there will be no permanent structures associated with Project activities. Therefore, the need for community services will be limited, but may include sourcing of some supplies and services locally where available such as machine maintenance services; fuel, oil and grease supply; small tools and equipment supply; garbage removal; health and safety supplies as well as drilling materials such as cement. Sio may initiate agreements for local / regional community services that would be beneficial for both the RM of Springfield and the Project.

Solid waste generated at the temporary annual work areas will be transported by a licensed local contractor to be disposed at a local licenced landfill to an amount that would be sustainable for the local landfill. Otherwise, solid waste will be transported 63 km to the Brady Road Landfill managed by the City of Winnipeg.

Benefits to the Local and Regional Project Area from the opportunities for local business to supply required goods and services are anticipated to result in an overall minor positive impact to community services.

6.6.3 Land and Resource Use

Magnitude of Effect: Minor
Direction of Effect: Adverse
Duration of Effect: Short term
Frequency: Intermittent
Scope of Effect: Project Site
Reversibility: Reversible

Project activities will occur on Sio mining claims sequentially from year 0 (2026) to year 4 (2030) which will result in temporary use of a very limited portion of the Project Site land each year of the Project. Land use for Project activities will occur in accordance with municipal and provincial approvals and legislative requirements.

Use of the land for other purposes will not be available in the locations of annual Project activities. However, due to the progressive annual reclamation of extraction sites and other Project-related disturbed areas, parcels of land used for Project activities during any given year of Project operation will be available for other uses the following year or once the activities are complete. Sand extraction activities occur over weeks in one area rather than months, with individual wells over days. Therefore, the Project is anticipated to result in an overall minor temporary adverse impact to land use within the Project Site.

6.6.4 Human Health

Magnitude of Effect: Negligible
Direction of Effect: Adverse
Duration of Effect: Long Term
Frequency: Intermittent
Scope of Effect: Local and Regional Project Areas
Reversibility: Reversible

Project activities have the potential to adversely affect human health through:

- Increased traffic due to employees and contractors accessing the Project Site;
 - Emissions from vehicles affecting air quality; and
 - Higher potential for traffic accidents;
- Dust and noise generated by Project activities.

Mitigation measures that will avoid or minimize potential adverse effects on human health are the following:

- Measures to avoid or minimize adverse effects on air quality (**Section 6.3.1**) and effects on climate (**Section 6.3.2**) will be applied.
- Measures to control noise will be applied (**Section 6.3.3**).
- Sio employees will abide by the standards, procedures and training required under *The Workplace Safety and Health Act* as well as Sio's internal Health and Safety Program and Environmental Emergency Response Contingency Plan (**Section 7.6**).
- Employee Orientation and Safety training will be mandated for all new hires in addition to required yearly safety reviews for existing staff.
- Applicable personal protective equipment (PPE) will be provided to employees. Where required, visitor orientation and PPE will be provided when visitors enter employee-only areas.

Through the implementation of the measures referenced above, impacts to human health are assessed as negligible.

6.6.5 Indigenous and Treaty Rights

The Project is not expected to adversely impact the exercise of Indigenous or Treaty rights because:

- The Project Site consists of private land covered under private surface rights that do not have public access unless by permission;
- No fish or fish habitat will be affected by the Project (**Section 6.4.2**);
- The residual environmental impact of the Project on vegetation beyond the Project Site is assessed to be negligible (**Section 6.5.1**); and
- The residual environmental impact of the Project on regional wildlife populations is assessed to be negligible (**Section 6.5.2**).

6.6.6 Heritage Resources

Magnitude of Effect: Minor

Direction of Effect: Adverse

Duration of Effect: Long Term

Frequency: Intermittent

Scope of Effect: Project Site

Reversibility: Irreversible

Activities related to Project construction and operations that disturb the land may have the potential to disturb or destroy heritage resources (e.g. unknown archaeological sites). Project activities that disturb the land include clearing for temporary access trails, clearing and leveling (as required) to prepare the well pad sites for establishment of extraction wells and drilling of extraction wells.

As indicated in **Section 4.6.5**, the results of previous on-site archaeological investigations by a qualified archaeologist, and screening of the current additional land area included in the current Project Site by Historic Resources Branch, have indicated a low potential for Project impacts on heritage resources.

If heritage resources are discovered within the Project Site, work will be stopped, Historic Resources Branch will be advised, and the discovered historic resources will be recorded by an archaeologist and adequately protected as required. The heritage resources protection practices outlined in the Heritage Resources Protection Plan for the Facility Project will also be used for this Project (AECOM 2020).

With the application of the above described mitigation measures and given the opinion of a qualified archaeologist and Historic Resources Branch indicating no heritage concerns regarding development of the Project at the Project Site at this time, the impacts on heritage resources are assessed as minor.

6.7 Traffic

Magnitude of Effect: Minor

Direction of Effect: Adverse

Duration of Effect: Long Term

Frequency: Intermittent

Scope of Effect: Regional Project Area

Reversibility: Reversible

As indicated in **Section 2.9**, a comprehensive draft traffic impact study (**Appendix D**) was conducted by Stantec in fall 2023 encompassing traffic from both the planned Processing Facility and the proposed sand extraction activities and has been submitted to Manitoba Transportation and Infrastructure for review.

The draft traffic impact study (**Appendix D**), which is under review by Manitoba Transportation and Infrastructure, concluded the following regarding potential impacts of traffic:

- *Peak hour traffic operations analysis found that the study interactions provide acceptable performance across all scenarios.*

- *The traffic signal warrant analysis found that no traffic signals are warranted for the study intersections.*
- *The average daily traffic analysis found that no existing road segments at the study intersections had projected average daily traffic that would warrant consideration for widening to four-lanes in any scenario...*

The increase in Regional Project Area traffic will be not substantial for the following reasons:

- The sand will be transported to the sand Processing Facility by slurry line rather than by haul truck which will limit traffic associated with the Project staff and contractors during the Project construction and operation.
- Project staff will be limited to approximately 30 to 40 personnel during the construction and operation phases of the Project (**Section 2.5**) with staff arrivals and departures being staggered daily to accommodate the 24 hours, seven days/week (24/7) operation schedule. Additional minor traffic will be related to weekly supply/parts deliveries and contractors for services such as waste disposal.
- To access the different well cluster locations which will vary within and between Project operation years (from April through November each year of the Project), traffic will travel within the Project Site along the PR 302 (Ostenfield Road) for up to 5 km to the intersection with PTH 15. Additionally, Project traffic for operation years 3 and 4 will travel along Centre Line municipal road 57N for up to 1.5 km west of from PR 302.
- The distance and frequency that traffic will travel on local roads will be variable depending on the locations of the well cluster sites within and between Project operation years.

Therefore, the overall annual increased use of regional roads will be minor.

6.8 Aesthetics

Magnitude of Effect: Minor

Direction of Effect: Adverse

Duration of Effect: Long Term

Frequency: Continuous

Scope of Effect: Project Site

Reversibility: Reversible

Project activities will result in temporary changes to the Local Project Area viewscape.

The impact of the Project on the aesthetics of the Local Project Area is anticipated to be minor for the following reasons:

- Land disturbances and Project components will be temporary within a very limited area in the Project Site during each year of operation;
- Most of the Project Site will remain in the current condition, and vegetation clearing to accommodate the Project footprint will be minimized to the extent feasible (refer to mitigation described in **Section 6.5.1** 'Vegetation').
- Most of the land that will be used for the footprint of Project operations is previously disturbed (e.g. agriculture; gravel quarry).
- Annual well cluster sites and wells will be progressively closed / sealed each year, and disturbed areas will be rehabilitated throughout each year of Project operation.
- Setback distances where no activity will occur (e.g. from residences) will be maintained as described in **Section 1.5.1**.

