

ENVIRONMENTAL IMPACT STATEMENT  
for the  
MACKENZIE GAS PROJECT

Volume 6: Part C

**Socio-Economic Impact Assessment**

**High Level  
Community Report**

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**Table of Contents**

<b>1</b>	<b>Introduction .....</b>	<b>1-1</b>
1.1	Background and Purpose .....	1-1
1.2	How to Use this Report.....	1-1
1.3	Approach.....	1-4
1.4	How the Effects Assessment is Conducted.....	1-4
1.5	Data Limitations.....	1-5
1.6	New Information.....	1-6
1.7	Summary of Socio-Economic Effects on High Level.....	1-7
<b>2</b>	<b>Geographic Area of Interest.....</b>	<b>2-1</b>
2.1	Boundaries .....	2-1
2.2	NGTL Project Facilities in the Area of Interest.....	2-2
<b>3</b>	<b>Public Participation .....</b>	<b>3-1</b>
<b>4</b>	<b>People and the Economy .....</b>	<b>4-1</b>
4.1	Procurement, Employment and Regional Economic Effects.....	4-1
4.1.1	Effect Pathways .....	4-1
4.1.2	Assessment and Management of Project-Specific Effects .....	4-2
4.1.3	Mitigation Measures .....	4-9
4.1.4	Construction Effects.....	4-10
4.1.5	Operations Effects.....	4-10
4.2	Demography.....	4-11
4.2.1	Effect Pathways .....	4-11
4.2.2	Assessment and Management of Project-Specific Effects – Construction.....	4-12
4.2.3	Mitigation Measures – Construction.....	4-12
4.2.4	Residual Effects – Construction.....	4-12
4.2.5	Operations Effects.....	4-12

<b>5</b>	<b>Infrastructure and Community Services .....</b>	<b>5-1</b>
5.1	Transportation .....	5-1
5.1.1	Effect Pathways .....	5-1
5.1.2	Assessment and Management of Project-Specific Effects – Construction.....	5-2
5.1.3	Mitigation Measures – Construction.....	5-3
5.1.4	Residual Effects – Construction.....	5-5
5.1.5	Operations Effects.....	5-6
5.2	Energy and Utilities .....	5-7
5.2.1	Effect Pathways .....	5-7
5.2.2	Assessment and Management of Project-Specific Effects – Construction.....	5-8
5.2.3	Mitigation Measures – Construction.....	5-9
5.2.4	Residual Effects – Construction.....	5-9
5.2.5	Operations Effects.....	5-9
5.3	Housing.....	5-10
5.3.1	Effect Pathways .....	5-10
5.3.2	Assessment and Management of Project-Specific Effects – Construction.....	5-11
5.3.3	Mitigation Measures – Construction.....	5-11
5.3.4	Residual Effects – Construction.....	5-11
5.3.5	Operations Effects.....	5-12
5.4	Recreation Resources.....	5-13
5.4.1	Effect Pathways .....	5-13
5.4.2	Assessment and Management of Project-Specific Effects – Construction.....	5-14
5.4.3	Mitigation Measures – Construction.....	5-14
5.4.4	Residual Effects – Construction.....	5-15
5.4.5	Operations Effects.....	5-15
5.5	Governance .....	5-16
5.5.1	Effect Pathways .....	5-16
5.5.2	Relevance to the Projects .....	5-17

5.5.3	Assessment and Management of Project-Specific Effects .....	5-18
5.5.4	Residual Effects .....	5-19
<b>6</b>	<b>Individual, Family and Community Wellness .....</b>	<b>6-1</b>
6.1	Community Well-Being and Delivery of Social Services .....	6-1
6.1.1	Effect Pathways .....	6-1
6.1.2	Assessment and Management of Project-Specific Effects – Construction.....	6-3
6.1.3	Mitigation Measures – Construction.....	6-4
6.1.4	Residual Effects – Construction.....	6-4
6.1.5	Operations Effects.....	6-4
6.2	Health Conditions and Health Care Services.....	6-5
6.2.1	Effect Pathways .....	6-5
6.2.2	Assessment and Management of Project-Specific Effects – Construction.....	6-8
6.2.3	Mitigation Measures – Construction.....	6-8
6.2.4	Residual Effects – Construction.....	6-9
6.2.5	Operations Effects.....	6-9
6.3	Human Health Risks .....	6-10
6.3.1	Effects on Air Quality – Diesel Engine Emissions.....	6-10
6.3.2	Summary of Human and Environmental Health Effect Attributes.....	6-11
6.4	Accidents and Malfunctions .....	6-12
6.4.1	Introduction.....	6-12
6.4.2	Identification of Potential Accidents and Malfunctions .....	6-13
6.4.3	Sensitive Biophysical and Social Components.....	6-16
6.4.4	Potential Impacts of Identified Accidents and Malfunctions .....	6-17
6.4.5	Accidents and Malfunctions Event Probability .....	6-21
6.4.6	Summary .....	6-25
6.5	Public Safety and Protection Services .....	6-26

TABLE OF CONTENTS

6.5.1	Effect Pathways .....	6-26
6.5.2	Assessment and Management of Project-Specific Effects – Construction.....	6-27
6.5.3	Mitigation Measures – Construction.....	6-28
6.5.4	Residual Effects – Construction.....	6-28
6.5.5	Operations Effects.....	6-29
6.6	Education Attainment and Services .....	6-30
6.6.1	Effect Pathways .....	6-30
6.6.2	Assessment Criteria .....	6-31
6.6.3	Assessment and Management of Project-Specific Effects – Construction.....	6-33
6.6.4	Mitigation Measures – Construction.....	6-34
6.6.5	Residual Effects – Construction.....	6-34
6.6.6	Operations Effects.....	6-34
<b>7</b>	<b>Traditional Culture .....</b>	<b>7-1</b>
7.1	Traditional Harvesting and Land Use.....	7-1
7.1.1	Effect Pathways .....	7-1
7.1.2	Assessment and Management of Project-Specific Effects – Construction.....	7-3
7.1.3	Mitigation Measures – Construction.....	7-3
7.1.4	Residual Effects – Construction.....	7-3
7.1.5	Operations Effects.....	7-3
7.2	Preservation of Traditional Language and Culture.....	7-4
7.2.1	Effect Pathways .....	7-4
7.2.2	Assessment and Management of Project-Specific Effects – Construction.....	7-5
7.2.3	Mitigation Measures – Construction.....	7-5
7.2.4	Residual Effects – Construction.....	7-6
7.2.5	Operations Effects.....	7-6
<b>8</b>	<b>Nontraditional Land and Resource Use .....</b>	<b>8-1</b>
8.1	Effects on Nontraditional Land and Resource Use.....	8-1

8.1.1	Effect Pathways .....	8-1
8.1.2	Assessment and Management of Project-Specific Effects .....	8-2
8.1.3	Mitigation Measures .....	8-3
8.1.4	Residual Effects .....	8-4
8.2	Effects on Protected Areas.....	8-6
8.2.1	Effect Pathways .....	8-6
8.2.2	Assessment and Management of Project-Specific Effects .....	8-7
8.2.3	Mitigation Measures .....	8-7
8.2.4	Residual Effects .....	8-7
8.3	Effects on Visual and Aesthetic Resources .....	8-9
8.3.1	Effect Pathways .....	8-9
8.3.2	Assessment and Management of Project-Specific Effects .....	8-10
8.3.3	Mitigation Measures .....	8-11
8.3.4	Residual Effects .....	8-11
<b>9</b>	<b>Heritage Resources .....</b>	<b>9-1</b>
9.1	Effect Pathways .....	9-1
9.2	Context.....	9-2
9.2.1	Environmental Context.....	9-2
9.2.2	Cultural Context.....	9-2
9.2.3	Baseline Conditions .....	9-2
9.3	Project-Specific Effects .....	9-3
9.4	Mitigation Measures .....	9-3
<b>10</b>	<b>Monitoring and Follow-Up.....</b>	<b>10-1</b>
	<b>References</b>	
	<b>Glossary</b>	



**List of Figures**

Figure 4-1: Project Effects on Regional Economies, the Northwestern Alberta Economy and the Northwest Territories Economy..... 4-1

Figure 4-2: Project Effects on Population, including Birth, Death, and In- and Out-migration Rates ..... 4-11

Figure 5-1: Project Effects on Transportation Infrastructure and Services ..... 5-2

Figure 5-2: Project Effects on Community Infrastructure, and Availability of Utilities and Energy ..... 5-7

Figure 5-3: Project Effects on Availability and Quality of Housing ..... 5-10

Figure 5-4: Project Effects on Recreation Resources ..... 5-13

Figure 5-5: Project Effects on Community and Regional Governance, and Development Decision Making ..... 5-16

Figure 5-6: Shared Responsibility for Effects Management..... 5-18

Figure 6-1: Project Effects on Family and Community Well-Being, and Family and Social Services..... 6-1

Figure 6-2: Project Effects on Health Conditions and Health Care Services ..... 6-5

Figure 6-3: Project Effects on Public Safety and Protection Services..... 6-26

Figure 6-4: Project Effects on Skill Levels, Educational Attainment, and Education and Training Services ..... 6-30

Figure 7-1: Project Effects on Traditional Harvesting and Land Use ..... 7-1

Figure 7-2: Project Effects on Traditional Language and Culture..... 7-4

Figure 8-1: Effects of the Projects on Nontraditional Land and Resource Use ..... 8-2

Figure 8-2: Project Effects on Environmentally Protected Areas..... 8-6

Figure 8-3: Project Effects on Visual and Aesthetic Resources ..... 8-9

Figure 9-1: Project Effects on Heritage Resources..... 9-1



**List of Tables**

Table 1-1: Environmental Impact Statement Topic Areas .....	1-2
Table 4-1: Project Procurement Opportunities .....	4-3
Table 4-2: Project Employment Opportunities .....	4-5
Table 4-3: Procurement, Employment and Regional Economic Effects – Construction Effect Attributes for the Industrial and Commercial Centres in Northwestern Alberta.....	4-9
Table 4-4: Procurement, Employment and Regional Economic Effects – Operations Effect Attributes for the Industrial and Commercial Centres in Northwestern Alberta .....	4-10
Table 4-5: Population Mobility – Construction Effect Attributes for High Level .....	4-12
Table 5-1: Transportation – Construction Effect Attributes for the Industrial and Commercial Centres in Northwestern Alberta.....	5-6
Table 5-2: Housing – Construction Effect Attributes for High Level .....	5-12
Table 5-3: Governance – Project Effect Attributes for the Northwestern Alberta Communities .....	5-19
Table 6-1: Community Well-Being and Delivery of Social Services – Construction Effect Attributes for the Northwestern Alberta Industrial and Commercial Centres .....	6-4
Table 6-2: Health Conditions – Construction Effect Attributes for High Level .....	6-9
Table 6-3: Health Care Services – Construction Effect Attributes for High Level .....	6-9
Table 6-4: Human and Environmental Health – Construction Effect Attributes.....	6-11
Table 6-5: Protection Services – Construction Effect Attributes for High Level .....	6-28
Table 8-1: Nontraditional Land and Resource Use – Project Effect Attributes for Northwestern Alberta .....	8-5
Table 8-2: Protected Areas – Project Effect Attributes for Northwestern Alberta.....	8-8
Table 8-3: Visual and Aesthetic Resources – Project Effect Attributes for Northwestern Alberta.....	8-11



## 1 INTRODUCTION

### 1.1 Background and Purpose

The purpose of this report on High Level is to respond to the Joint Review Panel (JRP) request for a community-specific presentation of the environmental impact statement (EIS) socio-economic impact assessment (SEIA). For consistency and ease of use, the report is similar in structure to the regional-level material contained in the existing EIS, Volumes 6A and 6B. It also refers to information found in the document entitled *EIS Supplemental Information: Northwestern Alberta* (2005). This report (hereinafter referred to as Volume 6C) presents a community focus on a stand-alone basis, with the intent of meeting the needs of, and facilitating review by, the applicable community without substantial reference to other EIS documentation. A corresponding Volume 4B has been prepared to present the socio-economic baseline conditions on a community-specific basis.

The Mackenzie Gas Project includes development of three onshore natural gas fields (anchor fields) in the Mackenzie Delta, Northwest Territories, and construction and operation of pipelines to transport natural gas and natural gas liquids (NGLs) to market. The Mackenzie Gas Project will terminate just south of the Northwest Territories–Alberta boundary and is regulated by the National Energy Board (NEB). In Alberta, NOVA Gas Transmission Ltd. (NGTL) will extend and expand its NGTL pipeline system between the terminus of the Mackenzie Gas Project and the existing NGTL Thunder Creek compressor station. For this report, the NGTL activities are referred to as the NGTL ancillary project or the NGTL project. NGTL is regulated by the Alberta Energy Utilities Board.

For this report, the term *project* refers to the Mackenzie Gas Project and does not include NGTL activities. The term *projects* refers to both the Mackenzie Gas Project and the NGTL ancillary project. The term *project proponents* refers to the companies undertaking the Mackenzie Gas Project.

### 1.2 How to Use this Report

In order to help the reader to locate content that may be of particular interest and to allow linkages for a given topic between the baseline information in Volume 4B and the effects assessment in Volume 6C, the existing Volumes 4 and 6 of the EIS, and the document entitled *EIS Supplemental Information: Northwestern Alberta* (2005), the following concordance table provides cross-references for the topics in each volume. The numbering has changed in Volume 6C from the EIS to accommodate new sections (see Table 1-1).

Table 1-1: Environmental Impact Statement Topic Areas

Topic	EIS, Volume 4	Volume 4B	EIS, Volumes 6A and 6B	Volume 6C	Supplemental Information: Northwestern Alberta
Introduction	1.0	1.0	1.0	1.0	1
Geographic Area of Interest	–	–	–	2.0	–
Public Participation	–	–	–	3.0	12
Project Expenditures	–	–	2.0	–	–
National Economic Effects	–	–	3.2	–	–
Population Composition and Dynamics (Demography)	2.2.1, 2.3.1, 2.4.1, 2.5.1, 2.6.1, 2.7.1, 2.8.1, 2.9.1	2.2	3.3	4.2	–
Economic Activity	2.2.2, 2.3.2, 2.4.2, 2.5.2, 2.6.2, 2.7.2, 2.8.2, 2.9.2	2.3	3.1	4.1	11
Labour Force	2.2.3, 2.3.3, 2.4.3, 2.5.3, 2.6.3, 2.7.3, 2.8.3, 2.9.3	2.4			
Income Sources and Amounts	2.2.4, 2.3.4, 2.4.4, 2.5.4, 2.6.4, 2.7.4, 2.8.4, 2.9.4	2.5			
Cost of Living	2.2.5, 2.3.5, 2.4.5, 2.5.5, 2.6.5, 2.7.5, 2.8.5, 2.9.5	2.6			
Transportation Infrastructure	3.2.1, 3.3.1, 3.4.1, 3.5.1, 3.6.1, 3.7.1, 3.8.1, 3.9.1	3.3	4.1	5.2	11
Utilities, Energy and Communications	3.2.2, 3.3.2, 3.4.2, 3.5.2, 3.6.2, 3.7.2, 3.8.2, 3.9.2	3.4	4.2	5.3	–
Housing	3.2.3, 3.3.3, 3.4.3, 3.5.3, 3.6.3, 3.7.3, 3.8.3, 3.9.3	3.5	4.3	5.4	–
Recreation	3.2.3, 3.3.3, 3.4.3, 3.5.3, 3.6.3, 3.7.3, 3.8.3, 3.9.3		4.4	5.5	–

Table 1-1: Environmental Impact Statement Topic Areas (cont'd)

Topic	EIS, Volume 4	Volume 4B	EIS, Volumes 6A and 6B	Volume 6C	Supplemental Information: Northwestern Alberta
Governance	3.2.4, 3.3.4, 3.4.4, 3.5.4, 3.6.4, 3.7.4, 3.8.4, 3.9.4	3.2	4.5	5.1	–
Health Conditions	4.2.1, 4.3.1, 4.4.1, 4.5.1, 4.6.1, 4.7.1, 4.8.1, 4.9.1	4.2	5.3	6.2	–
Health Care Facilities and Services	4.2.2, 4.3.2, 4.4.2, 4.5.2, 4.6.2, 4.7.2, 4.8.2, 4.9.2	4.3	5.2	6.1	–
Family and Community Conditions (Community Well- Being)	4.2.3, 4.3.3, 4.4.3, 4.5.3, 4.6.3, 4.7.3, 4.8.3, 4.9.3	4.4			–
Human Health Risks	–	–	5.4	6.3	–
Accidents and Malfunctions	–	–	–	6.4	–
Social and Protection Facilities and Services	4.2.4, 4.3.4, 4.4.4, 4.5.4, 4.6.4, 4.7.4, 4.8.4, 4.9.4	4.5	5.5	6.5	–
Education and Training	4.2.5, 4.3.5, 4.4.5, 4.5.5, 4.6.5, 4.7.5, 4.8.5, 4.9.5	4.6	5.6	6.6	–
Traditional Harvesting	5.2.1, 5.3.1, 5.4.1, 5.5.1, 5.6.1, 5.7.1, 5.8.1, 5.9.1	5.2	6.2	7.1	–
Trapping	5.2.2, 5.3.2, 5.4.2, 5.5.2, 5.6.2, 5.7.2, 5.8.2, 5.9.2	5.3			–
Aboriginal Language	5.2.3, 5.3.3, 5.4.3, 5.5.3, 5.6.3, 5.7.3, 5.8.3, 5.9.3	5.4	6.3	7.2	–
Nontraditional Land and Resource Use	6.0	6.0	7.0	8.0	11
Heritage Resources	7.0	7.0	8.0	9.0	–

Table 1-1: Environmental Impact Statement Topic Areas (cont'd)

Topic	EIS, Volume 4	Volume 4B	EIS, Volumes 6A and 6B	Volume 6C	Supplemental Information: Northwestern Alberta
Cumulative Effects	–	–	9.0	–	13
Monitoring and Follow-Up	–	–	10.0	10.0	–
References, Glossary	end	end	end	end	end
NOTE: – = not included, or not discussed					

### 1.3 Approach

This SEIA is designed to focus on how the projects may affect the wellness of a community. Wellness is often the most highly valued aspect of community life, and depends on the well-being of individuals, families and the community as a whole. Community wellness may be significantly enhanced by benefits of the projects, and be vulnerable to adverse effects.

The effects assessment is focused on addressing community concerns, with the aim of designing and implementing the projects using procedures that optimize beneficial effects and reduce effects the communities believe to be undesirable.

A community-driven approach requires:

- knowledge about the characteristics of the communities that may be affected
- understanding of the interests and concerns of these communities

Knowledge of community characteristics has been obtained by collecting information from residents who are informed about a particular circumstance. Information on interests and concerns was gained in the meetings and community consultations held with residents of High Level and the other industrial and commercial communities (ICCs) in northwestern Alberta.

### 1.4 How the Effects Assessment is Conducted

Communities experience socio-economic effects in accordance with two primary interactions:

- physical, social or economic interaction between the components of the projects, activities or personnel, and community residents and their economic, social or cultural resources and pursuits

- supplying workers or business services to the projects, which generates income for firms and individuals. The spending or investment of this income will have both positive and negative effects.

These community-specific reports do not address cumulative effects as this is not an appropriate analysis to conduct at the community level.

## 1.5 Data Limitations

To the extent feasible, assessment information in the EIS, Volumes 6A and 6B has been supplemented by data and information available at the community level. In order that regional and community presentations are internally consistent and comparable, only limited new data has been presented.

Currently, predictions of the effects of the projects on northwestern Alberta residents are constrained because the requisite information is incomplete or lacking. Projecting the effects of development depends first on having a reasonably complete and accurate description of baseline conditions in the region or communities that might benefit or suffer from the effects of project activity. The available information on northwestern Alberta (see the EIS, Volume 4, Socio-Economic Baseline) is incomplete because the DTFN limited its participation to providing certain statistics and administrative data, pending a broader project agreement with the project proponents. Therefore, the necessary public and key informant participation in the EIS was not possible. This limits the SEIA findings.

Given the broad similarities between the situations of the people in northwestern Alberta and some of the Deh Cho communities in the Northwest Territories, broad generalizations about expected project residual effects can be made. These generalizations are based on:

- what is now known about the people in the affected communities
- ways in which the pipeline and associated facilities will probably be built
- the health and social services available in northwestern Alberta

These are included in the various relevant key question discussions.

Adequate data was obtained in the predominantly non-Aboriginal service centres of High Level, Rainbow Lake and Zama City. The assessed effects apply only to construction. Most employment numbers and opportunities generated by the projects will end once design and construction, associated cleanup, and site reclamation activities, are complete. Few people in this region are likely to obtain NGTL project employment during operations. Operation of NGTL facilities will be integrated into existing NGTL programs in the region. Accordingly, there will be no significant socio-economic effects induced by NGTL project operations in northwestern Alberta.

Some of the communities in the northwestern Alberta have relatively small populations, which means that data collected by Statistics Canada and other agencies, at the community level, is either suppressed or has limitations to maintain confidentiality and privacy. As a result, in several instances, information and analysis is constrained to a regional-level discussion.

For the reasons described above, this report contains a significant amount of information common to all northwestern Alberta ICCs. However, the report also contains some community data previously collected but not presented in the EIS. Where distinct community-specific effects have been identified, they are provided in this report.

This approach is consistent with input from the public participation program for the EIS. During issues scoping meetings with individual communities it was found that the majority of issues were commonly held among communities. Not only were issues similar among communities in the region, but some concerns were common across the study area.

## 1.6 New Information

In its letter of December 3, 2004, the JRP requested additional information related to the effects assessment. This volume contains the following new information:

- the geographic area of interest of each community is addressed by relating project facilities and activities to communities that have either stated an expressed geographic interest during project studies and consultations, or whose interests are documented in public plans or agreements. This exercise was undertaken to respond to a request from the JRP. In the process of identifying the geographic area of interest, some overlap of interests between communities occurs. Consequently, the geographic area of interest might not exactly represent an individual community's point of view. Further, it is only one of several factors taken into account in the effects assessment.
- the public participation program (EIS, Volume 1, Section 3) has been summarized by providing an overview of the important meetings and consultation events, quantifying the extent of participation, and listing the key issues identified for each community
- the human environment aspects of accidents and malfunctions scenarios have been developed. The description of accidents and malfunctions is the same for all communities.

## 1.7 Summary of Socio-Economic Effects on High Level

High Level, with a population of about 3,500 persons, is the centre for administrative, commercial, health and social services in northwestern Alberta. Oil and gas exploration and production, and lumbering and wood products, the major industries in the region, are serviced by High Level. As well, High Level is the convenient stop-over point between Edmonton and Hay River for truckers and others driving on Highway No. 35.

The nearest NGTL project activity will be 174 km northwest of High Level, and the nearest construction camp will be 152 km distant. The major effects of the projects on High Level will be because of the great amount of project supplies of all kinds that will pass through High Level by truck and rail, bound primarily for Hay River, and also to the pipeline spreads and worker camps farther northwest. High Level service station, food service and accommodation establishments will likely experience economic benefits from the increased highway traffic.

Effects of the projects are assessed for direction, magnitude, duration and geographic extent. These are commonly referred to as attributes. The direction of a project effect is evaluated as neutral, adverse or positive, while the magnitude of an effect can be no effect, low, moderate or high. Low-magnitude effects would be barely discernible, while high-magnitude effects would represent noticeable changes in the community. The duration of an effect can be short term (occurring during the Construction Phase only) or long-term (lasting into the Operations Phase). The geographic extent of an effect can be local (experienced by the community only) or regional (experienced throughout northwestern Alberta) in extent. Virtually all construction effects are short term, and those High Level may experience may be local or regional in extent.

For this assessment, implementing the mitigation plans and techniques in Volumes 6 and 7 of the EIS has been assumed when evaluating residual effects of the NGTL interconnect facility and the NGTL Northwest Mainline (Dickins Lake and Vardie River Sections). Specific environmental management plans will be prepared by NGTL for its facilities, based on requirements of the applicable regulatory agencies.

A socio-economic effect is only considered significant if the effect will be:

- high magnitude, short term, and regional, beyond regional or national in extent
- high magnitude, long term and any geographic extent
- moderate magnitude, long term, and beyond regional or national in extent

The following is a summary of some of the expected effects of the projects for northwestern Alberta, some of which might be experienced in High Level. Please see the appropriate sections of this report for full descriptions.

**SECTION 1: INTRODUCTION**

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- Procurement, employment and income are expected to have low-magnitude, short-term, positive effects in the region and beyond.
- Limited effects on in-migration are expected, and thus local, adverse, low-magnitude effects are expected on housing in the short term and no noticeable effects are expected on recreation facilities.
- Effects of increased traffic in the northwestern Alberta ICCs will be low to moderate in magnitude, regional in extent, short term and adverse because of highway congestion. Local, low-magnitude, short-term, adverse effects are expected on adequacy of truck parking space and safety at highway and railway crossings.
- Because residents of the northwestern Alberta ICCs are familiar with rotational employment, effects on individual, family and community wellness are expected to be local, adverse but low in magnitude in the short term.
- Regional effects on health conditions and health care services are expected to be adverse and low in magnitude for the short term.
- Regional effects on protection services are expected to be short term, adverse and moderate in magnitude.
- No adverse effects are expected on education attainment and education services.
- Activities of the projects are not expected to affect traditional harvesting or traditional language and culture in High Level.
- High Level is an important centre in northwestern Alberta, and as such it is expected that a number of nontraditional land users will be based out of this community. Effects on nontraditional land and resource use valued components, including land ownership, granular resources, timber resources, mineral resources, oil and gas activities, nontraditional resource harvesting, other commercial activities and tourism and recreation, are expected to be positive, neutral and adverse, ranging from no effect to low in magnitude. These effects are expected to occur locally to regionally in extent. In some cases, the project will have no effect on specific valued components, such as granular or mineral resources. Effects on visual and aesthetic resources or protected areas are expected to range between no effect to low in magnitude, adverse, local to regional in extent, and short to long term.
- As there will be no components of the projects in the High Level area, effects on heritage resources are not expected.

