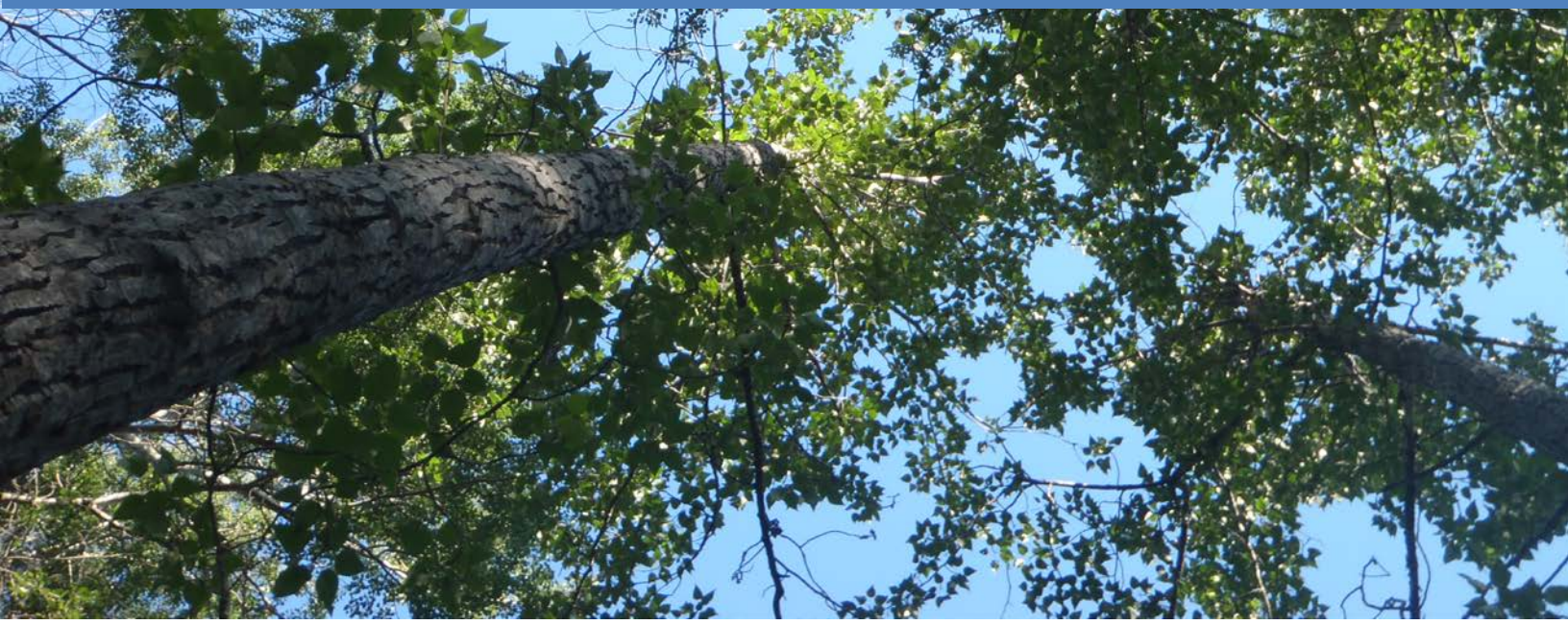
FORTUNE CREEK GAS PLANT

Application Information Requirements

DRAFT REPORT



Prepared for:
The British Columbia Environmental Assessment Office
Victoria, B.C.

Proponent:
Quicksilver Resources Canada Inc.
2000, 125 – 9th Avenue SE
Calgary, AB T2G 0P6

Project No.:
1231-10408

Date:
March 5, 2012

QUICKSILVER RESOURCES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RESOURCES

PREFACE TO THE APPLICATION INFORMATION REQUIREMENTS

Quicksilver Resources Canada Inc. (QRCI) has submitted a Project Description to the British Columbia (B.C.) Environmental Assessment Office (EAO) for the proposed Fortune Creek Gas Plant (Plant, or the Project), to be located in the Horn River Basin north of Fort Nelson.

The planned built out capacity of the natural gas processing Plant is 16.90 million m^3/day (600 MMcf/d) of natural gas. Pursuant to Part 4 of the Reviewable Projects Regulation, the Project is subject to a review under the *British Columbia Environmental Assessment Act* (BCEAA) because it would qualify as a new natural gas facility with design capacity to process natural gas at a rate greater than or equal to 5.634 million m^3/day (EAO 2009). This AIR applies to the full build out of the proposed Plant. The environmental assessment will be led by the EAO.

The Project is not expected to be subject to a review under the *Canadian Environmental Assessment Act* (CEAA) because there are no identified triggers. The Project does not involve the use of federal lands, federal funding, nor will it require any federal authorization identified under the *Law List Regulations*. In a letter dated February 1, 2012 the Canadian Environmental Assessment Agency indicated that it and other federal departments had reviewed the project description, and that the federal government has determined that the Project will not require a review pursuant to the CEAA.

The purpose of the Application Information Requirements (AIR) is to identify information that must be included in the application for an Environmental Assessments Certificate (EAC). The AIR will include a list of all relevant agencies that will be involved in the environmental assessment. Representatives from Provincial agencies, regional and local government, B.C. Treaty No. 8 First Nations, Dene Tha' First Nation and the Acho Dene Koe First Nation (FN) will be invited to review and comment on the draft AIR.

The EAO will invite the public to provide comments on the AIR during a formal 30-day public comment period. QRCI is responsible for responding to the comments received from First Nations, government agencies, stakeholders and the public during the comment period and incorporating those comments into the AIR as appropriate. During the review, QRCI will develop tracking tables to document feedback on the draft AIR received, as well as the response from QRCI and any changes made to the draft AIR.

Once the AIR review process has been completed and required revisions incorporated, the EAO may approve the AIR. QRCI's EAC Application will be prepared in accordance with the AIR approved by the EAO, and will be compliant with any other relevant instructions provided in a Section 11 Order issued pursuant to the BCEAA.

The Application will be submitted to the EAO and will be made available to First Nations, government agencies, stakeholders and the public. The EAO will subsequently initiate a public comment period, as set out in the Section 11 procedural Order issued under BCEAA. QRCI is responsible for responding to comments received on the Application during this public comment period.

TABLE OF CONCORDANCE

A table, in the format below, will summarize concordance between the information requirements identified in the approved AIR and the EAC Application.

Table 1: Table of Concordance between Approved AIR and Application Documentation

AIR Section	Brief Description of Relevant Section and Sub-section	Application Volume and Section

PREFACE TO THE APPLICATION

This section of the Application will explain the context of the Application and why it is required. It will include the following information:

- A statement indicating that the proposed Project is subject to review under the BCEAA, following the issuance of an order under Section 10(1) (c) of the BCEAA—because the proposed Project will be a new natural gas facility with design capacity for processing natural gas at a rate greater than or equal to 5.634 million m^3/day—and pursuant to the procedural Order issued under Section 11 of the BCEAA.
- A statement indicating that the proposed Project is not expected to be reviewable by the Canadian Environmental Assessment Agency because no CEAA triggers or requirements have been identified. The Project does not involve federal lands or funding, and the Project does not require any federal authorization identified under the *Law List Regulations*.
- Affirmation by the Canadian Environmental Assessment Agency that the Project is not reviewable under CEAA.
- A statement indicating that the Application has been developed pursuant to the AIR approved by the EAO and complies with relevant instructions provided in the Section 11 Order.
- Identification of the agencies, First Nations and other stakeholders involved in the development of the Application.
- A description of the structure of the Application.

ACRONYMS AND ABBREVIATIONS

AIA ..... Archaeological Impact Assessment
AIR ..... Application Information Requirements
B.C. ..... British Columbia
BCEAA ..... *British Columbia Environmental Assessment Act*
CAPP ..... Canadian Association of Petroleum Producers
CCS ..... Carbon Capture and Sequestration
CDC ..... Conservation Data Centre
CEAA ..... *Canadian Environmental Assessment Act*
CEAA ..... *Canadian Environmental Assessment Agency*
CEMP ..... Construction Environmental Management Plan
CO_2 ..... carbon dioxide
COSEWIC ..... Committee on the Status of Endangered Wildlife in Canada
DFO ..... Fisheries and Oceans Canada
EA ..... Environmental Assessment
EA ..... Environmental Assessment Agency
EAO ..... Environmental Assessment Office
EMP ..... Environmental Management Plan
ERP ..... Emissions Reduction Program
GHG ..... greenhouse gas
ha ..... hectare
H_2S ..... hydrogen sulphide
HCA ..... *Heritage Conservation Act*
HST ..... Harmonized Sales Tax
KI ..... Key Indicator
KNE ..... TransCanada Piplines Limited Komie North Extension Project
LAA ..... Local Assessment Area
LiDAR ..... Light Detection and Ranging
LRMP ..... Land and Resource Management Plan
MMcf/d ..... million cubic feet per day
NGTL ..... Nova Gas Transmission Ltd.
NPRI ..... National Pollutant Release Inventory

OEMP.....Operations Environmental Management Plan
OGC.....Oil and Gas Commission
QRCI ..... Quicksilver Resources Canada Inc.
RAA..... Regional Assessment Area
RISC..... Resource Information Standards Committee
SARA .....*Species at Risk Act*
m^3/d..... cubic metres per day
TCPL.....TransCanada PipeLines Ltd.
UTM ..... Universal Transverse Mercator
VC .....Valued Component

EXECUTIVE SUMMARY

The Executive Summary will provide an overview of the Application, and will include the following information:

- Brief description of the proposed Project
- Brief description of the environmental setting
- Summary of the consultation activities undertaken by QRCI prior to entering the environmental assessment process and how QRCI considered and responded to the issues raised
- Summary of the consultation activities undertaken by QRCI as part of the environmental assessment process
- Summary of the key potential Project effects considered in the Application and their significance
- Summary of the proposed mitigation measures identified to address potential effects of the Project
- Summary of the potential cumulative effects of the Project and their significance
- Summary of the follow up programs proposed (if applicable)
- Summary of the estimated Project benefits
- Proponent's conclusions from the assessment.

AUTHORSHIP

Name, Designations..... Role

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PART A—INTRODUCTION AND BACKGROUND

Quicksilver Resources Canada Inc. (QRCI) is proposing the construction of a natural gas-processing facility to be located in northeast British Columbia, approximately 110 km north of Fort Nelson, B.C. The proposed facility, to be called the Fortune Creek Gas Plant (the Plant, or the Project), would process raw natural gas for end-market use by removing carbon dioxide (CO_2) and trace amounts of hydrogen sulphide (H_2S). The Plant would be constructed in phases, eventually having processing capacity of approximately 16.90 million m^3/day (600 MMcf/d), which would be the total inlet volume for the proposed Plant. The initial phase would be constructed with the capability of having a gas inlet volume of 4.25 million m^3/day (150 MMcf/d; or approximately 125 MMcf/d sales gas). Subject to regulatory approvals, QRCI will work toward bringing the initial phase into operation by May 2014, with subsequent phase(s) being constructed as processing demand requires.

1 PURPOSE OF THE APPLICATION

This section of the Application will summarize the purpose of the Application, indicate that the Application meets the information requirements of the British Columbia Environmental Assessment Office (EAO), and provide an overview of the structure of the Application to guide readers to specific sections. This section will also describe the purpose of the proposed Project.

2 PROPOSED PROJECT OVERVIEW

2.1 Proponent Description

This section of the Application will present a detailed description of QRCI, including the following information.

Quicksilver Resources Canada Inc. (QRCI) is an oil and gas exploration and production company that is a wholly-owned subsidiary of Quicksilver Resources Inc., a Texas-based natural gas and oil exploration and production company. Quicksilver Resources Inc. is a publically traded company listed on the New York Stock Exchange.

Corporate headquarters are located in Texas at:

Quicksilver Resources Inc.
801 Cherry Street
Suite 3700, Unit 19
Fort Worth, TX 76102

Telephone: 817-665-5000
Facsimile: 817-665-5005

Website: www.qrinc.com

QRCI's exploration and production is principally focused on unconventional natural gas reservoirs located within fractured shales, coal seams and tight sands in Alberta and British Columbia (B.C.). In Alberta, QRCI's operations are focused in the Horseshoe Canyon geographical trend where its natural gas production has grown from 0.225 million m^3/d (8 MMcf/d) in 2003 to approximately 1.69 million m^3/d (60 MMcf/d) as of the second quarter of 2011. QRCI is currently increasing exploration and production in the Horn River Basin (the Basin) in northeastern B.C. The Basin is a Devonian era reef structure that is characterized by a layer of silica-rich shales, over 180 m thick, lying at approximately 2,700 m below the surface, and distributed over an area larger than 600,000 hectares (ha).

QRCI has acquired the mineral rights in over 52,600 net hectares in the Basin and anticipates significant growth in this area. QRCI is currently producing five of nineteen shale gas wells drilled on QRCI mineral rights within the Basin. These five wells are producing more than 0.562 million m^3/d (20 MMcf/d) of natural gas through a 30 km 20-inch pipeline tied into the Spectra Energy pipeline system. A compression facility for this 20-inch line was recently constructed and is operational. It is adjacent to the proposed Plant site. This compression facility has been permitted by the B.C. Oil and Gas Commission (OGC).

Mike Biersteker is the key contact for this Project. All related communications should be addressed to:

Mike Biersteker, Environmental Coordinator
Quicksilver Resources Canada Inc.
One Palliser Square
2000, 125 – 9th Avenue SE
Calgary, AB T2G 0P6

Telephone: 403-538-5513
Facsimile: 403-537-3237

E-mail: mbiersteker@qrinc.ca
Website: http://www.qrinc.com/operations/canada/

QRCI has retained Stantec Consulting Ltd. (Stantec) to manage the proposed Project Environmental Assessment (EA). Contact information for Stantec is as follows:

Frank Bohlken, Project Manager (Environmental Assessment Lead)
Stantec Consulting Ltd.
4370 Dominion Street, 5th Floor
Burnaby, B.C. V5G 4L7

Telephone: 604-412-2988
Facsimile: 604-436-3752

Email: frank.bohlken@stantec.com
Website: http://www.stantec.com

This section will also indicate where information in the Application is prepared by a qualified professional and how the information relates to the qualified professional's expertise.

2.2 Proposed Project Description

This section of the Application will form the basis for the assessment of the proposed Project and will describe all phases of the Project in sufficient detail to allow QRCI to predict potential adverse environmental effects and to address concerns from interested parties. All phases of the proposed Project will be described in this section, from construction, operation, to decommissioning. Included will be a description of Project components and activities, including temporary and permanent infrastructure, as well as a timeline for all phases of the Project. A summary of any modifications to the Project resulting from the environmental assessment process that results in benefits to the environment or yield other indirect social, public health or economic benefits will be included.

The scope of the Project will be based on the Project Description provided to the EAO. The scope of the provincial review will be confirmed in the Section 11 Order issued by the EAO.

This section of the Application will present the following information:

- Identification of requirement for environmental assessment under the *British Columbia Environmental Assessment Act* (BCEAA)
- Affirmation that the Project is not subject to the *Canadian Environmental Assessment Act* (CEAA)
- Location of the proposed Project, including geographical co-ordinates of the site and maps showing local setting and regional context
- Identification of nearby communities
- Any relevant history of the Project, including key Project changes and refinements in response to feedback obtained from government agencies, First Nations, stakeholders, and the general public
- Description of the gas processing system used at the proposed Plant
- Description of temporary and permanent components associated with the Project, including facilities and infrastructure both on-site and off-site
- Description of the environmental management system and adaptive management approach for the proposed Project.

2.2.1 Provincial and Federal Environmental Assessment Triggers

The Application will describe the regulatory requirements for the environmental assessment.

The Project is subject to review under the BCEAA Pursuant to Part 4 of the *Reviewable Projects Regulation*, the review is required because the proposed Project would be a new natural gas facility that would have an eventual design capacity to process natural gas at a rate greater than or equal to 5.634 million m^3/day.

The Project is not subject to a review under the CEAA because there are no identified triggers[1]. The Project does not involve the use of federal lands, federal funding, or require any federal authorization identified under the federal *Law List Regulations* (Table 2-1). In a letter dated February 1, 2012 the Canadian Environmental Assessment Agency (CEA Agency) indicated that it and other federal departments had reviewed the project description, and that the federal government has determined that the Project will not require a review pursuant to the CEAA.

Table 2-1: Applicability of Federal Law List Regulation Triggers to the Project

Legislation	CEAA Trigger(s)	Applicability	Rationale
Canada Oil and Gas Activity Act	Operating license under subsection 5(1). Approval of development plan under Section 5.1(4)	Not Applicable	Act only applies in Northwest Territories, Nunavut, Sable Island, and territorial seas with federal jurisdiction.
Canadian Environmental Protection Act	Permit under subsection 127(1) for disposal at sea	Not Applicable	The Project will not dispose of any substances into waters under Canadian jurisdiction.
International River Improvements Regulations	License under subsection 10(1) for water projects in international waters	Not Applicable	The Project will not involve any activity in international waters.
Explosives Act	Magazine license, under paragraph 7(1)(a)	Not Applicable	The Project will not involve manufacture or on-site storage of explosives.
Fisheries Act	Authorization under section 32	Not Applicable	The Project will not involve the destruction of fish.
Fisheries Act	Authorization under subsection 35(2)	Not Applicable	The Project will not result in the harmful alteration, destruction, or disruption of fish habitat. The wetland area in the southeast corner of the Project site is not fish bearing and does not connect via surface flow to any downstream fish bearing waters.
Fisheries Act	Authorization under subsection 36(5)(a) to (e)	Not Applicable	The Project will not involve placement of deleterious substances into fish bearing waters. Effluent will not be discharged into fish bearing waters.

[1] The legislation cited in Table 2-1 includes both common CEAA triggers (such as under the *Fisheries Act*) and Acts that are relevant to the natural gas industry (such as the *National Energy Board Act*). The federal *Law List Regulations* includes other pieces of legislation, but no triggers with respect to the proposed Fortune Creek Gas Plant were identified.

Legislation	CEAA Trigger(s)	Applicability	Rationale
Navigable Waters Protection Act	Approval under paragraph 5(1)(a) and 6(4)	Not Applicable	The Project will not include works built or placed on, over, under, through or across any navigable waterways.
National Energy Board Act	Permit, order, direction, or leave granted by NEB under subsection 108(4) to build, operate, or modify an NEB regulated pipeline or transmission line.	Not Applicable	The Project is not regulated under the *National Energy Board Act* because it does not involve the construction of a trans-boundary pipeline or transmission line, is not integral to an NEB-regulated pipeline system, and QRCI is not an NEB regulated company.

2.2.1.1 Project Location

The proposed Plant will be located in northeast B.C., approximately 110 km north of Fort Nelson, B.C., at approximately 59°47'48" N and 122°33'55" W (Universal Transverse Mercator [UTM] N 6628851 E 524324; Figure 1-1 and Figure 1-2). The proposed Plant will be located within Units 55, 56, 65 and 66 Block A of 94-O-15, within the Fort Nelson Etsho Resource Management Zone.