6.9 Accidents and Malfunctions

To minimize the probability of accidents and malfunctions, the proposed Project activities will be conducted in accordance with applicable regulatory requirements. The following sections provide additional details on precautionary measures that will be implemented by Sio to further minimize the potential for accidents and malfunctions to occur.

6.9.1 Worker Health and Safety

Worker protection in Manitoba is regulated through standards, procedures and training under the *Workplace Safety and Health Regulation, M.R. 219/2015*. Safety equipment and personal protective equipment will be supplied to employees. Employees and contractors will be subject to site specific environmental health and safety orientation for all phases of the Project.

6.9.2 Spills and Leaks

Environmental effects may occur due to fuel and chemical spills from diesel fuel, lubricants, oils and hydraulic fluids. An accidental release of hazardous materials and/or equipment fluids could occur from improper storage and handling procedures. An accidental release of slurry or return water may also occur if a break or crack occurs in the slurry and/or water return line. Accidental releases, depending on the type and quantity of substances released, have the potential to affect air, surface water, groundwater and soils, with consequential effects on vegetation, aquatic resources and possibly human health and safety.

The following standard procedures will be implemented to prevent spills from occurring during Project activities:

- Diesel tanks used on-site will be self-contained aboveground storage tank(s);
- When servicing requires drainage or pumping of lubricating oils or other fuels from equipment, a groundsheet of suitable material and size and drip tray where applicable will be spread on the ground to catch all fluid in the event of a leak or spill. An adequate supply of suitable absorbent material and any other supplies and equipment necessary to immediately clean up spills will also be available;
- Storage and disposal of liquid wastes and filters from equipment maintenance, and residual material from spill clean-up will be contained in an environmentally safe manner and in accordance with existing regulations;
- Waste oils, fuels, and other hazardous wastes will be handled in a safe manner. Staff will be required to transport, store and handle all such substances as recommended by the suppliers and/or manufacturers and in compliance with applicable federal, provincial and municipal regulations. Manitoba Conservation and Climate will be notified immediately if a reportable spill occurs;
- Fuels, oils or other hazardous materials will be stored in designated areas;
- Storage sites will be inspected regularly for compliance;
- Personnel on-site will be trained in how to deal with spills, including knowledge of how to properly deploy site spill kit materials which will be available on-site;
- Spill kits will be stationed and readily available for easy access;
- Service and repairs of equipment will be performed at the Processing Facility whenever possible, and all service and repairs will be done by trained personnel;
- Vehicles and Equipment will have pre-shift inspections and walk arounds to check for fluid leaks, primarily from the fuel system and/or hydraulics. Any detected leak will result in the unit being pulled from service until repaired. All service and repairs will be logged and tracked in the units operating and maintenance logs. A manufacturer defined maintenance and preventative care will be practiced by Sio and its employees;
- Slurry and water return line will be inspected on a daily basis, and after extreme weather events, to check for leaks and/or breaks in the line. If leaks or breaks in the line are detected, appropriate spill

containment and clean-up measures will be applied as soon as feasible and the line will be repaired or replaced; and

- Fuel and chemical handlers will be trained and qualified, and appropriate emergency response measures will be in place and readily available.

Taking into account application of the above mitigation measures as necessary, and assuming the implementation of safe work practices, the risk of spills and leaks is considered to be appropriately mitigated.

6.9.3 Fires and Explosions

The presence of mechanical equipment, fuels and other hazardous materials creates a potential for fires and explosions. Such incidents can harm on-site personnel, cause equipment damage and lead to a release of contaminants, resulting in consequent effects to other environmental components (air, surface water, groundwater, plants, wildlife, aquatic resources and aesthetics).

Necessary precautions will be taken to prevent fire hazards at the Project Site; including but not limited to:

- Removal of flammable waste on a regular basis and disposal at a licenced disposal facility;
- Workers will be provided with appropriate fire prevention training;
- Appropriate fire extinguishers will be available on the Project Site. Such equipment will comply with and be maintained to the manufacturers' standards and employees will be appropriately trained in their use;
- Storage, transportation and use of hazardous materials, including flammable waste, will comply with regulatory requirements;
- On-site fire prevention/response equipment will be checked on a routine basis and in accordance with local fire safety regulations to maintain proper working order;
- Greasy or oily rags or materials subject to spontaneous combustion will be deposited and stored in appropriate receptacles. This material will be removed from the Project Site on a regular basis and be disposed of at licenced waste disposal facility;
- Emergency communication devices will be available and easily accessible to personnel to communicate and emergency as not all sites will have cellular signal; and
- Smoking will be restricted to designated areas.

With the measures outlined above, and assuming implementation of safe work practices, the risk of fires and explosions is assessed to be appropriately mitigated.

6.9.4 Transportation Accidents

An increase in traffic due to employee and contractor traffic to and from the Project Site has the potential to increase the likelihood for transportation accidents. Transportation accidents can consequently result in the release of pollutants to the environment such as fuel and oils, or materials that the vehicles colliding are transporting (e.g. construction wastes). Such accidental releases to the environment could potentially result in secondary effects on other environmental components (e.g., groundwater contamination through seepage, decline in surface water quality through runoff) or tertiary effects on vegetation (e.g., decline of growth potential due to soil contamination), wildlife, aquatic resources and human health.

The following measures will be employed to reduce the risk of transportation accidents:

- The sand will be transported from the extraction wells to the sand Processing Facility directly by slurry line rather than using transport trucks.
- Personnel retained to drive and operate vehicles and equipment such as drill rigs will have a valid appropriate-Class Manitoba Driver's License with a copy provided to Sio.

- Speed limits on municipal road and provincial roads/highways will continue to be implemented. Signage and speed limits on the PR 302 and PTH 15 are regulated by the Province of Manitoba.

The above noted measures are assessed to appropriately mitigate the potential risk of transportation accidents during all phases of the Project.

6.10 Summary of Environmental Effects and Mitigation Measures

Table 6-4 summarizes potential environmental effects of the proposed Project and the design features, standard operating procedures and other mitigation measures that will be implemented.

Table 6-5 summarizes potential accidents and malfunctions and measures to reduce the risk of such occurrences.

With the application of proposed mitigation measures, adverse environmental impacts of the Project are expected to be sufficiently mitigated.

Table 6-4: Summary of Environmental Assessment and Mitigation Measures

Environmental and Social Component	Project Phase	Sources of Potential Effects	Summary of Measures *	Residual Adverse Impact
PHYSICAL ENVIRONMENT				
Geology / Topography	Construction/Operation	Clearing, levelling (as needed), and construction of temporary components including access trails, well clusters, extraction well drilling, slurry and return water line/routing trails and associated pumping stations.	Where applicable, existing roads and trails and other previously disturbed areas will be utilized to minimize disturbance to the natural topography.	Minor (Topography and Geology)
			The locations of annual extraction wells will be determined in consideration of the results of preliminary geotechnical modeling used to predict thresholds of extraction amounts to mitigate adverse effects related to the potential for underground and surface subsidence (Appendix C).	
			Additional testing will be conducted to further assess and confirm the limestone and overburden thickness and structure as the Project progresses geographically.	
	Decommissioning	Progressive annual removal of Project components; progressive annual closure of extraction wells and rehabilitation of disturbed areas.	Progressive annual decommissioning of extraction wells will be done using a concrete cap, bentonite and permeable backfill in accordance with applicable guidance documents such as 'Constructing and Sealing Wells in Manitoba' (Province of Manitoba, 2018).	
			Levelling and grading will occur during progressive annual decommissioning of extraction wells to return the landscape to elevations typical to the surrounding area.	
Soil Erosion	Construction	Clearing, levelling (as needed), and construction of temporary components including access trails, well clusters, extraction well drilling, slurry and return water line/routing trails and associated pumping stations.	An Erosion and Sediment Control Plan will be implemented for all phases of the Project. Access matting will be used to prevent excessive ground disturbance where needed (e.g., low, wet areas).	Minor

