Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

ENVIRONMENTAL ASSESSMENT
NORTH SOLUTION GAS GATHERING FLOWLINE PROJECT
KOLA AND CROMER TO SINCLAIR, SOUTHWESTERN MANITOBA

Report Prepared for:
TUNDRA OIL & GAS LIMITED

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Version 1.0
November 2021
Virden, Manitoba

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ENVIRONMENTAL ASSESSMENT

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Report prepared for Tundra Oil and Gas, November 2021

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DISCLAIMER

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EXECUTIVE SUMMARY

Tundra Oil & Gas Limited (Tundra) is proposing to construct six new interconnected flowline segments totalling 46 km in length within a 20 m wide right-of-way (RoW). These flowlines start 2 miles east of Kola, Manitoba, and will be used to collect and transport unrefined solution natural gas from six existing battery facilities to the Steel Reef Infrastructure Corp. compressor terminal, northwest of Sinclair, Manitoba. The unrefined solution natural gas will be refined into a marketable gas product. Solution natural gas is normally ignited and flared off to the atmosphere, due to its unrefined state. Once this project is completed, the refined gas will be sold to other industrial and residential users to meet their energy needs. Once the project is in operation with no flare stack emissions, there will be a greenhouse gas (GHG) emissions reduction of ~180,000 tonnes of CO_2 equivalent/year from the Tundra facilities.

The planned start of construction is July 15, 2022 and will conclude on approximately December 31, 2022.

The baseline environmental and socio-economic conditions that may be affected by the project are well understood based on field assessments and focused desktop studies completed between April to October 2021, on plants, wildlife, wildlife habitat, and wetlands. The construction activity occurs entirely on private land.

Potential environmental and socio-economic effects associated with the construction and operation of the project are typical and can be mitigated by standard environmental protection measures. No species at risk (SAR) plants or wildlife will be impacted. Route selection is one of the primary mitigation options for avoiding conflict between the project and biophysical, socio-economic, and cultural resources. Timing the construction of the project from mid-July to the end of December also mitigated most environmental effects. Project-related residual effects are anticipated to be reversible in the short to long-term and are generally of low magnitude. The assessment determined that a high probability occurrence of permanent and/or long-term residual effects of high magnitude can be mitigated. As a result, residual effects associated with the project are predicted to be not significant.

The project may act cumulatively with past, present, or future projects or activities in the vicinity of the project. Cumulative residual effects of the project are minimal and are anticipated to be reversible in the short to long-term and are of low magnitude. The assessment determined that a high probability occurrence of permanent and/or long-term residual effects of high magnitude can be mitigated. Consequently, cumulative residual effects associated with the project are predicted to be not significant.

Tundra has developed general and project-specific mitigation measures which include routing changes, horizonal directional drilling, temporal and spatial contingency plans, reclamation, and monitoring activities to minimize the effects of the project and ensure the recommended mitigation measures and commitments made in the environmental assessment are implemented throughout the construction and operations phases of the project.

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1 INTRODUCTION

Tundra Oil and Gas Limited (Tundra) is proposing to construct a new 46 km flowline within a 20 m wide right-of-way (RoW) as part of the North Solution Gas Gathering Flowline Project (the Project). These flowlines start at an existing Tundra facility 2 miles east of Kola, Manitoba and will be used to collect and transport unrefined solution natural gas from five existing Tundra battery facilities to the Steel Reef Infrastructure Corp. compressor terminal, northwest of Sinclair, Manitoba (Figure 1). Solution natural gas is normally ignited and flared off to the atmosphere, due to its unrefined state. This unrefined solution natural gas will be refined into a marketable gas product. Once this project is completed, the refined gas will be sold to other industrial and residential users to meet their energy needs. When the project is in operation, there will be a greenhouse gas (GHG) emission reduction of ~179,396 tonnes of CO_2 equivalent/year in the first year of operation from the Tundra facilities.

Two flowline segments already exist underground, which will be re-purposed to transport solution gas and become part of this overall gas collection project (Figure 1). The flowline will be comprised of a 4" composite and a 10" high density polyethylene (HDPE) lines. The Project requires two crossings of the Pipestone Creek within NE ¼ 26-009-29 W1M (west crossing) and NW ¼ 04-009-28 W1M (east crossing). Site photographs of the general landscape of the proposed Project footprint and associated wetlands and watercourse crossings are provided as Appendix A.

An Environmental Assessment (EA) is required under the *Manitoba Environment Act*. This EA is conducted in accordance with *Environment Act Proposal Report Guidelines* (Manitoba Sustainable Development 2018), derived from the *Licensing Procedures Regulation* (Manitoba Regulation 163/88).

Environmental and socio-economic considerations for this project were identified through a variety of methods. A scoping assessment, which involved the review of literature, mapping resources, and other historic documentation, was completed to identify environmental and socio-economic components that may affect or be affected by the Project. Sources used to conduct the scoping assessment included literature reviews; and standards and guidelines produced by government agencies, academic institutions, and industry groups, such as:

- quantitative and qualitative environmental and ecological information available for the assessment areas
- current publicly available information about past, present, and future projects and activities in the assessment areas
- municipal, provincial, and federal government databases

The environmental and socio-economic considerations identified were factors used to refine the proposed flowline route and develop budgets, schedule, and planning details necessary for the completion of the EA. The current (baseline) environmental setting for the project was defined by completing desktop assessments and field studies.

1.1 Regulatory Framework

The Project is a Class 2 development as the proposed flowline is greater than 10 km (*Manitoba Environment Act* (MEA). This project will also be constructed in areas sensitive to environmental disturbance, as defined by the "Classes of Development Regulation" under the MEA. The filing of an Environment Act application proposal form, covering letter, supporting EA document, and application fee will initiate a formal regulatory public review process under the MEA.

Tundra will ensure all applicable federal, provincial, and municipal licences and/or permits are obtained prior to beginning construction.

1.2 Report Structure

This EA has been prepared to fulfill the requirements of *Environment Act Proposal Report Guidelines* (Manitoba Conservation and Climate 2021a), under the MEA.

The EA document is divided into the following sections:

1. **Introduction:** provides background information pertaining to the project, the regulatory framework, and the purpose of the document.
2. **Project Description:** describes the project components and project phases.
3. **Public Consultation:** describes Tundra's consultation with provincial regulatory agencies with respect to the EA and consultations with landowners and businesses affected by the proposed flowline.
4. **Current Environmental and Socio-economic Setting:** describes the biophysical and socio-economic conditions and current state of the environment where the project will occur.
5. **Environmental and Socio-economic Effects Assessment:** describes the potential environmental and socio-economic methods used and effects that may result from the project, and mitigation measures to eliminate or reduce the effects and predicted residual effects. An evaluation of significance is provided for each residual effect.
6. **Cumulative Effects Assessment:** describes potential cumulative effects that may arise when effects from past, present, and future projects interact in time or space with residual effects from the project. An evaluation of significance is provided for the project's contribution to the cumulative effect assessment.
7. **Construction and Reclamation Planning:** describes construction and reclamation activities that are associated with the project. Construction activities and post-construction reclamation activities are described.
8. **Follow-up and Monitoring:** describes the environmental inspection, and monitoring procedures to be applied during the construction and operation of the project, as well as follow-up programs, as required.

9. **Conclusions:** provides conclusions related to the significance of potential residual environmental and cumulative effects associated with the project.

1.3 Project Need

The proposed Project will allow Tundra to collect and transport unrefined solution natural gas from six existing battery facilities to the Steel Reef gas collection facility, northwest of Sinclair, Manitoba. The solution natural gas will be refined into a useable energy products like natural gas, propane, and butane. By transporting the unrefined solution natural gas, it will eliminate the practice of burning off (flaring) gas into the atmosphere at the five existing Tundra battery sites. The refined gas will be sold as a marketable product to other industrial, commercial, and residential users.

Once the project is in operation and unrefined gas is no longer flared off at the six existing battery facilities, Tundra operations will realize a GHG emissions reduction of ~179,356 tonnes of CO_2 equivalent/year based on current production forecasts.

This project is funded solely by Tundra Oil & Gas Limited. Tundra Oil & Gas Limited and Natural Resources Canada have entered into a re-payable Contribution Agreement via The Emissions Reduction Fund for this project.

2 PROJECT DESCRIPTION

2.1 Route Selection

The following criteria and/or factors were considered when considering alternatives and determining the proposed Project route:

- location of existing battery facilities
- input from landowners
- avoidance of rural residences, farm buildings, well sites, and water wells
- repurpose or parallel existing flowlines or pipelines, or other linear developments
- minimize crossings of native grassland
- avoidance of special land use areas and/or environmentally sensitive areas such as wildlife management areas, private conservation agency lands, protected areas, provincial parks, regional parks, and archaeological/historical sites, where possible
- avoidance or minimization of wetland crossings
- avoidance, to the extent possible, of steep or unstable terrain
- ensure the crossing of windbreaks, roads, and rail lines, occur at right angles to minimize the width of the RoW, to the extent possible

2.2 Construction Timeline

The flowline planning, routing, and design phases of this project were completed in 2021. Field assessments were completed during the appropriate survey windows in Q2 and Q3 2021. Stakeholder consultation commenced in Q3 and Q4 2021 and will be ongoing during the construction and monitoring phase of the project. Pending approval and the acquisition of all required permits, construction and rough clean-up is scheduled to be completed between July 15, 2022, and December 31, 2022. Final clean-up and reclamation will be completed in Q2 and Q3 of 2023.

2.3 Construction Activities

The progression of construction, including activity type and order of construction along the RoW is summarized in Table 2.1. The proposed construction timeline is dependent on receiving all regulatory approvals and permits. Photographs of typical flowline installation and the minimally disturbed flowline trench after installation (from previous flowline projects) are found in Appendix A (Site Photographs; Images 107 and 108).

At any given time, it is anticipated that various construction activities will be occurring at multiple locations along the flowline RoW.

TABLE 2.1 Proposed Construction Activity Timeline

Proposed Timeline	Project Activities
June 2022	• RoW boundaries are staked by surveyors.
July 15, 2022, to December 15, 2022. (Dates are approximate. Weather could cause construction delays)	• Workforce and equipment are mobilized. • Cross fences are modified with bracing and gates to control access. • Traffic control measures are implemented. • To comply with the Federal *Species at Risk Act* (SARA) and the *Migratory Birds Convention Act* during the restricted activity bird nesting period of April 15 to August 31, bird nest sweeps will be conducted in suitable habitat (grasslands, hay lands, wetlands), at least 7 days prior to construction activities. If active bird nests are found, species-specific setback buffers will be implemented to allow the nest to hatch and the young leave the nest, before construction activities within the setback zone is allowed to resume. • Based on 2021 field wetland assessment, Class III and Class IV wetland (Stewart and Kantrud 1971) locations along the flowline RoW were verified to determine if they would be directly impacted by flowline construction, so that appropriate mitigation measures could be recommended. For Class I, II, and dry Class III wetlands, the flowline will be ploughed-in, buried, and the wetland contours will be reclaimed to the original condition. • Class III wetlands holding water and Class IV wetlands within the RoW will be bored under (using horizontal directional drilling [HDD]) to avoid impacts to overwintering amphibians. • Clearing and mulching of trees within the flowline RoW is performed, as required. • HDD of two Pipestone Creek crossings are conducted.

Proposed Timeline	Project Activities
	• Bell-holes are excavated at crossings, and a channel between bell-holes is created under the creek crossings, by boring/directional drilling. • Tie-in joints at crossings are fused or crimped. Flowline conduit segments are hauled in and strung along the RoW in 60' sections. (Appendix A; Image 107). • Flexible composite fibreglass or HDPE flowlines will be installed by using a plough when land conditions or existing infrastructure allow. This minimizes ground disturbance to the RoW. If the RoW conditions are unfavourable for ploughing, the flowline will be installed using traditional trenching methods. • Flowline joints are fused and/or crimped together between sections. • Flowline fused HDPE sections are lowered into the trench created by a small bucket backhoe. • Flowline pipe is covered with backfill material (no rocks or frozen lumps). • Subsoil is returned to the trench and compacted lightly, to original density (Appendix A; Image 108). • Topsoil is mounded beside the trench in dry or frozen conditions to avoid mixing soils. • Risers at flowline ends are fabricated, installed, and supported. • A test head and pig barrel are installed at flowline ends. • Flowline warning signs are installed.
October 1 to December 31, 2022	• The flowline is filled with a water/methanol test medium mixture and allowed to stabilize to ground temperature. • The flowline is pumped up to the required leak and test pressures, which are maintained, as required by code. • Pressure test data is recorded. • The test medium is removed and returned to storage. • The flowline is dewatered using foam pigs pushed by compressed air and dried by pushing through a slug of methanol. The methanol is captured and stored. • The flowline is ready to be purged and put into service. • Fences are returned to their original or improved condition. • Contractor demobilizes equipment and removes surplus material.
Spring 2023	• Final clean-up and reclamation • Preconstruction contours will be re-established. • When weather and soil conditions permit, topsoil will be replaced. • Non-cultivated areas of the RoW will be seeded with approved certified seed mix • Temporary access roads will be reclaimed, where required. Fences are returned to their original or improved conditions. • RoWs are monitored for any trench subsidence or issues with crop re-growth.
Summer 2024	• RoWs are monitored for any trench subsidence or issues with crop re-growth during the first growing season following reclamation.
End of Life	• Decommissioning and abandonment activities that meet applicable regulatory conditions

2.4 Flowline Specifications

Table 2.2 summarizes the technical specifications of the proposed flowline.

TABLE 2.2 Flowline Project Technical Summary

	Flowline Segments					
Start Point	13-10-009-28 W1M	12-24-010-29 W1M	08-28-009-29 W1M	01-28-009-29 W1M	13-14-008-29 W1M	03-04-008-29 W1M
End Point	01-36-008-29 W1M	01-28-009-29 W1M	01-28-009-29 W1M	16-16-008-29 W1M	16-32-007-29 W1M	16-32-007-29 W1M
Pipe Type	Flexpipe	Flexpipe	Flexpipe	Poly	Poly	Star
Material	Composite	Composite	Composite	HDPE 4710	HDPE 4710	Fibreglass
Grade	FP 301	FP 301	FP 301	SDR 13.5	SDR 13.5	SP 1000
OD (mm)	124	124	124	232.6	232.6	109
ID (mm)	99	99	99	192.2	192.2	101.1

2.5 Trench Specifications

It is anticipated that the trench will be approximately 0.5 m (20 inches) to 0.6 m (24 inches) wide and 1.65 m (5 feet 6 inches) deep. The trench line will be created by backhoe digging. If trenching or 'ploughing-in' is not feasible, some grassland segments may be bored under.

2.6 Hydrotesting

In order to test the integrity of the flowline prior to "In Service," a hydrotest is completed. The hydrotest entails filling the flowline with a mixture of methanol and water as the test medium and pressuring it to 1.25 times the maximum operating pressure, as required by code. The test will consist of a leak test followed by a strength test. Total time of the test, including temperature stabilization, is anticipated to be 24 hours, and is most likely to occur in early November 2022.

The hydrotest test medium will be from Tundra test medium stock or rented if required, utilized, then recovered, and returned to stock upon completion of the test. No test medium will be released to the surrounding environment. Procedures will be in place to prevent spills and a spill response plan will be in place to address any spills or releases (refer to Section 8.1.1.1).

2.7 Temporary and Permanent Facilities

No new permanent facilities are planned as part of the Project.

The Project contractor will have a temporary staging area at 02-16-008-29 W1M, which is a Tundra-owned yard currently used for various oilfield activities. The temporary facility will be used as staging, maintenance, and storage area for personnel and construction equipment. A mobile temporary office will also be situated in the staging area.

2.8 Work Force

Construction of the Project will require an estimated peak workforce of approximately 35 people. Necessary skills will range from entry level labourers to highly skilled trades. Subject to regulatory approval, the Project work force will fluctuate throughout the construction timeline based on the requirements of the construction activities.

2.9 Construction Equipment

It is anticipated that the following equipment may be required for construction:

- vehicles for personnel transportation
- mulcher for a limited amount of tree/shrub mulching (most of the RoW is open cultivated farmland)
- hydrovac trucks for exposing underground infrastructure
- bulldozers and graders for RoW preparation, soil stripping, spoil pile management, and trench line ripping
- flatbed tractor trailer units for transporting equipment and flowline reels
- welding trucks
- plough unit
- cable truck
- tracked backhoes for trenching, bellhole excavation, and backfilling
- boring (horizontal directional drilling) equipment for creek and road crossings
- side booms for handling flowline strings
- water trucks for dust control (if necessary)
- pressure testing trucks

3 PUBLIC CONSULTATION

As part of the project, Tundra has consulted with all levels of government and engaged local landowners impacted by the project. Tundra has maintained close contact with the Manitoba Petroleum Branch in the early planning stages and throughout the project to address regulatory requirements for the flowline licensing. The Rural Municipalities of Pipestone and Wallace-Woodworth have been consulted on the project as part of regular updates to council on activities in the area.

On behalf of Tundra, Matrix consulted with Manitoba Historic Resources Branch (HRB) and the Conservation Data Centre to obtain a screening of the project footprint to determine information of known heritage and species at risk occurrences for survey planning. Matrix set up an online account to obtain a scientific fisheries permit in May 2021 and met virtually with Manitoba Fish and Wildlife Branch biologists in June 2021 to discuss environmental surveys and project regulatory requirements. Matrix has

also maintained close contact with Manitoba Water Resource Officers in Brandon, Manitoba, to engage on pertinent regulatory requirements pertaining to wetlands.

To date, 96% of the RoWs have been successfully acquired with the landowners. Active engagement and negotiations are continuing with the remaining landowners. Special conditions requested by landowners have been documented and incorporated throughout the project planning. Throughout the project, Tundra will continue to adhere to the landowner's commitments. Any deviations will be negotiated and communicated to the landowner through the appropriate Tundra representative.

4 ENVIRONMENTAL AND SOCIO-ECONOMIC EXISTING ENVIRONMENT

4.1 Objective

The objective of this environmental and socio-economic setting section is to describe the baseline environmental and socio-economic conditions that exist prior to the development of the project and to determine the effects that exist from past or present projects or activities. Baseline information is presented by different environmental and socio-economic components for the project and is summarized in Table 4.1.

