

Foster Creek Thermal Project Phase J Expansion

Application for Approval Amendment



Application to ERCB

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15 SOCIAL ASPECTS INTRODUCTION

15.1 FOSTER CREEK THERMAL PROJECT

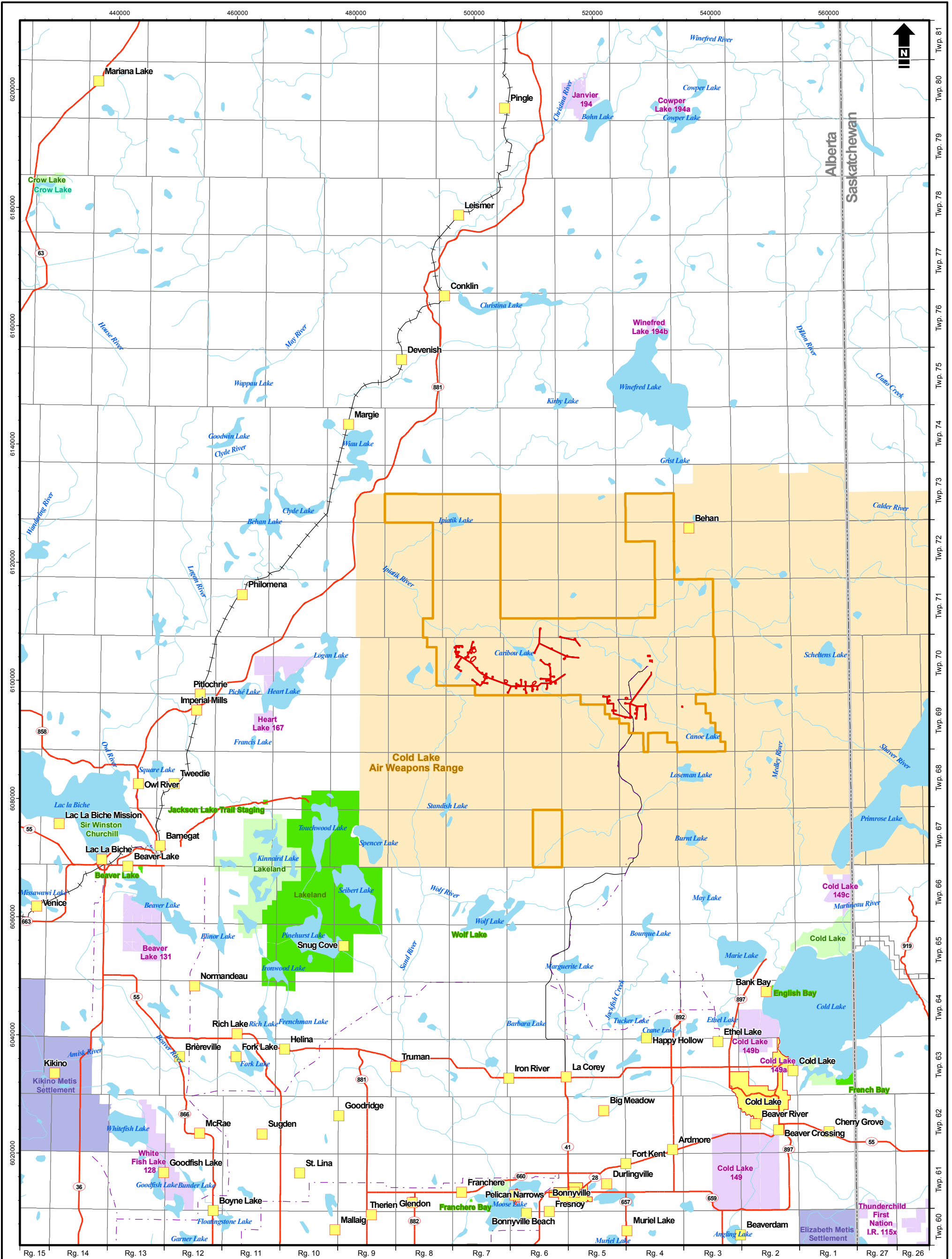
15.1.1 Overview

Cenovus FCCL Ltd. (Cenovus), as operator for FCCL Partnership, is proposing to develop an expansion to its existing and approved Foster Creek Thermal Project (FCTP) Phase 1 A-H facilities. The proposed expansion, referred to as Phase J (the Project), is located within the Cold Lake Air Weapons Range (CLAWR) approximately 90 km north of the City of Cold Lake, Alberta, in Townships 69 to 71, Ranges 3 to 7, West of the Fourth Meridian (W4M). The Project location is illustrated in [Figure 15.1-1](#).