Environmental and Social Component	Project Phase	Sources of Potential Effects	Summary of Measures *	Residual Adverse Impact
Groundwater	Decommissioning	Progressive annual removal of Project components; progressive annual closure of extraction wells and rehabilitation of disturbed areas.	During the progressive annual decommissioning activities, after Project components have been removed, the landscape will be leveled and graded, and disturbed areas will be revegetated as quickly as feasible to stabilize the soil and minimize soil erosion.	Minor
	Construction/Operation and Decommissioning	Withdrawing quantities of groundwater water that exceed capacity of the source aquifer may potentially affect the regional groundwater aquifer and potentially affect regional aquifer quantity and quality.	Process water will be recycled in a loop system for reuse, which reduces the quantity of water required from groundwater. When each well is drilled, casing will be installed and grouted in place to isolate the Red River Carbonate and Winnipeg Sandstone aquifers from one another to mitigate vertical mixing of the aquifers. Extraction wells will be progressively (sequentially) established and sealed (decommissioned) during the ongoing sand and groundwater extraction activities in accordance with applicable guidance documents such as 'Constructing and Sealing Wells in Manitoba' (Province of Manitoba, 2018) and Environment Act Licence requirements. Geochemical modelling (Appendix B) has indicated that reinjection of groundwater (which will be UV-treated) back to the sandstone aquifer will not adversely affect groundwater quality in either the Winnipeg Sandstone or Red River Carbonate aquifers. A Waste Characterization and Management Plan, Water Management Plan, Trigger Action Response Plan, Groundwater Monitoring and Impact Mitigation Plan and Progressive Well Abandonment Plan (Section 7) will be developed and implemented to protect groundwater quality and guide responses to any potential impacts to	

Environmental and Social Component	Project Phase	Sources of Potential Effects	Summary of Measures *	Residual Adverse Impact
			groundwater quantity and quality. Measures will be developed to avoid and/or mitigate any well interference issues as required by <i>The Water Rights Act</i> of Manitoba. A Complaint Handling Plan will be developed prior to Project construction that will describe the procedure for handling complaints that are brought to the attention of Sio (e.g., Project related groundwater complaints), and will describe how complaints are managed and addressed (Section 7.10). Groundwater quality will be maintained in accordance with requirements in an Environment Act Licence.	
ATMOSPHERIC ENVIRONMENT				
Air Quality	Construction/Operation and Decommissioning	Generation of greenhouse gases from Project equipment. Dust generation from construction traffic along the main roads and temporary trails, and during other Project activities.	Idling of motorized equipment will be minimized to the extent feasible. Water will be applied on gravel roads to control dust, as required. Equipment and vehicles will be properly maintained.	Minor to Negligible
Climate / Greenhouse Gases	Construction/Operation, and Decommissioning	Generation of greenhouse gases from Project equipment.	Emissions will be minimized by regularly maintaining equipment and vehicles and minimizing idling of vehicles. Vehicles and equipment will meet required emission standards.	Negligible
Noise	Construction/Operation and Decommissioning	Noise from Project construction/operations activities such as extraction well drilling; operation of vehicles and machinery such as	Vegetation clearing will be minimized to the extent feasible. Project activities will setback a minimum of 100 m from nearest residences.	Minor to Moderate

Environmental and Social Component	Project Phase	Sources of Potential Effects	Summary of Measures *	Residual Adverse Impact
		pumping stations and noise from decommissioning activities.	Mobile equipment and vehicles will be kept well maintained and will be fitted with mufflers, and other noise mitigation equipment as required.	
			Unnecessary idling and revving of engines will be avoided.	
			Noise Mitigation Plan will be prepared that will describe additional noise mitigation measures to be applied (e.g. portable noise barriers) as required (Section 7.9).	
			Complaint Handling Plan will be developed prior to Project construction that will describe the procedure for handling complaints that are brought to the attention of Sio (e.g., Project related noise complaints), and will describe how complaints are managed and addressed (Section 7.10).	
AQUATIC ENVIRONMENT				
Surface Water	Construction/ Operation, and Decommissioning	Clearing, leveling (as needed), compacting; ditching for water drainage as required; stockpiling overs; progressive annual closure of extraction wells and rehabilitation of disturbed areas.	Drainage ditching will be constructed along Project access trails and at disturbed areas, as required, to assist in directing runoff flow from rain and snow and maintaining natural drainage pathways through low areas.	Negligible
			Portable toilets will be located at active well cluster sites which will be regularly pumped out by a licensed local contractor for proper disposal as a means to prevent potential contamination of local waterbodies with potentially harmful substances.	
			An Erosion and Sediment Control Plan will be implemented for all phases of the Project.	
Fish and Fish Habitat	Construction/Operation and Decommissioning	Not applicable.	Project related impacts on fish and fish habitats are not anticipated due to the lack of potential fish habitat within the Project Site, no expected impacts on surface water quantity and application of an Erosion and Sediment Control Plan.	None

Environmental and Social Component	Project Phase	Sources of Potential Effects	Summary of Measures *	Residual Adverse Impact
TERRESTRIAL ENVIRONMENT				
Vegetation	Construction/Operation and Decommissioning	Clearing, leveling, compacting, ditching for water drainage as required; operation of machinery and activities that produce dust; progressive annual closure of extraction wells and rehabilitation of disturbed areas.	Areas to be cleared of vegetation will be minimized to the extent feasible and will be clearly marked to avoid clearing more than required. Access matting will be used to prevent excessive ground disturbance where needed (e.g., low, wet areas). Usable trees/wood will be cut and stacked at the Project Site for local use as firewood for no longer than one year or disposed of in accordance with applicable regulations. Disturbed areas will be allowed to revegetate naturally and will be augmented using an approved native seed mixture and native plantings if required. A Revegetation Monitoring Program (Section 7.7) will be implemented annually after the first year of Project operations to determine the success of the revegetation program and determine if follow-up reseeding or replanting is required. The monitoring program will include monitoring during the growing season until the seedlings appear to be established. Mitigation measures to control dust (see Air Quality component in this table) will be applied.	Minor (Project Site) to Negligible (Local Project Area)
Wildlife	Construction/ Operation, and Decommissioning	Vegetation clearing; human presence and noise related to Project construction/operation and decommissioning activities such as operation of machinery and well drilling; increased human presence at the Project Site and increased traffic at the Project Site and adjacent Local Project Area.	Areas to be cleared of vegetation will be minimized to the extent feasible and will be clearly marked to avoid clearing more than required. Vegetation clearing will take place outside of the spring and summer months to the maximum extent feasible to avoid disturbance to breeding birds and other spring breeding wildlife species.	Negligible

Environmental and Social Component	Project Phase	Sources of Potential Effects	Summary of Measures *	Residual Adverse Impact
			Vegetation clearing will not take place during the breeding bird season for this 'Zone B4' area: April 14 – August 24 (Government of Canada, 2018). Areas disturbed during annual Project activities will be allowed to revegetate naturally after each Project operation year and will be augmented using an approved native seed mixture and native plantings if required. Mitigation measures to control noise (see Noise component in this table) and dust (see Air Quality component in this table) will be applied. Fully shielded directional lighting fixtures will be used to focus light specifically to work areas to minimize the dispersal of light to the surrounding Project Site. Workers using the temporary access trails to access the Project Site (e.g. well cluster sites) will be required to limit vehicle speed to a maximum of 30 km/hr. Employees and contractors will be required not to feed or harass wildlife.	
Species of Conservation Concern	Construction/Operation, and Decommissioning	As above for the Vegetation and Wildlife components.	Mitigation measures as listed for the Vegetation and Wildlife components above will be applied.	Minor to Negligible
SOCIOECONOMIC ENVIRONMENT				
Labour Force and Employment	Construction/Operation and Decommissioning	Employment and contract services required for Project construction/ operation and decommissioning phases.	Employment opportunities associated with the Project will be advertised as needed within the Regional Project Area.	None (adverse) to Minor (benefit)
Emergency Services	Construction/ Operation, and Decommissioning	Accidents, malfunctions and extreme natural events such as storms.	An Environmental Emergency Response Contingency Plan will be available on-site during all Project phases that will clearly outline	Minor