The Plant will be located on an 82 ha site (approximately 860 m x 1,000 m), which will be leased by QRCI from the Crown. The site includes an existing natural gas compression facility owned by QRCI that is currently in operation, located on a 7.75 ha plot of land. The amount of land occupied by the Plant will be approximately 76 ha.

Principal access to the proposed Plant site will be via the existing Coles Lake/Gegut'o all weather road branching off of the Liard Highway/Hwy 77 at km 122. Fort Nelson, located approximately 110 km south of the proposed Plant site, is the nearest community within B.C.

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- Proposed Fortune Creek Plant
- Quicksilver Access
- Proposed Trans Canada Pipeline
- Highway / Highgrade
- Quicksilver Lands

FOCUS

Northwest Territories

British Columbia

Proposed Fortune Creek Gas Plant

Proposed Komie North Extension Pipeline

Encana Cabin Gas Plant

Fort Nelson

Liard Highway (77)

Cabin Road (PDR 332)

Komie Road

Sierra-Yoyo-Desan Road

Petitot River

Maxhamish Lake

Dilly Creek

July Lake

Thinahtea Lak

Sandoanah Creek

Tsea River

Thetlaandoa Creek

Kwokullie Lake

Kotcho Lake

Sahtaneh River

Kiwigana River

Kledo Creek

Kotcho River

Kyklo Creek

Hay Rive

124°30'0"W 124°0'0"W 123°30'0"W 123°0'0"W 122°30'0"W 122°0'0"W 121°30'0"W 121°0'0"W 120°30'0"W

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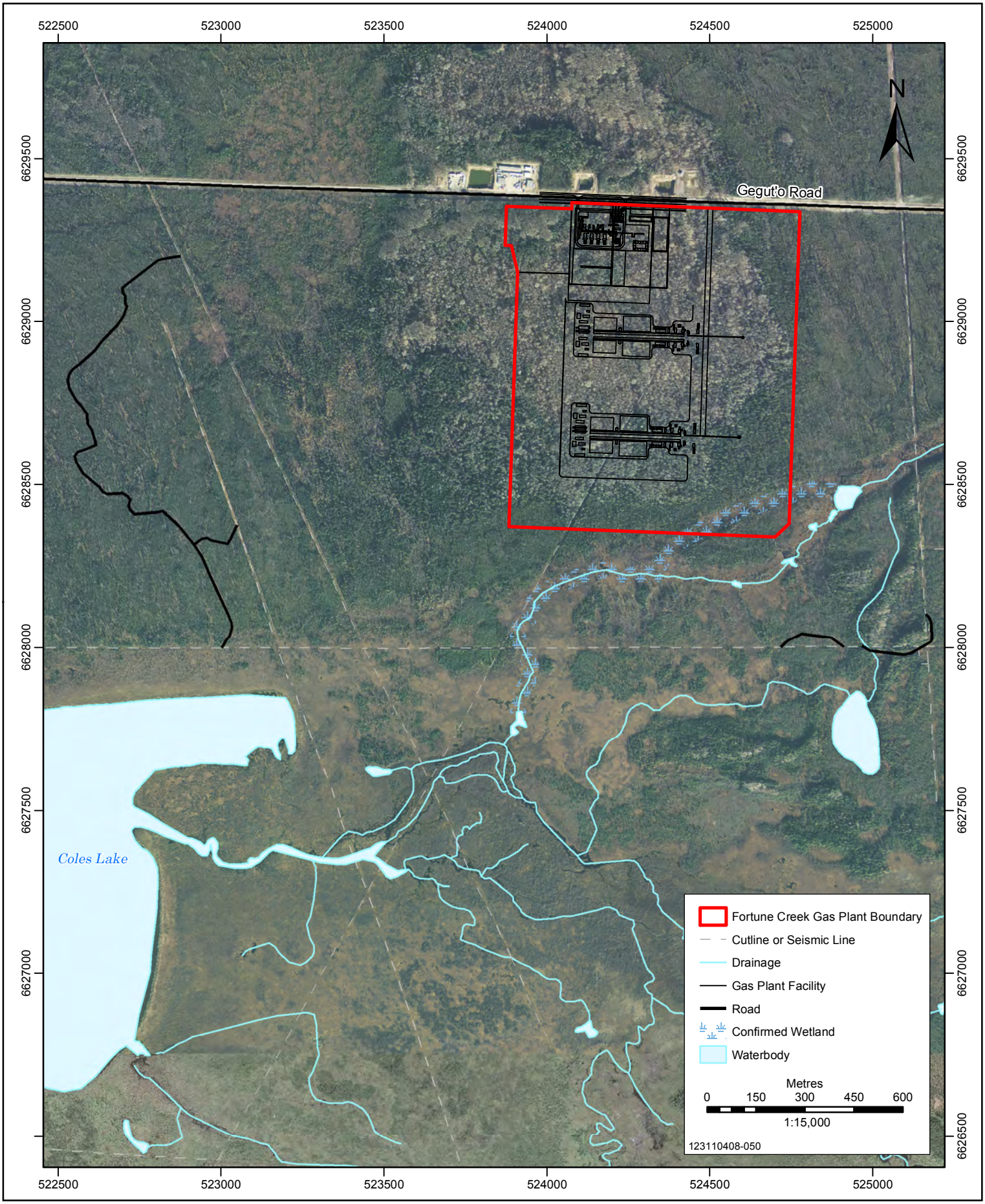

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FORTUNE CREEK GAS PLANT SITE MAP

FORTUNE CREEK GAS PLANT
FORT NELSON, BC

Sources: BC TRIM Topographic Database; Valtus Imagery Services, 2010.

PROJECTION	DRAWN BY
UTM - ZONE 10	KP
DATUM	CHECKED BY
NAD 83	FB
DATE	FIGURE NO.
02-DEC-11	2-2

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2.2.2 Project Background

The Application will provide any relevant history of the proposed Project.

The purpose of the Plant will be to remove H_2S and CO_2 from the raw natural gas to produce treated sales gas for transport to market. The Plant will be located near the centre of QRCI's mineral claims area within the Horn River Basin. The site was selected because it is located on higher ground and is centrally located within QRCI's operating area.

The Plant will be adjacent to the existing QRCI compressor station, located to the northwest corner of the Plant footprint near the Coles Lake/Gegut'o Road. The compressor station is operating under a Facility Permit issued by the B.C. OGC on September 23, 2010. Gas processed at the Plant will be transported to the market by a pipeline owned and operated by TransCanada PipeLines Limited (TCPL), or its subsidiary NOVA Gas Transmission Ltd. (NGTL).

2.2.3 Technical Specifications and Process Information

Technical details of the Plant, including the amine process QCRI proposes are summarized in Table 2-2 and in Sub-sections below.

Table 2-2: Proposed Plant Information

Component	Details
Plant Site Dimensions	**Footprint:** approximately 860 m x 1,000 m
Processing Capacity	**Initial:** 4.25 million m^3/day (150 MMcf/day) **Final:** 16.90 million m^3/per day (600 MMcf/day)
Construction Period(s)	**Initial Phase:** January 2013 to May 2014 **Subsequent Phases:** to be determined based on demand for processing

2.2.3.1 Gas Processing

This section of the Application will describe the gas processing systems used at the proposed Plant.

The raw natural gas from QRCI wells in the Horn River Basin contains CO_2 and trace amounts of H_2S. These substances need to be removed from the raw gas before it can be transported to a sales gas pipeline. QRCI is proposing to remove these substances from the raw gas using an amine gas treatment process. This is a common process used to treat or "sweeten" raw gas, and will remove approximately 92% of CO_2 and effectively all H_2S, resulting in sales gas that is 98.8% methane by volume, 1.2% CO_2, and trace amounts, if any, H_2S.

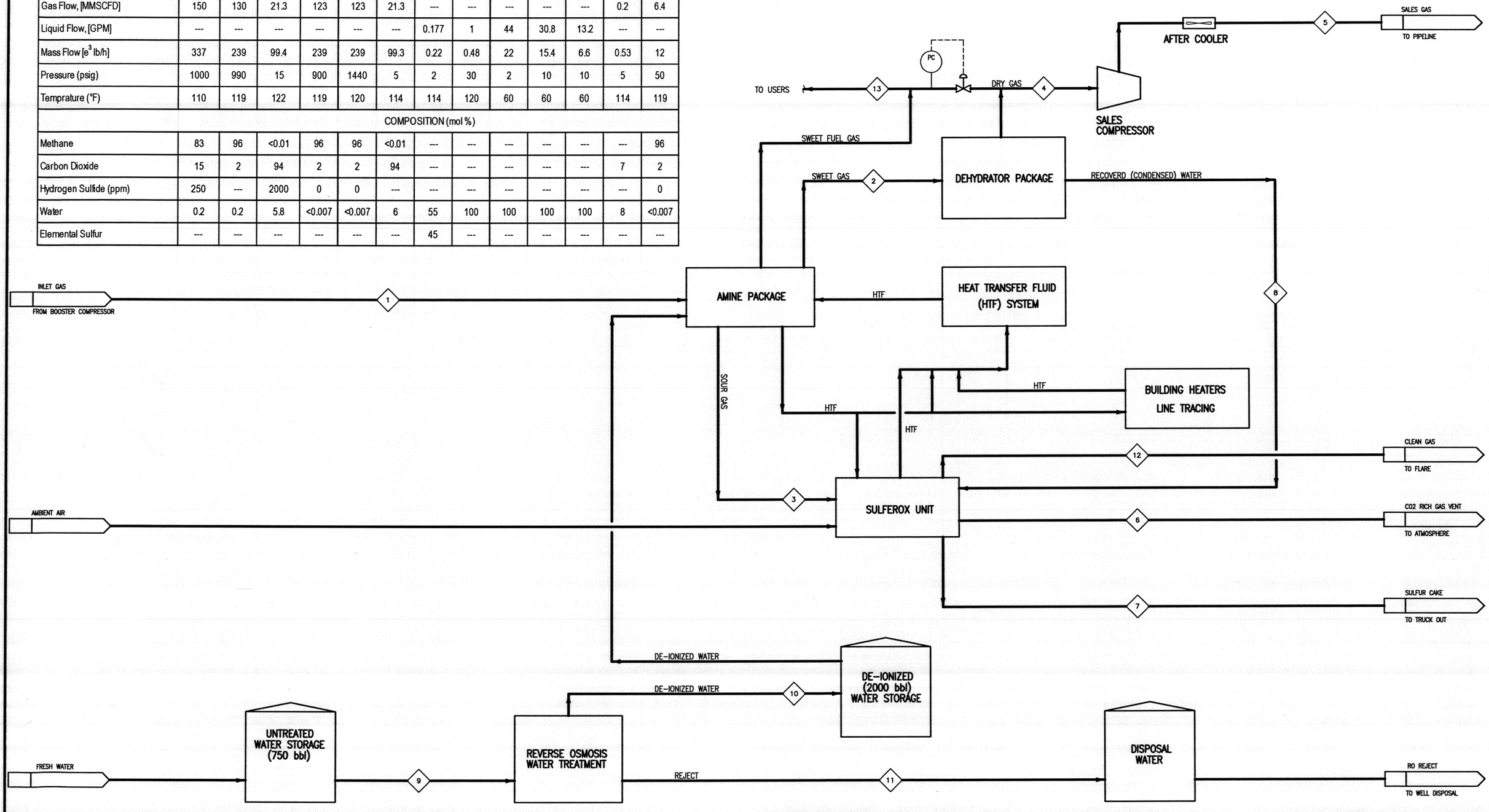
The inlet raw feed gas will be routed to the inlet separator to remove any extraneous liquids from the raw gas feed stream and will then enter the bottom of the amine contactor (Figure 2-3). There, waste gas components will react chemically with the amine solution and produce a re-generable

salt. The CO_2 and H_2S gas will be removed and the gas 'sweetened' as it rises through the contactor column, and will exit through an overhead scrubber in place to collect any carryover amine solution from the contactor.

The sweetened gas (no H_2S and minimal CO_2 content) will then be compressed and dehydrated prior to entering the sales gas pipeline. The rich amine leaving the bottom of the contactor tower will be routed to the regenerator where the CO_2 and H_2S will be removed from the rich amine solution yielding a lean amine solution. The lean amine solution will be pumped by a booster pump back to the amine contactor to repeat the process. The waste gas stripped from the rich amine solution will exit the top of the regenerator.

H_2S will be removed from the waste gas stream by routing this stream through an H_2S scavenger chemical removal system. During this process the sulphur within the H_2S reacts with a chemical and would produce an inert, elemental sulphur cake which will be transported to Ft. Nelson for sale or disposal via a local transportation contractor. If sold the elemental sulphur would be shipped via rail to Vancouver. Approximately two to three tonnes of sulphur (based on inlet gas H_2S concentration) will be produced per 4.25 million m^3 of processed gas each day. A conceptual Gas Processing Flow Diagram depicting the gas treatment process planned for the proposed Plant is shown below (Figure 2-3).

	STREAM NUMBER												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Gas Flow, [MMSCFD]	150	130	21.3	123	123	21.3	---	---	---	---	---	0.2	6.4
Liquid Flow, [GPM]	---	---	---	---	---	---	0.177	1	44	30.8	13.2	---	---
Mass Flow [e^3 lb/h]	337	239	99.4	239	239	99.3	0.22	0.48	22	15.4	6.6	0.53	12
Pressure (psig)	1000	990	15	900	1440	5	2	30	2	10	10	5	50
Temprature (°F)	110	119	122	119	120	114	114	120	60	60	60	114	119
COMPOSITION (mol %)													
Methane	83	96	<0.01	96	96	<0.01	---	---	---	---	---	---	96
Carbon Dioxide	15	2	94	2	2	94	---	---	---	---	---	7	2
Hydrogen Sulfide (ppm)	250	---	2000	0	0	---	---	---	---	---	---	---	0
Water	0.2	0.2	5.8	<0.007	<0.007	6	55	100	100	100	100	8	<0.007
Elemental Sulfur	---	---	---	---	---	---	45	---	---	---	---	---	---



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0	ISSUED FOR PROPOSAL	169536	PP	2011.12.15	·	·

REFERENCE P & ID'S

Figure 2-3: Process Diagram

GENERAL NOTES:

1. THOSE CONSTRUCTION DRAWINGS ARE GENERATED FROM CONSTRUCTION DRAWING INFORMATION FURNISHED TO AMEC BDR LIMITED BY THE OWNER'S FIELD SUPERVISORS AND OR THIRD CONTRACTORS. ANY CHANGES NOT DOCUMENTED WILL NOT APPEAR ON THE DRAWINGS AND THEREFORE, THE DRAWINGS MAY NOT BE AN ACCURATE REPRESENTATION OF THE CONSTRUCTED FACILITY.
2. PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION AND OR EXCAVATION IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR REPRESENTATIVE TO VERIFY THE LOCATION AND STATUS OF ANY PIPING, ELECTRICAL EQUIPMENT OR BUILDINGS.
3. ANY REVISIONS MADE TO EXISTING EQUIPMENT, PIPING OR ELECTRICAL OR A FACILITY NOT REMARKED BY AMEC BDR LIMITED IS ONLY SHOWN AS A REPRESENTATION OF WHAT EXISTS AND MUST BE VERIFIED BY THE OWNER.

	BY	DATE
DRN.	CT	2011.05.02
CHK.	·	·
APP'D.	·	·
L.S.D.		·

amec

AMEC BDR Limited

QUICKSILVER RESOURCES

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AMINE & SULFEROX BLOCK FLOW DIAGRAM

	DRAWING NUMBER	REV
1 OF 1	167977-BF-00-01	0

2.2.4 Project Components

This section of the Application will describe the components associated with the Project.

The components and facilities associated with the operation of the proposed Plant are listed in Table 2-3. The Project components and infrastructure information provided in the table below will be included in the Application. In addition, the Application will include figures of the Project components.

Table 2-3: Project Components

Gas plant footprint	On-site	Includes (raw gas) plant inlet compression, utilities, maintenance and warehouse complex, electrical and control systems, motor control centre and building, emergency shutdown system (ESD), instrument and utility air systems, utility heat medium, elemental sulphur drying, storage and loading area, chemical storage
Electricity generation	On-site	Includes primary electricity generation (~20 MW) and back-up diesel electricity generation (~3 MW) and fuel storage
Piping	On-site	Includes inlet piping (raw gas) from compressor area to gas processing equipment, and outlet piping (sales gas) from gas treatment process to compression and third party meter station, produced water piping system (to edge of existing pipeline connected to disposal well), and pipe racks as necessary to carry piping to the Project
Sales gas processing facility	On-site	Includes inlet gas separators; acid gas treatring with H_2S and CO_2 removal unit (i.e. amine contactors; amine tanks; amine regenerators; H_2S scavenger systems); wet gas glycol dehydration unit, heat media unit; and sales gas compression
Flare Systems	On-site	CO_2 vent stacks; and emergency flare and stack
Water supply	On-site	Water supply and treatment systems; recovered produced and fresh water storage and pumping systems; chemical pumping system and septic system

2.2.4.1 Water Supply

At full build out, the plant will require approximately 89,000 m^3 per year (244 m^3 per day at 100% Plant runtime) of clean water for the amine processing plant and the H_2S removal unit. The principal sources will be produced water, recovered from natural gas extraction and treated in a reverse osmosis unit, and water extracted from natural gas dehydration. At full build out, the available water supply from these sources (estimated at 1246 m^3/day) will exceed the plant's process water requirements (244 m^3/day) plus the reject stream from the reverse osmosis unit (105 m^3/day). Thus, the plant would use aquifer water as back up only if the two primary sources of water were unavailable. The aquifer supply will be from a deep saline groundwater source located near the plant, and not from a potable groundwater source. This water source well has been flow tested and is capable of 113 m^3 of sustained flow per day without seeing any drop in the static water level of the well.

2.2.4.2 Other Supporting Facilities and Infrastructure

There are a number of supporting facilities and infrastructure that will interact with the Project but that are outside of the scope of the Project as proposed by QRCI. Some of these supporting facilities are owned and operated by QRCI and some of them are owned and operated by other parties. In addition, some of these facilities already exist and are in operation, while others will be constructed at some point in the future. The Application will briefly discuss these other supporting facilities (listed in Table 2-4) and how they will interact with the Plant. They are outside of the scope of the Project effects assessment but will be included in the cumulative effects assessment.

