

CUMULATIVE EFFECTS ASSESSMENT

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FIGURES

FIGURE 7.1 1:250,000 SCALE MAP OF THE PROPOSED PIPELINE PROJECT AREA

7.0 CUMULATIVE EFFECTS ASSESSMENT

The cumulative effects assessment evaluates the adverse residual effects directly associated with the Provident Pipeline Project (as identified in Section 6.0 of this EA) in combination with the adverse residual effects arising from other projects and activities that have been or will be carried out in the vicinity of the Provident Pipeline Project (Figure 7.1).

7.1 Methodology

The assessment methodology used to evaluate the cumulative effects of the adverse residual environmental and socio-economic effects of the Project contained the following steps:

- identification of potential adverse residual effects of the Project;
- determination of spatial and temporal boundaries for each biophysical and socio-economic element where adverse residual effects have been identified for the Project;
- identification of other past, present and future projects and activities with adverse residual effects which may act in combination with the adverse residual effects of Project;
- identification of potential cumulative effects;
- development of technically and economically feasible mitigative measures; and
- determination of the significance of the cumulative effects.

This cumulative effects assessment methodology has been developed based party on the CEA Agency's "*Cumulative Effects Assessment Practitioners Guide*" (Hegmann *et al.* 1999), and the *CEA Act*.

7.1.1 Identification of Adverse Residual Effects

The environmental and socio-economic effects assessment presented in Section 6.0 of this EA describes and justifies the methodology used to predict residual effects associated with the Provident Pipeline Project.

If a physical, biological and socio-economic element evaluated in the environmental and socio-economic effects assessment had no adverse residual effects predicted, then no further analysis of that element is required in the cumulative effects assessment. In addition, adverse residual effects arising from accidents and malfunctions also may potentially act cumulatively with the adverse residual effects from other projects and activities in the area and were analyzed where applicable.

7.1.2 Spatial and Temporal Boundaries

The spatial boundaries used in the cumulative effects assessment varied depending on the scope of activities and the element in question. Although most Project-related effects on biophysical and socio-economic elements are limited to the Footprint, some elements could experience some form of Project-related impact beyond the Footprint but within the LSA (e.g., 1 km either side of the pipeline right-of-way for sensory disturbances to wildlife). For other elements, Project-related effects could extend beyond the LSA to the RSA (e.g., for Infrastructure and Services element, the RSA includes large communities that will be used as construction offices).

Similarly, the temporal boundaries used in the cumulative effects assessment include past development (up to the construction of the Project), the construction phase of the proposed development commencing in 2011, to the expected life of the Provident Pipeline Project (*i.e.*, 50+ years).

7.1.3 Past, Present and Future Projects

The other projects and activities that have occurred or that are likely to occur in the Provident Pipeline Project area will vary depending on the spatial boundaries identified for the specific biophysical or socio-economic element. The criteria used to determine projects that may act cumulatively with the Project are:

- projects or activities that have been already built or conducted in the vicinity of the Project; or
- projects that have been proposed (public disclosure) and/or have been approved to be built in the next year or two years, but not yet built in the vicinity of the Project.

7.1.3.1 Past Development

European settlement of southern Manitoba began as early as the mid-1700s with the establishment of trading posts. Agricultural settlement began in the early 1800s but population growth prior to the 1870s and the construction of the railroad was slow and sporadic. Once constructed, the railroad provided access to grain markets in the Great Lakes, and during the 1800s, the population in southern Manitoba doubled.

Prior to agricultural settlement, southern Manitoba was composed of rough fescue grasslands (United Nations Educational, Scientific and Cultural Organization 2005). During the late 19th century, these grasslands began to be altered as the land provided fertile soil suitable for farming and agriculture (Weir 2006). Agriculture in this area mainly consisted of raising cattle and growing grain (Webb and Vodden 1997). Presently, agriculture remains one of Manitoba's key industries with 19.1 million acres of land farmed in 1996. Wheat is the most important crop and is produced in abundance in southern Manitoba (Travel Manitoba 2009). Other major crops grown in southern Manitoba include oats, barley, canola and flax. Agriculture is the dominant land use in southern Manitoba.