Environmental and Social Component	Project Phase	Sources of Potential Effects	Summary of Measures *	Residual Adverse Impact
			appropriate emergency response protocols (Section 7.6).	
			Sio will notify the RM of Springfield emergency services regarding the annual Project activities schedule.	
			Measures to avoid accidents and malfunctions as described in Table 6-5 will be applied.	
Community Services	Construction/ Operation, and Decommissioning	Requirement for use of Local and Regional Project Area supplies and services (e.g. contractor services; waste removal)	Sio may initiate agreements for local / regional community services that would be beneficial for both the RM of Springfield and the Project.	None (adverse) to Minor (benefit)
			Solid waste will be transported by a licensed local contractor to be disposed at a local licenced landfill to an amount that would be sustainable for the local landfill. Otherwise, solid waste will be transported 63 km to the Brady Road Landfill managed by the City of Winnipeg.	
Land and Resource Use	Construction/ Operation, and Decommissioning	Use of the Project Site for Project activities which will result in temporary use of a very limited portion land each year of Project operations.	Land use for Project activities will occur in accordance with municipal and provincial approvals and legislative requirements.	Minor
			Due to the progressive annual reclamation of extraction sites and other Project-related disturbed areas, parcels of land used for Project activities during any given year of Project operation will be available for other uses the following year or once the activities are complete.	
Human Health	Construction/Operation, and Decommissioning	Increased traffic due to employees and contractors accessing the Project Site; dust and noise generated by Project activities.	Mitigation measures that will avoid or minimize potential adverse effects on human health are those that will be implemented to control noise (See Noise component in this table), avoid or minimize effects on air quality (see Air Quality component in this table) and avoid or minimize	Negligible

Environmental and Social Component	Project Phase	Sources of Potential Effects	Summary of Measures *	Residual Adverse Impact
			effects on climate (see Climate/Greenhouse Gasses component in this table). Sio employees will abide by the standards, procedures and training required under <i>The Workplace Safety and Health Act</i> as well as Sio's internal Health and Safety Program and Environmental Emergency Response Contingency Plan (Section 7.6). Employee Orientation and Safety training will be mandated for all new hires in addition to required yearly safety reviews for existing staff. Applicable personal protective equipment (PPE) will be provided to employees. Where required, visitor orientation and PPE will be provided when visitors enter employee only areas.	
Effects on Indigenous and Treaty Rights	Construction, Operation, and Decommissioning	Potential effects as above Land and Resource Use and Human Health components.	The Project is not expected to adversely impact the exercise of Indigenous or Treaty rights because: • The Project Site consists of private land covered under private surface rights that do not have public access unless by permission; • No fish or fish habitat will be affected by the Project (See Fish and Fish Habitat section of this table); • The residual environmental impact of the Project on vegetation beyond the Project Site is assessed to be negligible (See Vegetation section of this table); and • The residual environmental impact of the Project on regional wildlife populations is	None anticipated ¹⁷

¹⁷ Note: there are no First Nation reserve lands within the Local or Regional Project Area.

Environmental and Social Component	Project Phase	Sources of Potential Effects	Summary of Measures *	Residual Adverse Impact
			assessed to be negligible (See Wildlife section of this table).	
Heritage Resources	Construction and Decommissioning	Clearing, leveling, compacting, ditching for water drainage as required; removal of Project infrastructure and rehabilitation of disturbed areas	If heritage resources are discovered within the Project Site, work will be stopped, HRB will be advised, and the discovered historic resources will be recorded by an archaeologist and adequately protected as required.	Minor
			The heritage resources protection practices outlined in the Heritage Resources Protection Plan for the Facility Project will also be used for this Project (AECOM 2020).	
Aesthetics	Construction, Operation, and Decommissioning	Clearing, leveling (as needed), compacting; ditching for water drainage as required; stockpiling overs; progressive annual closure of extraction wells and rehabilitation of disturbed areas	Mitigation measures as listed for Vegetation above will be applied.	
			Annual well cluster sites and wells will be progressively closed / sealed each year, and disturbed areas will be rehabilitated throughout each year of Project operation.	
			Setback distances where no activity will occur (e.g. from residences) will be maintained as described in Section 1.5.1 .	

*Additional mitigation measures are proposed in the Closure Plan (**Section 7.13**) submitted to Manitoba Conservation and Climate as a requirement under the project licencing process. The Closure Plan outlines detailed mitigation and monitoring requirements for reclamation of the Project Site.

Table 6-5: Summary of Potential Accidents and Malfunctions and Measures to Mitigate Risk of Occurrence

Risks Associated with Accidents and Malfunctions	Project Phase	Possible Consequences	Measures to Reduce Risk of Occurrence	Conclusion
Worker Health and Safety	Construction/ Operation and Decommissioning	Risk of workplace accidents affecting worker health.	Worker protection in Manitoba is regulated through standards, procedures, and training under the Workplace Safety and Health Regulation, M.R. 217/2006.	Risk is assessed to be appropriately mitigated
			Safety equipment and personal protective equipment will be supplied to employees.	
			Employees and contractors will be subject to site specific environmental health and safety orientation for all phases of the Project.	
Spills and Leaks	Construction/ Operation and Decommissioning	Spills and leaks from diesel fuel, lubricants, oils, hydraulic fluids, and other hazardous materials can have adverse effects to air quality, water quality, groundwater quality, wildlife, plants and human health and safety.	Diesel tanks used on-site will be self-contained aboveground storage tank(s).	Risk is assessed to be appropriately mitigated
			When servicing requires drainage or pumping of lubricating oils or other fuels from equipment, a groundsheets of suitable material and size will be spread on the ground to catch all fluid in the event of a leak or spill. An adequate supply of suitable absorbent material and any other supplies and equipment necessary to immediately clean up spills will also be available.	
			Storage and disposal of liquid wastes and filters from equipment maintenance, and residual material from spill clean-up will be contained in an environmentally safe manner and in accordance with existing regulations.	
			Waste oils, fuels, and other hazardous wastes will be handled in a safe manner. Staff will be required to transport, store, and handle all such substances as recommended by the suppliers and/or manufacturers and in compliance with applicable federal, provincial, and municipal regulations. Manitoba Conservation and Climate will be notified immediately if a reportable spill occurs.	
			Fuels, oils, or other hazardous materials will be stored only in designated areas.	
			Storage sites will be inspected regularly for compliance.	
			Personnel on-site will be trained in how to deal with spills, including knowledge of how to properly deploy site spill kit materials which will be available on-site.	
			Spill kits will be stationed and readily available for easy access.	