TABLE 4.1 Environmental and Socio-economic Components

Environmental Components	
Physical Environment	Fish and Fish Habitat
Soil and Soil Productivity	Water Quality and Quantity
Vegetation Communities	Air Quality
Wetlands	Acoustic Environment
Wildlife and Wildlife Habitat	
Species at Risk	
Watercourses	
Socio-economic Components	
Heritage Resources	Social and Cultural Well-being
Traditional Land Use	Employment and Economy
Human Occupancy and Resource Use	

4.2 Assessment Boundaries

The EA predicts the potential effects of the Project on the environmental and socio-economic conditions within defined spatial boundaries. These boundaries will vary with the issues and biophysical or socio-economic elements or interactions to be considered, and will reflect:

- the biophysical and socio-economic baseline setting within the spatial boundaries of the Project
- the area potentially affected by construction, operations, and decommissioning or abandonment phases of the proposed physical works and physical activities

- the area in which an element occurs or functions, and within which a Project effect may be detected
- the time required for an effect to become evident
- the time required for an element to recover from an effect and return to a pre-effect condition

4.2.1 Spatial Boundaries

Two spatial areas, local study area (LSA) and regional study area (RSA), were selected to describe the environmental and socio-economic existing environment. The LSA was selected to account for the Project footprint and includes the 20 m Project RoW and a 100 m buffer on either side of the RoW to account for construction activities. The LSA boundary will be used to examine baseline conditions for all environmental and socio-economic components, where there is a reasonable possibility for direct and indirect effects. The assessment only pertains to the construction footprint of the proposed new flowlines and not the two segments of existing underground flowlines, which will eventually become part of this overall project (Figure 1).

A larger RSA was selected to account primarily for socio-economic elements that may be affected beyond the LSA. The RSA will also be used to account for regional past, present, and future projects and activities that have the potential to interact cumulatively with the Project. The RSA boundary includes the portion of the Rural Municipality (RM) of Wallace-Woodworth, south of the municipal east-west road 4.8 km north of Kola, east to Highway #1, and 9.6 kilometres west of Provincial Road #257; and the RM of Pipestone, west of the correction line on the east-west Provincial Road #255 (9.6 km west of Cromer), and north of Provincial Highway #2 (Government of Manitoba n.d.). The RSA boundary was delineated to a larger geographical and ecological area to evaluate cumulative environmental and socio-economic effects (Figure 1).

4.3 Methods

The baseline environment and socio-economic components identified within the LSA were assessed through desktop reviews and field surveys. Desktop Information was acquired from a variety of sources and included a review of existing studies, if available, environmental databases, baseline data, ecological land classification, and traditional ecological knowledge, if applicable.

The following environmental and socio-economic components were assessed in the LSA using desktop studies:

- description of the prevailing physical environment, including climate and weather conditions
- description of the local area and regional setting including important terrain
- identification and description of the regional groundwater conditions
- description of the aquatic environment including fish, fish habitat, wetlands, and watercourses
- description of the terrestrial environment including soil, vegetation, wildlife, and wildlife habitat
- identification and description of provincial or federal species at risk (SAR) and their habitats

- identification and description of the existing land and resource use
- identification of existing air and acoustic conditions
- description of the socio-economic environment

The field studies assessed terrestrial vegetation, wetlands, wildlife, and wildlife habitat in the LSA. The field studies were completed within the LSA between April to October 2021 and included:

- aerial imagery and ground-verification classification of wetlands
- assessing wetlands for potential over-wintering habitat for amphibians
- documentation of native terrestrial vegetation communities (i.e., grassland, shrubland, or woodland) and rare plants
- identification of potentially important wildlife habitat
- surveys for sharp-tailed grouse breeding grounds, breeding and SAR songbirds
- fisheries and streambank assessment at two Pipestone Creek crossings

4.4 Protected Areas

4.4.1 Environmentally Significant and Protected Areas

The Project does not cross any national parks, national wildlife areas, municipal conservation areas, provincial parks, ecological reserves, provincial forests, recreation areas, or conservation lands (i.e., Nature Conservancy of Canada, Ducks Unlimited Canada, Manitoba Wildlife Federation Habitat Trust land), resource management areas, or special conservation areas (Manitoba Agriculture and Resource Development 2021a).

4.4.2 Provincial Wildlife Management Areas and Conservation Lands

Provincial wildlife management areas (WMA) in Manitoba are Crown land and are regulated by the Manitoba Wildlife Act (1981). No provincial WMAs, special conservation areas, or wildlife refuges are located within the flowline LSA.

A Crown agency, the Manitoba Habitat Heritage Corporation (MHHC), own wildlife conservation lands and are considered private property. Development on MHHC lands is restricted to specific activities and must include appropriate mitigations. Two properties holding conservation agreements with the MHHC will be crossed but the wetlands and grasslands in those properties will be avoided as much as possible by route deviation or boring under the sites. A 115 m segment of the Project traverses across native grassland on a MHHC conservation agreement property (Elm Creek SE ¼ 09-009-28 W1M), 2.4 km southeast of Cromer, Manitoba. In addition, an 890 m segment of the Project crosses cultivated land adjacent to wetlands on another MHHC conservation agreement property (SW ¼ 16-009-29 W1M), southwest of Ebor, Manitoba.

4.5 Physical Environment

4.5.1 Physiography

The project is located within the Aspen Parkland Ecoregion of the Prairie Ecozone in Manitoba. The Aspen Parkland Ecoregion is associated with black Chernozemic soils and a climate with short, warm summers and long, cold winters. The ecoregion is glacial till covered with undulating terrain and kettle depressions with moderate slopes (2% to 5%) and level, lacustrine deposits. Landscapes include open grassland areas and knob and kettle areas with tree-ringed ponds and sloughs that provide habitat for waterfowl and migratory birds (Ecological Stratification Working Group 1995).

Approximately 89% of the land use along the Project RoW is agricultural (i.e., cultivated land, hayland, modified grassland/pasture).

4.5.2 Surficial Geology

Surficial geology in the LSA is comprised of calcareous clay diamicton that is between 1 and 75 m thick, with subglacial deposits primarily derived from Mesozoic Shale above the Manitoba Escarpment and covered discontinuously by thin veneers (<1 m) of glaciolacustrine and glaciofluvial sediments (Blais-Stevens and Fulton 1998).

4.5.3 Bedrock Geology

The LSA is located within the Western Canadian Sedimentary Basin and is underlain by the Riding Mountain Formation. This is a Cretaceous-aged strata consisting of the Coulter, Millwood, Odanah, Morden, Boyne, and Pembina members (Manitoba Department of Mines, Resources and Environmental Management 1979).

4.5.4 Climate

The climate in the LSA is characterized by short, warm summers and cold winters with annual precipitation between 467 to 473 mm (ECCC 2021a). The mean May to September temperature along the proposed route is 11.8°C to 12.3°C. The LSA has, on average, 105 to 115 frost-free days a year indicating a relatively short growing season (AAFC 2021). The majority of the LSA is outside of historical flooding areas (Natural Resources Canada 2010); however, excess water conditions occurred in 2011 and 2014 (ECCC 2021a).

4.6 Soils and Soils Productivity

4.6.1 Soil Characteristics

Soils within the LSA are black chernozemic soils of the Newdale soil series (Manitoba Agriculture and Resources Development 2010; AAFC 2021). The Newdale series is characterized by orthic black chernozems on moderately to strongly calcareous, loam to clay loam morainal till derived from limestone, granite, and shale (Manitoba Agriculture and Resources Development 2010). These soils are moderately

well to well drained and occur in mid to upper slope positions of undulating to hummocky landscapes. Surface runoff is moderate to moderately rapid; permeability is moderately slow. Most of these soils are presently cultivated and have formed under a mixture of aspen grove and grassland vegetation. Soils in the LSA are generally at low risk of erosion (AAFC 2021).

4.6.2 Soil Capability for Agriculture

The LSA is in the Southwest Agricultural Region of Manitoba and is dominated by agricultural land uses that include crop production, hay land, and pasture lands. The Agricultural Soil Capability in the LSA is primarily described as Class 2 and Class 3 (AAFC 2021). Class 2 soils are suitable for sustained production of common cultivated field crops. Class 3 soils are also suitable for sustained production of field crops. However, they have moderate limitations that restrict the range of crops or require special conservation practices. The typical soil "A" horizon within the LSA is predominantly loam to clay loams with a depth ranging from 12 cm to greater than 30 cm and is rated as fair or poor, predominantly due to higher proportions of coarse fragment content (AAFC 2021).

Soils in the Pipestone and Stoney Creek valleys are primarily Class 5 and have very severe limitations which restrict agricultural production to perennial forage crops (Virden-62F; Canada Land Inventory 1966).

4.7 Water Quantity and Quality

4.7.1 Surface Water

The Project is in the Souris River West watershed of the Souris River watershed drainage basin (AAFC 2021). The Souris River basin covers an area of ~61,000 km^2 (Saskatchewan Watershed Authority 2006) with the headwaters originating in the Yellow Grass marshes approximately 50 km northeast of Weyburn, Saskatchewan. The Pipestone Creek is a tributary of the Souris River watershed, with headwaters south of Grenfell, Saskatchewan. Pipestone Creek flows to Oak Lake and Stony Creek flows east intermittently to Maple Lake. Both are part of the Souris River watershed drainage basin (WSRIWMP 2012).

4.7.2 Groundwater

Groundwater movement in Manitoba is predominantly from west to east with discharge occurring in the outcrop area beneath Lake Winnipeg (Betcher et al. 1995). In the north and east portions of the LSA, there are small lenses of sand and gravel aquifers. Most of the flowline, south of the Pipestone Creek, has few widely scattered small lenses of sand/gravel aquifers of useable groundwater. No bedrock aquifers are encountered at less than 150 m depths in the LSA or along the flowline RoW (Rutulis 1986). The flowline does not cross the Oak Lake Aquifer Management Plan Area (Oak Lake Aquifer Technical Advisory Group 2000).

No springs were observed along the RoW and a detailed listing of springs within Manitoba is not publicly available. Groundwater in useable quantities is not available in all areas of the LSA. Groundwater quality

in shallow unconfined surficial aquifers is highly variable. Potable aquifers may not be present on the west and south sides of the West Souris River watershed (WSRIWMP 2012).

In general, total dissolved solids (TDS) concentrations in these aquifers are at levels below the Canadian Drinking Water Quality (CDWQ) aesthetic objective of 500 mg/L and therefore, meet drinking water quality standards. Deeper, confined sand and gravel aquifers typically have water quality with TDS concentrations greater than 1,000 mg/L and sulphate concentrations above drinking water guidelines (Enbridge 2010). Therefore, the taste, smell or colour of the shallow groundwater may be naturally impaired.

4.8 Air Quality

A desktop qualitative study was completed to evaluate air quality conditions and potential greenhouse gas emissions (GHG) associated with the construction phase of the project. Some localized air monitoring has taken place in southwest Manitoba (Manitoba Agriculture and Resource Development 2020) but no regional monitoring program exists.

The Project is located mainly in rural areas, and there are no major industrial activities along the flowline RoW. Agriculture (cultivated land, hay land, and modified grassland/pasture) is the primary land use (Figures 2-1 to 2-41). Air emissions, including GHGs, in the vicinity of the project are related to agricultural activities, intensive livestock operations, oil and gas operations, vehicular traffic, and some natural sources. Emissions include ammonia (NH_3) from fertilizers and livestock and carbon dioxide (CO_2) and methane (CH_4) from fuel combustion at battery flare-stacks. The principal compounds emitted from vehicular traffic and farm equipment include sulphur dioxide, nitrogen oxides, particulate matter, carbon monoxide (CO), as well as trace amounts of metals, volatile organic compounds, polycyclic aromatic hydrocarbons, and total reduced sulphur compounds (Enbridge 2010).

4.9 Acoustic Environment

Background noise in the LSA is primarily associated with vehicle traffic. Existing oil infrastructure, such as pumpjacks and battery facilities are found in the LSA. Local residences and communities are potential receptors to noise effects associated with the construction and operation of the flowline.

4.10 Vegetation Communities

4.10.1 Ecological Land Classification

The Project is located within the Aspen Parkland Ecoregion of Canada (Environment Canada 2000). This ecoregion is a transitional area between the boreal forest and grassland ecoregions. A large proportion of this ecoregion has been converted to agricultural land uses. Some patches of aspen parkland remain in a native condition. Native patches are characterized by stands of trembling aspen, bur oak, Manitoba maple, and mixed tall shrubs intermixed with fescue grasslands. Stands of trembling aspen, Manitoba maple, and tall shrubs occur throughout the region on a variety of sites while grasslands occupy

increasingly drier sites. Stands of bur oak are typically associated with richer soils located along bottomland habitats such as riparian areas and floodplains.

4.10.2 Vegetation Community Types

The LSA is dominated by agriculture land uses intermixed with small stands of trembling aspen and tall shrubs, native grassland, and wetlands.

Table 4.2 describes the dominant vegetation community types observed in the LSA. The distribution of vegetation communities in the LSA is provided in Figures 2-1 to 2-41.

TABLE 4.2 Vegetation Community Types in the Local Study Area

Vegetation Community	Description	Percentage of Land Type in the Project Area
Cultivated Land (CU)	Cultivated land occurs where the land tends to be flat and well drained. The land has been broken, tilled, and seeded to crops for fallow and continuous crop rotation.	85%
Hay land (HA)	Previously cultivated land used for growing legumes and grasses for domestic animal forage. Hay land tends to be located on flat upland sites with locally productive soils. Fertilizers are sometimes applied early in the growing season. Plants are harvested at the appropriate growth stage, cured, and baled.	
Modified Grassland (MG)	Includes perennial pasture, rotation pasture, and annual pasture used temporarily for grazing domestic livestock. The land area tends to be flat and well drained and may have previously been used for hay or annual crops (Vallentine 1989).	4%
Native Grassland (NG)	Grass-dominated plant communities that have evolved primarily under the influence of climate, fire, and herbivory (Wright and Bailey 1982). NG is uncultivated land that provides the necessities of life for grazing and browsing animals (Vallentine 1989).	4%
Woodlands (WD)	Aspen (*Populus tremuloides*) dominated woodland communities	1%
Riparian (RI)	Vegetation communities associated with flowing water systems found along rivers and streams (Thompson and Hansen 2003)	6%
Wetlands (WL)	Land that is saturated with water for a duration sufficient to promote wetland processes. Wetlands are characterized by poorly drained soils, hydrophytic vegetation, and biological activity adapted to a wet environment.	
Seasonal Waterways (SW)	Low linear feature that can be water-saturated on a seasonal basis; intermittently conveys surface water	

TABLE 4.3 Plant Species on Grassland Segments Identified Within the Local Study Area

Common Name	Scientific Name
Vascular Plants	
Heart leaved alexanders	*Zizia aptera*
Common milkweed	*Asclepias syriaca*
Common yarrow	*Achillea millefolium*
Ragweed	*Ambrosia artemissfolia*
Pussytoes	*Antennaria neglecta*
Low everlasting	*Antennaria aprica*
Common burdock	*Arctium minus*
Absinthe	*Artemisia absinthium*
Pasture sage	*Artemisia frigida*
Prairie sage	*Artemisia ludoviciana*
Canada thistle	*Cirsium arvense*
Flodman's thistle	*Cirsium flodmanii*
Bull thistle	*Cirsium vulgard*
Gumweed	*Grindelia vulgare*
Sneezeweed	*Hekenium autumnale*
Sunflower species	*Helianthus* spp.
False hairy golden aster	*Heterotheca villosa*
Meadow blazing star	*Liatris ligustylus*
Blue lettuce	*Lactura tatarica*
False dandelion	*Hypochaeris radicata*
Purple prairie coneflower	*Ratibida columnifera*
Stiff goldenrod	*Solidago rigida*
Perennial sow thistle	*Sonchus arvensis*
Common tansy	*Tanacetum vulgare*
Common dandelion	*Taraxacum officinale*
Goat's beard	*Tragopogon dubius*
Common harebell	*Campanula rotundifolia*
Kochia	*Bassica scoparia*
Lamb's quarters	*Chenopodium album*
Purple milk vetch	*Astragalus dasyglottis*
Chickpea	*Cicer arientinum*
Wild licorice	*Glycyrrhiza lepidota*
Black medick	*Medicago lupulina*
Alfalfa	*Medicago sativa*
White sweet clover	*Melilotus alba*
Yellow sweet clover	*Melilotus officinalis*
Purple locoweed	*Oxytropis Lambertii*
Silver leafed psoralea	*Psoralea agrophylla*
Alsike clover	*Trifolium hybridum*
Seaside arrow grass	*Triglochin maritima*
Wild mint	*Mentha arvensis*
Small yellow lady's slipper	*Cypripedium parviflorum*
Field dock	*Rumex pseudonatronatus*

Common Name	Scientific Name
Canada anemone	*Anemone canadensis*
Prairie crocus	*Anemone patens*
Spearwort	*Ranuculus* spp.
Silverweed	*Potentilla anserine*
Woodland strawberry	*Fragaria vesca*
Rough cinquefoil	*Potentilla norvegica*
Wild raspberry	*Rubus idaeus*
Northern bedstraw	*Galium boreale*
Beardtongue spp.	*Penstemon* spp.
Common cattail	*Typha latifolia*
Many flowered aster	*Aster ericoides*
Rough fleabane	*Erigeron strigosus*
Pennycress	*Thlaspi arvense*
Green millet	*Setaria viridis*
Grasses, Sedges, Rushes	
Crested wheatgrass	*Agropyron cristatum*
Big bluestem	*Andropogon gerardii*
Slough grass	*Beckmannia syzigachne*
Side-oats grama grass	*Bouteloua curtipendula*
Meadow brome	*Bromus biebersteini*
Smooth brome grass	*Bromus inermis*
Tufted hairgrass	*Deschampsia cespitoa*
Canada wild rye	*Elymus canadensis*
Slender wheat grass	*Agropyron trachycaulum*
Fowl manna grass	*Glyceria striata*
Fox-tail barley	*Hordeum jubatum*
Reed grass spp.	*Calamagrostis* spp.
Kentucky bluegrass	*Poa pratensis*
Western wheatgrass	*Pascopyrum smithii*
Little bluestem	*Schizachynum scoparium*
Awned wheatgrass	*Agropyron subsecundum*
Water sedge	*Carex aquatilis*
Low sedge	*Carex umbellata*
Sedge spp.	*Carex* spp.
Baltic rush	*Juncus balticus*
Creeping spike rush	*Eleocharis erythropoda*
Trees and Shrubs	
Manitoba maple	*Acer negundo*
Western snowberry	*Symphoricarpos occidentalis*
Wolf-willow	*Elaeagnus commutate*
American elm	*Ulmus americana*
Sandbar willow	*Salix exigua*
Red willow	*Salix laevigata*
Prickly rose	*Rosa acicularis*
Saskatoon	*Amelanchier alnifolia*

4.10.3 Plant Species at Risk

Plant SAR that could potentially occur in the LSA were identified by searching the following databases:

- Manitoba Conservation Data Centre (Manitoba Conservation and Climate 2021a)
- *Endangered Species and Ecosystems Act* (Manitoba Agriculture and Resource Development 2021a)
- Federal SAR (COSEWIC 2004)
- *Species at Risk Public Registry* (Government of Canada 2019)

The Manitoba Conservation Data Centre (MBCDC) uses a system for rare plants that ranks species on a scale of 1 (rarest) to 5 (common) at a provincial (S) and global (G) scale (Manitoba Conservation and Climate 2021a). A species that may be ranked S1 provincially and G5 globally, indicates that it is considered rare in Manitoba but secure globally. In the Federal Species at Risk Act (SARA), wildlife species are ranked on a scale from highest to lowest concern of being extirpated (e.g., highest to lowest: endangered, to threatened, to special concern.)