Table 2-4: Supporting Facilities

Facility and Owner	Status	Comments
Roads	QRCI plans to use existing roads (Liard Highway/Highway 77 and Coles Lake/Gegut'o all weather road) for transportation of workers, equipment, and materials	No new roads will be constructed for the Project. QRCI will negotiate road use and maintenance agreements with other parties who have tenure for parts of the Coles Lake/Gegut'o all weather road.
Construction Camp	QRCI proposes to use existing construction camp(s), located near the Project site, to house workers during Project construction.	No additional construction camps will be built for the Project. QRCI is in the process of extending its OGC permitted work camp. This is a regional operations camp that supports existing and proposed operations.
Borrow sites	Borrow sites may be used for the Project if fill is required. QRCI proposes to use existing pre-approved sources of borrow material if fill is required during construction.	New borrow sites are not expected to be required for construction of the Project.
Compressor Station	QRCI currently owns and operates a gas compressor station located at the proposed Project site. This station will not be incorporated into the design of the Project.	The compressor station currently compresses raw gas from QRCI wells, which is sent via pipeline to Spectra Energy's gas processing plant near Fort Nelson, B.C. No new approvals are required as the station is operated with all required permits.
Wastewater Disposal Facilities	QRCI plans to use an existing disposal well and wastewater pipeline to the well located at c-C68-B/94-O-15. Wastewater disposal is estimated at 26 m^3 per day when the Project is processing 150 MMcf/d of natural gas and 105 m^3/day when the Project is processing 600 MMcf/d of natural gas.	It is expected that wastewater from the Project will be transported via pipeline offsite for disposal at one of the existing OGC approved deep disposal well(s) located near the Project site.

Facility and Owner	Status	Comments
Upstream Raw-Gas Supply Pipelines from QRCI wells These pipelines are owned and operated by QRCI to transport gas to the existing QRCI compressor station.	The upstream pipelines are regulated by the OGC and have been approved and constructed. The pipelines are currently on-stream and flowing gas into existing QRCI facilities.	The pipeline right-of-ways are adjacent to the proposed Project site and Coles Lake/Gegut'o road. The pipelines are tied into the existing QRCI compressor station, which will be tied into and flow the raw gas to the Plant. No new approvals are required for these pipelines because they already exist and operate with all required permits. QRCI may construct additional pipelines in the future to transport gas from future drilling operations. The need for these pipelines will be determined by QRCI based on the location of future well pads. Accordingly, no specific information about these pipelines is available at this time, and any such pipeline will be the subject of an OGC application and approval process.
Downstream Raw Gas Pipeline to Spectra plant This 508 mm (20") pipeline is owned and operated by QRCI to transport compressed raw gas to Spectra's processing facility near Fort Nelson.	This pipeline is regulated by the OGC and has been approved and constructed. It is currently on-stream.	The pipeline right-of-way is along the Coles Lake/Gegut'o road. It ties in with the Spectra system within 59-A/94-O-14. No new approvals are required as the pipeline exists and is operated with all required permits.
Downstream Sales Gas Pipeline to Alberta NOVA Gas Transmission Ltd. (NGTL) has applied to the National Energy Board (NEB) to construct the Komie North Extension Project (KNE).	This pipeline is currently in the application phase. If approved, it will be regulated by the NEB. If approved, TCPL will design and construct this pipeline and any related tie-in facilities. This pipeline will be tied-in at the Project site boundary.	The KNE will connect to the Project but has independent utility and is not dependent on the Project. The KNE is intended to transport natural gas from several natural gas producers in northeast B.C. in addition to QRCI and is expected to connect to multiple gas processing plants. The Project is one of multiple gas plants that could connect to the KNE in the upper Horn River Basin. The KNE will be sized and capable of shipping over 1 billion cubic feet per day of sales gas to market, well above the proposed final build out of the proposed QRCI Project. QRCI understands that this pipeline will require a Certificate of Public Convenience and Necessity from the NEB under section 52 of the *National Energy Board Act* and will thus involve an EA under the CEAA.

2.2.4.1 Greenhouse Gas Management

The proposed Plant will be designed and operated in compliance with all existing federal and provincial regulatory requirements in regards to air emissions. QRCI recognizes that greenhouse gas (GHG) policy is evolving. QRCI is committed to working with the Provincial and Federal governments to meet GHG targets as they are developed. QRCI is investigating various technical and commercial solutions and concepts to manage the proposed Plant's CO_2 emissions (including carbon capture and sequestration [CCS] options). QRCI will also seek to be part of any broader industry-based solution that may be developed for the Horn River Basin.

The proposed Plant will be designed and engineered to vent recovered CO_2. It will, however, be designed 'carbon-capture ready' to facilitate a carbon management option, should this technology become economically and technically feasible during the life of the Plant. This 'carbon-capture ready' option will include the installation of required piping and valves, which will provide appropriate isolation of the CO_2 stream.

2.2.4.2 Design Mitigation

An overview of the site selection process and engineering design features that minimize the environmental footprint will be provided.

2.2.5 Project Activities

The Application will include the information on construction, operation, and decommissioning of the proposed Project, as identified in Table 2-5 below. The Application will provide additional information about the activities associated with construction, operation, and decommissioning of the proposed Project, as well as figures of activities as information becomes available.

Table 2-5: Project Activities

Project Activity	Description
Construction	
Surveying	Activities include staking of the boundaries of the site, work spaces, and existing utilities.
Clearing and Grubbing	Trees, brush and other vegetation will be cleared from the site. Merchantable timber will be cut and decked. Other non-woody vegetation will be mowed. Non-merchantable vegetative debris will be burned or chipped. Large stumps and rocks removed from the cleared site.
Topsoil Salvage	Graders, bulldozers and backhoes will be used to strip and stockpile surficial materials (surface organic material and upper mineral soil). This material will be stockpiled in a designated location for restoration of the site following decommissioning.
Grading	Following topsoil/strippings salvage, grading will be conducted to level the site, introduce site drainage, and provide a safe and clean work surface.

Project Activity	Description
Facility Installation	Once the site is prepared, ground infrastructure will be installed, and subsequent gas plant components will be installed and tested. This may include controlled gas releases during testing.
Clean-Up and Reclamation	Waste materials from construction will be removed and disposed of at an approved location. The site will be graded, erosion control measures will be implemented, and all disturbed areas will be seeded. Marker signs will be installed, as necessary.
Operation	
Plant Operation	Gas plant operation activities include inlet feed gas system, chemical feed system, heating and ventilation system, fire detection system, and electrical system.
Facility Maintenance/Testing	Routine inspections and maintenance of all systems will be completed on an ongoing basis.
Vegetation Maintenance	A vegetation management program will be developed for vegetation management around the perimeter of the site in accordance with section 10.5.2 of CSA Z662.
Closure and Decommissioning	
Decommissioning	Decommissioning and reclamation of the proposed Plant will be required at the end of the project life, or potentially earlier if premature closure is required. The timing for decommissioning and reclamation will be dependent on many factors. At the appropriate time, a conceptual decommissioning and reclamation plan will be prepared for the proposed Plant, in accordance with the laws, regulations and standards in effect at that time.

2.2.6 EA and Project Schedule

The Application will include information on anticipated timelines for the environmental assessment and Project engineering and construction. Table 2-6 provides a summary of principal tasks associated with the environmental assessment process, including pre-submission activities such as technical studies and preparation of the EAC Application, as well as the Application review process timeline.

Table 2-6: Proposed Fortune Creek Gas Plant Schedule

Project Component	Estimated Date
Submission of Project Description to BCEAO	July 2011
Section 10 Order	November 2011
First Working Group Meeting	February 2012
Anticipated Section 11 Order	March 2012
Draft AIR posted on e-pic	March 2012
Public comment period/Open House in Fort Nelson	March 2012

Project Component	Estimated Date
Approved AIR	April 2012
Submission of concurrent permitting applications	May 2012
Submission of Environmental Assessment Certificate Application for Screening	May 2012
Submission of Environmental Assessment Certificate Application	June2012
Application Review Period	June 2012 – November 2012
Public Comment Period	June 2012 – July 2012
Open House in Fort Nelson on Application for an Environmental Assessment Certificate	June 2012
Referral of Project to the Ministers	December 2012
Ministerial decision on Environmental Assessment Certificate Application	January 2013
Decision on eligible permits under concurrent permitting	Early 2013
Start construction	Early 2013
Complete construction	May 2014

Preliminary engineering and environmental technical investigations for the Project commenced in the spring of 2011 and will be ongoing through to the end of 2011. Information on environmental investigations will be included within Sections 5.0 through 9.0 of the Application, supplemented as applicable with technical data reports attached as appendices.

The capital cost of the first phase of the proposed Plant is estimated to be $175 million. The total capital cost to build the proposed Plant (final processing capacity of 16.90 million m^3/day) will be approximately $460 million. It is anticipated that during the construction of the first phase, the proposed Plant will result in approximately 100 person years of employment, and during operations is anticipated to employ 12 people. The proposed Plant will employ approximately 30 to 35 fulltime employees once at full operating capacity. The proposed Plant will have an anticipated project life of approximately 25 years.

Phases two and three of the Project will be built when needed to service gas processing requirements which are anticipated to grow with the expansion of QRCI's gas collection in the Horn River Basin. Table 2-7 summarizes project components and activities anticipated through Project build-out.

Table 2-7: Project Build-out Components and Activities

Component	Phase 1	Phase 2	Phase 3
Planned service date	May 2014	2018 (estimated)	2021 (estimated)
Inlet gas input capacity (million m^3/day	4.25	7.08 (additional)	5.67 (additional)
Sales gas capacity (million m^3/day	3.54	5.67 (additional)	4.25 (additional)
Clearing (% of site)	75%	0%	25%
Gravel pad construction (% of site)	50%	25%	25%
Project components (common)	Facilities, water supply, wastewater disposal, surface water retention pond	n/a	n/a
Project components (skid mounted)	Gas processing train, electrical, piping	Gas processing train, electrical, piping	Gas processing train, electrical, piping
Project components (other)	Flare stack and vent stack	Flare stack and vent stack	Flare stack and vent stack

2.2.7 Environmental Management System

The Project Environment Management System will be detailed in the Application and will be addressed through the following plans and programs:

- Construction Environmental Management Plan (CEMP)
- Operation Environmental Management Plan (OEMP)
- Construction Environmental Monitoring.

2.2.7.1 Construction Environmental Management Plan

The CEMP will be developed to identify environmental protection measures to mitigate potential adverse effects of Project construction. The CEMP will be developed before construction begins.

2.2.7.2 Operation Environmental Management Plan

The OEMP will be developed to identify environmental protection measures to mitigate potential adverse effects of Project operation. The OEMP will be developed before operation begins.

2.2.7.3 Construction Environmental Monitoring

During construction, an Independent Environmental Monitor (IEM) will be present to monitor construction activity for compliance with the CEMP and all applicable permits, approvals, and authorizations. The IEM will have authority to stop construction in the case of non-compliance with the CEMP, or where it is anticipated that circumstances are likely to cause environmental problems.

The IEM will:

- Attend project planning meetings, pre-job meetings and tailgate meetings to convey environmental sensitivities and environmental requirements
- Recommend actions to prevent or correct where construction activities are out of compliance with the CEMP
- Inspect and recommend maintenance to the sediment and erosion control structures, as necessary
- Provide regular environmental monitoring reports identifying:
    - Current construction activities
    - Environmental mitigation measures applied (including erosion control measures)
    - Effectiveness of mitigation measures
    - Recommendations to change or maintain mitigation measures.

2.3 Provincial Review—Scope of Proposed Project

The scope of the proposed Project to be assessed in the Provincial EA (pursuant to the Section 11 Order) consists of the following components:

- Gas plant footprint, including (raw gas) plant inlet compression, utilities, maintenance and warehouse complex, electrical and control systems, motor control centre and building, emergency shutdown system (ESD), instrument and utility air systems, utility heat medium, elemental sulphur drying, storage and loading area, chemical storage
- Onsite electricity generation, including primary electricity generation (~20 MW) and back-up diesel electricity generation (~3 MW) and fuel storage
- Inlet piping (raw gas) from compressor area to gas processing equipment, and outlet piping (sales gas) from gas treatment process to compression and third party meter station, produced water piping system (to edge of existing pipeline connected to disposal well), and pipe racks as necessary to carry piping to the Project
- Sales gas processing facility, including Includes inlet gas separators; acid gas treating with H_2S and CO_2 removal unit (i.e. amine contactors; amine tanks; amine regenerators; H_2S scavenger systems); wet gas glycol dehydration unit, heat media unit; and sales gas compression
- Water supply and treatment systems; recovered produced and fresh water storage and pumping systems; chemical pumping system and septic system.

2.4 Federal Scope of Proposed Project

The Canadian Environmental Assessment Agency has determined that the Project will not require an assessment under the *Canadian Environmental Assessment Act*. Therefore, a federal scope of assessment is not applicable to the Project.

2.5 Alternative Means of Undertaking the Proposed Project

QRCI will consult with the EAO, First Nations, other Working Group members, and other relevant stakeholders on alternative means of undertaking the Project, and the Application will include the following information:

- Brief description of potential alternative means of undertaking the Project
- Identification of the key issues in considering the alternative means of undertaking the proposed Project
- Analysis of the alternative means of carrying out the proposed Project that are technically and economically feasible
- Identification of the rationale for selecting the preferred alternative.

2.6 Project Land Use

This section of the Application will include Project land use information (other than information relating to land use by First Nations for traditional purposes) such as:

- Description of the land ownership and land use regime (for example, fee simple, Crown land, Indian Reservation, Treaty Settlement Land, Treaty Entitlement Settlement Lands. Description of Zoning, Agricultural Land Reserve Designation, Applicable Land and Resource Management Plans and other land use designations as applicable) including tenures, licenses, permits or other authorizations that will be potentially required for or affected by the proposed Project
- Report on the status of consultations with the holders of such tenures and permits, and with private land owners on resolving issues with tenure and permit holders
- Management objectives of the Fort Nelson Land and Resource Management Plan (LRMP) for the assessment area
- Identification of any relevant Official Community Plans or regional government plans
- Description of existing and proposed management and monitoring programs or regional studies
- Identification of Parks, reserves, conservancies, and management areas, if any, potentially affected by the Project
- Identification of other developments and/or land uses, even if not directly related to the proposed Project, that may result in overlapping effects with the proposed Project

- Identification of future developments and/or land uses, which are reasonably foreseeable and sufficiently certain to proceed.

2.7 Project Benefits

This section of the Application will include the following information:

- Initial capital construction cost estimates including:
  - Breakdown of costs for the land, buildings, and equipment associated with the proposed Project
  - Indication of the potential for use of local facilities and indicate if these are currently under-utilized.
- Estimated operating costs over the life of the proposed Project (for land, buildings and equipment) including:
  - Estimated annual operating costs (excluding labour)
  - Indication of how the costs are measured (i.e., current dollar value or the use of Net Present Value)
  - Costs for decommissioning/closure/abandonment/reclamation.
- Employment estimates including:
  - Direct employment, stated in number of person years to be created by major job category (e.g., labour, management, business services) during construction and operation, distinguishing among full-time, part-time and seasonal workers
  - Wage levels, by major job category, for the construction and operating periods
  - Breakdown of the number of people that will be hired locally, provincially, nationally or internationally for the Project
  - Potential for QRCI to use local human resources that are currently under-utilized
  - QRCI will determine future staffing requirements and engage with First Nations and other stakeholders to determine and potentially assist with training courses needed for employees or contractors that would be hired to operate the Plant
  - Indicate any relevant employment policies/practices
  - Indirect employment for the construction and operation phases of the proposed Project including any assumptions relating to industry specific multipliers or other multipliers used.
- Contractor supply services estimates including:
  - List of the major types of businesses/contractors, broken down at the local, provincial, and national level that would benefit from the proposed Project

    - Value of supply of service contracts expected for both the construction and operation phases of the proposed Project
    - Information about QRCI's local purchasing strategy, if any.
- Annual government revenues for the construction and operation phases of the proposed Project including:
    - Local/municipal (property taxes, other)
    - Regional District (taxes, other)
    - Provincial (income tax, sales tax, lease, license and tenure, royalties[2], other)
    - Federal (income tax, Harmonized Sales Tax [HST], payroll taxes, other).
- All assumptions and reference information sources for the above information.
- Identification of proposed Project contributions to healthy living and community development.

2.8 Applicable Permits

The Application will present the following information:

- List of all applicable licenses, permits, authorizations and/or approvals required for the construction, operation and decommissioning of the proposed Project and the associated responsible regulatory agency
- Relevant Provincial plans or local government official community plans, and zoning requirements for the proposed Project
- An indication that a request for concurrent permitting will be submitted under the BCEAA pursuant to the *Concurrent Approval Regulation*

The following table provides a preliminary table of permits, approvals, and authorizations anticipated for the Project.

Table 2-8: Anticipated Permits, Approvals, and Authorizations Required for the Project

Statute	Instrument	Purpose
B.C. *Environmental Assessment Act*	Environmental Assessment Certificate	Confirms the Project can be undertaken in accordance with the environmental, economic and social sustainability goals of British Columbia
Land Act	License of Occupation	Initial land tenure for the proposed Plant site (valid for two years)
Land Act	Lease	Conversion of the Plant site License of Occupation into a 30 year lease

[2] In addition to taxes directly associated with the Project, such as property taxes, a royalty will be paid on the gas that will eventually be processed at the plant. As this royalty is based on raw gas volume calculated at the wellhead rather than sales gas volume calculated at the Plant it is considered an indirect economic benefit of the Project.

Statute	Instrument	Purpose
Forest Act	Cutting Permit (part of Master License to Cut)	Approval to harvest timber from the Project site
Oil and Gas Activities Act	Gas Processing Plant Scheme Approval	Plant design approval
Waste Discharge Regulation under the *Environmental Management Act*	Waste Discharge Permit	Permit to discharge air emissions from the Plant
Sewerage System Regulation under the *Public Health Act*	Sewage Disposal Permit	Permit to construct domestic sewage holding tank or sewage treatment system with disposal field.

3 ASSESSMENT PROCESS

3.1 Provincial EA Process

3.1.1 Pre-Application Stage

The Application will briefly explain the Provincial EA process, including the features of the proposed Project that cause it to be reviewable under the BCEAA and the role of the Application in the overall review process.

The Application will include:

- List of the agencies/departments/organizations involved in the review
- List and discussion of applicable milestones, including but not limited to issuance of Sections 10 and 11 Orders, working group meetings and public comment periods
- Tabulated record of documented issues and concerns raised during the preparation of the Application Information Requirements (AIR) by First Nations, local, regional, Provincial and Federal government agencies and the public and how these issues were addressed and the degree to which they were addressed or resolved
- Identification of regulatory authorizations required for the proposed Project that will be requested for concurrent review with the Application (see Section 2.7; Table 2-5).

3.2 Federal Review

The Project is not reviewable under CEAA (see Section 2.2.1).

3.3 First Nations Information Distribution and Consultation

This section of the Application will summarize QRCI's past and proposed consultation initiatives with First Nations, in accordance with the provisions set out in the Section 11 Order, as well as consultation activities completed prior to entering the BCEAA review process.