Risks Associated with Accidents and Malfunctions	Project Phase	Possible Consequences	Measures to Reduce Risk of Occurrence	Conclusion
			Service and repairs of equipment will only be performed by trained personnel.	
			Vehicles and Equipment will have pre shift inspections and walk arounds to ensure no fluid leaks, primarily from the fuel system and/or hydraulics. Any detected leak will result in the unit being pulled from service until repaired. All service and repairs will be logged and tracked in the units operating and maintenance logs. A manufacturer defined maintenance and preventative care will be practiced by Sio and its employees.	
			Slurry and water return line will be inspected on a regular basis, and after extreme weather events, to check for leaks and/or breaks in the line. If leaks or breaks in the line are detected, appropriate spill containment and clean-up measures will be applied as soon as feasible and piping will be repaired or replaced.	
			Fuel and chemical handlers will be trained and qualified, and appropriate emergency response measures will be in place and readily available.	
Fires and Explosions	Construction/ Operation and Closure	Accidental fires and explosions from mechanical equipment, fuels, and other hazardous materials may result in loss of equipment and infrastructure, worker health and safety risk, and deterioration or loss of natural habitat.	Removal of flammable waste on a regular basis and disposal at a licenced disposal facility.	Risk is assessed to be appropriately mitigated
			Workers will be provided with appropriate fire prevention training.	
			Appropriate fire extinguishers will be available on the Project Site. Such equipment will comply with and be maintained to the manufacturers' standards, and employees will be appropriately trained in their use.	
			Storage, transportation and use of hazardous materials, including flammable waste, will comply with regulatory requirements.	
			On-site fire prevention/response equipment will be checked on a routine basis and in accordance with local fire safety regulations to maintain proper working order.	
			Greasy or oily rags or materials subject to spontaneous combustion will be deposited and stored in appropriate receptacles. This material will be removed from the Project Site on a regular basis and be disposed of at licenced waste disposal facility.	
			Emergency communication devices will be available and easily accessible to personnel to communicate and emergency as not all sites will have cellular signal.	
			Smoking will be restricted to designated areas.	

Risks Associated with Accidents and Malfunctions	Project Phase	Possible Consequences	Measures to Reduce Risk of Occurrence	Conclusion
Transportation Accidents	Construction/ Operation and Decommissioning	Vehicular collisions (human health and safety, traffic disruption, road closure, release of contaminants) and wildlife collisions (loss of wildlife, human health and safety, road closures).	The sand slurry will be transported from the extraction wells to the sand Processing Facility directly by slurry line rather than using transport trucks.	Risk is assessed to be appropriately mitigated
			Personnel retained to drive and operate vehicles and construction equipment will have a valid appropriate-Class Manitoba Driver's License with a copy provided to Sio.	
			Speed limits on access roads, local road and Provincial Highways will continue to be implemented. Signage and speed limits on the PR 302 and PTH 15 are regulated by the Province of Manitoba.	

7. Follow-up Plans

Follow-up programs verify the accuracy of the environmental assessment of a project and determine the effectiveness of measures taken to mitigate the potential adverse environmental effects of the Project. **Sections 7.1 to 7.13** describe the follow-up plans and programs that will be included in Sio's Environmental Management Program implemented during the construction, operation, and decommissioning phase of the Project. Complete follow-up plans will be developed and submitted to the Environmental Approvals Branch based on requirements as stipulated in an Environment Act Licence for the Project, which is common practice regarding the timing of follow-up plans for developments in Manitoba. Therefore, **Sections 7.1 to 7.13** describe the intent of the follow-up plans and programs and the proposed content of those plans.

The follow-up plans and programs developed for this Project are intended to be 'living documents' that will be updated periodically, as needed, and will be available on-site as reference documents for Project staff and contractors. Other follow-up plans in addition to those listed below may be required as stipulated in a future Environment Act Licence for the Project. Sio will comply with requirements of a potential future Environment Act Licence for the Project.

7.1 Waste Characterization and Management Plan

The Waste Characterization and Management Plan will focus on expanding the dataset for geochemical interpretations and validating the conclusions of the geochemical assessment. This plan will be developed under the guidance of a geochemist with specialization in ML/ARD to guide future characterization, management and monitoring of geologic waste materials generated during Project operations. This plan will be consistent with industry guidance pertaining to the characterization and management of waste materials to prevent, manage and mitigate ML/ARD risks. As with other follow-up plans, the Waste Characterization and Management Plan will be a 'living document', intended to be revise/updated as needed based on characterization of drill cuttings during operations and additional geochemical testing in the laboratory, or field testing to evaluate the geochemical behaviour of each rock type under field conditions.

The objectives of the Waste Characterization and Management Plan are to:

- Describe Project activities, with a focus on site preparation, sand extraction and the resultant waste streams.
- Summarize characteristics of each type of waste material that will be extracted based on the Hydrogeological Assessment Report (**Appendix B**), literature and laboratory testing.
- Describe protocols for identifying, sampling, characterizing and managing waste materials to minimize the risk of ML/ARD and incremental impacts to the environment by following protocols consistent with industry standards.
- Define appropriate end uses for each type of waste material based on the volume of waste material generated, degree of characterization, geochemical classification (e.g., Potentially Acid Generating [PAG], Uncertain, Non-PAG, Metal Leaching [ML]), understanding of its geochemical behaviour and the intended end use.
- Describe measures that can be implemented to mitigate ML/ARD and incremental impacts to the environment.
- Describe protocols for monitoring surface water and groundwater quality to assess field performance against the design goals and objectives of the management plan.

The Waste Characterization and Management Plan will include procedures for documenting and reporting information obtained through the various characterization and monitoring activities contained in the plan. This includes reporting frequency, minimum information to be contained within reports (soil quality, surface and groundwater quality, geochemical testing data, volume of waste generated), and procedures for the review and modification of monitoring programs.

A draft Table of Contents for the Waste Characterization and Management Plan is as follows:

- 1.0 Introduction
 - 1.1 Initiation
 - 1.2 Objectives
 - 1.3 Background
- 2.0 Guidelines and Regulatory Context
- 3.0 Mine Plan
- 4.0 Geochemical Considerations
- 5.0 Operational Waste Rock Screening
 - 5.1 Training of Personnel
 - 5.2 Waste Rock Sampling
 - 5.2.1 Pre and Early Operational Sampling
 - 5.2.2 Routine Operational Sampling
 - 5.2.3 Evaluation of Screening Results
 - 5.2.4 Laboratory Testing
- 6.0 Waste Rock Management
 - 6.1 Waste Classification Framework
 - 6.2 Mitigation Measures
 - 6.2.1 Waste Rock Management
- 7.0 Monitoring
- 8.0 Reporting
- 9.0 References

7.2 Water Management Plan

The Water Management Plan will establish policies, procedures and objectives for the management of water during operations and closure pertaining to management of surface water, groundwater, slurry and process water contained in the slurry lines. It will include separation of contact / non-contact water and management of sediment-laden water related to Project operations.

The objectives of this plan will be to:

- Describe Project activities, with a focus on site preparation, sand extraction and the resultant flow of water, solids and/or slurry, the volume of storage vessels and the expected volume of groundwater returned to the aquifer. The volume of water required to commission the slurry system each year will be provided.
- Describe the operational management strategy for water and solids during operations and closure phases of the Project. Inputs to the water balance, storage volumes and outputs will be identified for Extraction Mobile Equipment.
- Establish a framework for monitoring of water, solids, and slurry flow during and following Project operations to assess field performance against the design goals and objectives of this Water Management Plan.
- Establish the parameters that will be monitored, the frequency of monitoring, monitoring locations (e.g. pumping rates, groundwater use, return rates).
- Identify best management practices for the management of water, solids, slurry and sediment during Project operations and closure to protect groundwater and surface water resources.

The Water Management Plan will present a refined water balance for the extraction and reinjection / treatment of groundwater following additional testing by Sio to refine the solid / liquid ratio and the volume of water required to commission and decommission the conveyance system each year. It will specify elements that require ongoing monitoring and confirmation (e.g. pumping rates, groundwater use,

reinjection rates). The water monitoring component of the Water Management Plan will rely on the following components:

- Establishment of a groundwater and surface water monitoring network consisting of flow meters, and water level monitoring devices to facilitate monitoring of water levels, pressures, stored quantity and flows during and after seasonal extraction operations.
- Assessment of groundwater return efficiency based on volume of sand extracted.
- Routine inspections of water management infrastructure including extraction facilities, mitigation measures, conveyance piping, storage volumes, and other water management related infrastructure.
- A rigorous water monitoring plan to confirm the findings of the Hydrogeological Assessment Report (**Appendix B**) with respect to the effective pumping rate from each extraction well and the resultant zone of influence around Project operations to confirm the magnitude and extent of any impacts on groundwater quantity. Results will be evaluated by a qualified professional with experience in hydrogeology and geochemistry, with findings reported.
- Primary mitigation measures (Best Management Practices) that aim to avoid impacts and secondary mitigation measures that aim to sufficiently minimize any potential effects to reduce any impacts.