## 2 GEOGRAPHIC AREA OF INTEREST

### 2.1 Boundaries

Within the province of Alberta, the *Municipal Government Act (MGA)* provides the foundation for preparing a Municipal Development Plan (MDP). The *MGA* determines what must, in addition to what may, be included in the plan. As dictated by the *MGA*, the MDP must be in unison with Provincial Land Use Policies. Both municipalities and an area that has been classified by the province as a *town* produce MDPs. Any overlap between the Municipal District and a town or hamlet is referred to as an Inter-Municipal Plan. This largely is in regard to highways and major roadways. The next phase of land use planning is the Area Structure Plan (ASP). The ASP is an overall strategy that is established within a municipality and is employed mainly by hamlets. Lastly, the Land Use Bylaw (LUB) is the final determinant in land use and is employed by the municipal district, towns and hamlets alike. The LUB applies to all land and buildings, and breaks down the individual development requirements, i.e., the grade of a driveway or the height of an industrial warehouse.

Within Municipal District No. 23, the fundamental mandate when producing the MDP is to encourage concentrated development within existing communities. Residential, industrial and commercial development will be encouraged as this promotes the use of existing municipal facilities and infrastructure while preserving and granting supremacy to rural lands for agricultural purposes. This must be considered by all towns and hamlets when formulating MDPs and ASPs. The residents of the Municipal District of Mackenzie are involved in developing the MDP via public participation.

The Town of High Level's MDP, as of April 26, 2004, is divided into three sections: residential, commercial and industrial development planning. There are currently 96 hectares of residential developable land, located on the north half of Sections 3 and 4 of 110-19 W5M. At the town's current growth rate, this area should be fully developed by 2028. These lands will need to be annexed from Municipal District No. 23. The commercial sector of High Level is located in the downtown core. As of spring 2004, 80% of these spaces were occupied and the remaining 20% are expected to be in use by 2008. In anticipation of future growth, the town is prepared to rezone areas that are currently deemed residential. The industrial area of High Level is divided into General and Restricted Industrial. The Restricted Industrial area is located away from residential lands and separated from the General Industrial by Highway No. 35. Those that occupy the restricted region are heavy industrial users that emit odours or smoke, or produce high noise levels. At current development rates, all available lots will be sold by the end of 2005. The town has designated 196 hectares of land to be used for general and restricted industrial. Future development will ensure that residential development is kept to the north and industrial development will occur

to the south (south of Highway No. 58 and east of Highway No. 35). An Inter-Municipal plan between High Level and M.D. 23 is in place to connect 100<sup>th</sup> Avenue (of the commercial, downtown core) with Highway No. 35. This project will coincide with the realignment of Highway No. 58, and is expected to provide safe and easy access to and throughout all areas of High Level.

## **2.2 NGTL Project Facilities in the Area of Interest**

The extension and expansion of the NGTL pipeline will begin at the NGTL interconnect facility and end at the existing NGTL Thunder Creek compressor station. This 103-km pipeline will be divided into two sections. The first 66-km section of new pipeline is referred to as the Dickins Lake Section. It will extend from the NGTL interconnect facility to a point on the existing NGTL Northwest Mainline pipeline near Bootis Hill in SW 19-120-11 W6M. A second section of new pipeline, the Vardie River Section, will share the existing NGTL Northwest Mainline right-of-way from the south end of the Dickins Lake Section for about 37 km, terminating at the existing NGTL Thunder Creek compressor station. The right-of-way will be widened by 14 to 17 m to accommodate the additional pipeline.

### 3 PUBLIC PARTICIPATION

The public participation program for the Mackenzie Gas Project (see the EIS Volume 1, Section 4) was conducted in all regions in the Mackenzie Valley, including the:

- Inuvialuit Settlement Region (ISR)
- Gwich'in Settlement Area (GSA)
- Sahtu Settlement Area (SSA)
- Deh Cho Region (DCR)

The public participation program involved two rounds of activity:

- Round 1 – identifying and scoping issues
- Round 2 – assessing and managing effects

Each round consisted of meetings with potentially affected communities, followed by regional workshops. Adjustments to this approach were made to accommodate the overall schedule of the EIS and to respond to regional preferences. Follow-up meetings are being planned and held in the individual communities. The purpose of these meetings is to review the findings of the EIS, and discuss with communities how their input in the public participation process was addressed in the EIS.

Initially, the Mackenzie Gas Project was to be constructed from the anchor fields to a location near the Bootis Hill area in northwestern Alberta. Subsequently, the Mackenzie Gas Project was modified to end the pipeline just south of the Northwest Territories–Alberta boundary, where it would connect with the NGTL system. The Mackenzie Gas Project EIS Terms of Reference included the proposed NGTL pipelines – the Dickins Lake and Vardie River Sections – in northwestern Alberta. Therefore, the Mackenzie Gas Project public participation program was adapted to include northwestern Alberta communities. However, the intention of the Mackenzie Gas Project was to communicate information only on the Mackenzie Gas Project. Socio-economic and biophysical data was collected for the EIS in northwestern Alberta along the Dickins Lake and Vardie River Sections. This data collection was separate from the public participation program.

Interested parties who might be affected by the Dickins Lake and Vardie River Sections include:

- the DTFN
- local business owners
- municipal governments
- other public agencies
- the general public

In July 2002, Mackenzie Gas Project representatives initiated the public participation process and conducted preliminary discussions with interested parties in northwestern Alberta. Meetings were held with municipal government representatives and community service providers, primarily to obtain baseline information for the socio-economic assessment.

Mackenzie Gas Project representatives held meetings with municipal government representatives and community service providers in the region, to obtain baseline information for the socio-economic assessment. Communities visited included:

- Rainbow Lake
- High Level
- Zama City

During these meetings, local officials and public service delivery representatives were briefed on the Mackenzie Gas Project. The main concerns raised were:

- business and employment opportunities
- the impact of increased traffic volumes on regional transportation infrastructure expected during construction

Mackenzie Gas Project representatives also participated in a March 2004 seminar in High Level, hosted by the Northern Alberta Development Council.

### **Specific Issues Identified**

For a complete listing of all the issues and their respective suggested mitigative measures identified for High Level, please see Volume 1, Section 4 of the EIS. The main issues identified by representatives of the business community of High Level include:

- opportunities that would be made available to northern businesses
- contracting procedures that would be followed
- effects of the project on supply and demand of labour, and goods and services

4 PEOPLE AND THE ECONOMY

4.1 Procurement, Employment and Regional Economic Effects

4.1.1 Effect Pathways

The expected influences of the projects on procurement, employment and regional economy of northwestern Alberta are shown in Figure 4-1. In broad overview, project effects will derive from interactions of demand and supply. The projects will generate a large demand for goods, services and workers at project locations. Qualified and competitive suppliers of goods, services and workers in northwestern Alberta will respond to the demand if possible and within their capacity limitations. Where demand exceeds supply capacity, the projects will look beyond the local communities and regional centres in Alberta to meet supply requirements.

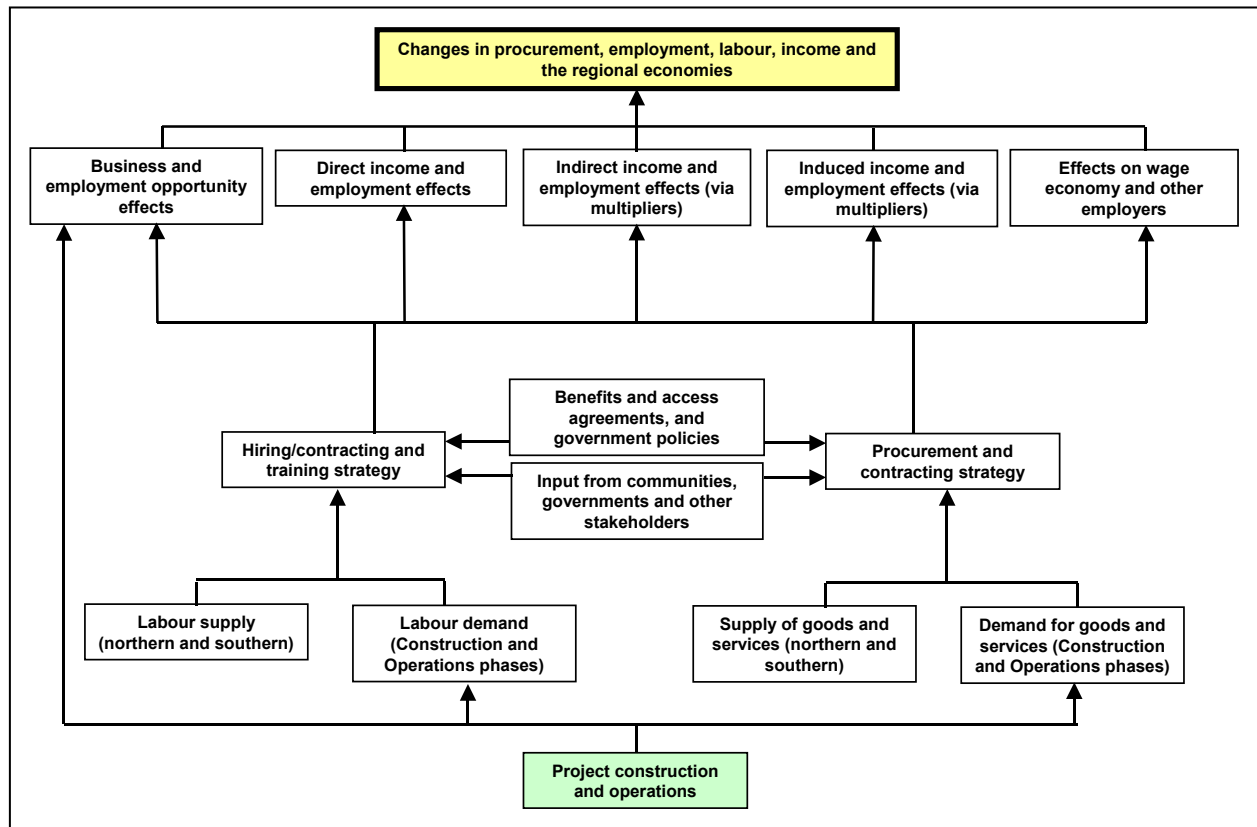


Figure 4-1: Project Effects on Regional Economies, the Northwestern Alberta Economy and the Northwest Territories Economy

Addressing purely labour considerations first, labour demand and labour supply, potential agreements, and inputs from communities and other stakeholders will influence educational upgrading, training, hiring and contracting strategies. These strategies will have multiple regional effects on:

- direct, indirect and induced employment and income
- capacity development
- the wage economy
- other employers

The influences driving effects on goods and services are similar to those for labour. The supply of goods and services and the demands for them, potential agreements, and inputs from communities and other stakeholders will affect procurement and contracting strategies. These strategies will have multiple regional effects on:

- business opportunities
- revenue and capacity development
- direct, indirect and induced income and employment
- the wage economy and other employers

This analysis of the effect pathways for project effects on the regional economy, and employment and expenditures therein, is based on both quantitative and qualitative data. There are empirical indicators for most of the links in the diagram. It is clear that project-induced demands will affect the supplies of, and the demands for, employees, goods and services in study area regions and communities.

Although effects of the projects on individual community labour, goods and services were not provided, it is reasonable to assume that community effects will largely be influenced by community labour force and business capacity. In turn, availability, qualifications and interest of local labour force, and suppliers of goods and services will affect local capacity, as will mitigation measures designed to expand capacity and qualifications of local businesses and labour force.

#### **4.1.2 Assessment and Management of Project-Specific Effects**

The assessment of project-specific effects includes:

- an overview of some procurement and employment opportunities associated with the projects
- a description of the methods used to assess procurement, employment, income and regional economic effects

- an assessment of expenditure, employment and labour income in the study area, taking into consideration capacity constraints that exist in the study area as a whole and the individual regions therein

The assessment of expenditure, employment and labour income has been extracted from a more detailed economic assessment of project effects on the economies of the study regions, the Northwest Territories, Alberta and the rest of Canada, entitled *Predicted Economic Impacts of the Proposed Mackenzie Gas Project* (Ellis Consulting Services 2004). This assessment and the extracts from it are presented for the regional but not the community level, because most community data is too small to meet the quantitative requirements of statistical modelling procedures.

#### 4.1.2.1 Procurement and Employment Opportunities

Table 4-1 and Table 4-2 show the direct and indirect opportunities related to the projects available to qualified business and individuals.

**Table 4-1: Project Procurement Opportunities**

Business Opportunity	Typical Goods and Services Required
Communication	<ul style="list-style-type: none"> <li>• Voice: telephone, cellular, satellite, VHF or UHF radios</li> <li>• Data: Internet, internal company systems</li> <li>• Satellite and cable television</li> </ul>
Community accommodation and related services	<ul style="list-style-type: none"> <li>• Apartments, hotels and motels</li> <li>• Restaurants</li> <li>• Taxi, laundry and dry-cleaning services</li> <li>• Drilling                             <ul style="list-style-type: none"> <li>• drilling engineering and geologist</li> <li>• drilling supervision</li> <li>• drilling and completion rigs</li> <li>• coiled tubing unit</li> </ul> </li> <li>• Oilfield services                             <ul style="list-style-type: none"> <li>• cementing</li> <li>• drilling fluids</li> <li>• directional drilling</li> <li>• bit supply</li> </ul> </li> <li>• Facilities                             <ul style="list-style-type: none"> <li>• concrete, crushed rock, sand, gravel and ready-mix products</li> <li>• forms, rebar, cribbing, cement finishing and masonry products</li> </ul> </li> <li>• Pipelines                             <ul style="list-style-type: none"> <li>• timber for pipeline skids and survey laths</li> <li>• welding services and supplies, such as acetylene and oxygen</li> </ul> </li> <li>• Construction services</li> <li>• Surveying</li> <li>• Welding and inspection services</li> </ul>

Table 4-1: Project Procurement Opportunities (cont'd)

Business Opportunity	Typical Goods and Services Required
Construction (cont'd)	<ul style="list-style-type: none"> <li>• Building trades               <ul style="list-style-type: none"> <li>• electrical, mechanical, instrumentation, insulating and pipefitting</li> </ul> </li> <li>• Building materials and supplies               <ul style="list-style-type: none"> <li>• wire, fittings and pipe</li> </ul> </li> <li>• Civil construction services</li> <li>• Crane services</li> <li>• Heating, ventilation and air conditioning supply, installation and maintenance</li> <li>• Environmental monitor services</li> <li>• On-site safety professional services</li> </ul>
Equipment	<ul style="list-style-type: none"> <li>• Heavy equipment supply and service</li> <li>• Drilling equipment and services</li> <li>• Small engine and equipment supply and service</li> <li>• Industrial supplies, steam and high-pressure water</li> <li>• Industrial rental services</li> </ul>
Fuel and fuel storage	<ul style="list-style-type: none"> <li>• Propane, diesel, aircraft fuels, gasoline, grease, lubricant oil, anti-freeze and chemicals</li> <li>• Propane and fuel storage tanks: storage, inventory management and fuel delivery</li> <li>• Oil spill response services and equipment</li> <li>• Super cargo services</li> </ul>
Logistics	<ul style="list-style-type: none"> <li>• Safety equipment, supplies and training</li> <li>• Materials management, expediting, freight transport, flight planning</li> <li>• Hot shot services</li> <li>• Air transport, aircraft charters and maintenance</li> <li>• Vehicle sales, rentals, repairs and service</li> <li>• Charter boats and barges</li> <li>• Procurement, including customs brokers</li> </ul>
Office	<ul style="list-style-type: none"> <li>• Janitorial services</li> <li>• Office space, supplies, furniture, computers and other equipment</li> <li>• Administrative services: secretarial (word processing), clerical, accounting, bookkeeping and payroll</li> <li>• Travel reservation services</li> <li>• Banking services</li> </ul>
Remote site services	<ul style="list-style-type: none"> <li>• Camps, camp catering, camp supplies</li> <li>• Retail and wholesale grocery supply</li> <li>• Water delivery, sewage treatment, snow removal and garbage disposal</li> <li>• Security services</li> </ul>
Safety and medical	<ul style="list-style-type: none"> <li>• Emergency medical facilities, staff, supplies, air and ground ambulance, dentistry, optometry and prescription drugs</li> <li>• Occupation health services</li> </ul>
NOTES: UHF = ultra-high frequency VHF = very high frequency	
SOURCE: Imperial Oil (2004e)	

Table 4-2: Project Employment Opportunities

Job Type	Specific Job Titles	
<b>Construction</b>		
Management or supervisory	<ul style="list-style-type: none"> <li>• Construction manager</li> <li>• Superintendent</li> <li>• Foreman</li> </ul>	<ul style="list-style-type: none"> <li>• Assistant foreman</li> <li>• Assistant (lead hand)</li> </ul>
Equipment operators	<ul style="list-style-type: none"> <li>• Heavy equipment operator</li> <li>• Truck driver (oilfield or transport)</li> </ul>	<ul style="list-style-type: none"> <li>• Bus driver</li> <li>• Crane operator</li> </ul>
Trades	<ul style="list-style-type: none"> <li>• Welder</li> <li>• Electrician</li> </ul>	<ul style="list-style-type: none"> <li>• Mechanic</li> <li>• Pipefitter</li> <li>• Other similar trades</li> </ul>
Labour, semi-skilled and unskilled	<ul style="list-style-type: none"> <li>• Swamper</li> <li>• Welder's helper</li> <li>• Nozzleman</li> <li>• Labourer</li> <li>• Oiler</li> </ul>	<ul style="list-style-type: none"> <li>• Rigger</li> <li>• Painter</li> <li>• Parts runner</li> <li>• Mechanic's helper</li> </ul>
<b>Drilling</b>		
Drilling supervision	<ul style="list-style-type: none"> <li>• Drilling supervisor</li> </ul>	<ul style="list-style-type: none"> <li>• Drilling engineer</li> </ul>
Rigs and crews	<ul style="list-style-type: none"> <li>• Rig manager</li> <li>• Derrickhand</li> <li>• Driller</li> </ul>	<ul style="list-style-type: none"> <li>• Motor man</li> <li>• Floor hand</li> </ul>
Services	<ul style="list-style-type: none"> <li>• Bit supplier</li> <li>• Directional drilling personnel</li> <li>• Coring personnel</li> <li>• Power tong crew</li> </ul>	<ul style="list-style-type: none"> <li>• Cementing crew</li> <li>• Wireline services personnel</li> <li>• Drilling fluids personnel</li> <li>• Well site geologist</li> </ul>
<b>Engineering and Technologists</b>		
Engineer	<ul style="list-style-type: none"> <li>• Mechanical</li> <li>• Chemical</li> <li>• Civil</li> </ul>	<ul style="list-style-type: none"> <li>• Geotechnical</li> <li>• Drafting</li> </ul>
Technologists	<ul style="list-style-type: none"> <li>• Instrumentation</li> <li>• Chemical</li> <li>• Information</li> <li>• Project manager</li> </ul>	<ul style="list-style-type: none"> <li>• Production operations</li> <li>• Mechanical</li> <li>• Petroleum</li> <li>• Electrical</li> </ul>
<b>Logistics Services</b>		
Accommodation	<ul style="list-style-type: none"> <li>• Camp manager</li> <li>• Camp attendant</li> </ul>	<ul style="list-style-type: none"> <li>• Camp maintenance trades and labourers</li> </ul>
Food services	<ul style="list-style-type: none"> <li>• Chef</li> <li>• Cook or baker</li> </ul>	<ul style="list-style-type: none"> <li>• Kitchen help</li> <li>• Food preparer</li> </ul>
Health and safety	<ul style="list-style-type: none"> <li>• Health, safety, environment coordinator</li> <li>• Safety professional (CRSP-certified)</li> </ul>	<ul style="list-style-type: none"> <li>• Emergency medical professional</li> <li>• First aid technologist</li> </ul>
Logistics	<ul style="list-style-type: none"> <li>• Expeditors</li> <li>• Warehouse person</li> <li>• Parts person</li> <li>• Shipper and receiver</li> </ul>	<ul style="list-style-type: none"> <li>• Supercargo</li> <li>• Logistics coordinator</li> <li>• Logistics manager</li> </ul>

Table 4-2: Project Employment Opportunities (cont'd)

Job Type	Specific Job Titles
Office support	<ul style="list-style-type: none"> <li>• Office manager</li> <li>• Administrative assistant</li> <li>• Expenditures</li> <li>• Flight planners</li> <li>• Contracts coordinator</li> </ul>
Security	<ul style="list-style-type: none"> <li>• Security guard (watchperson)</li> </ul>
<b>Project Management</b>	
Management	<ul style="list-style-type: none"> <li>• Project manager</li> <li>• Production operations</li> <li>• Engineering manager</li> <li>• Information manager</li> </ul>
Procurement and purchasing	<ul style="list-style-type: none"> <li>• Procurement manager</li> <li>• Purchasing agent</li> <li>• Materials coordinator</li> </ul>
Socio-economic specialists	<ul style="list-style-type: none"> <li>• Field coordinator</li> <li>• Cultural relations coordinator</li> <li>• Employment and training counsellor</li> <li>• Traditional knowledge specialist</li> <li>• Community consultation and socio-economic coordinator</li> </ul>
Environmental specialists	<ul style="list-style-type: none"> <li>• Environmental monitor</li> <li>• Renewable resource technician</li> <li>• Wildlife technician</li> <li>• Biologist</li> </ul>
NOTE: CRSP = Canadian registered safety professional	
SOURCE: Imperial Oil (2004e)	

Capital expenditures made in the northwestern ICCs of High Level, Rainbow Lake and Zama City for goods, services and labour will be linked to NGTL-owned facilities, activities or both located adjacent to these centres and in this region of Alberta. These include:

- the NGTL interconnect facility
- NGTL’s gas pipeline spread known as the NGTL Northwest Mainline, Dickins Lake Section
- NGTL’s gas pipeline spread known as Northwest Mainline Loop – Vardie River Section
- block valve, control valve and line heater
- infrastructure sites for camps, fuel and equipment storage
- rail sidings and laydown areas for pipe storage
- the logistics required to transport project camps, fuel, pipe, equipment and granular materials to locations where they are required
- other labour, goods and services required by the projects

See Section 4.1.2.2, Measures of Regional Economic Effects, for more details on project sourcing of goods and services, associated employment, and methods used in the analysis.

#### 4.1.2.2 Measures of Regional Economic Effects

Economic effects were assessed at a regional and provincial level rather than a local level because a community-level assessment with any degree of accuracy would not be possible given small size, capacity constraints and data limitations for individual communities, coupled with the magnitude, scope and complexity of a project of this nature. There are some exceptions where economic effects on regional centres can be estimated. Further, economic analysis for a project of this size, scope and capital cost is typically done at the territorial or provincial level.

The regional and provincial economic effects of the projects were analyzed for the Construction Phase only because effects during the Operations Phase will be negligible. Four variables were measured to determine the effects for construction:

- expenditures by the projects for the region
- employment for each region
- labour income for the region
- project-related taxes for the province

Total estimated effects include the direct effects associated with on-site construction and operations, and the effects of the projects generated by the spin-off from this activity. The spin-off economic effects are referred to as *indirect* and *induced* effects, and are the result of the multiplier effects on the provincial economy.

Economic multipliers trace the effect of a change in output or demand for a good or service. For example, an increase in demand for a commodity will produce three effects that are described by economic multipliers:

- *direct* effects – effects on industries (firms) that expand production to satisfy increased demand. For building the project, they are the effects associated with supplying major components and with construction contractors.
- *indirect* effects – ripple effects as the construction contractors purchase additional required inputs from other firms. In this case, these are the firms that supply goods and services to the construction contractors or those operating the pipeline and fields, such as expeditors, located in various communities in the Northwest Territories.
- *induced* effects – as all these firms expand production, they hire more staff and pay out wages, thereby increasing the income received by households.

Households, after withdrawing a certain part for taxes and savings, spend this income, which in turn increases demand for other commodities.

The economic impacts for the NGTL ancillary project in Alberta were estimated using direct employment information provided by NGTL as well as a simulation produced by the Government of Alberta Input-Output model (I-O model). The Alberta model simulates direct, indirect and induced effects for Alberta at the provincial level only. The model does not provide estimates at the regional level for northwestern Alberta nor impacts on the rest of Canada. The results for Alberta from the Alberta I-O model were added to the national I-O model results (used to estimate the impacts of the Northwest Territories portions of the pipeline) to provide an estimate for the total project impact.

All dollar values in this analysis are measured in constant 2003 dollars. All employment is expressed in jobs or person-years. All direct employment generated during construction is expressed as *jobs* because much of the work will be short term or seasonal, whereas all indirect and induced employment is expressed in *person-years*. All operations employment is expressed in *person-years* because it will be full-time or full-time equivalent (FTE) employment.

It is important to note that the results of the economic models should be viewed only as estimates and not absolutes. A major deficiency of most input-output models is that they are not subject to capacity constraints. In the case of northwestern Alberta, capacity is limited. The problem is compounded because it is unlikely that new investments will be made to meet a short-term increase in demand generated by NGTL project construction that will take place during a single winter season. As a result, although northwestern Alberta and the Northwest Territories might produce goods and services that will be in demand by the project, there will likely not be sufficient capacity to meet both the normal market share met by local northwestern Alberta producers and the incremental demand generated by the project. This will mean proportionately more goods and services will have to be imported than is normally the case.

### **Demographic and Labour Market Estimates**

It is assumed that people from within northwestern Alberta will fill some of these jobs, but people from outside the local centres in northwestern Alberta will also be recruited. Some of the incoming population will rotate to and from their primary residences. Others may move to northwestern Alberta for the brief duration of construction.

It is recognized that there will be some currently employed northwestern Alberta residents that seek and find work on the projects. These individuals could include employees of local businesses contracted to undertake work on the project or they could be qualified people that choose to leave their current jobs to secure higher

paying and possibly more fulfilling work on the project. No assumptions have been made in the economic modelling as to the size of this labour market. However, estimates of locals leaving existing jobs in search of project employment have been considered in terms of effects on community and regional demographics in Section 4.2, Demography.

### Definition of Migration

In this economic analysis, employment demands in the northwestern Alberta are assumed to be satisfied from the local labour supply. However, this is limited by the capacity of the local labour market. It is assumed that the projects will lead to no permanent in- or out-migration between northwestern Alberta and other parts of the province.

Although no permanent in- or out-migration is expected, there will be a significant movement of direct employees from designated points of hire in southern Alberta to and from construction camps. When working on the projects, they will live in camps and will not establish residency in the region. The effect of spending their wages and salaries will occur in their home communities in the south and not in northwestern Alberta, although there could be some spending in High Level on goods and services when construction workers are enroute to or from the construction camps. The movement of workers on a fly-in and fly-out basis is not considered in- or out-migration.

### 4.1.3 Mitigation Measures

For this assessment, implementing the mitigation plans and techniques in Volumes 6 and 7 of the EIS and *EIS Supplemental Information: Northwestern Alberta* (2005) has been assumed when evaluating the effects of the NGTL interconnect facility and the NGTL Northwest Mainline (Dickins Lake and Vardie River Sections).

