

6 CUMULATIVE EFFECTS ASSESSMENT

A cumulative effects assessment differs from a project-specific EA by considering a larger geographic study area to include interactions between past, present, and future activities located in the vicinity of a project, with the residual effects identified from the project. This section of the EA provides the environmental and socio-economic cumulative effects assessment for the project by:

- describing residual effects of the project as identified in EA (Section 5)
- identifying past, present, and future projects and activities with actual or potential residual effects that may act in combination with the identified residual effects of the project
- identifying the project's contribution to potential cumulative effects
- describing technically and economically feasible mitigation measures for potential cumulative effects
- determining the significance of the potential residual cumulative effects

If there are no predicted interactions between project activities and an environmental or socio-economic element, then no further analysis (i.e., cumulative effects) is necessary.

6.1 Methods

Determining the significance of the project's potential contribution to regional cumulative effects is the final step in the cumulative effects assessment. The effectiveness of mitigation procedures performed during construction, operational, and post-operational phases will determine the cumulative effects on the criteria described previously (Sections 4 and 5 of this EA; Hegmann et al. 1999). The cumulative effects assessment is considered a conservative assessment of environmental and socio-economic conditions since the future projects and activities included in the assessment may not proceed. For the cumulative effects assessment, all projects are assumed to proceed.

All three assessment scenarios in this EA describe cumulative effects:

- baseline (Section 4) - conditions that exist including effects resulting from past and present projects or activities
- project effects assessment (Section 5) - baseline conditions with the effects of the project added
- cumulative effects assessment (Section 6) - the environmental conditions that would exist because of the interaction of the project with past, present, and future projects and activities

Residual effects related to the construction and operation of the project was identified as part of the effects assessment (Section 5). The project-related residual effects were carried forward for analysis of potential cumulative effects.

Project-related accidents and malfunctions may act cumulatively with the residual effects from other projects and activities in the vicinity of the project. Therefore, the cumulative residual effects were analyzed where applicable.

A desktop study was completed to identify past, present, and future projects and activities and collect any available information (e.g., location and construction schedule) to support the cumulative effects assessment. The literature review focused on publicly available documents from:

- Federal listings
 - ✦ *Canadian Impact Assessment Registry* (IAAC 2021)
 - ✦ Major Projects Management Office Tracker (MPMO n.d.)
- Manitoba province-wide listings
 - ✦ *Public Registries* (Manitoba Conservation and Climate 2021b)
 - ✦ *Manitoba Infrastructure Projects Map* (Manitoba Infrastructure 2021)
- Municipal listings

The future projects and activities list includes only those future projects and activities planned to be constructed in 2022 or later and therefore are considered to have the potential for overlap in time and space with the project. Planned projects for 2021 were defined as “past projects and activities” for the purpose of this cumulative effects assessment.

6.2 Spatial and Temporal Boundaries

The spatial boundary used in the cumulative effects assessment was selected to provide a larger geographical and ecological framework to evaluate residual effects of the project in combination with other past, present, and future projects and activities. For the purposes of this project, the cumulative effects assessment area was defined as the RSA (Figure 1). 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. This area was considered large enough for the cumulative effects assessment as it encompassed all of the environmental and socio-economic components associated with the LSA.

Temporal boundaries for each component are based on the timing of the project phases (Section 2.3) in combination with component-specific considerations.

6.3 Other Projects

Past projects and activities in Manitoba include settlement and development activities such as:

- agricultural activities
- transportation activities (e.g., vehicular and railway traffic, as well as maintenance activities on roadways, bridges, and railways)
- power generation, transmission, and utility activities
- petroleum production transport (e.g., pipeline and facility maintenance and line patrol)
- oil and gas industry construction projects
- mining activities

Past, present, and future projects in the RSA are provided in Table 6.1.

TABLE 6.1 Recent Past, Present, and Future Projects and Activities in the Regional Study Area*