Mining of industrial minerals including sand and gravel, building stone, lime, silica sand, quartz, salt and sulphur, began in southern Manitoba in the early 1800s (Environment Canada 1977). Rapid growth in production occurred during World War II as construction projects throughout the province increased. Although there is still mining activity in southern Manitoba, there was a shift to the mining of metallic minerals in the northern portion of Manitoba.

Oil was first discovered in the Virden area in 1951. Drilling operations peaked in 1956. This oilfield has recently been resurrected and is growing rapidly with over 250 wells drilled in 2005 (Manitoba Science, Technology, Energy and Mines 2006).

EOG Resources Canada Inc. recently constructed an oil pipeline from Waskada to Cromer in winter 2010. Several Enbridge pipelines were constructed in the early 1950s. The Enbridge Terrace Phase I pipeline project from the Saskatchewan / Manitoba border to the US border near Gretna was constructed in 1999. The Enbridge Alberta Clipper Expansion Project that was mechanically completed and ready to receive oil into the pipeline as of April 1, 2010. Enbridge's Southern Lights Project was came into service July 2010.

7.1.3.2 Current and Ongoing Development Activities

Other projects or activities that are currently ongoing in the LSA (*i.e.*, 2 km buffer centred on the proposed pipeline right-of-way) include the following:

- agricultural activities (*e.g.*, farming and livestock grazing);
- transportation activities (*e.g.*, regular and commercial vehicle traffic and rail traffic as well as maintenance activities on county roads, bridges, highways and rail lines);
- utility activities (*e.g.*, maintenance on powerline rights-of-way, upgrades to water distribution facilities);

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-
- oil, gas and other hydrocarbon shipping (e.g., pipeline and facility maintenance, line patrol); and
 - petroleum industry construction projects;

7.1.3.3 Proposed Future Development

The Manitoba Conservation online index of public registries and list of latest licenses issued was checked for any projects or activities that could interact with the Provident Pipeline Project (Manitoba Conservation 2010). Of the numerous projects listed, one project was identified in the general vicinity of the Provident Pipeline Project. EOG Resources Canada Inc. recently constructed an oil pipeline from Waskada to Cromer in winter 2010 (Public Registry File # 5450.00). However, due to the scope, location and scheduling of this project, it was determined not to have potential to interact with the Provident Pipeline Project.

The Canadian Environmental Assessment Registry (CEAR) was also checked for proposed or ongoing projects that could potentially interact with the Provident Pipeline Project. Of the numerous projects listed, some were identified in the general vicinity of the Provident Pipeline Project. This includes the Enbridge Bakken Pipeline Project near Cromer, Manitoba (CEAA Public Registry File # 10-01-58441). However, due to the scope, location and scheduling of this project, it was determined not to have potential to interact with the Provident Pipeline Project.

Additional sources for projects that could have cumulative interactions with the Provident Pipeline Project, aside from consultation with various government representatives, are limited due to the lack of provincial information available online.

7.1.4 Prediction of Cumulative Effects

Predictions of potential cumulative effects that may occur during construction and operation of the Provident Pipeline Project relied in part on historical trend data and information on resource status within the area of the Project. In addition, agency representatives were asked during the government consultation process to identify other existing developments or proposed projects in the vicinity that could act cumulatively with the Project.

The cumulative effects of the Project depend on many factors, including: the source of the disturbance; spatial and temporal context; resilience of the receiving environment; and whether the disturbances combine in a linear, exponential, discontinuous, additive, synergistic or other manner. The level of detail provided in the analysis reflects the extent to which a cumulative effect on a biophysical or socio-economic element is probable, its likely scale or magnitude of effect, as well as the extent to which these effects can be accurately and reasonably quantified and described relative to the receiving environment.

7.1.5 Mitigative Measures

In order to ensure that potential cumulative environmental and socio-economic effects are minimized during pipeline construction and/or operation, mitigative measures are provided, where warranted.

7.1.6 Determination of Significance

The significance of the cumulative effects is determined in a manner similar to that employed in determining the significance of residual effects as previously outlined in Section 6.1.6 of this EA. The six criteria used to assess the significance of cumulative effects are defined in Table 6.3 of this EA with the exception of spatial and temporal context, which are discussed in Section 7.1.2 of this EA.

