March 2014

WOLVERINE RIVER LATERAL LOOP (CARMON CREEK SECTION)

Environmental and Socio-economic Assessment

Submitted to:
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REPORT

Report Number: 1313340047/6000/6001

Distribution:

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Golder Associates

Executive Summary

NOVA Gas Transmission Ltd. (NGTL), a wholly owned subsidiary of TransCanada PipeLines Limited (TransCanada), is applying to the National Energy Board (NEB) under Section 52 of the *NEB Act* for an order to authorize construction and operation of the proposed Wolverine River Lateral Loop (Carmon Creek Section) Project (the Project).

NGTL commissioned Golder Associates Ltd. (Golder) to prepare this environmental and socio-economic assessment (ESA) report to meet the requirements and guidance of the NEB, including that in the NEB *Filing Manual* Release 2014-01 (NEB 2014). This ESA report also meets requirements of the *Canadian Environmental Assessment Act, 2012 (CEA Act 2012)* (Government of Canada 2012), and is submitted to the NEB as part of the Section 52 Application for the Project.

The Project is located in Northern Sunrise County northeast of the town of Peace River, Alberta. The proposed 60.5 kilometres (km) of 20 inch (508.0 millimetre [mm]) outside diameter buried pipeline will transport sweet natural gas to meet contracted customer requirements in the area for electrical and industrial processes. The Project will extend from an existing block valve site located in SW 08-91-16 W5M on NGTL's existing North Central Corridor Pipeline (North Star Section), approximately 86 km northeast of the town of Peace River, to the site of the independently proposed Carmon Creek East Sales Meter Station located in NW 22-85-18 W5M, approximately 35 km northeast of the town of Peace River. The pipeline and valves installed in NW 25-88-18 W5M and SE 06-91-16 W5M are the only permanent Project infrastructure.

NGTL proposes to use existing and future commercial and camp accommodations to house the temporary Project construction personnel. If necessary, NGTL will consider constructing an additional temporary construction camp in an existing clearing on Crown land near the Project footprint.

The Project will parallel existing disturbance for 57.3 km or 94.8% of its length. For 55.6 km or 91.9% of its length, the Project will parallel existing pipeline rights-of-way (ROW) that are considered contiguous according to the NEB; that is, an electrical transmission line, an oil or gas pipeline, a railway or an all-season public highway.

The Project footprint required for construction consists of new permanent ROW and temporary workspace (TWS). By using TWS on an existing ROW, the need for new ROW is minimized; this also results in a variable ROW width depending on the existing ROW paralleled. The minimum ROW width required for safe and efficient construction will be 27 metres (m), which includes 16 to 27 m of new permanent ROW. TWS is required at staging areas, crossings, sidebends, log decks, and where grading is necessary.

No new permanent access is planned to support construction or operation of the Project. Access to the Project during construction will be primarily by existing highways and public roads, industry access roads, pipeline ROW, and the proposed Project ROW. Temporary access will use existing disturbances and only limited brushing will be required.

The Project is entirely on Crown land and crosses forested land, wetlands, and the Cadotte River and Little Cadotte River sub-basins of the Peace River basin. The Project crosses 12 watercourses, six of which are impounded by beaver activity near the crossing location. The Project also crosses approximately 44 hectares (ha) of wetlands (approximately 24.3% of the Project footprint) of which 7 ha are non-peaty (mineral) wetlands,

36 ha are peatland (organic) wetlands, and 1 ha is shallow non-vegetated open water. Two segments of the Project, for distances of approximately 6 km and 3 km, cross a Key Wildlife and Biodiversity Zone (KBWZ).

The design, construction and operation of the Project will comply with all applicable codes, standards and regulations. Subject to regulatory approval, construction is scheduled to commence in November 2015, with an expected in-service date in April 2016. For construction activities occurring in the KWBZ Restricted Activity Period (RAP) of January 15 to April 30, NGTL will adhere to requirements determined in consultation with Alberta Environment and Sustainable Resource Development (ERSD), which will be outlined in a KWBZ Protection Plan.

Preparation of the ESA included desktop, which were conducted for all environmental and socio-economic elements considered in the effects assessment, and field studies for specific elements. Appropriately timed field studies were conducted in 2013 and 2014 for the following environmental elements:

- wildlife surveys, including reconnaissance level, remote camera, and winter track surveys;
- vegetation and wetlands surveys, including reconnaissance level, listed plants, and noxious weeds surveys; and
- aquatic and fish habitat surveys, including watercourse crossing location surveys.

Supplemental field work to support vegetation, wildlife and fisheries assessments has been recently conducted or is planned during the appropriate seasons in 2014 to support the ESA. Traditional Land and Resource Use (TLU) helicopter flyovers, TLU community sessions and ground-based surveys were conducted in winter 2014, and TLU studies will continue into summer 2014.

The Project encounters no previously recorded historic resource sites, and lands in the Project footprint have low potential for as yet unrecorded historic resource sites. However, lands with potential for historic resources occur close to the Project crossing of the Cadotte River, and a Historical Resources Impact Assessment (HRIA) for the Project is planned for spring 2014.

Supplemental reports presenting the results, and environmental and social assessment based on these additional studies, will be submitted to the NEB in separate discipline-related reports before or in August 2014, depending on the timing of the study. The supplemental data will be used to confirm the appropriateness of the environmental protection measures currently planned for the Project and, if necessary, to plan additional protection measures specific to the Project.

The socio-economic assessment considered the traditional, recreational and industrial activities occurring in Northern Sunrise County and the town of Peace River. The potential effects on the communities, including Aboriginal communities, and on infrastructure and services, were assessed based on introducing the Project workforce, which is expected to reach 475 persons at the peak of construction.

The potential environmental effects associated with the Project are those typically encountered during pipeline construction and operation in a forested setting in the Green Area of Alberta. Similarly, potential socio-economic effects are those typically identified in association with pipeline construction projects in northern Alberta.

Project-specific mitigation will be implemented by NGTL to avoid or reduce potential adverse effects during construction and operation. The environmental protection measures designed to mitigate potential environmental

effects are presented in the Environmental Protection Plan (Appendix A) and on the Environmental Alignment Sheets (Appendix B) of this ESA. Mitigation as set out in this ESA will also be implemented to alleviate potential adverse socio-economic effects, and will include safety protocols, accepted industry construction and operations standards, adherence to all applicable regulations, order, and permitting conditions, and ongoing consultation with Aboriginal communities and other stakeholders.

The design and implementation of TransCanada's environmental compliance strategy – including environmental protection planning and implementation, environmental inspection and monitoring, and post-construction monitoring and follow-up – is expected to avoid or mitigate potential adverse environmental and socio-economic effects. Assessment of the potential environmental and socio-economic effects resulted in the prediction that any adverse residual Project-related and cumulative effects will be not significant.

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List of Acronyms and Abbreviations

Acronym	Description
%	percent
<	less than
>	greater than
≤	less than or equal to
≥	greater than or equal to
°	Degree
°C	degrees Celsius
µg/m^3	micrograms per cubic metre
µm	micron or micrometre
µS/cm	micro-Siemens per centimetre
AAAQOs	Alberta Ambient Air Quality Objectives
AADNC	Aboriginal Affairs and Northern Development Canada
AADT	Average Annual Daily Traffic
AB	Alberta
ACA	Alberta Conservation Association
ACIMS	Alberta Conservation Information Management System
AENV	Alberta Environment
AER	Alberta Energy Regulator
AGS	Alberta Geological Surveys
AHS	Alberta Health Services
ANPC	Alberta Native Plant Council
AOA	Area Operating Agreement
ARC	Alberta Research Council
ARWQI	Alberta River Water Quality Index
ASL	Ambient sound level
ASRD	Alberta Sustainable Resource Development
ATV	all-terrain vehicle
AVI	Alberta Vegetation Inventory
AWI	Alberta Wetlands Inventory
BONN	open bog with no internal lawns present
BONS	shrubby, open bog
BTNN	treed bogs
BTNR	wooded bog with forested islands
CAC	Criteria Air Contaminant
Canadian Natural	Canadian Natural Resources Limited
CAPP	Canadian Association of Petroleum Producers

Acronym	Description
CCME	Canadian Council of Ministers of the Environment
CEA Act	*Canadian Environmental Assessment Act*
CEA Agency	Canadian Environmental Assessment Agency
CEMA	Cumulative Effects Management Association
CEPA	Canadian Environmental Protection Act
CGA	Canadian Gas Association
cm	centimetre
CLI	Canadian Land Inventory
CLML	Cadotte Lake Métis
CNC	Consultative Notation Company
CNT	Consultative Notation
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	equivalent carbon dioxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CSA	Canadian Standards Association
CSNO	Conseil Scolaire du Nord-Ouest
CTLP	Coniferous Timber Licence/Permit
CWC	Carmon Creek Watercourse
CWCS	Canadian Wetland Classification System
DA	drainage area
dB	decibels
dBA	“A-weighted” decibel
DFO	Fisheries and Oceans Canada
DO	dissolved oxygen
e.g.	for example [Latin: exempli gratia]
EIA	Environmental Impact Assessment
ELC	Ecological Land Classification
EMS	Emergency Medical Services
EMT	Emergency Medical Technologies
EPP	Environmental Protection Plan
ERCB	Energy Resources Conservation Board
ERP	Emergency Response Plan
ESA	Environmental and Socio-economic Assessment
ESRD	Alberta Environment and Sustainable Resource Development
et al.	and others [Latin: et alia]
ETS	Electronic Transfer System

Acronym	Description
EUB	Alberta Energy and Utilities Board
EUB/AGS	Alberta Energy Utilities Board/Alberta Geological Survey
EZE	Easement
FL	fork length
FMA	Forest Management Agreement
FMU	Forest Management Unit
FONG	graminoid fen
FONS	shrubby fen
FTNN	treed fen
FTNN_bu	Treed fen (burned)
FWMIS	Fisheries and Wildlife Management Information System
g	gram
GHG	Greenhouse Gas
GHGRP	Greenhouse Gas Reporting Program
GIS	Global Information System
GOA	Government of Alberta
Golder	Golder Associates Ltd.
GPS	Global Positioning System
ha	hectare(s)
HCOM	Health Co-Management
HI	Hanna Instruments
HRIA	Historic Resources Impact Assessment
HRV	Historic Resource Value
HSI	Habitat Suitability Index
Hz	hertz
i.e.	that is [Latin: id est]
ID	Identification
ILI	in-line inspection
IR	Indian Reserve
ISP	Industrial Sample Plot
KI	Key Indicator(s)
km	kilometre(s)
km^2	square kilometre
KP	Kilometre Post
kPa	kilopascal
Kt	kilotonnes
KWBZ	Key Wildlife and Biodiversity Zone

Acronym	Description
L_{eq}	equivalent continuous sound pressure level
LEED	Leadership in Energy and Environmental Design
LLIN	Lubicon Lake Indian Nation
LOC	License of Operation
LSA	Local Study Area
LSD	Legal Sub-Division
m	metre(s)
m^3	cubic metres
mbgs	metres below ground surface
ms	metres per second
m/m	metre per metre
m^3/s	cubic metres per second
masl	metres above sea level
MBCA	*Migratory Birds Convention Act*
MDP	Municipal Development Plan
mg/L	milligram per litre
MLL	Miscellaneous Lease
MLP	Miscellaneous Permit
mm	millimetre(s)
MNA	Métis Nation of Alberta
MONG	marsh swamp
MOP	Maximum Operating Pressure
MSD	mean seasonal discharge
MSL	Mineral Surface Lease
Mt	Mega tonnes
MWPA	Mighty Peace Watershed Alliance
N	north
n/a	Not Applicable
NAD	North American Datum
NCC	North Central Corridor
NE	Northeast
NEB	National Energy Board
NEB Act	*National Energy Board Act*
NGTL	NOVA Gas Transmission Limited
NO	nitric oxide
No.	number
NO_2	nitrogen dioxide

Acronym	Description
NO_x	nitrogen oxides
NPS	Nominal Pipe Size
NSC MDP	Northern Sunrise County Municipal Development Plan
NW	Northwest
NWWG	National Wetland Working Group
OCC	Operations Control Centre
OPR	Onshore Pipeline Regulations
OS	DFO Operational Statement
PAZA	Peace Airshed Zone Association
PCM	Post-construction Monitoring
pers. comm.	personal communication
pH	Potential hydrogen
pHRIA	palaeontological Historical Resources Impact Assessment
PIL	Pipeline Installation Lease
PLA	Pipeline Agreement
PM	Particulate Matter
$PM_{2.5}$	particulate matter with a mean aerodynamic diameter of 2.5 microns (µm) or smaller
PNT	Protective Notation
PRRG	Peace River Gazette
PSL	Permissible Sound Level
Q4	fourth quarter
QA/QC	Quality assurance/Quality control
RAP	Restricted Activity Period
RCMP	Royal Canadian Mounted Police
RDS	Roadway
RFMA	Registered Fur Management Area
ROW	Right-of-Way
RS	Shell Canada Limited Resource Selection
RSA	Regional Study Area
S	south
SAGD	Steam Assisted Gravity Drainage
SAR	Species at Risk
SARA	*Species at Risk Act*
SCA	Soil Correlation Area
SCADA	Supervisory control and data acquisition
Shell	Shell Canada Ltd.
SO_2	sulphur dioxide