The existing Phase A-E operation includes a central processing facility (Phase A-E CPF) at 070-04 W4M, as well as field facilities (i.e., well pads and utility corridor) adjacent and east of the CPF at 070-03 W4M and 070-04 W4M. Equipment within the Phase A-E CPF includes 15 once through steam generators (OTSGs), two 40-MW cogeneration plants, water handling and treatment facilities, oil treatment equipment, and associated utilities and infrastructure. The field facilities include 182 well pairs on 25 well pads adjacent to (070-04 W4M) and east (070-03 W4M) of the main plant area. Cenovus also operates 61 wells using Wedge Well™ technology, one bypassed pay well, and one secondary pay well as part of Phase A-E. The utility corridor consists of an aboveground pipeline (emulsion, gas, steam) network, high grade road, and associated power line. Steam assisted gravity drainage (SAGD) in situ bitumen resource recovery methods are utilized at the FCTP.

Cenovus continues to evaluate and optimize the existing Phase A-E operations to enhance reliability and performance. In September 2012, Cenovus filed the Phase A-E Facility Optimization Application (Cenovus 2012a) with the ERCB (Application No. 1740407, pending approval). The application proposes to increase the design production rate of the Phase A-E facility to 22,258 m³/sd. Additional oil treating, vapour recovery, produced water and utilities equipment are proposed as part of the 2012 Phase A-E optimization. No additional air emission sources are included in the application.

In May 2009, Cenovus filed a joint application with the ERCB and AESRD for Phase FGH (EnCana 2009). The application proposed a further production expansion at the FCTP to approximately 34,990 m³/d (220,060 bbl/d), in a staged approach. The Phase FGH application was approved by AESRD under the *Environmental Protection and Enhancement Act* (EPEA) and the ERCB in July and September 2010 (EPEA Approval No. 68492-00-15 and Scheme Approval No. 8623 W). Cenovus subsequently filed a production capacity increase application based on a steam to oil ratio (SOR) of 1.87 in July 2011, to bring the overall FCTP production to 38,271 m³/d (240,717 bbl/d). This application was approved by the ERCB in January 2012 (Scheme Approval No. 8623 DD).



- Project Footprint
- Cenovus FCCL Ltd. Oil Sands Lease
- Community
- Cold Lake Air Weapons Range
- Ecological Reserve
- Indian Reserve
- Metis Settlement
- Provincial Park
- Provincial Recreation Area
- Wildland Park
- Water Body
- Watercourse
- Highway
- Road
- Railway
- Powerline



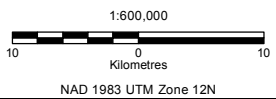
Foster Creek Thermal Project Phase J Expansion

Phase J Expansion Location Map

Date: 19 Feb 2013 Project: 11029-514 Technical: B.Lamoureux Reviewed: R.Lauzon Drawn: C.Jackson

Disclaimer: Prepared solely for the use of Cenovus FCCL Ltd. as specified in the accompanying report. No representation of any kind is made to other parties with which Cenovus FCCL Ltd. has not entered into contract.

Figure 15.1-1



Reference: Data obtained from AltaLIS, GeoBase and GeoGratis. Used under license.

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Phase FGH facilities (currently under construction) include a CPF directly north of the Phase A-E CPF at 070-04 W4M. Equipment within the Phase FGH CPF includes 12 OTSGs, water handling and treatment facilities, oil treatment equipment, and associated utilities and infrastructure. The field facilities include 268 well pairs on 50 well pads and associated utility corridor west (070-04 W4M and 070-05 W4M) of the main plant area. SAGD in situ bitumen resource recovery methods are utilized in this area as well.

In November 2012, Cenovus submitted the Development Area Boundary Expansion Application (Cenovus 2012b) to the ERCB (ERCB Application No. 1747426). The application requests approval for an additional 19 well pads to sustain production for the Phase A-H facilities, and includes a proposed Development Area expansion within Townships 70 and 71, Ranges 3 and 4, W4M. The application does not request an increase to the approved bitumen capacity. The 2012 Development Area expansion application is currently under review with the ERCB.