All significance assessment criteria (*e.g.*, temporal context, magnitude, etc.) were considered by the assessment team for each cumulative environmental or socio-economic effect. Where appropriate, the key or most influential assessment criteria used to determine the significance of each residual effect(s) are noted.

7.2 Cumulative Effects Assessment - Project Construction and Operation

Using the cumulative effects assessment methodology described in Section 7.1 of this EA, the following subsections evaluate the adverse residual effects directly associated with the Provident Pipeline Project in combination with the adverse residual effects arising from other projects and activities that have been or will be carried out in the vicinity of the Project.

Of the physical, biological and socio-economic elements evaluated in the environmental and socio-economic effects assessment (Section 6.0 of this EA), only the Social and Cultural Well-Being, Human Health, and Employment and Economy elements had no adverse residual effects predicted for any component of the Provident Pipeline Project and, consequently, require no further analysis in the cumulative effects assessment.

Those biophysical and socio-economic effects in which residual effects are predicted and are analyzed in the cumulative effects assessment include:

- physical elements such as physical environment, soil capability, water quality and quantity, GHG and air quality, and acoustic environment;
- biological elements such as fish and fish habitat, wetlands, vegetation, wildlife and wildlife habitat, and species at risk; and
- socio-economic elements such as human occupancy and resource use, heritage resources, traditional land and resource use, and infrastructure and services.

In addition, residual effects arising from accidents and malfunctions may also potentially act cumulatively with other projects and activities in the area.

An evaluation of significance of cumulative residual effects was conducted for the Provident Pipeline Project. Details of the significance evaluation are discussed below.

7.2.1 Physical Environment

The Provident Pipeline Project will act cumulatively with past activities and future activities, in those minor areas of instability in fill material and an incremental change in topography may occur.

Given that any adverse residual effects are confined to the construction right-of-way, no additional mitigative measures were deemed warranted. Consequently, the cumulative residual effects of pipeline construction and operation on the physical environment are considered to be of low magnitude.

Based on the review, there are no situations where there is a high probability of occurrence of a permanent or long-term cumulative effect of high magnitude that cannot be technically or economically compensated. Consequently, it is concluded that the cumulative residual effects of pipeline construction

and operation on physical environment will be not significant.

7.2.2 Soil Capability

The Provident Pipeline Project will act cumulatively with previous disturbances in that an incremental change in soil capability will occur. Past activities which have affected soil capability are largely attributed to agricultural activities and previous pipeline construction programs.

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 6.0 of this EA. With the implementation of the above mitigation measures, it is anticipated that the cumulative residual effects of pipeline construction and operation on soil capability are anticipated to be of low magnitude.

Based on this review, there are no situations where there is a high probability of occurrence of a permanent or long-term cumulative effect of high magnitude that cannot be technically or economically compensated. Consequently, it is concluded that the cumulative residual effects of construction and operation of the Provident Pipeline Project on soil capability will be not significant.

7.2.3 Water Quality and Quantity

The Provident Pipeline Project will act cumulatively with previous disturbances in that an incremental change of water quality and quantity will occur. These residual effects include alteration of natural drainage patterns, disruption of water well flows and disruption of shallow groundwater flow where springs are encountered.

In general, no additional mitigation pertaining to water quality and quantity is warranted given the anticipated effectiveness of the proposed mitigation outlined in Section 6.0 of this EA.

With the implementation of the above mitigation measures, it is anticipated that the cumulative residual effects of the Provident Pipeline Project on water quality and quantity are anticipated to be reversible in the immediate to short-term and generally of low magnitude.

Based on this review, there are no situations where there is a high probability of occurrence of a permanent or long-term cumulative effect of high magnitude that cannot be technically or economically compensated. Consequently, it is concluded that the cumulative residual effects of pipeline construction and operation on water quality and quantity will be not significant.

7.2.4 Greenhouse Gases and Air Quality

Greenhouse Gas Emissions

The Provident Pipeline Project will act cumulatively with other proposed projects in that an incremental increase in indirect GHG emissions will be attributable to the operation of a flare stack at a proposed facility at LSD 13-17-10-18 WPM. Consequently, the cumulative residual effect of the Provident Pipeline Project on GHG emissions is of low magnitude.