This plan will also establish a framework for reporting. A procedure for documenting and addressing public concerns and complaints will be included in the Plan. This Plan will be prepared based on conditions and requirements within an Environment Act Licence for the Project.

7.3 Progressive Well Abandonment Plan

A Progressive Well Abandonment Plan will be prepared in accordance with provisions of an Environment Act Licence. The purpose of the Progressive Well Abandonment Plan (PWAP) will be to provide an operational plan for progressive closure of each extraction well to ensure groundwater resource remains protected. The PWAP is developed in a manner that is consistent with industry standard practice and meets or exceeds the requirements of *The Groundwater and Water Well Act* and its supporting regulations, including the Groundwater and Water Well Regulation and the Well Standards Regulation. The PWAP will also meet borehole abandonment requirements of *The Mines and Minerals Act*, and borehole licences issued under Part 3 of the Drilling Regulation.

Wells will be abandoned (also known as well sealing) in accordance with *The Groundwater and Water Well Act* and with guidance from the Construction and Sealing Wells in Manitoba – Information for Well Driller and Well Sealers document (Manitoba Government, 2018).

The following procedures will be used to abandon or seal Project wells:

- A mechanical plug will be placed at the predetermined depth to isolate the movement of water within the already cemented casing between the sandstone and limestone aquifers. Then a bentonite plug will be placed prior to cementing to ensure the cement does not dilute or leak into the water prior to setting.
- Above this plug, a several foot-thick cement plug will be placed and allowed to set. Cement will be pumped into place using a tremie grout system. The cement plug will be confirmed by manual contact prior to proceeding to the next step.
- Once set, layers of bentonite and pea gravel will be used, or a bentonite grout to 5 feet (1.5 m) within surface.
- Where pea gravel and bentonite are used, no more than 15 feet (4.6 m) of pea gravel will be used before another layer of bentonite. In addition, careful attention will be paid to the layering of bentonite across any interfaces between aquifers (e.g., the limestone to the till interface) to mitigate vertical mixing of the aquifers.

- A 5 feet (1.5 m) thick cement cap will be placed at the very top, allowed to set and then the topsoil/organics are replaced on top of the cement to allow for vegetation regrowth/remediation of the surface land to occur.
- Detailed logs will be kept of the well abandonment and depths of each layer, in addition to the GPS coordinates of each well.

This procedure will be used in all extraction wells and wells that exceed 2 inches (5 cm) in diameter. Where a monitoring well exists, these are often nested 5-inch (12.7 cm) and 2-inch (5 cm) PVC (polyvinyl chloride) casing sizes. As per the above referenced guidelines (Manitoba Government, 2018), the 2-inch (5 cm) casing is grouted the entire length of the well as other sealing materials like bentonite chips can bridge off (expand and create a blockage) in the small diameter PVC casing.

A draft Table of Contents for the Progressive Well Abandonment Plan is as follows:

- 1.0 Introduction
 - 1.1 Initiation
 - 1.2 Objectives
 - 1.3 Background
 - 1.4 Project Activities
- 2.0 Regulatory Setting
 - 2.1 *The Groundwater and Well Act*
 - 2.1.1 Well Construction Requirements
 - 2.1.2 Well Sealing Requirements
 - 2.2 *The Mines and Minerals Act*
 - 2.3 Abandoned Wells
 - 2.4 Responsibility for Well Sealing and Abandonment
- 3.0 Preparation for Well Sealing and Abandonment
- 4.0 Well Sealing Requirements
 - 4.1 Timeframe for Sealing
 - 4.2 Sealing Materials
 - 4.3 Seal Configuration and Implementation
 - 4.3.1 Boreholes
 - 4.3.2 Sand Extraction Wells
 - 4.3.3 Shallow Wells
 - 4.3.4 Small Diameter Wells
 - 4.3.5 Deep and Large Diameter Wells
 - 4.3.6 Flowing Artesian Wells
 - 4.4 Contamination Found During Sealing
- 5.0 Quality Assurance and Quality Control
- 6.0 Reporting

7.4 Groundwater Monitoring and Impact Mitigation Plan

A Groundwater Monitoring and Impact Mitigation Plan will be prepared for the Project that will provide a framework for surveying of existing domestic wells in advance of operations, monitoring of groundwater quantity and quality during and following Project operations and responding to well owner complaints. It will establish the parameters that will be monitored, the frequency of monitoring, monitoring locations and reporting requirements. Mitigation measures provided in the Plan will avoid and/or mitigate any well interference issues as required by *The Water Rights Act*.

The Groundwater Monitoring and Impact Mitigation Plan will include the following:

- Description of Project activities, with a focus on site preparation, sand extraction and the resultant waste streams.
- Summary of hydrogeological characteristics of each aquifer and aquitard, including an overview of groundwater flow based on the Hydrogeological Assessment Report (**Appendix B**).
- Establishment of a framework for survey of existing water supply wells in advance of operations, monitoring of groundwater quantity and quality during and following Project operations, and responding to well owner complaints.
- Description of protocols for monitoring surface water and groundwater quality to assess field performance against the design goals and objectives of this Groundwater Monitoring and Impact Mitigation Plan, the Waste Characterization and Management Plan (**Section 7.1**) and the Water Management Plan (**Section 7.2**).
- Establishment of the parameters that will be monitored, the frequency of monitoring, monitoring locations and reporting requirements.
- Identification of mitigation measures required to avoid and/or mitigate any well interference issues. Mitigations may include establishment of a set back distance between extraction activities and wells, modification of extraction operations to avoid impacts, lowering of pumps or provision of alternate water supply.
- Establishment of a framework for reporting findings.

The groundwater monitoring component of this plan will address the following components:

- Establishment of a regional and local groundwater monitoring well network consisting of monitoring wells completed in the Glacial Sediments, Red River Carbonate and Winnipeg Sandstone to facilitate monitoring of groundwater levels (groundwater quantity), and groundwater quality before, during and after operations. Proposed Project activities will be evaluated in advance of each operational year to determine the zone of influence and water supply wells that may be impacted by Project operations. A local groundwater monitoring well network may be installed to supplement the regional network based on proximity to Project operations each year and access to existing water supply wells for monitoring.
- Conducting a water well survey within the zone of influence to determine the precise location of existing water supply wells, well construction, well condition, well performance history and water quality. Some of these wells may be utilized to expand upon the regional groundwater monitoring well network before, during and immediately following nearby Project operations.
- A rigorous monitoring plan to confirm the findings of the Hydrogeological Assessment Report (**Appendix B**) with respect to the zone of influence around Project operations and any impacts on groundwater quantity and groundwater quality. Results will be evaluated by a qualified professional with experience in hydrogeology and geochemistry, with findings documented.
- Primary mitigation measures that aim to avoid impacts and secondary mitigation measures that aim to significantly reduce any impacts.

The Groundwater Monitoring and Impact Mitigation Plan will also have provisions for the development of monitoring reports that interpret impacts from operations on water quantity and quality, and a procedure for documenting and addressing private well owner concerns and complaints will be prepared and implemented.