Acronym	Description
SoJ	Statement of Justification
SO_x	sulphur oxides
SONS	shrubby swamp
SSA	Socio-economic study area
STNN	treed swamps
SW	Southwest
SWI	Specific Work Instructions
TEK	Traditional Ecological Knowledge
TFA	Temporary Field Authorization
the Project	Carmon Creek Pipeline Project
TLU	Traditional Land Use
TPA	Trapping Area
TransCanada	TransCanada PipeLines Limited
Twp	Township
TWS	Temporary Workspace
UTM	Universal Transverse Mercator
VC	Valued Components
VDC	volts direct current
W	west
W5M	West of the Fifth Meridian
WCFN	Woodland Cree First Nation
WHMIS	Workplace Hazardous Materials Information System
WMU	Wildlife Management Unit

1.0 INTRODUCTION

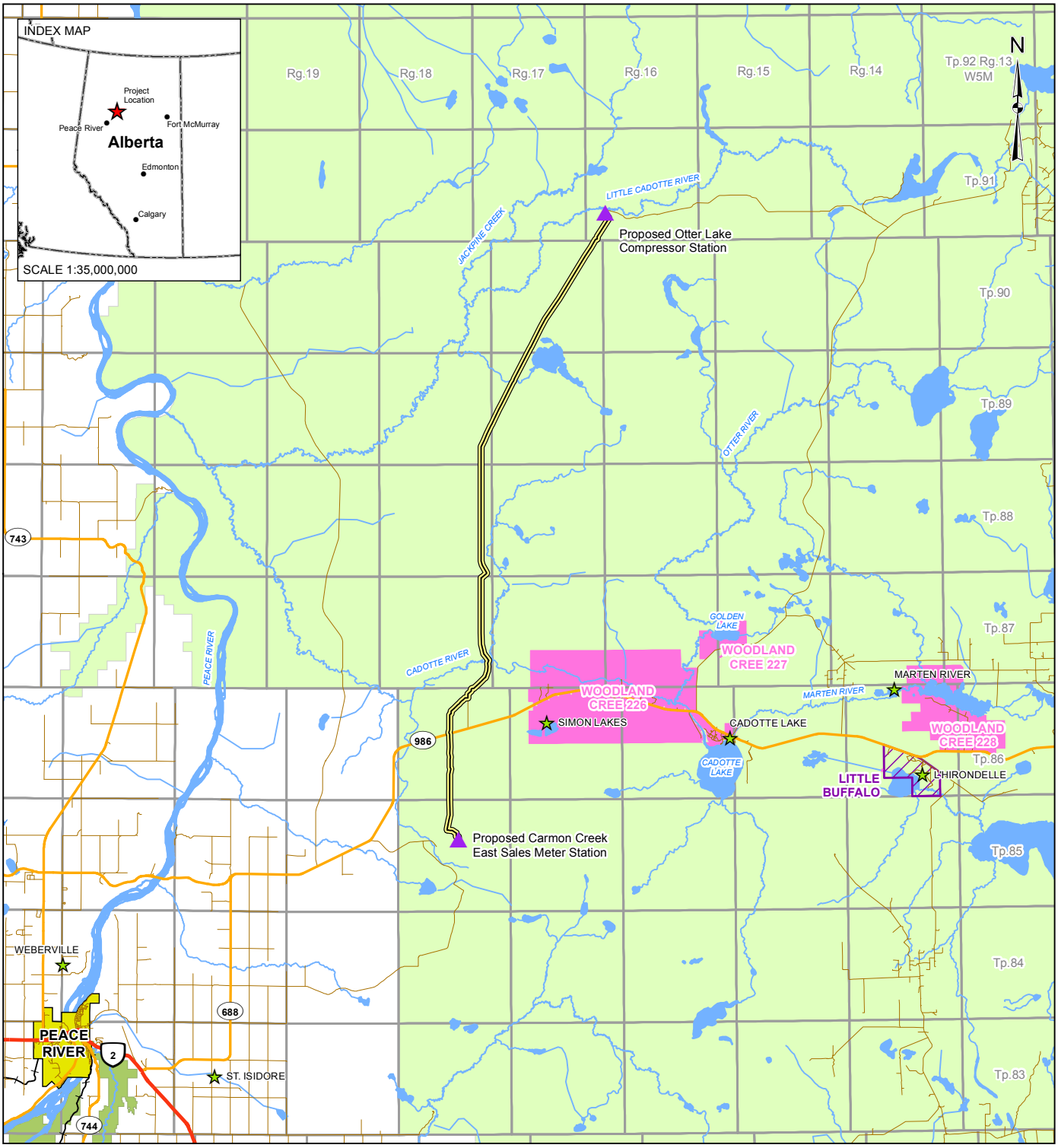
NOVA Gas Transmission Ltd. (NGTL), a wholly owned subsidiary of TransCanada PipeLines Limited (TransCanada), is applying to the National Energy Board (NEB) for a *Certificate of Public Convenience and Necessity* (CPCN) under section 52 of the NEB Act to authorize construction and operation of the Wolverine River Lateral Loop (Carmon Creek Section) Project (the Project) (Figure 1.0-1).

NGTL commissioned Golder Associates Ltd. (Golder) to prepare an environmental and socio-economic assessment (ESA) to meet the requirements and guidance of the NEB, including that in the NEB *Filing Manual* (NEB 2014). This ESA report is submitted to the NEB as part of the section 52 Application for the Project.

The Project is located northeast of the town of Peace River, Alberta. The Project involves the construction and operation of a new buried pipeline to transport sweet natural gas, and will include approximately 60.5 kilometres (km) of 508 millimetres (mm) Nominal Pipe Size 20 (NPS 20) pipe and valve sites. The Project will extend from an existing block valve site located in SW 08-91-16 W5M on NGTL's existing North Central Corridor (NCC) Pipeline (North Star Section) approximately 86 km northeast of the town of Peace River to the site of the proposed Carmon Creek East Sales Meter Station located in NW 22-85-18 W5M, approximately 35 km northeast of the town of Peace River. NGTL has filed a separate application under section 58 of the NEB Act to build the Otter Lake Compressor Station at the block valve site (NEB Application A56099). The compressor station is required to meet contracted demand for natural gas in the area independent of the Project. If the compressor station is not approved or built at the time of construction for the Project, then the Project will tie in to the existing block valve. In the alternative, if the compressor station is approved and built at the time of Project construction, the Project will tie in to equipment at the same block valve site within the fenced compressor station site. The Carmon Creek East Sales Meter Station will also be applied for under separate section 58 NEB Act application, and is required to meet contracted demand for gas in the area independent of the Project. The Project crosses Crown land in the Green Area of Alberta, including 12 watercourses, six of which are impounded by beaver activity near the crossing location.

The Project footprint required for construction consists of both new right-of-way (ROW) and temporary workspace (TWS). The Project parallels existing disturbance for 57.3 km or 94.8% of its length, and the ROW is considered contiguous by the NEB (i.e., parallel to an electrical transmission line, an oil or gas pipeline, a railway or an all-season public highway) for 55.6 km or 91.9% of the route. By using TWS on existing ROWs, the need for new ROW is minimized; this also results in a variable ROW width depending on the existing ROW paralleled. The minimum space required for construction will be 27 metres (m), which includes 16 to 27 m of new permanent ROW. In addition to the permanent ROW, the Project footprint includes TWS at staging areas, crossings, sidebends, log decks, and where grading is necessary. Existing highways and public roads, industry access roads, pipeline ROW, and the proposed Project ROW will be used to access the Project. Temporary access will use existing disturbances, and only limited brushing will be needed. No new permanent access is planned to support the Project.

This document has been prepared in accordance with the NEB Act and the NEB guidance, including the *Filing Manual*, Release 2014-01 (NEB 2014), as part of NGTL's application for approval of the Project. The ESA has also been prepared to meet the requirements of the *Canadian Environmental Assessment Act, 2012* (CEA Act 2012). Subject to regulatory approvals, pipeline construction is scheduled to commence in November 2015 with the pipeline scheduled to be in-service, and the operation phase to commence in April 2016.



LEGEND

- STUDY ROUTE*
- PROPOSED FACILITY**
- POPULATED PLACE
- PRIMARY HIGHWAY
- SECONDARY HIGHWAY
- LOCAL ROAD
- RAILWAY
- WATERCOURSE
- GREEN
- WHITE
- INDIAN RESERVE
- PARK/PROTECTED
- SETTLEMENT
- TOWN
- WATERBODY

20 0 20

SCALE 1:500,000 KILOMETRES

NOTE

*PROPOSED WOLVERINE RIVER LATERAL LOOP (CARMON CREEK SECTION) DITCHLINE 2014-01-06

**PROPOSED FACILITIES ARE NOT PART OF THE WOLVERINE RIVER LATERAL LOOP (CARMON CREEK SECTION)

REFERENCE

DATUM: NAD83 PROJECTION: UTM ZONE 11

PROJECT

TransCanada
In business to deliver

WOLVERINE RIVER LATERAL LOOP (CARMON CREEK SECTION)

TITLE

PROJECT LOCATION

Golder Associates

PROJECT		13-1334-0047	FILE No.
DESIGN	KM	20 Sep. 2013	SCALE AS SHOWN REV. 0
GIS	AB	19 Feb. 2014	
CHECK	KM	20 Feb. 2014	FIGURE: 1.0-1
REVIEW	CC	20 Feb. 2014	

I:\CLIENTS\TRANSCANADA\13-1334-0047\Mapping\MXD\General\Fig1.0-1_ProjectLocation_20140219.mxd

1.1 Proponent

The Project will be constructed, owned, and operated by NGTL, a wholly owned subsidiary of TransCanada. TransCanada operates the NGTL System pursuant to an Operating Agreement between TransCanada and NGTL. TransCanada applies corporate policies in its operations of the NGTL System that are common to TransCanada's operation of other federally-regulated pipelines, including the TransCanada Mainline and the Foothills System.

1.2 Contacts

The contact person for the **regulatory** approvals component of the Carmon Creek Pipeline is:

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1.3 Regulatory Approvals and Authorizations

The Project is subject to the NEB Act and requires an order pursuant to section 52 of the NEB Act. Application to the NEB involves the filing of an environmental socio-economic assessment (ESA) prepared in accordance with the NEB *Filing Manual* (NEB 2014) and section 19 of CEA Act 2012 (Government of Canada 2012).

This report will serve as the primary environmental application for the Project; however, other federal and provincial approvals will also be necessary. A summary of the potential permits and approvals required prior to construction of the Project is presented in Table 1.3-1.

Table 1.3-1: Summary of Potential Environmental Permits and Approvals Required Prior to Project Construction

Agency	Permit / Approval / Authorization / Notification
Federal	
National Energy Board (NEB)	Approval under section 52 of the *National Energy Board Act* (NEB Act); Approvals for pipelines that pass in, on, over, under, through or across navigable waters (*Navigable Waters Protection Act*); Assessment of potential impacts to fisheries (*Fisheries Act*) or aquatic species at risk (*Species at Risk Act*)
Fisheries and Oceans Canada (DFO)	Authorization under section 35(2) and section 32 of the *Fisheries Act*
Provincial	
Alberta Environment and Sustainable Resource Development (ESRD)	Notification under the *Water Act* Code of Practice for Pipelines and Telecommunications Lines Crossing a Water Body (AENV 2000)
ESRD	Notification under the *Water Act* Code of Practice for Watercourse Crossings (AENV 2001)
ESRD	Notification under the *Water Act* Code of Practice for the Temporary Diversion of Water for Hydrostatic Testing of Pipelines (AENV 1999)
ESRD	Approval for land use dispositions under the *Public Lands Act:* Environmental Field Report for the pipeline (PLA) on public lands
Alberta Culture	Clearance under the *Historical Resources Act*

1.4 Document Organization

The purpose of this ESA report is to meet the requirements of the NEB *Filing Manual* in predicting and describing the changes that the Project may have on the biophysical and socio-economic environments, using an environmental assessment approach. In addition, the mitigation identified in the report and detailed in the Environmental Protection Plan (EPP), as well as environmental contingency plans, environmental follow-up and monitoring plans, and the Environmental Alignment Sheets as part of this ESA will form the foundation for future environmental management activities by NGTL.

The ESA document is presented in the following sections:

- **Section 1**: Introduction – provides an overview of the Project, the regulatory framework, purpose and organization of the document, and identifies the Project assessment team.
- **Section 2**: Project Description – provides a description of the route selection process and rationale, justification and need for the Project, Project components, Project location, and the Project's schedule of activities for Project construction and operation.
- **Section 3**: Project Engagement – provides a summary of consultation and engagement with landowners, regulators, First Nations, Métis groups, and other stakeholders.
- **Section 4**: Environmental and Socio-economic Effects Assessment Methodology – provides a description of the effects assessment methodology, including effects descriptors and significance evaluation criteria.
- **Section 5**: Environmental and Socio-economic Setting – provides a description of the existing biological and socio-economic environment.