Nuisance Air Emissions During Construction

The construction of the Provident Pipeline Project will act cumulatively with present air emission sources in that an incremental increase in nuisance vehicle emissions, dust and smoke during construction will occur. Residual effects expected to act cumulatively are associated with vehicle traffic arising from transportation activities, agricultural activities and ongoing pipeline maintenance activities. Given that the mitigation measures outlined in Table 6.2 of this EA are accepted industry standard practices, the cumulative residual effects are generally of low magnitude and reversible in the immediate to short-term.

Nuisance Air Emissions During Maintenance

The Provident Pipeline Project will also act cumulatively with ongoing air emission sources in that an incremental increase in nuisance vehicle emissions during pipeline maintenance activities will occur. This cumulative residual effect on air quality is reversible in the short-term and of negligible to low magnitude.

7.2.5 Acoustic Environment

Nuisance Noise During Construction

The Provident Pipeline Project will act cumulatively with present noise sources in that an incremental increase in nuisance noise during construction will not occur. Residual effects expected to act cumulatively are associated with vehicle and equipment traffic arising from transportation activities, agricultural activities and ongoing pipeline maintenance activities and operation of facilities.

With the implementation of mitigative measures to reduce the potential for noise impacts during the construction of all components of the Provident Pipeline Project, this cumulative residual effect on the acoustic environment is considered to be of low magnitude.

Nuisance Noise During Maintenance

The Provident Pipeline Project will also act cumulatively with ongoing noise sources in that an incremental increase in nuisance noise during pipeline and facility maintenance activities will occur. This cumulative residual effect on acoustic environment is immediately reversible and of negligible to low magnitude.

Based on this review, there are no situations where there is a high probability of occurrence of a permanent or long-term cumulative effect of high magnitude that cannot be technically or economically compensated. Consequently, it is concluded that the cumulative residual effects of the construction and operation of the Provident Pipeline Project on acoustic environment will be not significant.

7.2.6 Fish and Fish Habitat

7.2.6.1 Ecological Context

The ecological context of fish and fish habitat was previously discussed in Section 6.2.6 of this EA.

7.2.6.2 Significance

Habitat for many fish species in watercourses in the vicinity of the Provident pipeline route is generally confined to the larger watercourses. The habitat available for fish in most of the smaller watercourses is generally limited by inadequate streamflows, high summer temperatures, siltation from adjacent agricultural lands and / or trampling of the banks and streambed. Fish production in some of the larger watercourses is anticipated to be limited by eutrophication, occasional reduced flows and low dissolved oxygen levels. In addition, ditching of some smaller watercourses has occurred to improve drainage on agricultural lands while streamflows in a few watercourses are regulated by dams and/or weirs. Habitat utilization in some of the smaller watercourses is confined to the spring due to inadequate streamflows during the remainder of the year.

Past activities which have affected riparian habitat and instream habitat at watercourse crossings along the route include agricultural activities, roads and railways.

Disturbance of Riparian Habitat

The construction right-of-way of the Provident Pipeline Project and will not result in an incremental loss or alteration of riparian habitat as no instream construction will be undertaken. Also, bellhole excavations for

boring will occur outside of riparian areas.

There will be no cumulative residual effect as there will be no incremental increase in riparian habitat loss or alteration.

Contamination from Spills during Construction and Operations

Mitigative measures will be implemented to minimize the risk of small spills during the construction of the Provident Pipeline Project. Contingency plans are in place to address the containment and clean up of spills. Should a spill of fuel, lubricant or other hazardous material occur within or near a watercourse during construction fish and fish habitat could be adversely affected.

Although the effects of a large release into watercourse by the proposed pipeline would be of high magnitude and could be considered significant, the probability for release of high magnitude into a watercourse is low.

Based on this review, there are no situations where there is a high probability of occurrence of a permanent or long-term cumulative effect of high magnitude that cannot be technically or economically compensated. Consequently, it is concluded that the cumulative residual effects of pipeline construction and operation on fish and fish habitat will be not significant.