A draft Table of Contents for the Groundwater Monitoring and Impact Mitigation Plan is as follows:

1.0 Introduction

- 1.1 Initiation
- 1.2 Objectives
- 1.3 Background
- 1.4 Existing Groundwater Use
- 1.5 Hydrogeological Setting

- 1.6 Proposed Site Activities
- 2.0 Regulatory Context
 - 2.1 *The Groundwater and Well Act*
 - 2.1.1 Well Construction Requirements
 - 2.2 *The Water Rights Act*
 - 2.3 Groundwater Quality Standards
 - 2.4 *The Mines and Minerals Act*
- 3.0 Water Well Inventory
- 4.0 Groundwater Monitoring Plan
 - 4.1 Standard Operating Procedures
 - 4.2 Proposed Groundwater Monitoring Network
 - 4.3 Groundwater Monitoring Zones
 - 4.3.1 Background Groundwater Monitoring Zone
 - 4.3.2 Operational Performance Monitoring Zone
 - 4.3.3 Local Groundwater Monitoring Zone
 - 4.3.4 Regional Groundwater Monitoring Zone
 - 4.4 Methods
 - 4.4.1 Groundwater Level Monitoring
 - 4.4.2 Groundwater Sampling
 - 4.4.3 Purging of Groundwater Monitoring Wells
 - 4.4.4 Field Parameter Measurements
 - 4.4.5 Sample Collection and Analysis
 - 4.4.6 Data Analysis
- 5.0 Impact Mitigation Plan
 - 5.1 Trigger Events
 - 5.2 Response Stages
 - 5.3 Threshold Development
 - 5.3.1 Water Levels (Well Yield)
 - 5.3.2 Water Quality
 - 5.4 Mitigation Plans
- 6.0 Data Review and Reporting
 - 6.1 Monthly Data Review
 - 6.2 Annual Data Review and Reporting
- 7.0 References

7.5 Erosion and Sediment Control Plan

Erosion and sediment control will be applied to all aspects of the Project as required including development and operation of extraction wells, placement of slurry pipe, and any access trail and ditch construction. The implementation of environmental best management practices (BMP) to limit sediment introduced to streams, ditches and low-lying wet areas will require sound judgment by the contractor based on dialogue with Sio, AECOM, and regulators according to the natural conditions at each site. The general approach to the ESC Plan implementation will be to monitor construction activities, preserve the natural environment to the extent possible, minimize the extent of disturbance, implement the BMP measures to reduce the amount of erosion or sedimentation, and respond to concerns and additional measures required from a list of acceptable BMPs to prevent erosion or sedimentation.

The objective of the Erosion and Sediment Control (ESC) Plan is to prevent, minimize and/or control the potential for erosion and sediment accumulation that transpire on site as a result of natural environmental occurrences or human induced events. The water that enters or leaves the Project site is to be controlled so that deleterious materials do not leave the site, and sediments are not transported elsewhere and potentially cause further environmental damage.

7.5.1 Application of Erosion and Sedimentation Control Best Management Practices (BMP)

The following list of BMPs are provided as a quick reference of measures to be implemented at all applicable sites regardless of proximity to watercourses, channel bed slope or soil type. These measures would be considered a first level of protection suitable in all locations and weather events.

- Adhere to the conditions of the Environment Act License and other applicable approvals.
- Modify work accordingly when seasonal and environmental influences increase the risk of wind and water erosion and sedimentation.
- Existing vegetation provides natural erosion and sedimentation control, and these features should be maintained as much as possible. Make every reasonable effort to minimize disturbance by confining the work area to the predefined and staked area.
- Protect aquatic areas from sedimentation by installing and maintaining silt fences, energy dissipation and erosion control mats or other erosion control devices such as a straw blanket on disturbed slopes. Silt fences will need to be checked after rain events to ensure that they are still in place and functioning as intended.
- Replace topsoil and restore the area to the original condition (to the maximum extent possible) as soon as practical upon completion of construction using an appropriate seed mix or fast-growing cereal crops for late fall or spring germination.
- Maintain natural drainage patterns as much as possible and implement new drainage patterns as designed.
- Place excess material from the excavation in a location where it won't be a source of siltation to any wetland areas.
- Provide dust suppression as required.
- Construction should occur in stages to minimize dust erosion from exposed soils.

Ensure that employees are aware of the ESC Plan and that they are trained on how to prevent erosion and siltation from happening on the Project.

7.5.2 General Site Management

Erosion and sedimentation will be controlled, to the degree possible, by implementing the ESC Plan practices described in the BMPs above and by following the best site management practices below:

- General ESC Plan practices are to be discussed with the contractor at the start of construction and will be adhered to at all times.
- Vegetation clearing will not be permitted from April 14 to August 24 inclusive to protect breeding migratory bird species.
- The contractor must ensure that employees are trained on the implementation, inspection, maintenance and repairs of ESC BMP outlined in the ESC Plan.
- All manufactured erosion control devices will be installed and maintained in accordance with the manufacturer's recommendations.
- Erosion and sediment control measures will be inspected at the frequency indicated below during construction and afterwards to ensure that they are functioning properly and are maintained and/or upgraded as required until vegetation has been re-established on the disturbed area.
 - Daily, informal checks during active construction and after storm events by the appointed on-site contractor personnel.
 - Weekly, formal inspections during active construction.

- Phase construction to limit soil exposure to wind and water erosion. Stabilize exposed soils as soon as practical following construction and before commencing the next stage of construction by using protective barriers or plant materials.
- Every reasonable effort must be made to minimize disturbance to wetlands and to retain as much of the existing plant cover as possible.
- Maintenance of erosion control materials and structures is necessary and silt that accumulates in silt fences will be removed and disposed of in a location which is at least 100 m from any known water body, wetland or storm water drainage channel.
- The installation of permeable sediment barriers or permanent erosion control measures, site clearing, and any earthworks such as ditch or embankment grading will occur before the removal of temporary measures.
- All equipment on site will be maintained free of external grease, oil and mud. Measures must be taken to ensure that gasoline, diesel fuel, grease or other deleterious substances do not enter the water body or wetland. Fuel will be stored, and equipment shall be refueled and serviced, at least 100 m from any surface water. A fuel spill kit must be available for use on site in case of accidental fuel or oil spill.
- On a daily basis the construction site must be cleared of scrap wood, excess concrete and other debris, and disturbed soils adequately protected with rip rap, vegetation or geo-fabric to prevent erosion from seasonal precipitation runoff.

The contractor(s) will be made aware of all concerns with regard to erosion and sedimentation and be given a copy of the ESC Plan. Judgment will be used to determine the most viable options for erosion prevention and sediment control considering factors such as site conditions, site access needs, and both seasonal and daily forecasted weather.

7.6 Environmental Emergency Response Contingency Plan

Sio is committed to protecting the community and the environment in the event that environmental emergency situations arise from the Project. The purpose of the Environmental Emergency Response Contingency Plan (EERCP) is to identify and respond to potential environmental accidents and emergency situations, and to identify preventative and mitigative measures for any associated potential impacts.

The EERCP will outline the general procedures to be followed for environmental emergency situations and incidents that could occur as a result of Project activities, equipment failure, human error, or natural causes. The EERCP will identify roles and responsibilities, emergency contact numbers, equipment and resources, and training requirements. A copy of the will be maintained on-site during all phases of the Project.

An Environmental Manager (or designated person) will review and revise, as necessary, the EERCP quarterly, and after the occurrence of any environmental accident or emergency situation, to ensure its relevance.

The EERCP will contain detailed policies and standard operating procedures for the communication of environmental emergency situations to Sio employees, contractors, emergency responders, regulators and the general public. The EERCP will include procedures for responding to emergencies and reporting and investigating environmental incidents. These procedures will address a variety of potential environmental emergency situations, including:

- Spills of potentially hazardous materials;
- Fire;
- Extreme weather, including hail, thunderstorms, lightning, and flooding;
- Erosion emergency; and
- Wildlife.