- **Section 6**: Environmental and Socio-economic Effects Assessment – identifies the potential environmental and socio-economic effects of the Project, mitigation to avoid or reduce potential effects, residual Project effects following implementation or mitigation, and determination of the significance of any residual Project effects.
- **Section 7**: Cumulative Effects Assessment – provides a description of the cumulative environmental assessment methodology, and assesses residual Project effects in combination with effects from other past, present or reasonable foreseeable future projects or activities in the region.
- **Section 8**: Inspection, Monitoring and Follow-up – outlines the various biophysical and socio-economic inspection, monitoring, and follow-up programs.
- **Section 9**: Summary and Conclusions – provides a summary of the environmental and socio-economic assessment and its conclusions.
- **Section 10**: Closure – closure of the Environmental and Socio-economic Assessment report.

1.5 Project Assessment Team

The environmental assessment and ESA report were completed by Golder, in association with other companies. The responsibilities in relation to completing the environmental assessment are identified in Table 1.5-1.

Table 1.5-1: Carmon Creek Pipeline Assessment Team

Company	Responsibility
NOVA Gas Transmission Limited	Project Description Pipeline Route Selection Public Consultation and Engagement Environmental Protection Planning Construction and Post-construction Monitoring Program
Universal Geomatics Solutions	Pipeline Route Selection Pipeline Route Survey
Golder Associates Ltd.	Soils Assessment Fisheries and Aquatic Investigation and Assessment Hydrology Investigation and Assessment Hydrogeology Assessment Vegetation Investigation and Assessment Wetland Investigation and Assessment Wildlife and Wildlife Habitat Investigation and Assessment Air Quality Assessment Acoustic Environment Assessment Historic Resources Investigation and Assessment Traditional Land and Resource Use Assessment Socio-economic Assessment Environmental Protection Planning Construction and Post-construction Monitoring Program

The investigations, supporting studies, and engagement indicated above provided information relevant to the existing environmental and socio-economic setting, relevant issues, planned mitigation and the effects assessment presented in this ESA.

1.6 Concordance with the NEB Filing Manual

Table 1.6-1 is included as a reference to assist the regulators in locating response to NEB requirements in this ESA report, which was prepared based on the NEB *Filing Manual* (NEB 2014).

Table 1.6-1: Concordance with Guide A – A.2 Environmental and Socio-economic Assessment of the NEB *Filing Manual*[(a)]

Filing Manual No.	Filing Requirement	Section in this ESA Report
A.2.5 Description of the Environmental and Socio-Economic Setting		
1.	Identify and describe the current biophysical and socio-economic setting of each element (i.e., baseline information) in the area where the project is to be carried out.	5.0
2.	Describe which biophysical or socio- economic elements in the study area are of ecological, economic or human importance and require more detailed analysis taking into account the results of consultation (see Table A-1 for examples). Where circumstances require more detailed information in an ESA, see: i. Table A-2 – Filing Requirements for Biophysical Elements; or ii. Table A-3 – Filing Requirements for Socio- Economic Elements.	5.0 6.0
3.	Provide supporting evidence (e.g., references to scientific literature, field studies, local and traditional knowledge, previous environmental assessment and monitoring reports) for: ▪ information and data collected; ▪ analysis completed; ▪ conclusions reached; and ▪ the extent of professional judgment or experience relied upon in meeting these information requirements, and the rationale for that extent of reliance.	4.1 4.2 5.0
4.	Describe and substantiate the methods used for any surveys, such as those pertaining to wildlife, fisheries, plants, species at risk or species of special status, soils, heritage resources or traditional land use, and for establishing the baseline setting for the atmospheric and acoustic environment.	5.0
5.	Applicants must consult with other expert federal, provincial or territorial departments and other relevant authorities on requirements for baseline information and methods.	4.1 4.2 5.0
A.2.6 Effects Assessment		
Identification and Analysis of Effects		
1.	Describe the methods used to predict the effects of the project on the biophysical and socio-economic elements, and the effects of the environment on the project.	4.4 6.0
2.	Predict the effects associated with the proposed project, including those that could be caused by construction, operations, decommissioning or abandonment, as well as accidents and malfunctions. Also include effects the environment could have on the project. For those biophysical and socio- economic elements or their valued components that require further analysis (see Table A-1), provide the detailed information outlined in Tables A-2 and A-3.	6.0
Mitigation Measures		
1.	Describe the standard and project specific mitigation measures and their adequacy for addressing the project effects, or clearly reference specific sections of company manuals that provide mitigation measures. Ensure that referenced manuals are current and filed with the NEB.	6.0 Appendix A (EPP)
2.	Ensure that commitments about mitigative measures will be communicated to field staff for implementation through an Environmental Protection Plan (EPP).	8.2 Appendix A (EPP)

Table 1.6-1: Concordance with Guide A – A.2 Environmental and Socio-economic Assessment of the NEB *Filing Manual*[(a)] (continued)

Filing Manual No.	Filing Requirement	Section in this ESA Report
3.	Describe plans and measures to address potential effects of accidents and malfunctions during construction and operation of the project.	6.18 Appendix A (EPP)
Evaluation of Significance		
1.	After taking into account any appropriate mitigation measures, identify any remaining residual effects from the project.	6.0
2.	Describe the methods and criteria used to determine the significance of adverse effects, including defining the point at which any particular effect on a valued component is considered "significant".	4.4.5
3.	Evaluate the significance of residual adverse environmental and socio-economic effects against the defined criteria.	6.0
4.	Evaluate the likelihood of significant, residual adverse environmental and socio-economic effects occurring and substantiate the conclusions made.	6.0
A.2.7 Cumulative Effects Assessment		
Scoping and Analysis of Cumulative Effects		
1.	Identify the valued components for which residual effects are predicted, and describe and justify the methods used to predict any residual effects.	4.5 6.0 7.1
2.	For each valued component where residual effects have been identified, describe and justify the spatial and temporal boundaries used to assess the potential cumulative effects.	7.0 7.2
3.	Identify other physical works or activities that have been or will be carried out within the identified spatial and temporal boundaries for the cumulative effects assessment.	7.1
4.	Identify whether the effects of those physical works or activities that have been or will be carried out would be likely to produce effects on the valued components within the identified boundaries.	7.2 7.3
5.	Where other physical works or activities may affect the valued components for which residual effects from the applicant's proposed project are predicted, continue the cumulative effects assessment, as follows: ▪ Consider the various components, phases and activities associated with the applicant's project that could interact with other physical work or activities. ▪ Provide a description of the extent of the cumulative effects on valued components. ▪ Where professional knowledge or experience is cited, explain the extent to which professional knowledge or experience was relied upon and justify how the resulting conclusions or decisions were reached.	7.2 7.3
Mitigation Measures for Cumulative Effects		
1.	Describe the general and specific mitigation measures, beyond project-specific mitigation already considered, that are technically and economically feasible to address any cumulative effects.	6.0 7.0 8.0 Appendix A (EPP)

Table 1.6-1: Concordance with Guide A – A.2 Environmental and Socio-economic Assessment of the NEB *Filing Manual*[(a)] (continued)

Filing Manual No.	Filing Requirement	Section in this ESA Report
Evaluation of Significance of Cumulative Effects		
1.	After taking into account any appropriate mitigation measures for cumulative effects, identify any remaining residual cumulative effects.	7.2 7.3
2.	Describe the methods and criteria used to determine the significance of remaining adverse cumulative effects, including defining the point at which each identified cumulative effect on a valued component is considered “significant”.	4.4 4.5 7.0
3.	Evaluate the significance of adverse residual cumulative effects against the defined criteria.	7.2
4.	Evaluate the likelihood of significant, residual adverse cumulative environmental and socio-economic effects occurring and substantiate the conclusions made.	7.0
A.2.8 Inspection, Monitoring and Follow-up		
1.	Describe inspection plans to ensure compliance with biophysical and socio-economic commitments, consistent with sections 48 (Environmental Protection Program), 53 (General Compliance), and 54 (Construction Inspection) of the Onshore Pipeline Regulations (OPR).	8.0
2.	Describe the surveillance and monitoring program for the protection of the pipeline, the public and the environment, as required by section 39 of the OPR.	2.6 8.6 6.18
3.	Consider any particular elements in the Application that are of greater concern and evaluate the need for a more in-depth monitoring program for those elements.	8.4 8.5
4.	For *CEA Act* designated projects, identify which elements and monitoring procedures would constitute follow-up under the CEA Act 2012.	8.4 8.5
Table A-1 Circumstances and Interactions Requiring Detailed Biophysical and Socio-Economic Information		
	Physical and meteorological environment	5.2
	Soil and soil productivity	5.3 6.2 7.2.1
	Vegetation	5.4 6.3 7.2.2
	Water quality and quantity	5.5 6.4 7.2.3
	Fish and fish habitat, including any fish habitat compensation required	5.6 6.5 7.2.4
	Wetlands	5.7 6.6 7.2.5
	Wildlife and wildlife habitat	5.8 6.7 7.2.6

Table 1.6-1: Concordance with Guide A – A.2 Environmental and Socio-economic Assessment of the NEB *Filing Manual*[(a)] (continued)

Filing Manual No.	Filing Requirement	Section in this ESA Report
	Species at Risk or Species of Special Status and related habitat	5.4 5.6 5.8 5.9 6.8 7.2.7
	Air emissions	5.10 6.9 7.2.8
	Greenhouse gas (GHG) emissions	5.10 6.9 7.2.8
	Acoustic environment	5.11 6.10 7.2.9
	Human occupancy and resource use	5.12 6.11 7.2.10
	Heritage (Historic) resources	5.13 6.12
	Navigation and navigation safety	5.12
	Traditional land and resource use	5.14 6.13 7.2.11
	Social and cultural well-being	5.15 6.14 7.2.12
	Human health and aesthetics	5.12 5.16 6.11 6.15 7.2.13
	Infrastructure and services	5.17 6.16 7.2.14
	Employment and economy	5.18 6.17 7.2.15

(a) National Energy Board 2014.

1.7 Concordance with the *Canadian Environmental Assessment Act, 2012*

This Project is a "designated project" under the *Regulations Designating Physical Activities* of the CEA Act 2012 (Government of Canada 2012). The factors to be considered in the environmental assessment for designated projects are identified in section 19 of the CEA Act 2012. The location in this ESA of relevant information addressing the factors to be considered is indicated in Table 1.7-1.

Table 1.7-1: Concordance with the *Canadian Environmental Assessment Act*, 2012[(a)] (CEA Act 2012)

CEA Act 2012 Requirement	Section in CEA Act 2012	Section in the ESA
The environmental assessment of a designated project must take into account the following factors:		
▪ the environmental effects of the designated project, including the environmental effects of malfunctions or accidents that may occur in connection with the designated project and any cumulative environmental effects that are likely to result from the designated project in combination with other physical activities that have been or will be carried out;	s.19.1 (a)	6.0 7.0
▪ the significance of the effects referred to in paragraph (a);	s.19.1 (b)	6.0 7.0
▪ comments from the public — or, with respect to a designated project that requires that a certificate be issued in accordance with an order made under section 54 of the *National Energy Board Act*, any interested party — that are received in accordance with this Act;	s.19.1 (c)	3.0 5.15, 6.14 5.14, 5.13
▪ mitigation measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the designated project;	s.19.1 (d)	6.0 Appendix A (EPP)
▪ the requirements of the follow-up program in respect of the designated project;	s.19.1 (e)	8.4 8.5 Appendix A (EPP)
▪ the purpose of the designated project;	s.19.1 (f)	2.0
▪ alternative means of carrying out the designated project that are technically and economically feasible and the environmental effects of any such alternative means;	s.19.1 (g)	2.2
▪ any change to the designated project that may be caused by the environment;	s.19.1 (h)	6.2
▪ the results of any relevant study conducted by a committee established under section 73 or 74; and	s.19.1 (i)	n/a
▪ any other matter relevant to the environmental assessment that the responsible authority, or — if the environmental assessment is referred to a review panel — the Minister, requires to be taken into account.	s.19.1 (j)	n/a
The scope of the factors to be taken into account under paragraphs (1)(a), (b), (d), (e), (g), (h) and (j) is determined by:		
▪ the responsible authority; or	s.19.2 (a)	1.0
▪ the Minister, if the environmental assessment is referred to a review panel.	s.19.2 (b)	n/a
The environmental assessment of a designated project may take into account community knowledge and Aboriginal traditional knowledge.	s.19.3	5.14 6.13

(a) Government of Canada 2012.

2.0 PROJECT DESCRIPTION

This section describes the Project, identifying the purpose and need for the Project and alternatives to the Project, Project location, Project components and Project phases.

The Project is located on Crown land in the Green Area of Alberta in Northern Sunrise County, northeast of the Town of Peace River, Alberta. The Project will include construction of approximately 60.5 km of 508.0 mm (NPS 20) pipe and associated valve sites. The Project will extend from a block valve located in SW 08-91-16 W5M on NGTL's existing North Central Corridor Pipeline (North Star Section) approximately 86 km northeast of the town of Peace River, to the site of the proposed Carmon Creek East Sales Meter Station located in NW 22-85-18 W5M approximately 35 km northeast of the town of Peace River. The Project parallels existing linear disturbances (i.e., pipeline ROW) for the majority of its length (i.e., 57.3 km or 94.8%).