7.2.7 Wetlands

7.2.7.1 Ecological Context

The ecological context of wetlands was previously discussed in Section 6.2.7 of this EA.

7.2.7.2 Significance

The pipeline component of the Provident Pipeline Project will act cumulatively with past and future activities in that alteration of wetland function may occur. Past activities which have affected wetlands include agricultural activities, creation of roads and railways, and oil and gas activities (*i.e.*, pipeline rights-of-way).

Wetlands in the area were avoided by the proposed pipeline during the routing selection process. No construction through wetlands is proposed. No additional mitigation is deemed warranted.

Based on this review, there are no situations where there is a high probability of occurrence of a permanent or long-term cumulative effect of high magnitude that cannot be technically or economically compensated. Consequently, it is concluded that the cumulative residual effects of pipeline construction and operation on wetlands will be not significant.

7.2.8 Vegetation

7.2.8.1 Ecological Context

The ecological context of vegetation was previously discussed in Section 6.2.8 of this EA.

7.2.8.2 Significance

Alteration in Native Vegetation and Vegetation Important to Wildlife Along the Proposed Route

The pipeline component of the Provident Pipeline Project will act cumulatively with past and future activities resulting in the clearing of vegetation in that an incremental change in native vegetation will occur. Past activities which have affected native vegetation are largely attributed to clearing and ground disturbance associated with agricultural activities. Other past activities contributing to the change in native

vegetation over time include transportation activities (*i.e.*, for the creation of roads and railways), oil and gas activities (*i.e.*, pipeline and facility development), utilities (*i.e.*, powerlines), rural residential development and urban development.

The cumulative residual effect of the pipeline component of the Provident Pipeline Project on alteration of vegetation is considered to be of low to medium magnitude.

Loss or Alteration of Rare Vascular Plant Species or Plant Communities of Concern

The Provident Pipeline Project will act cumulatively with past and future activities in that rare vascular plant species or plant communities may be lost or altered. Past activities which have affected native vegetation are largely attributed to clearing and ground disturbance associated with agricultural activities. Other past activities contributing to the loss or alteration of rare vascular plants and sensitive plant communities over time include transportation activities (*i.e.*, for the creation of roads and railways), oil and gas activities (*i.e.*, pipeline and facility development), utilities (*i.e.*, powerlines), rural residential development and urban development.

For each rare vascular plant and sensitive plant community location along the Provident Pipeline Project route identified during the spring/early summer 2011 supplemental study, appropriate site-specific protection measures will be selected from the suite of proven and effective mitigation strategies outlined in Appendix 6B. The mitigation will be selected in order that the local population of rare vascular plant species and sensitive plant communities are not placed at risk. The cumulative residual effect of the pipeline component of the Provident Pipeline Project on rare vascular plants and sensitive plant communities is considered to be of medium magnitude.

Weed Introduction and Spread

The Provident Pipeline Project will act cumulatively with past and future activities in that weeds may be introduced and spread. Weeds typically establish in areas that have been previously disturbed. Past activities resulting in ground disturbance and potential introduction and spread of weeds include agriculture, creation of roads and railways as well as past pipeline and facility development.

In general, no additional weed mitigation is warranted given the proven effectiveness of the proposed weed-related mitigation outlined in Section 6.0 of this EA. With the implementation of the above mitigation measures, it is anticipated that the cumulative residual effect of the Provident Pipeline Project on weed growth and spread is anticipated to be of low magnitude.

Based on this review, there are no situations where there is a high probability of occurrence of a permanent or long-term cumulative effect of high magnitude that cannot be technically or economically compensated. Consequently, it is concluded that the cumulative residual effects of construction and operation of the Provident Pipeline Project on vegetation will be not significant.

7.2.9 Wildlife and Wildlife Habitat

7.2.9.1 Ecological Context

The ecological context of wildlife and wildlife habitat was previously discussed in Section 6.2.9 of this EA.