The objectives of consultation include providing information on the Project to interested communities, identifying and discussing potential Project interactions, identifying opportunities to engage with the proponent, and identifying issues of concern and interest. An important objective of First Nations consultation is to identify how each First Nation exercises treaty rights in the Project area, potential impacts of the Project on the exercise of those rights, and measures to avoid or mitigate any potential adverse impacts on treaty rights from the proposed Project.

The proposed Project is located in an area subject to B.C. Treaty 8 and is within traditional territory of the Fort Nelson First Nation, Dene Tha' First Nation and Acho Dene Koe First Nation (ADK), a Treaty 11 First Nation. The Project intersects two registered traplines maintained by members of the ADK. Other traditional land uses will be identified during traditional use studies being conducted by interested First Nations for the Project area. QRCI has initiated consultations with First Nations whose treaty rights might be affected by the Project. Consultation activities to date have included meetings, telephone discussions, and distribution of Project information to the First Nations included in Table 3-1.

Table 3-1: First Nations Consultation List

First Nation	Land Office Contact	Chief
Fort Nelson FN	Lana Lowe	Chief Kathi Dickie
Acho Dene Koe FN	Gilbert Capot Blanc	Chief Harry Deneron
Prophet River FN	Shirley Tsakoza	Chief Lynette Tsakoza
West Moberly FN	Bruce Muir	Chief Roland Willson
Saulteau FN	Naomi Owens	Chief Harley Davis
Halfway River FN	Rosyln Pokiak	Chief Ed Whitford
Blueberry River FN	Debbie Apsassin	Chief Joe Apsassin
Doig River FN	Jane Calvert	Chief Norman Davis
McLeod Lake Indian Band	Alec Chingee or Stephanie Rocheleau	Chief Derrick Orr
Dene Tha' FN	Baptise Metchooyeah	Chief James Ahnassay

Detailed information on First Nations Consultation will be provided under Part C, First Nations Consultation Requirements.

3.4 Public and Agency Information Distribution and Consultation

This section of the Application will summarize QRCI's current and planned consultation initiatives for both the public and governmental agencies in accordance with the provisions set out in the Section 11: Order, issued by the EAO.

The Application will identify those parties that were engaged in the consultation process, including the public and other key stakeholders, federal, provincial, and local government agencies; describe means of information distribution and consultation; and document issues, concerns and interests identified during these consultations, and how these matters were addressed.

The desired outcome of the consultation program will be to ensure that all affected or interested stakeholders have been informed of the Application process and have been provided opportunities to provide their input or comments with respect to the proposed Project.

3.4.1 Pre-Application Consultation

This section of the Application will summarize QRCI's pre-Application consultation initiatives. Included will be a summary of consultations undertaken in the pre-Application stage, covering both the preparation of the AIR and the Application. The Application will provide the following information regarding pre-Application consultation:

- Summary of consultations with the public and other key stakeholders
- Summary of consultations with federal, provincial and local government representatives
- Tracking tables to document issues and concerns raised by the public and government agencies and the degree to which issues are considered resolved or addressed by the Proponent and other parties during the preparation of the AIR and the Application.

3.4.2 Consultation Planned during Application Review

This section of the Application will summarize QRCI's consultation activities planned for the Application review stages. This will include:

- Public consultation program proposed for the Application review stage of the EA process
- Proposed programs for consultation with government agencies
- Documenting of proposed methods and process to resolve outstanding issues.

PART B—ASSESSMENT OF POTENTIAL EFFECTS, MITIGATION, AND SIGNIFICANCE OF RESIDUAL EFFECTS

4 GENERAL

4.1 Assessment Methods

The Application will provide a clear description of the methods used to conduct the assessment of potential incremental and cumulative environmental, social, economic, heritage, and health effects of the proposed Project, including:

- Scope of the EA
- List of the agencies, First Nations, and stakeholders that reviewed and commented on the draft AIR
- List of the guidance documents provided by agencies used to develop the assessment methods
- A list of all valued components considered in the EA
- Methods used for assessing potential effects of the proposed Project, including identification of the criteria used to characterize effects in support of the evaluation of the significance of effects (i.e., magnitude, geographic extent, duration and frequency, reversibility, context and probability) for construction, operation, post-closure, and decommissioning phases of the proposed Project
- Description/reference for each standard used in baseline studies and assessment analyses
- List of applicable best management practices, and guidance documents that will be implemented.

4.1.1 Valued Components

This section of the Application will identify the valued components (VCs) used in the assessment, explain the methods used to identify VCs, and describe how the assessment relates to the pillars of British Columbia's EA review process.

The assessment will focus on specific components of the biophysical and human environments (which encompass environmental, economic, social, heritage, and health) referred to as VCs. VCs are selected through development of the AIR and reflect regulatory issues and guidelines, First Nations concerns, issues identified by stakeholders, and the professional judgment of the study team.

VCs for the biophysical environment are typically major components, such as wildlife or vegetation, or are aspects of the physical and biological environment that are widely recognized as important for ecological reasons. Representative VCs for the socio-cultural and economic environment are

aspects of the human environment that include such components as economy, employment and business, land use, communities or community life, and traditional land and resource use.

Criteria for selecting VCs include:

- Do they represent a component of the environmental, economic, social, heritage, and health conditions in the vicinity of the Project?
- Are they vulnerable to the effects of the Project?
- Have they been identified as important by regulators, First Nations, stakeholders, or other effects assessments previously undertaken in the region?

For each selected VC, one or more measurable parameters will be selected to facilitate quantitative or qualitative measurement of potential Project environmental effects and cumulative environmental effects. Measurable parameters provide a means to determine the level or amount of change to a VC. For example, the area of each vegetation community cleared for development of the Plant site might be chosen as the measurable parameter for change in available habitat for caribou or moose, or other indicator species in the “wildlife environment” VC.

The potential VCs considered for inclusion in the Application and the rationale for inclusion and exclusion are provided in Table 4-1. The Application will also provide further rationale for the inclusion or exclusion of VCs in the assessment. In addition, the method and rationale used to select VCs will be presented by each environmental and socio-economic study area in Sections 5 to 9 of the Application.

Table 4-1: Proposed VCs and Rationale for Inclusion or Exclusion

Valued Component	Included/ Excluded	Reason
Environmental		
Air Quality	Included	Air quality has been included because of the atmospheric emissions that will occur during operation of the Plant. A Waste Discharge Permit will be needed for these emissions.
GHG Management	Included	GHG management is included because of the CO_2 emissions that would occur during operation of the Plant.
Acoustic Environment	Included	Sound quality has been included because of the acoustic emissions that will occur during operation of the Plant. Higher than normal sound levels may affect people using lands around the Plant and may affect wildlife use in adjacent forest habitat.
Vegetation Resources	Included	Clearing of the site will be required to construct the Plant; this will be a direct interaction between the Project and site vegetation. Vegetation resources are of importance to overall ecological function and to the exercise of treaty rights through traditional use of this resource.
Wildlife Resources	Included	There will be direct and indirect interactions between the Project and wildlife due to vegetation removal during construction and noise levels during operation of the Plant. Wildlife resources are of importance due to their ecological value, harvesting, and continued exercise of treaty rights.
Ecological Health	Included	Ecological health risk is included because of potential health effects associated with air emissions. No other potential health risks have been identified.
Fisheries/Aquatic Resources	Excluded	Fisheries and aquatic resources are excluded from the Application because there are no watercourses or water bodies located on the Plant site. The Project does not have any components that will directly affect watercourses or water bodies and no works are proposed within riparian areas.The wetland area in the southeast corner of the Project site is not fish bearing and does not connect via surface flow to any downstream fish bearing waters.
Hydrogeology	Excluded	Hydrogeology is excluded because water supply and wastewater disposal will not be expected to affect non-saline groundwater resources. The Project will obtain its water from produced water flowing in the raw gas and gas dehydration process. As back-up, a non-potable water well is located on the adjacent compressor site. At final capacity, the Plant would require approximately 10 m^3/hour, which is less than a third of what is available from the water capture and treatment process described above. Wastewater disposal will utilize existing permitted facilities in the area. The Project will not discharge effluent into any surface waters.

Valued Component	Included/ Excluded	Reason
Soils	Excluded	Soils are not included within the scope of the Application because the Project is not located within the Agricultural Land Reserve. The soils affected by the Project will be limited to the Plant site itself. Standard industry practices for salvage and storage of topsoil will be undertaken for future reclamation of the site. The Project will incorporate erosion and sediment control measures, which will be designed to prevent the migration of fine particulates into any nearby watercourses. There will be no stockpiling of any solid residues of the gas treatment process (such as elemental sulphur). Such materials will be transported off-site to permitted disposal facilities or sold.
Economic		
Economic Environment	Included	Employment and economy are included in the Application because of the potential Project-induced effects on regional employment and economies.
Social		
Infrastructure and Services	Included	Infrastructure and services are included in the Application because of the anticipated potential Project-related increase in demand for regional infrastructure and services.
Land and Resource Use	Included	Land and resource use is included in the Application because of the potential for Project-related interactions with other existing or proposed land and resource uses.
First Nations' Land Use and Interests	Included	The Project will occur on Crown land within the boundaries of Treaty 8. As a result, there will be anticipated Project effects on the exercise of treaty rights.
View sheds and Aesthetics	Included	The visual effect of the Plant may be an issue of concern to First Nations, and other land users and rights holders in the vicinity of the Project.
Heritage		
Archaeological and Heritage Resources	Included	Archaeological and heritage resources are a mandatory component of an environmental assessment under BCEAA.
First Nations Heritage	Included	The Project may affect heritage values associated with traditional land use, including subsistence, habitation, ceremonial and spiritual, wildlife and ecological, transportation and landscape values.

Valued Component	Included/ Excluded	Reason
Health		
Human Health	Included	Human health risk is included because of potential health effects associated with air emissions. No other potential health risks have been identified.
Healthy Living	Included	Health effects are a mandatory VC to be assessed and reported in the Application under the BCEAA. Components of health effects are community health, health education, and sports/physical activity.
View sheds and Aesthetics	Included	The visual effect of the Project may be an issue of concern to First Nations, and other land users and rights holders in the vicinity of the Project.
Effects of Incidents and Malfunctions	Included	Potential incidents and malfunctions associated with Project construction, operations, and de-commissioning has been identified as an issue of concern by the EAO and several other stakeholders. Incidents and malfunctions can affect a number of environmental, human health, and social VCs.
Human Health & Safety	Excluded	Human health and safety, beyond that covered by the human and ecological health and the incidents and malfunctions sections of the Application (noted above), is not included in the Application as this is addressed by regulated processes in British Columbia. Occupational health and safety regulations (enforced through WorkSafeBC) require QRCI to provide a safe working environment for employees. CSA design standards and the OGC permitting process ensure the engineering design of the Plant protects both the employees and the public. As human health and safety are governed by legislation and QRCI is required to comply with the laws of British Columbia, there is no need to include this in the Application.

4.1.2 Spatial Boundaries

This section of the Application will describe the spatial boundaries of the Local Assessment Area (LAA) and Regional Assessment Area (RAA) relative to the VCs. An overview map summarizing the spatial extent of the LAA and RAA used in the assessment will be included, while detailed assessment area maps will be provided within each VC section.

A number of factors are considered when defining the spatial boundaries for each selected VC, including:

- The scope of the Project and scope of the assessment as defined in the BCEAO section 11: Order
- The biophysical conditions
- Available traditional use information and traditional knowledge
- Technical or scientific information
- Social considerations.

The boundaries include a LAA for consideration of direct effects of the Project on the selected VCs and a RAA for consideration of potential cumulative effects. These boundaries are clearly defined for each VC selected for consideration based on the anticipated spatial extent of measurable interactions between the Project and environmental, economic, social, heritage VCs.

For the environmental, heritage and health components of the assessment, the LAA boundary consists of the Project footprint (i.e., the Project site) plus a defined buffer zone within which direct and indirect effects of the Project are reasonably expected to occur (Table 4-2). The RAA covers a larger area to encompass other projects that are expected to have residual effects that might interact with residual effects from construction, operation or decommissioning of the Plant (Table 4-3).

For the economic and social components the LAA consists of the Project footprint plus the area outside of the Project footprint in which there is a reasonable likelihood that socio-economic interactions could occur. Given the broad boundaries for the social and economic LAAs, they also encompass the areas where effects of the Project may overlap with those of other existing and known future activities. As a result, the LAA and RAA for the social and economic VCs do not differ.

Table 4-2: Local Assessment Area Boundaries

Valued Environmental Component	Local Assessment Area Boundary
Air Quality	The *Guidelines for Air Quality Dispersion Modelling in British Columbia* (BCMOE March 2008) recommends that Plant effects representing 10% of the ambient air quality objective for the criteria air contaminants should be captured within the modelling domain. For all criteria air contaminants, the CALPUFF air dispersion model that is recommended by the Environmental Protection Agency in the United States usually determines this threshold to be within a distance of 10 km distance from the centre of the Plant. Therefore the LAA for the air quality assessment is within a 10 km radius from the Project centre.

Valued Environmental Component	Local Assessment Area Boundary
GHG Management	CO_2 emissions will be estimated for the Plant during initial and final build-out phases. There will be no LAA for GHG Management. Rather, the assessment will consider CO_2 emissions associated with the Project in the context of both provincial and federal GHG emissions inventories.
Acoustic Environment	The *British Columbia Noise Control Best Practices Guideline* (OGC 2009) and Alberta *Directive 038 on Noise Control* (ERCB 2007) both recommend night-time sound levels from industrial facilities should not exceed 40 dBA at a distance of 1.5 km from the fenceline. To ensure acoustic emissions from the facility are fully characterized, the LAA for the assessment of sound quality has been established as 2 km from the fenceline.
Vegetation Resources	The B.C. Ministry of Forests has issued a variety of peer and technically reviewed extension notes addressing environmental issues in the Province's forests. Extension Note 21 reports that edge effects on soil temperature and moisture resulting from removal of forest cover can extend 60 – 120 m from a clear-cut edge. As a result, the LAA for vegetation resources includes the footprint of the Plant site plus a 120 m buffer surrounding the site to encompass potential edge effects.
Wildlife Resources	For wildlife resources the LAA includes the Plant site footprint plus a 1.5 km buffer surrounding the site to encompass the habitats potentially affected by disturbance from the Plant.
Ecological Health	The ecological health assessment will rely on baseline vegetation and wildlife studies to identify key species distributions. The baseline and project air quality assessments will also be used to characterize potential effects of criteria air contaminants (CACs) on local biota. The LAA will be based on the same spatial boundaries as for Air Quality.
Economic Environment	Employment and economy is a broad, regionally-influenced aspect of the human environment and affects areas of local government responsibility. As a result, the LAA for these VCs consists of the federal census tracts within the Northern Rockies Regional Municipality.
First Nations' Land Use and Interests	The LAA for FN land use and interest has been defined as a 5 km radius from the Plant area, consistent with the spatial extent of traditional use studies.
Land and Resource Use	The LAA spatial boundaries for land and resource use are the two traplines that intersect the Project footprint, TR0755T006 and TR0755T007. These tenures are chosen as they establish the broadest boundary for potential land use conflicts.
Infrastructure and Services	Infrastructure and services that could be affected by the Project include the Project footprint, the town of Fort Nelson and a corridor encompassing roads used to access the Project (i.e., Coles Lake/Gegut'o all weather road branching off of the Liard Highway/Hwy 77). As a result, the LAA for this VC is the corridor encompassing this infrastructure as well as Fort Nelson.
Archaeological and Heritage Resources	The LAA spatial boundaries for the archaeological and heritage resources assessment will be the footprint of the full Plant site, to account for ground disturbance during site preparation activities.
First Nations Heritage	The LAA for First Nations culture assessment will be the same as for First Nations' land use and interest.

Valued Environmental Component	Local Assessment Area Boundary
Healthy Living	The LAA for health effects will include recreation and health services that are proximate to people employed at the Plant site. This has been broadly defined to include facilities within a 3 hour driving distance (approximately 240 km) of the Plant site.
Human Health	The LAA for human health risk is the same as with air quality (10 km radius from Plant centre) usually determined by a distance where the Plant emissions effects are greater than or equal to 10% of ambient air quality objectives for the criteria air contaminants.
View sheds and Aesthetics	The LAA spatial boundaries for view sheds and aesthetics will be defined as the area within which the Plant will be visible from the perspective of an individual standing on the ground, up to a distance of 10 km from the Project site.
Incidents and Malfunctions	The spatial boundaries are specific to each incident or malfunction scenario and encompass the total area over which all VCs may be affected.

Table 4-3: Regional Assessment Area Boundaries

Valued Environmental Component	Regional Assessment Area Boundary
Air Quality	To encompass baseline air quality and air emissions from regional facilities that could interact with the Plant emissions effects, the RAA for the air quality assessment is established as a 25 km radius from Project centre. Air emissions from facilities greater than 25 km away are inherently recognized in the ambient air quality determined at representative monitoring stations.
GHG Management	There will be no RAA for GHG Management. Rather, the assessment will consider CO_2 emissions associated with the Project in the context of both provincial and federal GHG emissions inventories.
Acoustic Environment	To encompass sound emissions that may emanate from surrounding facilities and interact with those from the Plant, the RAA for the assessment of sound quality is a buffer that extends 4 km from the facility fence line.
Vegetation Resources	The proposed RAA for vegetation resources is the Lower Petitot River watershed, within which the Plant is located.
Wildlife Resources	The RAA for wildlife resources encompasses the ecological boundary for one of the indicator species that could be affected by the Plant. Because of their conservation status and concerns raised by the Ministry of Environment, the boundary of the Maxhamish boreal caribou herd has been used.
Ecological Health	The RAA spatial boundaries for ecological health include the overlap between RAAs defined for wildlife and air quality. This encompasses the area with the greatest potential for measurable cumulative effects on ecological health.
Archaeological and Heritage Resources	The RAA spatial boundaries for the archaeological and heritage resources assessment will be the same as those used in the Archaeological Impact Assessment (AIA) for the Project.

Valued Environmental Component	Regional Assessment Area Boundary
First Nations' Land Use and Interests	The RAA for the First Nations' land use and interests assessment includes the overlap between the RAAs defined for vegetation and air quality. This encompasses the areas with the greatest potential for a measurable cumulative effect on treaty rights.
First Nations Heritage	The RAA for First Nations' heritage will be the same as for First Nation's land use and interests. This is a broad area that encompasses other projects that may interact in a cumulative manner with the Project, upon First Nation's heritage.
Land and Resource Use	For the land and resource use, infrastructure and services, economic environment, healthy living, and view sheds and aesthetics VCs, the LAA boundaries are broad and encompass all areas where effects of the Project may overlap with those of other existing and known future activities. As a result, the RAA boundaries are the same as the LAA boundaries defined in Table 4-3.
Infrastructure and Services	
Economic Environment	
Healthy Living	
Viewsheds and Aesthetics	
Human Health Risk	The RAA for human health risk is the same as for air quality (25 km radius from centre of the Plant).
Incidents and Malfunctions	The spatial boundaries are specific to each incident or malfunction scenario and encompass the total area over which all VCs may be affected.