Project	Status	Information
Pipelines	2010	Penn West Petroleum Ltd. pipeline constructed between Waskada and Cromer, Manitoba
Pipelines	2011	EOG Resources Canada Inc. pipeline constructed between Waskada and Cromer, Manitoba
Pipelines	2012	Construction of the Enbridge Bakken Oil pipeline from the Steelman terminal near Steelman, Saskatchewan to the Cromer terminal in Cromer, Manitoba
Pipeline	2013	Tundra Cromer Pipeline Project in RM of Wallace and Pipestone
Pipelines	2013-2016	Enbridge Line 3 Replacement Program in Manitoba from Scarth, Manitoba to Gretna, Manitoba
Oil/Gas Well Drilling	2012 to 2020 and future	The total number of wells drilled in Manitoba in 2020 (January 1 to December 31) was 83, down from 222 in 2019, and from 276 in 2018 and a high of 616 in 2012 (Manitoba Petroleum Branch 2021)
Flowline Installation	2013	Tundra flowline from Tundra Cromer tank farm to railway tank loading facility
Rural Municipality of Wallace-Woodworth	2021	No applicable information available on the Rural Municipality of Wallace-Woodworth, Manitoba, internet site (www.rmofwallace.ca)
Rural Municipality of Pipestone	2021	No applicable information available on the Rural Municipality of Pipestone Vertex facility
Manitoba Infrastructure (MI)	2021	Numerous road upgrades (Highway #1, #255, #256, and #542) and culvert re-installation (Manitoba Infrastructure 2021)
Canadian Pacific Railway (CPR)	2021	Rail line maintenance and tie replacement
* No major municipal, provincial, or federal projects are planned in the RSA during 2022		

6.4 Potential Cumulative Effects

The cumulative effects assessment is completed only for the components with residual effects (Section 5.20, Table 5.2) and that have the potential to overlap in time and space with the potential effects of other projects and activities. Environmental and socio-economic criteria that have the potential to interact with potential effects from other projects include:

- soil and soil productivity
- vegetation and wetland communities (including SAR or Species of Special Concern)
- wildlife and wildlife habitat (including SAR or Species of Special Concern)
- water quality and quantity
- acoustic environment
- other socio-economic elements

6.4.1 Soil and Soil Productivity

Potential residual soil and soil productivity effects (Section 5.20) include:

- reduced soil capability due to construction activities
- reducing topsoil capability due to admixing of topsoil and subsoil
- reducing topsoil capability due to admixing of topsoil and subsoil due to trench instability
- reducing topsoil capability due to increased surface stoniness
- reducing soil capability due to increased soil compaction from construction traffic
- reducing topsoil capability due to loss of topsoil from wind erosion
- reducing topsoil capability due to loss of topsoil from water erosion
- reducing topsoil capability due to pulverization of soil
- reduced soil capability due to soil contamination

Project construction is scheduled to occur in the late summer, fall, and winter; under dry or frozen conditions; with standard, proven mitigation measures that will minimize the potential for reduced soil capability. In general, no additional soil mitigation is warranted given the anticipated effectiveness of the proposed soils handling and other soils-related mitigation outlined in Section 5.20 of this EA.

Accidental spills may have adverse effects on soils, vegetation, and water quality. However, once remediated, project-related soil contamination will have little residual effect and are not predicted to contribute to cumulative effects.

6.4.1.1 Mitigation

With the implementation of mitigation measures, most project-related residual effects are expected to be mitigated within two years after construction and are predicted to have a negligible contribution to cumulative effects.

6.4.1.2 Evaluation of Significance

There are no situations where there is a high probability of occurrence of a permanent or long-term soil and soil productivity cumulative residual effect of high magnitude that cannot be mitigated (Table 6.2). Consequently, it is concluded that the cumulative residual effects of construction and operation of the project on soil capability will be not significant.

6.4.2 Water Quantity and Quality

Potential residual surface water and groundwater quality and quantity effects (Section 5.4) include:

- localized alteration of natural drainage patterns
- reduction in water quality due to accidental release
- disruption of springs

6.4.2.1 Localized Alteration of Natural Drainage Patterns

Project-related, localized alteration of natural drainage patterns and disruption of springs are predicted to be limited to temporary disturbance of the landscape for flowline construction. Construction is not expected to act cumulatively on water quantity and quality with other projects and activities in the RSA. Therefore, assessment of cumulative effects was not warranted.

6.4.2.2 Reduction in Water Quality Due to Accidental Spills

Accidental spills or releases are discussed in Section 5.3. Project-related accidental releases are expected to have minimal residual effects once remediated; a negligible to low effect to groundwater quality is expected to occur.

6.4.2.3 Mitigation Measures

Mitigation measures that can be implemented to mitigate the project's contribution to adverse cumulative water quality and quantity effects are the same as those described for the effects assessment (Table 5.2). Therefore, no additional mitigation measures were deemed warranted for the project.

6.4.2.4 Evaluation of Significance

There are no situations where there is a high probability of occurrence of a permanent or long-term cumulative water quality or quantity residual effect of high magnitude that cannot be mitigated (Table 6.2).

6.4.3 Acoustic Environment

Potential residual acoustic environment effects (Section 5.6) include a temporary increase in noise during flowline construction.

6.4.3.1 Temporary Increase in Noise During Flowline Construction

Construction activities will result in a temporary increase in noise due to traffic and equipment operation. Construction may act cumulatively with noise from existing oil and gas activity in the RSA, such as the Cromer terminal, existing pipeline facilities, and oil extraction facilities (i.e., batteries, compressor stations). During operations, traffic noise will return to levels prior to construction.