7.2.9.2 Significance

Alteration of Wildlife Habitat Along the Proposed Route

The Provident Pipeline Project will act cumulatively with past and future activities result in that an incremental alteration of wildlife habitat will occur. Past activities which have affected wildlife habitat in the vicinity of the proposed route are largely attributed to clearing and ground disturbance associated with agricultural activities. Other past activities contributing to the alteration of wildlife habitat over time include transportation activities (*i.e.*, for the creation of roads and railways), oil and gas activities (*i.e.*, pipeline

and facility development), utilities (*i.e.*, powerlines), rural residential development and urban development.

Proven mitigative measures to minimize disturbance such as trench width stripping on non-cultivated lands and restore wildlife habitat (*e.g.*, appropriate seed mixes), will be implemented during pipeline construction. In addition, wildlife surveys will be conducted in spring 2011 to identify site-specific habitat. In the event that a site-specific wildlife feature is discovered, appropriate mitigation will be selected. Pre-clearing and pre-mowing of the construction right-of-way will be undertaken, if warranted. No other additional mitigation is deemed warranted. The cumulative residual effect of the pipeline component of the Provident Pipeline Project on alteration of wildlife habitat is considered to be of low to medium magnitude

Sensory Disturbance of Wildlife During Construction

The Provident Pipeline Project will act cumulatively with present sources of audio and visual disturbances, and future activities in that wildlife will experience sensory disturbances resulting from construction activities.

The cumulative residual effect of the Provident Pipeline Project on sensory disturbance of wildlife during construction is considered to be of low magnitude.

Wildlife Mortality

The Provident Pipeline Project may act cumulatively with other projects which also have the potential to increase wildlife mortality. However, given that mitigation measures to reduce the potential for wildlife mortality on the commute to and from the job site and along the construction right-of-way will be implemented during construction, the probability of the construction of the Provident project resulting in mortality levels which would place a local wildlife population at risk is considered to be low.

Based on this review, there are no situations where there is a high probability of occurrence of a permanent or long-term cumulative effect of high magnitude that cannot be technically or economically compensated. Consequently, it is concluded that the cumulative residual effects of construction and operation of the Provident Pipeline Project on wildlife and wildlife habitat will be not significant.

7.2.10 Species at Risk

Fish Species at Risk

The Provident Pipeline Project will act cumulatively with past and future activities which have fish species at risk or their habitat. Past activities affecting riparian habitat include agricultural activities, creation of roads and railways, and previous pipeline crossings.

Measures to minimize disturbance of riparian areas and disturbance of instream habitat in the watercourse during construction and post-construction have been outlined in Section 6.0 of this EA. The cumulative residual effect of the pipeline on fish species at risk is considered to be of low magnitude.

Vascular Plant Species at Risk

The Provident Pipeline Project will act cumulatively with past and future activities in that vascular plant species at risk may be lost or altered. Past activities which have affected native vegetation are largely attributed to clearing and ground disturbance associated with agricultural activities. Other past activities contributing to the loss or alteration of vascular plant species at risk over time include transportation activities (*i.e.*, for the creation of roads and railways), oil and gas activities (*i.e.*, pipeline and facility development), utilities (*i.e.*, powerlines), rural residential development and urban development.

Studies for vascular plant species at risk will be undertaken along the Provident Pipeline Project route during spring/early summer 2011. For each vascular plant species at risk location, appropriate site-

specific protection measures will be selected from the suite of proven and effective mitigation strategies outlined in Appendix 6B of this EA. The mitigation will be selected in order that the local population of vascular plant species at risk are not placed at risk. The cumulative residual effect of the Provident Pipeline Project on vascular plant species at risk is considered to be of medium magnitude.

Wildlife Species at Risk along the Proposed Route

The Provident Pipeline Project will act cumulatively with past and future activities which affect northern leopard frogs, loggerhead shrikes, long-billed curlews, burrowing owls or their habitat. Past activities which have affected wildlife habitat are largely attributed to clearing and ground disturbance associated with agricultural activities. Other past activities contributing to the loss or alteration of wildlife habitat over time include transportation activities (*i.e.*, for the creation of roads and railways), oil and gas activities (*i.e.*, pipeline and facility development), utilities (*i.e.*, powerlines), rural residential development and urban development.