4.1.3 Temporal Boundaries

The purpose of the temporal boundary is to identify when an effect may occur in relation to specific Project phases and activities. This section of the Application will:

- Describe the temporal extent of the environmental assessment relative to the VCs for each of the following phases of the proposed Project: pre-construction; construction; operations; decommissioning and closure; and post-closure
- Describe any annual or seasonal variation related to VCs and biophysical constraints for all phases of the proposed Project (e.g., migration patterns/breeding patterns/freeze-thaw cycles).

Based on the current Project schedule, the temporal boundaries for the effects assessment for the first phase of the Project are:

- **Construction:** Q1 of 2013 through Q2 of 2014
- **Operation:** beginning in Q2 2014 (the Plant is designed to operate for a minimum of 25 years and is expected to extend well beyond that time frame)
- **Decommissioning:** approximately 12 month period at the end of the Plant life.

The construction period for the second and third phases of the Project will be similar in length as for the first phase (approximately 16 months). The phases will be built in accordance with market

demand for sales gas. It is estimated that phase 2 will be operational in 2018, and Phase 3 operational in 2021.

Since the life span of the Project is expected to exceed 25 years and is dependent on the regional supply of natural gas, information in the Application regarding the temporal boundary for decommissioning will be at a conceptual level only.

4.1.4 Administrative and Technical Boundaries

Where relevant, this section of the Application will identify the administrative and technical boundaries for the selected VCs. Administrative boundaries might include specific aspects of provincial and federal regulatory requirements, as well as regional planning initiatives that are relevant to the assessment of the Project's effects on a specific VC. Administrative boundaries are sometimes selected to establish spatial boundaries based on changes in regulatory requirements. Technical boundaries might include limitations in information, data analyses, and data interpretation relevant to a particular VC.

4.1.5 General Description of the Existing Environment

This section of the Application will provide an overview of the approach for developing the baseline description of the existing biophysical environment and economic, social, heritage and health setting of the proposed Project. More specific detailed summaries will be provided in each of the discipline-specific baseline summary sections.

Key elements of the approach for all disciplines will include:

- Existing reports and documents will be appended and/or referenced as appropriate
- Data collection, analysis and presentation will follow appropriate provincial or federal standards (e.g., Resource Information Standards Committee [RISC])
- Rationale will be provided for the selection of sampling sites and analytical parameters as appropriate
- Application will comment on the quality and reliability of these data sources and how they will be used to support the environmental assessment
- Application will consider traditional ecological knowledge (TEK) in addition to information collected through field studies, surveys, and other research methods.
- Field and laboratory methods will be described, along with any quality assurance and quality control measures applied.

4.1.6 Assessment of Potential Significant Adverse Effects Methods

This section of the Application will describe the general methods used to identify, describe, and evaluate the potential for Project-related effects, and the methods used to identify any potential significant effects of the Project.

The Application will assess whether the proposed Project will likely have significant adverse environmental, social, economic, heritage and health effects, taking into account the mitigation measures proposed in the Application.

For each VC under consideration, the Application will provide the following:

- Summary of relevant background information
- Identification of interactions with the biophysical and human environment
- Identification of potential effects of the proposed Project
- Identification of cumulative effects for VCs, where relevant
- Consideration of TEK, in addition to information collected through field studies, surveys, and other research methods
- Description of the proposed mitigation measures including those considered in the design of the proposed Project, including any additional measures, works, processes, or features that were not part of the basic features of the proposed Project but have been developed through the EA specifically to mitigate a potential effect
- Assessment of the potential for residual adverse effects, taking into account the mitigation measures proposed in the Application
- Assessment of whether any residual adverse effects, are predicted to be significant based on an evaluation of the direction, magnitude, geographic extent, frequency, duration, reversibility, context, probability and prediction confidence of the effect, assuming effective implementation of prescribed mitigation measures.

4.1.6.1 Interactions with the Biophysical and Human Environment

In this step, interactions between the Project, both in isolation and in combination with other existing or known future projects, and VCs are identified. Potential interactions between Project activities and these aspects of the biophysical and human environment will be ranked according to the potential for any one Project activity to interact with one or more of the selected VCs (see Table 4-4). The Project activities will be described in Section 2 of the Application (Project Description). The intent of this interaction table is to identify where the higher risk Project-VC interactions are expected to occur and focus the effects assessments on these potential interactions. Lower risk interactions will not be carried forward into the detailed effects assessment.

Table 4-4: Interaction of the Project with the Biophysical and Human Environment

Project Activities and Physical Works	Air Quality	Acoustic Environment	Vegetation Resources	Wildlife Resources	Ecological Health	Economic Environment	First Nations' Land Use and Interests	Land and Resource Use	Infrastructure and Services	Archaeological and Heritage Resources	First Nations Heritage	Healthy Living	Human Health	View sheds and Aesthetics	Incidents and Malfunctions
Construction															
Activity #1															
Activity #2															
Operations															
Activity #1															
Activity #2															
Decommissioning															
Activity #1															
Activity #2															
Other Projects and Activities (potential for cumulative effects)															
Activity #1															
Activity #2															

RANKING OF EACH INTERACTION WILL BE ASSIGNED AS FOLLOWS:

0 = No measurable interaction

1 = Nominal interaction occurs; however, based on past experience and professional judgment the interaction would not result in a significant environmental effect if no mitigation is applied; or interaction would not be significant due to application of codified environmental protection practices that are known to effectively mitigate the predicted environmental effects.

2 = Interaction could result in an effect of concern and the potential environmental effect is considered further in the assessment

The justification for assigning the rankings for each selected VC will be provided in the specific assessment section for the VC. Interactions ranked "1" (i.e., no significant environmental effect) are not discussed in further detail in the assessment. For example, vegetation management (e.g., brushing) around the perimeter fence line to the Plant during operation will alter potential wildlife habitat but not to a level that could have a significant effect on any local or regional wildlife populations.

In the "Other Projects and Activities" section of Table 4-4, potential cumulative interactions between the potential effects arising from the Project and known or anticipated effects from other past, present or announced projects within the VC RAA will be identified with a check-mark. Other projects that are either existing or reasonably foreseeable and that have effects that may overlap with the effects of the Project within the defined temporal and spatial boundaries will be considered further in the cumulative effects assessment.

4.1.6.2 Project Inclusion List

A list of projects that will be considered in the cumulative effects assessment will be included in the Application (Table 4-5). Existing projects and activities occurring within the described spatial and temporal boundaries will be identified based on their potential to interact with the Project's activities or components. The actual projects and activities included in the cumulative effects assessment depends on the extent of their expected environmental effects on each selected VC. Environmental effects of other projects will only be considered if it is reasonably foreseeable that they might affect a particular VC and there is enough information about the project to assess its effects.

With respect to future projects for consideration in the cumulative effects assessment, only those projects or activities that have been publicly announced (with a defined project execution period and where project details have been provided), are currently undergoing an environmental assessment, or are in a permitting process will be taken into account in determining the potential for cumulative effects. The cut-off for inclusion of new projects as part of the assessment will be based on when comments on the first draft of the AIR from the BCEAO Working Group, potentially affected First Nations, and any interested members of the public were received.

Table 4-5: Project Inclusion List

Project/Facility/Activity	Description
Existing forestry activity Canfor and MoF Timber Forest Sales	Existing and future cutblocks
Existing roads (i.e., paved, gravel, winter, and all weather)	Existing resource, forest service roads and permanent access roads, including Liard Highway/Hwy 77 and Coles Lake/Gegut'o all weather Road
Mineral Reserves and Claims	Mining reserves and claims could be potential future development sites
Well sites and small facilities	Typical well pad is approximately 120 m by 400 m, and includes a sand/water separator
QRCI's existing compressor station	Authorized and permitted by OGC
QRCI's existing pipelines	Raw gas gathering pipelines that will be tied to the Plant. As well, a 30 km 20-inch pipeline tied into the Spectra Energy pipeline system
Proposed NGTL Komie North Extension Project	Application to the National Energy Board filed in October 2011. To be constructed by NGTL. Komie North Section P Project currently proposed to extend south from the Plant site
Spectra Gas sales gas pipeline	May 3, 2011—Decision; CEAA Registry 11-01-61081
Other pipelines and linear developments including seismic lines	Existing and reasonably anticipated pipelines and seismic lines.

4.1.6.3 Assessment of Project-Specific Effects

This section will include the interactions between Project activities and selected VCs that are ranked as "2" in the interaction table (Table 4-5), and therefore carried forward into the detailed effects assessment. Interactions ranked "1" (no significant effect) or "0" (no measurable interaction) will not be discussed in further detail in this section.

4.1.7 Description of Potential Project Effects

The assessment of each potential effect begins with a description of the mechanisms whereby specific Project activities and actions could result in an environmental, economic, social, heritage, or health effect. The anticipated spatial and temporal extent of these changes (i.e., where and when an effect might occur) will also be described.

4.1.8 Mitigation of Project Effects

Mitigation is defined as changes in Project activities to reduce or eliminate potential adverse Project effects. These changes may be in the temporal (e.g., changing construction seasons) or spatial (e.g., adjusting site layout or positioning) aspects of the Project and/or the means in which the Project will be constructed, operated, or decommissioned. Mitigation can also include specialized measures such as species transplant and or timing considerations (i.e., adjusting schedules/activities).

Mitigation measures that would help reduce or eliminate an adverse environmental, economic, social, heritage, or health effect will be described, with an emphasis on how these measures would minimize the environmental effect. Where possible, the effectiveness of the proposed mitigation measure(s) will be expressed in terms of the expected change in the measurable parameter(s) for the effect.

This section will only describe measures that are in addition to mitigation already included in the Project design; mitigation incorporated in the Project design will be described in the Design Mitigation section of the Project Description (see Section 2.2.4.2 of this AIR).

4.1.9 Characterizing Residual Project Effects

This section will include a discussion of Project effects that are expected to remain following the application of mitigation measures (i.e., residual effects). Below are the criteria that will be used to characterize residual environmental, economic, social, heritage, and health effects. Where possible, these criteria will be described quantitatively. When residual effects cannot be characterized quantitatively, characterization will be completed using qualitative terms of which examples are provided in parentheses for each criterion below. Where qualitative terms are used, definitions will be provided.

- **Magnitude:** this refers to the magnitude or severity of effect. Low magnitude effects may have no impact, while high magnitude effects may have an impact

- **Geographical Extent:** this refers to the extent of change over the geographic area of the proposed Project. The geographic extent of effects can be local or regional. Local effects may have a lower impact than regional effects.
- **Duration and Frequency:** this refers to the length of time the effect lasts and how often the effect occurs. The duration of an effect can be short term or longer term. The frequency of an effect can be frequent or infrequent. Short term and/or infrequent effects may have a lower impact than long term and/or infrequent effects.
- **Reversibility:** this refers to the degree to which the effect is reversible. Effects can be reversible or permanent. Reversible effects may have lower impact than irreversible or permanent effects
- **Context:** this refers to the ability of the environment to accept change. For example, the effects of a project may have an impact if they occur in areas that are ecologically sensitive, with little resilience to imposed stresses.
- **Probability:** the likelihood that an adverse effect will occur.

Residual Project effects upon each selected VC will be presented in a summary table following the format of Table 4-6 below.

Table 4-6: Summary of Residual Project Environmental Effects

Project Phase	Proposed Mitigation Measures	Residual Effects Rating Criteria						Significance	Prediction Confidence	Recommended Follow-up and Monitoring
		Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Context	Probability			
Pre-construction										
Construction										
Operations										
Closure										
Post-closure										
Residual Project effect for all phases										
Pre-construction										
Construction										
Operations										
Closure										
Post-closure										

Project Phase	Proposed Mitigation Measures	Residual Effects Rating Criteria						Significance	Prediction Confidence	Recommended Follow-up and Monitoring
		Magnitude	Geographic Extent	Duration and Frequency	Reversibility	Context	Probability			
Residual Project environmental effect for all phases										
Pre-construction										
Construction										
Operations										
Closure										
Post-closure										
Combined residual Project effect for all phases										

4.1.9.1 Determination of Significance of Residual Effects

A determination of the significance of predicted residual Project effects will be made in this section of the Application. Where possible, established threshold criteria or management standards will be identified for each selected VC, beyond which a residual effect would be considered significant. Threshold criteria reflect the limits of an acceptable state for a VC based on scientific literature, resource management objectives, community standards, or ecological processes (e.g., desired states for wildlife habitats or populations). Management standards are government or industry regulations, objectives, or best management practices for physical aspects such as air quality, water quality, or effluent releases. Where management standards or threshold criteria do not exist, significance criteria will be defined and justifications for the criteria will be provided.

The determination of significance will include a discussion of the “prediction confidence” based on:

- Scientific certainty relative to quantifying or estimating the effect, including the quality and/or quantity of data and the understanding of the effect mechanisms
- Scientific certainty relative to the effectiveness of the proposed mitigation measures
- Professional judgement from past experience including industry-standard mitigation measures
- Input from regulatory stakeholders and First Nations.

Higher confidence in these variables produces greater confidence in the effect predictions, assessment of significance, and the selection of mitigation measures.

4.1.10 Assessment of Cumulative Effects

This section of the Application will describe the approach used for the cumulative effects assessment.

The cumulative effects assessment will consist of two phases; screening and assessment. Screening will be undertaken for all VCs assessed in the Application. Screening consists of determining whether all three of the following conditions are met for the environmental, economic, social, heritage, and health effects under consideration:

- The Project will result in a demonstrable and measurable residual effect on a component of the biophysical or human environment
- The Project-specific residual effect on that component will, or will be likely to, act in a cumulative fashion with the anticipated effects of other existing or future announced projects and activities in the study area (i.e., there is an overlap of known or anticipated effects)
- There is a reasonable expectation that the Project's contribution to the identified cumulative effects will affect the viability or sustainability of the VC.

A cumulative effects assessment for a particular VC will proceed past the screening only if all three screening conditions described above are met. The focus will be on the incremental impact directly attributable to the Project on the VC.

The cumulative effects assessment will first consider the baseline effects that have resulted or are resulting from other past physical works and activities. Thus the baseline used to measure cumulative effects incorporates the effects of previous development. The cumulative contribution of the residual Project effects will then be considered. Finally, the cumulative contribution of other known and announced projects and activities will be considered. Each discipline section will address cumulative impacts relative to its VC. The residual cumulative environmental or socio-economic effects will be characterized and evaluated using the same criteria and significance thresholds established for the VC.

5 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

5.1 Environmental Background

This section of the Application will include a description of the existing biophysical environment, including surrounding areas within the zone of potential influences of the Project.

Geophysical Environment

The proposed Plant will be located within the Fort Nelson Lowlands physiographic region, which is a subdivision of the Interior Plains. This area is characterized by low-relief topography, shale bedrock, and silt and clay-rich mineral deposits. Soils and the shale parent materials are easily eroded,

resulting in deep melt water channel systems. The landscape consists of an undulating surface dominated by wetlands, poorly drained soils, and slow flowing, meandering streams. Small lakes are abundant throughout the region.

Climate

The Fort Nelson region is characterized by a northern continental climate with long, very cold winters and short growing seasons. The mean annual daily temperature is -0.7°C. Temperatures range from 16.8°C in July to -21.2°C in January. Temperatures remain below 0°C from November to March and above 10°C from June to August. Monthly averaged daily maximum temperatures can exceed 20°C from June to August, decreasing to -17°C in January. In January monthly averaged daily minimum temperatures can fall below -25°C.

On average, snow cover is present from October through April. In cold years, soils can remain frozen year round. Annual precipitation averages 451.7 mm, with 71% falling as rain. Maximum daily rainfall is 80.5 mm recorded during August, but high intensity events have also been recorded in May and June.

Aquatic Environment

The major drainages in the region include the Liard River, and the Fort Nelson River and its major tributaries; the Fontas River, Sahtaneh River, and the Petitot River. The proposed Plant will be within the Lower Petitot River watershed which drains to the north. The Plant site is within one kilometre of Coles Lake and about 40 km from Maxhamish Lake. The proposed Plant site is relatively dry compared to its surroundings which are characterized by poorly drained wetlands (bogs and fens). An unnamed watercourse is within approximately 50 m of the proposed Plant site.

Vegetation

The proposed Plant site will fall within the Fort Nelson Boreal White and Black Spruce moist warm 2 (BWBSmw2) biogeoclimatic zone. This zone is characterized by mixed stands of trembling aspen, balsam poplar, white birch, white spruce, black spruce, lodgepole pine, and (rarely) balsam fir. Poorly drained wetlands (bogs and fens) are also common and include black spruce bogs characterized by an understory of sphagnum moss, Labrador tea, sweet gale, and scrub birch.

Wildlife

The proposed Plant location is located within the BWBS biogeoclimatic zone which supports a relatively diverse fauna. Large ungulates and carnivores are widespread throughout this area, including caribou, moose, deer, black bear, grizzly bear, wolves and coyotes. Small mammals, raptors, owls, cavity nesters, and waterfowl are also common. Wetlands, waterbodies, and watercourses support beaver, muskrat, mink, waterfowl and shorebirds. The proposed Plant site falls within the Maxhamish Caribou Range.

5.2 Air Quality

5.2.1 Introduction

This section of the Application will introduce the air quality assessment, describe the rationale for selecting air quality as a VC and identify linkages to other sections of the Application.

Interactions between the Project and ambient air quality are expected due to the air contaminant contributions to the receiving environment that will occur during the Project construction and operations phases. Air quality will refer to the ambient environment in the vicinity of the Project site. Air quality is proposed for assessment because of the importance to the environment, wildlife, human and ecological health.

5.2.2 Scope of Assessment

This section of the Application will describe the Project components to be assessed, and the approach used in the air quality assessment, including:

- Identification of measurable parameters for detailed assessment (e.g., nitrogen oxides, sulphur dioxide, particulate matter, hydrogen sulphide, carbon monoxide)
- Acid deposition potential
- Rationale for selection of measurable parameters (air contaminants regulated by the provincial government)
- Delineation of assessment area(s)
- Timeframes for Project phases
- Influence of consultation on issues scoping and the assessment.

The air quality assessment will focus on the emissions sources (routine and abnormal) associated with the Project.

The *Guidelines for Air Quality Dispersion Modeling in British Columbia* (BCMOE March 2008) recommends that Plant effects representing 10% of the ambient air quality objective for the criteria air contaminants should be captured within the modeling domain. For all criteria air contaminants, the USEPA-recommended CALPUFF air dispersion model usually determines this threshold to be within a distance of 10 km distance from the centre of the Plant. Therefore the LAA for the air quality assessment is within a 10 km radius from Project centre. The RAA boundary for the air quality assessment is established at 25 km from the Project centre.

The assessment will also define technical boundaries which include limitations in scientific information, data analyses, and interpretation. These limitations cannot be identified *a priori*, but instead will be defined through the assessment process.