This plan will be prepared based on conditions and requirements within an Environment Act Licence for the Project.

7.7 Revegetation Monitoring Program

As described in **Section 6.5.1**, vegetation in areas temporarily disturbed by construction activities is expected to naturally re-establish. A Revegetation Monitoring Program will be implemented to determine the success of the revegetation program and determine if follow-up reseeding or replanting is required using approved native seed mixture and native plantings. Where reseeding or replanting is required, Sio will communicate with regional MECC staff to determine strategies for potentially enhancing revegetation of disturbed areas to benefit wildlife species such as the Golden-winged Warbler which is a Species at Risk that may occur in the Regional Project Area (**Section 4.4.3**).

The revegetation monitoring program will include monitoring during the growing season until the seedlings appear to be established. Details of the revegetation monitoring program will include but necessarily be limited to the following:

- What will be monitored (plant abundance, height, or other measures of success) and at which frequency (e.g. monthly, annually)
- Monitor qualifications, roles, and responsibilities
- Revegetation schedule, including a review of potential conflicts (e.g., migratory bird nesting season conflicts)
- Reseeding and replanting methods (appropriate seed mixes, plant species, plant source and quality control, seeding and planting methods, including rates and spacing)
- Erosion-control methods to be employed
- Use of existing infrastructure such as roads, trails or natural features
- Measures for the control of weeds and invasive plant species
- List of corrective actions in the event of poor vegetative success
- Recordkeeping and reporting requirements

7.8 Heritage Resources Protection Plan

As indicated in **Section 4.6.5**, the results of an on-site archaeological investigation for land section encompassing the Project Site, and Historic Resources Branch screening of an additional land section included within the current Project Site boundary, found the Project Site to have substantial previous disturbances and concluded that there were no heritage concerns regarding development of the Project at the Project Site (**Appendix G**).

If heritage resources are discovered within the Project Site, work will be stopped, Historic Resources Branch will be advised, and the discovered historic resources will be recorded by an archaeologist and adequately protected as required. The heritage resources protection practices outlined in the Heritage Resource Protection Plan for the Facility Project will also be used for this Project (AECOM 2020).

7.9 Noise Mitigation Plan

Prior to commencing Project activities, a Noise Mitigation Plan will be developed and submitted to MECC. The objective of the Noise Mitigation Plan will be to effectively manage Project generated noise and implement noise attenuation mitigation measures, as required, to address noise complaints brought to the attention of Sio. Where Project activities are in close proximity to a residence, Sio will proactively notify residents of the near-term Project activities schedule.

As indicated in **Section 4.2.2**, vibration is not expected due to lack of vibration complaints associated with other well drilling in the regional area. Complaints brought to Sio's attention regarding vibrations due to

Project activities will be addressed in accordance with a Complaint Handling Plan as proposed in **Section 7.10**.

7.10 Complaint Handling Plan

Prior to commencing Project activities, a Complaint Handling Plan will be developed and submitted to MECC. The objective of the Complaint Handling Plan will be to effectively manage and address, in a timely manner, Project-related complaints brought to the attention of Sio throughout the life of the Project. The Complaint Handling Plan will include methods for documenting, investigating and tracking complaints, including the resolution methods and outcomes. Sio will assign a Complaint Handling Lead who will track and manage complaints, and provide regular reporting to MECC as stipulated in a potential future Environment Act Licence for the Project.

7.11 Wildlife Monitoring and Impact Mitigation Plan

Although the Project is not anticipated to have a measurable effect on wildlife populations within the Interlake Plain Ecoregion (**Section 6.5.2**), incidental impacts on wildlife (e.g., Project related traffic collisions) will be tracked as part of Sio's Environmental Management Program implemented during the construction, operation, and decommissioning phase of the Project. The Environmental Management Program will indicate how wildlife incidents will be monitored and reported, and will describe criteria for determining if any additional impact mitigation measures will be necessary, beyond those described in **Section 6.5.2**. Wildlife populations in Manitoba are managed by MECC, Wildlife Branch. Therefore, Sio will work cooperatively with the Wildlife Branch to determine and implement additional wildlife impact mitigation measures that maybe necessary to avoid the potential for significant adverse impacts on wildlife populations in the Regional Project Area and Interlake Plain Ecoregion.

7.12 Trigger Action Response Plan

Prior to Project construction, Trigger Action Response Plans (TARPs) will be developed during Phase 1 of the Project to monitor groundwater and short-term and long-term ground surface settlement and underground settlement. The groundwater TARP is included as part of the Groundwater Monitoring and Impact Mitigation Plan (**Section 7.4**). The geotechnical TARP will be developed during Phase 1 of the Project. The TARPs will include criteria for determining thresholds of change that require action to be taken to respond. The TARPs will include a risk assessment for the Project including 'worst case scenarios', and will describe response methods for specific scenarios, including an early warning system that will halt operations.

7.13 Closure Plan

At the request of MECC, a Closure Plan has been developed for this Project (**Appendix H**) in accordance with the Manitoba Mine Closure Regulation 67/99 General Closure Plan Guidelines, although this Project is proposed to be licenced under *The Environment Act*. The cost estimate associated with a required Closure Plan under *The Mines and Minerals Act* will be provided on request from the applicable regulatory agency. **Sections 7.13.1** and **7.13.2** summarize key information included in the Closure Plan (**Appendix H**) regarding site decommissioning and end use of the Project Site.

7.13.1 Site Decommissioning

The decommissioning of the Project, including progressive rehabilitation, will be conducted in accordance with the Closure Plan and will generally include the following:

- Sealing and decommissioning of extraction wells and well cluster sites;
- Removal and disposal of miscellaneous infrastructure (e.g., slurry and water return lines; pumping stations; generators);

- Removal of sand overs/fines (some to be used in well decommissioning)
- Removal of surface and well drilling equipment;
- Removal of propane, fuel and oil tanks, as applicable;
- Testing and remediation of contaminated soils, as required;
- Re-grading and contouring of previously disturbed areas; and
- Revegetation of disturbed areas to restore the landscape to native conditions to the extent feasible.

As observed at previous mine closures in the region, the growth of grasses and forbs is expected within the first few years following closure. The establishment of shrubs and trees is expected to be evident within 5 to 10 years following closure.

7.13.2 End Use

At the Project end of life, the Project Site will be re-purposed to another form of industrial use activity or returned to a natural state to the extent possible, with no known plans for residential, commercial or industrial development on the site at this time.

8. Conclusion

The Project follow-up plans and monitoring programs that will be implemented include, but are not necessarily limited to, the following:

- Waste Characterization and Management Plan
- Water Management Plan
- Progressive Well Abandonment Plan
- Groundwater Monitoring and Impact Mitigation Plan
- Erosion and Sediment Control Plan
- Environmental Emergency Response Contingency Plan
- Revegetation Monitoring Program
- Heritage Resources Protection Plan
- Noise Mitigation Plan
- Complaint Handling Plan
- Wildlife Monitoring and Impact Mitigation Plan
- Trigger Action Response Plan (to monitor groundwater and ground surface settlement)
- Closure Plan.

It is recommended that mitigation measures, follow-up plans, and monitoring programs described in this report be implemented to avoid or minimize potential environmental effects and/or identify any unanticipated adverse effects early so that appropriate adaptive management action can be undertaken.

In summary, based on the proposed Project description and with the application of the proposed mitigation measures and follow-up plans outlined in this Environment Act Proposal, adverse residual environmental impacts resulting from the Project are expected to be sufficiently mitigated. The success of the Project is anticipated to be a substantial benefit to the local and regional area communities in terms of training, employment, and potential business opportunities related to the services that will be required for the Project and the tax revenue that will be realized with the proposed Project being in the RM of Springfield.

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