2.1 Purpose and Need for the Project

The purpose of the Project is to meet customer requirements for sweet natural gas in the area for electrical and industrial processes. Firm Delivery (FT-D2) contracts have been executed to support the Project.

2.2 Alternatives to the Project

Alternatives to the Project are defined as functionally different ways to meet the need and achieve the purpose of the Project (CEA Agency 2007, 2013). Only buried pipeline options realistically meet the Project need and purpose, while being technically and economically feasible to implement.

There are no existing pipelines that provide a feasible alternative for transportation between the tie-in points. This is because of capacity restrictions due primarily to existing pipeline size. Therefore, there are no realistic alternatives that meet the Project need and purpose.

NGTL evaluated whether an alternative route could meet the Project need and purpose. The Project route selection process is discussed in Section 2.3 of this ESA.

2.3 Pipeline Route Selection

Route selection is one of the primary mitigation options for avoiding conflict between the Project and environmental, socio-economic, and historic resources, as discussed in Section 2.3.2. The following factors were considered when determining a potential route for the Project.

2.3.1 Initial Pipeline Route Selection

Section 5.3, Description of Facility Alternatives, in the Project Application describes how a facility solution connecting NCC (North Star Section) and the Cadotte River Lateral (South Flow alternative) is required to increase delivery capability in the Peace River Project Area. Two options paralleling the existing NGTL Wolverine River Lateral (WRL) were considered, with both routes paralleling WRL in the same south to north corridor for approximately 46.2 km. Where the routes deviate, Option A continues north, paralleling WRL for an additional 23.5 km, and crosses Jackpine Creek and Little Cadotte River (69.7 km total route length). Option B follows an existing Shell pipeline corridor North East for an additional 14.3 km (60.5 km total route length). Option A was eliminated as a viable alternative due to its additional route length and crossing of two additional named watercourses. Option B was advanced as the preferred route and is addressed by this assessment.

2.3.2 Control Points

NGTL selected its proposed route for the Project based the following primary control points:

Source Control Points	Existing Valve Site on NCC (North Star Section)	SW 08-91-16 W5M
Delivery Control Point	Proposed Carmen Creek East Sales Meter Station (independent application)	NW 22-85-18 W5M

2.3.3 Routing Considerations

In addition to the control points, NGTL considers the following factors:

- paralleling existing linear disturbances to:
  - reduce the potential fragmentation of wildlife habitat;
  - maximize the amount of TWS located on existing ROW or other existing disturbances; and
  - reduce the amount of new (non-parallel) ROW required.
- reduce the development of new access into remote areas;
- reducing the number and complexity of watercourse crossings;
- avoiding or reducing effects on identified environmentally sensitive areas (e.g., wetlands);
- avoiding or minimizing routing through areas of unstable terrain;
- avoiding lands of designated status such as parks, cemeteries, reserves under the *Indian Act*, and known historic sites;
- input from Aboriginal communities, stakeholders and landowners;
- ensuring the facilities are economical to construct and operate;
- consulting with regulatory agencies to understand issues that may need to be addressed in the routing process;
- avoiding routing near urban development and residences;
- reducing the number of road crossings, particularly of highways and paved roads;
- ensuring construction feasibility of watercourse and road crossings along the selected route; and
- optimally locating the pipeline corridor within producing areas to maximize potential for future connections.

2.3.4 Pipeline Route Selection Considerations and Rationale

The route selection process for the Project involved a desktop review of the area including high resolution digital imagery and LiDAR, in addition to helicopter reconnaissance, ground verification and field surveys, and engineering, geotechnical, and environmental field studies. The Project start and end points were determined by the locations of valve installations on existing NGTL pipelines, minimizing the length of new construction, and

minimizing environmental effects. NGTL's routing strategy was to install the pipeline parallel to existing linear disturbances to the extent feasible.

The NEB considers a contiguous ROW to be equivalent to a "new right-of-way" as defined in the Regulations *Designating Physical Activities of the CEA Act 2012* (CEA Act 2012) (Government of Canada 2012) (i.e., "new right-of-way" means land that is subject to a new right-of-way that is proposed to be developed for an electrical transmission line, an oil or gas pipeline, a railway or an all-season public highway and that is not alongside and contiguous to an existing right-of-way). The Project has been aligned with existing ROW, including NGTL and third-party ROW, considered contiguous for 55.6 km (91.9%) of its length. The Project follows other existing disturbance (e.g. industry access road, seismic, facility) for an additional 1.7 km, thus paralleling disturbances for a total of 57.3 km (94.8%) of its length. For the remaining 3.2 km (5.2%) of its length, the Project does not follow existing disturbances.

2.4 Project Components

The pipeline and associated valve sites are the only planned permanent facilities for the Project. Associated operational components will include in-line inspection launcher and receiver facilities, a cathodic protection system (new or upgrades to an existing system), and Supervisory Control and Data Acquisition (SCADA) System (if required during detailed engineering design). Temporary facilities include TWS for construction activities and temporary infrastructure (e.g., pipe storage yard, construction camp, temporary access).

2.4.1 Pipeline and Valve Sites

The Project will include 60.5 km of 508 mm (NPS 20) pipe and valve sites. The Project will extend from an existing block valve site located in SW 08-91-16 W5M to the independently proposed Carmon Creek East Sales Meter Station. A block valve will be installed at approximately kilometre post (KP) 34 in NW 25-88-18 W5M. This site will also include crossover valves to the existing NGTL Wolverine River Lateral. A second crossover valve site located at approximately KP 58 will connect to the existing NGTL Hunt Creek Lateral in SE 06-91-16 W5M. Access to the valve sites will be by permanent ROW or helicopter.

Access to pipeline locations during construction will be primarily by existing roads, including Highway 688 and 986, other existing access roads, industry access roads (Licence of Occupation [LOC]) and pipeline ROW (Pipeline Agreement [PLA]), as well as the Project ROW. New temporary access to water sources is proposed to support construction of the Project. Temporary access will use existing disturbances and only limited brushing will be required. No new permanent access is planned to support the Project. Shoo-flies (temporary access roads) to the pipeline ROW may be required in specific locations along the pipeline route.

The Project is located on Crown land and crosses forested land, wetlands, the Cadotte River and Little Cadotte River sub-basins of the Peace River basin. The Project crosses 12 watercourses: five unnamed permanent watercourses located in the Little Cadotte River watershed, six unnamed small permanent watercourses located in the Cadotte River watershed, and the Cadotte River.

Technical details for the Project are presented in Table 2.3-1. The Project footprint required for construction consists of both permanent ROW and TWS. The Project requires a minimum construction ROW width of 27 m for safe and efficient construction, which can be comprised of new ROW or a combination of new and existing ROW for workspace. Through use of existing ROW, the new permanent ROW is as little as 16 m in many areas. In addition to the construction ROW, site-specific TWS will be required at highway, road, pipeline and watercourse crossings, log deck sites, truck turn-arounds, and other locations to accommodate pipeline

construction activities. The construction ROW will be reclaimed after construction and maintained for pipeline operation.

The total area of the permanent ROW will be 109.6 hectares (ha). Additional areas, totalling up to 72.5 ha, will be required for TWS for construction activities and staging areas. The total area of ROW and TWS (i.e., the Project footprint) will be approximately 181.1 ha. The locations and areas of ROW and TWS are shown on the Environmental Alignment Sheets (Appendix B).

Table 2.3-1: Technical Details of the Project

Feature	Description
Length	Approximately 60.5 km
Length Contiguous to Existing Pipeline Right-of-Way	55.6 km (91.9%)
Tie-in locations	Existing Valve Site (SW 08-91-16 W5M) Crossover Valve Connection to the NPS 12 Hunt Creek Lateral (SE 06-91-16 W5M) Block Valve and Crossover Valve Connection to the NPS 12 Wolverine River Lateral (NW 25-88-18 W5M) Independently proposed Carmon Creek East Sales Meter Station (anticipated in service November 2015) (NW 22-85-18 W5M)
Pipe size	508 mm Outside Diameter (NPS 20) steel pipe
Pipe material types, categories, and grades	Will meet Canadian Standards Association (CSA) Z245.1
Maximum operating pressure (MOP)	9,930 kPa
Product	Sweet natural gas
New ROW Width	From 16 to 27 m wide new ROW is required depending on existing dispositions. The Project footprint (ROW and TWS) will be 27 m wide along the full length of the Project.
Temporary Workspace (TWS)	Up to 54 ha of TWS will be required at crossings, side bends and for grading
Project Footprint	181 ha (including ROW and TWS)
Typical Trench Width	Approximately 1.5 m
Minimum Depth of Cover	0.9 m for forested lands; 1.5 m at watercourse crossings
Hydrostatic Test Medium	Water
Pipeline Construction Schedule	Scheduled to begin November 2015
In Service Date	April 2016
Expected life of the pipeline	More than 30 years

Project construction, operation and maintenance activities will follow the requirements of all applicable codes, standards and regulations, including the latest version of Canadian Standards Association Standard Z662, Oil and Gas Pipeline Systems (CSA Z662). TransCanada has material specifications for all pipeline components, which outline the engineering requirements for these commodities, including any certification or testing requirements. Materials are only purchased from suppliers that have been qualified by TransCanada, and critical engineering components require third party inspection to verify that the product meets TransCanada's requirements.

2.4.2 Associated Components

Other components associated with the pipeline include the following:

- In-Line Inspection (ILI) Facilities – Launcher and receiver facilities for in-line inspection will be installed.
- Cathodic Protection – A cathodic protection system will be installed. Facilities could include new, or upgrades to existing, anode beds, rectifiers, and associated facilities. The scope of the cathodic protection system will be addressed during detailed design.
- Supervisory Control and Data Acquisition (SCADA) System – The Project may include the installation and operation of a SCADA system to allow for remote monitoring and control of valves (if required based on detailed engineering design). The Project SCADA system will be connected to TransCanada's Operations Control Centre (OCC) located in Calgary. This centre is staffed 24 hours per day.

2.4.3 Temporary Facilities

The following temporary facilities will require temporary use of lands during Project construction:

- TWS – for crossings, side bends, log decks, and grading during pipeline construction;
- Staging areas – for equipment and fuel storage, and muster points during construction; and
- temporary construction camp(s) to accommodate Project personnel during construction.

All temporary facility sites will be reviewed from an environmental perspective by NGTL prior to use, and reclaimed as part of the post-construction reclamation activities. TWS is planned at specific locations, including pipeline crossing of watercourses and roads, as well as side bends, log decks, staging areas, and where grading is required. The amount of TWS will be limited to the extent practical, and existing clearings will be used to the extent available.

2.4.4 Temporary Construction Camps

NGTL has applied to construct a temporary camp for the proposed Otter Lake Compressor Station Project (Otter Lake Project) under a separate NEB section 58 application. The temporary camp will be located at the north end of the proposed Project ROW, on part of the Pipeline Installation Lease (PIL) for the Otter Lake Project, in SW 08-91-16 W5M. Upon completing construction of the Otter Lake Project in Q3 2015, the temporary camp will be used by the pipeline Project. The Project will use the temporary camp for approximately 50 personnel, who will work on ROW preparation activities, such as clearing, grading, and frost-packing from November 2015 until mid-January 2016.

The temporary camp for the Otter Lake Project is located in an ESRD designated Key Wildlife and Biodiversity Zone (KWBZ) that has a Restricted Activity Period (RAP) that begins in mid-January. As this RAP starts as clearing activities near completion, NGTL proposes to close the camp following clearing, grading and frost-packing activities to limit NGTL's presence during the RAP. Should the camp be kept open during the RAP, it would not be sufficient to lodge the full workforce for the Project during peak construction, which NGTL estimates will include up to 475 personnel from mid-January to mid-February 2016, and as such will not be used past ROW preparation activities.

NGTL is reviewing available hotel and rental accommodations in Peace River and existing open construction camps in the south end of the Project area that may provide accommodation for the peak Project workforce which will construct the Project from south to north. It is anticipated that existing and future commercial and camp accommodations will be sufficient to house the Project workforce. NGTL will continue to monitor vacancy rates for rental, commercial and camp accommodations in Peace River and near the Project. If necessary, NGTL will consider constructing an additional temporary construction camp in an existing clearing on Crown land near the Project footprint. The Project will be responsible for demobilization of the camp constructed for the Otter Lake Project, and any other camp constructed for the Project, including all camp modular structures and associated facilities (i.e. generators, fuel tanks, and water tanks).

2.5 Construction

The following sections describe the pipeline construction activities, workforce, and schedule.

2.5.1 Pipeline Construction Activities

The pipeline is the only permanent facility planned as part of the Project. The standard activities associated with pipeline construction are described in Table 2.5-1.