5.2.3 Baseline Conditions

This section of the Application will provide the following information which would be used to characterize baseline conditions for relevant VCs:

- Regional Climate
- Ambient air quality
- Background air contaminant concentrations and their sources
- Present regional facilities and their emissions sources
- Sensitive and other appropriate receptors and their distance from the facility
- Methods used to estimate source emissions
- Traditional ecological or community knowledge, where available.

5.2.4 Effects Assessment

5.2.4.1 Effects Analysis Methods

This section of the Application will describe the specific approach and methods used to determine the Project effects on air quality, including criteria used for characterizing Project effects and determining effects significance. Project effects that are regarded as being potential effects of concern, as indicated by a score of "2" in the Project Interaction Table (Table 4-4) will be carried forward into the subsequent analysis.

5.2.4.2 Effects Assessment and Proposed Mitigation

This section of the Application will present an assessment of potential effects of the Project on air quality during representative phases of the Project. Project effects on air quality may occur during Plant construction, operations, and decommissioning. The measurable parameters used to assess Project effects are the B.C. and Canada regulatory ambient air quality objectives for SO_2, NO_2, CO, $PM_{2.5}$, and H_2S. Exceedances of these regulatory objectives are deemed to be significant. Mitigation measures designed to reduce or avoid predicted effects will be described, and any relevant management plans will be referenced.

5.2.5 Residual Effects and their Significance

Project residual effects will be characterized based on the magnitude, geographic extent, duration and frequency, reversibility, context, and probability of the potential effects, as outlined in Section 4.1.9. A summary of residual effects and their significance, based on Table 4-6 will be provided. Significance criteria ratings will be supported, where possible, through reference to threshold criteria, management standards and regulatory objectives. Where management standards or threshold criteria do not exist, significance criteria will be defined and justifications for the criteria will be provided.

5.2.6 Cumulative Effects

This section of the Application will identify the existing and known future projects that may affect the regional air quality. A description will include the:

- Methods and rationale used to identify these other developments
- Descriptions of any potential adverse effects to air quality resulting from these developments.

Residual cumulative effects will be characterized for the future cases and aggregated within the Project and baseline cases. The significance of predicted potential cumulative effects and the Project contribution to cumulative effects will then be determined using the methods outlined in Section 4.1.10.

Incremental mitigation or management measures designed to avoid or reduce cumulative effects will be described.

5.2.7 Conclusion

This section of the Application will include a conclusion regarding the potential residual effects of the Project on air quality and the significance of these effects.

5.3 Greenhouse Gas Management

The Application will quantify the anticipated monthly and annual CO_2 production the Plant would produce during the initial phase and also full build-out (i.e., for 150 MMcf/day and 600 MMcf/day of gas treatment, respectively) and describe the carbon management options currently being investigated which include venting, carbon capture and storage (CCS) involving downhole disposal, and/or CCS involving providing the CO_2 to a third party for use in enhanced oil recovery.

Preliminary analysis indicates that current CCS options may not be viable at this time due to a combination of geologic, technical and commercial considerations. The Application will describe potential methods for transport and sequestration of CO_2, and will identify cost and technical considerations that affect the feasibility of using CCS technologies at this time. QRCI will continue to investigate appropriate and practical options for GHG management, and The Project will be designed to be CCS ready. However, in the absence of a currently viable CCS option, the Project will be designed for the venting of CO_2. QCRI will participate in industry-led or industry-government initiatives to study and assess the feasibility of CCS in the Horn River Basin, as well as other solutions for addressing climate change concerns, such as through the use of carbon offsets.

The Application will discuss anticipated GHG emissions of the Project in relation to current provincial GHG emission levels and trends, as well as federal and provincial policies and targets for GHG reduction, such as British Columbia's Climate Action Plan. QRCI will work with provincial and federal regulatory bodies to ensure the Plant aligns with applicable guidelines and legislation.

5.4 Acoustic Environment

The Application will quantify acoustic emissions associated with construction and operation of the Plant. This information will be incorporated into the assessment of Project effects upon wildlife and human health.

Acoustic emissions within the region are mainly associated with oil and gas processing facilities and industrial facilities for the wood processing industry. Local acoustic emissions at the Project site are influenced by the existing compressor station located adjacent to the proposed Plant.

Fort Nelson, located approximately 110 km south of the Plant site, is the nearest continually inhabited residential community within B.C., while the hamlet of Ft. Liard is located about 70 km northwest of the proposed Plant, in the Northwest Territories. At the time of the assessment, any permanent or seasonal residences within 2 km of the Project boundary, such as cabins and camps, would be identified as sensitive receptors.

5.4.1 Scope of Assessment

The Plant location meets the definition of a remote site in accordance with the *British Columbia Noise Control Best Practices Guideline* and Alberta ERCB *Directive 038: Noise Control.* As a result, the LAA boundary will extend 2 km from the Project boundary (i.e., edge of the 860 m by 1,000 m Plant site). Noise modeling will be conducted for the operational phase of the Project in accordance with the *British Columbia Noise Control Best Practices Guideline* and Alberta ERCB *Directive 038: Noise Control*.

5.4.2 Baseline Conditions

Baseline conditions will be confirmed by conducting a continuous sound survey at the Project site (or closest noise sensitive receptor, if identified within the defined LAA boundaries). The method of measurement will be based on recommendations within the *British Columbia Noise Control Best Practices Guideline* (March 2009) and Alberta ERCB *Directive 038: Noise Control*. The assessment will be further informed through consultation with interested First Nations.

5.4.3 Effects Assessment

Acoustic emissions will be highly localized during the operation phase of the Project. Acoustic emissions will be generated by on-site sources such as plant processing and power generation.

Significant sources of noise will be described and acceptable sound levels will be calculated for the Project according to the procedures stipulated by the *British Columbia Noise Control Best Practices Guideline* and Alberta ERCB *Directive 038: Noise Control*. Operational noise level predictions will be made using Cadna/A or another proven model. Noise modeling will be conducted in accordance with the ISO 9613 standard (as recommended by the Alberta ERCB). Based on outcomes of the modeling, appropriate mitigation measures will be recommended, as required, to reduce noise levels.

The assessment of acoustic effects will not be undertaken as a stand-alone assessment. Rather, results of acoustic modeling will be incorporated into the effects assessments of potentially sensitive receptors including wildlife (Sub-section 5.6), Human Health (Section 9), and treaty tights (Section 14).

5.5 Vegetation Resources

5.5.1 Introduction

This section of the Application will introduce the vegetation resources assessment, describe the rationale for selecting vegetation resources as a VC and identify linkages to other sections of the Application (e.g., air quality, wildlife resources).

Interactions between the Plant and vegetation resources are anticipated. There will be interaction between the Project and vegetation due to removal of vegetation during project construction.

Vegetation resources are proposed for assessment because of their ecological, aesthetic, and recreational value and their importance to First Nations communities with interests in the Project area. Vegetation resources considered in this assessment will include rare vascular plant species as defined by SARA, COSEWIC and the B.C. Conservation Data Centre, rare ecological communities, traditional use plants identified through consultation with interested First Nations, old growth forests and wetlands.

5.5.2 Scope of Assessment

The vegetation assessment will focus on the planned areas of disturbance associated with the facility as identified in the vegetation resources assessment boundaries.

The LAA spatial boundaries for vegetation resources will include the Project footprint plus a 120 m buffer. This was chosen based on B.C. Ministry of Forests peer reviewed and technically reviewed extension notes (e.g., Note 21) which state that edge effects on soil temperature and moisture can extend 60 – 120 m from a clear-cut edge. The LAA will extend to 120 m beyond the Project footprint to conservatively assess the effects to vegetation resources.

The RAA spatial boundaries for the vegetation assessment will be the Lower Petitot River watershed. This was selected because the Project will lie within this watershed.

The assessment will also define technical boundaries which include limitations in scientific information, data analyses, and interpretation. These limitations cannot be identified *a priori*, but instead will be defined through the assessment process.

5.5.3 Baseline Conditions

This section of the Application will provide the following information that will be used to characterize the baseline conditions for the vegetation VC:

- Descriptions of ecosystem units identified in the terrestrial ecosystem mapping (TEM) completed for the Project, including wetlands
- Descriptions of rare ecological communities identified through TEM and fieldwork
- Identification of areas of old growth forest
- A summary of rare vascular plants identified through rare plant surveys and a query of the Conservation Data Centre
- Information on the presence of weeds in the Project area
- A summary of species identified by First Nations as being of cultural, spiritual, or traditional use importance including vegetation used as country food.

5.5.4 Effects Assessment

5.5.4.1 Effects Analysis Methods

This section of the Application will describe the specific approach and methods used to determine the Project effects on vegetation resources, including criteria used for characterizing Project effects and determining significance. Those Project effects that are regarded as being a potential effect of concern, as indicated by a score of “2” in the Project Interaction Table (Table 4-4) will be carried forward into this analysis.

5.5.4.2 Effects Assessment and Proposed Mitigation

This section of the Application will present an assessment of potential effects of the Project on vegetation resources during representative phases of the Project. Project effects on vegetation resources may occur during Plant construction, operations, and decommissioning. The following are examples of measurable parameters that may be used to assess Project effects to vegetation resource:

- Abundance and distribution of rare vascular plants
- Area of rare ecological communities
- Area of old growth forest
- Area of wetlands.

Mitigation measures designed to reduce or avoid predicted effects will be described, and any relevant management plans will be referenced.

5.5.5 Residual Effects and their Significance

Project residual effects will be characterized based on the magnitude, geographic extent, duration and frequency, reversibility, context, and probability of the potential effects, as outlined in Section 4.1.9

of the AIR. A summary of residual effects and their significance, based on Table 4-6 will be provided for the vegetation resources VC. Significance criteria ratings will be supported, where possible, through reference to threshold criteria, management standards and objectives. Where management standards or threshold criteria do not exist, significance criteria will be defined and justifications for the criteria will be provided.

5.5.6 Cumulative Effects

A cumulative effects screening will be completed for vegetation resources. The screening consists of determining whether all three of the following conditions would be met:

- The Project will result in a demonstrable and measurable adverse residual effect on a vegetation resource within the defined study area.
- The Project-specific residual effect on vegetation resources will, or will likely, act in a cumulative fashion with the anticipated effects of other known or future announced projects and activities in the study area (i.e., there will be an overlap of known or anticipated effects).
- There is a reasonable expectation that the Project's contribution to the identified cumulative impacts would affect the viability or sustainability of the vegetation resource.

The cumulative effects assessment for vegetation will proceed past the screening only if all three of the above screening conditions are met.

- Residual cumulative effects will be characterized for the future case and in terms of the Project contribution to overall effects. The significance of predicted potential cumulative effects (future case) and the Project contribution to cumulative effects will then be determined using the methods outlined in Section 4.1.10.
- Incremental mitigation or management measures designed to avoid or reduce cumulative effects will be described.

5.5.7 Conclusion

This section of the Application will include a conclusion regarding the potential residual effects of the Project on vegetation and the significance of these effects.

5.6 Wildlife Resources

5.6.1 Introduction

This section of the Application will introduce the wildlife resources assessment, describe the rationale for selecting wildlife resources as a VC and identify linkages to other sections of the Application (e.g., air quality and vegetation resources).

Interactions between the Plant and wildlife resources are anticipated. There will likely be direct and indirect interactions between the Project and wildlife due to vegetation removal during construction and noise levels during operation of the Plant.

Wildlife resources are proposed for assessment because of their ecological, aesthetic, and recreational value and their importance to First Nations communities with interests in the Project area. For the purposes of this assessment, wildlife resources refer to wildlife and their habitats potentially affected by the Project. Species to be considered for assessment include those that have special conservation status, were identified from the provincial red and blue lists, and species identified and agreed to through consultation with interested First Nations.

5.6.2 Scope of Assessment

This section of the Application will describe the Project components to be assessed, and the approach used in the wildlife resources assessment, including:

- Identification of key indicators or measurable parameters for detailed assessment
- Rationale for selection of key indicator species
- Delineation of assessment area(s)
- Timeframes for Project phases
- Influence of consultation on issues scoping and the assessment.

The wildlife resources assessment will focus on the areas of habitat alteration (through direct habitat loss and indirect disturbance) from the Plant, including the disturbance from noise associated with Project construction and operations.

A key indicator species approach will be used in the effects assessment. Indicator species are those species whose presence, absence, or relative well-being provide an indication of the overall health of its ecosystem. Indicator species for the assessment will be boreal caribou, grizzly bear, moose, fisher, American marten, and nesting birds, with a focus on warblers-at-risk. These indicator species were selected as their loss would result in a decrease in regional and/or provincial biodiversity. Caribou are a provincially red-listed species. Grizzly bear and fisher are provincially blue-listed. Warblers-at-risk include Connecticut Warbler (red-listed), Cape May Warbler (red-listed), Bay-breasted Warbler (red-listed), Black-throated Green Warbler (blue-listed), and Canada Warbler (blue-listed). Moose are an important game species for First Nations. Marten and fishers are indicator species for small fur-bearing carnivores.

Potential effects of noise from the Plant may extend up to 1.5 km from the Plant boundary and past studies have found that sensitive species, such as caribou or grizzly bear, may avoid industrial developments due to disturbance from noise. The LAA for the wildlife resources assessment will therefore be the footprint of the full Plant site plus a 1.5 km buffer surrounding the site to encompass the area potentially affected by disturbance from the Plant.

The RAA for wildlife resources encompasses the ecological boundary for one of the indicator species that could be affected by the Plant. Because of their conservation status and concerns raised by the Ministry of Environment, the boundary of the Maxhamish boreal caribou herd has been used for the RAA.

The assessment will also define technical boundaries which include limitations in scientific information, data analyses, and interpretation. These limitations cannot be identified *a priori*, but instead will be defined through the assessment process.

5.6.3 Baseline Conditions

This section of the Application will provide the following information that will be used to characterize baseline conditions for the wildlife resources VC:

- Summary of existing wildlife inventory and habitat use information for the Project area including information on the distribution and abundance of key indicator species and species groups, and information on movement patterns, travel corridors, and potential breeding areas
- Assessment of habitat availability within the LAA from habitat suitability modeling of key indicator species based on terrestrial ecosystem mapping (TEM)
- Summary of important wildlife habitats and features (e.g., raptor nests, dens, and mineral licks), identified Ungulate Winter Ranges, and Wildlife Habitat Areas
- Summary of the results of 2011 field studies, including winter track surveys, breeding bird surveys, wildlife habitat assessments, and incidental observations of wildlife or wildlife signs
- CDC element occurrence records
- A list of wildlife species identified on provincial (red- and blue-listed) and federal (COSEWIC and under the *Species at Risk Act*) lists of species of concern with the potential to occur in the assessment area
- A list of wildlife species of cultural, spiritual, or traditional use importance for First Nations (including any wild game used as country food) with potential to occur in the assessment area
- Any other traditional ecological or community knowledge, where available.

5.6.4 Effects Assessment

5.6.4.1 Effects Analysis Methods

This section of the Application will describe the specific approach and methods used to determine the Project effects on wildlife resources, including criteria used for characterizing Project effects and determining significance. Those Project effects that are regarded as being a potential effect of concern, as indicated by a score of “2” in the Project Interaction Table (Table 4-1) will be carried forward into this analysis.

5.6.4.2 Effects Assessment and Proposed Mitigation

This section of the Application will present an assessment of potential effects of the Project on wildlife resources during representative phases of the Project. Project effects on wildlife resources may occur during Plant construction, operations, and decommissioning. The following measurable parameters will be used to assess Project effects:

- Availability of preferred habitat
- Risk of mortality to wildlife based on habitat suitability, habitat use and relative abundance
- Presence of barriers to movement.

Mitigation measures designed to reduce or avoid predicted effects will be described, and any relevant management plans will be referenced.

5.6.5 Residual Effects and their Significance

Project residual effects will be characterized based on the magnitude, geographic extent, duration and frequency, reversibility, context, and probability of the potential effects, as outlined in Section 4.1.9 of the AIR. A summary of residual effects and their significance, based on Table 4-2 will be provided for the Wildlife VC. Significance criteria ratings will be supported, where possible, through reference to threshold criteria, management standards and objectives. Where management standards or threshold criteria do not exist, significance criteria will be defined and justifications for the criteria will be provided.

5.6.6 Cumulative Effects

This section of the Application will identify past, present or future projects that may affect wildlife resources. This section will also include the following:

- Methods and rationale used to identify other developments
- Descriptions of any other developments identified
- Descriptions of any potential adverse effects to wildlife resulting from these developments
- Residual cumulative effects will be characterized for the future case and in terms of the Project contribution to overall effects. The significance of predicted potential cumulative effects (future case) and the Project contribution to cumulative effects will then be determined using the methods outlined in Section 4.1.10
- Incremental mitigation or management measures designed to avoid or reduce cumulative effects will be described.

5.6.7 Conclusion

This section of the Application will include a conclusion regarding the potential residual effects of the Project on wildlife resources and the significance of these effects.

5.7 Ecological Health Assessment

5.7.1 Introduction

This section of the Application will describe the methods used to evaluate effects to ecological resources (i.e., wildlife and vegetation) from potential exposure to chemical hazards associated with

the Project. It will discuss the qualitative approach planned for the health assessment of vegetation and wildlife, and will identify linkages to other sections of the Application (e.g., air quality, vegetation, wildlife). Where appropriate, a risk assessment framework will be applied to evaluate potential hazards.

5.7.2 Scope of Assessment

This section of the Application will describe the Project components to be assessed, and the approach used in the assessment of ecological health, including:

- Information/data sources used
- Identification of measureable parameters for detailed assessment
- Rationale for selection of measureable parameters
- Delineation of assessment area(s)
- Timeframes for Project phases
- Influence of consultation on issues scoping and the assessment.

The ecological health assessment will rely on baseline vegetation and wildlife studies to identify key species distributions. The baseline and Project air quality assessments will also be used to characterize potential effects of criteria air contaminants (CACs) on local biota. The assessment will also examine potential chemical effects of herbicide use on ecological receptors.

5.7.3 Baseline Conditions

The baseline conditions for measureable parameters relevant to ecological health will be described in this section. Information will be obtained from any existing data sources and from air dispersion modeling.

5.7.4 Effects Assessment

5.7.4.1 Effects Analysis Methods

This section of the Application will describe the specific approach and methods used to determine the Project effects on ecological receptors, including criteria used for characterizing Project effects and determining their significance. Those Project effects that are regarded as being a potential effect of concern, as indicated by a score of “2” in the Project Interaction Table (Table 4-4) will be carried forward into this analysis.

5.7.4.2 Effects Assessment and Proposed Mitigation

This section of the Application will present an assessment of potential effects of the Project on ecological receptors during representative phases of the Project. Project effects on ecological health may occur during Plant construction, operations, and decommissioning. The following are examples of measureable parameters that may be used to assess Project effects on ecological health:

- Concentrations of CACs (e.g., nitrogen oxides, sulphur dioxide, particulate matter, hydrogen sulphide, carbon monoxide)

- Qualitative assessment of herbicide application
- Qualitative measurement of the potential for acid deposition from emissions of SO_2 and NO_x.