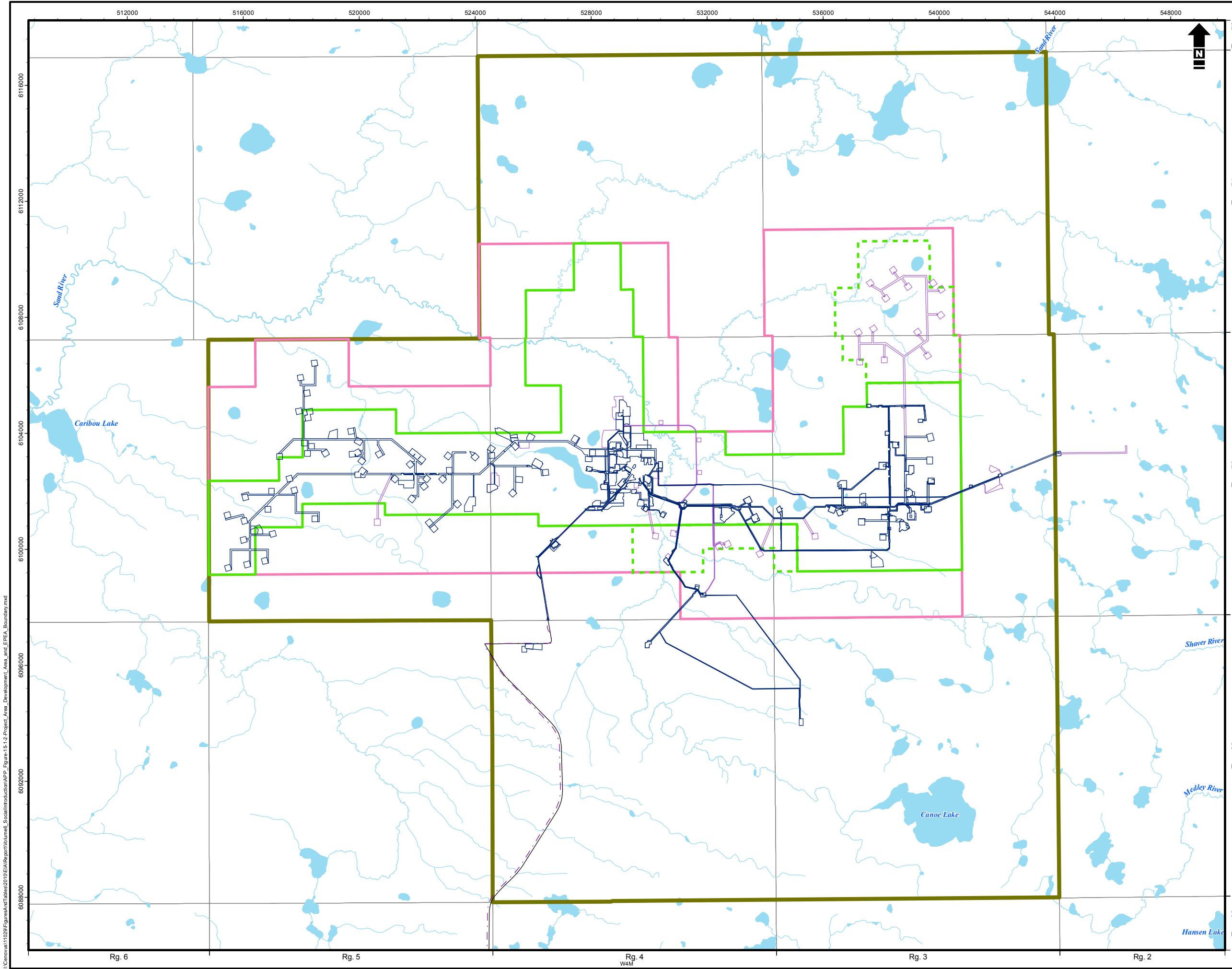
The FCTP phased development history and associated regulatory approval dates are provided in [Volume 1, Section 1.2, Overview](#). The approved EPEA plant boundary, the current Phase A-H footprint and the proposed 2012 Development Area expansion boundary and well pads are illustrated on [Figure 15.1-2](#).

15.1.2 Phase J Development

As part of Phase J, Cenovus proposes to modify and expand the Phase FGH facilities to increase the overall ERCB approved capacity from 38,271 m³/d (240,717 bbl/d) to 46,928 m³/d (295,165 bbl/d). This represents an incremental bitumen capacity increase of 8,657 m³/d, or 54,448 bbl/d. The capacity increase will be achieved through the optimization and expansion of the Phase FGH CPF, with development of additional field facilities located west and south of the existing and approved operations. The anticipated production is expected to be sustained over a period of 35 years. The Phase J development involves the following:

- Phase FGH plant site modification and expansion (the CPF) at 070-04 W4M;
- Phase J Development Area expansion (located at 070-06 W4M); and
- Phase J Project Area expansion (located in 069-071, 0 3-07, W4M).

The Project will apply SAGD technology throughout the period of production. Initial development includes 142 SAGD well pairs to be drilled from 20 well pads within the proposed Phase J Development Area expansion, together with the construction of the main plant expansion. Ultimately, up to 657 well pairs will be drilled from 73 well pads designated within the proposed Phase J Project Area expansion to maintain FCTP production for 35 years. This includes 531 well pairs on 59 well pads in the western portion Project Area expansion and 126 well pairs on 14 well pads in the south portion of the Project Area expansion. [Figure 15.1-3](#) shows the Project footprint, the proposed Phase J Development Area and the Project Area.