Any construction effects in the ICCs, which include High Level, are expected to be positive, low in magnitude, and regional and beyond regional in extent (see Table 4-3).

**Table 4-3: Procurement, Employment and Regional Economic Effects – Construction Effect Attributes for the Industrial and Commercial Centres in Northwestern Alberta**

Location	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Northwestern Alberta ICCs	Positive	Low	Regional and beyond regional	Short term	No

**4.1.4 Construction Effects**

The NGTL ancillary project will be constructed during winter 2008–2009. These facilities will run from the termination point of the Mackenzie Gas Project pipeline near the Northwest Territories–Alberta boundary to NGTL’s existing Bootis Hill junction in northwestern Alberta and continue south to a tie-in point at NGTL’s existing Thunder Creek Compressor Station. The total capital cost of this section is \$194.3 million, of which \$113.7 million will be spent on purchasing goods and services from Alberta businesses and \$81 million will be spent outside Alberta. The value of expenditures that will be retained in the northwestern Alberta ICCs, which include High Level, has not been determined (NGTL 2004).

It is estimated that construction of the NGTL project will generate a peak of 400 direct jobs for Alberta residents during winter 2008–2009. Camps will be provided for all workers involved in initial access development, pipeline and facilities construction and final cleanup. The NGTL project will also generate 1,096 indirect and 414 induced jobs, for a total of 1,910 jobs in the province. Labour income associated with this project-related employment is expected to exceed \$75 million (NGTL 2004).

**4.1.5 Operations Effects**

Because the NGTL project involves an expansion to the existing NGTL system in Alberta, the existing control centre, regional operations and maintenance support and resources are in place to operate and maintain the pipeline system. As a result, incremental direct, indirect and induced employment and labour income will be negligible, amounting to less than one full-time equivalent job, and additional direct operations and maintenance expenditures for the northwestern Alberta expansion will total approximately \$150,000 a year.

No operations effects are expected in the northwestern Alberta ICCs, which include High Level (see Table 4-4).

**Table 4-4: Procurement, Employment and Regional Economic Effects – Operations Effect Attributes for the Industrial and Commercial Centres in Northwestern Alberta**

Location	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Northwestern Alberta ICCs	Neutral	No effect	Regional	Long term	No

## 4.2 Demography

### 4.2.1 Effect Pathways

The effect pathway diagram in Figure 4-2 illustrates the projected influence of the projects on birth, death, and in- and out-migration rates. All aspects of project construction, which will create demands for labour, and needed goods and services, might initially affect all three rates. These demands will create an inflow of southern workers, both those with employment contracts and those looking for work, and with some bringing their families. As well, local workers will be hired and purchases made from businesses located in northwestern Alberta. These directly employed southern and local workers will contribute to indirect and induced income and employment effects. Quality-of-life expectations will be affected by increased demands for labour, goods and services, and by the direct, indirect and induced income and employment effects.

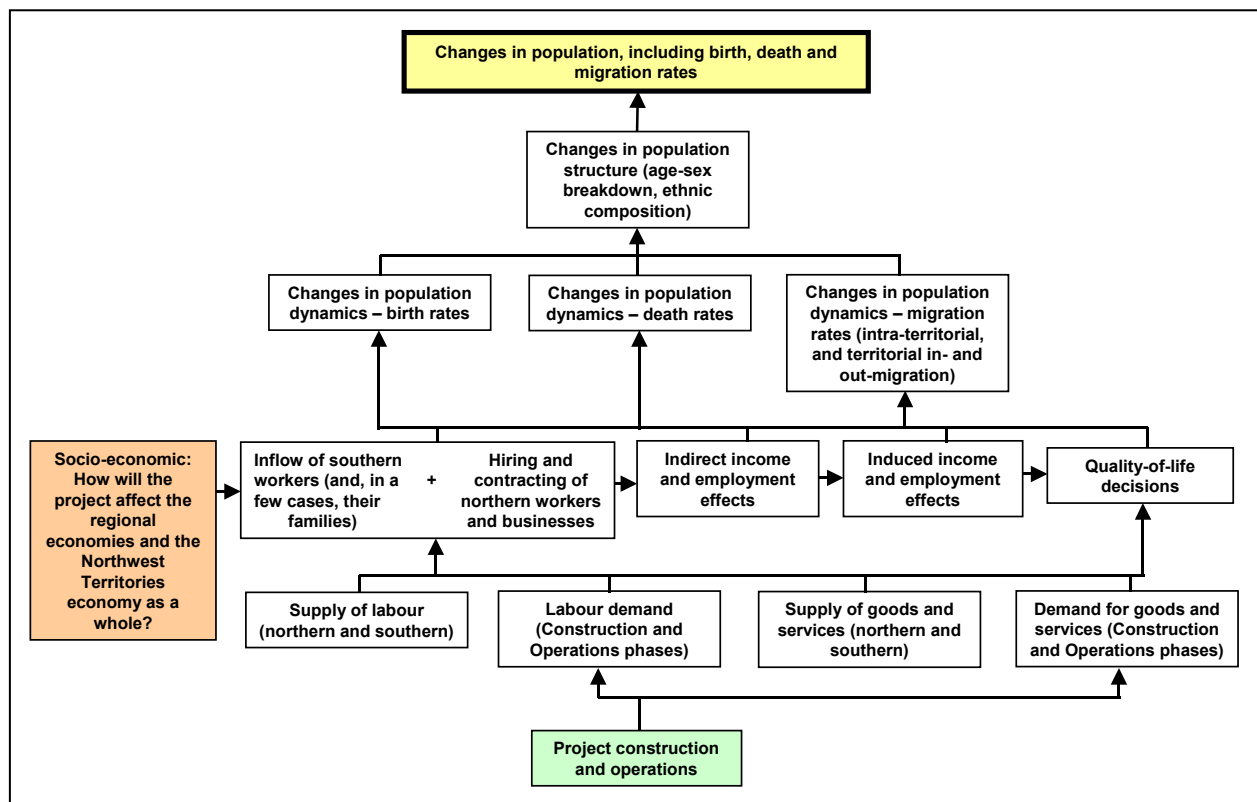


Figure 4-2: Project Effects on Population, including Birth, Death, and In- and Out-migration Rates

The importance of population change to the SEIA is as a key link between economic opportunities and social effects. Increases in population will increase demands on a wide range of public services and could affect social conditions. These effects will be addressed in subsequent sections.

This analysis of the effect pathways for project effects on in-migration from elsewhere in the province and population movement within the region is largely conceptual; there are empirical indicators for only a few of the links. As a result, the following analysis is largely based on current baseline information, the experience of other development projects, self-evident logic and years of relevant observations by the assessment team.

**4.2.2 Assessment and Management of Project-Specific Effects – Construction**

The opportunities generated by the projects in northwestern Alberta will be at quite low levels in comparison to existing economic activity. In addition, the regional economy is already very well adjusted to these types of projects.

**4.2.3 Mitigation Measures – Construction**

For this assessment, implementing the mitigation plans and techniques in Volumes 6 and 7 of the EIS and *EIS Supplemental Information: Northwestern Alberta* (2005) has been assumed when evaluating the effects of constructing the NGTL interconnect facility and the NGTL Northwest Mainline (Dickins Lake and Vardie River Sections).

**4.2.4 Residual Effects – Construction**

It is expected that construction will stimulate a low-magnitude positive effect on the population of High Level (see Table 4-5).

**Table 4-5: Population Mobility – Construction Effect Attributes for High Level**

Location	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
High Level	Positive	Low	Local	Short term	No

**4.2.5 Operations Effects**

NGTL does not expect that additions to operations and maintenance staff will be required in northwestern Alberta because of the pipeline extension and facilities being considered in this assessment. However, regional businesses could benefit from the long-term purchasing and contracting opportunities generated by the NGTL project, particularly for maintaining facilities and parts of the right-of-way located in the area. Precise estimates of local purchasing requirements have not yet been determined, but these opportunities will likely represent only a marginal addition to the local economy. It is expected that these opportunities will be met by the substantial existing regional service industry and will not be large enough to trigger in-migration from outside the region. Thus, no mitigation should be required and no residual effects are expected during operations.

## 5 INFRASTRUCTURE AND COMMUNITY SERVICES

### 5.1 Transportation

#### 5.1.1 Effect Pathways

This section provides information about expected influences of the projects on transportation infrastructure quality and availability. The general project effects on highway, railroad and air transportation infrastructure and services will be:

- direct, indirect and induced demands for short-term transportation services
- increased supply, because the projects will provide for some of its own needs
- elevated demands on some local community transportation infrastructure, including operations and maintenance
- upgraded and increased operations of regional transportation infrastructure

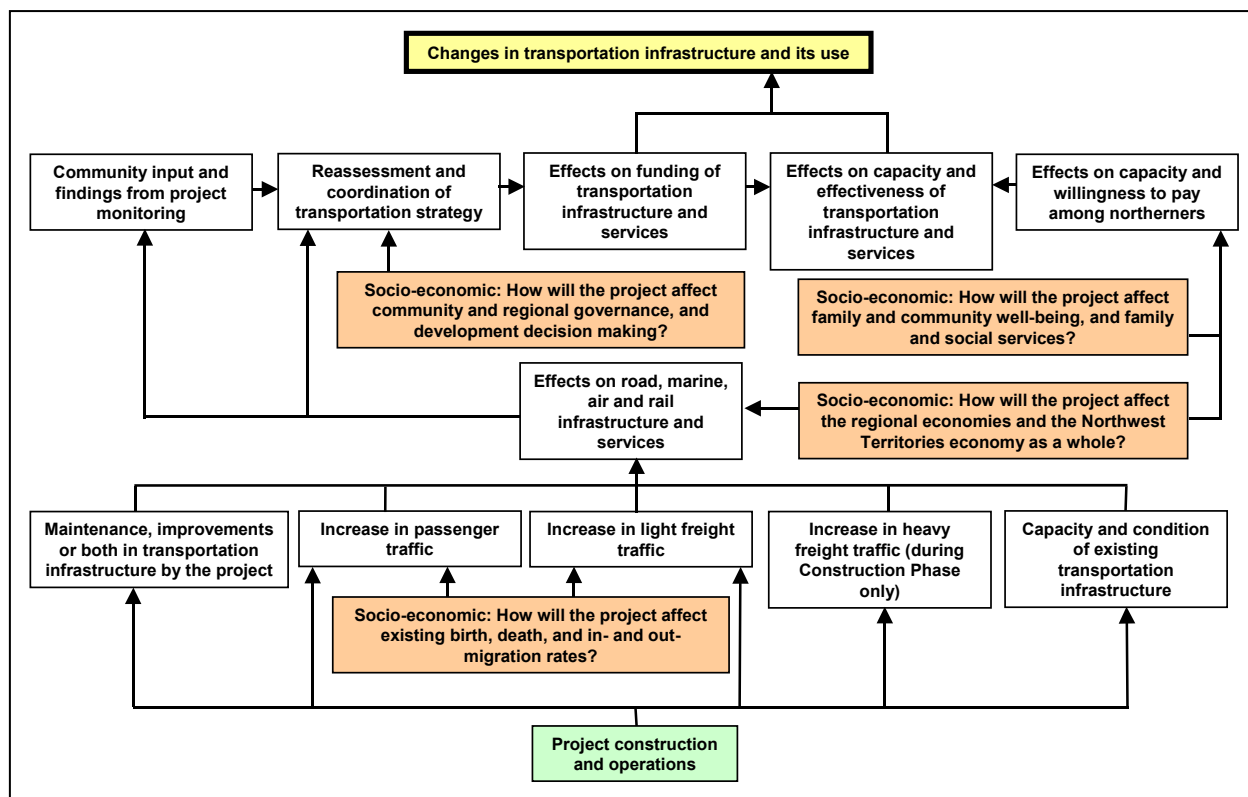
The combined effects of project-induced increases in freight and passenger traffic, and the responses of transport infrastructure and service providers, will:

- determine effectiveness and capacity of infrastructure facilities and services
- result in changes to transport infrastructure facilities, services and use

Figure 5-1 shows that during construction, the projects will induce increased demands on all transportation modes because of the many construction activities, in addition to increased project-related and -stimulated travel. The projects will also encourage transportation infrastructure maintenance and improvement. These influences, along with project effects on the regional and provincial economies, will affect road, rail, marine and air infrastructure and services. These effects will stimulate community input and findings from project monitoring. The findings, along with the effects on transport infrastructure and services, and project effects on local governance, will influence transport infrastructure and services funding.

The level of funding will affect transport capacity and effectiveness. Also affecting capacity and effectiveness will be project effects on:

- construction-related transport and travel
- the regional and provincial economies
- people's quality of life and need for public services, which will drive the travel needs and affordable travel interests of northwestern Alberta residents



**Figure 5-1: Project Effects on Transportation Infrastructure and Services**

Changes in transportation infrastructure and usage induced by the projects will thus be a function of the levels of funding, and the freight and passenger demands on these facilities and services.

Analysis of the effect pathways for project effects on transportation is largely conceptual; empirical indicators exist for only a few links. However, it is clear that project-induced changes in demand for freight and passenger movement, population size and income levels will be important driving forces that affect transportation infrastructure and use in the study area communities.

**5.1.2 Assessment and Management of Project-Specific Effects – Construction**

As NGTL is continuing to both develop its project plans and consult with potentially affected communities, the following is based on preliminary information and could change.

None of the northwestern Alberta ICCs, including High Level, have marine access, and the residents are not dependent on air carriers for access or supply, as are some communities in the Northwest Territories. Thus, the possible adverse effects of the projects on transportation are expected to be restricted to road and rail traffic.

NGTL construction activity in northwestern Alberta will be about 174 km northwest of High Level. According to current plans, pipeline construction equipment and materials will be hauled to the right-of-way on the Zama Road. This road, branching to the west off Highway No. 35 (the Mackenzie Highway) about 70 km north of High Level, is a main transport route for trucks to the oil and gas development area farther west. The NGTL project will increase trucking traffic on this road, but without noticeable adverse effects on Zama City because the road bypasses the hamlet. Only the very few residents of Zama City might be aware of the increased traffic when going to High Level.

Rail carloads transporting fuel and pipe, and trucks transporting construction equipment, facility modules, drilling rigs and food will be used over a period of several months during each of the construction years. The Mackenzie Highway is currently the eastern boundary of High Level, and the railway track runs parallel to the highway on the east side. Both truck and train traffic will thus be on the east side of High Level. A large number of trucks and lengthy freight trains will skirt High Level with unusual frequency during the months when pipeline goods are being delivered. This increase in traffic could pose a nuisance or safety concern, or both, particularly at crossings and intersections.

There are currently no stoplights on the highway passing the edge of High Level, or anywhere else in town. This roadway is somewhat elevated and narrower in width where it passes through town. The congestion and related problems of the highway are recognized, and the town has suggested to Alberta Transportation that this two-lane road be increased to four lanes where it passes through town. Alberta Transportation is considering this recommendation.

Four roads cross the railroad track: Highway No. 58 and three smaller roads in High Level. The highway crossing has a flashing red light when a train is approaching. The other three roads each have a sign calling attention to the railroad crossing.

Effects of the projects on transportation in northwestern Alberta will be most pronounced in High Level, as this town is the regional centre of the area. Other residents in northwestern Alberta travelling to this regional centre for shopping or recreation might experience an increase in traffic congestion in High Level throughout construction.

### **5.1.3 Mitigation Measures – Construction**

All of the effects described in the preceding section are manageable, provided that:

- there is adequate and timely planning
- needed human and financial resources are available

Joint planning, information sharing, cooperation and coordination among the project proponents, project transportation and logistics functions, local communities, or provincial and municipal government transportation departments will be essential.

A timely, cooperative planning effort by the project proponents, relevant transportation logistics managers, government transportation departments and community leaders is required to design mitigation measures for the expected project effects on transportation. These efforts must focus on the steps to be taken, development of effective protocols and procedures, and the resources required to implement them.

Agreements between the project proponents and the provincial transportation authorities, and between the project and applicable municipalities, will be negotiated and will include provisions for project use of permanent and seasonal roads. The agreements will consider:

- coordination of road maintenance activities, recognizing:
  - the timing of highway and winter road maintenance
  - access restrictions
- coordination of road upgrading where required
- options that could include making contributions in kind, such as constructing winter roads, maintaining and repairing highways, or contributing to a portion of maintenance costs

Other general mitigation measures will include:

- continuing discussions with air transportation providers to give them with ample lead time so that regional carriers can expand their aircraft inventories to meet existing community requirements and project demands
- coordinating with responsible authorities to provide construction air traffic demand projections, including provisions for assessing the need for, and completing, upgrading and other improvements to, regional and municipal airports
- continuing discussions with the Mackenzie Northern Railroad so that the Mackenzie Northern Railroad can complete railbed upgrades and add new sidings, where required, to meet existing transportation requirements and project demands
- using pilot vehicles when transporting oversized truck loads (on public roads), where appropriate

- observing road bans before winter freezeup and during spring breakup, unless otherwise approved
- posting and enforcing speed limits for project vehicles on project access roads, and having project vehicles adhere to speed limits on public roads
- developing plans for truck traffic routes, as required
- providing bus transportation of construction workers, where required
- sharing information about new borrow sites in the region with responsible authorities and local communities for negotiation of post-project use of, and responsibility for, those sites

NGTL will develop its own mitigation measures for approval by the appropriate authorities, based on its detailed NGTL project development and consultation programs.

The transportation problems currently in northwestern Alberta relate primarily to congestion on the two-lane Mackenzie Highway where it passes through High Level. Inadequate truck parking space in the town and the increased risks of incidents during periods when there is much heavier project-related truck and train transport passing through High Level are safety concerns.

Enactment by appropriate government agencies of the Town of High Level's recommendation that the Mackenzie Highway be widened to four lanes where it passes through town should alleviate the town bottleneck. It might be necessary to install stoplights at the points where Highway No. 58 intersects, but does not cross, the Mackenzie Highway from the west, and farther north where it intersects, but does not cross, the Mackenzie Highway from the east. Such lights would likely provide greater safety at the intersections.

Construction will likely increase local travel within the region and increase the risk of an incident at one of the High Level railway crossings. Mitigation will involve upgrading the warning devices at the crossings. The flashing red light device at the Highway No. 58 crossing could be replaced by a barrier that lowers to block the road when a train approaches, and the warning signs found at the smaller crossings could be replaced by flashing red lights.

New overflow truck parking should be provided.

#### **5.1.4 Residual Effects – Construction**

Traffic and truck parking problems in High Level will be reduced by the projected control measures.

Table 5-1 shows effects of the projects on transportation for the ICCs in northwestern Alberta, which include High Level. The effects are expected to be of low to moderate magnitude with respect to highway congestion, but only of low magnitude for parking and public safety issues, and truck parking space. There will be a substantial increase in the number of trains passing through High Level at certain seasons during construction. Accordingly, traffic controls at railroad and highway crossing points in High Level might be upgraded, if currently unavailable information on numbers and frequencies of north- and south-bound trains, and relevant highway traffic counts indicate that this would be appropriate. Project effects at these crossing points are expected to be low in magnitude, adverse and local in extent. In all cases, these effects on the northwestern Alberta ICCs, which include High Level, are expected to last only during construction.

**Table 5-1: Transportation – Construction Effect Attributes for the Industrial and Commercial Centres in Northwestern Alberta**

Transportation Issue	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Highway congestion	Adverse	Low to moderate	Regional	Short term	No
Inadequate truck parking space	Adverse	Low	Local	Short term	No
Safety at highway and railway crossings	Adverse	Low	Local	Short term	No

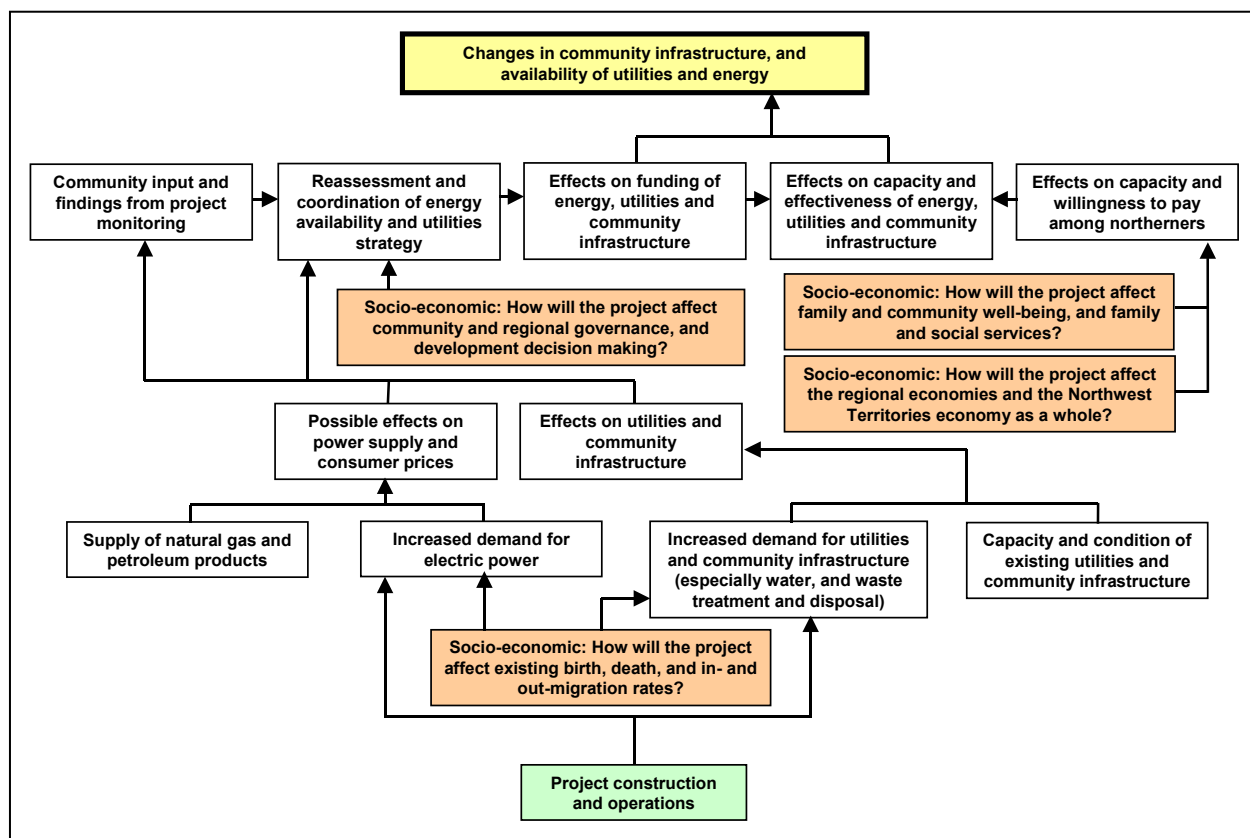
**5.1.5 Operations Effects**

After construction, there will be a sharp decline in the truck and train traffic passing through High Level. There will be continued volume of oil and gas exploration and production drilling in both the Northwest Territories and northwestern Alberta which will likely increase after construction. However, traffic conditions in High Level are expected to return to near-normal levels during operations, and there will be no need for additional mitigation measures and no residual adverse effects. If the mitigation measures discussed previously are implemented, enhanced transportation capacity will result.

## 5.2 Energy and Utilities

### 5.2.1 Effect Pathways

Figure 5-2 shows the expected influences of the projects on community infrastructure, and availability of utilities and energy in northwestern Alberta. In summary, the projects might have effects on infrastructure, utilities and energy supply in some study area communities.



**Figure 5-2: Project Effects on Community Infrastructure, and Availability of Utilities and Energy**

During both construction and operations, there could be effects on power supply and consumer prices because of:

- demand for electric power
- the available supply of natural gas and petroleum products
- demographic effects of the projects

Likewise, utilities and community infrastructure might be affected by:

- project-induced increases in demands on utilities and community infrastructure, especially water and waste disposal
- the capacity and condition of the existing utilities and community infrastructure
- demographic effects of the projects

Whether or not effects of the projects will result in a community population increase, and if so how large an increase, are central to this assessment.

Two potential effects, i.e., power supply and prices, and utilities and infrastructure, will affect community input to, and findings from, project monitoring and reassessment of the energy availability and utilities strategy. This reassessment, also affected by potential project effects on community and regional governance, will drive funding of energy, utilities and community infrastructure. Project effects on quality of life, social infrastructure, and the regional and provincial economies will affect the capacity and willingness of residents to pay for energy and utilities. The effects on funding, and on ability and willingness to pay, will jointly affect the capacity and effectiveness of energy, utilities and infrastructure. This, along with effects on funding of energy, utilities and infrastructure, will induce changes in energy availability, community infrastructure and utilities.

Project-induced changes in energy, utilities and infrastructure will be a function of the levels of funding, and the community and regional demands on energy, infrastructure and utilities.

The effect pathway of the projects on communications infrastructure is not presented here, but it is generally similar to that described previously. The projects will affect the demands for communications facilities and services, and the ability and readiness of residents to pay for them. These will affect the funding available, and the capacity and effectiveness of these services that, jointly, will determine the changes in the availability of the communications services.

### **5.2.2 Assessment and Management of Project-Specific Effects – Construction**

As there will be limited migration into High Level, and the community is not located near any construction camps or proposed development, no adverse effects on nontransport infrastructure in High Level are expected.

**5.2.3 Mitigation Measures – Construction**

As no adverse project effects on nontransport infrastructure are expected in High Level, no mitigation measures will be required.

**5.2.4 Residual Effects – Construction**

As no adverse effects on the nontransport infrastructure are expected in High Level, no residual effects are expected.

**5.2.5 Operations Effects**

During operations, no population increase is expected in High Level related to operations and maintenance of the projects. Therefore, mitigation of project effects will not be required and no residual effects are expected during operations.