5.7.5 Residual Effects and their Significance

Project residual effects will be characterized based on the magnitude, geographic extent, duration and frequency, reversibility, context and probability of the potential effects, as outlined in Section 4.1.9 of the AIR. A summary of residual effects and their significance, based on Table 4-6 will be provided for the ecological health VC. Significance criteria ratings will be supported, where possible, through reference to threshold criteria, management standards and objectives. Where management standards or threshold criteria do not exist, significance criteria will be defined and justifications for the criteria will be provided.

Mitigation measures designed to reduce or avoid predicted effects will be described, and any relevant management plans will be referenced. Any follow up programs or monitoring measures that are recommended based on the ecological health assessment will also be presented.

5.7.6 Cumulative Effects

This section of the Application will identify past, present or future projects that may have chemical-related effects on ecological health.

5.7.7 Conclusion

This section of the Application will include a conclusion regarding the potential residual effects of the Project on ecological health and the significance of these effects.

5.8 Summary of Assessment of Potential Environmental Effects

The Application will provide a summary table of potential residual environmental effects of the Project (as per the format of Table 5-1 below).

Table 5-1: Summary of Residual Project Environmental Effects

Valued Components (Note Phase of Project)[1]	Potential Effects	Key Mitigation Measures	Significance Analysis of Residual Effects (Summary Statement)

NOTES:
[1] Construction Phase = C; Operation Phase = O; Closure Phase = CL; Decommissioning Phase = D

6 ASSESSMENT OF POTENTIAL ECONOMIC EFFECTS

6.1 Economic Background

This section will include a description of the economic environment of the Northern Rockies Regional Municipality (NRRM), in which the proposed Project will be located.

The energy sector is an important element in the economic stability of the NRRM. For the past 20 years the economy in the area has been largely based on the oil and gas and forestry sectors (though forestry activities have been declining). Residents in and around the Town of Fort Nelson and within the NRRM depend on these industries for employment and business opportunities. The economic assessment will be completed to examine economic effects of the proposed Project on individuals and families, First Nations, businesses, and local infrastructure.

6.2 Economic Environment

6.2.1 Introduction

This section of the Application will introduce the assessment of economic effects, describe the rationale for selecting economic conditions as a VC and identify links to other sections of the Application (e.g., social environment and First Nations).

Interactions between the Plant and the local and regional economies are anticipated. There will likely be both direct and indirect relationships between the Project and the regional and provincial economy resulting from procurement of goods and services for construction and operation of the Plant.

The economic environment is proposed for assessment because of its regional and provincial importance. For the purposes of this assessment, economic environment refers to the supply and demand of skilled and non-skilled employees, the income generated from direct employment, and regional and provincial tax revenues resulting from the Project. Additionally, the economic environment assessment will include indirect implications to the regional and provincial economy including indirect creation of employment and business opportunities in other economic sectors.

6.2.2 Scope of Assessment

This section of the Application will describe the Project components to be assessed, and the approach used in the assessment of economic effects, including:

- Identification of measurable parameters for detailed assessment
- Rationale for the selection of measurable parameters
- Delineation of assessment area(s)
- Timeframes for Project phases
- Influence of consultation on issues scoping and the assessment.

The assessment of economic effects will focus on the economic contribution of the Project to local and regional economies and economic aspects of overlap and interactions with other land users and tenures.

The LAA spatial boundaries for the assessment of the economic environment will be the Northern NRRM. It was selected as it encompasses all of the communities closest to the Project site that would have a high level of interest in the employment and economic benefits associated with the Project. The RAA spatial boundaries for the economic assessment will be the same as the LAA.

6.2.3 Baseline Conditions

The current characteristics of the economic environment will be described in this section. Information will be obtained from existing literature and other data sources, where available. Communication/interviews with representatives from appropriate government departments/agencies and other organizations (e.g., First Nations, local business organizations) will be carried out as necessary to fill data gaps.

This description will summarize:

- Current economic conditions of the region and local communities, including existing businesses and industry
- Key economic indicators and trends in the region in the absence of the Project
- Labour market, including employment/unemployment, current employers, available labour supply and level of education/skills/training of the labour force
- Supply of goods and services in the region.

6.2.4 Effects Assessment

6.2.4.1 Effects Analysis Methods

This section of the Application will describe the specific approach and methods used to determine the Project effects on the economic environment, including criteria used for characterizing Project effects and determining their significance. Those Project effects that are regarded as being a potential effect of concern, as indicated by a score of “2” in the Project Interaction Table (Table 4-4) will be carried forward into this analysis.

6.2.4.2 Effects Assessment and Mitigation Measures

This section of the Application will present an assessment of potential effects of the Project on the economic environment during representative phases of the Project. Project effects on the economic environment may occur during Plant construction, operations, and decommissioning. The following are examples of measurable parameters that may be used to assess Project effects on the economic environment:

- Regional employment (direct, indirect, induced)

- Procurement expenditures
- Revenues from taxation and royalties[3].

Mitigation measures designed to reduce or avoid predicted adverse effects will be described, and any relevant management plans will be referenced.

6.2.5 Residual Effects and their Significance

Project residual effects will be characterized based on the magnitude, geographic extent, duration and frequency, reversibility, context, and probability of the potential effects, as outlined in Section 4.1.9 of the AIR. A summary of residual effects and their significance, based on Table 4-6 will be provided for the economic VC. Significance criteria ratings will be supported, where possible, through reference to threshold criteria, management standards and objectives. Where management standards or threshold criteria do not exist, significance criteria will be defined and justifications for the criteria will be provided.

6.2.6 Cumulative Effects

This section of the Application will identify other past, present or future projects that may affect the economic environment in the RAA. This section will also include the following:

- Methods and rationale used to identify other developments
- Descriptions of any other developments identified
- Descriptions of any potential adverse effects to the economic environment resulting from these developments
- Residual cumulative effects will be characterized for the future case and in terms of the Project contribution to overall effects. The significance of predicted potential cumulative effects (future case) and the Project contribution to cumulative effects will then be determined using the methods outlined in Section 4.1.10.
- Incremental mitigation or management measures designed to avoid or reduce cumulative effects will be described.

6.2.7 Conclusion

This section of the Application will include a conclusion regarding the potential residual effects to the economic environment from the Project and the significance of these effects.

[3] In addition to taxes directly associated with the Project, such as property taxes, a royalty will be paid on the gas that will eventually be processed at the plant. As this royalty is based on raw gas volume calculated at the wellhead rather than sales gas volume calculated at the Plant it is considered an indirect economic benefit of the Project.

6.3 Summary of Assessment of Potential Economic Effects

The Application will provide a summary table of residual economic effects of the Project similar to the one used for residual environmental effects (Table 5-1).

7 ASSESSMENT OF POTENTIAL SOCIAL EFFECTS

7.1 Social Background

This section of the Application will include a description of the social environment of the NRRM, in which the proposed Plant will be located.

The Fort Nelson town-site is the only large population center in the municipality. According to the 2006 Federal census, the population size of the region (including the Northern Rockies Regional district and Fort Nelson) was 6,147. First Nations communities comprised 18% of the population.

7.2 Local and Regional Social Conditions

7.2.1 Introduction

This section of the Application will introduce the assessment of social effects, describe the rationale for selecting social conditions as a VC and identify linkages to other sections of the Application (e.g. economic effects, and First Nations).

Interactions between the Plant and the social environment are anticipated. There will likely be direct and indirect interactions between the Project and social environment due to the increase in temporary workers required during construction and the land use requirements of the Project.

The social environment is proposed for assessment because of the potential increase in demand of local infrastructure and services within the NRRM; and because the Project has the potential to affect current and future land and resource users in the vicinity of the Project. For the purposes of this assessment, social environment will encompass land and resource use and infrastructure and services. Land and resource use will refer to current and future proposed occupation and use of lands adjacent to the Plant (e.g., timber, oil and gas, trapline, guide outfitting, hunting). Infrastructure and services will focus on the infrastructure and services likely to have direct and indirect demands resulting from the Project (e.g., housing, accommodations, transportation, and municipal services).

The assessment will focus on communities in the region where infrastructure demands may increase either directly or indirectly because of the Project and Project personnel. Infrastructure and services related to housing, accommodations, transportation, education, emergency, social, recreational and other municipal services and infrastructure will be considered.

Infrastructure and services that could be affected by the Project include the Coles Lake/Gegut'o all weather road, the Liard Highway/Highway 77 between the intersection with the Coles Lake/Gegut'o all

weather road and the town-site of Fort Nelson, camps, and municipal services in the Fort Nelson town-site (e.g., Fort Nelson airport). As a result, the LAA for this VC will be the corridor encompassing this infrastructure.

Land and resource use is defined as current and future proposed occupation and use of the lands adjacent to the proposed Plant, and any land adjacent to off-site areas, such as marshaling yards, directly related to the Project.

The land and resource tenures in the vicinity of the Plant include timber, oil and gas, and traplines. Of these trapline tenures, TR0755T006 and TR0755T007 establish the broadest boundary for potential conflicts with land and resource use; therefore these tenures will be used as the LAA for this VC.

The assessment will provide a separate summary of baseline conditions and analysis of potential Project effects upon the socio-economic condition of communities with treaty rights and interests in the Project area. This information will be included in Sections 12, 13, and 14 of the Application.

7.2.2 Scope of Assessment

This section of the Application will describe the Project components to be assessed, and the approach used in the assessment of social effects, including:

- Identification of measurable parameters for detailed assessment
- Rationale for selection of measurable parameters
- Delineation of assessment area(s)
- Timeframes for Project phases
- Influence of consultation on issues scoping and the assessment.

The assessment of social effects will focus on issues associated with housing availability, local participation in employment, contracting and business opportunities, social aspects of changes in land use and tenure, and local population changes due to workers relocating to the area.

The LAA spatial boundaries for infrastructure and services will be the Project footprint, the town of Fort Nelson and a corridor encompassing roads used to access the Project (i.e., Coles Lake/Gegut'o all weather road branching off of the Liard Highway/Hwy 77). This area was chosen as the LAA because it will be the most likely to experience effects from Project activities.

The LAA spatial boundaries for land and resource use will be the two traplines that intersect the Project footprint, TR0755T006 and TR0755T007. These tenures were chosen for the LAA because they establish the broadest boundary for potential land use conflicts.

The RAA spatial boundaries for both infrastructure and services and land and resource will be the same as the LAA boundaries.

The assessment will also define technical boundaries which include limitations in scientific information, data analyses, and interpretation. These limitations cannot be identified *a priori*, but instead will be defined through the assessment process.

7.2.3 Baseline Conditions

This section of the Application will describe the approach and methods used to collect baseline social information (e.g., demographic data, housing information) required to support the assessment, and will identify the sources of this information. It will characterize baseline conditions, and will include information relating to:

- Demographic characteristics
- Regional governance
- Infrastructure and services
- Housing and accommodations
- Local health characteristics and services.

7.2.3.1 Infrastructure and Services

Within the baseline section of the infrastructure and services portion of the Application, a description of the existing infrastructure and services in nearby communities and within the region will be included. Infrastructure and services will be described using existing literature and other data sources, where appropriate. Discussions with representatives from appropriate government departments/agencies (municipal and provincial) and other organizations (e.g., First Nations and community organizations) will be completed as required.

Current community and regional baseline conditions will be collected regarding housing, accommodations, education, emergency, social, recreational and other municipal services and infrastructure.

Within the baseline section of the traffic and transportation portion of the Application, a description of the existing road network and use estimates, along the principal access routes to the Project area will be provided. The baseline will also describe other transportation modes in the NRRM, which may be affected by the Project. Information will be developed from secondary data, and discussions with appropriate government agencies and other organizations as appropriate.

7.2.3.2 Land and Resource Use

Baseline land and resource use near the Plant site will be described. In order to evaluate the potential effects on land and resource use, the following would be included:

- Requirements for Crown land
- Current land use tenures and activity levels within the land and resource LAA.

7.2.4 Effects Assessment

7.2.4.1 Effects Analysis Methods

This section of the Application will describe the specific approach and methods used to determine the Project effects on the social environment, including criteria used for characterizing Project effects and determining their significance. Those Project effects that are regarded as being a potential effect of concern, as indicated by a score of "2" in the Project Interaction Table (Table 4-1) will be carried forward into this analysis.

7.2.4.2 Effects Assessment and Proposed Mitigation

This section of the Application will present an assessment of potential effects of the Project on the social environment during representative phases of the Project. Project effects on the social environment may occur during Plant construction, operations, and decommissioning. The following are examples of measurable parameters that may be used to assess Project effects on the social environment:

- Road traffic volume and use patterns
- Emergency services use
- Area of land physically lost for trapping activities
- Area of land physically lost for current and future timber harvesting
- Area of land potentially affected due to increased noise.

Mitigation measures designed to reduce or avoid predicted effects will be described, and any relevant management plans will be referenced.

7.2.5 Residual Effects and their Significance

Project residual effects will be characterized based on the magnitude, geographic extent, duration and frequency, reversibility, context, and probability of the potential effects, as outlined in Section 4.1.9 of the AIR. A summary of residual effects and their significance, based on Table 4-2 will be provided for the social VC. Significance criteria ratings will be supported, where possible, through reference to threshold criteria, management standards and objectives. Where management standards or threshold criteria do not exist, significance criteria will be defined and justifications for the criteria will be provided.

7.2.6 Cumulative Effects

This section of the Application will identify other past, present or future projects that may affect the social environment in the RAA. This section will also include the following:

- Methods and rationale used to identify other developments
- Descriptions of any other developments identified

- Descriptions of any potential adverse effects to the social environment resulting from these developments
- Residual cumulative effects will be characterized for the future case and in terms of the Project contribution to overall effects. The significance of predicted potential cumulative effects (future case) and the Project contribution to cumulative effects will then be determined using the methods outlined in Section 4.1.10
- Incremental mitigation or management measures designed to avoid or reduce cumulative effects will be described.

7.2.7 Conclusion

This section of the Application will include a conclusion regarding the potential residual effects of the Project on the social environment and the significance of these effects.

7.3 Summary of Assessment of Potential Social Effects

The Application will provide a summary table of residual social effects of the Project similar to the one used for residual environmental effects (Table 5-1).

8 ASSESSMENT OF POTENTIAL HERITAGE EFFECTS

8.1 Archaeological and Heritage Background

This section of the Application will provide the archaeological background of the NRRM, in which the proposed Plant will be located. It will include a description of ethnohistory and ethnography, as well as discussion of general archaeological potential and any significant findings in the vicinity of the proposed Plant.

8.2 Archaeological and Heritage Resources

8.2.1 Introduction

This section of the Application will introduce the assessment of potential archaeological and heritage effects, describe the rationale for selecting heritage resources as a VC, and identify linkages to other sections of the Application (e.g., social environment and First Nations).

Interactions between the Plant and archaeological and heritage resources are anticipated. Direct and indirect interactions between the Project and archaeological and heritage resources are anticipated due to site preparation activities during Project construction.

Archaeological and heritage resources are proposed for assessment because of their historical, cultural, aesthetic, scientific and/or educational value to British Columbia, surrounding communities, and aboriginal peoples. Archaeological and heritage resources are also protected under the *Heritage Conservation Act* (HCA). For the purposes of this assessment, archeological and heritage resources refer to heritage objects and sites identified during the Project Archaeological Impact Assessment (AIA) and through consultation with interested First Nations.

8.2.2 Scope of Assessment

This section of the Application will describe the Project components to be assessed, and the approach used in the assessment of heritage effects. Because this section of the Application will be focused specifically on archaeological resources, the scope of the assessment will reflect the requirements of the AIA as required by the HCA.

The archaeological and heritage resources assessment will focus on the areas of direct and indirect disturbance from the Plant, including the disturbance from site preparation during construction.

The LAA spatial boundaries for the archaeological and heritage resources assessment will be the footprint of the full Plant site to account for the ground disturbance during site preparation activities.

The RAA spatial boundaries for the archaeological and heritage resources assessment will be the same as those used in the AIA for the Project.

The assessment will also define technical boundaries which include limitations in scientific information, data analyses, and interpretation. These limitations cannot be identified *a priori*, but instead will be defined through the assessment process.

8.2.3 Baseline Conditions

This section of the Application will provide the following information that would be used to characterize the baseline conditions for archaeological and heritage resources:

- Information on the location and nature of recorded archaeological sites in the proposed Plant area will be obtained through desktop and field studies. The desktop sources include:
    - Remote Access to Archaeological Data (RAAD) online application
    - GIS-based archaeological potential maps completed for the Fort Nelson area by Millennia Research
    - Orthophotos
    - LiDAR
    - Previous local archaeological assessments.
- These sources, combined with extensive experience and consultation in the area, will be used to evaluate archaeological potential at the proposed Plant site to determine where archaeological inventory and impact assessment may be required.

- Detailed archaeological field work has been carried out in 2011 at the Plant site and in the immediately surrounding area as part of the EA activities, in accordance with the British Columbia *Archaeological Impact Assessment Guidelines*, and under a Heritage Inspection Permit issued by the B.C. Archaeology Branch.

8.2.4 Effects Assessment

8.2.4.1 Effects Analysis Methods

This section of the Application will describe the specific approach and methods used to determine the Project effects on archaeological and heritage resources, including criteria used for characterizing Project effects and determining their significance. Those Project effects that are regarded as being a potential effect of concern, as indicated by a score of "2" in the Project Interaction Table (Table 4-4), will be carried forward into this analysis.

8.2.4.2 Effects Assessment and Proposed Mitigation

This section of the Application will present an assessment of potential effects of the Project on archaeological and heritage resources in the AIA during representative phases of the Project. Project effects on archaeological and heritage resources may occur during Plant construction, operations, and decommissioning. The following measurable parameters will be used to assess Project effects:

- Potential loss or alteration of heritage sites identified in the AIA.

Mitigation measures designed to reduce or avoid predicted effects will be described, and any relevant management plans will be referenced.

8.2.5 Residual Effects and their Significance

Project residual effects will be characterized based on the magnitude, geographic extent, duration and frequency, reversibility, context, and probability of the potential effects, as outlined in Section 4.1.9 of the AIR. A summary of residual effects and their significance, based on Table 4-6 will be provided for the archaeological and heritage resources VC. Significance criteria ratings will be supported, where possible, through reference to threshold criteria, management standards and objectives. Where management standards or threshold criteria do not exist, significance criteria will be defined and justifications for the criteria will be provided.

8.2.6 Cumulative Effects

This section of the Application will identify past, present or future projects that may affect archaeological and heritage resources in the RAA. This section will also include the following:

- Methods and rationale used to identify other developments
- Descriptions of any other developments identified
- Descriptions of any potential adverse effects to archaeology and heritage resources resulting from these developments

- Residual cumulative effects will be characterized for the future case and in terms of the Project contribution to overall effects. The significance of predicted potential cumulative effects (future case) and the Project contribution to cumulative effects will then be determined using the methods outlined in Section 4.1.10.
- Incremental mitigation or management measures designed to avoid or reduce cumulative effects will be described.