Table 2.5-1: Activities Associated with Pipeline Construction

Pipeline Construction Phase	Description of Activity
Engineering Design	The Project will follow the requirements of the latest version of Canadian Standards Association (CSA) Standard Z662, Oil and Gas Pipeline Systems (CSA Z662) and will be in compliance with the latest version of the National Energy Board (NEB) Onshore Pipeline Regulations (OPR).
Surveying	Line-of-sight clearing with chain saws (as required), flagging, and staking of the proposed construction right-of-way (ROW), any temporary workspace (TWS), and marking of the trench line and any utilities. Surveying also involves marking of any sensitive areas to be avoided during construction such as rare plants or habitat, and historic resources.
Clearing	Removal of snow, trees, shrubs, and other obstacles from the construction footprint. Merchantable timber will be harvested and made available according to commercial use agreements. Other salvageable timber will be made available according to use agreements. Equipment used for clearing activities includes chain saws, rotary grinders, feller-bunchers, hydro-axes, mulchers or other tree-clearing equipment, as well as skidders, dozers, and backhoes.
Stripping / Salvage	Strippings will be salvaged at areas where grading is necessary. The area stripped is to correspond to the area to be graded. Equipment used during strippings handling activities includes dozers, graders, and backhoes.
Grading	Grading may be required at some locations to establish a level and safe working surface. Grading follows strippings salvage and uses backhoes and dozers.
Stringing and Welding	Sections of pipe will be transported to the ROW by trucks from a stockpile site, ideally located south of the Project. The pipe will then be field bent, lined-up, welded, joint-coated, and inspected, prior to being lowered into the trench. Equipment used includes pipe trucks, booms, bending machines, pick-up trucks, and x-ray or ultrasonic inspection equipment mounted on pick-up trucks or skids.
Trenching	The trench for the pipeline will provide a minimum cover of 0.9 m to top of pipe and a typical trench width of approximately 1.5 m. Excavated subsoil material will be stored adjacent to the trench, on the spoil side of the ROW. Trenching will likely be done with tracked excavators and wheel ditchers.
Pipe lowering	Welded pipe sections will be lowered into the trench by sideboom tractors and/or backhoes. Trench dewatering may be required prior to lowering-in the welded pipe. Weights and/or screw anchors may be installed with the pipe in wetland areas or areas with a high water table, where applicable.

Table 2.5-1: Activities Associated with Pipeline Construction (continued)

Pipeline Construction Phase	Description of Activity
Backfilling	After the pipe has been lowered, the trench will be filled with the previously excavated spoil and crowned over the trench. Equipment used will consist of backhoes, graders, dozers or specialized backfilling equipment.
Watercourse Crossings	Watercourse crossing methods will be decided in consultation with engineering and environmental specialists. Crossing methods typically used during watercourse construction include dry or frozen open-cut crossings, and isolated (i.e., dam and pump, flumes) crossing techniques.
Clean-up and Reclamation	Final clean-up and reclamation procedures will be initiated following construction, once weather and soil conditions permit, using bulldozers, backhoes, and graders. The ROW contours will be returned to a stable and maintenance free condition. The strippings, where salvaged, will be replaced, with cross ditches and diversion berms installed on moderate to steep slopes to reduce the risk of erosion. Erosion prone areas will be seeded with an appropriate native seed mix and special reclamation measures will be applied, where warranted.
Waste Disposal	The anticipated Project wastes are typical pipeline construction wastes, such as scrap materials, used lubricants, welding rods, and domestic garbage. Project operations are also expected to produce used lubricants, oily rags, and chemical containers. All waste will be disposed of at an approved site or, in the case of the chemical containers, returned to the supplier. The contractor, in accordance with NGTL's Waste Management Plan, will handle waste management and disposal during the Project.
Pipeline Integrity Validation and Testing	NGTL will validate the integrity of the new pipeline through CSA and/or NEB approved methods prior to commissioning the pipeline. This will be accomplished using non-destructive examination and hydrostatic tests when the pipeline is filled with water to a pressure beyond normal daily operating pressures.
Emergency Response Plan	NGTL will have an emergency response plan for the Project that meets or exceeds regulatory requirements. NGTL currently has operations in the area, and will adapt its response plans to include the Project. NGTL will communicate with emergency response personnel in the area and work co-operatively to link company emergency plans appropriately into plans maintained by other affected agencies.

2.5.2 Inspection

NGTL will retain the services of a qualified Environmental Inspector for the duration of construction. The Environmental Inspector will monitor construction activities and confirm the implementation of protection measures outlined in NGTL's documentation, including the EPP and Environmental Alignment Sheets (Appendices A and B of this ESA).

2.5.3 Workforce Requirements

The total construction workforce is expected to be a maximum of 475 persons, including supervisors and inspectors, over the course of the Project construction. During pipeline operation and maintenance, there will be no increase in the workforce as operation and maintenance activities associated with the Project will be performed by existing NGTL personnel or contractors.

2.5.4 Schedule

The Project schedule has been developed based on receipt of all required regulatory permits and approvals to construct and operate the pipeline with an in-service date in April 2016. Engineering design and planning activities are ongoing and are expected to continue, including the procurement of materials, until major construction commences in November 2015. Estimated dates for the construction and operation and

maintenance activities of the pipeline are provided in Table 2.5-2. NGTL requests NEB approval by September 2015 to facilitate the proposed start of construction of the Project on November 1, 2015.

Winter construction provides the most suitable conditions in the terrain crossed and avoids the most sensitive timing periods for wildlife such as migratory songbirds and trumpeter swans. It is anticipated that construction will be necessary in KWBZs that occur from approximately KP 14 to KP 20 and KP 57 to KP 60 of the Project (refer to Section 5.8.3 – Wildlife Areas and Acts) during the RAP for KWBZ from January 15 to April 30. A KWBZ Protection Plan to address this occurrence is being developed in consultation with ESRD and will be finalized prior to construction. NGTL will initiate clearing activities in the KWBZ as early as possible when construction starts and will work expeditiously to limit winter activities. Ongoing consultation with ESRD will be maintained to manage necessary work activities in the KWBZ.

Table 2.5-2: Proposed Construction and Operation Schedule

Pipeline Construction Phase / Activity	Proposed Schedule (Start Date and Duration)
Engineering Design and Environmental Planning	July 2013 (15 months)
Surveying	September 2013 (6 months)
Pipeline Construction	November 2015 to April 2016
Clearing / Mowing	November 2015 (8 weeks)
Stripping and Grading (as required)	November 2015 (11 weeks)
Stringing	December 2015 (9 weeks)
Welding	January 2016 (8 weeks)
Trenching	January 2016 (8 weeks)
Pipe Lowering and Backfilling	January 2016 (7 weeks)
Pipeline Integrity Validation and Testing	February 2016 (4 weeks)
Clean-up and Reclamation	February 2016 (7 weeks)
In Service	April 2016
Operation and Maintenance	Through the life of the pipeline
Post-construction Monitoring	May 2016 to September 2018 (during the first and second complete growing seasons following construction)
Line Patrols	Approximately every six months, or twice per year, by helicopter or fixed winged aircraft
In-line Inspection	Launcher and receiver facilities will be installed to facilitate future ILI. There are no current plans to conduct in-line inspection in the immediate future.
Vegetation and Weed Management	As required
Maintenance Integrity Digs	As required; excavation only following detection of pipeline issue by smart pig, or suspected contact by a third party
Facility Inspections	Valves are inspected every 12 to 18 months; cathodic protection test readings are taken yearly
Decommissioning, Abandonment, and Reclamation	The Project is expected to operate for at least 30 years. Decommissioning and abandonment activities will comply with all applicable federal and provincial regulatory requirements in force at the time

2.6 Operation and Maintenance

The Project is expected to be commissioned, operational, and in-service by April 2016. TransCanada operates the NGTL System pursuant to an Operating Agreement between TransCanada and NGTL. NGTL applies TransCanada policies in its operations of the NGTL System that are common to NGTL's operation of other federally-regulated pipelines. For the Project, NGTL will develop and implement a Post-construction Monitoring (PCM) program to assess the effectiveness of mitigation and reclamation measures on soils, vegetation and watercourses disturbed during construction of the pipeline. NGTL will conduct monitoring and prepare maintenance plans to address any identified potential adverse environmental effects.

NGTL has systems in place to manage the safe operation and integrity of its existing facilities. These programs will be applied to the Project. The new pipeline and valves will be covered by integrity management plans ensuring that the on-going requirements of this pipeline and facilities are met throughout their respective service lives. Internal inspection is an integral part of NGTL's Integrity Management Program and the proposed in-line inspection facilities will be designed to allow passage of various types of in-line inspection including cleaning tools and high and low resolution in-line inspections tools.

NGTL has Operation Procedures that describe how its pipelines are operated and maintained. The Operations and Procedures Manual provides detailed information on ROW maintenance, including information on Alberta One-Call, aerial reconnaissance, pipeline crossings, road usage, pipeline signage, brush control, and weed control. This manual will be expanded to include work completed for the Project.

2.6.1 System Protection and Controls

The Project facilities will be controlled from the OCC in Calgary, operated by TransCanada. The OCC is staffed 24 hours per day and uses a computer-based SCADA system to continuously monitor and control pipeline operations.

The pipeline control system will monitor pipeline flows, pressures, temperatures and equipment status continuously. The SCADA system will alert the OCC operator of significant operational changes of the pipeline system. Status and control information will be received by the SCADA system.

2.6.2 Maintenance

Activities that occur during regular operation and maintenance of the pipeline include the following:

- aerial pipeline inspection;
- placing pipeline markers at roads and watercourse crossings;
- vegetation management;
- cathodic protection monitoring (where warranted);
- in-line inspection; and
- SCADA monitoring.

2.6.3 Public Awareness

NGTL will follow the TransCanada Public Awareness Program to educate key stakeholders about living and working safely near pipelines. The program is holistic in nature, and is designed to inform the affected public, excavators and contractors, emergency officials, and local public officials of facility locations and operational activities to:

- protect the public from injury;
- prevent or reduce effects on the environment;
- protect the facilities from damage by the public; and
- provide an opportunity for ongoing public awareness.

The Public Awareness Program provides safety messaging on leak recognition and response, and damage prevention awareness including the message to 'call before you dig'.

The Project consultation and engagement program is described in Section 3.

2.7 Decommissioning and Abandonment

The Project has been designed to operate for 30 years or more. Decommissioning and abandonment activities will comply with all applicable federal and provincial regulatory requirements. Any decommissioning and abandonment activities will require the approval of the NEB and other applicable agencies. These approvals will be applied for at the time of decommissioning planning.

3.0 PROJECT ENGAGEMENT

3.1 Principles and Goals of the Consultation and Engagement Program

The stakeholder engagement program was designed and conducted in accordance with the principles of TransCanada's community relations best practices. The goals of the consultation and engagement program are to:

- build, maintain, and enhance a positive reputation for TransCanada, regardless of the status of the Project;
- gather, understand, consider, and integrate stakeholder issues and concerns into Project design and execution as appropriate;
- provide feedback to stakeholders on how their input was integrated into the ESA or on the rationale for not integrating it; and
- enable the development and maintenance of positive relationships with stakeholders by encouraging them to do the following:
  - learn about Project activities;
  - engage in the consultation process; and
  - be involved in addressing potential issues or concerns that might be identified through the consultation and engagement process.

3.2 Design of the Consultation and Engagement Methods

A number of methods have been used to inform the public, obtain feedback and identify issues related to the Project, including the following:

- Project-specific Information Package, which includes a fact sheet and Project map;
- National Energy Board – Fact Sheet – January 2014;
- personal contacts with stakeholders, including face-to-face meetings;
- newspaper advertisements;
- public notices;
- Project-specific website;
- Project e-mail box;
- Project toll-free telephone number; and
- mail-outs to provide updates throughout the life of the Project.

The consultation and engagement program for the Project is implemented in phases using open communication and participatory community involvement practices. Consultation and engagement phases I through IV are outlined below.

Phase I – Stakeholder Identification and Material Development

This phase of consultation and engagement focuses on the identification of possible interested/affected stakeholders in the Project area and the development of high level consultation and engagement materials including stakeholder letters, maps and informational fact sheets, to be used for project notification purposes. The initial project information distribution list is developed in this stage and is updated regularly as additional stakeholders are identified.

Phase II – Stakeholder Notification

This phase focuses on the first wave of initial project notification to stakeholders identified in Phase I. This notification contains some high level details relating to the Project, including proposed facility locations and key Project related activities, as well as information on how stakeholders can provide input into the project planning and NEB regulatory review process.

Phase III – Ongoing Stakeholder Outreach and Regulatory Filings

This phase consists of ongoing stakeholder consultation, engagement, and communication including the distribution of additional project information (mail-outs), project advertising, telephone contact, and face-to-face meetings. The purpose of this continued outreach is to keep stakeholders informed about the Project's progress, to continue to solicit feedback about the Project and to identify and address issues.

Phase IV – Post Filing through Construction

This consultation and engagement phase will continue through the regulatory review process and if approval is granted, until the completion of construction. Stakeholders will be informed of the NEB's decision and advised of any pre-construction and construction activities. During this phase, NGTL will respond to inquiries and emerging issues; resolve issues carried over from Phase III activities; and continue to communicate with all stakeholders. NGTL will update stakeholders regularly as Project milestones are met and will seek their continued feedback and input. This phase will conclude with the completion of construction, at which point consultation and engagement activities will be transferred from the project team to TransCanada's Integrated Public Awareness Program, through its Land, Aboriginal and Community Relations group, to ensure ongoing stakeholder communication and issue resolution as required during operation.