6.4.3.2 Mitigation Measures

Mitigation measures that can be implemented to mitigate the project's contribution to cumulative effects are the same as those described for the effects assessment (Table 5.2). Therefore, no additional mitigation measures were deemed warranted for the project.

6.4.3.3 Evaluation of Significance

There are no situations where there is a high probability of occurrence of a permanent or long-term cumulative acoustic environment residual effect of high magnitude that cannot be mitigated (Table 6.2).

6.4.4 Vegetation and Wetland Communities

Potential residual vegetation (Section 5.7) or wetland (Section 5.8) effects include:

- land clearing resulting in:
 - ✦ decline in amount of vegetation communities
 - ✦ loss of vegetation communities with rare plant potential
 - ✦ fragmentation of wildlife habitat
- introduction of new weeds/invasive species or establishment of present weeds, non-native, or invasive species.

Residual effects specific to wetlands include:

- wetland vegetation removal

- alteration of wetland hydrology or water quality

6.4.4.1 Land Clearing

The Project will result in the temporary clearing of cropland and other agricultural land during flowline construction. Reclamation of agricultural land is expected to be straightforward, as it will be returned to agricultural land use in the growing season following construction. The project will contribute to a temporary decline in the amount of non-agricultural vegetation communities (i.e., native grassland and woodlands) in the RSA, until the disturbed communities have re-established. In the unlikely occurrence that land clearing results in a reduction in wetland habitat with a high potential to support rare plants, there may be reduced opportunities for the establishment of new populations of these plant species. Effects of land clearing to wildlife and wildlife habitat are discussed in Section 6.4.3.

Loss or fragmentation of native grasslands due to flowline construction will be a temporary effect and can have a short-term negative effect on wildlife until the habitat can be functionally reclaimed. However, most wildlife present in the RSA is accustomed (habituated) to anthropogenic disturbances as most of the area has been disturbed historically from agriculture and other developments. Therefore, a negligible increase in wildlife habitat fragmentation is expected to occur.

6.4.4.2 Introduction of Weed, Non-native, or Invasive Species

The presence of weed, non-native, and invasive plant species can lower the quality of native vegetation communities and crops. It is assumed that activities, primarily associated with agriculture, have been proportionally the greatest contributor to the introduction and establishment of weed, non-native, and invasive plant species. It is assumed that proponents of present and future project and activities will also implement similar vegetation management strategies.

6.4.4.3 Wetland Vegetation Removal

Construction of the Project is expected to result in the temporary disturbance of Class I, II and dry Class III wetlands, primarily along the wetland margins. However, the project will impact 115 wetlands and seasonal waterways; primarily 34 Class I (ephemeral), 77 Class II (temporary), and four seasonal waterways during construction. There are a total of 37 Class III (seasonal) within the Project footprint. Due to extremely low moisture conditions in the RSA some of these Class III wetlands may be dry at the time of construction and may be trenched/ploughed. The remaining Class III wetlands that are holding water at the time of construction and 13 Class IV (semi-permanent) wetlands will be completely avoided by flowline routing and/ or boring underneath the basin profile. Dry construction combined with appropriate soil salvage techniques will minimize permanent effects to wetlands. Organic topsoil will be replaced providing a seed bank for natural regeneration to occur. Suitable compensation for lasting impacts to wetlands, if any, will be determined in consultation with MHHC, Manitoba Fisheries and Wildlife Branch and others, as may be required. Therefore, a negligible decrease in wetlands in the RSA is expected to occur.

6.4.4.4 Alteration of Wetland Hydrology or Water Quality

Many of the wetlands in the RSA have been disturbed through past agricultural activities. Future projects and activities (e.g., infrastructure) are anticipated to also disturb wetlands. However, a negligible increase in the disturbance of wetland hydrology or water quality is expected to occur.

6.4.4.5 Mitigation Measures

Mitigation measures that can be implemented to mitigate the project's contribution to adverse cumulative vegetation and wetland effects are the same as those described for the effects assessment (Table 5.2). Therefore, no additional mitigation measures were determined to be required for the project.

6.4.4.6 Evaluation of Significance

There are no situations where there is a high probability of occurrence of permanent or long-term cumulative vegetation and wetland community residual effects of high magnitude that cannot be mitigated (Table 6.2).

6.4.5 Wildlife and Wildlife Habitat

Potential adverse wildlife and wildlife habitat effects include:

- habitat loss and alteration
- sensory disturbance
- mortality

Habitat loss and alteration, and sensory disturbance have been discussed in Section 5.9.