### 5.3 Housing

#### 5.3.1 Effect Pathways

Figure 5-3 shows the expected influences of the projects on housing availability and quality in northwestern Alberta. In summary, project effects on housing and short-term accommodations will be:

- direct and indirect demands for short- and long-term accommodation
- reduced short-term accommodation demands through provision of construction camps
- potentially increased demand if some existing short- and long-term accommodation becomes unsuitable because of shortages of the skilled trades required to perform major repairs

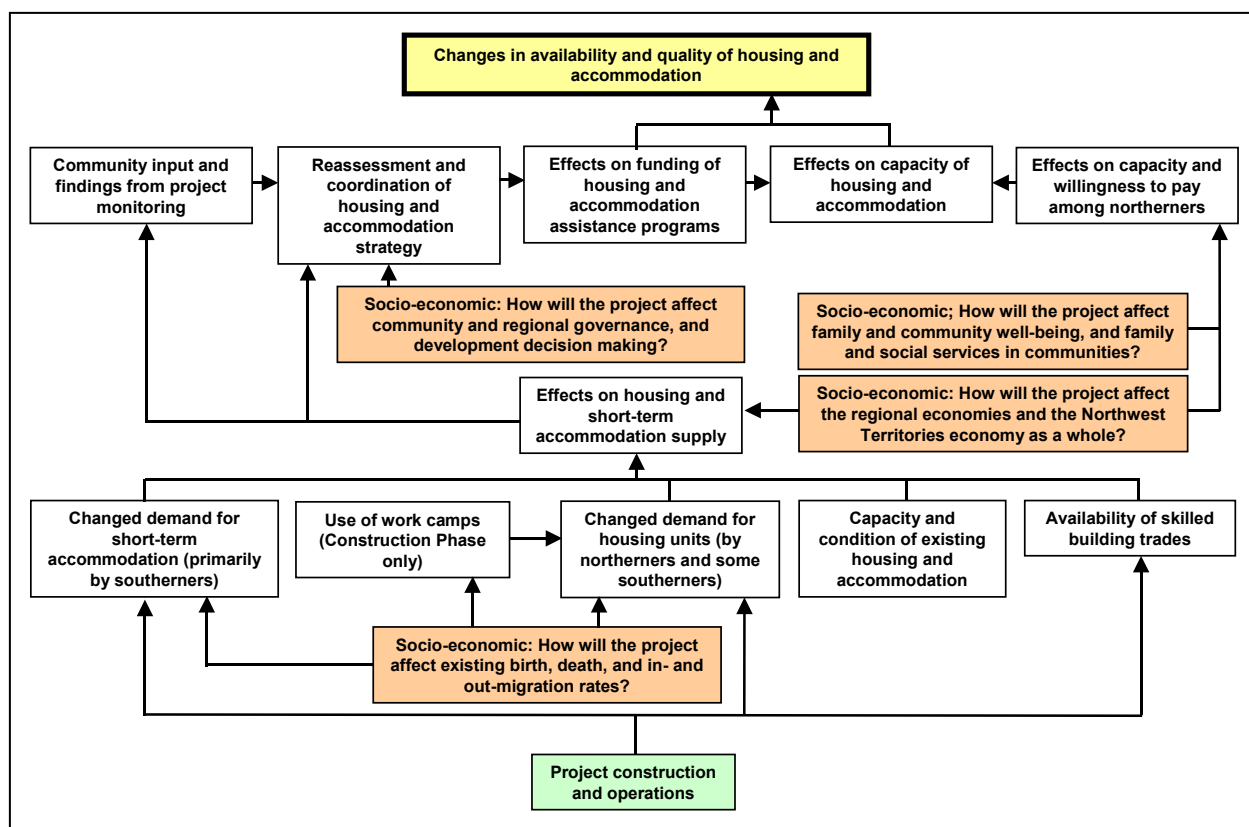


Figure 5-3: Project Effects on Availability and Quality of Housing

The resulting effects on short-term accommodation and housing, and project effects on the regional and provincial economies, might be apparent in relevant inputs from communities and findings from monitoring project effects. These, in association with residents' capacity and willingness to pay for housing, driven by project influences on the regional economy and quality-of-life expectations, will influence housing and accommodation capacities.

As a result, two influences, i.e., the capacities of housing and accommodations, and funding of housing assistance programs, will determine changes in the availability and quality of housing and accommodation.

In common with other resource development towns, housing is expensive and there is a zero vacancy rate in High Level. In February 2004, housing availability was very limited and there was continuing high demand. Because of high construction costs, affordable housing is a continuing issue of such significance that the town hospitality industry is having difficulty employing food service and housekeeping workers. However, there is relatively little new construction, with only about 12 building permits issued annually.

Analyzing the effect pathway for project effects on housing is largely conceptual; there are empirical indicators for only a few links. However, project-induced changes in population size and income levels could be important driving forces that affect housing availability and conditions in the study area communities.

### **5.3.2 Assessment and Management of Project-Specific Effects – Construction**

During the pre-construction and construction years, High Level will experience a substantial increase in truck traffic, and likely some increase in passenger vehicles. Therefore, effects of the projects will be experienced by the temporary accommodation and hospitality industry. However, a large new hotel, *The Mirage*, is under construction, and the *Super 8 Motel* is considering a significant expansion.

During the construction years, there will be increased demand for accommodations for hospitality industry workers, and shortages exist already.

### **5.3.3 Mitigation Measures – Construction**

For this assessment, implementing the mitigation plans and techniques in Volumes 6 and 7 of the EIS and *EIS Supplemental Information: Northwestern Alberta* (2005) has been assumed when evaluating the effects of the NGTL interconnect facility and the NGTL Northwest Mainline (Dickins Lake and Vardie River Sections).

### **5.3.4 Residual Effects – Construction**

As shown in Table 5-2, residual effects on housing in High Level are expected to be adverse, low in magnitude, local and short term in duration.

**Table 5-2: Housing – Construction Effect Attributes for High Level**

Region	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
High Level	Adverse	Low	Local	Short term	No

**5.3.5 Operations Effects**

No adverse effects on housing are expected in High Level resulting from activities of the projects during operations are expected. Therefore, no mitigation measures will be required and no residual effects are expected.

5.4 Recreation Resources

5.4.1 Effect Pathways

Figure 5-4 shows the influence of the projects on increased incomes of some workers and in-migrants along with potential direct project effects on preservation of traditional language, culture and knowledge. There may be effects on the culture and lifestyle preferences of some northwestern Alberta workers and their families. Some in-migrants might become new users of nontraditional cultural and recreational facilities such as community recreation centres, playgrounds, sports fields and libraries.

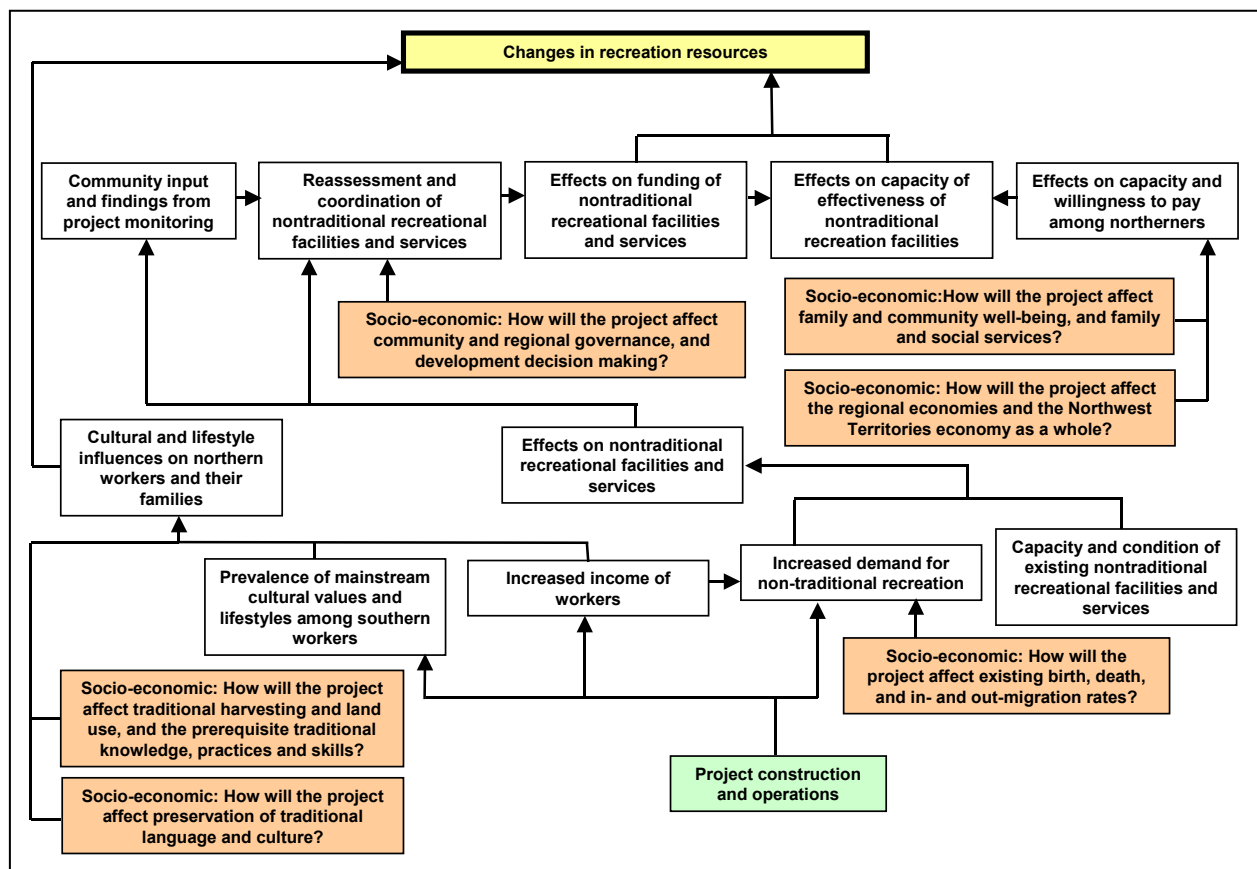


Figure 5-4: Project Effects on Recreation Resources

Project-induced increased demands for recreation from in-migrants and new users, and the capacity and condition of existing recreation facilities and services, will determine project effects on these facilities and services. This might drive community input and findings from project monitoring and, with evolving governance arrangements, could promote reassessment of recreation facilities and services. This reassessment might influence funding for recreation facilities and services, thus affecting the capacity and adequacy of these facilities.

Changes in recreation resources might result from:

- effects of demands of project-induced in-migrants
- effects of cultural and lifestyle influences on workers and their families
- capacity and effectiveness of recreation facilities

The capacity and effectiveness of recreation facilities are related to:

- the funding available for these facilities
- the capacity and willingness of northwestern Alberta residents to pay for recreation and cultural facilities and services
- the demands of new in-migrants

This analysis of the effect pathways for project effects on recreation resources is largely conceptual; empirical indicators exist for only a few links. Project-related in-migration and increases in income could be important driving forces affecting recreation resources.

This section does not deal with participation in activities or use of resources for which capacity and utilization information is either unavailable or less directly linked to the causal factors previously described. These activities could include various outdoor pursuits such as hiking, boating, camping and snowmobiling. To the extent that these activities relate to designated areas or the tourism sector activity, they are discussed in Section 8, Nontraditional Land and Resource Use.

#### **5.4.2 Assessment and Management of Project-Specific Effects – Construction**

In-migration and increases in income related to the projects could be important driving forces affecting recreation resources. Increased demands for recreation from in-migrants and new users, and the capacity and condition of existing recreation facilities and services, will determine effects of the projects on these facilities and services.

As there will be limited net migration into High Level, and construction workers will be accommodated in camps that provide recreation facilities and equipment, no adverse effects on recreational facilities and services are expected in High Level.

#### **5.4.3 Mitigation Measures – Construction**

As no adverse effects of the projects on recreation facilities are expected in High Level no mitigation measures will be required.

#### **5.4.4 Residual Effects – Construction**

As no adverse effects on recreation facilities are expected in High Level, no residual effects are expected.

#### **5.4.5 Operations Effects**

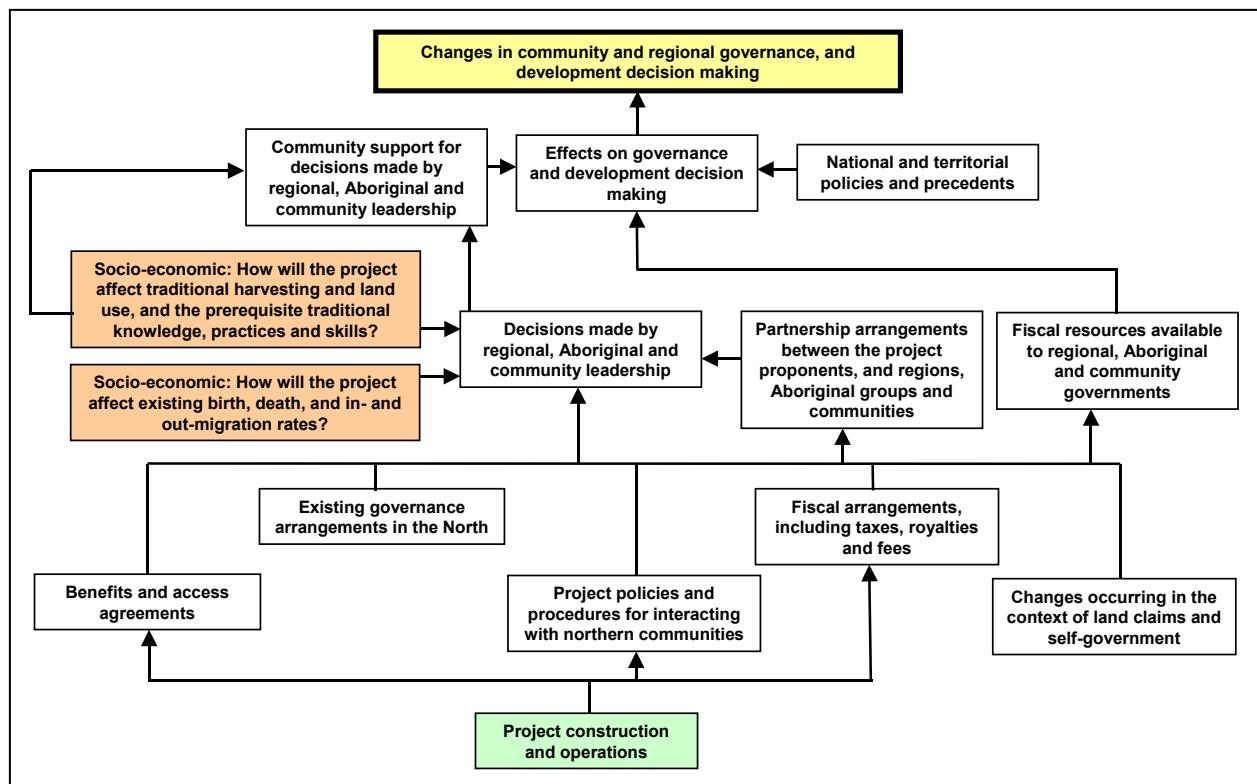
No adverse effects on recreation facilities resulting from activities of the projects during operations are expected in High Level during operations. Therefore, no mitigation measures will be required and no residual effects are expected.

## 5.5 Governance

### 5.5.1 Effect Pathways

Figure 5-5 shows the expected influences of the projects on community and regional governance in northwestern Alberta. Existing influences, independent of the projects, include:

- existing governance arrangements
- changes occurring in the context of Aboriginal rights
- the legacy of previous project proponent interactions with communities



**Figure 5-5: Project Effects on Community and Regional Governance, and Development Decision Making**

Additional construction influences of the projects will include:

- agreements between the project proponents and government, including First Nations
- the fees, taxes and royalties that might accrue to governments in the study area
- policies and procedures for dealing with communities

Collectively these will influence:

- partnership arrangements between the project, and regions, Aboriginal groups and communities
- decisions made by senior governments, and regional, Aboriginal and community leaders

Possible effects on population dynamics and the traditional commitments of Aboriginal people and will also influence leadership decisions. The decisions made by leaders, along with potentially changing traditional cultural valuations, will determine community support of leadership decisions. This degree of support, along with the funding available to the decision-making bodies, and national and provincial policies and precedents, will have effects on governance and decision making which might induce changes in governance and development decision-making procedures.

What has been analyzed in this section is a process of change that is perhaps always occurring in democratic decision making. Relevant influences change, and as they change, people's expectations and reactions change as well. The result might be to stimulate changes in governance. One of the most powerful sources of change is an increase or decrease in available funding that is not just based on external political influences, but is often dependent on economic influences as well.

### **5.5.2 Relevance to the Projects**

Two governance issues are most important to the projects:

- Which levels of government have the authority, funding and human resources to deal with the range of possible effects of the projects?
- Will the levels of government charged with the responsibility for dealing with possible project effects have sufficient resources, with sufficient lead time, to deal with likely project effects on the physical and social infrastructure of the communities and regions that might be affected by the projects?

In this context, physical infrastructure refers to:

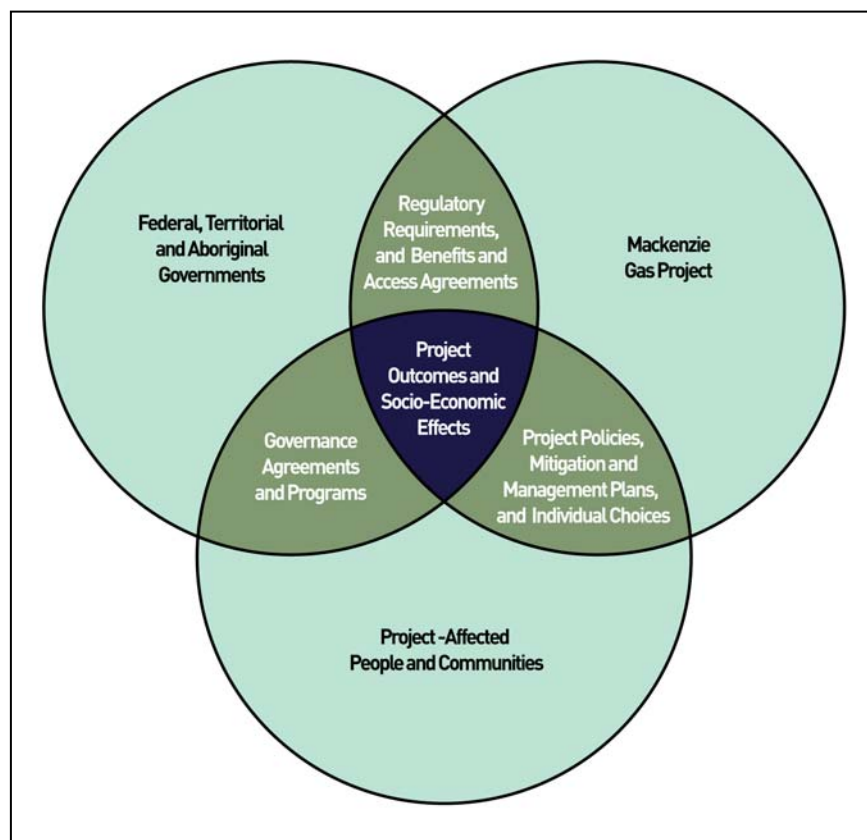
- all of the facilities, roads, airstrips and other items that might require maintenance or repair
- all of the facilities that might have a shortened lifespan because of project-related activities

Social infrastructure refers to the health, social wellness and education facilities and services that might require enhancement or expansion because of project-related activities.

Governmental decision making related to review and approval of the project itself is not addressed in this document. The analysis in the EIS focuses on the post-decision governance implications of the project.

**5.5.3 Assessment and Management of Project-Specific Effects**

The local communities, Aboriginal governments, Alberta and Northwest Territories governments, and project managers will all have responsibilities for managing the social and physical infrastructure needs, and the human implications of this project. This shared responsibility for effects management is a consequence of the nature of socio-economic issues. The project proponents will cooperate with communities and different levels of government but cannot, and should not, make unilateral decisions in areas that are the responsibility of others. Figure 5-6 illustrates that all parties must cooperate to achieve the common objective of optimizing project effects on people.



**Figure 5-6: Shared Responsibility for Effects Management**

**5.5.4 Residual Effects**

The NGTL pipeline route will not be near High Level and will not result in new demands for public expenditures in northwestern Alberta. Therefore, no NGTL project effects on governance are expected in High Level or the northwestern Alberta area.

Table 5-3 shows that NGTL project effects on governance are expected to be neutral, have little or no effect in northwestern Alberta during construction.

**Table 5-3: Governance – Project Effect Attributes for the Northwestern Alberta Communities**

Region	Phase	Effect Attribute				Significant
		Direction	Magnitude	Geographic Extent	Duration	
Northwestern Alberta	Construction	Neutral	No effect	Regional	Short term	No



6 INDIVIDUAL, FAMILY AND COMMUNITY WELLNESS

6.1 Community Well-Being and Delivery of Social Services

6.1.1 Effect Pathways

As indicated in Figure 6-1, activities of the projects might attract transient job seekers and residents from other areas, and will employ many people. They will stay in work camps and will periodically return to their families. Those employed will have increased income to spend, in ways that can affect the quality of life and well-being of individuals, families and communities. They can affect demands on family and social services as well. Project-related migration trends and work camp life can also affect family and community quality of life, and family and social services.

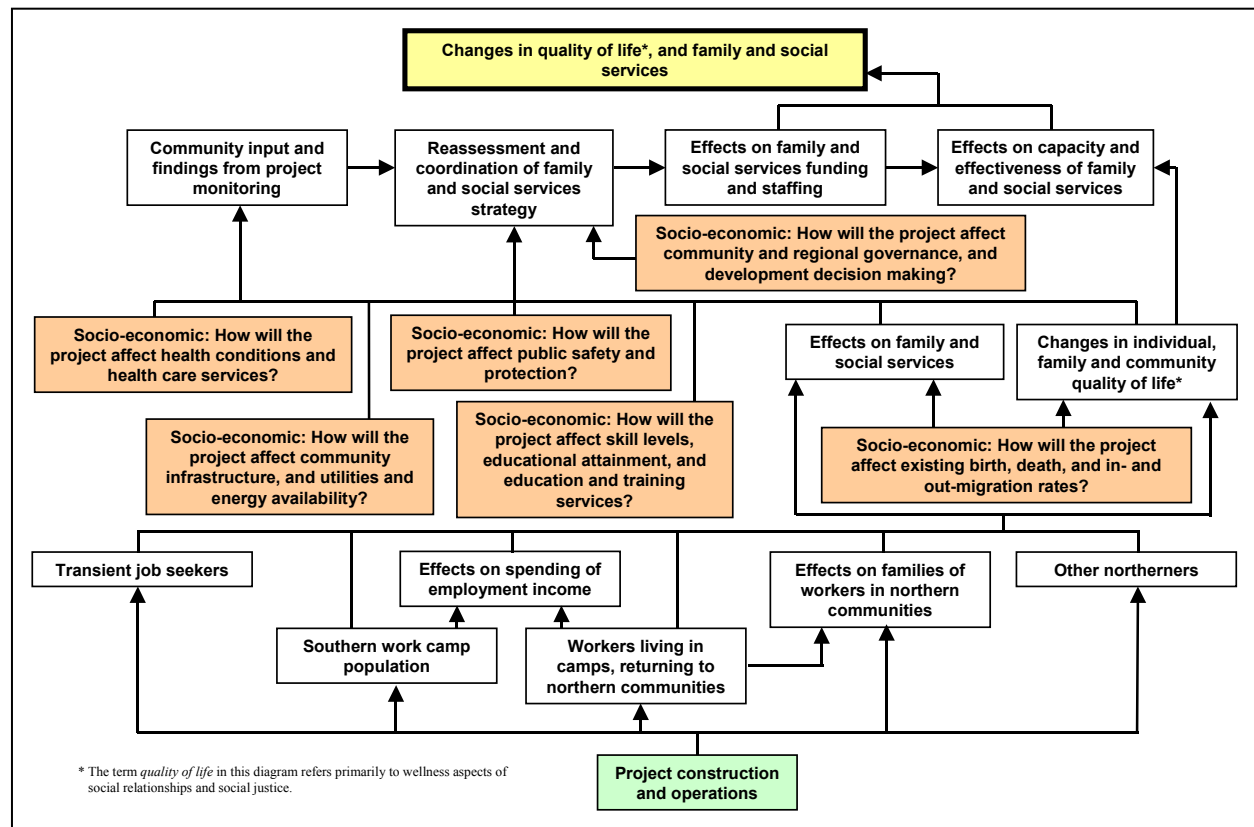


Figure 6-1: Project Effects on Family and Community Well-Being, and Family and Social Services

Many other possible project effects, discussed elsewhere in this report, and quality-of-life conditions and effects on family and social services, will affect assessments of conditions coming from community sources and project monitoring. These other influences include effects on:

- community infrastructure and utilities
- physical and mental health
- health care services
- public safety and protection services

The assessments of conditions from community sources and project monitoring, and changes in community well-being, demands on social services and regional governance influences will stimulate reassessment of delivery procedures. Reassessment will affect funding and staffing of family and social services, and the resulting changes will affect the capacity and effectiveness of family and social services delivery, as will changed service demands resulting from changes in quality of life.

Changes in family and social services delivery, and hence changes in individual, family and community wellness, will be brought about by the interaction of staffing and funding changes with:

- effects on family and social services capacity and effectiveness
- changes in demands from increased income

This analysis of the effect pathway for community well-being and social services delivery is largely conceptual; there are empirical indicators for only a few links.

The primary analytically relevant driving forces affecting well-being conditions include:

- income levels, particularly how individuals spend increased disposable income
- duration of work period separations from home
- family and community levels of stress
- availability of alcohol

Well-being conditions, and migration and resourcing responses to changes in demand are the primary drivers affecting the workloads of social service personnel, and thus the delivery of social services.

The effects of income on well-being might be beneficial. Increased income can lead to purchases of amenities that make possible more comfortable, enjoyable living, and more efficient resource harvesting. During 2001 and 2002, many people in the Beaufort Delta Region (BDR) of the Northwest Territories bought large diesel pickup trucks, snow machines, boats and outboard motors with their earnings. There were increased sales of home entertainment equipment, appliances and furniture. Under these conditions, the quality of life and effective resource harvesting might both improve, and demands on family and social service agents might be modest. These positive influences tend to increase as work and income stabilizes, and families learn to manage their increased income.

However, increased earnings can make possible increased gambling or spending on alcohol that might jeopardize the purchase of necessities. Substance abuse can have serious adverse effects on family and community relationships, and well-being.

Workers experiencing lengthy work-induced separations want and need rest and recreation upon returning home. Their spouses, having managed the household and child-rearing alone, need and look forward to sharing these responsibilities with the workers upon their return. Such incompatible needs can often lead to more serious conflicts. When stresses and mistrust in families or communities are combined with new sources of conflict and easy access to alcohol, the result can be abusive and violent relationships. Family and community solidarity and well-being, and indeed community social controls, can suffer.