3.2.1 Stakeholders

TransCanada engages with a broad range of stakeholders, including:

- Aboriginal communities;
- municipal leaders and representatives (e.g., municipal districts, counties, rural municipalities, cities, towns, villages);
- provincial and federal elected officials;
- government agencies and representatives;
- other non-governmental organizations;
- lease holders;
- landowners;
- land users; and
- other interested stakeholders.

3.3 Consultation and Engagement Outcomes

Information gathered during the consultation and engagement program has been considered and incorporated in the ESA where relevant, including the effects assessment and mitigation and enhancement measures. With this information, NGTL identified issues, addressed concerns, and responded to questions raised by stakeholders. Engagement has also provided communities and regulators with an understanding of the Project's potential effects. Project-specific concerns raised to date have been addressed, and mitigation agreed to as appropriate.

3.4 Aboriginal Engagement

3.4.1 Engagement Activities Conducted To Date

The Aboriginal engagement program for the Project is guided by TransCanada's Aboriginal Relations Policy. The program is designed to assist NGTL in planning the Project. NGTL has made efforts to incorporate any potential concerns by Aboriginal communities in the region. Initial engagement of Aboriginal communities began in August 2013.

The following First Nations communities have been engaged on the Project:

- Woodland Cree First Nation (WCFN);
- Lubicon Lake Band (LLB);
- Duncan's First Nation (DFN);
- Whitefish Lake First Nation (WLFN);
- Loon River First Nation (LRFN); and
- Horse Lake First Nation (HLFN).

The following Métis Settlements communities have been engaged on the Project:

- Métis Nation of Alberta (MNA);
- Métis Nation of Alberta – Region 5 (MNA Region 5);
- Métis Nation of Alberta – Region 6 (MNA Region 6);
- Cadotte Lake Métis Local 1994 (CLML 1994);
- Gift Lake Métis Settlement (GLMS); and
- Peavine Métis Settlement (PVMS).

Project information has also been provided to the following communities and Treaty association that were identified by the Board as being potentially affected by the Project:

- Beaver First Nation;
- Kapewa'no First Nation;
- Sawridge First Nation; and
- Treaty 8 Alberta.

As a result of engagement with Kapawe'no First Nation, NGTL further contacted Sawridge First Nation to determine engagement for the Project.

The LLB and the WCFN provided Traditional Ecological Knowledge (TEK) information during environmental field programs in fall 2013. The LLB provided TEK information during the fisheries surveys on September 29 and October 1 and 2, 2013. The WCFN provided TEK information during fisheries surveys on October 4, 2013.

Meetings were held with the Aboriginal communities to discuss the approach to conducting TLU and TEK studies, and ROW flyovers. Duncan's First Nation (DFN) provided TLU and TEK information during a ROW flyover and a TLU community workshop held on January 22, 2014. The LLB provided additional TLU and TEK information during a ROW flyover and TLU community meeting held on January 28, 2014. The CLML 1994 provided TLU and TEK information during a ROW flyover and a TLU community workshop held on January 23, 2014. The WCFN provided TLU and TEK information during a ROW flyover held on January 24, 2014. A community meeting was also held with WCFN on February 13, 2014 to discuss the Project, community concerns, and the approach for conducting TLU and TEK studies.

3.4.2 Key Comments, Concerns and Interests

Aboriginal Interest and Concerns

Communities have expressed concern about health and safety (e.g., emergency preparedness, spraying for vegetation control), potential increase in predation of wildlife, location of the pipeline in relation to burial sites, and an interest in opportunities to participate as environmental monitors for the Project (Section 5.14). An Aboriginal engagement summary report of potential issues, concerns and interests is provided in the application for the Project. Supplemental TLU and Aboriginal engagement may result in the identification of new Project-specific issues, which may require mitigation. As a result of the initial engagement and meetings held in January and February 2014, NGTL is working with the Aboriginal communities to schedule additional meetings in March or April 2014 to discuss their project-specific concerns and mitigation agreed to as appropriate. A summary of potential issues and concerns is provided in Section 5.14 and in the Aboriginal Engagement section of the application for the Project.

Results of the consultation and engagement program have been considered and incorporated through the ESA where relevant, including the effects assessment and mitigation and enhancement measures. NGTL has made efforts to incorporate any potential concerns by Aboriginal communities in the region. NGTL will continue to work with communities to ensure areas of concerns are reasonably and appropriately mitigated.

Public Concerns and Interest

NGTL has initiated consultations with local municipalities and communities with generally positive outcomes to date. While some concerns are being expressed, such as Northern Sunrise County's concern regarding the transportation of workers during construction and a preference for coordinated bussing of construction personnel to the worksite, NGTL is working to evaluate preferred scenarios with the intent of developing mutually satisfactory plans to address these concerns. NGTL anticipates continued positive and collaborative consultations throughout the planning period of the Project, and through all phases of the Project. A full description of the Stakeholder Engagement Program, results and status of engagement is presented in the Stakeholder Engagement section (Section 12) of the section 52 Application document. Concerns raised to date, or potentially raised, are also addressed as appropriate throughout this ESA in Traditional Land and Resource Use (Sections 5.14 and 6.15), Quality of Life (Sections 5.15 and 6.14), Human Health (Section 6.15), and Infrastructure and Services (Section 6.16).

4.0 ENVIRONMENTAL AND SOCIO-ECONOMIC EFFECTS ASSESSMENT METHODOLOGY

This section describes the approach and methods used to carry out the assessment of environmental and socio-economic effects for the Project. The Project is described in Section 2 of the ESA and Section 2.0 of the Application. The methodology was developed based on the NEB *Filing Manual*, Release 2014-01 (NEB 2014) using Guide A – Facilities Applications (NEB Act section 52 and section 58), section A.2 (Environmental and Socio-Economic Assessment).

The methodology for this ESA involves the following steps:

- describe the existing environmental and socio-economic setting (i.e., baseline conditions) in which the Project will be constructed and operated;
- determine the environmental and socio-economic Valued Components (VC) and associated key indicators that may interact with the Project;
- determine the temporal and spatial boundaries of interactions between the Project and the VCs;
- conduct the project-specific effects assessment, including identification of potential project effects, recommended mitigation, evaluation of residual Project effects, and determination of their significance;
- conduct a cumulative effects assessment for the Project in combination with other reasonably foreseeable projects and activities; and
- identify any follow-up and monitoring programs that will be undertaken post-construction to evaluate effectiveness of planned mitigation and address environmental issues identified during Project operation.

4.1 Describing the Existing Environment

The description of the existing environment includes all the environmental or socio-economic elements that were considered when determining which aspects of the environment may potentially be affected as a result of the Project. The environmental baseline, describing the environment and socio-economic elements as they are now, is the basis for determining the incremental change and likely environmental and socio-economic effects associated with the proposed Project. The following sources were used to prepare the baseline section:

- review of available topographic and resource maps, aerial imagery, databases, scientific papers, technical reports, government websites, interactive websites, information letters, and fact sheets;
- Project-specific field investigations;
- environmental applications prepared for other projects in the area; and
- communication with Aboriginal groups, local land users, representatives from local and regional governments, provincial and federal regulators, and the general public.

The study methods and the existing environmental and socio-economic setting in which the Project will be constructed and operated are described in Section 5.

4.2 Determining Valued Components and Key Indicators

The assessment of effects on the environment focuses on the environmental and socio-economic elements prescribed to be considered in the NEB *Filing Manual* (NEB 2014). All elements, referred to as VC in this ESA, considered relevant to this ESA are described in Section 5; however, only those identified as having possible interactions with the Project were scoped into the assessment and described in further detail in Section 6.

To focus the effects analysis for each VC, one or more key indicators were selected. A key indicator represents a primary issue related to the VC that has the potential to change as a result of the Project, and can be described as an aspect or characteristic of the VC that, if changed as a result of the Project, may result in an effect on the VC.

The assessment is focused on key indicators that have environmental or socio-economic importance as identified by the Project team through a variety of means, including the following:

- stakeholder consultation;
- discussion with regulators;
- literature and database review;
- information from previous environmental assessments for projects proposed under similar environmental conditions; and
- the experience of TransCanada personnel and their consultants.

The identified scientific or community issues or concerns regarding the Project are represented by key indicators which have the potential to be affected by the proposed Project. A number of factors, including the following, influenced the selection of key indicators:

- the sensitivity or vulnerability of the key indicator;
- the uniqueness or rarity of the key indicator;
- the sustainability of the key indicator;
- the value attributed to the key indicator by stakeholders;
- recognition of the importance of a key indicator by a statute, policy, regulation, or court;
- risks to the health, safety or well-being of people; and
- the likelihood of an indirect effect on an associated key indicator (i.e., a link exists between the affected key indicator and another key indicator such as water quality affecting fish habitat).

The VCs and key indicators selected to address the issues identified in relation to this Project, the rationale for their selection, and associated expressions of change are presented in Table 4.2-1.

Table 4.2-1: Valued Components, Key Indicators, Associated Expression of Change and Rationale

Valued Component	Key Indicator	Expression of Change	Rationale
Biophysical			
Soil and Soil productivity	Terrain	Change in terrain contour Change in terrain stability	▪ Instability can affect pipe integrity. Changes in stability and contour can affect other components (e.g., vegetation, surface water, wetlands) and land uses
	Soil Quality	Change in areal extent of productive soil units	▪ Regulatory requirement to maintain land capability; reclamation suitability (*Environmental Protection and Enhancement Act*) ▪ Ecosystem conservation concern; importance to ecosystem diversity and interrelation with other components (e.g., groundwater, vegetation) ▪ Importance of soil productivity in maintaining forest capability
Vegetation	Vegetation Type	Change in area of native vegetation community types important to wildlife and traditional use	▪ Potential implications to wildlife habitat potential, species diversity, and use of plants for traditional purposes ▪ Regulatory requirement (e.g., Alberta Environment and Sustainable Resource Development [ESRD])
		Introduction of prohibited noxious or noxious weed species	▪ Regulatory requirement to control noxious weeds and eliminate prohibited noxious weeds (Alberta *Weed Control Act*)
	Listed Plant Species	Change in known occurrences of listed plant species Change in total area of suitable habitat with high potential to support listed plants	▪ Regulatory requirement: potential adverse effect on federally listed (COSEWIC 2013a; *Species at Risk Act* (SARA) 2012) or provincially listed (Alberta Conservation Information Management System (ACIMS 2013); General Status of Alberta Wild Species (ASRD 2011) plant species ▪ Potential implications to species and community level biodiversity
	Listed Ecological Communities	Change in area of vegetation community/ies	▪ Provincial regulatory concern as ecological communities are tracked by ACIMS (2013) ▪ Potential implications to wildlife habitat potential, species and community level biodiversity
	Timber Resources	Change in amount of timber available to harvest	▪ Potential conflict (economic concern) with local forest management agreement (FMA) holder

Table 4.2-1: Valued Components, Key Indicators, Associated Expression of Change and Rationale (continued)

Valued Component		Key Indicator	Expression of Change	Rationale
Water Quantity and Quality	Surface Water	Natural flow patterns	Change in natural drainage patterns	▪ Response to alteration may include erosion and instability ▪ Maintain natural local / regional drainage patterns ▪ Regional users and potential public concerns
		Lateral and vertical stability	Scour or lateral migration of watercourse	▪ Regulatory requirements (Alberta *Water Act*) ▪ Possibility of detrimental effects associated with an exposed in-service pipeline
		Water quantity	Change in natural watercourse flow rates	▪ Regulatory requirements (Alberta *Water Act*) ▪ Regional users and potential public concerns
		Water quality	Change in water quality	▪ Regional users, regulatory (e.g., *Environmental* Protection *and Enhancement Act*) and general public concern ▪ Maintain water quality for the protection of aquatic life
	Groundwater	Groundwater Quantity	Change in groundwater quantity	▪ Regulatory (Alberta *Water Act*) and potential public concern
		Groundwater Quality	Change in groundwater quality	▪ Regulatory (Alberta *Water Act*) and potential public concern
Fish and Fish Habitat		Fish habitat	Change in habitat quality and quantity	▪ Regulatory requirement; potential to adversely affect fish habitat protected under the *Fisheries Act*
		Fish populations, including species at risk	Change in abundance and distribution of fish populations	▪ Ecosystem conservation concerns; importance to ecosystem diversity and inter-relation to other environmental components (e.g., wildlife) ▪ Arctic grayling is listed as 'Sensitive' in The General Status of Alberta Wild Species 2010 (ASRD 2011) ▪ Regional users and potential Aboriginal and public concern
Wetlands		Wetland Habitat	Change in number and area of mineral and organic (fen and bog) wetlands and change in hydrological and water quality function	▪ Regulatory requirement regarding no net loss of wetland habitat (Government of Canada 1991) and Alberta *Water Act* Code of Practice requirements

Table 4.2-1: Valued Components, Key Indicators, Associated Expression of Change and Rationale (continued)