Project construction is scheduled for late summer, fall, and winter. Migratory bird nest sweeps in suitable habitat (grasslands, wetlands, and woodlands) will be conducted between July 15 to August 31 to comply with the *Migratory Birds Convention Act* and appropriate setback buffers will be implemented to avoid impacts to SAR and migratory birds. Wetlands which provide suitable habitat for amphibians will be bored underneath the wetland profile to avoid impacts to amphibians. Therefore, the potential for wildlife mortality of amphibians, reptiles, and birds is minimal. Mortality of mammals may occur through collisions with vehicles or through disturbance of wildlife or habitat features (e.g., nests, dens) during construction. Present oil and gas and transportation infrastructure are on-going activities that will occur at the same time the project is under construction. Therefore, there is potential for mortality from those projects to act cumulatively with similar effects from the project. With mitigation, the project's contribution to cumulative effects is predicted to be negligible.

6.4.5.1 Mitigation Measures

Mitigation measures that can be implemented to mitigate the project's contribution to adverse cumulative wildlife and wildlife habitat effects are the same as those described for the effects assessment (Table 5.2). Therefore, no additional mitigation measures were deemed warranted for the project.

6.4.5.2 Evaluation of Significance

There are no situations where there is a high probability of occurrence of a permanent or long-term cumulative wildlife and wildlife habitat residual effect of high magnitude that cannot be mitigated (Table 6.2).

6.4.6 Socio-economic Components

The subsections below summarize the potential cumulative effects on other socio-economic components in the project RSA with a focus on specific communities that may be affected by changes in temporary population or temporary use of services. Residual effects from socio-economic components (Sections 5.14, 5.15, and 5.16) include:

- human occupancy and resource use:
 - ✦ disruption of land use activities during construction
 - ✦ increased demand on local and regional infrastructure and services
- social and cultural well-being:
 - ✦ change of social and cultural well-being

6.4.6.1 Disruption of Land Use Activities During Construction

The project will act cumulatively with oil and gas development, and agricultural activities to potentially disrupt land use activities during construction. Current development of the oil and gas fields in the area is anticipated to continue in southwestern Manitoba. Many companies hold mineral rights in the RSA, and each may have future development plans for resource leases.

Mitigation measures are outlined in Section 5.20 of this EA, and include appropriate notification to landowners and occupants and, if applicable, compensation for directly-affected landowners, in accordance with the land acquisition agreements. Landowners will also be notified of the approximate timing of construction and, if applicable, of the precautions that landowners may need to take during the short construction period. These mitigation measures are expected to reduce the residual effects resulting from the construction of the project on agricultural land activities.

Operation of the project will have minimal interaction with other land uses. The flowline design incorporated the weight of agricultural equipment for crossing a flowline and is addressed by the flowline

design. Therefore, no additional mitigation is required for normal agricultural practices. The flowline depth (minimum 1.5 m of cover) exceeds regulatory requirements and is sufficient to mitigate any interaction with agricultural practices.

6.4.6.2 Infrastructure and Services

The project will act cumulatively with other future construction projects and oil and gas projects in the RSA. The potential overlap in timing with other present and future projects and activities (i.e., oil and gas drilling, road construction) may increase demand on infrastructure and services during construction by contributing to an increase:

- in traffic on highways and local roads during construction
- use of waste facilities
- in demand for accommodation
- in demand for medical facilities and services

6.4.6.3 Social and Cultural Well-Being

The temporary workforce required for the construction of the project may act cumulatively with other temporary workers required for construction and energy development projects in southwestern Manitoba. Examples of other future projects or activities that may require temporary workforce include oil well drilling and road construction.

6.4.6.4 Mitigation Measures

Mitigation measures that can be implemented to mitigate the project's contribution to adverse cumulative socio-economic effects are the same as those described for the effects assessment (Table 5.2). Therefore, no additional mitigation measures were deemed warranted for the project.

6.4.6.5 Evaluation of Significance

There are no situations where there is a high probability of occurrence of a permanent or long-term cumulative socio-economic residual effect of high magnitude that cannot be mitigated (Table 6.2).

6.4.7 Accidents and Malfunctions

It is possible that substantial adverse effects could occur due to an accident or malfunction related to the construction or operation of the project. The potential risk is considered low for an accident or malfunction that would have substantial cumulative environmental effects. Tundra will have in place an Emergency Response Plan which outlines actions to immediately respond to accidents and malfunctions as well as to contain and clean-up after these incidents. Therefore, an evaluation of significance is not deemed warranted.

6.4.7.1 Mitigation Measures

Mitigation measures that can be implemented to mitigate the project's contribution to cumulative effects are the same as those described for the effects assessment (Table 5.2). Therefore, no additional mitigation measures were deemed warranted for the project.