In-migration increases the number of people who might become social service clients. Excessive demands, beyond the effective response capabilities of social service agents, can be associated with these conditions. Such adverse effects also increase the demands on protection services (analyzed in Section 6.5, Public Safety and Protection Services). Under these conditions, resourcing (primarily staffing levels) can determine the relative adequacy of the treatment that clients receive.

### **6.1.2 Assessment and Management of Project-Specific Effects – Construction**

High Level and the other northwestern Alberta communities differ from most others in the study area because many residents have had direct or indirect experience with oil industry employment. This is commonly rotation employment, involving working for a period without a break, followed by a period at home. As a result, many people are familiar with the stresses associated with the regular absences of workers from their families and communities, and with the effects of income from well-paying jobs.

Because of the distance to construction sites of the projects and the abundance of local job opportunities, it is unlikely that many people from this area will obtain either direct or induced pipeline employment. A few of those who do obtain

employment might celebrate in loud or unruly ways when on a break from their job, but the frequency of this behaviour will be within the range of normal variation. The local police and community are familiar with this celebratory and sometimes aggressive behaviour, and are able to deal with it.

Aside from the increased truck and railroad traffic passing through the towns, the projects are not expected to be a source of significant intrusions or disruptions in High Level.

**6.1.3 Mitigation Measures – Construction**

As the projects are not expected to be a source of significant intrusions or disruptions in High Level, no project-specific mitigation measures will be required.

**6.1.4 Residual Effects – Construction**

The effects of the projects on individual, family and community wellness in High Level, although adverse, are expected to be low in magnitude, local and of short duration (see Table 6-1).

**Table 6-1: Community Well-Being and Delivery of Social Services – Construction Effect Attributes for the Northwestern Alberta Industrial and Commercial Centres**

Location	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Northwestern Alberta ICCs	Adverse	Low	Local	Short term	No

**6.1.5 Operations Effects**

No effects on community well-being and delivery of social services during operations are expected in High Level during operations. Therefore, no mitigation measures will be required and no residual effects are expected.

## 6.2 Health Conditions and Health Care Services

### 6.2.1 Effect Pathways

Effects of the projects on the health conditions and effectiveness of health care services are addressed in this section. Both might be affected by several project-induced influences, shown in Figure 6-2.

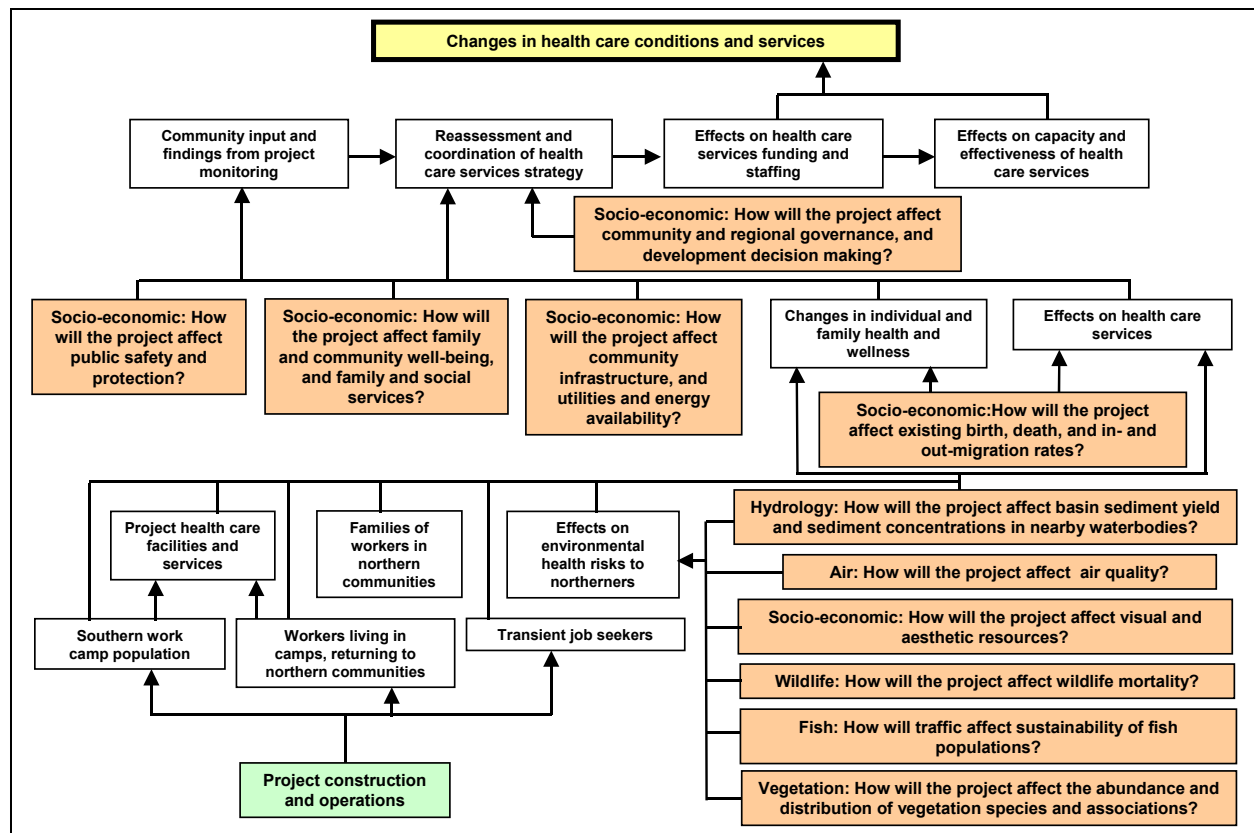


Figure 6-2: Project Effects on Health Conditions and Health Care Services

Activities of the projects will lead to the association of residents from study area communities with each other, with project workers from other areas, and on occasion with transient job seekers. After a variety of such contacts, local workers will return home. These project-related effects and associations with others, on or off the job, might adversely affect health through the following:

- exposure to contagious diseases, including sexually transmitted infections (STIs)
- increased consumption of unhealthy food

- possible influences on how project earnings are spent, i.e., excessively on alcohol, leading to vehicle incidents or family violence
- lessons learned from dangerous behaviour of role models

Construction-related and -induced activities of the projects might benefit the health of individuals and groups when project earnings are:

- spent on improving traditional or nontraditional lifestyles
- spent on a better, more nutritious diet
- spent on better climate-appropriate clothing
- spent on healthier housing arrangements or facilities
- saved for future opportunities

When project-influenced associations with others result in knowledge from new role models that promote health or safety, health conditions will benefit.

Other possibilities that might affect health include project effects on:

- family and community well-being
- family and social services
- public safety and protection

The health of individuals can be affected by environmental health risks, resulting from possible project effects on:

- water quality
- ambient air quality
- health of wildlife, fish and vegetation species

Project-induced effects on health facilities and services can include increasing their workloads by providing treatment to persons affected by the project because of:

- ill health resulting from risks to human health from the quality of air, water or soil, game and other wild foods, and from noise
- illness brought home by camp workers that infects others in the workers' families
- any health condition of a camp worker which the camp health service could not address

- mental or emotional disorders induced by various conditions, including:
  - family separation
  - costs and inaccessibility of child care
  - other stresses associated with employment absences and workplace issues, including harassment, safety, low pay and undervalued work
- transient job seekers, attracted by the projects, and their families who are ill or injured

Changes in health conditions or health centre workloads because of the projects might give rise to community reactions and relevant project monitoring findings, possibly leading to a reassessment of the health care services strategy. Such a reassessment could influence health care funding and staffing, in turn affecting the capacity and effectiveness of health care services. Together, these could lead to changes in health care services, and to possible changes in health conditions in the local population.

This analysis of the pathways for project effects on individual health and health care services is largely conceptual; there are empirical indicators for only a few links. The primary, analytically relevant driving forces affecting health conditions are:

- project-induced or -related exposures to disease-causing contagion conditions
- project-induced or -related changes in income levels and associated spending patterns
- physical risk levels
- stress levels, which might increase emotional or mental disorders

The primary drivers affecting the workloads of health centres, and thus the delivery of health care services, are:

- local health conditions
- diseases of returning workers which spread to family members
- migration and resourcing responses to changes in demand

Any increases in the number of potential patients and resourcing (primarily staffing levels), and staff morale will determine the relative adequacy of the treatment that patients receive.

## 6.2.2 Assessment and Management of Project-Specific Effects – Construction

Data reviewed in the EIS, Volume 4, Socio-Economic Baseline shows that rates of accidents and injuries, and selected mental disorders are higher in Health Region 17 (HR 17) (the health district for northwestern Alberta) than in all Alberta. HR 17 includes High Level, Rainbow Lake and Zama City, among other communities. These elevated rates are reflective of the pressures and risks associated with this area of oil industry, where peak activity is during the winter months when work pressures and incident risks are elevated. The local Royal Canadian Mounted Police (RCMP) reported that heavy trucks losing control from travelling too fast cause many incidents.

Town of High Level is aware that the narrowing of Highway No. 35 where it passes through the town now adds to congestion at times, and thus to incident risks. Alberta Transportation is considering a recommendation to broaden and reduce the present elevation of this stretch of the highway.

The High Level Hospital and the air ambulance permanently stationed in High Level to fly patients to Edmonton provide adequate local facilities for dealing with incident injuries. However, emphasis must be on prevention of incidents rather than on dealing with consequences.

## 6.2.3 Mitigation Measures – Construction

The NGTL project will provide health care facilities in conformity with the *Alberta Occupational Health and Safety Regulations* (Government of Alberta 2003), which specify the health care staffing and facilities required for camps of varying sizes, depending on the distance of the camp from a health centre. The NGTL project and its contractors will implement *best-practice* levels of staffing and facility equipment, and thus ensure the capability of stabilizing trauma victims or seriously ill patients for air evacuation to hospitals, even in small camps.

The following measures will be taken to improve safety. The project will ensure that:

- safety is the highest priority for the project
- transportation equipment is regularly inspected for safety
- safety is taken into account when planning contractor delivery schedules

Provincial and regional governments could ensure that:

- RCMP detachments have sufficient strength to permit regular patrolling of heavy traffic areas, with particular attention given to drunk driving

- railroad crossing points at Highway No. 58 and other High Level streets are upgraded, where warranted, to enhance safety

#### 6.2.4 Residual Effects – Construction

Despite these measures, it is expected that the projects will tend to further increase these risks and pressures because of much increased traffic on Highway Nos. 35 and 58. Therefore, some increase in accident and injury rates during project construction is probable. To some extent, this increase might be experienced at intersections and crossing points in High Level, and more generally throughout the area patrolled by the High Level RCMP detachment.

However, as Table 6-2 shows, these effects are expected to be low in magnitude and last only during construction.

**Table 6-2: Health Conditions – Construction Effect Attributes for High Level**

Location	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
High Level	Adverse	Low	Regional	Short term	No

As shown in Table 6-3, no significant effects on health care services are expected in the ICCs in northwestern Alberta. High Level supplies physician and hospital services to the surrounding area. The adverse effects on these services are expected to be held to a low level because of the ease of evacuating patient overloads to facilities in Edmonton.

**Table 6-3: Health Care Services – Construction Effect Attributes for High Level**

Location	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
High Level	Adverse	Low	Regional	Short term	No

#### 6.2.5 Operations Effects

With termination of construction, the associated increases in traffic volume will decline to more normal levels and no increase in the existing NGTL operations workforce is expected. There will be no need for mitigation measures and no residual effects are expected in High Level during operations.

### 6.3 Human Health Risks

Risks to human health related to the projects for residents of High Level are briefly described here. Because this community is 174 km from the nearest pipeline construction site and 152 km from the nearest construction camp, there is no concern about risks related to the construction process or activity. However, High Level residents did express concerns about diesel truck fumes, and particularly about the effects on health from air pollution when many diesel trucks are parked near motels, with their engines running all night.

These concerns are addressed in the following section on the effects of diesel engine emissions on air quality.

#### 6.3.1 Effects on Air Quality – Diesel Engine Emissions

A substantial increase in diesel-fuelled vehicular traffic transporting equipment and materials is anticipated, along with diesel emissions from diesel engines used to power off-road vehicles, and various types of construction and excavation equipment. Where these increases occur in remote areas with very low human habitation, the atmosphere will dilute the particulate and gaseous emissions, and human exposure will be very low to nonexistent.

While diesel exhausts are known to contain potentially dangerous polycyclic aromatic hydrocarbons and metals, they are in such relatively small quantities in any construction scenario that they do not present a substantial threat to vegetation, or to animals and humans consuming that vegetation.

Only if there was heavy diesel-fuelled vehicular traffic within settlements or communities with high densities of human habitation would human exposure to diesel emissions likewise increase. In such situations, diesel particulate matter would be added to the ambient suspended particulate matter normally present from such activities as wood and refuse burning, wind-generated resuspension of soil and contaminated soil, and emissions from fixed electric power stations.

There are several actions that can reduce general public exposure to the toxic components of diesel exhaust. These actions include:

- encouraging the use of late-model diesel-powered vehicles
- avoiding idling vehicles near communities, except under extreme cold conditions
- using railroad and barge transportation systems instead of trucks to move materials and equipment, where practical
- using by-pass roads through and around settlements where available

- using low-sulphur diesel fuel

### 6.3.1.1 Conclusions Regarding Air Quality Effects

Construction of the projects will result in increased traffic and over-night engine-idling by diesel trucks in High Level. The adverse effect of these traffic-associated emissions on air quality is expected to be temporary and associated with seasonal atmospheric phenomena, such as inversions, that naturally cause air quality degradation. Mitigation measures can be instituted to reduce exposure of the general population to these types of emissions.

### 6.3.2 Summary of Human and Environmental Health Effect Attributes

The direction, magnitude, extent and duration of diesel engine exhaust during construction are shown in Table 6-4. All effects are expected to be low in magnitude and local in extent.

**Table 6-4: Human and Environmental Health – Construction Effect Attributes**

Human and Environmental Health Key Indicators	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Diesel engine exhaust	Adverse	Low	Local	Short term	No

## 6.4 Accidents and Malfunctions

The following section provides information on potential accidents and malfunctions that could affect communities close to the Mackenzie Gas Project.

### 6.4.1 Introduction

Accidents and malfunctions can result from numerous causes, including pipeline and equipment failure, human error, and natural perils. It is necessary to have in place procedures to deal with the potential effects of accidents and malfunctions on people, property and the environment.

Prior to undertaking construction and operation of the project, the project proponents will be preparing a formal accidents and malfunctions assessment, as discussed in CAN/CSA-Z731-95, *Emergency Planning for Industry* (Canadian Standards Association 2002), which will include:

- *identification and documentation of worst-probable accidents and malfunctions involving the specific products being used or transported*
- *a determination of what can go wrong, its effects, its likelihood of occurrence, how often it could occur and the location of occurrence*
- *consideration of the dangers arising from human activity, such as fire, explosion, environmental contamination, hazardous substance release or pipeline ruptures, in addition to natural perils*
- *an evaluation of the potential for multi-accidents and malfunctions emergencies, e.g., natural gas line breaks, causing fires and explosions, which result in injury and property damage*
- *measures that could reduce or eliminate the potential for the accident or malfunction*

This assessment will be used as the basis for developing emergency response plans for the different components and phases of the project.

At this stage, the project proponents have identified the types of accidents and malfunctions that might occur as a consequence of project activities. See, for example:

- Section 10 of the application for approval of the development plan for the Taglu field
- Section 11 of the application for approval of the development plan for the Niglintgak field
- Section 11 of the application for approval of the development plan for the Parsons Lake field
- Volume 7, Section 5 of the EIS

In addition, the project proponents have considered the potential effects of accidents and malfunctions, and have identified those areas that would be particularly susceptible to such effects.

#### **6.4.2 Identification of Potential Accidents and Malfunctions**

The project proponents will use an assessment decision-making process to evaluate the potential for accident and malfunction occurrence during all phases and components of the project. This assessment decision-making process follows industry-proven practice, and federal expectations and standards, including:

- NEB All Company Letter, File 172-A000-73, Security and Emergency Preparedness and Response Programs (24 April 2002)
- CAN/CSA-Z731-03, Emergency Preparedness and Response Standard (Canadian Standards Association 2002)

The discussion of accidents and malfunctions, as presented in the balance of this section, follows common industry processes that include:

- identification of the accident or malfunction event(s)
- evaluation of who or what may be exposed (effects)
- impact or consequence of the accident or malfunction occurrence

Actions taken after identifying accidents and malfunctions may include modifying project engineering, construction and operations planning, revising engineering design, and including the potential accidents and malfunctions into project emergency preparedness response and preparedness plans. Critical in this planning is the understanding of the possible influences that local conditions may have on the capacity of the project to implement necessary emergency response, and how those same local conditions, e.g., harvesting, cultural conditions and

weather, may affect the long-term recovery requirements after the event has been brought under control, and the business and commercial considerations have been satisfied.

Project specific scenarios are developed to examine potential incidents in the context of site-specific locations and construction or operations conditions anticipated for the project. The scenario-based accidents and malfunctions assessments are used in the developing emergency response plans, and may also identify potential human health, community or social, environmental, and engineering and operations impacts and consequences.

Accident and malfunction identification involves identifying and understanding realistic events that may occur in connection with the various phases and components of the project. The possible categories of project accidents and malfunctions that may occur during engineering, construction or operations are as follows:

- materials design failure – metal and fabrication requirements for the project do not achieve the specified properties or are unable to endure the stress of the operating conditions, including climate
- construction accidents and malfunctions – impact to the facilities and pipelines during installation
- operations accidents and malfunctions – metal failure due to unanticipated operating conditions, inadequacy of engineering design features or change in operating conditions, and equipment malfunction
- third party – potential impact of nonproject-related activities on project components
- environmental hazards – soil settlement, thaw subsidence, frost heave, erosion and slope failure, flooding and scour at water crossings, and weather
- equipment events – traffic accidents and equipment failures

The potential accidents and malfunctions identified for the project as the basis for project engineering planning, and construction and operations emergency preparedness and response may include, but not be limited to, the following:

- Fire and explosion:
  - equipment operation at infrastructure facilities, borrow areas, along the pipeline right-of-way
  - fuel loss during transfer, vehicle accident

- natural gas or natural gas liquid (NGL) leak or pipeline rupture
- wildfire, threatening project personnel and equipment
- fuels or flammable materials storage, transportation or transfer
- vehicle or equipment accident
- NGL or natural gas pipeline rupture
- well blowout
- Hazardous materials loss or spills:
  - transportation accident, vessel or equipment failure on rail or truck
  - materials transfer failure of equipment, e.g., valves, hoses, fittings and gauges
  - storage equipment failure of tanks, equipment, e.g., valves, fittings and gauges
  - pinhole leak, resulting in release of natural gas or NGLs
  - well blowout, resulting in loss of natural gas and NGLs
  - leak from facility piping, storage or processing vessels, resulting in release of natural gas or NGLs
  - rupture of pipeline gathering system and flow line, resulting in release of natural gas, NGLs
  - spills of lube oils (unused and waste), solvents, glycol, methanol, degreasers, and transmission and brake fluids
  - failure at equipment, hoses or tanks, resulting in release of untreated industrial and domestic wastewater
  - loss of containment in storage facility and release of hazardous waste
  - transportation accident, resulting in loss of or spill of hazardous waste
  - placement of hazardous waste into nonapproved community waste management facilities

- Vehicle or equipment accidents:
  - single vehicle accident with other project vehicle, nonproject vehicle, human or animal
  - multi-vehicle accident with other project vehicle, nonproject vehicle, human or animal
  - vehicle collision with project equipment or facility, or non-project equipment of facility
- Environmental hazards:
  - flooding of project facilities
  - slope erosion, causing pipe exposure, sediments into watercourses
  - slope failure and subsidence because of disturbance of permafrost conditions
  - effect of cold on equipment
  - unseasonable weather conditions, limiting access to facilities and project right-of-way

The possible project-related accidents and malfunctions, as presented in the above list, may impact or affect local biophysical and social components found along or traversing the pipeline right-of-way and associated facilities. The following section identifies the biophysical and social components being considered by the project in its accidents and malfunctions analysis.

### **6.4.3 Sensitive Biophysical and Social Components**

Biophysical and social components were identified within the project area in order to determine possible impacts of project-related accident and malfunction events on the environment and communities. Information regarding the use of site-specific components, such as water sources and traditional harvesting areas, will provide the basis for the community-level planning activities to be included in project emergency response planning.

Biophysical components included:

- air quality
- noise
- soil and landforms (permafrost)
- vegetation
- wildlife

- water and aquatic environment

Social components included:

- community resources
- community wellness
- land and resources, in particular traditional harvesting activities and protected areas
- community safety

For any given accident or malfunction event, not all components would be affected. An explosion would likely not affect water quality, while a loss of containment may not affect air quality. However, either of those events could affect traditional land uses.

#### **6.4.4 Potential Impacts of Identified Accidents and Malfunctions**

This qualitative analysis summarizes the more common accident and malfunction events as:

- fire and explosion
- hazardous materials and fuels spills
- human error or equipment-related incidents

Environmental accidents and malfunctions are anticipated to influence project activities throughout all phases and components. Fires associated with the project may occur:

- along the right-of-way
- at facilities, camps or storage facilities
- in equipment or vehicles

Explosions may involve the:

- pipeline
- facilities
- wellheads
- camps
- storage facilities
- equipment or vehicles

Hazardous materials loss or spills may include:

- pipeline leaks or ruptures
- spills of hazardous materials, such as fuel, freeze depressants, wastewater, and drilling and completion fluids

Human error and equipment-related events may result from:

- collisions
- traffic noncompliance
- incidents with equipment

They may involve air, water or land vehicles. Preventative measures, or safeguards, will be put in place to reduce the likelihood of events that may impact the surrounding lands and communities.

The identified accidents and malfunctions are considered applicable for all project components and phases. Several events are considered to be more likely to occur than others, e.g., a fuel spill during construction is considered more likely to occur than a pipeline explosion.

The project proponent's accident and malfunction event planning assumes that the most common accident or malfunction will be a leak or spill of hazardous materials, with a focus on:

- fuels, such as diesel
- wellsite events (drilling or maintenance)
- natural gas and NGL release as a result of processing facilities or compressor station events (leaks or release from vessels or piping)
- natural gas or NGL release from the operating pipelines

#### **6.4.4.1 Accident and Malfunction Effects**

The possible consequence of an accident or malfunction will usually depend upon the:

- extent of the loss of pipeline or storage system integrity (leak or rupture)
- extent of loss to the infrastructure pipeline, compressor station, or protection or processing facilities (explosion, fire)
- location

- seasonal or weather variables at the time of the event

The consequences of an event are generally categorized as impact to:

- health and safety – the loss of life, injury or impairment of health to the public, an employee or a contractor as a result of event
- public and community disruption – the degree to which the general public and the local communities located close or adjacent to project components may be inconvenienced
- financial aspects – the economic loss associated with:
  - project schedule
  - drilling or processing facilities interruptions or pipeline system repair
  - additional operations costs
  - property damage
- biophysical components, such as air, water, soil, fauna or flora

The following sections discuss accident and malfunction events identified from this qualitative assessment that might occur during the life of the project, and identifies potential impacts of those events on the environment and communities.

### **Fire and Explosion**

Of the possible accidents and malfunctions, the project proponents consider fire to have the greatest potential impact on communities and harvesting activities. Negative impacts from fire may include altered vegetation and wildlife habitat, which could affect the harvesting ability of communities. However, the impacts on vegetation and habitat may not be considered negative by the community, and those plants favoured by wildlife are early successional and colonize areas quickly after fire.

A fire could negatively affect air quality and community health, although a decrease in air quality is anticipated to be similar to short-term air quality impacts from wildfires regularly experienced in the project area. Land stability and access to the land may be affected, although access would only be restricted during and immediately after the fire. Effects on access will be dependent on the location of the event in relation to the community and harvest area, and the conditions at the time of the event. Fires associated with accidents and malfunctions may negatively impact air quality and community health. Potential impacts to local communities will be determined by:

- closeness to the community
- local weather conditions, e.g., wind direction

- the possible hazardous nature of the materials
- the time of the event

As the pipeline is below ground, external fires should not impact it. Following a right-of-way fire, ground stability and the insulating materials that are part of the pipeline integrity system will be checked to ensure maintenance of condition. Facility fire protection systems, gravel pads and firebreaks should allow for effective fire management at the facilities and infrastructure sites.

The effects of the explosion will depend on the magnitude and location of the explosion. In the event of an explosion, it is expected that the effect will be localized with a loud noise, a hole in the ground in the area of the explosion and a fire. This localized impact could result in the possible obstruction of surface drainage and possible burning of vegetation, which could threaten the local community or nearby residences if the fire is allowed to get out of control. Access to the area around the explosion and possible fire would be restricted during the event and repairs, which would impact a community's access to harvesting areas for a period of time. Effects on access will be dependent on the location of the event in relation to the community and harvest area, and the conditions at the time of the event.

In the event of a pipeline explosion the communication element of the project proponents' emergency response plan would be activated, and residents of any adjacent communities advised of the nature and seriousness of the event. Community and worker safety would only be affected if a person was in the immediate area of the explosion. Current pipeline routing makes it unlikely that there would be any major impacts to a community from a pipeline explosion.

An explosion involving hazardous materials, such as diesel fuel, would likely result in a fire. It is anticipated that such an event would have similar short-term impacts on local air quality as a pipeline explosion.

Harvesting areas and natural areas of particular value are unlikely to be affected by an explosion. However, access to the area around the explosion would be restricted during the event and repairs, which would impact a community's access to harvesting areas for a short time. Effects on access will depend on the location of the event in relation to the community and harvest area, and the conditions at the time of the event.

### **Hazardous Materials Loss and Spills**

The effects of a hazardous material loss or spill will depend on the volume lost and location of the spill. Air quality could be negatively affected, particularly if a vapour cloud forms, and could have some impact on community and worker safety, and community wellness. Wildlife in the area could also be affected. However, the vapour cloud would likely dissipate within hours, and thereafter

would not pose a threat to human or wildlife health. Access to the area around the rupture and where the vapour cloud is located would be restricted for a short time, and could affect a community's access to harvesting areas. Soil and vegetation near the rupture would be negatively impacted. Land stability could be affected if the rupture were to occur on a slope or in a thaw-sensitive area, and could affect access routes to harvesting and traditional land use areas.

Communities could be affected by a hazardous material, e.g., diesel fuel, spill. Project activities involving fuel transport and transfer are the most likely situations where a loss of containment would occur. A spill to a flowing watercourse has the potential to distribute the material along the banks of the watercourse, necessitating additional cleanup efforts. The spill may result in short-term loss of community water intake until the plume from the spill has passed the intake point, and may prevent communities from harvesting from the watercourse. If the spill were to occur on land, the soil and vegetation would likely be negatively affected, particularly in the immediate area around the spill.