Mitigative strategies for the project include the application of timing constraints applicable to the sensitive habitats to construction activities unless otherwise approved by wildlife authorities and salvaging and removal of animals in the trench. In addition, contingency measures have been developed to ensure that appropriate mitigative measures are available to minimize potential impacts on wildlife species at risk and their habitat identified during future surveys (Appendix 6B of this EA). The cumulative residual effect of the Provident Pipeline Project on wildlife species at risk is considered to be of low to medium magnitude.

Summary

There are no situations where there is a high probability of occurrence of a permanent or long-term cumulative effect of high magnitude that cannot be technically or economically compensated. Consequently, it is concluded that the cumulative residual effects of construction and operation of the Provident Pipeline Project on species at risk will be not significant.

7.2.11 Human Occupancy and Resource Use

Disruption of Land Use Activities During Pipeline Construction

The Provident Pipeline Project will act cumulatively with other proposed projects to potentially disrupt land use activities during construction. Depending on the season, the pipeline construction of the Provident Pipeline Project may disrupt present land use activities along the route including farming, ranching, hunting, guide outfitting, water-based recreation (fishing, canoeing) and outdoor recreation.

Mitigative measures proposed in Section 6.0 of this EA, including appropriate notification and, if applicable, compensation, will greatly reduce the residual effects resulting from the construction of these pipeline projects. The cumulative residual effect of the Provident Pipeline Project on land use activities is considered to be of low magnitude.

Summary

There are no situations where there is a high probability of occurrence of a permanent or long-term cumulative effect of high magnitude that cannot be technically or economically compensated. Consequently, it is concluded that the cumulative residual effects of construction and operation of the Provident Pipeline Project on human occupancy and resource use will be not significant.

7.2.12 Heritage Resources

The Provident Pipeline Project will act cumulatively with previous activities in that known and previously unidentified buried heritage resources may be disturbed.

No segments of the pipeline route will traverse lands with heritage resources, therefore, adverse effects

on archaeological resources during construction is not expected.

With the adoption of appropriate mitigative strategy outlined in Section 6.0 of this EA, including the Heritage Resources Discovery Contingency Plan (Appendix 6B of this EA), valuable heritage resource information pertaining to any heritage resource sites, which could otherwise be destroyed during construction activities, may be retrieved and documented. The permanent loss of in situ data will be balanced by the information gained through the mitigation strategy. No additional mitigation is deemed warranted. An assessment of cumulative effects to the known heritage resource data base indicates a magnitude of low and with the compensatory effects of mitigative studies, it is anticipated that the magnitude of cumulative residual effects on previously recorded heritage resources will also be low.

Based on this review, there are no situations where there is a high probability of occurrence of a permanent or long-term cumulative effect of high magnitude that cannot be technically or economically compensated. Consequently, it is concluded that the cumulative residual effects of construction and operation of the Provident Pipeline Project on heritage resources will be not significant.

7.2.13 Infrastructure and Services

7.2.13.1 Infrastructure

The Provident Pipeline Project will act cumulatively with other proposed projects in that increased traffic on highways and local roads used to access the pipeline route and facility sites will occur during construction. The contractors for the project should work together to minimize overall traffic volumes during pipeline construction. Given the above mitigation strategy, the cumulative residual effect of the Provident Pipeline Project on highways and local roads is considered to be of low magnitude.

7.2.13.2 Services

The Provident Pipeline Project will act cumulatively with other proposed projects in that an increased demand on municipal services, accommodation and emergency services of communities in the vicinity of the pipeline route and facility sites will occur during construction.

The cumulative effects assessment for services is based upon a worst-case scenario of one construction crew of 30 people for using a community for their temporary construction offices over a one-month period. Communities in Manitoba deemed to have sufficient services to be selected as a temporary construction office include Virден.

Municipal Services

In terms of waste management, the contractors for the Provident Pipeline Project should liaise with the county/rural municipality to ensure that the local sanitary landfill and other applicable landfills will be accessible during project construction. Given the above mitigation strategy, the cumulative residual effect of the Provident Pipeline Project on waste management is considered to be of low magnitude.

Accommodation

Within the Provident Pipeline Project area, currently available temporary accommodation (*i.e.*, hotel/motel rooms) is sufficient in Virден. However, the demand on temporary accommodation by the construction workforce may result in short-term displacement of existing business and tourist clientele.