6.4.7.2 Evaluation of Significance

As the project will not contribute to cumulative effects related to accidents and malfunctions, no evaluation of significance was conducted.

TABLE 6.2 Cumulative Effects Assessment

Predicted Cumulative Effects	Direction	Magnitude	Duration	Frequency of Occurrence	Spatial Extent	Reversibility	Probability of Occurrence	Prediction Confidence	Significance
SOILS AND SOILS CAPABILITY									
Reduced soil capability due to construction activities	Negative	Negligible	Short-term	Isolated	Local	Reversible in the short to medium-term	Low	High	Not significant
Reduced soil capability due to soil contamination	Negative	Negligible	Medium-term	Isolated	Regional	Reversible in the medium-term	Low	High	Not significant
WATER QUANTITY AND QUALITY									
Reduction in water quality due to accidental spill	Negative	Negligible	Medium-term	Isolated	Local	Reversible in the medium-term	Low	Medium	Not significant
ACOUSTIC ENVIRONMENT									
Temporary increase in noise during construction	Negative	Negligible	Short-term	Isolated	Local	Reversible in the short-term	High	High	Not significant
VEGETATION AND WETLAND COMMUNITIES									
Land clearing	Negative	Negligible	Medium to long-term	Isolated	Local	Reversible in the long-term	High	Medium	Not significant
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	Medium	Not significant
Alteration of wetland hydrology or water quality	Negative	Negligible	Medium-term	Isolated	Local	Reversible in the medium-term	Low	Medium	Not significant
WILDLIFE AND WILDLIFE HABITAT									
Amphibian mortality	No residual effects								
Reptile mortality	No residual effects								
Avifauna mortality	No residual effects								

Predicted Cumulative Effects	Direction	Magnitude	Duration	Frequency of Occurrence	Spatial Extent	Reversibility	Probability of Occurrence	Prediction Confidence	Significance
Mammal mortality	Negative	Negligible	Short-term	Occasional	Regional to extra-regional	Reversible in the short-term	Low	High	Not significant
WATER QUANTITY AND QUALITY									
Reduction in water quality due to accidental spill	Negative	Negligible to Low	Medium-term	Isolated	Local	Reversible in the medium-term	Low	Medium	Not significant
ACOUSTIC ENVIRONMENT									
Temporary increase in noise during construction	Negative	Negligible	Short-term	Isolated	Local	Reversible in the short-term	High	High	Not significant
SOCIO-ECONOMIC ELEMENTS									
Disruption of land use activities during construction	Negative	Negligible to low	Short-term	Occasional	Local	Reversible in the short-term	Low	Medium	Not significant
Increased demand on local and regional infrastructure and services	Neutral to negative	Negligible to low	Short-term	Occasional	Regional	Reversible in the short-term	Low	Medium	Not significant
Change of social and cultural wellbeing	Neutral to negative	Low	Short-term	Occasional	Regional	Reversible in the short-term	Low	Medium	Not significant

7 CONSTRUCTION AND RECLAMATION PLAN

7.1 Construction

7.1.1 Clearing and Vegetation Removal

Vegetation (i.e., trees, stumps, brush, crops, and other vegetation) will be cleared from the proposed construction RoW and any temporary workspaces, as needed, to facilitate construction activities. Equipment used during clearing activities may include chainsaws, rotary grinders, mulchers, chippers, or other tree-clearing equipment, as well as skidders, dozers, and excavators.

7.1.2 Stripping and Stockpiling Topsoil

7.1.2.1 Topsoil Salvage Depth

- Where topsoil is less than 30 cm, salvage topsoil to (1) colour change, (2) bottom of sod or duff layer, (3) plough layer, or (4) 10 cm depth, whichever is deepest. Increase minimum stripping depth to 15 cm where work side topsoil salvage is conducted.
- Where soil horizon differentiation is not readily distinguishable by colour, the Crew foreperson will provide direction based on an evaluation of soil texture, structure, and topsoil depth.
- Where required, conduct three-lift soil handling under dry or frozen conditions to minimize admixing of lower subsoil into the upper subsoil or topsoil.

7.1.2.2 Topsoil Salvage Width

Only the trench line will be stripped of topsoil in areas of native grassland, modified grassland, and wetlands. Other considerations include:

- salvage topsoil from all crossings where the width of the trench line will be increased to follow ground workplace safety and health regulations
- salvage topsoil from all areas that require grading
- salvage a greater width of topsoil at sharp side bends and at crossings of watercourses, roads, and foreign lines to accommodate a wider and deeper trench and larger workspace
- salvage topsoil where heavy traffic is anticipated as well as extremely dry areas to reduce loss of soil structure
- where grading is required in treed areas, salvage stripped material to a depth of approximately 15 to 20 cm
- limit the topsoil salvage width to reduce the potential for bringing stones to the surface

7.1.2.3 Topsoil Storage

Maintain separation between the topsoil and subsoil stockpiles (min 1 m). At locations where topsoil salvage is conducted to accommodate grading requirements, identify the topsoil stockpiles from the graded materials with a suitably marked survey stake or sign to minimize the risk of confusion at the time of restoration.