The pipeline trench will initially contain any leak from an NGL pipeline. Where the NGLs come to surface and disperse over the land surface, it is anticipated that they will contaminate soils and have possible short-term effects on vegetation.

### **Equipment Accidents**

The effects of a transportation event will be dependent on the number of people involved and the location of the incident. The primary concern with a vehicle incident is community and worker safety. Vehicle incidents may involve more than a single vehicle, and may occur in or near a community. A vehicle incident could require the support of community resources, such as nursing stations or hospitals, and RCMP detachments. Community access to such resources could be negatively impacted for a short time.

Harvesting areas and natural areas of particular value are unlikely to be affected by a vehicle incident. However, access along the travel corridor where the incident occurred would be restricted for a short time, and could affect a community's access to harvesting areas.

#### **6.4.5 Accidents and Malfunctions Event Probability**

Data on accident and malfunction event occurrence for the oil and gas, and the natural gas pipeline industries is tracked and maintained by regulatory authorities in Canada, the United States and Europe. The data allows for representation of probable accident and malfunction occurrence for:

- drilling activities
- operating pipeline systems
- transportation and worker incident and accident events
- the loss or spill of hazardous materials

Transportation, worker incident and spill events are not specific to the oil and gas, and the pipeline industries, but are considered relevant as they provide the basis for the consideration of events with a greater likelihood of occurrence because of increased traffic and equipment activity during construction.

#### **6.4.5.1 Project Components Consideration**

##### **Drilling**

Drilling programs at the anchor fields will incorporate applicable industry standards and will meet regulatory requirements. Information on potential drilling activity accidents and malfunctions is presented in the EIS supplementary information report, *Worst-Case Scenarios in the Inuvialuit Settlement Region*, submitted to the JRP in November 2004.

##### **Pipelines**

Pipeline accident and malfunction events may be a leak of the product or a rupture that releases the natural gas or NGLs. The NEB, indicated that regulated pipelines such as the project pipeline have 0.049 rupture events per 1,000 km of natural gas pipelines and 0.063 ruptures per 1,000 km for liquids pipelines (approximately one event per 20 years) (NEB 2004). The data also indicates that many of the rupture events are because of external corrosion and stress corrosion events. The same data indicates fewer ruptures from material failure on new pipelines, attributable to improved quality of materials and construction methods.

##### **Facilities**

Probability data for facilities (gas processing, Inuvik area facility and compressor stations) is not as readily available as data used for drilling and pipeline probability assessments. For facility accident and malfunction assessments, the project proponents have assumed that events would be similar to those for the pipeline system. Probable events are anticipated to be as a result of operations or equipment malfunction, human error, or third-party damage.

#### **6.4.5.2 Fire and Explosion**

Fire may occur as a result of project activities or from an external nonproject-related source during any project phase. Project facility and infrastructure site emergency response systems are designed to industry standards that provide response capabilities in the event of a fire.

Data suggests that external fires may be a greater concern than project-related fires, and are very likely to occur within the project area during the life of the project. Between 1988 and 1999, there were 236 fires within a 300 km corridor centred over the pipeline route (Natural Resources Canada 2002). Lightning was

the cause of 231 fires, human error the cause of four, and one was of unknown causes.

Facility gravel pads and metal buildings are anticipated to reduce or prevent the possible impact of fire on the integrity of the facilities and infrastructure sites. The depth of pipeline burial, in conjunction with clearing the right-of-way, will prevent fires from having an impact on pipeline integrity. However, fires associated with fuels or other hazardous materials will likely result in short-term smoke and facility disruption.

Explosions may be associated with various project components, including the pipelines, facilities, production wells, storage and infrastructure sites, and equipment and vehicles, and may occur during any project phase. Explosions may be caused by a variety of situations:

- improper handling of explosives required during construction
- pipeline failure, e.g., corrosion
- vapour release, e.g., of NGLs, or at fuel storage sites
- failed electrical grounding systems
- failure to follow hazardous conditions operating procedures, e.g., during pigging, material transfer

An explosion associated with fuel or other hazardous material would likely result in a fire, potentially causing smoke and facility disruption.

A pipeline explosion would result in the release of natural gas or NGLs, and ignition of the natural gas or NGLs would be likely. The NGLs will be a low vapour pressure product consisting of greater than 86% pentane plus (C<sub>5+</sub>), butane (C<sub>4</sub>) and a small component of propane (C<sub>3</sub>). If there is any methane (C<sub>1</sub>) or ethane (C<sub>2</sub>) present, it will only be in trace amounts. If the NGL line were to explode without ignition of the products, liquids would likely evaporate into a vapour cloud because of the pressure in the pipeline. If the explosion were to occur in a low-lying area, or if there was little wind, the vapour cloud could remain in the area for several hours.

### 6.4.5.3 Hazardous Materials Loss or Spills

Hazardous materials loss or spill assessments include transporting, handling, storing and transferring products identified from a review of Northwest Territories data from 2001 to 2004 (GNWT Resources, Wildlife and Economic Development [RWED] 2001, 2002b, 2003, 2004), and include:

- chemicals

- fuels, e.g., gasoline and diesel
- lube oils, e.g., unused and waste
- untreated industrial and domestic wastewater
- other products, e.g., crude oil and drilling mud)

This data indicates that wastewater and fuels, followed by crude oil and drilling mud, comprised the greatest materials volumes lost over the three-year reporting period reviewed. This list of hazardous materials provided the basis for the project accident and malfunction assessments that will be conducted for all project phases and components. Accident and malfunction assessments for handling construction-related explosives and other chemicals, such as glycols and methanol, will be developed in consultation with suppliers.

#### **6.4.5.4 Equipment Accidents**

Accident events associated with equipment operations, materials transfer and transport can result in injury to personnel or obstruction to roadways. Data from Alberta Human Resources and Employment (2004) suggests that traffic loads and vehicle activity associated with construction sites (data is not specific to pipeline industry) is a common factor in increased traffic and vehicle accidents.

#### **6.4.5.5 Environmental Hazards**

Environmental hazards have the potential to impact project schedules and activities associated with all project phases and components. The US Department of Transport data for 2002 to 2003 indicates that of 180 incidents reported for gas transmission pipeline systems, 12 of the events were from natural or environment-related events (US Department of Transportation 2002, 2003). Events identified included:

- flooding
- stream bank failure and slumping
- soil and slope failures
- settlement

#### 6.4.6 Summary

This section has identified, from industry data, accident and malfunction events of fire and explosion, loss of containment, and equipment incidents that may occur during all phases and components of the project. Of the events identified, fire and loss of containment, e.g., fuels or other hazardous liquids, have the greatest potential for long-term impacts on the environment, human health, community harvesting and social or cultural elements. Project emergency response preparedness planning, developed using proven industry processes, will incorporate the information identified in this response to ensure ongoing project accountability for the identified environmental and social components. This information is also included in the project proponents' Additional Information Report, provided in response to the JRP letter dated December 3, 2004.

## 6.5 Public Safety and Protection Services

### 6.5.1 Effect Pathways

As indicated in Figure 6-3, activities of the projects could attract transient job seekers and Alberta residents from other areas, and will affect camp-based workers, their families and their spending patterns. These influences in combination, along with project-induced demographic effects, will affect public safety conditions and the demands on protection services. These two effects could lead to relevant community inputs and findings from project monitoring, and to potential reassessment of the public safety services strategy. Community inputs on project monitoring, and project effects on community wellness and wellness services might also influence this reassessment process.

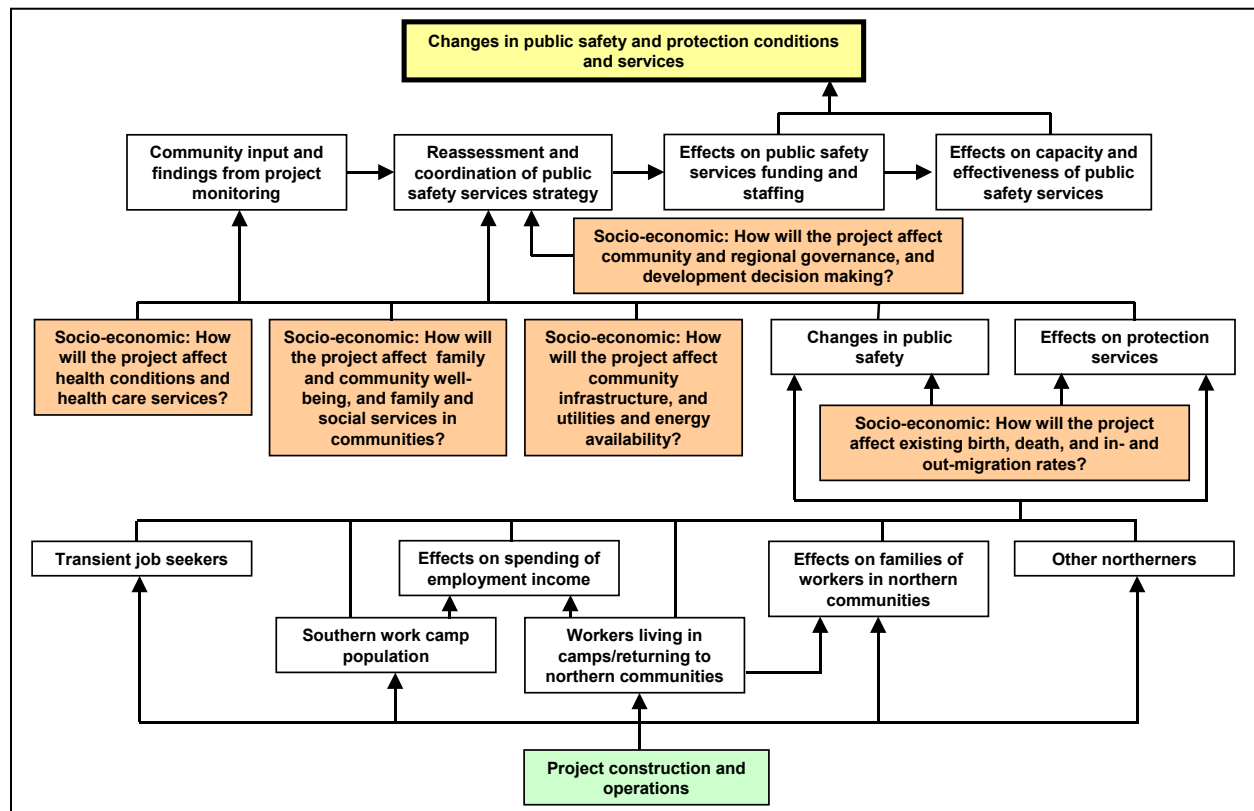


Figure 6-3: Project Effects on Public Safety and Protection Services

Reassessment of public safety services strategies might lead to effects on public safety services funding and staffing, which in turn would affect the capacities and effectiveness of these public safety services. Jointly, these can result in changes in public safety and protection conditions and services. Note that this analysis focuses on how policing is affected by the projects. Effects of the projects on community fire protection services should be undetectable and within the normal range of variation, for two reasons:

- most construction activities are scheduled during winter months
- the projects will have emergency response plans, on-site equipment and personnel trained in fire suppression

This analysis of the effect pathways for project effects on public safety and protection is largely conceptual; there are empirical indicators for only a few links. It is clear that increases in income induced by the projects could result in increased substance abuse, increased violence and incremental demands on protection services.

The process, depicted in Figure 6-3, shown previously, could be beneficial or adverse. Project-induced changes in public safety and protection services can lead to reassessments, with resulting increased capacity and effectiveness of public safety services. However, there are no familiar empirical examples of this.

### **6.5.2 Assessment and Management of Project-Specific Effects – Construction**

The RCMP in High Level are responsible for policing the town, three neighbouring reserve communities and parts of Highway No. 35, Highway No. 58 and the Zama Road. Demands on the High Level detachment are so heavy that the only highway incidents they have time to investigate are injury incidents. The commanding officer reported that although he felt they should patrol the highways in his district, the available resources often do not permit it (High Level RCMP commanding officer, 2002 personal communication). Indicative as well is that the detachment at times find its holding cells so overcrowded that some prisoners must be transported to the cells of a neighbouring detachment.

The population of this northwestern Alberta area is increasing steadily because of logging, oil and gas, and agricultural activities. The projects are likely to:

- increase the importance of High Level as a transportation centre
- increase traffic volumes on three main roads in the areas
- increase the wealth available in the area

These trends, including increasing traffic and overnighting by truckers and others, are now stimulating increases in needed facilities, numbers of hospitality industry workers and community size.

Along with effects of the projects, such as higher incident rates associated with elevated traffic volumes and the increased substance abuse associated with higher incomes, these trends will increase the policing workload, of the High Level detachment.

### 6.5.3 Mitigation Measures – Construction

Incident rates and substance abuse problems can be addressed by appropriate mitigation measures, but unfortunately most would depend upon some increase in staffing of the High Level detachment. More frequent and visible highway patrols would lead to slower, more careful driving, and to fewer injury and other incidents. Enforcement of the *Alberta Alcohol and Drug Abuse Act* provisions against over-serving alcohol to persons who are inebriated in High Level, and taking into preventive detention persons so intoxicated as to be a danger to themselves or others, would reduce the time required for alcohol-related calls for service. It would also reduce the time spent investigating serious incidents. In this way, some time would be made available for other policing duties.

Widening the highway where it narrows as it passes through town, and upgrading highway and railroad crossing points where relevant to expected increases in highway and railroad traffic would also reduce injury and other incidents.

Adding to detachment holding cell capacities would reduce the time officers must wastefully devote to driving prisoners to available holding space in neighbouring detachments. Moreover, such additions will certainly be necessary if promoting the policy of preventive detention of intoxicated persons is to be implemented.

### 6.5.4 Residual Effects – Construction

It is likely that unless Highway No. 35 is widened where it passes through High Level, there will be traffic congestion. More effective controls installed at railroad and highway crossing points might also be indicated. These would somewhat reduce the incident-related demands on policing time. However, the detachment commander reported that most of their calls for service are alcohol-related, and the staffing additions needed to deal preventively with these problems might not be available (High Level RCMP commanding officer, 2002 personal communication). This is the conservative assessment that drives the effect attributes ratings seen in Table 6-5.

**Table 6-5: Protection Services – Construction Effect Attributes for High Level**

Location	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
High Level	Adverse	Moderate	Regional	Short term	No

The responsibilities of the High Level RCMP detachment are expected to increase with the increased highway and stop-over traffic the project will bring to High Level. Accordingly, High Level, and the larger territory policed by this detachment, are expected to experience moderate-magnitude, adverse, short-term effects on regional protection services.

#### **6.5.5 Operations Effects**

Such increases in policing burdens as the High Level RCMP detachment might experience during construction are expected to recede when construction is complete. No effects on public safety and protection services during operations are expected in High Level. Therefore, no mitigation measures will be required and no residual effects are expected during operations.



These two influences will affect community and project monitoring inputs, and the need for coordination of education and training strategies. Education and training services will also be influenced by community and monitoring inputs.

Education and training services in the study area might be affected by the project because of an increase or decrease in student enrollments, and changes to education and training programs offered. In turn, the changes could affect the numbers of teachers and training instructors required.

This analysis of the effect pathways for education and training services and attainments is largely conceptual; there are empirical indicators for only a few links. It is clear that the kinds of job and career opportunities generated by the projects, and the resulting wages and opportunities to increase incomes, will be important driving forces. These could affect the rates of retention of adolescents in school, education and training staff members, and the scope of education and training provided. The resulting effects can be positive or adverse.

Rates of high school completion and enrolling for post-secondary training will serve as relevant indicators of effects serve as relevant on education attainment. The best indicators of recent and present education achievement are the rates of high school graduation, and of those with some post-secondary training among adults.

Rates of graduation and having post-secondary training per 1,000 people aged 15 years and over are thus indicators of education achievement, not actual rates of people who graduate or have advanced training at some time in their lives. These are valid indicators, however, increasing when the proportion of graduates increases in the population, for example, and declining when the proportion falls.

Possible effects of the projects on education facilities and services translate into effects on classroom availability and teacher workloads. The project might affect enrollments through effects on migration, on school retention, and perhaps demands that additional subjects be taught. The utilization rate for a school, the actual number enrolled divided by the total capacity, is an appropriate indicator of the space resources available for responding to increased enrollment or pressures to increase subject offerings. It is assumed, generally, that additional teachers can be readily recruited if there is need and funding is available.

### **6.6.2 Assessment Criteria**

Separate criteria are required for effects of the projects on education attainment, and education facilities and services.

Positive effects will:

- reduce the tendency for students to drop out of school or post-secondary training
- increase the tendency for dropouts to return to school and others to enroll in or complete post-secondary education or training programs

Adverse effects will:

- increase the tendency for students to drop out of school or post-secondary training
- reduce the tendency for dropouts to return to school and others to enroll in or complete post-secondary education or training programs

With respect to education facilities and services, effects are adverse if they:

- cause enrollment or staffing changes incompatible with currently available facilities
- reduce needed teaching staff
- lead to staff-student ratios in excess of approved norms

All other effects on facilities and services are expected to be neutral.

Young peoples' tendencies to remain in school, drop out or return to school might be affected by such influences as:

- their present interests
- their perceptions of the earnings opportunity costs of remaining in school
- the future earnings opportunity benefits of returning to school
- the persuasions of people who might influence them

It is assumed that in regions with higher levels of education attainment, the tendency of young people to leave school early might be less than in regions with lower levels of education attainment.

Likewise, the tendency of persons or families to remain home or move to a regional centre is influenced by:

- their present interests
- their perceptions of the earnings opportunity costs of remaining at home
- the present and future opportunity benefits and costs of moving
- the persuasions of people who might influence them

Teachers' tendencies to continue teaching or to resign in favour of better-paying project employment opportunities are affected by very similar influences.

It is not possible to assess the net result of these various influences on young people, teachers or those considering moving to a regional centre. There have been no studies of people in situations resembling those resulting from the project to provide relevant guidelines. Accordingly, the strategy in this section is to identify and discuss the relevant influences with respect to leaving school early (dropping out), moving or resigning from teaching, in regionally relevant terms where possible.

However, because of the numbers or relevant operative influences and the lack of relevant prototypical examples, the final evaluations must be seen as informed but largely intuitive assessments.

### **6.6.3 Assessment and Management of Project-Specific Effects – Construction**

High Level is the most important stopover point for supplies travelling between Edmonton and Hay River, the territorial transportation hub. It is also effectively at the point where the supplies needed for constructing the NGTL pipeline will be diverted to the west. Therefore, its stopover functions will drive increased demand for overnight accommodations, and food and beverage services. Construction of the NGTL pipeline will likely increase the demands on some local businesses catering to oil industry needs.

This assortment of local NGTL project effects will increase the demand for hospitality industry and other service workers. However, the effects will be modest and will add only slightly to currently projected growth trends in the community. The numbers of children accompanying families that might move to the community are expected to fall within the currently expected growth range. The schools in High Level are currently at about 75% capacity. Although this level of usage is somewhat high, it might be expected that any increase in enrollments stimulated by the projects will fall within the range of normal variation.

As in the Northwest Territories communities, the NGTL project-related increased activity in this region will have mixed effects on educational attainment. Many of the hospitality industry employees in High Level are young local adolescents. Therefore, there are already strong local inducements for leaving school early, and the project is not likely to further increase this tendency. However, with the project-induced increased stop-over traffic, the resulting greater work pressures on employees might motivate some to return to school to qualify for more pleasant, better-paid employment.

#### **6.6.4 Mitigation Measures – Construction**

Given the present education facilities and the expected population movement, no adverse effects on education attainment and services in High Level are expected. Accordingly, there is no need to consider possible mitigation measures.

#### **6.6.5 Residual Effects – Construction**

As no adverse effects on education attainment and services are expected in High Level, no residual effects are expected.

#### **6.6.6 Operations Effects**

As there will be no NGTL operations and maintenance positions based in northwestern Alberta, the NGTL project is expected to have no operations effects in the area. Therefore, no mitigation measures will be required and no residual effects are expected during operations.

7 TRADITIONAL CULTURE

7.1 Traditional Harvesting and Land Use

7.1.1 Effect Pathways

Figure 7-1 shows the various ways in which activities related to and induced by the projects might affect traditional harvesting and land use throughout most of the study area. Because it may be relevant to a few of the Aboriginal people living in High Level, it is presented here. In brief, it illustrates the ways in which the effects of project influences might be positive or adverse, thereby strengthening or weakening traditional harvesting and land use.

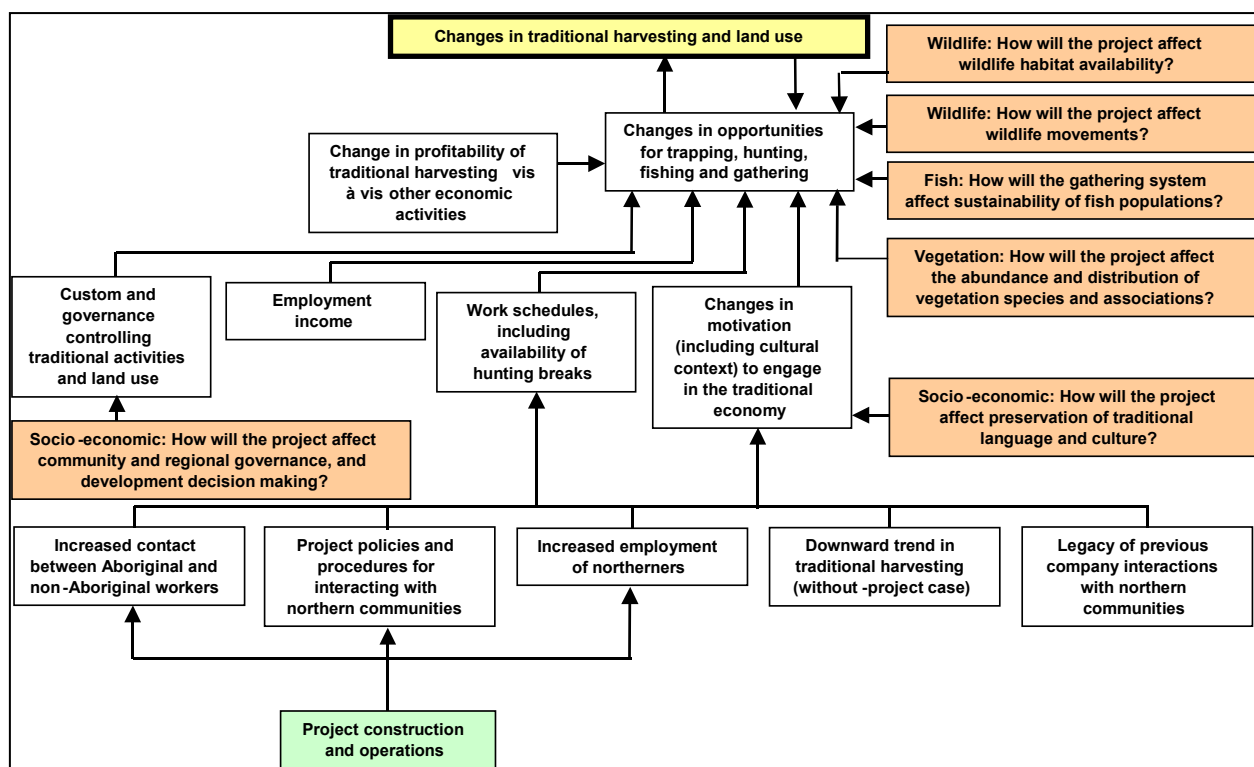


Figure 7-1: Project Effects on Traditional Harvesting and Land Use

Ongoing project consultations and agreements will determine policies and procedures for interacting with northwestern Alberta communities during construction. However, there will be an increase in employment of northern residents, and the number of Aboriginal and non-Aboriginal employees working together. Policies and procedures established by the projects – jointly with increased employment, Aboriginal and non-Aboriginal work-based associations, and the downward trend in traditional harvesting – can induce changes in motivation to engage in traditional harvesting and will determine project work schedules, including possible hunting leaves.

The requirements for labour during operations are so modest that the projects will have no noticeable effects on traditional harvesting and land use.

Traditional harvesting motivation might also be affected by possible project-induced changes in the transmission of TK practices and skills, and in Aboriginal language and culture preservation. Changes in opportunities for traditional harvesting, and thus changes in actual traditional harvesting and land use patterns, will be caused by project work schedules and induced changes in traditional harvesting motivation, together with:

- employment income
- customary and governance limitations on traditional harvesting and land use
- changes in the relative profitability of traditional harvesting and other sources of income
- project effects on the distribution and abundance of vegetation, fish and wildlife

Traditional harvesting and land use is driven by opportunities and motivation to participate. Opportunities are driven by:

- project effects on the land and wild food supplies
- changes in the time and resources available to engage in traditional activities

Motivation of Aboriginal harvesters could be affected by:

- strength of commitment to traditional culture
- favourable or unfavourable reactions to on-the-job associations with non-Aboriginal workers
- amount of income from other sources
- profitability of traditional harvesting relative to other income sources

The effect pathway diagram (see Figure 7-1, shown previously) provides a conceptual analysis of the influences affecting traditional harvesting and land use. However, there are empirical indicators for only a few of the links. As a result, the following analysis is mostly based on:

- relevant literature
- the experience and judgement of the analysts
- consultations with potentially affected groups or individuals

### **7.1.2 Assessment and Management of Project-Specific Effects – Construction**

Although traditional harvesting is important for the Dene Tha' First Nation, it is not as important for residents of High Level where livelihoods depend on the businesses and activities supporting the oil patch. Many residents are sport hunters and anglers, but these activities will be little influenced by the project.

### **7.1.3 Mitigation Measures – Construction**

As no effects on traditional harvesting in High Level are expected, no mitigation measures will be required.

### **7.1.4 Residual Effects – Construction**

As no effects on traditional harvesting in High Level are expected, no residual effects are expected.