- Existing and Approved Development
- Planned Development
- Current Development Area
- Proposed Development Area (2012)
- Current Project Area
- EPEA Boundary
- Water Body
- Watercourse
- Road
- Powerline

Reference:
Data obtained from AltaLIS, Altus and IHS. Used under license.

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Kilometres

NAD 1983 UTM Zone 12N



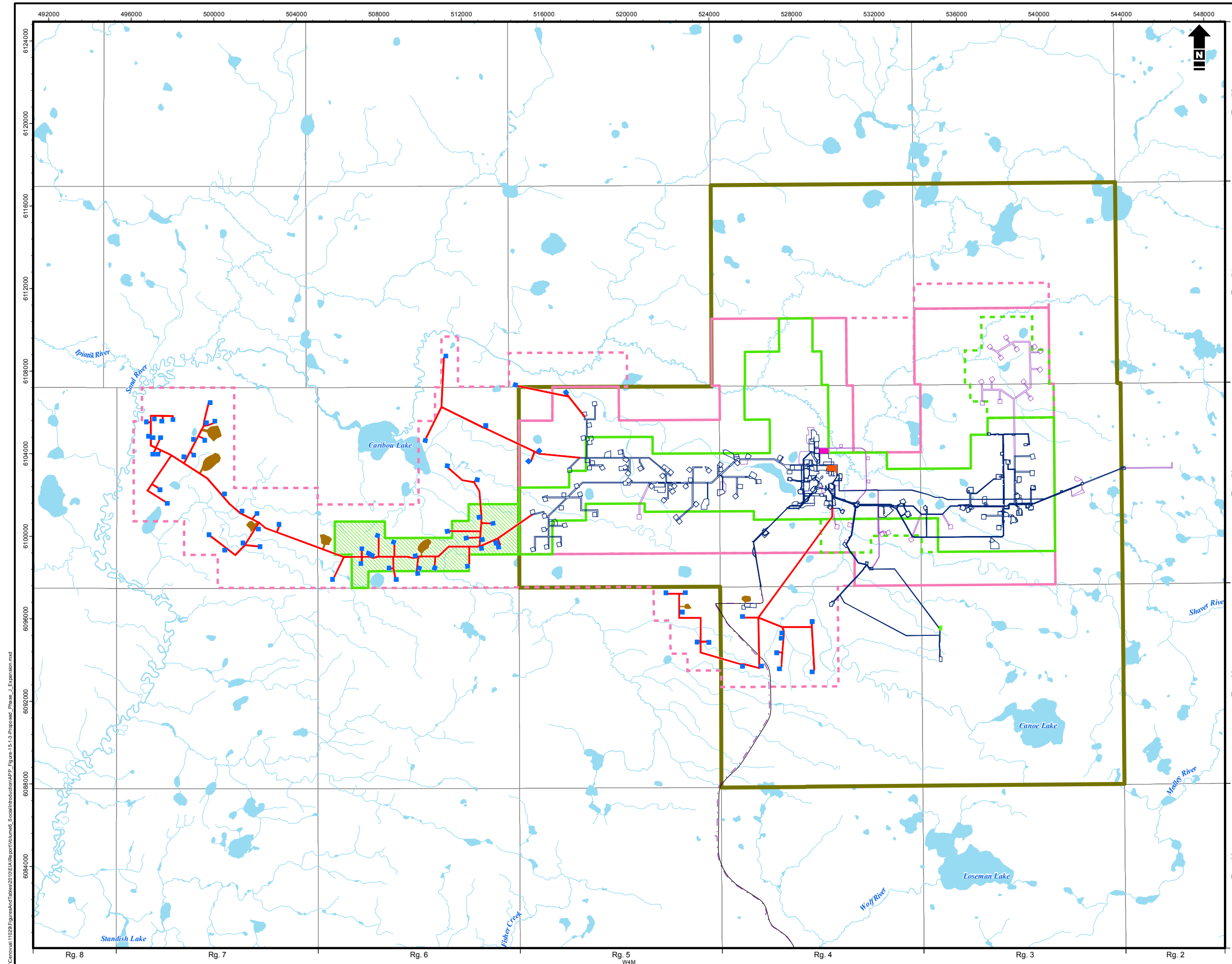
Foster Creek Thermal Project Phase J Expansion

Project Area, Development Area and EPEA Boundary

Date: 14 Feb 2013	Project: 11029-514	
Technical: B.Lamoureux	Reviewer: R.Lauzon	Drawn: C.Jackson

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- Existing and Approved Development
 - Planned Development
 - Current Development Area
 - Proposed Development Area (2012)
 - Phase J Development Area Expansion
 - Current Project Area
 - Phase J Project Area Expansion
 - EPEA Boundary
 - Water Body
 - Watercourse
 - Road
 - Powerline
- Project Components**
- Borrow Area
 - Disposal Well
 - SAGD Well Pad
 - CPF Expansion
 - Road, Pipeline and Utility Corridor
 - Substation

Reference:
Data obtained from AltaLIS, Altus and IHS. Used under license.