- Leave gaps in the soil windrows at obvious drainage courses and where needed to accommodate surface runoff.
- Leave gaps in the soil windrows to allow farm machinery, livestock, and wildlife to cross the construction RoW.
- Monitor the topsoil piles and other soil stockpiles for weed growth frequently if construction activities occur during the growing season. Implement weed control measures on topsoil stockpiles, where warranted.

7.1.3 Excavate Trench and Subsoil Stockpile

- Store excavated material in a manner that does not interfere with natural drainage patterns.
- Inspect the trench at the start of each day and remove any trapped animals from the trench before conducting construction activities.
- Reduce the length of open trench. Use reasonable efforts to limit the length of time that any one segment of trench is open, to limit the amount of trench sloughing, frost penetration, and interference with wildlife, landowners, and livestock.
- As trenching proceeds, identify locations where the trench wall instability affects non-salvaged topsoil areas. If non-salvaged topsoil areas are sloughing into the trench, suspend trenching operations until the topsoil is salvaged wide enough to prevent loss.
- Where requested by landowners, additional soil conservation activities may be required during trenching by excavating and storing different types of soils. Store topsoil and trench spoil separately.
- If construction occurs during wet conditions, prevent the flow of water along the trench by leaving hard or soft plugs at strategic locations, where dewatering could occur.

7.1.4 Backfill

- Prior to backfilling, inspect the trench for small mammals, reptiles, skids, refuse, welding rods, and other debris, and remove if present. Inspect the backfill material to ensure it is free of debris, rock, or other material that could damage the flowline.

- Backfill the trench without mixing spoil with the topsoil stockpile. Do not walk machinery on the topsoil stockpile while backfilling spoil.
- Avoid scalping of the sod layer on tame pasture lands, woodlands, hay lands, and native grassland when moving the spoil pile during backfill.
- Do not backfill large rocks in the upper 0.5 m of the trench on agricultural lands.
- Compact backfilled trench to the extent feasible, using suitable equipment along the trench line (e.g., grader). Avoid excessive trench crown height.

7.1.5 Crown Trench and Excess Trench Spoil

- Crown the trench with remaining spoil to allow for settlement. The height of the crown depends on land use, degree of compaction desired, swell coefficient of backfill, and soil temperature. An inspector will also monitor backfilling and compaction activities throughout construction.
- Leave breaks in the trench crown at obvious drainages and wherever seepage occurs, to minimize interference with natural drainage.
- Compact backfill where breaks have been left.

7.1.6 Recontour Right-of-Way

After spring break-up:

- Feather-out excess spoil over the salvaged portion of the construction RoW to minimize the creation of a permanent mound.
- Recontour the construction RoW and restore the pre-construction grades, wetland contours, and drainage channels.

7.2 Clean-up and Reclamation

7.2.1 Clean-up

- Remove equipment crossing structures, where required, before spring break-up unless otherwise approved.
- Collect and dispose of all construction-related garbage, debris, wastes, and hazardous material from the construction RoW in designated containers or at approved disposal facilities.

7.2.2 Reclamation for Soils and Subsoils

- Rip compacted subsoils, temporary access trails, and soils damaged during wet weather to a depth of 30 cm. If soils are moist, postpone ripping of subsoils until soils dry to ensure that the soils fracture when ripped.
- Employ a subsoiler plough (e.g., para-tiller) along segments of the construction RoW where topsoil salvage did not occur, and subsoil compaction is severe. Do not use a subsoiler plough on native vegetation communities such as grasslands and shrublands.
- Blade rutted subsoils flat prior to topsoil replacement, where required.
- Dispose of excess rock displaced from the trench as directed by the landowner and/or appropriate regulatory authority. Do not dispose of rocks in wetlands.
- Remove stones from disturbed subsoil to achieve equivalence with the surrounding subsoil. Also remove stones from the upper 30 cm of the trench and the grade spoil 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 appropriate regulatory authority.
- Immediately before replacing topsoil, cut a clean edge with a grader. Distribute edge cut material evenly over the prepared subsoil surface.
- Replace topsoil/stripped material as evenly as possible over areas of the construction RoW where topsoil/stripping salvage was conducted.