8.2.7 Conclusion

This section of the Application will include a conclusion regarding the potential residual effects of the Project on archaeological and heritage resources and the significance of those effects.

8.3 Summary of Assessment of Potential Heritage Effects

The Application will provide a summary table of residual heritage effects of the Project similar to the one used for residual environmental effects (Table 5-1).

9 ASSESSMENT OF POTENTIAL HEALTH EFFECTS

9.1 Health Background

This section of the Application will provide the health background of the NRRM, in which the proposed Plant will be located. It will include a summary of community health conditions and recreational opportunities in the NRRM.

9.2 Human Health and Healthy Living

9.2.1 Introduction

This section of the Application will introduce the assessment of potential health effects, describe the rationale for selecting health conditions as a VC and identify linkages to other sections of the Application (e.g. air quality, wildlife, ecological health, and social).

There will likely be both direct and indirect relationships between the Project and human health due to the atmospheric emissions expected during Project construction and operation. Direct and indirect relationships between the Project and healthy living are expected due to the expected increase in temporary employees and the potential increase in demand for municipal and health services in the region (i.e., recreational).

Human health is proposed for assessment because of its importance to local and regional populations. Healthy living is proposed for assessment due to the importance of recreational and health services to the communities living within the NRRM. Potential effects on worker health will not

be considered in the Application as this is regulated by the Province of British Columbia's *Occupational Health and Safety Regulation*.

9.2.2 Scope of Assessment

This section of the Application will describe the Project components to be assessed, and the approach used in the assessment of human health effects, including:

- Identification of measurable parameters for detailed assessment
- Rationale for selection of measurable parameters
- Delineation of assessment area(s)
- Timeframes for Project phases
- Influence of consultation on issues scoping and the assessment.

The assessment of effects will focus on issues associated with worker safety and health, recreational or aesthetic features, levels of physical activities in the region, and other features or indicators of community health.

The LAA spatial boundaries for the assessment of effects on human health will be the same as for the air quality assessment (10 km radius from Plant centre) which is set at 10% of ambient air quality objectives for the Plant emissions. Ambient air quality objectives are conservatively set to protect human health and the environment. They are established based on exposure testing and epidemiological studies and incorporate a safety factor to ensure people and sensitive environmental receptors are protected—even if there are synergistic effects of multiple exposures. As the LAA is established at 10% of the ambient air quality objectives, it is conservative and represents a ten-fold increase in the safety factor used in development of the objectives. The RAA spatial boundaries for human and ecological health are also the same as for air quality (25 km radius from centre of the Plant).

The LAA for healthy living will include recreation and health services that are proximate to people employed at the Plant site. This has been broadly defined to include facilities within a 3-hour driving distance (approximately 240 km) of the Plant site.

The potential for human health effects from chemicals associated with the Project (i.e., air emissions, herbicide use) will also be addressed, analogous to the assessment of ecological health in Section 5.5. Where appropriate, a risk assessment framework will be used to evaluate potential hazards.

The assessment areas for incidents and malfunctions will be analogous to those of the valued components that could be affected.

The assessment will also define technical boundaries which include limitations in scientific information, data analyses, and interpretation. These limitations cannot be identified *a priori,* but instead will be defined through the assessment process.

9.2.3 Baseline Conditions

The baseline conditions for measurable parameters relevant to human health will be described in this section. Information will be obtained from literature, existing data sources, and air dispersion modelling. Where necessary, communication/interviews with representatives from the B.C. Ministry of Environment and Ministry of Health will be carried out to fill data gaps.

9.2.3.1 Visual Effects and Aesthetics

Relevant land use plans will be reviewed to identify any relevant visual quality objectives within the Project Area. QRCI is assessing whether LiDAR data could be used to create a three dimensional rendering of the area, in which the Plant structures could be super-imposed. This would allow for a qualitative assessment of visual effects of the Plant from a variety of different viewpoints. This information would be presented during consultations. Any further analysis required as a result of the visual rendering will be conducted in accordance with MOFR (2001) Visual Quality Guidelines.

9.2.4 Effects Assessment

9.2.4.1 Effects Analysis Methods

This section of the Application will describe the specific approach and methods used to determine the Project effects on human health and healthy living, including criteria used for characterizing Project effects and determining their significance. Those Project effects that are regarded as being a potential effect of concern, as indicated by a score of “2” in the Project Interaction Table (Table 4-4), will be carried forward into this analysis.

9.2.4.2 Effects Assessment and Proposed Mitigation

This section of the Application will present an assessment of potential effects of the Project on human health and healthy living during representative phases of the Project. Project effects on human health and healthy living may occur during Plant construction, operations, and decommissioning. The following are examples of measurable parameters that may be used to assess Project effects on human health:

- Concentrations of CACs (e.g., nitrogen oxides, sulphur dioxide, particulate matter, hydrogen sulphide, carbon monoxide)
- Qualitative assessment of herbicide application
- Qualitative measurement of the potential for acid deposition from emissions of SO_2 and NO_x
- Change in recreational opportunities
- Change in visual quality.

Mitigation measures designed to reduce or avoid predicted effects will be described, and any relevant management plans will be referenced.

9.2.5 Residual Effects and their Significance

Project residual effects will be characterized based on the magnitude, geographic extent, duration and frequency, reversibility, context, and probability of the potential effects, as outlined in Section 4.1.9 of the AIR. A summary of residual effects and their significance, based on Table 4-6 will be provided for the human health and healthy living VC. Significance criteria ratings will be supported, where possible, through reference to threshold criteria, management standards and objectives. Where management standards or threshold criteria do not exist, significance criteria will be defined and justifications for the criteria will be provided.

9.2.6 Cumulative Effects

This section of the Application will identify past, present or future projects that may affect human health and healthy living in the RAA. This section will also include the following:

- Methods and rationale used to identify other developments
- Descriptions of any other developments identified
- Descriptions of any potential adverse effects to human health and healthy living resulting from these developments
- Residual cumulative effects will be characterized for the future case and in terms of the Project contribution to overall effects. The significance of predicted potential cumulative effects (future case) and the Project contribution to cumulative effects will then be determined using the methods outlined in Section 4.1.10
- Incremental mitigation or management measures designed to avoid or reduce cumulative effects will be described.

9.2.7 Incidents and Malfunctions

This section provides a summary of potential incidents and malfunctions, as well as the potential effect of these incidents on the environment and/or human health. Also identified are procedures and mitigations that will minimize or eliminate the potential for incidents and malfunctions to occur. The residual environmental effects and their significance are presented in the context of these well-established prevention and mitigation measures.

For this assessment, an “incident” is defined as an unexpected occurrence or unintended action that can result in an adverse environmental or human health effect and a “malfunction” is defined as the failure of a piece of equipment, a device, or a system to function normally that can result in an adverse environmental or human health effect. The assessment of incidents and malfunctions:

- Considers the potential incidents and malfunctions that may occur during Project construction, commissioning, operations, and decommissioning
- Considers the likelihood and circumstances under which these events could occur

- Identifies mitigation measures for avoiding or limiting the effects of incidents and malfunctions
- Determines the residual effects that may result and the significance of those residual effects.

Spatial boundaries are specific to each incident or malfunction scenario and encompass the total area over which all VCs may be affected. Criteria used to assess the significance of effects are specific to each VC that may potentially be affected. These criteria are defined in the assessment of potential Project effects for each VC. The residual environmental effects of an incident or malfunction scenario are considered to be significant if the likely effects on any individual VCs assessed under that scenario are determined to be significant.

9.2.8 Conclusion

This section of the Application will include a conclusion regarding the potential residual effects of the Project on human health and healthy living and the significance of these effects.

9.3 Summary of Assessment of Potential Health Effects

The Application will provide a summary table of residual health effects of the Project similar to the one used for residual environmental effects (Table 5-1).

10 SUMMARY OF PROPOSED ENVIRONMENTAL AND OPERATIONAL MANAGEMENT PLANS

This section of the Application will present the preliminary Environmental Management Plans (EMPs) for all phases of the proposed Project, which describe the practices and procedures that would be systematically applied during all phases of the Project to manage identified potential effects. EMPs will be developed based on the results of the assessment, including consultation, and would be discussed within relevant sections of the Application.

Some examples of EMPs that may be developed for the Project include, but are not limited to:

- Surface Erosion and Sediment Control Plan
- Elemental sulphur storage, loading and transportation management plan
- Solid Waste Management Plan (including camp solid waste management, recycling and disposal)
- Air Quality Monitoring and Dust Control Plan
- Wildlife Protection and Monitoring Plan
- Caribou Mitigation and Monitoring Plan
- Invasive Plant Management Plan

- Archaeological Sites Management Plan
- Reclamation Plan
- Emergency Response Plan
- Hazardous Waste Management Plan.

Additional EMPs may be added as they are identified and developed.

11 COMPLIANCE REPORTING

This section of the Application will provide a clear description of the reporting structure as identified within the EMPs, monitoring plans and commitments, including monitoring required for all permits, authorizations and licenses.

PART C—FIRST NATIONS INFORMATION REQUIREMENTS

12 BACKGROUND INFORMATION

This section of the Application will:

- Identify the First Nations named in the section 11 Order and include maps of their respective traditional territories, if available
- Provide background information for each of the First Nations including, but not limited to, ethnography, language, land use setting and planning, governance, economy, health condition and reserves.

The Project will be located within the boundaries of Treaty 8. Treaty 8 establishes constitutionally-protected rights for the signatory First Nations. As the Project will have the potential to adversely affect treaty rights and will require approvals from the Province of British Columbia, there is an obligation to determine whether the construction, operation, or decommissioning of the Project will adversely affect the exercise of treaty rights through a process of meaningful consultation and, if required, accommodation of the rights and interests of the affected First Nations. Therefore the potential Project effects on First Nations' land use and interests will be considered in the Application.

13 TREATY RIGHTS

The objectives of consultation include providing information on the Project to interested First Nations communities, identifying and discussing potential Project interactions with First Nations' land and resource use, identifying opportunities for First Nations communities to engage with the proponent on the Project, and identifying First Nations' issues of concern and interest. An important objective of First Nation consultation efforts is to examine how the Plant may impact the exercise of Treaty 8 rights, and to identify strategies that could be used to avoid or mitigate such impacts. QRCI recognizes that some First Nations outside of Treaty 8 may have aboriginal use in the Project area, such as the ADK.

As will be set out in more detail in the Consultation Plan, QRCI will report on and respectfully consider all assertions of First Nation's treaty rights.

This section of the Application will be based on all available information acquired during the pre-Application phase, prior to entering the EA process, and during the EA process prior to the Application, and would:

- Identify past, present and anticipated future uses of the proposed Project area by the Aboriginal groups
- Identify the potential effects of the proposed Project on First Nations heritage

- Identify the potential effects of the proposed Project on the use and availability of land and resources for the purpose of exercising treaty rights (in the case of First Nations that are adherents to Treaty No. 8)
- Incorporate appropriate measurable parameters for addressing effects on First Nations
- Describe mitigation measures to avoid or reduce effects of the Project on First Nations rights
- Incorporate both scientific and traditional knowledge in the assessment of potential effects of the Project and in the development of mitigation measures.

The spatial boundaries for the assessment will reflect, in part, First Nations advice on the exercise of treaty rights. The Consultation Plan will set out opportunities for First Nations to articulate the geographic scope of their treaty rights.

The temporal boundaries for the assessment will encompass historical, current and intended or future uses of land for the exercise of treaty rights.

The assessment of Project effects on treaty rights will be conducted in accordance with the methods described in Section 4 of this AIR, with the exception that the Application will not include an assessment of the significance of residual project effects or cumulative effects on Treaty Rights. The assessment will incorporate traditional knowledge and traditional land use in the development of assessment criteria and mitigation options, as outlined in Sub-section 13.1.

Over the course of consultation during the pre-Application and Application review periods it may become apparent that measures to accommodate First Nations' treaty rights are necessary. QRCI, BCEAO and potentially affected First Nations will consult further on accommodation measures, if necessary.

13.1 Traditional Knowledge and Traditional Use

Traditional Knowledge (TK) and Traditional Land Use (TLU) will be incorporated into the assessment of effects of the Project on biophysical components as well as on treaty rights and First Nations interests. TLU information will inform the assessment with regards to:

- Traditional activities that relate to treaty rights, such as hunting, fishing, and trapping
- Locations of harvestable natural resources
- Animal presence, movement patterns, and habitat use
- Locations of human receptors and their spatial relationship to the Project
- Human habitation sites, and sites of archaeological and heritage significance
- Travel and movement patterns
- Ceremonial and spiritual values
- Activities of First Nations peoples within the Project vicinity and surrounding areas.

This information will add to the data collected through scientific studies, and will enable QRCI to incorporate the community's perspective in the identification of Project effects and development of mitigation options.

TK/TLU will also be used in the identification of mitigation options, both in regards to potential biophysical effects of the Project and in regards to potential effects of the Project on treaty rights. Examples of where TK/TLU can be used in the development of mitigation measures include:

- Timing of construction to avoid wildlife concerns (e.g., migrations, rutting, birthing, nesting, etc.)
- Relocating key Project features if possible to avoid sensitive wildlife areas, sensitive vegetation areas, cultural areas and sacred areas
- Locating areas to be fenced to protect wildlife
- Determining areas for manual vegetation control to protect culturally and ecologically important plants (e.g., berries, food plants, medicines, sacred plants).

14 OTHER ABORIGINAL INTERESTS

This section of the Application will be based on all available information acquired during the pre-Application phase, prior to entering the EA process, and during the EA process prior to the Application, and will:

- Identify First Nations' interests with respect to potential social, economic, environmental, heritage and health effects of the proposed Project nor previously brought forward in Section 13
- Identify First Nations' heritage values including subsistence, habitation, ceremonial and spiritual, wildlife and ecological, transportation and landscape values
- Describe how these interests have been addressed
- Assess effects on those First Nations' interests not assessed in Section 13 in accordance with methods described in Section 4 and Sub-section 13.1 of this AIR.

15 ABORIGINAL CONSULTATION

The Application will set out a consultation program for First Nations for the Application review stage including measures taken to identify and document First Nation concerns regarding the proposed Project and attempts to mitigate or resolve concerns that are related to impacts on treaty rights. This section of the Application will:

- Provide a summary of past and planned consultation activities with First Nations
- Provide a summary of issues QRCI has been made aware of, and responses to these issues. Issues will be summarized in a tracking table

- QRCI has initiated consultations with the First Nations communities listed in Table 15-1, whose treaty rights may be affected by the proposed Plant. These consultations have included meetings, telephone discussions, and distribution of Project Information.

Table 15-1: First Nations Consulted Regarding the Project

First Nation	Land Office Contact	Chief
Fort Nelson FN	Lana Lowe	Chief Kathi Dickie
Acho Dene Koe FN	Gilbert Capot Blanc	Chief Harry Deneron
Prophet River FN	Shirley Tsakoza	Chief Lynette Tsakoza
West Moberly FN	Bruce Muir	Chief Roland Willson
Saulteau FN	Naomi Owens	Chief Harley Davis
Halfway River FN	Rosyln Pokiak	Chief Ed Whitford
Blueberry River FN	Debbie Apsassin	Chief Joseph Apsassin
Doig River FN	Jane Calvert	Chief Norman Davis
McLeod Lake Indian Band	Alec Chingee or Stephanie Rocheleau	Chief Derrick Orr
Dene Tha' FN	Baptise Metchooyeah	Chief James Ahnassay

16 SUMMARY

This section of the Application will:

- Summarize the potential effects of the proposed Project on the treaty rights of First Nations
- Identify in a table (as per the format of Table 16-1 below), specific commitments to address potential effects on those rights and interests.

Table 16-1: Summary of Potential Effects on Treaty Rights and Accommodation Measures

Potential Effects on Aboriginal Activities	Accommodation Measures
e.g., Decrease in traditional hunting grounds and hunting opportunities due to increased industrial activity and disturbance to wildlife.	e.g., Proponent commitment to an adaptive management strategy (i.e., clearing limits, noise buffering, and traffic management), implementation of a Wildlife Protection and Monitoring Plan and Caribou Mitigation and Management Plan.

PART E—CONCLUSIONS

17 SUMMARY OF RESIDUAL EFFECTS

This section of the Application will present a table that provides summary information for each environmental, economic, social, heritage or health effect that cannot be completely avoided or mitigated through the re-design or relocation of the proposed Project or through Proponent commitments.

The summary will be presented in a table as per the format of Table 17-1 below.

Table 17-1: Summary of Residual Effects

Potential Effect	Project Phase	Contributing Project Activity or Physical Works	Proposed Mitigation/Compensation	Significance
EFFECT CATEGORY (e.g., Archaeology, Wildlife, Vegetation)				
E.g., Impacts to archaeological sites; Disturbance to Bald Eagle nests	E.g., Construction; Operation; Decommissioning/ Closure	E.g., site preparation (i.e., clearing, grubbing); facility installation; project operation.	E.g., Final design to avoid as many sites and culturally modified trees as possible; Conduct updated nest survey at detailed design stage, and during construction maintain a 100 to 200 m vegetated buffer around active eagle nests (based on site-specific assessment).	E.g., No significant residual adverse effect; negligible, low, moderate or severe significant residual adverse effect.

18 SUMMARY OF COMMITMENTS

This section of the Application will identify, in tabular format, all commitments and assurances made by QRCI to minimize potential environmental, economic, social, heritage, and health effects of the proposed Project. This will include commitments related to mitigation measures, follow-up monitoring programs and resolution of any ongoing or previously unresolved issues identified during the consultation process.

The summary will be presented in a table as per the format of Table 18-1 below.

Table 18-1: Proponent's Table of Commitments

Commitment Number	Specific Project Effect	Commitment	Project Phase/ Timing	Source of Commitment	Responsible Agency	Status
Commitment Category (e.g., Air Quality, Environmental Management Plans)						
	E.g., Greenhouse gases from vehicle emissions; Environmental Management Plan – Construction; Follow up and Monitoring Plan		E.g., Construction; Operation; Decommissioning/ Closure			

19 CONCLUSION

This section of the application will:

- Summarize the Proponent's understanding of the B.C. EA process in promoting sustainable development while minimizing effects on environmental, economic, social, heritage and health values, as well as on First Nations' rights and interests.
- Describe how the proposed Project aligns with the goal of the B.C. EA process.
- State the request for an EA Certificate from the Government of British Columbia for the proposed Project and the need to successfully complete subsequent permitting/authorization processes prior to proceeding with the proposed Project construction, operation and decommissioning.

20 REFERENCES

This section will include a list of references used in developing the AIR and the Application.

21 APPENDICES

This section will include the appendices referenced in the Application.

Where information is prepared by professionals and provided under their professional seal, these areas will be identified in the Application and their seals will be included in an Appendix.