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Kilometres

NAD 1983 UTM Zone 12N



Foster Creek Thermal Project Phase J Expansion

Proposed Phase J Expansion

Date: 19 Feb 2013 Project: 11029-514

Technical: B.Lamoureux Reviewer: R.Lauzon Drawn: C.Jackson

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Equipment to be added to the CPF includes the following:

- six OTSGs;
- one 50 MW gas turbine generator (GTG) and heat recovery steam generator cogeneration unit and substation;
- electrical substation and transmission/distribution power lines;
- three glycol heaters and heat exchange equipment;
- one oil processing train (inlet degasser, free water knock-out drum, and two oil treaters);
- additional produced water processing equipment (induced static flotation and weak acid cation exchange); and
- additional utilities and tankage.

The plot plans for the CPF, which includes the major equipment to be added for the Project are provided in [Volume 1, Appendix B](#).

As described above, Phase J is proposed to optimize and expand the approved Phase FGH facilities. Given its location in relation to the existing and approved facilities, the Project is able to utilize a significant amount of the existing and approved site infrastructure, including the following:

- sales oil pipeline;
- natural gas source pipeline;
- site access roads and infrastructure;
- work site camps and office/support buildings;
- sulphur recovery facilities;
- steam/emulsion pipeline corridors; and
- water disposal facilities.

The use of this existing/approved infrastructure significantly reduces the footprint requirements for the Project.

Sulphur recovery for the Project is based on the use of the approved amine sweetening unit and modified Claus sulphur recovery facility (SRF) to meet the ERCB ID-2001: *Sulphur Recovery Guidelines for the Province of Alberta* (EUB 2001). The SRF was approved by the ERCB and AESRD in 2009 (ERCB Approval No. 8623P and AESRD EPEA Approval No. 68492-00-13). As a back-up to the SRF, Cenovus has included an additional non-regenerative scavenger unit (NRSU) in the design of the Project. The NRSU is proposed as a stand-by unit in the event that the SRF is non-operational during planned maintenance and short term SRF process upsets.

Electrical power for the Project will be sourced from the proposed Phase J 50 MW cogeneration unit. In addition, power requirements will be supplemented from the two existing on-site cogeneration units and the Alberta Interconnected Electric System, as needed. Appropriate emergency power generators have been included to meet minimum power needs during outages. An additional 144 kV substation and transmission lines are also

included in the Project. No additional natural gas or sales oil pipelines are proposed for the Project.

In addition to the central plant modification and expansion, water disposal infrastructure is needed for the Project. An additional disposal pad at 15-19-069-03 W4M (ED3) is currently being developed in the Basal McMurray aquifer to accommodate the disposal fluids associated with Phase FGH. Disposal capacity at ED3 will be extended to the Project. In addition, future disposal well pads may be developed, as required, at 069-03 W4M and 070-02 W4M to accommodate disposal for the FCTP. These locations are optimal due to the extensive basal aquifer thickness and minimal bitumen saturation that allows for water disposal with minimal affect to bitumen recovery. The need for additional water disposal wells will be determined based on the produced water to steam ratio observed for the Project.

No additional brackish or non-saline water source supply wells are proposed for the Project. Domestic and utility water needed for the Project will be supplied by the Phase A-H water wells.

To connect the SAGD well pads to the main plant, utility corridors will be created. The corridors will include an access road, power line and aboveground pipelines (emulsion, steam, fuel gas, and casing gas). The location of the well pads and corridors is included in the footprint ([Figure 15.1-3](#)). Potential borrow areas have also been incorporated into the footprint to supply fill materials for the construction of the well pads and roads.

15.1.3 Environmental Footprint Planning

Cenovus has operated within its leases since 1996 and has collected environmental information through studies conducted for previous EIAs, monitoring, pre-development assessments and various site assessments. As part of baseline studies for the Project, Cenovus specifically collected information on sensitive environmental and social features such as rare plants and historical resources. The development of the Phase J footprint incorporated both environmental and engineering constraints to guide the placement and size of the surface facilities. The purpose of constraints planning is to reduce or minimize environmental effects and to identify areas of low sensitivity that are more suitable for planned development.