MBCDC was also contacted in April 2021 to acquire updated SAR information for the LSA and the database identified two SAR plant occurrences (golden bean, S2S3 [*Thermopsis rhombifolia]* and narrow-leaved milkvetch, S2 [*Astragalus pectinatus*]) within the LSA (Appendix B; Manitoba Conservation and Climate 2021a).

Field surveys were completed by qualified biologists June and late July 2021. Survey methods met current industry standards and were conducted similar to Saskatchewan Species Detections Survey Protocols (Saskatchewan Environment 2019). No provincially ranked S1 or S2 species, SARA, and/or COSEWIC plant species (endangered or threatened) were identified during field surveys.

4.11 Wetlands

Wetlands were classified based on vegetation criteria following the Stewart and Kantrud wetland classification system and Ducks Unlimited Canada (DUC) Manitoba wetland classification guide (Appendix C; Stewart and Kantrud 1971, DUC 2020).

The presence or absence of characteristic vegetation assemblages and the spatial patterning of wetland zones are the primary factors distinguishing wetland classes in this classification system. The five main wetland zones (beginning from the furthest outside peripheral zone to the central zone) include low prairie, wet meadow, shallow marsh, deep marsh, and permanent open water. In each zone, characteristic plants may be found as a general mixture or may be represented by one or more distinct associations, each consisting of one or more species. These zones are closely related to differences in water permanence, modified by the permeability of bottom soils and influence of ground water. Certain wetlands contain only one zone, while others contain two or more zones. In wetlands with two or more zones, one zone usually occupies the central, deepest part of the pond basin. The remaining zones occur as separate peripheral bands of hydrophytic vegetation surrounding the central zone.

The presence/absence of wetland zones and the distributional pattern of the zones are the primary criteria used in distinguishing the seven major classes of wetlands.

There are seven primary classes of wetlands in natural basins. Each class is distinguished by the vegetation zone occurring in the central or deepest part of the wetland. This central zone occupies greater than 5% of the total wetland basin being classified. Characteristic wetland vegetation species typical of the Canadian prairies are included in the wetland description.

Wetland classification in the LSA was conducted using aerial imagery and field verification. Field assessments were conducted in September and October 2021 to verify classification and water regime status. The locations of all wetlands visited within the LSA were recorded using a GPS. Appendix C summarizes the wetland types identified on or within 25 m on either side of the flowline RoW boundary. Wetland ID, class, and mitigation can be found in Table 1. The location of wetlands on or adjacent to the flowline RoW are provided in Figures 2-1 to 2-41.

4.12 Wildlife and Wildlife Habitat

The wildlife and wildlife habitat baseline desktop and field assessment identified wildlife species and their habitat as well as wildlife SAR that could potentially occur or were detected within the LSA.

A desktop study was conducted to identify potential wildlife habitat as well as bird, mammal, amphibian, and reptile SAR that could potentially occur in the LSA by searching the following databases:

- *Endangered Species and Ecosystems Act* (Manitoba Agriculture and Resource Development 2021a)
- *Canadian Species at Risk* (COSEWIC 2004)
- *Species at Risk Public Registry* (Government of Canada 2019)

Potential wildlife SAR information is provided in Table 4.6.

Wildlife desktop studies included evaluation of some species that are not SAR. It included the following activities:

- obtaining historical wildlife occurrence data, including SAR, within 10 km of the flowline centreline from the MBCDC
- compiling a list of wildlife SAR that potentially occur within the RSA and within habitat types expected to occur in the LSA using published and unpublished literature sources (including reports from past projects in the area)
- delineating wetlands and vegetation communities important to wildlife species that may occur along the LSA

Communication received from Manitoba Conservation Data Centre (CDC) indicated occurrences of four 'threatened' birds: prairie loggerhead shrike (*Lanius ludovicianus excubitorides*), bobolink (*Dolichonyx oryzivorus*), lark bunting (*Calamospiza melanocorys*), and bank swallow (*Riparia riparia*; Appendix B).

TABLE 4.4 Provincial or Federal Status of the Potential Species at Risk within the LSA

Common Name	Scientific Name	MBCDC 2021 Rank[1]	Manitoba Conservation 2021 Status[2]	COSEWIC 2021 Status[3]	SARA 2021 Status[4]
Amphibians and Reptiles					
Great Plains Toad	*Bufo cognatus*	S2	Threatened	Special Concern	Schedule 1
Plain's Spadefoot	*Spea bombifrons*	S2S3	---	---	---
Northern Leopard Frog	*Lithobates pipiens*	S4	---	Special Concern	Schedule 1
Snapping Turtle	*Chelydra serpentine*	S3	---	Special Concern	---
Western Hognose Snake	*Heterodon nasicus*	S1S2	Threatened	Special Concern	---
Smooth Green Snake	*Liochlorophis vernalis*	S3S4	---	---	---
Northern Red-bellied Snake	*Storeria occipitomaculata*	S3S4	---	---	---
Northern Prairie skink	*Eumeces septentrionalis*	S1	Endangered	Special Concern	Schedule 1
Birds					
Black crowned night heron	*Nycticorax nycticorx*	S3S4B	---	---	---
Swainson's Hawk	*Buteo swainsoni*	S3S4B	---	---	---
Ferruginous Hawk	*Buteo regalis*	S1B	Endangered	Threatened	Schedule 1
Piping Plover	*Charadrius melodus circumcinctus*	S1B	Endangered	Endangered	Schedule 1
Burrowing Owl	*Athene cunicularia*	S1B	Endangered	Endangered	Schedule 1
Short-eared Owl	*Asio flammeus*	S2S3B	Threatened	Special Concern	Schedule 1
Common Nighthawk	*Chordeiles minor*	S2S3B	Threatened	Special Concern	Schedule 1
Chimney Swift	*Chaetura pelagic*	S2B	Threatened	Threatened	Schedule 1
Bank Swallow	*Riparia riparia*	S4B	----	Threatened	Schedule 1
Barn Swallow	*Hirundo rustica*	S4B	---	Threatened	Schedule 1
Red-headed Woodpecker	*Melanerpes erythrocephalus*	S3B	Endangered	Threatened	Schedule 1
Sprague's Pipit	*Anthus spragueii*	S2B	Threatened	Threatened	Schedule 1
Prairie Loggerhead Shrike	*Lanius ludovicianus excubitorides*	S1B	Endangered	Threatened	Schedule 1
Baird's Sparrow	*Ammodramus bairdii*	S1B	Endangered	Special Concern	Schedule 1
Chestnut-collared Longspur	*Calcarius ornatus*	S1S2B	Endangered	Threatened	Schedule 1

Common Name	Scientific Name	MBCDC 2021 Rank[1]	Manitoba Conservation 2021 Status[2]	COSEWIC 2021 Status[3]	SARA 2021 Status[4]
Bobolink	*Dolichonyx oryzivorus*	S3S4B	---	Threatened	Schedule 1
Rusty Blackbird	*Euphagus carolinus*	S3S4B	---	Special Concern	Schedule 1
Grasshopper sparrow	*Ammodramus savannarum*	S2S3B	---	---	---
Sharp-tailed grouse	*Tympanuchus phasianellus*	S5	Game bird	----	----
Mammals					
Mule Deer	*Odocoileus hemionus*	S3	Threatened	---	---
Insects					
Monarch	*Danaus plexippus*	---	---	Special Concern	Schedule 1

Sources:
[1] MBCDC 2021
[2] Manitoba Conservation and Climate 2021c
[3] COSEWIC 2019
[4] Government of Canada 2021 a
--- - not applicable

4.12.1 Wildlife Habitat

Wildlife habitat along the LSA is limited due to the majority of the land being cultivated. Class I to IV wetlands are located along the LSA (Figures 2-1 to 2-41). Classes IV wetlands provide suitable habitat for waterfowl and overwintering habitat for amphibians. The quality of wetland habitat varies within the LSA depending upon the extent of previous disturbances and the presence of weed species. In addition, the weather conditions of 2021 caused all wetlands (including Class IV wetlands) to be dry at the time of assessment in September. Therefore, the water status of wetlands may need to be assessed just prior to construction, to determine appropriate construction mitigation measures.

Some aspen parkland habitat is present within the LSA and is comprised of aspen woodland intermixed with shrubland and native grassland. The largest and most contiguous aspen parkland is located along the Pipestone Creek valley. The north, south, and east portions of the Project have isolated patches of aspen parkland habitat

Small parcels of native grassland and modified grassland, which provide potential habitat to wildlife and SAR were identified in the north and east portion of the route. These areas are identified in Figures 2-1 to 2-41 (native grassland [Figures 2-7, 2-8, 2-18, 2-19, and 2-40], modified grasslands [Figures 2-1, 2-7, 2-8, 2-11, 2-12, 2-21, 2-22, 2-34, and 2-35], haylands [Figures 2-18, 2-19, and 2-35], and wooded cover [Figures 2-2, 2-3, 2-8, 2-18, 2-24, 2-31, and 2-34]).

The majority of the proposed Project is located within cultivated land and not generally suitable for SAR wildlife. Modified grassland, hay lands, and small woodlands provide less suitable habitat for wildlife species. Modified grasslands contain a mix of native and agronomic species in addition to numerous weed

species that provide less suitable habitat opportunities for wildlife species. No dens or nesting areas were observed within the LSA in these habitat types. Small woodlands were composed of trembling aspen and tall shrubs with grasses and forbs in the understory. These areas provide limited cover for mammal species but during field surveys these areas contained common bird species.

No critical wildlife habitat was observed within the LSA. The presence of native grassland in the north, south, and east portions of the route does provide habitat for a diversity of species. However, within the entire LSA, potential SAR bird habitat is limited, modified, and fragmented.

4.12.2 Wildlife Field Surveys

Results of the desktop assessment were used to determine where targeted field surveys for wildlife, wildlife habitat and wildlife SAR would be conducted. Wildlife surveys were conducted in suitable wildlife habitat near grassland and wetland habitat to increase the possibility of detecting provincially regulated birds and provincial and/or federal SAR. Field surveys were conducted by qualified biologists to detect wildlife in suitable wildlife habitat within the LSA. Surveys were conducted at appropriate time periods and weather conditions with sufficient effort to maximize the chances for detecting wildlife. Survey methods met current industry standards and were conducted similar to Saskatchewan Species Detections Survey Protocols (Saskatchewan ENV n.d.).

Based on the results of the desktop wildlife review and initial field scouting, five native/modified grassland segments were surveyed for sharp-tailed grouse at seven different survey stations (Figures 2-1, 2-7, 2-8, 2-17, and 2-40). Breeding songbird observations were collected at 16 point-count stations (Figures 2-1, 2-7, 2-8, 2-11, 2-15, 2-18, 2-21, 2-27, 2-28, 2-31, and 2-40). Eight Class IV wetlands were surveyed for amphibians (Figures 2-15, 2-18, 2-21, 2-27, 2-28, and 2-31).

4.12.2.1 Sharp-tailed Grouse

Sharp-tailed grouse (STGR) are a provincially-regulated upland game bird that breed in the spring on native grassland habitat. These leks are habitat that is protected from disturbance (Manitoba Agriculture and Resource Development 2021a).

Methods

STGR breeding ground (i.e., lek) surveys were conducted in April 2021 to detect active sites. Seven survey stations within five native and modified grassland locations within the LSA were surveyed by qualified wildlife biologists. Surveys were completed between 5 AM and 9 AM under appropriate weather conditions (minimal wind, no precipitation) to maximize detection of STGR. Surveys were conducted on April 21 and 27, 2021, according to industry-accepted standard survey protocols (Saskatchewan ENV 2020).

Results

STGR leks were found in native/modified grassland habitat on SE ¼ 35-009-29 W1M and NW ¼ 04-009-29 W1M. Both lek locations will be avoided by re-routing the Project RoW a suitable

distance to reduce potential impacts to the leks. The lek on SE ¼ 35-009-29 W1M (12 birds) will be avoided by route deviation, 86 m to the south and will not be impacted by construction or reclamation activities.

The Project RoW will be re-routed 520 m to the east of the lek at NW ¼ 04-009-29 W1M lek (16 birds) which will completely avoid the lek.

4.12.2.2 Breeding Songbirds

Method

Breeding songbird surveys and incidental bird observations were conducted by qualified avian biologists in suitable habitats (grassland, woodland, and wetland) at 16 point-count stations along the flowline route. Surveys were done between 5 AM and 9 AM under appropriate weather conditions (minimal wind, no precipitation) to maximize detection of breeding birds, including potential SAR birds. Surveys were conducted on June 10 and 24, 2021, according to industry-accepted standard survey protocols (Saskatchewan ENV 2014a).

4.12.2.3 Results

A total of 56 different bird species were detected along the flowline footprint (Table 4.5).

TABLE 4.5 Avian Species Detected Within the Local Study Area

	Common Name	Scientific Name
1	Gadwall	*Anas strepera*
2	Mallard	*Anas platyrhynchos*
3	Blue-winged teal	*Anas discors*
4	Northern shoveler	*Anas clypeata*
5	Green-winged teal	*Anas crecca*
6	Great blue heron	*Ardea herodias*
7	Swainson's hawk	*Buteo swainsoni*
8	Red-tailed hawk	*Buteo jamaicensis*
9	Killdeer	*Charadrius vociferus*
10	Spotted sandpiper	*Actitis macularius*
11	Willet	*Tringa semipalmata*
12	Upland sandpiper	*Bartramia longicauda*
13	Wilson's snipe	*Gallinago delicata*
14	Ring-billed gull	*Larus delawarensis*
15	Black tern	*Chlidonias niger*
16	Mourning dove	*Zenaida macroura*
17	Black-billed cuckoo	*Coccyzus erythropthalmus*
18	Belted kingfisher	*Megaceryle alcyon*
19	Downy woodpecker	*Dryobates pubescens*
20	Northern flicker	*Colaptes auratus*
21	Least flycatcher	*Empidonax minimus*
22	Great crested flycatcher	*Myiarchus crinitus*
23	Western kingbird	*Tyrannus verticalis*
24	Eastern kingbird	*Tyrannus tyrannus*
25	Warbling vireo	*Vireo gilvus*
26	Black-billed magpie	*Pica hudsonia*
27	American crow	*Corvus brachyrhynchos*
28	Common raven	*Corvus corax*

	Common Name	Scientific Name
29	Horned lark	*Eremophila alpestris*
30	Tree swallow	*Tachycineta bicolor*
31	Bank swallow*	*Riparia riparia*
32	Cliff swallow	*Petrochelidon pyrrhonota*
33	Barn swallow*	*Hirundo rustica*
34	House wren	*Troglodytes aedon*
35	Marsh wren	*Cistothorus palustris*
36	American robin	*Turdus migratorius*
37	Gray catbird	*Dumetella carolinensis*
38	Common yellowthroat	*Geothlypis trichas*
39	Yellow warbler	*Setophaga petechia*
40	Chestnut-sided warbler	*Setophaga pensylvanica*
41	Chipping sparrow	*Spizella passerina*
42	Clay-coloured sparrow	*Spizella pallida*
43	Vesper sparrow	*Pooeceeetes gramineus*
44	Savannah sparrow	*Passerculus sandwichensis*
45	Le Conte's sparrow	*Ammodramus leconteii*
46	Song sparrow	*Melospiza melodia*
47	Rose-breasted grosbeak	*Pheucticus ludovicianus*
48	Bobolink*	*Dolichonyx oryzivorus*
49	Red-winged blackbird	*Agelaius phoeniceus*
50	Western meadowlark	*Sturnella neglecta*
51	Yellow-headed blackbird	*Xanthocephalus xanthocephalus*
52	Brewer's blackbird	*Euphagus cyanocephalus*
53	Common grackle	*Quiscalus quiscula*
54	Brown-headed cowbird	*Molothrus ater*
55	Baltimore oriole	*Icterus galbula*
56	American goldfinch	*Spinus tristis*

* Species at Risk

SAR birds detected include bobolink (BOBO), barn swallow (BARS), and bank swallow (BANS) at various locations within the LSA (Figures 2-1 to 2-41). Only BOBO and BANS were detected within the project LSA. No provincial S1 or S2 bird species were detected during the June songbird surveys.

One active raptor nest was observed 300 m southeast of the proposed RoW on SE ¼ 10-009-28 W1M within riparian habitat along the Pipestone Creek, but will not be disturbed during flowline construction. There were no colonial bird nesting areas (e.g., great blue heron rookeries) observed in the LSA.

4.12.2.4 Amphibians

Method

Amphibian visual surveys were conducted at eight locations within the LSA by qualified wildlife biologists in conjunction with breeding songbird surveys during June 2021 at Class IV wetlands that may be suitable overwintering habitat for amphibians. Walking surveys around wetland margins were conducted to search for amphibian adults, juveniles, or egg masses, under appropriate weather conditions (warm ambient temperatures, no precipitation, light winds). Surveys were conducted according to industry-accepted species detection protocols (Saskatchewan ENV 2014b). Most wetlands were dry during the walking amphibian surveys in June.

4.12.2.5 Results

One special concern amphibian occurrence (northern leopard frog [NOLF], *Lithobates pipiens*) was reported by MBCDC adjacent to the Project RoW. NOLF were detected adjacent to the flowline footprint at one Class IV wetland in SW ¼ 16-009-29 W1M (Wetland A-107) and one Class III wetland in SE ¼ 28-008-29 W1M (Wetland A-159).

4.13 Watercourses

The proposed Project will cross at the Pipestone Creek at two locations within NE ¼ 26-009-29 W1M and NW ¼ 04-009-28 W1M. Pipestone Creek is a slow-flowing 5th order prairie creek which flows to Oak Lake and contains stretches of complex fish habitat. In addition, four seasonal (intermittent flow) waterways will be crossed.

4.14 Fish and Fish Habitat

A scientific fish study permit was obtained from Manitoba Wildlife and Fisheries Branch (General scientific fisheries collection permit #26575638). Fish, fish habitat, and streambank assessments were conducted by qualified biologists at the two Pipestone Creek crossing locations (NE ¼ 26-009-29 W1M and NW ¼ 04-009-28 W1M). Minnow traps and seine nets were deployed in the creek to inventory fish species present at the time of the assessment. No SAR fish were detected. White sucker fry (1st year class) were captured at both the Pipestone Creek west and east crossings. Fish habitat will not be disturbed and will be completely avoided at water crossings by employing HDD to bore the flowline deeply underneath the creeks.