Given the small size of the construction force required, the cumulative residual effects of the Provident Pipeline Project on accommodation under the worst-case scenario are considered to be of low to medium magnitude.

Emergency Services

Some Manitoba communities within the region may not have adequate municipal services (*i.e.*, medical services, law enforcement, fire protection) capable of handling an additional 30 people construction crew within their community for an extended period of time. As a result, there will likely be an increased service demand for medical, law enforcement and fire protection services and resources that has the potential to disrupt the level of service to local residents.

The following are suggested measures to be implemented by Provident to alleviate any unnecessary pressure on municipal services within a community chosen as a temporary construction office for the Provident Pipeline Project.

With respect to medical services, it is recommended the contractors provide a list of emergency equipment at the construction site, a list of medically trained personnel on the construction right-of-way (*e.g.*, medic) and a list of emergency equipment and services that may be required from the community. Construction personnel should complete a safety orientation program to help prevent accidents during construction prior to entering the Provident right-of-way.

Construction personnel should travel in multi-passenger vehicles to the Provident construction right-of-way, where practical, to lessen the potential for accidents due to tiredness, excess speed and the volume of traffic on local roads. The contractors should outline appropriate behaviour expectations of its construction workers in the community in order to help diminish conflicts with local residents. The contractor should also establish communication with the contractor of Provident, if present in the community, to prevent inter-crew conflicts. The contractor should work cooperatively with the local law enforcement officials.

The contractors should inform the community fire protection service of any hazardous material used or stored on the Provident construction right-of-way. In addition, the service should also be given a general description of the type of work being completed (*e.g.*, welding), the emergency and fire equipment on the right-of-way, the type of emergency equipment and services that may be required from the department in the event of a fire or accident and a list of medically trained personnel (*e.g.*, medic). A Spill Contingency Plan and a Fire Contingency Plan have been developed for the Provident Pipeline Project and are described in Appendix 6B of this EA.

Given the above mitigation strategy, the cumulative residual effect of the Provident Pipeline Project on municipal services (including emergency services) under the worst-case scenario is considered to be of low magnitude.

7.2.13.3 *Summary*

Based on this review, there are no situations where there is a high probability of occurrence of a permanent or long-term cumulative effect of high magnitude that cannot be technically or economically compensated. Consequently, it is concluded that the cumulative residual effects of construction and operation of the Provident Pipeline Project on infrastructure and services will be not significant.

7.2.14 Accidents and Malfunctions

While substantial adverse effects could occur as a result of an accident or malfunction related to the construction or operation of the Provident Pipeline Project, the potential is low for an accident or malfunction that would have substantial cumulative effects. Provident will have in place, an Emergency Response Plan which outlines methods to immediately respond to accidents and malfunctions as well as to contain and clean-up after these incidents. Consequently, an evaluation of significance is not deemed warranted.

7.3 Summary of the Assessment of Potential Cumulative Residual Effects of the Project

The cumulative residual environmental and socio-economic effects associated with the construction and operation of the Provident Pipeline Project are not unlike those routinely encountered during pipeline and associated facility construction in an agricultural setting.

For each adverse residual effect associated with the Provident Pipeline Project, other past, present and future developments whose adverse residual effects which have or may act in combination with the Project were identified. Past activities identified include agriculture, transportation (*i.e.*, creation of roads and railways), utilities (*e.g.*, powerlines), oil and gas development (*i.e.*, pipelines, facilities), rural development and urban development.

Potential cumulative residual effects associated with the following biophysical and socio-economic elements were identified:

- physical elements such as physical environment, soil capability, water quality and quantity, GHG and air quality, and acoustic environment;
- biological elements such as fish and fish habitat, wetlands, vegetation, wildlife and wildlife habitat, and species at risk;
- socio-economic elements such as human occupancy and resource use, heritage resources, traditional land and resource use, and infrastructure and services; and
- accidents and malfunctions.

Through the implementation of the mitigative strategies, the cumulative residual effects associated with the construction and operation of the pipeline and associated facilities on the other biophysical and socio-economic elements were considered to be not significant.