Environmental constraints considered in Project footprint siting include:

- Topography – preference for high, stable ground, with facilities located to minimize watercourse crossings and limit interference with natural drainage;
- Soils – preferred siting of facilities on mineral soils in upland settings and avoidance of Organic wetland soils, where practical;
- Vegetation – avoiding rare plants and limiting disturbance in old growth forest areas;
- Surface water – maintaining a 100 m setback from water bodies and watercourses for all Project components, where practicable;
- Sensitive habitat – adjusting sites to avoid direct impact (e.g., species-specific sensitive habitat); and

- Historical resources and culturally significant sites – considering traditional land use and avoiding existing historical resource and culturally significant sites.

In development of the field facilities, Cenovus will use existing right-of-way (ROW) clearings wherever practicable to minimize surface disturbance. In addition, Cenovus will endeavour to combine the road, power line and pipeline ROW to optimize the use of cleared areas and minimize surface disturbance. For the well pads, the cleared area will vary depending on the well pad size. The well pad size is determined by the number of well pairs that are to be drilled from each pad.

The assessment in this EIA report has been conducted on the full development footprint (Figure 15.1-3) recognizing that progressive development and reclamation will occur. The total disturbances (i.e., including both vegetation and soils) associated with the full development footprint are listed in Table 15.1-1. The proposed total disturbance area for the Project is 975 ha, including approximately 57 ha of existing disturbance.

Field facilities for the Project include SAGD well pads, access roads, pipelines and utility corridors, substation, disposal well pad and borrow areas. Rights-of-way for access roads, aboveground pipelines and power lines that connect the SAGD well pads to the CPF will be combined in common access/utility corridors, to the extent practicable. Surface soil disturbance will occur mainly at the CPF expansion, SAGD well pads, access roads, substation, disposal well and borrow areas.

Table 15.1-1 Area of Proposed Project Footprint Components

Project Component	Project Disturbance (ha) ¹
Central Processing Facility	12
Steam Assisted Gravity Drainage (SAGD) Well Pads	289
Access Roads	169
Pipeline and Utility Corridors	335
Substation	9
Disposal Well Pad	3
Borrow Areas	158 ²
Total Project Disturbance	975³

¹ Areas presented include existing disturbances where vegetation or soils have been disturbed by activities prior to the development of the Project.

² Total area designated for potential borrow; the actual excavations within these designated areas will be minimized to the extent practicable to meet Project needs.

³ Total value might not equal the sum of the individual values, due to rounding.

The potential for and extent of future seismic exploration activities for the Project are applied for as a separate approval and consequently, potential future seismic activity has been excluded from the Application Case assessment. However, Cenovus estimated their future seismic plans and have included a potential seismic footprint in the Planned Development Case.

15.1.4 Project Schedule

The schedule for the Project is provided in [Table 15.1-2](#). The schedule shows SAGD well pair drilling and facility construction taking place from 2015 to 2018, pending corporate and regulatory approvals. First steam and bitumen production is scheduled to commence in 2018. With the current definition of resource potential, operations are expected to take place for approximately 35 years. Additional resource delineation or technology improvements resulting in improved resource recovery may extend the operational life of the facility. After cessation of operations, facility decommissioning and final reclamation will be undertaken.

This proposed schedule has been developed for the purpose of the application and supporting EIA. The actual project schedule remains subject to regulatory approval, company determination and market conditions.

Table 15.1-2 Phase J Project Schedule

Activity	Phase J
Public Consultation	Ongoing
Project Application Submission	Q1 2013
Regulatory Approval	Q1 2015 ⁽¹⁾
Start Field Construction	2015 ⁽¹⁾
Commissioning/Start-Up (First Steam)	2018 ⁽¹⁾
Operations	2018 ⁽¹⁾
Decommissioning Start	2053 ⁽¹⁾
Reclamation Complete	2059 ⁽¹⁾

1. Target dates based on conceptual schedule.

15.2 VOLUME 6 ORGANIZATION

The Social Aspects volume of the EIA for the Project provides an assessment of the potential effect to human activities. The Social Aspects volume contains the assessments for four components:

- Socio-Economic Impact Assessment ([Volume 6, Section 16](#));
- Traditional Land Use ([Volume 6, Section 17](#)); and
- Land Use and Management ([Volume 6, Section 18](#)); and
- Historical Resources ([Volume 6, Section 19](#)).

15.3 ASSESSMENT APPROACH

15.3.1 Terms of Reference

The Social Aspects Assessment follow the *Guide to Preparing Environmental Impact Assessment Reports in Alberta* (AENV 2011a), the *AESRD Interim Guide to Content for Industrial Approval Applications* (AEW 2012) and addresses the terms of reference (TOR) established for the Project EIA by AESRD (AESRD 2012; [Volume 3, Appendix 1A](#)). The

assessment also addresses the ERCB Directive 023: *Guidelines Respecting an Application for a Commercial Crude Bitumen Recovery and Upgrading Project* (ERCB 1991). Concordance tables for the TOR and Directive 023 are provided in [Volume 3, Appendix 1B](#).