Streambank habitat was deemed to be suboptimal for fish (see Appendix D for fish summary and streambank results).

4.15 Heritage Resources

Heritage resource impact assessments were completed by AtlHeritage Services Corp. (Appendix E). Final assessment results indicate there are no historic resources at risk from the planned Project construction. Assessments included systematic shovel probes and pedestrian surveys of the entire flowline footprint in June 2021.

Two areas received more detailed assessments. One heritage site at Pipestone Creek west will be avoided by employing HDD under the creek. The second site was an area identified as being part of the historic “Fort Ellice” trail. Detailed analysis did not detect any historic resources (Appendix E).

4.16 Traditional Land Use

The project traverses the western portion of Indigenous First Nation Treaty 2 land in Manitoba. Canupawakpa Dakota First Nation is located 20 km east of the Project. The Project is also situated within the homeland of the Métis Nation.

The Manitoba Métis Federation is the political organization for the Métis people throughout western Manitoba. Regionally, Métis people residing in the southwestern portion of the province are represented by the Southwest Region office.

Given the high proportion of agricultural land use in the LSA, impacts of the project on traditional land use, if any, will be minimal. No First Nations communities are located immediately adjacent or near to the Project. Sweetgrass (*Heirochloe odorata*) is a native plant used for traditional indigenous ceremonies and is collected across the aspen parkland region by First Nations peoples in the fall. No sweetgrass was observed on the flowline footprint; however, it can exist on private land, native grassland areas, and municipal ditches within the LSA.

The current land tenure consists entirely of privately-owned property and land use activities would appear to preclude the possibility of traditional use activities being practiced on these lands.

4.17 Human Occupancy and Resource Use

4.17.1 Human Occupancy

The project RSA is largely rural, encompassing one town, three villages, and two rural municipalities. There are no census figures for the villages of Kola, Cromer, and Sinclair (summarized in Table 4.8).

- Virden, Manitoba (town)
- Cromer, Kola, and Sinclair, Manitoba (villages)
- RM of Wallace-Woodworth and the RM of Pipestone, Manitoba

TABLE 4.6 Population of Communities in the Regional Study Area

Community/Rural Municipality	2011	2016	% Population Change (201 to 2016)
Virden, Manitoba	3,114	3,322	+6.7
RM of Wallace-Woodworth, Manitoba	2,857	2,948	+3.2
RM of Pipestone	1,447	1,458	+0.8

Source: Statistics Canada 2011a, Statistics Canada 2011b

4.17.2 Natural Resource Use

The entire project traverses privately-owned agricultural lands and is in Mineral Exploitation Zone A. The Project does not traverse any coal dispositions, mining claims, potash licenses, quarry leases or withdrawals, or mining restricted lands (Manitoba Agriculture and Resource Development 2020).

The Canada Land Inventory (1971) has rated lands within the LSA, ranging from moderately low (Class 5) to low (Class 6) capability for outdoor recreation. The Project is located within Forest Management Unit 6 and does not traverse any Forest Management Licenses or Integrated Wood Supply Areas. No community pastures or grazing leases are traversed by the Project (Government of Manitoba n.d.).

4.17.3 Land Use and Recreation

The Project is primarily located on existing agricultural land that is being used for domestic livestock grazing and crops such as wheat, oats, rye, canola, barley, flax, with some minor production of peas, lentils, beans, and corn. Arable land predominates on the landscape with wetlands, small parcels of native grassland, and limited areas of aspen woodlands. Other land uses in the RSA include resource extraction and residences. There are a few isolated parcels of Crown land within the RSA. Due to the predominance of private agricultural land in the area, access to the LSA for recreational use is limited.

The Project is located within Open Area Trapping Zone 1 (Manitoba Agriculture and Resource Development 2021b). Trapping in the Open Area requires a Manitoba Trapper's License which allows a person to trap anywhere in the Open Area, with permission from the landowner. Furbearer species of interest for trappers in Open Area Zone 1 include beaver, muskrat, coyote, and raccoon. There are no registered traplines located along the flowline.

Outfitters within Manitoba require permission from the landowner on private lands. Outfitting may occur in the Oak Lake area and on other private lands within the LSA. The Project lies within the Southern Fishing Division where the fishing season is open from May 15 until April 4 (Manitoba Agriculture and Resource Development 2021c).

The LSA is located within Game Hunting Area (GHA) 27, Deer Hunting Zone (DHZ) E, and Game Bird Hunting Zone (GBHZ) 4 (Manitoba Agriculture and Resource Development n.d.). The big game hunting seasons in Manitoba vary by animal and extend from early September to early December (Table 4.7). The Project is located on privately owned land, where access for hunting and trapping is controlled by the landowner.

TABLE 4.7 Firearm Hunting Seasons in Manitoba

Animal	Season Date	Applicable Area or Zone
Moose	November 29 to December 5	GHA 27
White-tailed deer	October 11 to November 28	DHZ E
Upland game birds	September 8 to January 1	GBHZ 4
Wild turkey	April 24 to May 3; September 15 to October 15	GHA 27
Ducks, coots, snipe, dark geese, and white geese	September 1 to December 6	GBHZ 4
Sandhill crane	September 1 to December 6	GBHZ 4
Spring conservation snow geese	March 15 to May 31	GBHZ 4
Spring conservation Canada geese	March 1 to March 31	GBHZ 4
Gray wolf	August 31 to March 31	GHA 27
Coyote	August 31 to February 28	GHA 27

4.17.4 Infrastructure and Services

4.17.4.1 Services

Temporary accommodations are available in Virden, Manitoba. Virden has two campgrounds, two bed and breakfasts, and six hotels or motels (Town of Virden 2021).

The LSA is located within the Assiniboine Regional Health Authority. The Virden Health Centre and the Virden Health Unit provide acute care services, emergency medical services, and public health services (Assiniboine Regional Health Authority 2021).

Fire and emergency services support in Virden, Manitoba, are provided by the Wallace District Fire department (Town of Virden 2021). The fire department is responsible for the Town of Virden and the surrounding region. The department provides fire and rescue services including responding to all types of fire, vehicle incidents, and rescue services, including hazardous materials (Town of Virden 2021). Twenty-four hour ambulance service is provided through the Virden Health Centre, which is the closest health centre to the proposed flowline. In addition, air ambulance service is available through the local airport.

The Town of Virden, Manitoba, has a petroleum industry waste treatment and disposal facility operated by Secure Energy Services Inc. Solid waste can be disposed at the Virden waste disposal grounds. The nearest hazardous waste disposal site in Manitoba is located at Letellier, approximately 75 km south of Winnipeg.

4.17.4.2 Transportation Corridors

There are several primary and secondary highways and rural municipal roads that can be used to access the LSA. Primary access is by highways #1, #2, #83, #256, #257, and existing RM roads. Traffic use of local municipal roads has increased since 2008 due to more oil and gas activity in the Rural Municipalities of Wallace-Woodworth and Pipestone, with a slight decrease since 2018 due to lower drilling activity (Manitoba Agriculture and Resource Development 2021b). Oil well drilling results in movement of rigs and the transportation of product by trucks. However, since 2018 there has been a steady decline in oil well drilling. Local municipalities are responsible to maintain and repair rural roads.

4.18 Social and Cultural Well Being

The Rural Municipality of Wallace-Woodworth and Pipestone have an aging but increasing population. The influx of younger skilled permanent workers associated with the oil and gas sector has generated community renewal. The oil and gas industry activity has varied in the past decade, with Covid-19 restrictions having the greatest impact on the area. However, the availability of construction contractors is approximately the same as in the previous years.

Resource-based construction activities have been ongoing for several years in these municipalities. Therefore, there has been an increase in localized trucking from construction and operation of well sites.

A mobile workforce has become a more common part of the social structure of these areas, resulting in lower availability of temporary accommodation.

Federal government employment support programs during the Covid-19 pandemic has helped to support local workers and local businesses.

4.19 Employment and Economy

The description of economic conditions in the RSA is focused on the larger communities (i.e., Virden) because there is limited data and information available from the smaller communities in the RSA. There are several reasons for the lack of information available. First, as the communities closest to the project have smaller populations and limited services, it is anticipated that much of the potential economic effect from the project will be in the larger regional service centres. In addition, Statistics Canada does not provide specific information on smaller communities to protect the privacy of the residences, as such, pools the information from these communities into the larger rural municipalities in which they are located.

4.19.1 Regional Employment

The economy of southwestern Manitoba has a range of businesses and occupations but is mostly centred on the agriculture and resource extraction industries. Virden, Manitoba, has a diverse business section including service sector, retail trade, agriculture, and resource-based industries. It also serves sectors directly related to natural resource extraction including, oil industry service companies, surveying, engineering, heavy construction, and trucking (Town of Virden 2021).

The area of southwestern Manitoba experienced an increase in economic activity from 2008 to 2017, largely related to oil and gas exploration and production, particularly in the Bakken Formation. There has been a recent drop in oil and gas activity and general business activity related to lower oil prices and the Covid-19 pandemic of 2020.

4.19.1.1 Labour Force

The most recent source of data for labour force in sub-provincial areas is found in Statistics Canada's 2016 Census. Statistics Canada data for the RSA are available for the rural municipalities (including smaller communities without services), and the larger communities. The labour force in the area is distributed across several industries with agriculture and other resource-based industries employing a high percentage of the labour force in most communities (Table 4.9). The regional employment rate is generally higher than the provincial average of Manitoba.

The occupational distributions vary throughout the communities in the RSA (Table 4.10). There are generally higher rates for trades, transport, and equipment operators and related occupations. Other occupations employing many people include sales and service as well as natural resources, agriculture, and related production.

Table 4.8 Percent of Labour Force by Industry in Urban Communities

Industry	Agriculture, Oil and Gas, and Resource-based Industries	Construction/ Utilities	Manufacturing	Wholesale Trade	Retail Trade	Finance and Real Estate	Health Care and Social Services	Educational Services	Business Services	Other Services	Total
Virden, Manitoba	15%	7%	3%	8%	18%	5%	10%	8%	22%	4%	100%
Rural Municipality of Pipestone	38%	9%	2%	4%	18%	3%	7%	6%	7%	6%	100%
Rural Municipality of Wallace-Woodworth	41%	10%	2%	3%	12%	3%	7%	6%	12%	4%	100%
Province of Manitoba	5%	9%	8%	9%	11%	7%	14%	8%	24%	5%	100%
Percent of Labour Force by Occupation											
Occupation	**Management Occupations**	**Business, Finance and Administration**	**Natural and Applied Sciences and Related Occupations**	**Health Occupations**	**Social Science, Education, Law, Government and Religion**	**Art, Culture, Recreation and Sport**	**Sales and Service Occupations**	**Trades, Transport and Equipment Operators and Related Occupations**	**Natural Resources, Agriculture, and Related Production**	**Manufacturing and Utilities**	**Total**
Virden, Manitoba	11%	12%	5%	7%	10%	2%	24%	17%	8%	4%	100%
Rural Municipality of Pipestone	23%	8%	1%	6%	7%	1%	13%	21%	17%	3%	100%
Rural Municipality of Wallace-Woodworth	24%	11%	3%	5%	7%	0%	18%	16%	13%	3%	100%

5 ENVIRONMENTAL AND SOCIO-ECONOMIC EFFECTS ASSESSMENT

This section of the EA identifies potential effects that might be caused by the project. This is achieved by relating the baseline description of the environmental and socio-economic setting (Section 4.0), including the current state of the environment within the LSA, to the overall project description. The environmental and socio-economic effects assessment uses the baseline information to:

- identify the important environmental and socio-economic components in the LSA
- develop appropriate site-specific mitigative measures that are technically and economically feasible
- identify and evaluate residual effects of the project attributed to each environmental and socio-economic component evaluated
- identify the effects of the environment on the project

This assessment also determines the significance of the potential adverse residual effects resulting from construction and operation activities, after taking into consideration the proposed mitigation, where required.

5.1 Methods

This assessment evaluated the environmental and socio-economic effects of construction, operation, decommissioning, and abandonment phases of each component of the project. An assessment team of experienced biologists, and project managers completed the assessment. The assessment methods included the following tasks:

- determination of spatial and temporal boundaries of the assessment
- identification of environmental and socio-economic components
- identification of potential environmental and socio-economic impacts
- development of technically and economically feasible mitigation
- identification of anticipated residual effects
- determination of significance of adverse residual effects

This method was developed based on the Manitoba Conservation *Environmental Act Proposal Report Guidelines* (Manitoba Conservation and Climate Change 2015) and the Canadian Environmental Assessment Agency's *Cumulative Effects Assessment Practitioners Guide* (Hegmann et al. 1999).

5.1.1 Spatial and Temporal Boundaries

5.1.1.1 Spatial Boundaries

The LSA is defined as the area directly disturbed by the project construction and related work construction workspace. This includes the permanent 20 m RoW and a 200 m buffer (100 m on either side of the RoW

centreline) to account for temporary construction workspaces, temporary stockpile sites, temporary staging areas, and existing facility sites. Effects within this LSA are described as "isolated" in this assessment.

The extent of the LSA may vary with the environmental and socio-economic component being assessed.

The RSA extends beyond the LSA. Areas outside the LSA could be potentially affected by the construction and reclamation of the project. The boundary of the RSA is consistent across all disciplines for this assessment and includes:

- the portion of the RM of Wallace-Woodworth, south of the municipal east-west road from Elkhorn, Manitoba and west of Trans Canada Highway #1
- the portion of the RM of Pipestone, west of Trans Canada Highway #1 and Provincial Trunk Highway #83, and north of Provincial Trunk Highway #2

5.1.1.2 Temporal Boundaries

The project is examined in phases: construction, operation, decommissioning and abandonment. The construction period including clearing/mulching, grading, ploughing-in/trenching, testing, and rough clean-up for the Project is planned to occur in the late summer and fall of 2022. A detailed construction schedule is provided in Section 2.0 of this EA. A change in the construction schedule will not affect the recommendations in this EA, as the assessment has considered construction during either dry, non-frozen or frozen soil conditions. The operations phase will commence in early 2023. Decommissioning and abandonment will occur at an undefined period in the future when operations are complete.

5.1.2 Environmental and Socio-economic Components

The potential environmental and socio-economic components interacting with the project were identified through the following processes:

- public and government consultation process
- regulatory guidelines
- learnings gained through Canadian Impact Assessment Agency (CIAA) environmental screenings
- learnings gained through environmental impact assessments in Manitoba and other jurisdictions which have processes like as those under the Manitoba Conservation and Climate *Environment Act Proposal Guidelines*
- reference to other environmental impact assessment (EIA) or EA submissions (e.g., EOG Resources Canada Inc. pipeline, Enbridge Bakken Pipeline Company Inc. pipeline)
- professional judgement of the assessment team

The environmental and socio-economic components interacting with the project include:

- physical components such as physical environment, soil capability, water quality and quantity, air quality, and acoustic environment
- biological components including fish and fish habitat, wetlands, vegetation, wildlife and wildlife habitat
- socio-economic components including heritage resources, traditional land use, human occupancy, and resource use, social and cultural conditions, infrastructure and services, and employment and economy

The EA also evaluates effects from accidents and malfunctions, and effects of the environment on the project.

5.1.3 Potential Environmental and Socio-economic Effects

The environmental and socio-economic effects were identified through the same processes and resources as indicated for identification of the environmental and socio-economic elements. The potential environmental and socio-economic effects arising from the construction and operation of the proposed flowline are identified in Section 5 of this EA.

5.1.4 Mitigation Measures

Various federal and provincial standards were considered when developing mitigation measures (Section 5.20, Table 5.2). Past flowline/ pipeline projects within southwestern Manitoba including Tundra Oil & Gas Limited flowlines were reviewed, and applicable protection measures were included in this EA.

5.1.5 Residual Effects

Residual effects are the net environmental and socio-economic effects remaining after mitigation measures have been implemented. In some cases, no residual effects will remain after mitigation, while in other cases some residual effect will occur. Residual effects may also be introduced through mitigation (for example, weeds could be introduced through the process of completing erosion control measures). If no residual effects remain from a given effect, then no further analysis is required.

5.1.6 Significance Analysis of Residual Effects

The significance analysis followed the protocols outlined in the Federal Environmental Assessment Review Office (CEAA 1997), and the Canadian Environmental Assessment's *Cumulative Effects Assessment Practitioners' Guide* (Hegmann et al. 1999). The main methods used for evaluating the significance of effects included:

- use of established environmental standards and guidelines
- quantitative and qualitative assessment of adverse residual effects

The determination of significance is based on the following selected list of parameters:

- direction
- magnitude
- duration
- frequency of occurrence
- spatial extent
- reversibility
- probability of occurrence
- prediction of confidence

These parameters are defined in Section 5.20.3, Table 5.2 of this EA.

For each environmental and socio-economic residual effect, the impact direction was established. A “positive” effect is a net benefit on the environment, a “neutral” effect is no net benefit or loss to the environment, and a “negative” effect is where there is a net loss to the environment.

The assessment team evaluated each adverse residual effect relative to the significance assessment criteria. Only negative residual effects were evaluated for significance, whereas positive or neutral effects were not evaluated. A summary of the significance evaluation for negative residual effects predicted from construction and operation of the flowline are identified in Section 5.20.3, Table 5.4 of this EA.

Based on the assessment methodology described in this Section, the subsections below evaluate the potential environmental and socio-economic effects associated with the construction and operation of the project.

5.2 Physical Environment

The potential effects on the physical environment associated with the construction of the flowline include:

- slope instability
- changes to local topography
- identification or exposure of historical soil contamination

5.2.1 Slope Instability

The local topography within the LSA ranges from undulating to kettle glacial till with some level to undulating lacustrine and glaciofluvial deposits. Therefore, construction of the flowline is not anticipated to directly affect slope stability throughout most of the flowline RoW.

In the LSA, the risk of material sloughing due to slope instability is low. The magnitude of slope instability effects are likely to be low, due to the lack of abrupt slope changes or steep slopes.

5.2.2 Changes to Local Topography

Construction of the Project may affect topography after the settling of replaced soil material, resulting in subsidence over the trench or ploughed-in line. This subsidence may cause localized depressions, which may cause damage to farm machinery used in hayland and cultivated fields. Localized depressions could also act as water collection areas, impeding vegetation growth or promoting rutting from passage of farm machinery.

Tundra will ensure that the trench/plough line is compacted with appropriate equipment once backfilling activities are completed. Trench/plough line compaction will be conducted prior to topsoil replacement to ensure that the flowline will have minimal post-reclamation settling. A follow up assessment will be completed after a full freeze-thaw cycle to address any areas of subsidence. Therefore, the effect of settling due to construction of the flowline is low.