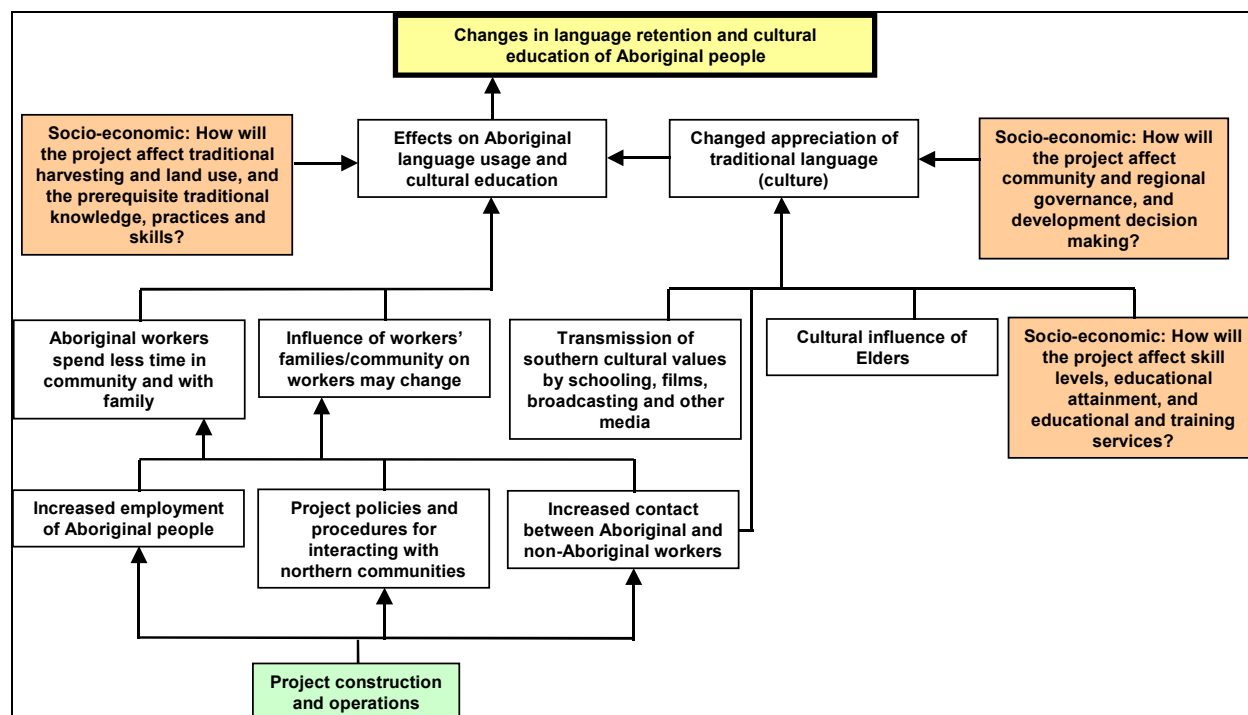
### **7.1.5 Operations Effects**

No operations effects from the NGTL project on traditional harvesting are expected in northwestern Alberta. Therefore, no mitigation measures will be required and no residual effects are expected during operations.

## 7.2 Preservation of Traditional Language and Culture

### 7.2.1 Effect Pathways

Figure 7-2 shows the various ways in which activities related to and induced by the projects might affect traditional language and culture throughout most of the study area. Because it may be relevant to a few of the Aboriginal people living in High Level, it is presented here. In brief, it illustrates the ways in which the effects of project influences might be positive or adverse, thereby strengthening or weakening language and culture.



**Figure 7-2: Project Effects on Traditional Language and Culture**

Ongoing project consultations and agreements during construction activities will determine policies and procedures for interacting with communities. There will be an increase in employment of Aboriginal people, and an increase in their on-the-job associations with non-Aboriginal workers. These influences will reduce the time workers spend in their home communities with their families, and might change the influence of the family and community on workers. Collectively, these influences, plus effects on traditional knowledge, practices and skills, and the harvesting that gives them functional importance, could affect Aboriginal language use and cultural education.

Influences unrelated to the projects include transmission of southern interests and values through the school system, films, television and other media, and the competing cultural influence of the Elders. These influences, plus effects of the projects on education and training services and achievements, and on community and regional governance, can induce changes in the appreciation of traditional language, culture and lifestyle. These changes could also affect Aboriginal language use and cultural preservation.

Therefore, possible changes in inter-generational transmission of language and culture will depend on:

- time spent with family and home community residents
- time spent with non-Aboriginal fellow workers
- the competing influences of southern media and schooling, and the Elders

Therefore, influences on the amount of time spent in traditional contexts will interact with influences affecting possible changes in appreciation of the traditional language and culture. The current level of language and culture preservation is also important in affecting its resistance to erosive influences.

Analysis of the effect pathways for project effects on preservation of traditional language and culture is largely conceptual; there are empirical indicators for only a few links. As a result, the following analysis is largely based on:

- available current baseline data
- consultations with potentially affected groups and individuals
- the broad experience of the analysts

It is likely that employment experiences and increases in income because of the projects will add to existing influences, affecting transmission of traditional language and culture to future generations.

## **7.2.2 Assessment and Management of Project-Specific Effects – Construction**

High Level has a population of diverse ethnic origins, including many Aboriginal people. Preservation of individual languages and cultures is important for groups sharing such interests. The closeness of High Level Aboriginal residents to the Dene Tha' Bushe River Reserve provides easy access to the traditional culture and language resources of this reserve community.

## **7.2.3 Mitigation Measures – Construction**

As any effects of the projects on traditional language and culture are expected to be negligible in High Level, no mitigation measures will be required.

**7.2.4 Residual Effects – Construction**

Activities of the projects are not expected to affect the traditional language and culture of Aboriginal and other people in High Level. Therefore, no residual effects are expected.

**7.2.5 Operations Effects**

No operations effects from the projects on traditional language and culture are expected in High Level. Therefore, no mitigation measures will be required and no residual effects are expected during operations.

## 8 NONTRADITIONAL LAND AND RESOURCE USE

This section provides a discussion of the potential effects of the projects on nontraditional land and resource uses, protected areas, and visual and aesthetic resources, focusing on High Level.

As part of the assessment of nontraditional land and resource use, a regional study area (RSA) was selected within which project effects were expected to be noticeable. The RSA selected for nontraditional land and resource use consisted of a 15-km buffer placed on the pipeline route. This resulted in a 30-km-wide corridor within which baseline information was gathered and effects of the projects were assessed. The assessment found that all effects are expected to be limited to the RSA or less. Further detail on study areas for nontraditional land and resource use can be found in the EIS, Volume 6, Section 7, Nontraditional Land and Resource Use.

The community of High Level is located approximately 174 km from the pipeline right-of-way. However, High Level is an important regional centre in northwestern Alberta. For this reason, activities of the projects could have an effect on nontraditional land and resource users in High Level, and so are discussed in the following sections.

### 8.1 Effects on Nontraditional Land and Resource Use

#### 8.1.1 Effect Pathways

The effect pathway diagram in Figure 8-1 illustrates the projected influence of the projects on nontraditional land and resource use. These pathways will be used throughout the analysis of effects to determine what level of effects could occur.

The first level in the diagram shows the phases of the projects, construction and operations, and decommissioning and abandonment. The second level identifies the key areas for potential project-specific effects of these activities on nontraditional land and resource use. These effects will directly apply to the valued components (VCs) for nontraditional land and resource use. The third level of the diagram shows indirect effects and will be discussed in terms of the VCs. The fourth or top level indicates that the expected outcome of all these direct and indirect effects will be a change in nontraditional land and resource use.

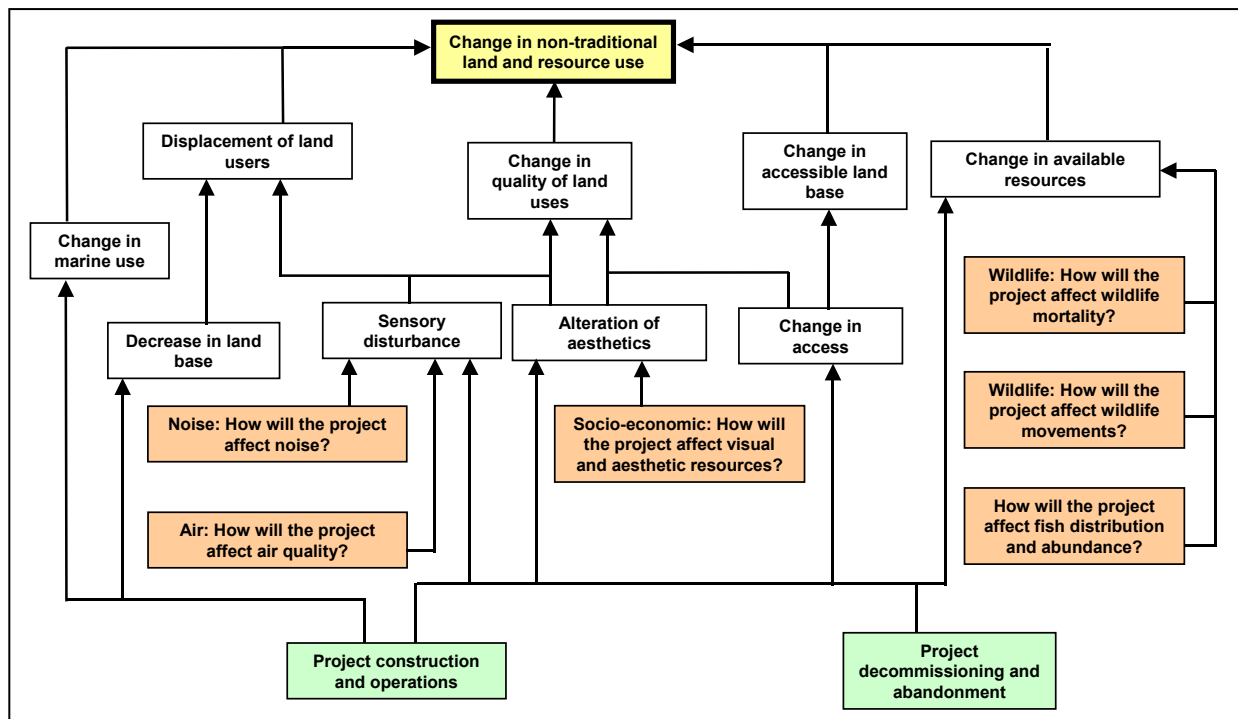


Figure 8-1: Effects of the Projects on Nontraditional Land and Resource Use

## 8.1.2 Assessment and Management of Project-Specific Effects

### 8.1.2.1 Land Ownership

No effects from the projects are expected on land ownership in northwestern Alberta. It is expected that the necessary permissions for components will be obtained from the Government of Alberta.

### 8.1.2.2 Granular Resources

There are no granular resources or mineral deposits currently identified in the RSA, so there will be no effects on these resources.

### 8.1.2.3 Timber Resources

The southern 22 km of the Vardie River Section (Townships 116, 117 and 118) are in Forest Management Agreement 0200040, a 25-year agreement held by Tolko Industries that allows the company to harvest conifers (Gabourie 2002). Tolko Industries has planned road development so it can begin harvesting in December 2004 (Cran 2004). Discussions will take place between NGTL and Tolko Industries before timber clearing starts. Following these discussions, the Vardie River Section is not expected to have an effect on timber operations in the area.

Because of its current remote nature, it is also unlikely that any individuals harvest wood from the RSA in northwestern Alberta. However, clearing of timber for the NGTL project in northwestern Alberta will result in a decrease in the available supply of timber in the local study area (LSA). If required, removed timber will be salvaged.

#### **8.1.2.4 Mineral Resources**

There are no mining operations or mineral deposits currently identified in the RSA, so there will be no effects on these resources.

#### **8.1.2.5 Oil and Gas Activities**

Other oil and gas operations should not be affected by the NGTL project. Oil and gas development in northwestern Alberta is quite extensive, and other oil and gas developers in this area have experience in working around each other with limited delays.

#### **8.1.2.6 Nontraditional Resource Harvesting**

Activities taking place in northwestern Alberta throughout the life of the NGTL project are not likely to affect nontraditional resource harvesting. This area is remote and is not likely to be visited by hunters or fishers. Further information regarding the potential project effects on wildlife can be found in the EIS, Volume 5, Section 10, Wildlife.

#### **8.1.2.7 Other Commercial Activities**

As it is unlikely that any other commercial activities take place in the NGTL project area in northwestern Alberta, there will be minimal effects on other commercial activities in this area if they occur.

#### **8.1.2.8 Tourism and Recreation**

Activities taking place in northwestern Alberta throughout the life of the NGTL project are not likely to affect tourism and recreational activities. This area is remote and is not likely to be visited by tourists or recreational users.

### **8.1.3 Mitigation Measures**

Several mitigation measures for nontraditional land and resource use were assumed before assessing project effects, including:

- all necessary access and land use permits will be obtained and their conditions followed

- access management will be used, to the extent practical and where identified by the communities, regulatory authorities or other concerned parties, to inhibit other potential land users, i.e., nontraditional hunters, timber harvesters and tourists, from using project infrastructure as a method of accessing resources that were previously inaccessible. These access controls will be left in place for operations, and decommissioning and abandonment, if needed.
- at locations directed by the project proponents' representative, access management techniques could include the following:
  - rolling back slash and timber to prevent access along the pipeline right-of-way
  - installing slash berms across the pipeline right-of-way, or winter road easements
  - planting trees or shrubs at potential access points, to visually screen the pipeline right-of-way or road easements
- hunting and fishing by workers will be prohibited while on the job site
- timber will be salvaged for use by the projects or where agreements have been made with a community
- the project proponents will inform other nontraditional land and resource users about the pipeline route and construction schedule before beginning construction
- compensation will be negotiated, where required, with granular resource owners for removal of granular resources from their lands
- once a borrow site is no longer required by the project, it might be available for use by communities or abandoned and reclaimed by the project

#### **8.1.4 Residual Effects**

Table 8-1 summarizes the expected project effects in northwestern Alberta, which includes High Level, and the direction, magnitude, extent and expected duration of those effects. No effects are expected to be significant.

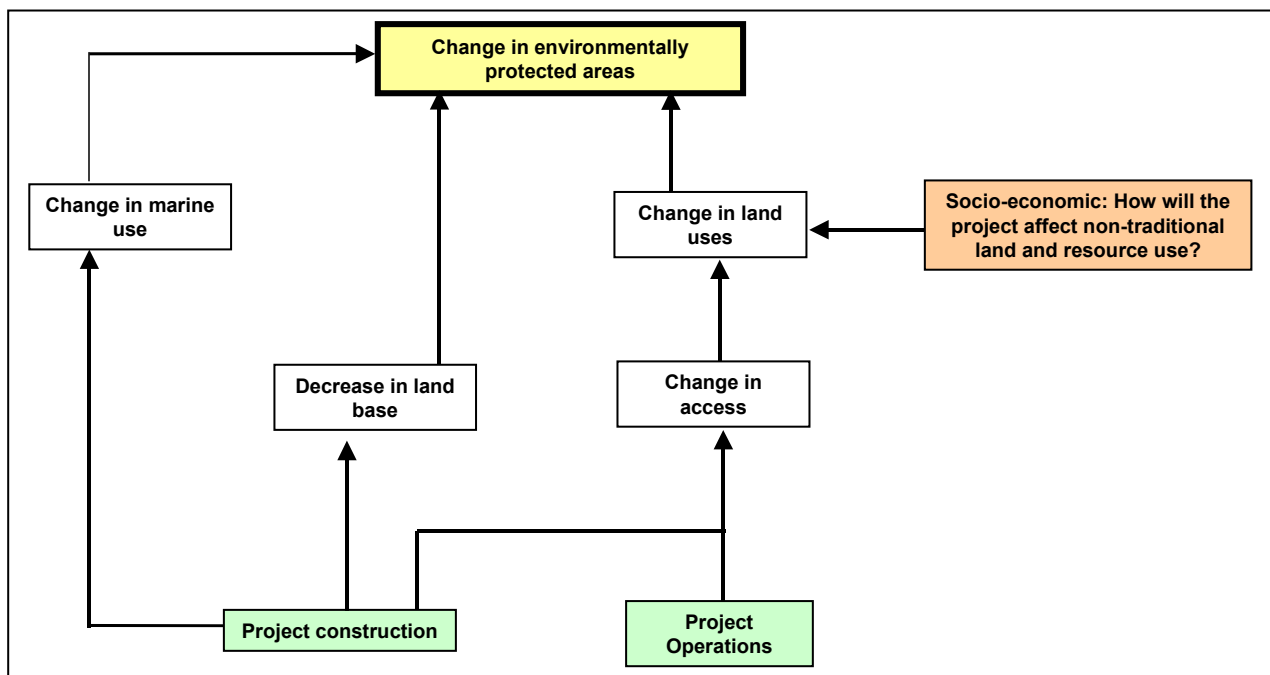
**Table 8-1: Nontraditional Land and Resource Use – Project Effect Attributes for Northwestern Alberta**

Valued Component	Effect	Effect Attribute				Significant
		Direction	Magnitude	Geographic Extent	Duration	
Land ownership	Contravention of zoning bylaws or land access requirements	Neutral	No effect	N/A	N/A	No
Granular resources	No effects are expected	N/A	N/A	N/A	N/A	No
Timber resources	Decrease in available land base for timber resources	Adverse	Low	Local	Short term to long term	No
	Disruption to existing forest industry practices	Neutral	No effect	N/A	N/A	No
	Changes to existing timber harvesting practices	Neutral	No effect	N/A	N/A	No
	Loss of timber resources	Adverse	Low	Local	Long term	No
Mineral resources	No effects are expected	N/A	N/A	N/A	N/A	No
Oil and gas activities	Decrease in available land base for other oil and gas activities	Neutral to adverse	Low	Local	Short term to long term	No
	Change in other oil and gas activities	Neutral to positive	No effect to low	Regional	Short term to long term	No
Nontraditional resource harvesting	Decrease in available land base for resource harvesting activities	Adverse	Low	Local	Short term to long term	No
	Change in nontraditional fishing, trapping and hunting success	Neutral	No effect	N/A	N/A	No
	Change in resource harvesting opportunities	Neutral	No effect	N/A	N/A	No
Other commercial activities	Decrease in available land base for other commercial activities	Neutral to adverse	No effect to low	Local	Short term to long term	No
	Change in other commercial activities	Neutral	No effect	N/A	N/A	No
Tourism and recreation	No effects are expected	N/A	N/A	N/A	N/A	No
NOTE: N/A = not applicable						

## 8.2 Effects on Protected Areas

### 8.2.1 Effect Pathways

The effect pathway diagram (see Figure 8-2) shows how construction and operations activities are expected to affect protected areas. The first level in the diagram shows the project phases, construction and operations, and the second level identifies the expected project-specific effects of these activities on protected areas. For example, construction activities in protected areas will lead to a decrease in available land base because of site clearing, and installation of the pipeline, facilities and associated infrastructure. Construction of new permanent and temporary roads for the projects will lead to an increase in access to protected areas.



**Figure 8-2: Project Effects on Environmentally Protected Areas**

The third level in the diagram shows a change in land use in the protected areas as a potential indirect effect. The increased access because of the projects could lead to increased use of the areas and new types of land uses could be proposed in these areas. The fourth level of the diagram shows the predicted effect – a change in environmentally protected areas.

The analysis used to assess the magnitude of effects on nontraditional land and resource use is largely qualitative. This is because of several factors, including the inability to quantitatively determine effects on VCs that are not easily defined by numbers. For example, although the project’s encroachment on protected areas

can be measured quantitatively, it is difficult to predict a numerical change in recreational activities, or the change in perceived enjoyment. Therefore, professional judgment, supplemented by the results of the EIS public participation process and linkages with other disciplines, was used to determine effect predictions.

### **8.2.2 Assessment and Management of Project-Specific Effects**

Development of the NGTL project will result in a loss of undisturbed land base in a Caribou Protection Area. As required by regulations, a Caribou Protection Plan will be developed for this area and NGTL project activities will be required to meet the conditions set in the plan to reduce disturbance to caribou.

### **8.2.3 Mitigation Measures**

For protected areas, access management will be the primary mitigation measure for controlling the extent that other potential land users, i.e., nontraditional hunters, timber harvesters and tourists, use project roads to access protected areas that were previously inaccessible.

At locations directed by the project proponents' representative, access management techniques could include the following:

- rolling back slash and timber to prevent access along the pipeline right-of-way
- installing slash berms across the pipeline right-of-way or winter road easements
- planting trees or shrubs at potential access points, to visually screen the pipeline right-of-way or road easements

These access controls will be left in place through operations, if needed. In addition, all government guidelines and regulations for activities in protected areas will be followed or, if this is not practical, the NGTL project will submit a request for a variance of the guidelines or regulations, if permissible.

NGTL will develop and implement mitigation measures as approved by the appropriate regulatory authority.

### **8.2.4 Residual Effects**

Table 8-2 summarizes the expected effects from the NGTL project on protected areas in northwestern Alberta, which includes High Level, and the direction, magnitude, extent and expected duration of those effects. No significant effects are expected.

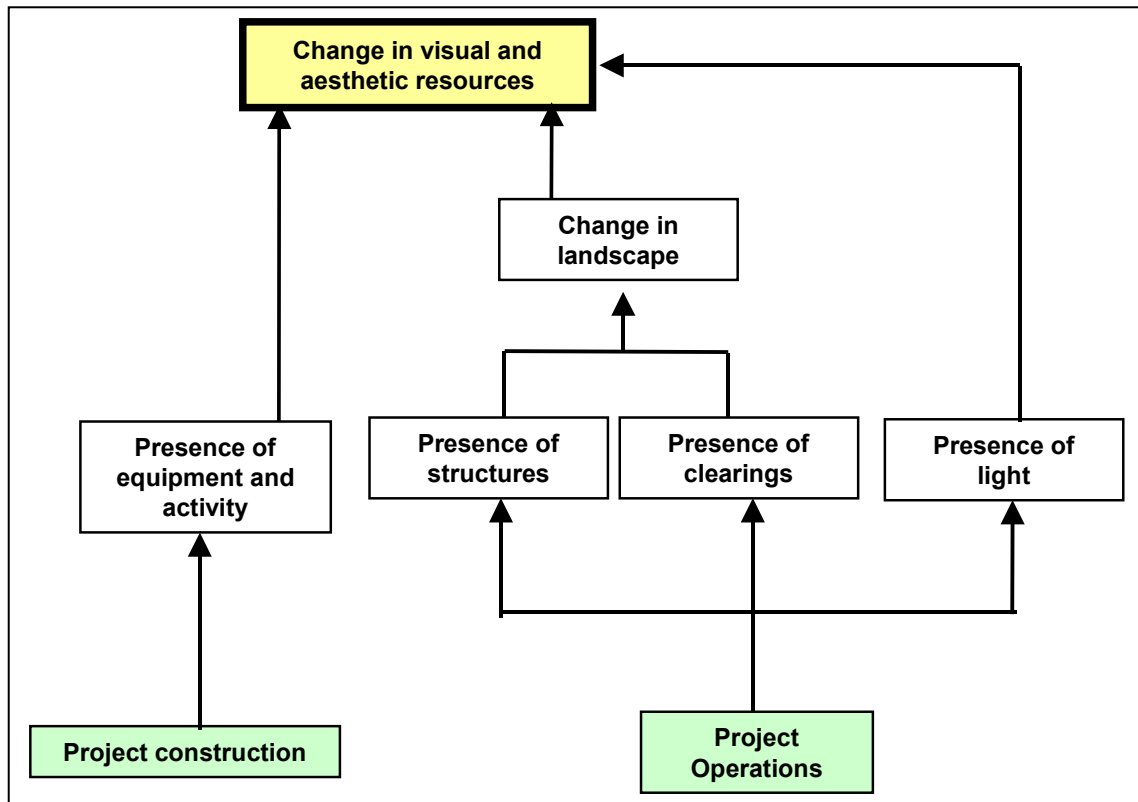
**Table 8-2: Protected Areas – Project Effect Attributes for Northwestern Alberta**

<b>Effect</b>	<b>Effect Attribute</b>				<b>Significant</b>
	<b>Direction</b>	<b>Magnitude</b>	<b>Geographic Extent</b>	<b>Duration</b>	
Loss of available land base in protected areas	Neutral to adverse	No effect to low	Regional	Short term to long term	No
Disturbance to caribou protected area	Adverse	Moderate	Local and regional	Short term	No
	Adverse	Low	Local	Long term	No

### 8.3 Effects on Visual and Aesthetic Resources

#### 8.3.1 Effect Pathways

Figure 8-3 shows the predicted effect pathways for visual and aesthetic resources.



**Figure 8-3: Project Effects on Visual and Aesthetic Resources**

The effect pathway diagram shows how construction and operations activities are expected to affect visual and aesthetic resources. The first level shows the direct effects. For example, construction will bring about the presence of equipment and activity in an area that has been previously undisturbed. This could cause sensory disturbance to people using the area or observing it from above.

Operations will bring about structures, clearings and lights, which in turn will lead to a change in the landscape. There could be ice fog during cold weather, lights will be visible during the winter dark season and flares could be present.

Decommissioning will reduce the effect on visual and aesthetic resources by removing structures, traffic and the human presence of the projects, except for the footprint left on the landscape. This could take longer to return to baseline conditions, because of the length of time required for revegetation in the northern climate.

### 8.3.2 Assessment and Management of Project-Specific Effects

Most effects will be felt during construction, when facilities and other components of the projects are first installed. Construction of the pipeline corridor, and facility, infrastructure and borrow sites will involve:

- site clearing
- terrain modification
- noise
- traffic
- smoke and exhaust
- lights
- a general change in the landscape

This will lead to an adverse effect on visual and aesthetic resources. However, for the most part, the effect will be local. Locating infrastructure sites on previously disturbed areas or at existing sites will greatly reduce the potential effects associated with developing a new area. Where practical, lighting will be placed to light only required areas.

Effects on visual and aesthetic resources during operations will be most strongly associated with facilities, as there will be noise, lights, and other sources of visual and aesthetic disturbance. The effect could be adverse for those who are disturbed by the presence of light on the landscape, or could be positive for those who use the light as a landmark or navigational aid. Where practical, lighting will be placed to light only required areas. Presence of the pipeline right-of-way will cause some effect because of the wide clearing, but the effects should be local.

Progressive reclamation will help reduce effects on visual and aesthetic resources. However, climate and terrain limitations will restrict the short-term benefits of reclamation activities. Following completion of construction, and decommissioning and abandonment, some seeding and revegetation efforts will speed up the recovery of native vegetation in disturbed areas. This will help reduce visual project effects. Seeding and revegetation will follow the reclamation strategies and guidelines in the EIS, Volume 7, Environmental Management.

During decommissioning and abandonment, there will be construction activity and equipment in some areas to remove facilities, roads and other features. Although borrow sites will be recontoured and revegetated, there will still be obvious clearings where sites were located. Reclamation of all features of the projects will be ongoing, and the degree of effect on visual and aesthetic resources will depend on the time it takes for reclamation to bring the land back to a condition similar to the surrounding land.