15.3.2 Traditional Ecological Knowledge and Land Use

Cenovus plans to incorporate Traditional Knowledge (TK) information in relation to Aboriginal communities who may be potentially impacted by the Project, and to progress the Project in a manner that minimizes potential impacts to their traditional uses and resources. Once it was determined through discussions with AESRD that one Aboriginal community, Cold Lake First Nations (CLFN), was to be engaged for the proposed Project, Cenovus initiated consultation with CLFN with respect to the Project.

Traditional Knowledge has two components: Traditional Land Use (TLU) and Traditional Ecological Knowledge (TEK). The TLU component focuses on sites and areas of cultural and historical significance and historical and/or current use of the land (i.e., settlement locations and gathering sites, resource harvesting sites and locales, trails and spiritual areas) that could overlap with the Project. Traditional use activities that may be conducted in an area include trapping, hunting, fishing as well as spiritual practices such as ceremonies. The TEK component focuses on Aboriginal communities' understanding of the natural environment, which might be used to enhance analyses of a project's environmental effects and project planning. TEK includes information about the variety of plants and animals harvested for dietary or medicinal uses. Oral traditions connect family histories and stories to the geographical locations that support these resources and activities, as well as cabins, trails, campsites, burials, settlements and culturally used landscape features.

With respect to obtaining additional TK information for the Project, Cenovus has been in discussion with CLFN, and has requested that a TK study be initiated, reviewed, and discussed, but to date CLFN has not provided Cenovus with a clear process for obtaining additional TK information. Cenovus continues to have meaningful discussions with CLFN with respect to the potential of conducting a TK study in association with the Project area, which would supplement the considerable, relevant TK information obtained previously, and referred to above. Cenovus continues to support the initiation of a TK study, and has retained a consultant to facilitate the TK study with CLFN. Initiation of the TK study is pending the completion of ongoing discussions between Cenovus and CLFN with respect to the TK study. Additional information on the consultation process is provided in the Traditional Land Use Assessment ([Volume 6, Section 17](#)).

15.3.3 Temporal Boundaries

The temporal boundaries reflect the timing and nature of the Project as well as information available on other proposed projects. The Project schedule including construction, operations and reclamation is identified in [Section 15.1.4](#).

Project facilities will be constructed sequentially during the Project's lifetime and will be reclaimed as soon as is practicable. In addition, Cenovus will use interim reclamation where

developments, or portions of a development, will not be needed through the life of the Project but may be required again at a later date or during reclamation (e.g., buried pipelines, the edges of well pads and roadways, topsoil storage areas). The temporal boundaries for the Social Aspects assessments are variable and are described in detail in their relevant sections. In general, the temporal boundaries extend from construction of the Project through reclamation.

15.3.4 Spatial Boundaries

The identification of appropriate study area boundaries is a critical component of impact assessments and the selection of a study area is intended to capture potential effects appropriate to the discipline. For the Project, each biophysical and socio-economic study area was selected to reflect the anticipated zone of influence for potential impacts and pathways. Therefore, each study area boundary was defined as the largest zone of influence of the expected effect in the appropriate context of the component.

For most disciplines, both a local study area (LSA) and a regional study area (RSA) were delineated to assess potential effects of the Project. The LSA is used to evaluate areas that may be directly affected by the Project. The RSA provides a larger geographical and ecological framework to evaluate impacts of the Project in combination with other existing and planned projects or land uses. The spatial boundaries for each Social Aspects assessment is specific and is, therefore, described in detail in each relevant section.