5.2.3 Identification or Exposure of Historical Soil Contamination

Construction activities may identify or expose soil contamination from historical spills, leaks or fueling of construction or farming equipment. Any contaminated soils that are encountered will be segregated and managed appropriately as per Manitoba regulatory guidelines. Mitigation procedures are provided in Section 5.20, Table 5.2, and further details on addressing contamination are provided in Section 5.3.7 of this EA.

5.2.4 Mitigation

Mitigation measures were designed to address the potential effects of flowline construction and operation on the physical environment including changes to slope stability, changes to local topography and previous contamination. Section 5.20, Table 5.2 summarizes mitigation measures that will be implemented to reduce impacts to the physical environment. Soil erosion and soil compaction are further described in Section 5.3.

5.2.5 Evaluation of Significance

Table 5.4 indicates there are no situations where a high probability occurrence of high magnitude of a permanent or long-term physical environment residual effect cannot be mitigated. Therefore, residual effects are determined to be not significant.

5.3 Soils and Soils Productivity

The potential for residual soil and soil productivity effects occurs mainly during the construction phase of the Project. There will be minimal residual effects during the operation phase. The following sections discuss the potential effects and residual effects after mitigation. Mitigation measures for each potential effect are presented in Table 5.2.

Potential direct and indirect effects from the construction of the Project are related to changes in soil quality and changes to terrain. Residual effects to soil quality are generally limited to reductions in soil capability for agriculture. Vehicle traffic on the Project RoW may lead to soil compaction and increase the potential for wind erosion due to soil pulverization. However, reclamation success could also be affected by:

- mixing of topsoil and subsoil
- trench or plough line instability
- increased surface stoniness
- soil compaction
- wind erosion
- pulverization of soil and sod
- soil contamination

5.3.1 Mixing of Topsoil and Subsoil

Mixing of topsoil (organic material and surface mineral material) with less fertile and/or saline subsoil material, or mixing of upper subsoil with poor quality lower subsoil, may occur during surface grading, stripping, and clean-up operations. Once soil mixing (admixing) occurs, it is irreversible.

Effects of admixing include:

- dilution of organic matter
- changes to soil texture and structure
- upward movement of salt in the soil profile
- increases in stoniness in the surface layers

Each of these potential effects may lower the agricultural soil capability and the reclamation suitability. Admixing may cause redistribution and loss of nutrients by exposing unfavourable subsoil (e.g., gravel or saline subsoil), and/or altering soil physical properties and drainage regimes thereby contributing to reduced capability to support vegetation growth. Soil quality and land capability can be negatively affected if salts originally found deep in the soil profile are replaced immediately below the topsoil, within the soil's rootzone.

The objective of soil salvage is to strip, store, and protect sufficient soil materials for future replacement and reclamation. Conserved soil is to be used exclusively for reclamation of the site from which the soil was salvaged. Planning and mitigation during construction and reclamation activities that require soil handling or disturbance can prevent or minimize unintentional admixing. Ensuring topsoil and subsoil are stripped and stored separately with 1 m separation between salvaged piles will maximize soil quality preservation. Therefore, the likelihood of admixing is low.

The residual effect of reduced soil capability and reclamation suitability from admixing would be confined to areas of soil disturbance associated with the Project. The duration of this effect would range from short to long-term, depending on the extent of admixing and the quality of the subsoil.

5.3.2 Trench Instability

Coarse-textured soils or soils overlaying a seasonally highwater table that are found within the trench and/or plough-in depth, may contribute to instability. Trench or plough-in wall failures may result in the loss of topsoil and increases the potential for soil admixing. With the implementation of mitigation measures, such as construction in dry or frozen conditions, the likelihood of trench/plough-in wall failure is low.

Soil mixing due to trench/plough-in wall failure may also result in reduced soil capability and reclamation suitability. This residual effect would be confined to the trench/plough line and area immediately adjacent to it. The duration of this effect would range from short to long-term, depending on the extent of admixing and the quality of the subsoil.

5.3.3 Increased Surface Stoniness

Where gravel or coarse fragment soil types are located within the subsoil, gravel subsoils could be mixed with topsoil or upper subsoils and result in an increase of stones/gravel in the reclaimed topsoil. This result could change the soil structure and porosity. This change may affect the agricultural soil capability. The use of appropriate mitigation measures will prevent or minimize an increase in surface stoniness. Therefore, the likelihood of an increase in surface stoniness is low.

Residual effects of reduced soil capability and reclamation suitability caused by increased surface stoniness would be confined to the RoW.

5.3.4 Soil Compaction

Construction disturbance (e.g., vehicle traffic, salvage) on wet moderately fine-textured soils may result in compaction, loss of soil structure and reduced soil permeability and aeration. These impacts reduce the soil capability for agriculture and reclamation suitability. Mitigation measures to prevent, minimize, or correct compaction such as delaying construction activities in areas of increased moisture conditions, use of low ground pressure equipment, matting high traffic areas, or deep ripping to alleviate compaction will be used during construction. Construction could also be delayed after intense short-term rain events. Therefore, there is a low likelihood that soil compaction will be an issue.

Residual effects of reduced soil capability and reclamation suitability from soil compaction would be confined to the Project RoW.

5.3.5 Wind and Water Erosion

Soil handling and disturbance can lead to soil erosion, which can change soil capability. Once soil salvage has occurred and the material is stockpiled, the wind erosion risk is moderate for loam textured soils, and high for sandy soils. There are two important time periods for proper erosion control:

- short-term control during the construction phase
- long-term control of disturbed areas after construction

To reduce erosion, soil exposure must be minimized. With the use of mitigation measures noted in Table 5.2, the likelihood of wind erosion is moderate.

Water erosion by surface runoff may occur during construction. Erosion of soil is possible after spring break up, prior to final reclamation, when soils cleared of vegetation are exposed to rain events. Mitigation measures using silt fences, erosion control matting, and temporary barriers will be implemented, as needed. Seeding of the permanent cover areas as soon as site conditions allow will mitigate long-term risk of erosion.

The residual effect of erosion is reduced soil capability for agriculture and reclamation suitability.

5.3.6 Pulverization of Soil and Sod

Construction activities (e.g., vehicle traffic) during dry conditions may result in the pulverization of soil and sod along the RoW. Pulverization breaks down topsoil and subsoil aggregates to a size that is more susceptible to wind and water erosion. Loss of topsoil reduces soil capability for agriculture by reducing nutrient availability, organic matter content and soil moisture holding capacity. With the use of mitigation techniques to prevent or minimize pulverization, such as minimizing vehicle traffic, maintaining vegetation cover wherever possible, and use of rig matting the likelihood of reduced soil capability for agriculture is low.

The residual effect of reduced agricultural soil capability and reclamation suitability from the impact of soil pulverization would be confined to the flowline.

5.3.7 Soil Contamination

Soil contamination may result from an accidental spill along the RoW. While the likelihood of an accidental release during operation is low, such an event has the potential to affect soil productivity until the spill has been cleaned up and remediated. Additional details related to soil contamination are provided in Section 6.4.7 of this EA.

Rapid response is critical to minimize impacts from spills. Spills will be promptly cleaned up and documented. Although procedures and preventative maintenance programs during the construction of the Project will be implemented, accidental spills and/or leaks of fuel, lubricants, hydraulic fluids, and

petroleum hydrocarbons may still occur. Ensuring initial spill supplies such as absorbent pads, soil bins, and fluid containment are available will greatly reduce the risk of soil contamination.

Most of the potential effects on soil and soil productivity will be minimized by implementing mitigation measures (Table 5.2). However, residual effects could include soil contamination.

5.3.8 Mitigation

Salvaged topsoil and subsoil will be stored in separate locations. Salvaged material will be stored on like material (i.e., topsoil will be stored on topsoil and upper subsoil will be stored on subsoil material [B or C horizon]). Section 5.20, Table 5.2 summarizes mitigation measures that will be implemented to reduce impacts to soils and soil capability.

5.3.9 Evaluation of Significance

Table 5.4 indicates there are no situations where a high probability occurrence of high magnitude of a permanent or long-term soil and soil productivity residual effect cannot be mitigated. Therefore, residual effects are determined to be not significant.

5.4 Water Quantity and Quality

The potential for residual water quality and quantity effects occurs mainly during the construction phase of the Project. There will be minimal residual effects during the operation phase. The following sections discuss the potential effects and residual effects after mitigation.

Potential direct and indirect water quality and quantity effects associated with construction of the Project include:

- alteration of natural drainage patterns until trench/plough line settlement is complete
- reduction in water quality and quantity from water withdrawal and use for hydrotesting
- reduction in surface water quality due to an accidental spill or release of hazardous materials

Potential direct and indirect effects on groundwater quality and quantity associated with the construction and operation of the project are related to:

- accidental releases of hazardous materials
- disruption of springs

Potential direct and indirect effects from operation activities are the potential for an accidental spill, which could affect surface water quality if the release occurred in or near a watercourse. An accidental spill could affect groundwater quality if the release occurred near shallow wells. While the likelihood of an accidental release during operation is low, such an event has the potential to affect surface water or groundwater quality until the spill has been cleaned up and remediated.

5.4.1 Alteration of Natural Drainage Patterns Until Trench Settlement Is Complete

Backfill and clean-up activities will ensure the RoW is restored to the pre-construction grade will ensure that disruption of surface flow patterns following construction will be negligible along the RoW.

5.4.2 Reduction of Water Quality and Quantity from Water Withdrawal and Use for Hydrostatic Testing

There is a risk that the water used for hydrostatic testing , which may contain agents added to the test water such as methanol, biocides, or corrosion inhibitors (CAPP 2012), or physical particulates from the flowline conduit itself could be released to the environment in the event the flowline fails during the test. A spill contingency and response plan will be implemented, in the event of a spill. Therefore, the probability of direct effects to water quality is low.

5.4.3 Accidental Spills or Releases of Hazardous Materials

Effects to surface water and groundwater quality are related to accidental spills or releases of hazardous materials during construction and operation of the flowline. The flowline will be installed at a depth of 1.5 m from the top of the conduit. This depth is generally above the groundwater table and bedrock aquifers in the LSA. Therefore, the probability of direct effects to groundwater quality is low.

5.4.4 Disruption of Springs

Flowline construction that intercepts shallow groundwater springs may cause groundwater to flow to the surface. While the field surveys did not identify the presence of springs, it is possible that springs may be encountered during construction.

5.4.5 Mitigation

Mitigation measures to be implemented during construction to reduce any potential effects to water quality and quantity are presented in Section 5.20, Table 5.2.

5.4.6 Evaluation of Significance

There are no situations where there is a high probability occurrence of high magnitude of a permanent or long-term water quality and quantity residual effect that cannot be mitigated. Therefore, residual effects are assessed to be not significant (Table 5.4).

5.5 Air Quality

The subsections below summarize the potential air quality effects in the project RSA. The potential air quality and greenhouse gas emissions effects associated with the construction and operation of the project include:

- greenhouse gas emissions associated with vehicles and construction equipment and clearing of vegetation
- dust (particulates) during construction

The operation phase of the project will not result in any continuous emissions of GHG, as flare stack emissions will be captured. However, during periodic maintenance activities of short-term duration, emissions from vehicles and equipment will occur. Depending on the location and season of the work, dust may result during maintenance activities.

5.5.1 Greenhouse Gas Emissions

The main sources of GHG emissions associated with the project construction are predicted to be combustion of fossil fuels associated with all vehicles, directional drilling equipment, heavy-duty construction equipment, and transport of equipment/material to the Project construction area during construction.

An assessment of the direct GHG emissions associated with the five flowline batteries was undertaken recently. Tundra commissioned an independent third-party consultant to assess GHG emissions from the existing batteries along the proposed flowline. The assessment calculated total gas flare volumes for carbon dioxide (CO_2) and methane emissions (CH_4) from 2019 based on the *Greenhouse Gas (GHG) Emissions and Criteria Air Contaminants (CAC) Calculator* (ECCC 2021b). Calculations for the entire waste stream indicated that once the project is in operation in 2023, there will be a reduction of ~179,396 tonnes of CO_2 equivalent in the first year of operation.

Manitoba's GHG emissions from the oil and gas sector in 2017 were 0.5 mega tons (MT) of carbon dioxide equivalent (CO^2e). That number represents only 0.023 % of Manitoba's 2017 total GHG emissions, which were 21.7 MT of CO^2e (CER 2021).

The GHG emissions associated with flowline construction were considered a one-time occurrence and of low magnitude. Where practical, GHG emissions associated with the construction of the flowline will be minimized by using multi-passenger vehicles to transport workers to and from construction sites.

No direct GHG emissions are anticipated to arise from the proposed operation of the Project. Operation of the Project is expected to reduce GHG emissions. The practice of flaring solution gas at six existing battery sites will be curtailed by the operation of the flowline gathering system which will transport solution gas to the Steel Reef compressor facility and be refined at a processing facility in Saskatchewan into a marketable gas product.

5.5.2 Dust (Particulates) During Construction

There is potential for increased dust emissions during construction of the Project and from increased traffic on unpaved access roads. Dust emissions are anticipated when construction occurs in dry, unfrozen conditions. This type of construction-related emission is reversible in the short-term and predicted to be

of low magnitude. The dust from heavily travelled gravel road sections can be mitigated by occasional wetting of dusty road surfaces.

5.5.3 Mitigation

Mitigation measures (Section 5.20, Table 5.2) will be implemented during construction and operation to reduce any potential effects to air quality from GHG and dust emissions.

5.5.4 Evaluation of Significance

There are no residual negative effects to air quality. Due to reduced flaring activities the Project will have a GHG emissions reduction of ~180,000 tonnes of CO_2 equivalent/year. Therefore, no evaluation of significance is required.

5.6 Acoustic Environment

The potential for residual acoustic environment effects occurs mainly during the construction phase of the Project.

Noise resulting from construction activities will occur as construction progresses along the RoW. A short-term noise increase will occur in areas of proximity to permanent residences. The linear progression of flowline construction will result in approximately a 1 to 2 week duration of concentrated construction activity at any given location from July 15, 2022 to December 31, 2022. The residual effect of construction noise on nearby residents is of low magnitude and immediately reversible.

The effect of noise on wildlife is provided in Section 5.20, Table 5.2.

Noise resulting from the operation of the Project will be undetectable and is not expected to add to baseline noise levels. Therefore, no assessment is required.

5.6.1 Mitigation

Mitigation measures (Section 5.20, Table 5.2) will be implemented during construction and decommissioning to reduce any potential effects to the acoustic environment.

5.6.2 Evaluation of Significance

There are no situations where a high probability occurrence of high magnitude of a permanent or long-term acoustic environment residual effect cannot be mitigated. Therefore, residual effects are determined to be not significant (Table 5.4).

5.7 Vegetation Communities

The potential effects on vegetation communities associated with the construction of the flowline are associated with vegetation removal and include:

- introduction and establishment of weed, non-native, and invasive species
- temporary loss of vegetation communities with high rare plant potential
- habitat fragmentation

5.7.1 Introduction and Establishment of Weed, Non-native, and Invasive Species

The ground disturbance that occurs during vegetation removal may expose buried weed, non-native, or invasive seeds and create open ground, providing ideal conditions for colonization by these species. During construction, the introduction of these species may come from construction vehicles and the clothing/boots of workers and site visitors. In native vegetated areas, annual weeds compete with native species and may out-compete native species for space and nutrients. Native grasslands are expected to take several years to establish following reclamation and are vulnerable to invasion by weed, non-native, and invasive species. However, native grassland species are assumed to take less time to colonize than wooded uplands species, because trees and shrubs need longer to achieve a similar size and structure to what was present prior to disturbance.

5.7.2 Temporary Loss of Vegetation Communities with Rare Plant Potential

Vegetation removal could temporarily reduce the area of native grasslands, woodlands, and riparian areas with rare plant potential and important wildlife habitat. Small, short-term losses of habitat can have effects on populations of rare species. Wetlands, riparian areas, and native grasslands in the LSA have the potential for rare plants (MBCDC 2012; Naiman and Decamps 1997; Olsen et al. 2007). Table 4.2 summarizes the vegetation community types in the RoW. Native grasslands in the LSA are identified in Figures 2-7, 2-8, 2-18, 2-19, and 2-40.

No rare plants were identified within the LSA during field surveys. Provincial species of conservation concern or federal SAR are not anticipated to be affected since topsoil will be salvaged and stripping will be limited to the trench/plough line (maximum 0.6 m width), minimizing disturbances to the seed bank. Native sod will be returned to the RoW. Construction impacts in native grass, woodland, and/or wetland communities are not expected to exceed existing impacts with agriculture production and cattle grazing (e. g., invasive weeds).

5.7.3 Habitat Fragmentation

Habitat fragmentation occurs where surface disturbance divides large patches of habitat into smaller patches. Although most of the LSA is cultivated and hay land, fragmentation of small parcels of native mixed grass prairie vegetation may further reduce available habitat for rare plant and wildlife species (WSRIWMP 2012). The direct loss or alteration of vegetation communities in the LSA will potentially remove habitat or reduce the quality of habitats for these wildlife species.

5.7.4 Mitigation

Avoiding native vegetation parcels and/or minimizing vegetation clearing and construction activity in native vegetation (e.g., grasslands, woodlands, wetlands) will reduce the potential for habitat fragmentation. Reclamation of native vegetation communities using certified, Manitoba-sourced, native seed mixes, as well as weed control methods, will allow native plants to re-vegetate these areas.

5.7.5 Evaluation of Significance

There is a high probability of occurrence of residual effects to vegetation communities. However, there are no situations where a permanent or long-term residual effect of high magnitude will occur which cannot be mitigated (Table 5.2). Therefore, it is concluded that the residual effects to native vegetation communities during construction and operation of the flowline will not be significant.

5.8 Wetlands

The potential for residual effects to wetlands occurs mainly during the construction phase of the flowline; there will be minimal residual effects during the operation phase.

Potential direct and indirect wetland effects associated with construction of the Project include:

- wetland vegetation removal
- alteration of wetland hydrology

5.8.1 Wetland Vegetation Removal

The main effects related to the removal or disturbance of vegetation in wetlands are:

- introduction and establishment of weed, non-native, or invasive species
- loss of rare plants
- temporary loss of habitat important for wildlife

The ground disturbance that occurs during wetland vegetation removal, if any, may expose buried weed, non-native, or invasive seeds and create open ground, providing ideal conditions for colonization by annual weeds. In some cases, the introduction of undesirable plant species may have a negative impact on wetland communities or rare plant habitat. However, all Class III wetlands holding water and Class IV wetlands will be avoided during construction by a boring under by HDD, thereby eliminating or minimizing most effects to wetland vegetation. During construction, the introduction and establishment of weed species may increase by seeds or propagules transported to the footprint from construction vehicles, workers clothing and boots, and site visitors. Weed control may be a necessary strategy for the project post-construction.