### 8.3.3 Mitigation Measures

Mitigation techniques will be used to decrease the effect of project components on visual and aesthetic resources, including:

- using existing disturbed areas for infrastructure sites to reduce development effects, where practical
- using terrain features or vegetation, e.g., forest in the southern regions of the project, to screen ground facilities from view of other land and resource users, where practical. Guidelines for installing a visual screen to reduce line-of-sight are included in the EIS, Volume 7, Environmental Management.
- placing lighting to illuminate only required areas, where feasible
- managing the need for, and duration of, flaring
- seeding and revegetating disturbed areas after construction and decommissioning to speed up recovery of native vegetation, and reduce effects on visual and aesthetic resources. Revegetation guidelines and the reclamation strategy are described in detail in the EIS, Volume 7, Environmental Management.

### 8.3.4 Residual Effects

Although some of the effects on visual and aesthetic resources could extend into post-decommissioning, it is predicted that these will be low in magnitude and therefore will be considered not significant.

Table 8-3 summarizes the expected NGTL project effects on visual and aesthetic resources in northwestern Alberta, including High Level, and the direction, magnitude, extent and expected duration of those effects. The magnitude of most effects on visual and aesthetic resources ranges from no effect to low effect within a local to regional extent and, with a short- to long-term duration. Although some of the effects on visual and aesthetic resources could extend into post-decommissioning, it is predicted that these will be low in magnitude and therefore will not be considered significant.

**Table 8-3: Visual and Aesthetic Resources – Project Effect Attributes for Northwestern Alberta**

Effect	Effect Attribute				Significant
	Direction	Magnitude	Geographic Extent	Duration	
Effect of change in landscape along pipeline corridor on people travelling in the area or on local land users	Adverse	No effect to low	Local to regional	Short term to long term	No



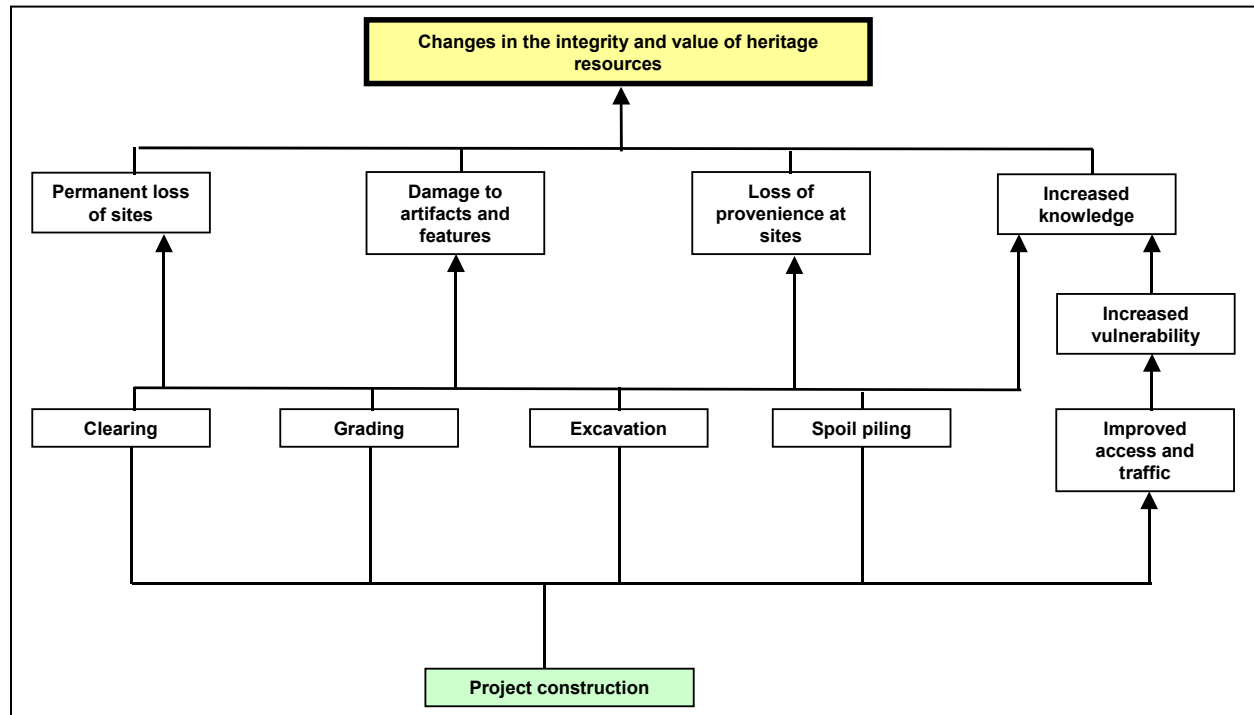
## 9 HERITAGE RESOURCES

The following information is a presentation of the heritage resources for the High Level area in northwestern Alberta.

The community of High Level is an ICC with respect to the projects. While historical resource sites are known to be present in the High Level area, no sites were investigated as they are not immediately adjacent to any development zone.

### 9.1 Effect Pathways

Figure 9-1 shows a linkage diagram developed to understand the mechanisms through which the projects could affect heritage resources.



**Figure 9-1: Project Effects on Heritage Resources**

Heritage resources are nonrenewable resources that might be located at, or near, the ground surface and therefore are highly susceptible to any activities that result in disturbance to the ground. Consequently, the linkages between development activities of the projects and potential effects on heritage resources focus on surface disturbances that will take place within the footprints of the projects. They also include effects in a regional context because of potential indirect effects of the heritage resources investigation.

## 9.2 Context

### 9.2.1 Environmental Context

As High Level is not immediately adjacent to any Mackenzie Gas Project development, the environmental context was not specifically outlined in the EIS.

### 9.2.2 Cultural Context

#### 9.2.2.1 Prehistory

The sequence of prehistoric (11,000 to 220 before present [BP]) occupation of the area around High Level is almost completely unknown, because of the virtual absence of previously recorded historical resources in the area. A survey of Bistcho Lake conducted by Wood (1978) did not identify any historical resources. Similarly, assessments of the Norman Wells to Zama Lake pipeline did not result in identification of any new historical resources. The prehistoric sequence outlined for the lower Liard River Basin, as revealed through the archaeological studies conducted in the Fisherman Lake area by MacNeish (1954), Millar (1968), and Fedirchuk and Millar (1981), applies to the part of northwestern Alberta through which the pipeline facilities will pass. The sequence of occupation within the High Level area of northwestern Alberta is similar to that described in the EIS, Volume 6, Section 8.6.1, Environmental and Cultural Contexts (Heritage Resources – Northwestern Alberta).

#### 9.2.2.2 History and Cultural Groups

The Slavey people also extend into northern Alberta, where they are known as the Acha'ottine, or *woodland people*. These Athapaskan-speaking people refer to themselves as the Dene Tha'. Although culturally and linguistically similar to the Slavey of the Northwest Territories, they are geographically located in northwestern Alberta.

### 9.2.3 Baseline Conditions

Baseline conditions and investigations within the High Level area of northwestern Alberta are similar to those described in the EIS, Volume 6, Section 8.6.2, Baseline Conditions (Heritage Resources – Northwestern Alberta).

### 9.2.3.1 Pipeline Corridor and Associated Facilities

Areas examined during the 2002 and 2003 field reconnaissance included a variety of landforms within the Mackenzie Gas Project pipeline corridor. Several previously recorded sites were identified in the prefield research as being associated with the pipeline corridor. These sites, and those recorded as part of the project, are variable in type and age. They include:

- palaeontological finds
- historic camps
- burials
- prehistoric sites
- traditional use sites

The 2002 and 2003 field programs only investigated historical resources clearly associated with the proposed project development areas. NGTL conducted a historical resource impact assessment in the area of the NGTL proposed facilities. No historical resources were identified.

### 9.2.3.2 Infrastructure

While numerous infrastructure locations were inspected as part of the 2002 and 2003 focused reconnaissance, none are located near the community of High Level. As a result, no historical resources within the High Level area were investigated in association with proposed infrastructure sites.

### 9.2.3.3 Borrow Sites

Numerous borrow sites were inspected as part of the granular resource component of the 2002 and 2003 reconnaissance. All of the potential borrow site locations are outside of the High Level area and consequently no historical resources were investigated in the High Level area associated with proposed borrow sites.

## 9.3 Project-Specific Effects

During the 2002 and 2003 field seasons, the archaeological team recorded previously unknown historical resource sites, and also revisited previously recorded historical resource sites, some of which are currently outside of any proposed impact areas because of changes in the configuration of the project components. As no project components are near the High Level area, no historical resource sites were investigated near this community.

## 9.4 Mitigation Measures

As no components of the projects are near the High Level area, no mitigation measures will be required.



## 10 MONITORING AND FOLLOW-UP

The proposed Socio-Economic Monitoring Plan for the Mackenzie Gas Project is intended to meet Canadian Environmental Assessment Agency regulatory requirements for follow-up on effects. A project of this magnitude will generate a range of positive and negative effects during construction. Because of the nature, scope and magnitude of the expected project-related effects, and in recognition of shared responsibility for effects management, the mitigation measures, management plans and programs that address the effects will require a coordinated and collaborative response from the project proponents and their contractors, affected communities, including High Level, and territorial, provincial and federal government agencies. Mitigation measures, management plans and programs will need to be monitored throughout project construction and initial operations to:

- determine their effectiveness in reducing adverse effects and enhancing positive effects
- enable adjustments to be made where necessary
- develop new mitigation plans and programs, where required

The proposed Socio-Economic Monitoring Plan applies only to the Mackenzie Gas Project in the Northwest Territories. The NGTL ancillary project in Alberta will develop and implement its own monitoring program, in consultation with affected parties.



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## GLOSSARY

<b>abandonment and reclamation</b>	The act of permanently stopping operations, removing facilities and restoring land to a productive state.
<b>Aboriginal person</b>	Any Indian, Inuit or Métis person who was born in the Northwest Territories or who is descended from an Aboriginal person born in the Northwest Territories.
<b>Aboriginal community</b>	A small community that is not a regional centre, in which 80% or more of the population is Aboriginal.
<b>Aboriginal Summit</b>	Negotiating body composed of virtually all the organized Aboriginal groups in the Northwest Territories, except the Deh Cho First Nation, which is not currently participating.
<b>adverse effect</b>	The impairment of, or damage to, the environment or health of humans, or damage to property, or loss of reasonable enjoyment of life or property.
<b>aesthetic resources</b>	The visual appearance of the natural landscape.
<b>anchor fields</b>	The three natural-gas fields, Niglintgak, Taglu, and Parsons Lake, whose production will provide the initial volume of gas shipped in the project pipelines.
<b>APG</b>	The abbreviation for Aboriginal Pipeline Group.
<b>archaeological site</b>	Where an archaeological artifact is found.
<b>artifact</b>	Any tangible evidence of human activity that is more than 50 years old, in respect of which an unbroken chain of possession cannot be demonstrated.
<b>baseline</b>	A surveyed condition that serves as a reference point to which later surveys or assessments are coordinated or correlated.
<b>BDR</b>	The abbreviation for Beaufort Delta Region.
<b>biophysical</b>	Referring to the air, noise, aquatic (groundwater, hydrology, water quality and fisheries) and terrestrial (soils, landforms, permafrost, vegetation and wildlife) conditions in the project area.

GLOSSARY

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<b>borrow site</b>	An area that could be excavated to provide material, such as gravel or sand, to be used, where required, by the project.
<b>BP</b>	The abbreviation for before present.
<b>combined effects</b>	The total effect of the three anchor fields, the gathering system and the pipeline corridor.
<b>compressor station</b>	A facility containing equipment that is used to increase pressure to compress natural gas for transportation in a pipeline.
<b>Construction Phase</b>	The phase of a project preceding the Operations Phase, during which project facilities and infrastructure are assembled and installed, and connected and tested to ensure that they operate as designed.
<b>country food</b>	Food traditionally harvested and eaten by local Aboriginal residents.
<b>critical habitat</b>	The habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species, according to the <i>Species at Risk Act</i> .
<b>CRSP</b>	The abbreviation for Canadian registered safety professional.
<b>cumulative effects</b>	Changes to the environment caused by an action, including projects and activities, in combination with other past, present and future human actions.
<b>debitage</b>	Remains of stone tool manufacture and use.
<b>decommissioning</b>	The act of taking a processing plant or facility out of service and isolating equipment, to prepare for routine maintenance work, suspending or abandoning.
<b>devolution</b>	Ongoing negotiations between the Government of Canada, the GNWT and the Aboriginal Summit that will transfer the current Indian and Northern Affairs Canada (INAC) control over land, water and resources to GNWT or Aboriginal settlement area governments.
<b>direct economic effect</b>	Effect on industries (firms) that expand production to satisfy increased demand created by the project.

<b>direct employment</b>	Employment related to a direct economic effect.
<b>direction</b>	Referring to an effect, the ultimate long-term trend of the effect. It can be adverse, neutral or positive, or a combination of these.
<b>duration</b>	Referring to an effect, how long an effect will occur for, or how long it will take a valued component to recover from an impact.
<b>EIS</b>	The abbreviation for environmental impact statement.
<b>employment rate</b>	Percentage of persons 15 years of age and over who are employed.
<b>environmental effect</b>	<p>Any effect of any project-induced change on:</p> <ul style="list-style-type: none"><li>• economic conditions</li><li>• social and cultural conditions</li><li>• the current use of lands and resources for traditional purposes by Aboriginal people</li><li>• any structure, site or thing that is of historical, archaeological, palaeontological or architectural significance</li></ul> <p>Also, any change to the project that might be caused by the environment.</p>
<b>environmental impact assessment</b>	The process of evaluating the biophysical, social and economic effects of a proposed project.
<b>environmental impact statement</b>	A report containing the environmental impact assessment.
<b>environmentally protected areas</b>	Areas with special designations that, through legislation or other means, are protected in some form or are given special status.
<b>environmentally sensitive area</b>	An area designated in regional or local land use plans, or by a local, regional, provincial or federal government body as being sensitive to disturbance, or identified by an applicant as being sensitive for some reason.
<b>facilities</b>	Structures of the gathering and gas pipeline systems, including compressor and pump stations, block valves, pigging facilities, heater stations and meter stations.

<b>five-year mobility status</b>	Referring to migration, the relationship between a person's usual place of residence on the census date compared to the previous five years.
<b>FTE</b>	The abbreviation for full-time equivalent.
<b>gas conditioning facility</b>	A facility located at each anchor field, which collects raw gas from the wells, and dehydrates and conditions the product for transport through the gathering system.
<b>gas pipeline</b>	The proposed gas pipeline that would extend from the Inuvik area facility, parallel to the NGL pipeline along the Mackenzie River to Norman Wells, and continue south to connect to an extension of the existing Alberta system south of the Northwest Territories–Alberta boundary. Also known as the <i>Mackenzie Valley Pipeline</i> .
<b>gathering pipelines</b>	Four pipelines, also known as laterals, that transport natural gas and NGLs from the anchor fields to the Inuvik area facility. These include the Niglintgak lateral, Taglu lateral, Parsons Lake lateral and Storm Hills lateral.
<b>gathering system</b>	A system of pipelines and associated facilities that include four gathering pipelines, the Inuvik area facility, the NGL pipeline and related facilities, such as valves, pig launchers and receivers.
<b>geographic extent</b>	Quantitative measurement of the area within which an effect occurs.
<b>GNWT</b>	The abbreviation for the Government of the Northwest Territories.
<b>granular resources</b>	Sand, gravel, clay, quarry materials and silt.
<b>grub stake</b>	Investment in consumables and other supplies required to support traditional harvesting.
<b>heritage resources</b>	Cultural, historic, archaeological and palaeontological resources, including pre-contact and post-contact features.
<b>historic archaeological resources</b>	Sites, artifacts, structures and documents that relate to the influx of Euro-Canadians in the region, and date to the last 250 years.

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<b>human health</b>	A state of complete physical, mental and social well-being, and the ability to adapt to the stresses of daily life.
<b>human health assessment</b>	Determining the effect of hazardous substances, environmental factors and exposure conditions on local and regional populations, including qualitative and quantitative analyses.
<b>ICC</b>	The abbreviation for industrial and commercial centres.
<b>INAC</b>	The abbreviation for Indian and Northern Affairs Canada.
<b>indirect economic effect</b>	The result of project contractors and suppliers purchasing additional required inputs from other firms.
<b>indirect employment</b>	Employment related to an indirect economic effect.
<b>induced economic effect</b>	The result of firms expanding production because of direct and indirect effects, hiring more staff and paying out wages, thereby increasing household income. Households, after withdrawing a portion for taxes and savings, spend this income, which in turn increases demand for other commodities.
<b>induced employment</b>	Employment related to an induced economic effect.
<b>infrastructure</b>	Basic facilities, such as transportation, communications, power supplies and buildings, which enable an organization, project or community to function.
<b>international migrants</b>	Individuals who move between countries.
<b>inter-provincial migrants</b>	Individuals who move between provinces and territories.
<b>intra-territorial migrants</b>	Individuals who move within communities in the Northwest Territories.
<b>Inuvik area facility</b>	The processing facility to be located near Inuvik where gas and liquids will be processed and separated, then delivered to the gas and NGL pipelines.
<b>I-O Model</b>	The abbreviation for the Statistics Canada input–output model.
<b>km</b>	The metric symbol for kilometre.

GLOSSARY

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<b>labour force</b>	Individuals 15 years of age or older that are working or actively seeking employment.
<b>lateral</b>	A gathering pipeline that connects the production area facilities to the Inuvik area facility.
<b>leakage</b>	Portion of investment in a region or jurisdiction that results in the import of a good or service.
<b>lithic</b>	Of, or pertaining to, stone.
<b>local study area</b>	A 1-km-wide buffer or corridor around each of the three lease areas, gathering pipelines rights-of-way, facility infrastructure sites, gas pipeline right-of-way and borrow sites.
<b>LSA</b>	The abbreviation for local study area.
<b>Mackenzie Gas Project</b>	A project that will develop three onshore natural gas anchor fields in the Mackenzie Delta and transport natural gas by pipeline to market in northwestern Alberta by 2009. The project comprises the anchor fields, wells, gathering pipelines and associated facilities, work camps, material stockpiling and shipping sites, roads, borrow sites, and other associated infrastructure.
<b>magnitude</b>	Relating to an effect, the severity or intensity of the effect. It is rated as low, moderate or high.
<b>Métis</b>	A person with a mixture of Aboriginal and non-Aboriginal ancestry.
<b>migrants</b>	Individuals who move to a different community.
<b>migration</b>	Moving from one jurisdiction to another to establish a permanent residence in the new jurisdiction.
<b>mitigation</b>	The elimination, reduction, or control of a project's adverse effects, including restitution for any damage to the environment caused by such effects through avoidance, replacement, restoration, compensation or other means.

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<b>monitoring</b>	Periodic inspection to meet the following objectives: <ul style="list-style-type: none"><li>• observe and report on compliance with approval conditions</li><li>• confirm effectiveness of approved protection measures</li><li>• verify the accuracy of impact predictions</li><li>• identify any effects not predicted in the impact assessment</li></ul>
<b>movers</b>	Individuals who have changed their community of residence.
<b>natural gas</b>	A compressible mixture of hydrocarbons with a low specific gravity that occurs naturally in a gaseous form.
<b>natural gas liquids</b>	Hydrocarbons that are gaseous in the reservoir, but that will separate out in liquid form at the pressures and temperatures at which separators normally operate. The liquids consist of varying proportions of butane, propane, pentane and heavier fractions, with little or no methane or ethane.
<b>NGL pipeline</b>	The pipeline connecting the Inuvik area facility with the Enbridge Pipeline facilities at Norman Wells.
<b>NGTL</b>	The abbreviation for NOVA Gas Transmission Ltd.
<b>Niglintgak field</b>	The anchor field to be developed by Shell Canada Limited, which includes three well pads, one gas conditioning facility, flow lines and supporting infrastructure. The gas conditioning facility might be barge-based or land-based.
<b>Niglintgak lateral</b>	The gathering pipeline connecting the Niglintgak gas conditioning facility to a connection point on the Taglu lateral at the outlet of the Taglu gas conditioning facility.
<b>nonmigrants</b>	Individuals who move only within their community or do not move at all.
<b>nonrenewable resources</b>	Resources, such as fossil fuels, i.e., oil, gas, coal and minerals, that occur naturally but cannot be replaced once exploited.
<b>nontraditional land use</b>	Land and resource use for residents and nonresidents of the Northwest Territories, including hunters and fishers, tourists, and government and industry representatives.
<b>nontraditional resource harvesting</b>	Includes hunting, fishing and trapping pursued by non-Aboriginal residents for domestic, sport or commercial purposes.

<b>NWT</b>	The abbreviation for Northwest Territories.
<b>Operations Phase</b>	The phase of a project during which the pipeline and associated facilities are operated.
<b>palaeontological sites</b>	Sites bearing evidence of multi-cellular invertebrate and vertebrate faunal remains, and plant materials that have been fossilized or otherwise preserved.
<b>Parsons Lake field</b>	The anchor field to be developed by ConocoPhillips Canada (North) Limited and ExxonMobil Canada Properties. Initially, the field will consist of the north pad, which will have one pad for the well sites and gas conditioning facility. A second well pad will be developed five to 10 years after the north pad.
<b>Parsons Lake lateral</b>	The gathering pipeline connecting the Parsons Lake gas conditioning facility to a connection point at the Storm Hills pigging facility.
<b>participation rate</b>	Percentage of persons 15 years of age and over who are in the labour force.
<b>pipeline corridor</b>	The 1-km-wide area that centres on the combined right-of-way for the gas and NGL pipelines, from the Inuvik area facility south to the NGTL interconnect facility in Alberta, defined for the purpose of the EIS biophysical baseline and effects assessment studies.
<b>potential acid input</b>	The sum of the wet and dry deposition of sulphur and nitrogen compounds that have the potential to contribute to acidification of the receiving environment.
<b>potential labour supply</b>	Composed of people who are unemployed and those not in the labour force who do want a job, less those who, because of disability, age, illiteracy, lack of education, skills or training and lack of interest in employment, could be considered unemployable.
<b>prehistoric archaeological resources</b>	Archaeological sites, objects and affiliated materials that represent occupation by Aboriginal peoples before the arrival of European goods, people and the historic records that characterize their culture (in North America).

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<b>production area</b>	The area that encompasses all project components located north of the Inuvik area facility, including the Niglintgak, Taglu and Parsons Lake fields, the gathering pipeline and associated facilities, infrastructure, and the 1-km buffer area surrounding each of these project components.
<b>project components</b>	The three anchor fields, Niglintgak, Taglu, and Parsons Lake, the gathering system and the gas pipeline.
<b>project proponents</b>	The five organizations (Imperial Oil Resources Ventures Limited, the Aboriginal Pipeline Group (APG), ConocoPhillips Canada (North) Limited, Shell Canada Limited and ExxonMobil Canada Properties) that are undertaking the Mackenzie Gas Project.
<b>project-specific effect</b>	An effect caused by the project. Such effects are sometimes referred to as direct effects as they only include the project's contribution to the effect (as opposed to cumulative effects, in which case other projects would contribute to the effect).
<b>project, the</b>	The abbreviation for the Mackenzie Gas Project.
<b>RCMP</b>	The abbreviation for Royal Canadian Mounted Police.
<b>reclamation</b>	The process of re-establishing a disturbed site to a former or other productive use, not necessarily to the same condition that existed before disturbance. The land capability might be at a level different, i.e., lower or higher, than that which existed prior to the disturbance, depending on the goal of the process. Reclamation includes the management of a disturbed site and revegetation where necessary.
<b>regional study area</b>	A 15-km-wide buffer around the three anchor fields, on either side of the gathering pipelines rights-of-way and on either side of the gas pipeline right-of-way.
<b>renewable resources</b>	Natural resources, e.g., forests, fresh water, fish, that can renew themselves and are normally replaced or replenished by natural processes. These resources are not depleted by moderate use.
<b>resident, northern</b>	A Canadian citizen or landed immigrant who has been living in the Northwest Territories (NWT) for at least one year and has a NWT health card.

GLOSSARY

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<b>residual effects</b>	Environmental or socio-economic effects that remain after mitigation. Effects that are present after mitigation has been applied.
<b>right-of-way</b>	The pipeline easement in which the pipeline will be installed and operated. The pipeline right-of-way width for the project will vary from 30 to 50 m, depending on pipe size and the number of pipes to be installed in the trench.
<b>RSA</b>	The abbreviation for regional study area.
<b>RWED</b>	The abbreviation for Resources, Wildlife and Economic Development, a department of the Government of the Northwest Territories.
<b>SEIA</b>	The abbreviation for socio-economic impact assessment.
<b>social infrastructure</b>	Health, social wellness and education services that might be affected by project-related activities.
<b>socio-economic effect</b>	Any effect of the project on a social or economic condition or service, including direct effects as well as effects resulting from a change in the environment.
<b>specific effects</b>	Effects of a specific component or activity of a project.
<b>STI</b>	The abbreviation for sexually transmitted infection.
<b>Storm Hills lateral</b>	The gathering pipeline connecting the Storm Hills pigging facility to a connection point at the inlet of the Inuvik area facility.
<b>study area</b>	The area within the spatial boundaries of the scope of the socio-economic effects assessment.
<b>Taglu field</b>	The anchor field to be developed by Imperial Oil Resources Limited, consisting of one site that will include the well pads, gas conditioning facility, flow lines and supporting infrastructure.
<b>Taglu lateral</b>	The gathering pipeline connecting the Taglu gas conditioning facility to a connection point at the Storm Hills pigging facility.

<b>traditional knowledge</b>	Cultural knowledge that is based on direct observation or information passed on orally from other community members, developed from centuries of experience of living off the land.
<b>unemployment rate</b>	Percentage of the labour force that is unemployed.
<b>utilidor</b>	An insulated linear container for municipal utility services such as water and sewerage.
<b>valued component</b>	Characteristic or feature that represents important socio-economic conditions identified by assessment specialists, communities or stakeholders.
<b>VC</b>	The abbreviation for valued component.
<b>visual resources</b>	Land, water, vegetation, animals and structures that are visible on the land.
<b>waterbody</b>	A body of water up to the high-water mark, including canals, reservoirs, oceans and wetlands, but not including sewage or waste treatment lagoons.
<b>well-being</b>	Everything that affects the experience of life, including the circumstances of physical existence and the quality of relationships.
<b>wellness</b>	Includes physical, emotional and mental health, and relationship well-being.