7.2.3 Regrading and Recontouring

- Re-grade areas with vehicle ruts, erosion gullies, or where the trench has settled.
- Recontour the construction RoW to restore surface drainage, wetland contours, and the approximate pre-construction profile.

7.2.4 Revegetation

- Cultivate the construction RoW where it crosses fields to a depth adequate to alleviate surface compaction and in a manner acceptable to the landowner. Do not cultivate into the subsoil. Limit cultivation in areas of fine textured soils to prevent pulverization of the soil.
- Disc and harrow only if the site is to be seeded immediately. Otherwise, leave the ripped topsoil in a rough condition until immediately prior to seeding, to reduce the wind erosion potential.
- Cultivate hay and tame pastureland if the sod layer is broken or badly compacted.

- Restore the pre-construction contours of wetlands and remove any excess backfill to an upland area approved by the landowner.
- Re-vegetate native grassland using an approved, Manitoba-sourced native seed mix.

8 INSPECTION AND MONITORING

8.1 Mitigation Measures During Construction

Mitigation measures to eliminate or minimize the effects on the environment during each phase of the project are described for each environmental and socio-economic component in Section 5.20, Table 5.2 of this EA. Additional mitigation measures to address the cumulative effects that may result from the project's interactions between past, present, and future projects; developments; and land uses located in the vicinity of the project, with residual effects from the project, are provided in Section 5 of this EA. Most of these mitigation measures are based on industry-standard mitigation and specific requirements of regulatory agencies, including:

- *Guidelines for Alternate Soil Handling Procedures during Pipeline Construction* (Pettapiece and Dell 1996)
- *Petroleum Industry Activity Guidelines for Wildlife Species at Risk in the Prairie and Northern Region* (Environment Canada 2009)
- *The Heritage Resources Act* (Government of Manitoba 1985)
- *National Energy Board, Onshore Pipeline Regulations, SOR/99-294* (Canada Energy Regulator 2021)

8.1.1 Environmental Contingency Plans and Procedures for Construction

Tundra or contractors hired by Tundra, will develop project-specific environmental contingency plans and procedures that provide guidelines for construction activities where mitigation described either in Section 5 or 6 of this EA, will require alternative/additional actions such as:

- accidental spills
- directional drilling procedures
- construction waste management

8.1.1.1 Accidental Spills

As part of the construction bid process, contractors will be required to submit a management plan for spills and releases during construction. The plan will address potential spills and releases of test fluid (e.g., hydro-testing) and operating fluids (e.g., fuel, lubricants, etc.) as well as including proactive

measures in place to prevent them. The plan will be evaluated as part of the contractor selection process, and where deemed inadequate, the plan will need to be modified.

8.1.1.2 General Measures

The contractor's contingency plan will:

- Ensure that supervisory personnel are aware of the contingency plan prior to commencement of drilling activity.
- Ensure that drilling mud composition is limited to bentonite mud drilling systems, fresh water and, if warranted, other inert additives. No toxic additives will be allowed. The contractor will provide Material Data Safety Sheets (MSDS) to Tundra prior to the commencement of drilling.
- Ensure there is adequate capacity to capture anticipated volumes of drilling mud that could be released during pullback and other drilling operations at the entry and exit points (i.e., sump or holding tanks).
- Prepare a clean-up plan prior to drilling. The plan will be prepared by the drilling contractor in consultation with Tundra.
- Follow applicable provincial and federal regulations and guidelines.

8.1.1.3 Emergency Response and Clean-up Procedures

The loss of drilling mud into seams of coarse material, fissures, etc. (i.e., frac out) can occur during drilling operations. Since drilling fluid does not always flow to the surface, a loss of fluid does not necessarily indicate that the drilling mud has been released near shore areas or into a watercourse.

In the event a frac out is observed or suspected, the following measures will be implemented:

- Suspend drilling operations immediately if excessive loss of drilling mud is noted. Conduct a detailed examination of the drill path and surrounding area for evidence of a release at the surface or in the waterway.
- Immediately notify the Site Engineer and the Construction Supervisor if a drilling mud release and/or excessive drilling mud loss is observed.
- If the drilling mud release enters a watercourse or wetland, the Construction Supervisor will immediately notify Tundra.
- Contain and further prevent drilling mud from entering the watercourse from near shore areas by installing a berm of subsoil, sandbags, or other material approved by the Construction Supervisor.

Drilling will only be allowed to resume if the potential for significant adverse impacts on the environment is low, as determined by the Construction Supervisor in consultation with Manitoba Environment officials. Clean-up procedures will be subject to site-specific conditions during the time of release.

8.1.2 Construction Waste Management

The contractor will be required to provide a project-specific waste management plan. The plan will ensure compliance with all local and provincial regulations governing the handling of waste material. The plan will be evaluated as part of the contractor selection process, and where deemed inadequate, the plan will need to be modified. The plan will be enforced by construction personnel during construction.