Wildlife may experience negative effects from vegetation removal or habitat fragmentation if the composition or physical structure of the disturbed wetland was providing cover, reproduction, and

foraging requisites. The direct impact of wetland vegetation communities in the Project RoW will occur along the outside margins (i.e., low prairie zone) of wetlands or during trenching/ploughing-in on Class I, Class II, and dry Class III wetlands.

A total of 326 wetland and seasonal waterways are located on or adjacent to the 20 m Project RoW (Appendix C). Of the 321 wetlands, a total of 161 wetlands are on the RoW footprint and may be temporarily affected by construction. Construction will not permanently remove wetlands, wetland habitat or reduce the classification of wetland habitats. No wetlands will be drained, diverted, or permanently altered during flowline construction. Class III wetlands holding water and Class IV wetlands will be bored under to completely avoid direct effects. Class I, Class II, and dry Class III wetlands will be temporarily stripped of organic soils, open cut trenched or ploughed-in under dry or frozen conditions, reclaimed, and contoured to the original condition. Locations of wetlands crossed in the LSA are provided in Figures 2-1 to 2-41.

5.8.2 Incidental Alteration of Wetland Hydrology

Construction activities are not planned to impact wetland hydrology but may result in short-term changes to wetland hydrology by alteration or impedance of natural flow and seasonal water level fluctuations. Alteration or impedance of natural water levels may result in increased wetland area because of flooding on the peripheral edge of the wetland. Flooding may alter species composition if hydrologic conditions for growth are no longer within their range of tolerance. Some species may be unable to grow, whereas others may be outcompeted by invasive species that are suited to the new conditions. However, if hydrology and soils are not significantly altered by the disturbance, native vegetation will re-establish from the seed bank (and other propagule material) over time (NPWG 2000).

5.8.3 Mitigation

Field surveys were completed to identify wetlands along the flowline RoW. Wet Class III and all Class IV wetlands at the time of construction, will be avoided by boring under (HDD) to prevent impacts to the wetland community and surface hydrology. Disturbance to Class I, II, and dry Class III will be reduced to the extent possible, with construction limited to the edge of wetland margins by slight variation (~3 m) of the trenched or ploughed-in flowline route within the 20 m RoW, if possible. During construction, Tundra will examine all Class I and II wetlands identified along the entire RoW. If water is not present at the time of construction in Class I and II wetlands, these sections will be trenched. If surface water is present, these wetlands will be bored under via HDD. This is a standard practice implemented for flowline construction.

Mitigation for each identified wetland can be found in Table 1. During construction, disturbance to wetlands will be minimized where practicable and reclaimed where disturbance is unavoidable. Any disturbance that does occur will only persist for a short duration required to install the flowline and reclaim the wetland area that was disturbed (Table 5.2). Impacts are not expected to exceed disturbances associated with existing agricultural practices.

5.8.4 Evaluation of Significance

There are no situations where there is a high probability occurrence of high magnitude of permanent or long-term watercourses and wetlands residual effect that cannot be mitigated. Therefore, residual effects are determined to be not significant (Table 5.4).

5.9 Wildlife and Wildlife Habitat

The potential for residual wildlife and wildlife habitat effects occurs during both the construction and operation phases of the flowline. Most of the Project occurs on agricultural land (i.e., cropland or hay land) that is highly fragmented by existing oil and gas infrastructure, residences, roads, railways, and other human infrastructure. Only small remnant areas of native wildlife habitat remain. Therefore, the LSA and the RSA have already been altered by past human activities, limiting the presence and distribution of many wildlife species.

Potential direct and indirect effects on wildlife from construction of the Project may occur from the individual or combined effects of:

- habitat loss and alteration
- sensory disturbance and reduced habitat effectiveness
- project-related wildlife mortality

The nature of these effects on wildlife are described in general, and in more detail for the following wildlife groups:

- amphibians and reptiles
- birds
- mammals

5.9.1 Wildlife Habitat Loss and Alteration

The project will result in direct loss or alteration of wildlife habitat. Direct habitat loss results from the minor physical clearing of vegetation at specific local sites associated with the Project RoW. Minor habitat alteration will occur along the Project RoW where native grasslands and woodlands will be removed or disturbed. Alteration may be short-term for grassland areas or long-term for woodland areas (i.e., trees and shrubs will be cleared) for flowline construction.

No habitat features of regional significance to wildlife were identified in the LSA. No raptor nests will be directly affected by construction activities. No dens, snake hibernacula, or colonial migratory bird nesting sites were observed within the flowline RoW. SAR and migratory birds may not be directly affected by the project construction because wildlife nest sweeps will be conducted in suitable SAR habitat prior to construction to determine if active nests are present. If nests are present on or immediately adjacent to the Project footprint then appropriate species-specific setback buffers will be implemented and

construction will not occur within the setback buffer during the nesting period. The setback buffers will be maintained until the nest eggs have hatched and the young have left the nest.

Wildlife species in the LSA are adapted to living in open habitat. It is unlikely that the reclaimed 20 m-wide flowline RoW will lead to the isolation of grassland habitat. Similarly, existing woodland habitats in the LSA are already small patches of aspen woodland and shrubs. Therefore, residual effects of habitat fragmentation on wildlife will be negligible.

5.9.2 Habitat Effectiveness

Habitat effectiveness or the ability of habitat to provide important wildlife requisites (e.g., shelter from disturbance, food) may be reduced during construction of the Project. Reduced habitat effectiveness can occur due to project activities. The wildlife response to a physical or sensory disturbance causing reduced habitat effectiveness varies between species. Project construction is not expected to cause long-term reductions in wildlife habitat effectiveness because construction will be delayed in native habitat between July 15 to August 31, if nest sweeps find active nests to ensure due diligence compliance with the *Migratory Birds Convention Act*. Construction cleanup and/or reclamation in the spring could result in sensory disturbances to migratory birds and their nests, as well as breeding amphibians and reptiles.

5.9.3 Project-related Wildlife Mortality

Wildlife mortality may occur through collisions with vehicles or through disturbance of wildlife or habitat features (e.g., nests, dens) during construction. Construction traffic speed limits will be established for access roads and multi-passenger vehicles will be encouraged to reduce the risk of collisions with wildlife. Any incidents or collisions with wildlife will be reported to appropriate Project representatives who will notify local wildlife authorities and the police, as appropriate.

Construction garbage will be collected daily and dispose in approved disposal locations to prevent attracting nuisance wildlife

5.9.4 Amphibians and Reptiles

Amphibians and reptiles (e.g., Great Plains toad, northern leopard frog, smooth green snake, red-bellied snake, western plains garter snake) have specialized summer reproductive and/or overwintering habitat requirements. Such habitats include hibernacula sites, breeding and overwintering wetlands.

These local habitat features may be affected by Project construction activities including physical disturbance during clearing/mulching or trenching/ploughing-in. Critical habitat and water quality may be affected by activities such as spills, use of fresh water for flowline hydrostatic testing, and recovered test water. Wetland habitats may be impacted through vegetation removal, grading, or trenching/ploughing-in of wetlands unless they are avoided by re-routing the Project footprint. The effect of habitat fragmentation is not likely to occur since the reclaimed Project RoW will not be a barrier to amphibian movement. Other potential project effects during the construction phase could include incidental mortality of individuals from clearing, grading, and/or trenching/ploughing-in activities.

No reptile observations were made within the LSA.

Amphibians (northern leopard frogs and wood frogs) were detected at one of 37 Class III and one of thirteen Class IV wetlands along the RoW, which provide suitable foraging and overwintering habitat for amphibians. The Project RoW is not located in areas of light sandy soil conditions under open dry grasslands, which is the preferred habitat of great plains toads (GPT; Manitoba Conservation 2010Manitoba Conservation 2010).No suitable survey periods for GPT (i.e., intense early summer rain events with ambient temperatures of +30^{o}) occurred in June 2021 and no GPT were detected.

The Project minimizes direct crossings of wetlands in the LSA by route adjustments and deviations. The Class III wetlands holding water and Class IV wetlands will be bored under by HDD to minimize impact. Therefore, the Project is not expected to have a negative effect on amphibians.

5.9.5 Birds

Two sharp-tailed grouse (STGR) leks were identified within the LSA. Mitigation measures have been already implemented by Tundra for the southern lek located in NW ¼ 04-009-29 W1M. The footprint was re-routed over 500 m to the east to completely avoid the lek. The Project was slightly re-routed to the south for a second lek on the grassland above the Pipestone Creek. There will be no surface disturbance within 86 m of the lek located in SE ¼ 35-009-29 W1M and construction will not be conducted until after July 15. No spring cleanup will occur near STGR leks between March 30 and June 1. Physical or sensory disturbance will be negligible for STGR.

Construction activity will minimize impacts to the native grassland, modified grassland, woodlands, wetland margins, and seasonal waterway locations for SAR bird species through nest sweeps that will be conducted between July 15 and August 31 prior to construction. Appropriate species-specific setbacks will be implemented to comply with the Migratory Birds Convention Act. Migratory bird nest sweeps will be conducted by qualified avian biologists at least seven days prior to construction, on and adjacent to the Project RoW to determine if active nests are present. If nests are detected, species-specific setback buffers will be implemented to halt construction within the buffers to allow the nest eggs to hatch and the young to leave the nest successfully. The active nest will be checked every seven days until it hatches, is abandoned, or predated. After the nest is no longer active, nest sweeps will be re-done to determine if new nests have been initiated during the time the setback buffers were in place. If a new nest is found, then the setback buffers will be implemented, and construction will continue to be delayed until the nest is no longer active. If no new nests are found, then the construction disturbance will be allowed to commence if disturbance begins within seven days of the last nest sweep.

There were no colonial bird nesting areas (e.g., great blue heron rookeries) observed in the LSA. The entire Project falls with the Pipestone Plain habitat subregion that is nationally significant for breeding ducks. There are no areas of national, regional, or local significance for moulting and staging ducks, breeding/staging Canada geese, or breeding/non-breeding colonial waterfowl (Poston et al. 1990) within the LSA. No effects to waterfowl is expected because nest sweeps will be conducted between July 15 and August 31 in native grasslands and wetland margins prior to construction. Trenching/ploughing-in will not

occur through any wetland areas with nesting/breeding potential (i.e., Class III holding water and Class IV wetlands). Collisions and sensory disturbances during construction are expected to be minimal.

Raptor SAR (e.g., ferruginous hawk, short-eared owl, and burrowing owl) may occur in the LSA, although there are no MBCDC records of these species near the LSA. No owl or hawk SAR nor their nests were found during surveys conducted in June 2021. Project effects to these species may include minor loss or alteration of grassland and wetland habitat. Sensory disturbance will be minimal. If nest sweeps are conducted between July 15 and August 31 to detect active bird nests then construction in native grassland habitat will be delayed until nests have successfully fledged. One active raptor nest was observed 300 m southeast of the proposed RoW on SE ¼ 10-009-28 W1M within the LSA in riparian woodlands. The site will be checked by a qualified biologist prior to construction start and appropriate mitigation measures (i.e., construction setback) will be implemented, if the nest is active.

Many avian passerine species were observed or may occur in the LSA. Most species detected were common and resilient to human development (Section 4.12.2, Table 4.5). The flowline footprint is not found within an Important Bird Area (Manitoba Important Bird Areas Program 2021).

Avian SAR such as red headed woodpecker, loggerhead shrike, Baird's sparrow, Sprague's pipit, and chestnut collared longspur were not detected during field surveys in 2021. Bank swallow (BANS) and bobolink (BOBO), which are both threatened SAR birds, were observed within the LSA. Both BANS and BOBO have low relative abundance throughout the Project area (Manitoba Breeding Bird Atlas 2015).

Although, bird SAR have been documented within the RSA, potential bird SAR habitat within the LSA is limited, modified, and fragmented.

5.9.6 Mammals

Mammal SAR (e.g., mule deer, American badger) are year-round residents that may be affected by loss or alteration of habitat. Since these species are adapted to open habitats and agricultural areas, effects are expected to be low. Winter range is critical wildlife ungulate habitat. The flowline crossing on the east section of Pipestone Creek provides Class 1 wintering habitat and the western crossing on the Pipestone Creek provides Class 2 breeding habitat for white-tailed deer (CLI 1970).

Mammal responses to human activities vary between and within species due to behavioural and population differences, varying use of the landscape/habitats, and anticipated sources of disturbance. Construction near the Pipestone Creek is planned to occur prior to the peak of breeding season for deer (in November). Since construction activities adjacent to the Pipestone Creek will be short-term, potential effects of sensory disturbance to large mammals are low and will be localized near woodland habitats, where large mammals (i.e., white-tailed deer) may be sheltered.

Construction may obstruct movements, especially by deer and moose, for short periods of time (one or two weeks) as construction proceeds along the Project RoW. Strung conduit segments, spoil piles, and open trenches may block or alter mammal movements. Smaller fur-bearing mammals (e.g., coyote, fox)

are likely to temporarily move away from disturbances. Other small mammals (e.g., voles and mice) will likely move short distances and shelter in place until the construction disturbance has halted.

Mammalian mortalities are most likely to result from vehicle/animal collisions on higher speed public access roads leading to and from the Project RoW. Actual vehicle speeds along the construction RoW will be too slow for collisions with large mammals to occur.

5.9.7 Mitigation

Tundra will employ mitigation measures during flowline planning, construction, and operations to reduce effects to wildlife and wildlife habitat. Wildlife sweeps will be conducted up to 7 days prior to construction in suitable migratory bird habitat between July 15 to August 31. If migratory or SAR birds are observed during wildlife sweeps in the LSA, provincial setback buffers will be implemented. General mitigation measures to minimize effects on wildlife are included in Table 5.2.

5.9.8 Evaluation of Significance

There is a high probability of occurrence that wildlife habitat will be lost or altered, because of the project. However, the magnitude is low and short to medium-term in duration. There are no other situations where there is a high probability occurrence of high magnitude of a permanent or long-term wildlife and wildlife habitat residual effect which cannot be mitigated. Overall, residual effects are determined to be not significant (Table 5.4).

5.10 Watercourses

The Pipestone Creek is the permanent watercourse present in the LSA. Both planned flowline crossings of Pipestone Creek will be conducted by horizontal directional drilling (HDD) underneath the creek, so actual physical disturbance to the creek is not expected. However, a borehole wall failure (frac out) could occur during the HDD construction. Tundra will follow Department of Fisheries and Oceans (DFO) operational planning statements for HDD operations and have an onsite environmental inspector to measure water turbidity before, during, and after HD, in case of a frac out (DFO 2010). Mitigation measures will be employed in case of a frac out including downstream turbidity curtains and spill containment booms to minimize effects. No residual effects are anticipated after a successful HDD operation. Impacts to Pipestone Creek are expected to be negligible.

There are some seasonal waterways (e.g., Stony Creek) located in the LSA. These waterways are characterized by channels with shallow gradients, seasonal water flows, and meandering courses. No residual effects are anticipated with the construction and operation of the flowline across ephemeral, seasonal waterways or drainage ditches.

5.11 Fish and Fish Habitat

There will be no anticipated impacts to fish bearing waters or fish habitat in the construction of this flowline as Tundra will employ HDD to install the flowline under the creek basin. However, a frac out may occur resulting in minor discharge of drilling fluids into the waters of Pipestone Creek.

5.11.1 Mitigation

The HDD will install a hollow impermeable sleeve deeply under Pipestone Creek. The flowline will be pulled back through the sleeve to completely enclose the flowline to prevent leaks into the creek waters once complete. During HDD operations, an environmental monitor will measure water turbidity before, during, and after HDD to determine if drilling activities are causing negative turbidity impacts to the waters and aquatic life of Pipestone Creek. If a frac out occurs, mitigation measures will be swiftly employed to contain any drilling fluids, remove surface water contaminants, and minimize other possible impacts. Assessment of the frac out effects will be determined, and remediation will be implemented according to DFO operational statements to return the Pipestone Creek to its original condition.

5.11.2 Evaluation of Significance

There are no situations where there is a high probability of occurrence of high magnitude of permanent or long-term fish and fish habitat residual effect that cannot be mitigated. Therefore, residual effects are determined to be not significant.

5.12 Heritage Resources

Heritage resource impacts and mitigation work was completed by AtlHeritage Services and is appended to this document (Appendix E). Final assessment results indicate there are no historic resources at risk from the planned flowline construction. Assessments included systematic shovel probes and pedestrian surveys of the entire flowline footprint in June 2021.

Two areas received more detailed assessments. One heritage site at Pipestone Creek west will be avoided by employing HDD under the creek. The second site was in an area identified as part of the historic “Fort Ellice” trail. Detailed analysis did not detect any historic resources (See Appendix E). No mitigation is anticipated; therefore, no residual effects are anticipated.

5.13 Traditional Land Use

As discussed in Section 4.16, the current land tenure and land use would appear to indicate minimal possibility of traditional activities being practiced on the Project flowline. Given the high proportion of agricultural land use in the LSA, impacts of the project on traditional land use, if any, will be minimal. The project is located within lands that are entirely privately-owned, rather than on Crown land. Therefore, the project is not expected to affect traditional land use in the LSA.

5.13.1 Mitigation

There are no effects predicted to affect heritage resources or traditional land use; therefore, no mitigation measures are proposed.

5.13.2 Evaluation of Significance

There are no residual effects to traditional land use; therefore, no evaluation of significance is required.

5.14 Human Occupancy and Resource Use

The potential effects on human occupancy and resource use include:

- conflicts with other natural resource extraction activities
- disruption of ranching and farming operations
- disruption of current land use and recreation activities
- increased demand on local and regional infrastructure and services

5.14.1 Conflicts with Other Natural Resource Extraction Activities

The Project does not traverse any coal dispositions, mining claims, potash licenses, quarry leases or withdrawals, mining restricted lands, Forest Management Licenses, or Integrated Wood Supply Areas.

5.14.2 Disruption of Ranching and Farming Operations

Ranchers and farmers along the Project route may experience short-term disruptions to their activities during the construction of the flowline. These disruptions are expected to be limited even though construction will occur during a portion of the productive agricultural period. Fields seeded to cropland will be disturbed but landowners will be compensated for crop loss during the growing season. Cattle grazing occurs on native grasslands in the LSA, and if the cattle are still present at construction, they may be moved, in consultation with the landowner. Advanced notification of the construction schedule to all affected ranchers and farmers will lessen the effects on their operations as they will have time to adjust their farming schedules, if possible. The construction of the flowline will not affect the sustainability of ranching and farming activities along the Project RoW or in the LSA as it is temporary, and the land will be returned to equivalent land capability.