Valued Component	Key Indicator	Expression of Change	Rationale
Wildlife and Wildlife Habitat	Moose	▪ Change in available habitat ▪ Change in wildlife abundance ▪ Change in movement patterns	▪ Economic importance (i.e., traditional and non-traditional hunting licenses), recreational importance, ecological importance (primary prey species), traditional importance ▪ Abundant data are available for moose populations in Alberta. The data are available from a number of sources including provincial government resources, environmental impact assessments, monitoring programs and published scientific literature ▪ Key Wildlife and Biodiversity Zone (KWBZ) present ▪ Provincial status – 'Secure' (ASRD 2011)
	Furbearers / carnivores (Canada lynx, fisher)	▪ Change in available habitat ▪ Change in wildlife abundance ▪ Change in movement patterns	▪ Ecological importance (carnivore, predator/prey relationship), traditional and economic importance (fur harvest) ▪ Representative carnivores found in old growth forest habitats (Canada lynx and fisher) ▪ Provincial status (Canada lynx and fisher) – 'Sensitive' (ASRD 2011)
	Old growth forest birds (bay-breasted warbler, cape may warbler, Canada warbler, black-throated green warbler)	▪ Change in available habitat ▪ Change in wildlife abundance ▪ Change in movement patterns	▪ Species identified are indicator species for passerines and representative of old growth forests ▪ Provincial status (bay-breasted warbler, cape may warbler, Canada warbler, black-throated green warbler) – 'Sensitive' (ASRD 2011) ▪ Federal status (bay-breasted warbler, cape may warbler, Canada warbler, black-throated green warbler) – 'Sensitive' (SARA 2012)
	Olive-sided flycatcher	▪ Change in available habitat ▪ Change in wildlife abundance ▪ Change in movement patterns	▪ Representative of open spruce and tamarack muskeg, bog, and swamp habitat ▪ Riparian indicator species for passerines ▪ Federal status – 'Threatened' (SARA 2012)
	Trumpeter Swan	▪ Change in available habitat ▪ Change in wildlife abundance ▪ Change in movement patterns	▪ Trumpeter Swan Waterbodies near the Project ▪ Provincial status – 'At Risk' (ASRD 2011)

Table 4.2-1: Valued Components, Key Indicators, Associated Expression of Change and Rationale (continued)

Valued Component		Key Indicator	Expression of Change	Rationale
Species at Risk or Species of Special Status		Included as part of Vegetation, Fish and Fish Habitat, Wildlife and Wildlife Habitat Valued Components		
Air Quality		Criteria Air Contaminant (CAC) Emissions	Change in ambient CAC concentrations	▪ Regulatory requirement (ESRD) to comply with *Alberta Ambient Air Quality Objectives* (AAAQOs) ▪ Potential human health implications
		Greenhouse Gas (GHG) Emissions	Change in GHG emissions	▪ Potential human health implications ▪ Contributor to climate change
Acoustic Environment		Noise Level	Change in noise level	▪ Regulatory requirement (NEB *Filing Manual* and Alberta Energy Regulator (AER) (Directive 038)
Socio-economic				
Human Occupancy and Resource Use	Human Occupancy	Population	Change in population	▪ Current trend of high in-migration and shadow population could be affected further by the Project ▪ Potential to increase competition for housing, jobs, and social services
	Land and Resource Use	Parks, protected areas and recreation areas	Disruption of recreational land use in parks, protected areas and recreation areas	▪ Potential disturbance to parks or protected areas
		Non-renewable resource use	Disruption of non-renewable resource use	▪ Potential disruption of non-renewable resource use (i.e., mining, rail and transportation, transmission)
		Forestry	Clearing of forestry land base and forestry resources	▪ Potential disturbance of the existing forestry land base in close proximity to the Project footprint
		Hunting, trapping, and fishing activities	Disruption of trapping, hunting, and fishing activities due to increased human activity	▪ Current trapping, hunting, and fishing activities could be disrupted by Project construction activities
		Navigable watercourses	Interference with navigation of watercourses	▪ Potential disruption of navigation on the existing navigable watercourses that are crossed by the Project footprint
		Water use	Change in water quantity available to users	▪ Potential temporary reduction in the amount of water available in the Socio-economic Study Area
		Visual aesthetics	Alteration of viewscapes and visual aesthetics	▪ The construction of the Project could alter the existing viewscape

Table 4.2-1: Valued Components, Key Indicators, Associated Expression of Change and Rationale (continued)

Valued Component		Key Indicator	Expression of Change	Rationale
Heritage Resources	Heritage (Historic) Resources	Historic resource site	▪ Number of historic resource sites lost or damaged ▪ Number of sites where information recovery is completed prior to Project construction	▪ Regulatory requirement (*Alberta Historical Resources Act*) ▪ The potential to disrupt or destroy historic resource sites is a concern due to its potential effect on our ability to understand the prehistory/history of the region ▪ Aboriginal and public concern
Traditional Land and Resource Use		Opportunity to harvest wildlife	▪ Change in abundance of moose and furbearers ▪ Change in access to wildlife harvesting areas	▪ Traditional hunting or trapping may be affected by changes in the abundance of large game or furbearers, and access to wildlife harvesting areas
		Opportunity to harvest vegetation	▪ Change in abundance of vegetation for harvesting ▪ Change in access to vegetation harvesting areas	▪ Traditional plant harvesting may be affected by changes in the abundance of plants, or access to plant harvesting areas
		Opportunity to harvest fish	▪ Change in abundance of fish ▪ Change in access to fishing areas	▪ Traditional fishing may be affected by changes in the abundance of fish, or access to fishing areas
		Opportunity to use culturally important areas	▪ Loss of culturally important sites or areas ▪ Change in access to culturally important areas	▪ Project activities may affect traditional-use cabins or other culturally important sites such as historical resources or spiritual sites, or access to the areas
Social and Cultural Well-being	Quality of Life	Transient workforce population	Increase in transient population during construction	▪ The Project could disrupt quality of life through increased transient population
		Traffic and associated noise	Increase in traffic and associated noise	▪ The Project could disrupt quality of life through increased traffic and associated noise
		Water quantity and quality	Concerns regarding water quantity and quality	▪ Potential public concern that Project activities could reduce the existing water quantity and water quality in the socio-economic study area
		Air quality	Concerns regarding fugitive emissions and dust	▪ Potential public concern that Project activities could result in dust and other emissions

Table 4.2-1: Valued Components, Key Indicators, Associated Expression of Change and Rationale (continued)

Valued Component		Key Indicator	Expression of Change	Rationale
Human Health and Aesthetics	Human Health	Air quality	Change in air quality	▪ Changes in air quality could affect the health of people near the Project
		Surface water quality	Change in water quality	▪ Changes in water quality could affect the health of people near the Project
		Traffic accidents	Potential for traffic accidents	▪ Potential for collisions between public and Project traffic, and associated bodily harm and property damage
Infrastructure and Services		Transportation and traffic	Change in traffic level	▪ The Project could increase the existing levels of traffic on local highways and roads
		Waste flow management	Change in waste flow management level	▪ The Project could place further demand on waste flow management in the socio-economic study area
		Emergency and protective services	Change in level of use of emergency services	▪ Potential increase in demand for emergency services (e.g., emergency medical services [EMS])
		Commercial accommodation	Commercial accommodation availability	▪ Increase in demand for available commercial accommodations in the SSA could be affected by the Project's labour force accommodation requirements
		Recreational, educational and health services	Change in level of use of recreational, educational and health services	▪ Potential increase in demand for recreational, educational, and health services
Employment and Economy		Labour force activity	Change in local employment opportunities	▪ Continued trend of potential for increased employment opportunities and benefits in the regional economic context
		Taxes and revenue	Change in taxes and revenue	▪ Continued trend of increased revenue for Northern Sunrise County from Project development

4.3 Temporal and Spatial Boundaries

4.3.1 Temporal Boundaries

The Project activities include engineering design and planning, construction, operation and maintenance, and decommissioning and abandonment. The temporal boundaries for the effects assessment encompass the construction, operation and maintenance, and decommissioning and abandonment phases of the Project. The construction phase is scheduled to begin in November 2015, and the pipeline is scheduled to be in-service and the operation phase to commence in April 2016. A detailed Project schedule is presented in Table 2.5-2, Section 2.5.4. The Project has been designed to operate for 30 years or more. Consequently, the operation and maintenance phase of the Project is expected to continue until beyond 2046. Project decommissioning and abandonment effects are addressed, as warranted, in Section 6.0 following the effects assessment for the construction, and operation and maintenance phases. NGTL's proposed decommissioning and abandonment activities for the Project are provided in Section 8.7.

4.3.2 Spatial Boundaries

The spatial scope of the assessment was determined based on the extent of potential direct and indirect environmental and socio-economic effects on a given VC resulting from the Project. This assessment uses the following spatial boundaries as described in Section 5.1 and shown in Figures 5.1-1 and 5.1-2:

- Project footprint;
- Local Study Areas (LSA);
- Regional Study Areas (RSA); and
- Socio-economic Study Area (SSA).

4.4 Project-specific Effects Assessment

The Project-specific effects assessment evaluates the environmental and socio-economic effects of the construction, operation, and decommissioning and abandonment phases of the Project. A step-wise process is used to assess the environmental effects of the Project in a systematic and transparent manner once the relevant Project works and activities, assessment boundaries, and relevant environmental and socio-economic VCs are identified. The assessment method includes the following steps:

- conduct an initial screening of potential Project-environment interactions;
- identify potential environmental and socio-economic effects;
- develop technically and economically feasible mitigation;
- predict likely residual effects following implementation of mitigation; and
- evaluate (i.e., describe and determine the significance of) the predicted residual effects.

4.4.1 Initial Screening of Project-Environment Interactions

The first step in the assessment process is to identify the likely Project-environment interactions at a screening level. The screening approach allows the assessment to focus on the issues of key importance. All relevant Project works or activities are analyzed individually to determine if there is a plausible interaction that could cause an effect on each VC during normal Project conditions. The analyses are based on professional judgement and experience of the ESA team with regard to the physical and operational features of the Project and their potential for interaction with the environment.

The results are summarized in a matrix illustrating where the Project may potentially interact with each VC and where adverse environmental or socio-economic effects are likely or possible. The interactions identified in the matrix are used to focus the description of the existing environment (Section 5) and the assessment and mitigation of potential effects (Section 6).

4.4.2 Identification of Potential Environmental and Socio-Economic Effects

The effects assessment considers the potential interactions between the Project infrastructure components and activities and the VCs, in the identified spatial and temporal boundaries. Project interactions may be direct (i.e., as a result of a Project infrastructure component or activity affecting a VC), or indirect (i.e., as a result of a change to one VC affecting another VC). Potential effects of the Project on the key indicators are determined by describing the existing environmental and socio-economic setting (i.e., baseline setting) in the Project footprint and study areas and comparing the baseline conditions to those which are expected to result from the introduction of the Project. In addition to assessing the potential Project effects on VCs, the assessment considers effects of the environment on the Project (e.g., climate change, severe weather, wild fires).

4.4.3 Identification of Mitigation

Development of mitigation to reduce or avoid potential effects on key indicators begins with the engineering design phase, and continues throughout the route selection, planning, assessment, and consultation and engagement activities for the Project. Refinements are made as specifics are identified and the Project and cumulative effects assessment is conducted. Mitigation is outlined in the effects assessment (Section 6) with reference to the Project specific EPP (Appendix A), including Environmental Contingency and Management Plans (Appendix A – Annexes E and F), and other industry standard practices and regulatory requirements.

4.4.4 Prediction of Likely Residual Effects

An effect is considered to occur where anticipated future conditions resulting from the Project differ from the conditions otherwise expected from natural change. In some situations, the recommended mitigation will eliminate a potential adverse effect while in other situations the measures will lessen, but not eliminate, the effect. Any adverse effect that will be eliminated, or is considered unlikely after mitigation, is not identified as a residual effect and is not considered further. Any adverse effect that may remain after the application of feasible mitigation is identified as a residual effect.

4.4.5 Evaluation of Predicted Residual Effects

4.4.5.1 Description of Residual Effects

Predicted residual Project effects, where identified, are described in terms of the following effect description criteria:

- direction;
- magnitude;
- geographic extent;
- duration/reversibility;
- frequency; and
- probability of occurrence.

Ecological context may also be relevant when describing an adverse effect on biological and some socio-economic VCs. Ecological context relates to the potential for Project effects to cause disruption of ecological functions in relation to the receiving environment, which may be ecologically fragile with little resilience to imposed stresses or may be already adversely affected by human activities. Where relevant, a statement regarding ecological context will be included in the description of residual effects.

The definition of effect levels comparable to each criterion can vary from one key indicator to another, recognizing that the units and range of measurement are distinct for each. The criteria used to describe a predicted residual effect are defined in Table 4.4-1. These criteria were considered in combination by the assessment team to assess the importance of an adverse residual effect on a key indicator.

Importance of the Predicted Residual Effect

The assessed importance of the predicted residual effect for each key indicator is primarily based on the combination of magnitude, geographic extent, and duration of the effect. The frequency of an effect is often implicit in the definition of effect magnitude or duration. The probability of occurrence is considered primarily in the case of assessing risk, such as in the case of accidents and malfunctions.

The combination of criteria used to describe a predicted residual effect, and to assess the level of importance of the residual effect on key indicator are provided in Table 4.4-2.