8.1.3 Company Management Plans for Construction

Tundra will employ existing operations and maintenance procedures for the operation of the project and will include:

- general reference procedures, including topics such as regulatory compliance, incident reporting, public awareness, record keeping, and training
- safety procedures, including topics such as safe work practices, hazard assessment, confined space entry, fire protection, lock-out/tag-out, and personal protective equipment
- flowline facility procedures, foreign crossings, flowline repair, and testing
- welding procedures, including welder qualification requirements
- emergency response procedures, including pre-emergency preparedness, emergency response responsibilities and actions, product containment, recovery and cleanup, local release control point mapping, and mitigation measures

8.2 Construction Personnel Roles and Responsibilities

Construction personnel for the project may include:

- non-supervisory general labour personnel
- supervisory construction personnel
- equipment operators

All personnel will be expected to:

- understand how their respective job duties may impact the environment
- maintain a positive attitude toward environmental protection
- report all incidents that have the potential to impact the environment

8.3 Environmental Monitoring During Construction

Responsibilities of the Tundra Construction Supervisor will be to monitor construction activities and oversee the implementation of mitigation and reclamation measures throughout the duration of the flowline project. Environmental monitors will be employed in to monitor HDD activities at the Pipestone Creek and will report to the Tundra construction supervisor.

8.3.1 Horizontal Directional Drilling (HDD) under Pipestone Creek

Environmental monitors will collect water turbidity measurements before, during, and after HDD operations on the two Pipestone Creek crossings (west and east of Cromer, Manitoba) to ensure regulatory compliance. Monitoring procedures are designed to measure potential exceedances according to the Canadian Council of Ministers of the Environment (CCME) *Water Quality Guidelines for the Protection of Aquatic Life* (CCME 2014). Sampling protocol will follow Matrix standard operating guidelines (SOG) to ensure regulatory compliance.

The HDD will be designed to minimally disturb the native grassland segments adjacent to Pipestone Creek by creating bell-holes no larger than necessary and avoiding rutting to prevent possible weed invasion.

8.4 Post-construction Monitoring Programs

Tundra will undertake a post-construction assessment, if necessary, to:

- evaluate the reclamation of areas disturbed through construction of the project
- determine if weed infestation is present
- address any outstanding landowner issues

The Project RoW will be visually inspected during the first growing season following construction for vegetation issues such as weed infestations or poor vegetation establishment. The vegetation assessment will be completed in the late summer/early fall when vegetation is mature enough for accurate identification and evaluation. Areas of terrain instability that may be susceptible to erosion will also be visually inspected at this time.

9 CONCLUSIONS

Tundra is proposing to construct six new flowline segments connected to two existing in-ground flowline segments, totalling 46 km in length within a 20 m wide RoW. These flowlines will be used to collect and transport unrefined solution natural gas from six existing battery facilities to the Steel Reef compressor terminal. 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 GHG emissions reduction of ~179,356 tonnes of CO₂ equivalent/year.

No archaeological resources, SAR plants, or wildlife will be negatively impacted by this project. The baseline environmental and socio-economic conditions that may be affected by the project are well understood, based on appropriately-timed field studies completed in 2021 (vegetation, wildlife and wildlife habitat, wetlands) as well as focused desktop studies conducted for the baseline environmental and socio-economic assessment for all elements. The construction and operation methods that will be used for the project are standard practices for similar projects in southern Manitoba. 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. Timing the construction of the Project from mid-July to end of December has 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. There are no situations where there is a high probability of occurrence of a permanent or long-term residual effect of high magnitude that cannot 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 including agriculture (e.g., farming activities), transportation (e.g., roads and railways), utilities (e.g., transmission lines), petroleum production transport (e.g., pipeline and facility maintenance), oil and gas development (e.g., pipelines, associated facilities), as well as rural residences. Cumulative residual effects of the project are anticipated to be reversible in the short- to long-term and are generally of low magnitude. Additional mitigation measures will be implemented, if warranted, to minimize potential cumulative effects. There are no situations where there is a high probability of occurrence of a permanent or long-term residual effect of high magnitude that cannot be mitigated. Consequently, cumulative residual effects associated with the project are predicted to be not significant.

Tundra has developed general and project-specific programs to ensure that the recommended mitigation measures and commitments made in the EA are implemented throughout the construction and operations phases of the project. Examples of project-specific programs that will be incorporated include environmental protection planning, training programs, environmental monitoring, contingency plans, and post-construction monitoring plans. Through the implementation of these programs, the EA concludes that the project can be constructed and operated without causing significant adverse environmental effects.

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