5.14.3 Disruption of Current Land Use and Recreation Activities

The project is located on private land and does not intersect any regional, provincial, or national parks; community pastures; or designated recreation areas. Because construction is proposed for the late summer, fall, and early winter season, hunting and trapping (which is only allowed with permission from the landowner) will not be greatly affected as most hunting and trapping does not occur on cultivated land and flowline construction disruption is very localized. No effects to other recreational activities (i.e., fishing) will be impacted by construction activities.

5.14.4 Increased Demand on Local and Regional Infrastructure and Services

The potential effects on infrastructure and services use due to Project construction include:

- shortfall of accommodations
- increased pressure on medical, emergency, and protective services
- increased traffic
- increase in waste flow

Current temporary accommodation (i.e., hotel/motel rooms) can be difficult to access in the regional area (i.e., Virden), due to limited supply and high use by current temporary workforce personnel. The demand on temporary accommodation by the construction workforce may result in short-term competition for limited accommodation.

Emergency and protective service requirements are not anticipated to increase because of the project construction schedule. It is expected that demands for these services during project construction activities will be similar to those that presently exist as a result of the presence of a mobile oil and gas workforce associated with on-going development in the surrounding oil and gas production area.

Traffic during construction from trucks and passenger vehicles will increase on area roads. Major excavation equipment and conduit/pipe will be delivered by truck and workers will arrive at site in personal vehicles. The increase in traffic will be short-term and for the duration of construction. Additional traffic is not expected during operations.

The construction of the flowline will generate waste products that will require transfer to landfill sites. Tundra will reduce waste quantities to the lowest levels practical and implement a waste management plan. Waste generated by the project will be hauled to an appropriate landfill site in the region.

5.14.5 Mitigation

Mitigation measures will be implemented to reduce any potential effects to human occupancy and resource use. The mitigation measures are summarized in Table 5.2.

5.14.6 Evaluation of Significance

There are no situations where a high probability occurrence of high magnitude of a permanent or long-term human occupancy and resource use residual effect cannot be mitigated. Therefore, residual effects are determined to be not significant (Table 5.4).

5.15 Social and Cultural Well-being

The construction of the flowline may result in a temporary increase in population. This impact will likely affect the Town of Virden, which has sufficient services to accommodate workers. The operation of the project will likely not create any permanent jobs. However, if jobs are created, they are expected to be

filled by long-term residents of the region. There may be associated benefits of temporary workers, including an increase in spending locally (i.e., Virden; Nichols Applied 2007).

The well-being of adjacent landowners is not expected to be affected by the construction of the Project as the progression of flowline construction is linear. Construction workers, heavy equipment and service vehicles travelling on roads will be present for a short time interval. The operation activities will be greatly reduced relative to the construction phase, with limited-service vehicle trips.

5.15.1 Mitigation

Mitigation measures will be implemented to reduce any potential effects to social and cultural well-being. The mitigation measures are summarized in Table 5.2.

5.15.2 Evaluation of Significance

There are no situations where there is a high probability occurrence of high magnitude of a permanent or long-term social and cultural well-being residual effect that cannot be mitigated. Therefore, residual effects are determined to be not significant (Table 5.4).

5.16 Employment and Economy

The potential economic effects of the construction and operation of the project include:

- benefits to local businesses and residents
- generation of revenue for municipal, provincial, and federal governments

5.16.1 Mitigation

There are no negative residual effects predicted to affect employment and economy; therefore, no mitigation measures are proposed.

5.16.2 Evaluation of Significance

There are no residual effects to employment and economy; therefore, no evaluation of significance is required.

5.17 Accidents and Malfunctions

The following potential residual effects could occur due to accidental events during construction of the flowline:

- localized spills, once remediated will have minimal adverse residual effects
- rupture of water or gas lines could cause an interruption in services and/or contamination of soil and water, depending on the location and severity of the rupture

- electrical cable damage could cause fires and lead to interrupted service of the utility to a local communities or residences
- release of drilling mud on land, once cleaned up and reclaimed would be expected to have minimal residual effect
- release of drilling mud into a watercourse could affect aquatic ecosystems in the short to medium-term
- a flowline failure could adversely affect adjacent soils, vegetation, wildlife habitat, and aquatic ecosystems, including aquifers

To minimize the risk of adverse effects from accidents, Tundra will implement industry best practice techniques and safety measures. Therefore, the potential for substantial adverse effects from accidents during construction is low.

5.17.1 Spills of Hazardous Materials During Construction

Spills onto land during construction will generally be limited to small areas within the RoW. Since light hydrocarbons (e.g., gasoline, light diesel) tend to disperse readily and break down, the potential for adverse residual effects are reversible in the short-term.

5.17.2 Rupture or Damage to Foreign Lines, Pipelines, and Cables During Construction

Rupture of a water line or buried electrical cable, fibre optic line, or telephone line along the route would create inconveniences for nearby residences. This type of occurrence would likely have a low magnitude effect to the environment and be reversible in the immediate to short-term since repair would be relatively straightforward.

If an adjacent high-pressure gas line were to be ruptured, there would be risk of explosion. Risk to human health would be considered significant. High-pressure metal pipelines are easily located for repair. These pipelines are of sufficient diameter and strength that ruptures are extremely unlikely; therefore, the probability of significant adverse effects resulting from an explosion of existing gas pipelines is low. An oil pipeline rupture would have similar consequences and probability.

Rupture of an existing oil pipeline during construction of the proposed Project may result in severe contamination of lands or water and could be considered a significant adverse effect. As Tundra will follow industry standards, government regulations, and company protocols, the probability of a significant adverse effect resulting from rupture or damage to existing pipelines is low.

5.17.3 Release of Drilling Mud During Horizontal Directional Drilling

The release of drilling mud during directional drilling of a watercourse is rare. In the event of a release on land or in a watercourse, effects will be minimal since the mud is inert and can often be cleaned up and the area rapidly reclaimed. The introduction of clay-based drilling mud into the environment will have variable effects depending on the location, volume, and level of clean-up applied. Monitoring programs

during directional drilling programs allows any release to be detected quickly. The ability to stop the flow rapidly limits the volume of drilling mud released to the environment. Drilling mud released into a watercourse will dissipate in the watercourse in a short period. The reversibility of an adverse residual effect on a riparian area depends on the length of time it takes for vegetation in the area disturbed by the mud and clean-up activities to recolonize; it is likely to be a short to medium-term duration.

5.17.4 Flowline Failure During Operations

Flowlines are the safest and most efficient manner for transporting large volumes of solution natural gas and other liquid petroleum products, over long distances. The type of product spilled, volume of product spilled, and sensitivity of the land at the location of the failure will determine the significance of the spill effect. For example, if an incident occurs within a berm-contained pump station, the residual effect of the release would be considered not significant. Alternatively, if the released product affected wildlife habitat during a critical life stage, sensitive aquatic ecosystems, aquifers or municipal water intakes, the residual effect would likely be considered significant.

5.17.5 Mitigation

Mitigation measures to be implemented during construction to reduce any potential effects to accidents and malfunctions are presented in Section 6.4.7, Table 6.2.

5.17.6 Evaluation of Significance

There are no situations where there is a high probability occurrence of high magnitude of a permanent or long-term accident or malfunction residual effect that cannot be mitigated. Therefore, residual effects are determined to be not significant (Table 5.4).

5.18 Decommissioning and Abandonment

When Tundra is considering decommissioning and/or abandoning this project they will review current options, issues, and regulatory requirements of the day. The decommissioning and/or abandonment plan will comply with the acceptable regulatory standards and will be developed in consultation with stakeholders interested in completing the decommissioning/abandonment work.

Regardless of approach, the activities are expected to include removal of aboveground infrastructure and reclaiming the site to pre-disturbance conditions, as is reasonably practical. The environmental and socio-economic components likely to interact with this program are:

- physical components such as physical environment (surface erosion), soil capability (admixing of topsoil/subsoil), water quality and quantity (sedimentation), air quality (nuisance health effect - dust, vehicle emissions), and acoustic environment (nuisance health effect - noise)
- biological components including fish and fish habitat (alteration of habitat, sedimentation), wetlands (alteration of habitat function), vegetation (weed introduction), wildlife and SAR (nesting habitat and auditory disturbance)

- socio-economic components such as human occupancy, resource use (disruption of agricultural activities), infrastructure and services (transport of workers and supplies), and accidents and malfunctions

With the implementation of standard mitigation for the future, it is expected that any adverse residual effects would be of similar or lesser magnitude compared with those current mitigation measures that are described for construction of the project.

5.19 Potential Effects from the Environment

The potential environmental conditions that could adversely affect the project during construction or operations includes severe and/or inclement weather (e.g., high wind speeds, heavy/persistent precipitation, or extreme temperatures).

5.19.1 High Winds

High winds could lead to a suspension of some construction activities including topsoil handling, clearing, burning, and welding. The buried flowline will not be adversely affected by high winds. Therefore, no adverse effects from high winds on the project are expected.

5.19.2 Heavy/Persistent Precipitation

Changes in precipitation may have a delaying impact on construction techniques, timing, and scheduling. Precipitation changes may also have an impact on surface runoff, that in turn may affect the design and maintenance of access roads.

5.19.3 Inclement Weather

Persistent or high levels of precipitation could result in a delay in the construction of the project if topsoil salvage activities have not been completed or if wet soil conditions create safety or transportation problems.

During the operations phase, persistent or high levels of precipitation or extreme temperatures are not expected to adversely affect the buried flowline. Therefore, no adverse effects on the project are expected to result from inclement weather.

5.20 Mitigation

5.20.1 Alternate Routes

During the RoW construction selection process, a preliminary reconnaissance of the route was completed to identify potential environmental constraints. Where possible, wetlands were avoided or only the peripheral edge of the wetland was intersected by the RoW. Re-routes also occurred to avoid STGR leks, Crown land, WMAs, and lands with conservation agreements, where possible.

5.20.2 General and Specific Mitigation Measures

General and specific mitigation measures, including project planning, project design, construction techniques, operational practices, reclamation techniques and scheduling that will be applied to prevent or minimize adverse effects are summarized in Table 5.2. The *Construction and Reclamation Plan* (Section 7.0) details additional mitigations and best practices that will be implemented during construction and post-construction to reduce impacts and reclaim disturbed land, where required. *Inspection and Monitoring* (Section 8.0) will be further implemented during post-construction to ensure reclamation is proceeding successfully.

TABLE 5.2 Potential Environmental and Socio-economic Effects, Mitigative Measures, and Residual Effects

Environmental or Socio-economic Element/Potential Effect	Spatial Boundary	Recommendations/Mitigation Measures	Residual Effect(s)
PHYSICAL ENVIRONMENT			
Slope Instability	LSA, specifically slopes at watercourse crossings	• Ensure cuts and fills along the trench line are properly back sloped. • Maintain or re-establish surface and/or subsurface drainage patterns. • Follow site-specific recommendations of a geotechnical engineer in areas where unstable slopes are anticipated. • Recontour the RoW and restore the grade to pre-construction conditions, as practicable.	• No residual effect identified.
Changes to Local Topography	LSA	• Recontour the RoW and restore the grade to pre-construction conditions, as practicable.	• No residual effect identified.
Identification or Exposure of Historical Soil Contamination	LSA	• Contact appropriate regulatory authorities and dispose of contaminated soils as per Manitoba regulations and guidelines.	• No residual effect identified.
SOILS AND SOILS CAPABILITY			
Mixing of topsoil with subsoil	LSA	**Topsoil Stripping (General)** • Where topsoil is less than 30 cm, salvage topsoil to colour change, bottom of sod or duff layer, plough layer or 10 cm, whichever is deepest. • Salvage all topsoil stripped along the trench line. • Salvage topsoil from all areas that require grading. Avoid over-stripping. Avoid grading of native grassland, bush, hay lands or pasture lands on level terrain, where practicable. In areas of native grassland, minimize the amount of stripping, where practicable. • For wet/thawed soil: In conditions where wheel-slip, mud build-up on tires and cleats, water ponding and ruts are occurring, the decision to temporarily shut down construction activities will be made based on: ▪ the plasticity of the surface soil to a depth of 10 to 20 cm ▪ the depth of the wetting front and/or ruts in relation to the A and B horizons ▪ the type of construction operations proposed for that day	• Minor amount of topsoil and subsoil mixing during topsoil salvage. • Reduced soil capability for agriculture and reclamation suitability due to soil mixing.
Mixing of topsoil with subsoil	LSA	**Topsoil Stripping (Frozen)** • Frozen soil conditions are in effect when frost has reached the depth of the interface between topsoil and subsoil.	• Same as above

Environmental or Socio-economic Element/Potential Effect	Spatial Boundary	Recommendations/Mitigation Measures	Residual Effect(s)
		• If practicable, maintain snow cover over the area to be stripped as long as possible. Remove snow just before stripping. • If practicable, remove or pack snow on the work side to increase frost penetration onto the soil. In early winter, pack snow on the work side to avoid premature thawing of the upper soils. • If practicable, windrow snow over the trench line to prevent deep frost penetration along the trench line. • If practicable, grade snow over the travel lane to improve driving conditions and grade snow over the spoil pile area on cultivated lands to smooth furrows and facilitate removal of spoil during backfilling. • Use equipment capable of practically separating topsoil from subsoil during topsoil stripping activities during frozen conditions. • Where practicable, complete backfilling of the lowered-in flowline by nightfall during winter construction. • Avoid mixing snow with spoil during backfilling. • Postpone compaction of frozen trench spoil until final clean-up and non-frozen conditions. • If practicable, begin clean-up along segments of the flowline constructed during frozen conditions as soon as possible after backfilling and before spring break-up. • If practicable, conduct three-lift soil handling under frozen conditions to minimize admixing of lower subsoil into the upper subsoil or topsoil.	
Mixing of topsoil with subsoil	LSA	**Topsoil Replacement** • Postpone replacing topsoil during wet weather, frozen conditions, or high winds to prevent damaging soil structure, placing topsoil on compacted subsoils, or erosion of topsoil. • Replace topsoil evenly over all portions of the trench line that were stripped. • Avoid scalping of the sod layer on hay and pasture lands when moving the topsoil pile during backfilling.	• Same as above
Increased surface stoniness	LSA	• Conduct three-lift soil handling on lands with a higher gravel content in the lower subsoil than the upper subsoil to minimize increases of gravel and stones from the lower subsoil into the upper subsoil or topsoil. • Store the first lift of trench subsoil on the spoil side, either next to the trench or back far enough to store the second lift. Maintain a separation between the topsoil pile and the subsoil piles, and between subsoil piles.	• Reduced soil capability for agriculture and reclamation suitability. • Increased surface stoniness.

Environmental or Socio-economic Element/Potential Effect	Spatial Boundary	Recommendations/Mitigation Measures	Residual Effect(s)
		• Remove stones to achieve equivalence with the surrounding subsoil/topsoil as well as stones from the upper 30 cm of soil that will interfere with topsoil replacement or cultivation (i.e., stones larger than 10 cm in diameter). • Dispose of stones at locations approved by the landowner or government land authority. Do not dispose of stones in wetlands.	
Soil compaction	LSA	• During winter construction, ensure the frost is deep enough to proceed without causing excessive rutting and soil compaction. • Use equipment that minimizes surface disturbance, soil compaction, and topsoil loss. • Confine traffic to the work lane and work along the work lane of the RoW to the extent practicable to reduce the area subjected to potential soil compaction. • Suspend construction activities to prevent compaction, when there is wet or thawing soils combined with the depth of the wetting front and/or ruts relative to the depth of the topsoil layer. • Rip up compacted subsoil, temporary access trails, and soils damaged during wet weather to the depth of compaction, prior to topsoil replacement. • Employ a subsoil plough (e.g., para-tiller) along segments of the flowline where topsoil salvage did not occur and subsoil compaction is severe. Do not use a subsoil plough on native grassland or woodlands.	• Reduced soil capability for agriculture and reclamation suitability.
Wind and water erosion	LSA	• Avoid scalping of the sod layer on pasture, shrublands, hay lands and native grassland when moving the topsoil and spoil piles during backfill. Use equipment (e.g., clean-up bucket) for final pass of backfilling that will minimize scalping. • Rollback small diameter slash on wooded non-agricultural lands. Over-picking small diameter (less than 4 cm in diameter) slash will be avoided on wooded areas with sandy soils where slash rollback is not allowed or is not practical. • Walk down topsoil windrow and windrow snow over the windrow to minimize the risk of wind erosion during frozen conditions. • For intensely grazed lands, fence the RoW if requested by the landowner, until vegetation is well established to prevent damage from livestock.	• Minor surface erosion of topsoil can be expected until vegetative cover is established. • Revegetation of coarse-texture soils after disturbance may be inhibited.
Soil Contamination	LSA	• Train staff on proper fuel dispensing methods and use industry best practice technology and safety measures. • In the event of an accidental spill, immediately implement measures to stop and control the migration of contaminant and clean-up the spilled substance. • Ensure spill clean-up materials are readily available to workers.	• Minor amount of soil contamination may occur during fueling due to spills or leaks.