Table 4.4-1: Definition of Criteria Used to Describe Predicted Residual Effects for Key Indicators

Criteria	Definition	Biophysical Key Indicator Description	Socio-economic Key Indicator Description
Direction	Direction relates to the "value" of the effect in relation to the environment	▪ Positive – net gain or benefit; effect is desirable ▪ Neutral – no change compared with baseline conditions and trends ▪ Negative – net loss or adverse effect; effect is undesirable	▪ Positive – an improvement over baseline values or conditions ▪ Neutral – no change compared with baseline conditions and trends ▪ Negative – a less favourable change relative to baseline values or conditions
Magnitude	Magnitude is the intensity of the effect or a measure of the degree of change from existing (baseline) conditions expected to occur in the key indicator	▪ Negligible – no detectable change is expected from baseline values ▪ Low – effect occurs that might be detectable, but is expected to be within the range of baseline or guideline values, or within the normal range of natural variability ▪ Moderate – effect is expected to be at or slightly exceed the limits of baseline or guideline values – clearly an effect but unlikely to pose a serious risk or represent a management challenge[(a)] ▪ High – effect is expected to be beyond the upper or lower limit of baseline or guideline values so that there is likely a change of state from baseline conditions – effect is likely to pose a serious risk and represents a management challenge	▪ Negligible – no detectable change is expected from baseline values ▪ Low – the change to the socio-economic setting would not be noticeable ▪ Moderate – the change modifies the socio-economic setting, but there is no change in the system ▪ High – the change is large enough to result in a change to the socio-economic system
Geographic extent	Geographic extent refers to the spatial area over which a Project effect will occur / can be detected	▪ Local – the effect is confined to the local study area (LSA) ▪ Regional – the effect extends beyond the LSA boundary, but is confined within the regional study area (RSA) ▪ Beyond regional – the effect extends beyond the RSA boundary	▪ Local – the effect is confined to the LSA ▪ Regional – the effect extends to communities within close proximity to the Project and beyond, but within the socio-economic study area (SSA) ▪ Beyond regional – the effect extends beyond the SSA

Table 4.4-1: Definition of Criteria Used to Describe Predicted Residual Effects for Key Indicators (continued)

Criteria	Definition	Biophysical Key Indicator Description	Socio-economic Key Indicator Description
Duration / reversibility	Duration is the period of time over which the environmental or socio-economic effect will be present. The amount of time between the start and end of a Project activity or stressor (which relates to Project development phases), plus the time required for the effect to be reversed. Duration and reversibility are functions of the length of time a key indicator is exposed to Project activities. Reversibility is an indicator of the potential for recovery of the key indicator from the Project effect. Reversible implies that the effect will not result in a permanent change of state of the key indicator compared to "similar" environments not influenced by the Project (similar being an environment of the same type, region and time period). For effects that are permanent, the effect is determined to be irreversible.	▪ Short-term – the effect occurs during construction and is reversible during operation ▪ Medium-term – the effect occurs during construction and/or operation and is reversible at abandonment ▪ Long-term – the effect occurs during construction and/or operation and persists beyond abandonment, but is reversible ▪ Permanent – the effect occurs during construction and/or operation and is irreversible	▪ Short-term – the effect occurs during construction and is reversible during operation ▪ Medium-term – the effect occurs during construction and/or operation and is reversible at abandonment ▪ Long-term – the effect occurs during construction and/or operation and persists beyond abandonment, but is reversible ▪ Permanent – the effect occurs during construction and/or operation and is irreversible
Frequency	Frequency refers to the occurrence of the effect over the duration of the Project. Discussions on seasonal considerations are made when they are important in the evaluation of the effect.	▪ Infrequent – the effect is expected to occur rarely ▪ Frequent – the effect is expected to occur intermittently ▪ Continuous – the effect is expected to occur continually	▪ Infrequent – the effect is expected to occur rarely ▪ Frequent – the effect is expected to occur intermittently ▪ Continuous – the effect is expected to occur continually
Probability	Probability of occurrence is a measure of the likelihood that a Project activity will result in an effect.	▪ Unlikely – the effect is not likely to occur ▪ Possible – the effect may occur, but is not likely ▪ Probable – the effect is likely to occur ▪ Certain – the effect will occur	▪ Unlikely – the effect is not likely to occur ▪ Possible – the effect may occur, but is not likely ▪ Probable – the effect is likely to occur ▪ Certain – the effect will occur

(a) An effect that poses a management concern can require action such as research, monitoring or a recovery initiative.

Table 4.4-2: Main Criteria for Assessing the Importance of a Predicted Residual Effect

Criteria			Assessed Importance
Magnitude	**Geographic Extent**	**Duration / Reversibility**	
Negligible	Local Regional Beyond Regional	Short-term Medium-term Long-term Permanent	Negligible
Low	Local	Short-term	Negligible
		Medium-term	Low
		Long-term	Low
		Permanent	Moderate
	Regional	Short-term	Low
		Medium-term	Moderate
		Long-term	Moderate
		Permanent	High
	Beyond Regional	Short-term	Low
		Medium-term	Moderate
		Long-term	Moderate
		Permanent	High
Moderate	Local	Short-term	Low
		Medium-term	Moderate
		Long-term	Moderate
		Permanent	High
	Regional	Short-term	Moderate
		Medium-term	Moderate
		Long-term	High
		Permanent	High
	Beyond Regional	Short-term	Moderate
		Medium-term	High
		Long-term	High
		Permanent	High
High	Local	Short-term	Moderate
		Medium-term	Moderate
		Long-term	High
		Permanent	High
	Regional	Short-term	Moderate
		Medium-term	High
		Long-term	High
		Permanent	High
	Beyond Regional	Short-term	High
		Medium-term	High
		Long-term	High
		Permanent	High

The assessed levels of importance of the predicted residual effect are defined in Table 4.4-3. The predicted residual effects for each key indicator are assessed using a combination of criteria, professional judgement and these definitions as guidelines.

Table 4.4-3: Definitions of the Assessed Levels of Importance of Predicted Residual Effects

Level	Definition
Negligible	Predicted effect may result in a change in the resource, but is not detectable or measurable.
Low	Predicted effect may result in a detectable change in the resource. Research, monitoring, or recovery initiatives would not normally be considered.
Moderate	Predicted effect is expected to result in a detectable change in the resource, but is not expected to threaten the sustainability of the resource. Management actions such as research, monitoring or recovery initiatives may be considered.
High	Predicted effect is expected to result in a detectable change that could threaten the sustainability of the resource and should be considered a management concern. Management actions such as research, monitoring or recovery initiatives should be considered.

4.4.5.2 Determination of Significance

The determination of significance of adverse residual effects generally followed the guidelines and principles of the NEB *Filing Manual* (NEB 2014), the Federal Environmental Assessment Review Office (1994), and the *Cumulative Effects Assessment Practitioners Guide* (Hegmann et al. 1999). These agencies identify several possible methods for the determination of whether residual adverse effects are significant, including the use of established environmental standards, guidelines or objectives in relation to potential residual effects, as well as quantitative and qualitative assessment of the residual effects.

The determination of significance of adverse residual effects applies to each VC, considering the following:

- combined assessed levels of importance of the residual effects on key indicator using ecological and socio-economic principles;
- sustainable development objectives; and
- professional judgement and experienced opinion.

Maintaining the integrity of ecological and socio-economic systems and protecting biological and social resources is based on an understanding of the functioning of natural and social systems. Ecological and socio-economic principles such as natural cycles, interdependence and networks, and diversity and resilience are considered throughout the effects assessment and specifically in assessing the significance of an identified effect on a biological or socio-economic resource.

Sustainable development (i.e., satisfying the needs of present generations without compromising the ability of future generations to meet their own needs) in the context of this ESA is based on established public objectives (e.g., land use plan or policy; government commitment on the use and conservation of resources; legislation, regulation or guideline) to preserve environmental integrity, improve social equity, and improve economic feasibility.

The evaluation of significance involves the professional judgment of experienced specialists. The ESA team is comprised of technical specialists with experience collecting data and assessing environmental and socio-economic effects for numerous projects in Alberta. The team understands the Project scope, the landscape, environmental sensitivities, communities and types of environmental and socio-economic issues commonly encountered across northern Alberta, and those specific to this Project during construction, operation and decommissioning.

Based on the application of the significance criteria, a significance conclusion is made for each VC. The possible significance conclusions are defined in Table 4.4-4.

Table 4.4-4: Definitions of the Significance Determination of Predicted Residual Effects

Significance	Definition
Biophysical	
Not significant	The effect might be detectable, but is not predicted to result in a change that will alter the sustainability of the Valued Component (VC) beyond an acceptable level.
Significant	The effect is measureable, and is predicted to result in a change to the VC that will alter its sustainability beyond an acceptable level.
Socio-economic	
Not significant	The effect is measurable at the individual, family, or community level, and strong enough to be detectable at the population level, but is not expected to result in substantial change in the well-being of defined populations and communities.
Significant	The effect is clearly distinguishable and can result in strong interest or concern, or results in substantial change in the well-being of defined populations and communities.

4.4.5.3 Prediction of Confidence

Prediction of confidence in the Project effects assessment refers to the degree of certainty of the residual effects prediction and associated evaluation of environmental significance. The environmental assessment deals with predictions of future circumstances, and predicts interactions of the Project and other developments or activities with complex biophysical and socio-economic environments. Therefore, the effect predictions vary in their level of certainty, which is influenced by factors such as:

- availability of data relevant to the environment in the study area;
- natural variability and resiliency of the environment and society;
- degree of scientific understanding of Project and VC interactions, and VC interrelationships; and
- other factors beyond the control of the Project assessment team.

The level of certainty was considered during the effects assessment. Where there was a high degree of uncertainty, conservatism was built into the assessment so that the predicted effect would not be underestimated.

4.5 Cumulative Effects Assessment

In addition to the assessment of environmental or socio-economic effects of the Project by itself, the assessment also considers the environmental effects of the Project in combination with those of other projects and activities that have been, or will be, carried out and which may interact with the residual effects of the Project.

The Canadian Environmental Assessment Agency (CEA Agency) defines cumulative effects as the sum of residual effects from all past, current and reasonably foreseeable projects or activities on the physical, biological, cultural and socio-economic components of the environment (Hegmann et al. 1999). The CEA Agency recognizes that while each single land-use change may result in a relatively negligible effect, the accumulation of these changes over time and space could cause a significant effect. The CEA Agency aims to determine the interaction of these individual developments to determine how a given project will influence not only the project site or area, but the entire region over time.

The steps used to consider cumulative effects are based on the Canadian Environmental Assessment Agency's *Cumulative Effects Practitioners Guide* (Hegmann et al. 1999) and CEA Agency (2013) guidance, and include the following:

- identify adverse residual Project effects;
- define spatial and temporal boundaries for each VC where adverse residual Project effects have been identified;
- identify other projects in the area with similar (additive) effects likely to overlap the predicted residual Project effects;
- identify potential spatial and temporal interactions between the VC and the Project in combination with other projects or activities;
- develop additional mitigation, if warranted, and predict likely combined (cumulative) effects; and
- evaluate and determine the significance of the likely cumulative effects.

Regarding future projects and activities, emphasis was focused on those that are certain to proceed or are reasonably foreseeable.

If residual Project effects on a key indicator are predicted, the VC that it represents is carried forward into the cumulative effects assessment. For a VC where no residual Project effects are anticipated, the VC is not carried forward for further analysis.

For a VC where residual effects were identified, it is necessary to determine if the effects from the Project interact temporally or spatially with the effects from one or more additional developments or activities. When Project activities or disturbances interact spatially and temporally, their combined effects may differ in nature or extent from the effects of individual Project activities. Cumulative effects also include natural influences on biophysical and socio-economic components prior to, during and after development of the Project (e.g., extreme rainfall events, periodic harsh and mild winters, economic changes that are independent of the Project). It is the goal of the cumulative effects assessment to estimate the contribution of these types of effects, in addition to Project specific (incremental) effects, to the amount of change in the key indicator and therefore the VC.

Typically, the potential effects of malfunctions and accidents are not included in the cumulative effects assessment because these events are hypothetical and have a low probability of occurrence. This is consistent with the CEA Agency's *Cumulative Effects Practitioners Guide* (Hegmann et al. 1999) which acknowledges that such events are 'rare" and should be assessed as 'unique scenarios", as their potential effects are too extreme to be assessed together with those caused by normal Project activities.

In this ESA, cumulative effects are identified, analyzed and assessed in Section 7. The method of cumulative effects assessment follows the same general approach used for the Project effects assessment and determination of significance outlined in Sections 4.3 and 4.4.

4.6 Inspection and Monitoring

The EPP (Appendix A) identifies the roles and responsibilities of all workers on the Project (including NGTL, contractors and consultants), and describes the mitigation to be implemented to reduce or avoid the potential adverse environmental effects of the Project. The EPP includes mitigation, including Environmental Contingency and Management plans, as well as other industry standard practices and regulatory requirements. Contingency plans have been included in the EPP to deal with unforeseen Project effects (e.g., accidental spills, discovery of unknown heritage resources). Inspection and monitoring (Section 8) will be carried out through the duration of the Project to guide the implementation of the mitigation, and to monitor its effectiveness.

The inspection and monitoring will:

- identify unanticipated potentially adverse effects, including possible accidents and malfunctions;
- evaluate the effectiveness of mitigation and modify or enhance measures as necessary;
- verify the accuracy of the assessment of the predicted residual effects; and
- contribute to continual improvement.