Environmental or Socio-economic Element/Potential Effect	Spatial Boundary	Recommendations/Mitigation Measures	Residual Effect(s)
WATER QUALITY AND QUANTITY			
Alteration of natural drainage patterns	LSA	• Install trench breakers, where warranted, at the edge of perched wetlands to prevent the flowline trench from acting as a drain. • Compact backfill to the extent feasible and crown trench to prevent channelized flow along the trench. Avoid excessive trench crown height. • Feather-out excess spoil over the stripped portion of the trench line to minimize the creation of a permanent mound. • Restore flowline drainage patterns to pre-construction contours where practical during reclamation.	• Localized alteration of natural drainage patterns may occur until trench settlement is complete.
Reduction in surface water quality	LSA	• Restrict grading to trench line and work areas where practicable. • Direct grading away from watercourses and drainages to reduce the risk of material entering the watercourse or drainages. • In the event of an accidental spill, immediately implement measures to stop, control the migration of contaminant, and clean up the spill. • Install erosion control structures between wetlands and disturbed areas to prevent siltation of surface water. Ensure erosion control structures have been installed properly.	• Only in the case of an accidental spill or release would surface quality potentially be affected.
Reduction in groundwater quality due to accidental release	LSA	• Field verify the locations of all registered or known water wells within 200 m of flowline construction excavation. Ensure adequate cathodic protection of the flowline conduit. • In the event of an accidental spill, immediately implement measures to stop, control the migration of contaminant, and clean-up the spilled materials. • Develop a plan to identify alternate water supplies and commit to provide alternate water sources to affected parties, if warranted, in the event of an accidental release.	• Only in the case of an accidental spill or release would groundwater quality potentially be affected.
AIR QUALITY			
Greenhouse gas emissions associated with vehicles and construction equipment and clearing of vegetation	LSA	• Use multi-passenger vehicle to transport workers to construction site whenever practicable. • Limit idling of construction and operations equipment where practicable. Where reasonable, vehicles and equipment will be turned off when not in use unless weather and/or safety conditions dictate the need for them to remain running. • Vehicle and equipment engines will be properly maintained according to the manufacturers' specifications.	• No residual effects identified

Environmental or Socio-economic Element/Potential Effect	Spatial Boundary	Recommendations/Mitigation Measures	Residual Effect(s)
Dust (particulates) during construction	LSA	• Suspend topsoil stripping and replacement during strong winds to prevent wind-blown dust emissions. • Limit the potential for wind erosion by: ✦ shortening the time between stripping and replacement as much as possible ✦ contouring topsoil and storage piles with a low profile, to reduce erosion potential ✦ limiting construction activities to the surveyed trench line and workspace	• No residual effects identified.
ACOUSTIC ENVIRONMENT			
Noise from construction and operation of the flowline	LSA	• Plan construction activity to occur between the hours of 07:00 and 22:00, when applicable, to reduce the potential effect of construction noise. • Advise nearby residents of noise-causing activities and schedule these events to reduce disruption. • Ensure all internal combustion engines are fitted with appropriate muffler systems. • Limit the use of engine retarders near residences. • Should a valid complaint be made during construction, Tundra will respond expeditiously and take appropriate action to ensure the issue has been managed responsibly.	• Temporary increase in noise during construction.
VEGETATION COMMUNITIES			
Introduction or establishment of weeds, non-native, and invasive species	LSA	• Reduce soil stripping to the trench line where possible. Minimize clearing and grading in areas with native grassland, woodlands. • Minimize grading along wetland margins. Clean equipment prior to site access to prevent spread of existing and invasive weeds. • Conduct post-construction weed monitoring. Mechanically and/or chemically control weeds in spring of 2023, as required.	• A minor introduction of weed, non-native, and invasive species may occur.
Reduced area of native grassland, riparian vegetation, and potential rare plant habitat through vegetation removal	LSA	• Only the trench line will be stripped or ploughed, where possible. Minimize where possible, and avoid areas with high rare plant habitat, such as native grassland and riparian areas. • Reduce RoW and/or work lane in native grassland, shrubland, and woodland, where practicable. • Construction to occur during the fall and winter to minimize effects to vegetation. • Restore native vegetation communities according to site conditions. Use Manitoba approved and sourced native seed mixes.	• Temporary decline in extent of native grassland vegetation.

Environmental or Socio-economic Element/Potential Effect	Spatial Boundary	Recommendations/Mitigation Measures	Residual Effect(s)
		• Allow natural regeneration to occur in wetlands, unless post-construction monitoring indicates revegetation is required.	
Fragmentation of patches of native grassland through vegetation removal	LSA	• Mitigation measures are the same as described above to minimize the residual effects of loss of native grassland.	• Temporary increase in amount of habitat edge and therefore, increased area of habitat exposed to edge effects.
WETLANDS			
Wetland vegetation removal	LSA	• Allow native wetland vegetation to re-establish naturally from the seed bank or from root material. • Conduct post-construction weed monitoring and mechanically and/or chemically control weeds, as required.	• Minor loss of wetland vegetation.
Alteration of wetland hydrology	LSA	• Construction in Class I and II and dry Class III wetland areas will occur during dry or frozen ground conditions. • If surface water is present at the time of construction, Class I and II wetlands will be bored under by HDD. • Bore under Class III wetlands holding water and Class IV wetlands by HDD method. • Minimize removal of vegetation and disturbance of soil to areas directly adjacent to wetlands. • Minimize the width of grubbing through wet areas during construction to facilitate the restoration of shrub communities. • Restrict grading as much as practical. Conduct grading away from the wetland to the extent practical to reduce the risk of sediment and other material entering the wetland. • Keep wetland soils separate from upland soils. • If construction occurs during wet conditions, install trench breakers, where warranted, at the edge of perched wetlands to prevent the flowline trench from acting as a drain. • Do not dewater any permanent wetland.	• With mitigation, potential effects will be minimized.

Environmental or Socio-economic Element/Potential Effect	Spatial Boundary	Recommendations/Mitigation Measures	Residual Effect(s)
WILDLIFE AND WILDLIFE HABITAT			
Habitat alteration and loss	LSA, where native grasslands, modified grassland, hay lands, woodlands, or wetlands occur	• If a tree to be cleared contains an active bird nest, or if a ground nest, burrow, or den is discovered during clearing, suspend the work activity, fence, or flag off the area, and contact the consultant biologist. • Where possible, avoid the vegetated margins of wetlands. • Restore pre-construction profile in wetlands during reclamation. • Re-vegetate disturbed non-cultivated portions of the RoW with an appropriate, Manitoba-sourced, native seed mix. • Wildlife sweeps may be completed by qualified biologists for SAR and their habitat when construction occurs in late summer or fall. • Wildlife nest sweeps will be conducted in suitable SAR and migratory bird habitat prior to construction to determine if active nests are present. If nests are present on or immediately adjacent to the RoW then appropriate species-specific setback buffers will be implemented and construction will not occur within the setback buffer. The setback buffers will be maintained until the nest eggs have hatched and the young have left the nest.	• Long-term habitat alteration will occur where treed areas are cleared. • Medium-term habitat alteration will occur in grassland areas that will be reclaimed following construction.
Sensory disturbance and reduced habitat effectiveness	LSA	• No critical ungulate winter range occurs along the flowline RoW or in the LSA. • Waterfowl or other migratory birds will be in the LSA during the planned late summer (July 15 to August 31) construction. If active nests are detected, species-specific setback buffers will be implemented to minimize sensory disturbance. • Minimize construction vehicles travelling to and from worksite (e.g., use multi-passenger vehicles to transport workers).	• Short-term sensory disturbance during late summer/fall period of July 15 to August 31.
Project-related wildlife mortality	LSA, primarily in non-agricultural lands (excluding collisions)	• Establish construction traffic speed limits and post speed limits on access roads to reduce the risk of collisions with wildlife. • Minimize construction vehicles travelling to and from worksite (e.g., use multi-passenger vehicles to transport workers). • Report any incidents or collisions with wildlife to the consulting biologist and notify local wildlife authorities and the police, as appropriate. • Collect construction garbage daily and dispose in approved disposal locations to prevent attracting nuisance wildlife.	• Wildlife injury or mortality

Environmental or Socio-economic Element/Potential Effect	Spatial Boundary	Recommendations/Mitigation Measures	Residual Effect(s)
FISH AND FISH HABITAT			
Harm to Fish and Fish Habitat	LSA	• Complete crossings by HDD to avoid fish habitat. HDD will follow DFO operational statement guidelines. • Implement immediate emergency response and containment activities in the event of a frac out.	No effects anticipated due to trenchless crossing of watercourse.
HERITAGE RESOURCES AND TRADITIONAL LAND USE			
No effects identified		• No mitigation.	• No residual effects identified.
HUMAN OCCUPANCY AND RESOURCE USE			
Conflicts with other natural resource extraction activities	LSA	• Obtain all necessary crossing agreements and adhere to all third-party conditions	• No residual effects identified.
Disruption of ranching and farming operations	LSA	• Tundra will obtain land access agreements from all landowners along the Project. • Tundra will communicate its construction schedule to landowners. • Construction equipment and vehicles will be confined to the Project RoW, existing public roads, and approved temporary access roads. • Complete clean-up as soon as practicable, to minimize disturbance to ranching and farming operations.	• Temporary disruption of ranching and farming operations.
Disruption of current land use and recreation activities	LSA	• Tundra will communicate expectations regarding proper conduct when using community facilities to all construction workers, subcontractors, and support personnel during the project orientation.	•
Increased demand on local and regional infrastructure and services	LSA	• If crew accommodation cannot be found locally, Tundra will consider alternate options, which will mitigate lack of vacancy in the area. • A Waste Management Plan will be implemented during construction to reduce waste quantities to the lowest levels practical. Waste generated by the project will be hauled to an appropriate landfill site in the region. • The contractors for the project will be required to outline appropriate behaviour expectations of its construction workers while in the community, to help diminish conflicts with residents.	• Temporary increase in demand for accommodation and services.
SOCIAL AND CULTURAL WELL-BEING			
Reduction of social and cultural well-being due to	LSA	• Tundra will communicate:	• No negative residual effects.

Environmental or Socio-economic Element/Potential Effect	Spatial Boundary	Recommendations/Mitigation Measures	Residual Effect(s)
temporary workers and construction activities		✦ The project construction schedule to all adjacent landowners and a Tundra representative will be available to discuss the project for the duration of the construction period. ✦ Expectations regarding proper conduct when using community facilities to all construction workers, subcontractors and support personnel during the project orientation.	
EMPLOYMENT AND ECONOMY			
Benefits to local businesses and residents	RSA	• No mitigation.	• No negative residual effect, only an economic benefit.
Generation of revenue for municipal, provincial, and federal governments	RSA	• No mitigation.	• No negative residual effect, only an economic benefit.
ACCIDENTS AND MALFUNCTIONS			
Accidental spills and/or releases	LSA	• All contractor and subcontractors will be required to have a construction Spill Response Plan. • Personnel will be trained on proper fuel dispensing methods and use industry best practice technology and safety measures. • Tundra will identify restrictions and procedures for fuel storage locations and containment, fueling activities, and construction equipment maintenance. • Project contractor and subcontractors will be required to comply with applicable environmental and safety laws and regulations. • In the event of an accidental spill, Tundra will immediately implement measures to stop, control the migration of contaminant, and clean-up the spilled substance as per the Spill Response Plan. • Tundra will ensure all reclamation and remediation necessary to restore any damaged land to its pre-spill condition will occur.	• An accidental release may result in residual effects on soils, vegetation, wildlife habitat, aquatic ecosystems, groundwater, and air quality
Release of drilling mud into a watercourse	LSA	• Use an inert, non-toxic bentonitic clay-based material as drilling mud. • The drilling contractor will be required to have a contingency plan in place for directional drilling operations. • Drilling mud will be disposed according to applicable government standards.	• Minor possibility of reduced water quality and harm to fish and fish habitat in the unlikely event of an HDD frac out.

5.20.3 Evaluation of Significance

Conclusions for the effects criteria are based on both quantitative and qualitative assessments.

- Quantitative assessments include the results of measurable predictions or objective comparisons of residual effects with established limits.

- Qualitative assessments are subjective and consider evaluations based on best professional judgement when environmental objectives are not available or quantitative predictions are not feasible.

A summary of the effects assessment criteria is provided in Table 5.3.

The integration of the various effects criteria result in a final significance impact rating for each potential project effect, resulting in an impact rating that is either not-significant or significant.

Table 5.4 provides a final significance rating to predicted residual effects for all criteria evaluated in this EA. The final significance rating relates to effects remaining after the application of mitigation using the defined effects assessment criteria for the project.

TABLE 5.3 Effects Assessment Criteria

Rating	Description
Direction	Describes if there is a net benefit, net loss or a net balance to the resource or affected party as result of the impact
Positive	Project has a net benefit
Neutral	Project has a net balance
Negative	Project results in a net loss, or otherwise referred to as an adverse effect
Magnitude	Describes the size and severity of the effect
Negligible	No discernible contribution
Low	Within acceptable protective standards and/or causes no detectable change to the resource
Medium	Within acceptable protective standards and/or causes a detectable change to the resource
High	Exceeds protective standards and/or causes a detectable change to the resource beyond the range of tolerance
Duration	Describes how long the effect will occur. The time span of duration will be defined as required by each discipline; therefore, the definitions below may be appropriate for some terrestrial disciplines but may not be appropriate for noise or air quality.
Short-term	Less than one year
Medium-term	One to ten years
Long-term	Greater than ten years

Rating	Description
Frequency of occurrence	Describes how often an effect occurs within a set time period
Isolated	Occurs at a specific time
Occasional	Intermittent and sporadic
Regular	Occurs recurrently during the assessment period
Continuous	Occurs continually during the assessment period
Spatial Extent	Describes the area within which the effect occurs
Isolated	Effects are those confined to the area directly disturbed by project activities
Local	Occur beyond the construction right-of-way and are restricted to within 200 m of the project (i.e., 200 m on either side of the flowline [centreline]).
Regional	Those that are beyond the local effects and within 10 km
Reversibility	Describes the potential for the recovery or reversibility of an effect
Reversible in short-term	Time period to be defined by each discipline
Reversible in medium-term	Time period to be defined by each discipline
Irreversible (permanent)	Time period to be defined by each discipline
Probability of occurrence	Describes the likelihood of a residual effect
Low	Unlikely to occur
High	Likely to occur
Prediction confidence	Describes the certainty of the effect assessment and considers data quality, rigor of the assessment/measurement approach, and/or the certainty of prescribed mitigation measures
Low	Poor understanding of cause-effect relationships and coarse or low resolution data
Medium	Good understanding of cause-effect relationships and coarse or low resolution data or high resolution quality data but poor understanding of cause-effect relationships
High	Good understanding of cause-effect relationships and high resolution data
Significance	Describes the probability of occurrence of a permanent or long-term residual effect. A significant impact would be anything that was rated as having a “moderate” or “high” impact.
Not significant	Low probability of occurrence of a permanent or long-term residual effect of high magnitude that cannot be technically mitigated or economically compensated
Significant	High probability of occurrence of a permanent or long-term residual effect of high magnitude that cannot be technically mitigated or economically compensated

TABLE 5.4 Project Residual Effects Assessment

Residual Effects	Direction	Magnitude	Duration	Frequency of Occurrence	Spatial Extent	Reversibility	Probability of Occurrence	Prediction Confidence	Significance
PHYSICAL ENVIRONMENT									
No residual effects									
SOIL AND SOIL PRODUCTIVITY									
Lowering of topsoil capability due to mixing of topsoil with subsoil	Negative	Low	Long-term	Isolated	Isolated	Irreversible	Low	High	Not significant
Lowering of topsoil capability due to mixing of topsoil and subsoil due to trench instability	Negative	Low	Long-term	Isolated	Isolated	Irreversible	Low	High	Not significant
Lowering of topsoil capability due to increased surface stoniness	Negative	Low	Short-term	Isolated	Isolated	Reversible in the short-term	Low	High	Not significant
Lowering of soil capability due to increased soil compaction from construction traffic	Negative	Low	Short-term	Isolated	Isolated	Reversible in the short-term	Low	High	Not significant
Lowering of topsoil capability due to loss of topsoil from wind erosion	Negative	Low	Long-term	Isolated	Isolated	Reversible in the long-term	Low	High	Not significant
Lowering of topsoil capability due to loss of topsoil from water erosion	Negative	Low	Long-term	Isolated	Isolated	Reversible in the long-term	Low	High	Not significant
Lowering of topsoil capability due to pulverization of soil	Negative	Low	Short-term	Isolated	Isolated	Reversible in the short-term	Low	High	Not significant

Residual Effects	Direction	Magnitude	Duration	Frequency of Occurrence	Spatial Extent	Reversibility	Probability of Occurrence	Prediction Confidence	Significance
Reduced soil capability due to soil contamination	Negative	Low	Medium-term	Isolated	Isolated	Reversible in the medium-term	Low	High	Not significant
WATER QUANTITY AND QUALITY									
Localized alteration of natural drainage patterns	Negative	Low	Short-term	Isolated	Isolated or local	Reversible in the short-term	Low	High	Not significant
Reduction in water quality due to accidental spills or release of hazardous materials	Negative	Low to high	Medium to long-term	Isolated	Local	Medium to Long-term	Low	High	Not significant
Disruption of springs	Negative	Low	Short-term	Isolated	Local	Short-term	Low	High	Not significant
AIR QUALITY									
Increase in GHG emissions during construction	No residual effects								
Dust during construction	No residual effects								
ACOUSTIC ENVIRONMENT									
Temporary increase in noise during construction	Negative	Low	Short-term	Isolated	Local	Reversible in the short-term	Low	High	Not significant
VEGETATION COMMUNITIES									
Introduction or establishment of new or present weed, non-native or invasive species	Negative	Low	Medium-term	Isolated	Local	Reversible in the medium-term	High	High	Not significant
Temporary loss of vegetation communities with high rare plant potential	Negative	Low	Medium-term	Isolated	Local	Reversible in the medium-term	High	High	Not significant

Residual Effects	Direction	Magnitude	Duration	Frequency of Occurrence	Spatial Extent	Reversibility	Probability of Occurrence	Prediction Confidence	Significance
Temporary loss of habitat	Negative	Low	Medium-term	Isolated	Local	Reversible in the medium-term	High	High	Not significant
WATERCOURSES AND WETLANDS									
Watercourses	No residual effects								
Wetland vegetation removal	Neutral to Negative	Low	Medium-term	Isolated	Local	Reversible in the medium-term	Low	High	Not significant
Alteration of wetland hydrology	Negative	Low	Medium-term	Isolated	Local	Reversible in the medium-term	Low	High	Not significant
WILDLIFE AND WILDLIFE HABITAT									
Habitat loss and Alteration	Negative	Low	Medium-term	Continuous	Isolated	Medium-term	High	High	Not significant
Sensory disturbance and reduced habitat effectiveness	Neutral to Negative	Negligible to low	Short-term	Regular	Local	Short-term	Low	Medium	Not significant
Project related wildlife mortality	Negative	Negligible	Short-term	Occasional	Regional	Short-term	Low	High	Not significant
FISH AND FISH HABITAT									
No residual effects									
HERITAGE RESOURCES									
No residual effects									
TRADITIONAL LAND USE									
No residual effects									
HUMAN OCCUPANCY AND RESOURCE USE									
Conflicts with other natural resource extraction activities	No residual effects								
Disruption of ranching and farming operations	Negative	Negligible to low	Short-term	Occasional	Local	Reversible in the short-term	Low	Medium	Not significant
Disruption of current land use and recreation activities	No Residual Effects								

Residual Effects	Direction	Magnitude	Duration	Frequency of Occurrence	Spatial Extent	Reversibility	Probability of Occurrence	Prediction Confidence	Significance
Increased demand on local and regional infrastructure and services	Negative	Negligible	Short-term	Occasional	Regional	Reversible in the short-term	Low	Medium	Not significant
SOCIAL AND CULTURAL WELL BEING									
Change to social and cultural well- being	Neutral to Positive	Low	Short-term	Occasional	Regional	Reversible in the short-term	Low	Low	Not significant
EMPLOYMENT AND ECONOMY									
No negative residual effects									
ACCIDENTS AND MALFUNCTIONS									
An accidental release may result in residual effects on soils, vegetation, wildlife habitat, aquatic ecosystems, and groundwater	Negative	Low to high	Medium to Long-term	Isolated	Local	Reversible in the medium to long-term	Low	High	Not significant
Release of drilling mud into a water body may result in a residual effect on the aquatic ecology of the water body.	Negative	Low to medium	Short to medium-term	Occasional	Isolated to Local	Reversible in the short-term	Low	Medium	Not significant