15.4 ASSESSMENT SCENARIOS

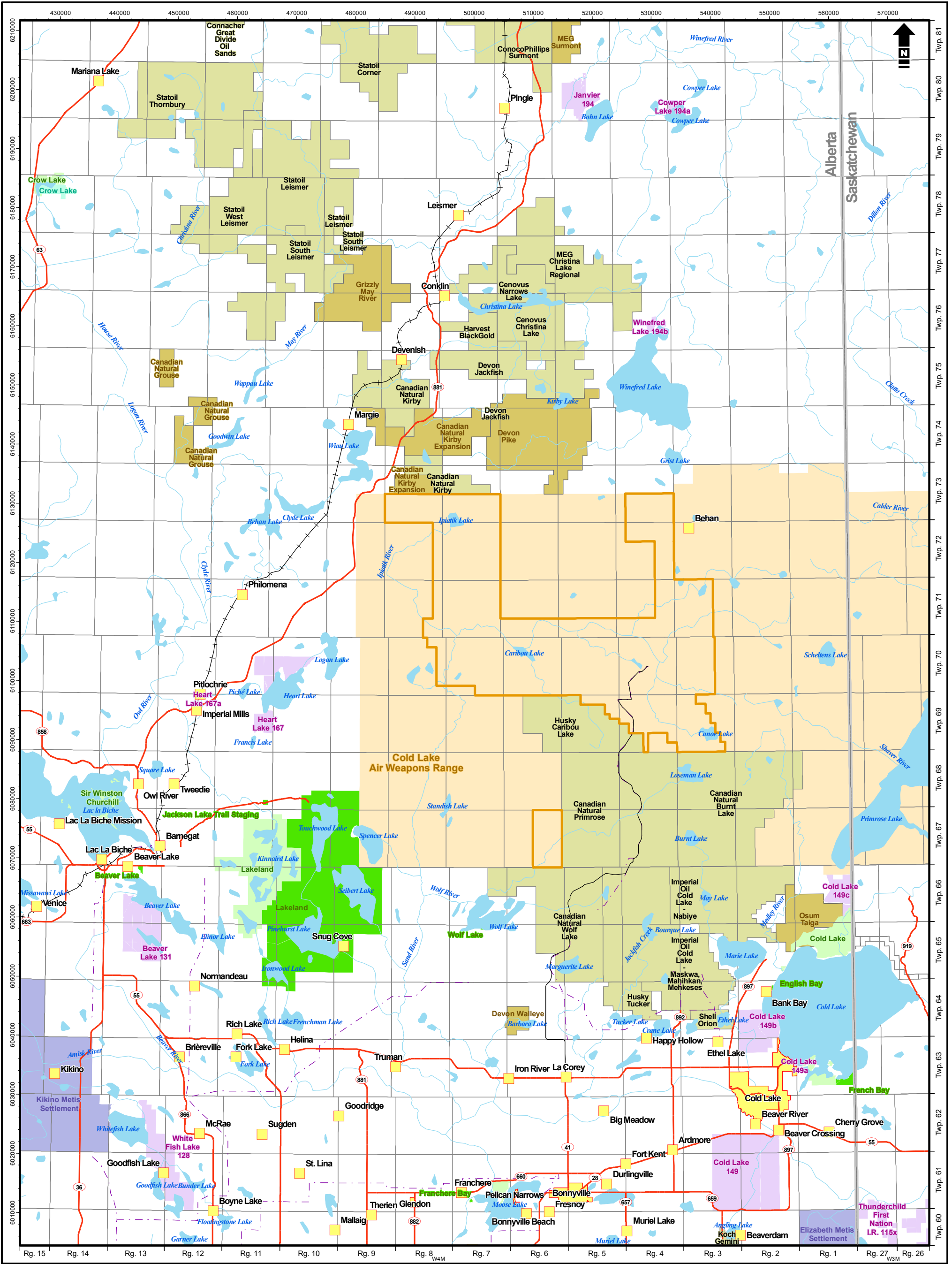
As required in the *Guide to Preparing Environmental Impact Assessment Reports in Alberta* (AENV 2011), this EIA report considers three development scenarios:

- the Baseline Case, which includes consideration of the environmental effects from existing and approved projects or activities within the study areas;
- the Application Case, which includes the Baseline Case plus the Project; and
- the Planned Development Case, which describes the environmental conditions that would exist as a result of the interaction of the Project, other existing projects and other planned projects that can be reasonably expected to occur.

The only development added to the Baseline Case for consideration under the Application Case is the Project. By focusing the assessment, changes in environmental or social components identified from those reported for the Baseline Case are associated with the Project. The data for the potential effects of the Project are based on the Project design and operational information, as provided in [Volume 1](#).

The Planned Development Case is a cumulative effects assessment for the Project and includes the Application Case developments plus other locally or regionally planned projects that have not been publicly announced. The methodology for completing this case is the same as for the Application Case.

For this EIA report, existing projects are defined as those that have been built, are under construction or have been approved by the ERCB or AESRD as of August 31, 2012. A summary of the developments considered by each component in the EIA report are provided in [Volume 3, Section 1.4, Table 1.4-1](#) for the Baseline Case and [Volume 3, Section 1.4, Table 1.4-2](#) for the Planned Development Case. Locations of oilsands projects included in the Baseline and Planned Development cases are presented on [Figure 15.4-1](#).



- Cenovus FCCL Ltd. Oil Sands Lease
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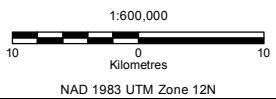
Foster Creek Thermal Project Phase J Expansion

Oil Sands Developments - Existing, Approved and Planned

Date: 19 Feb 2013 Project: 11029-514 Technical: B.Lamoureux Reviewed: R.Lauzon Drawn: R. Witty

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Figure 15.4-1



NAD 1983 UTM Zone 12N

Reference: Data obtained from AltaLIS, GeoBase and GeoGratis. Used under license.

15.5 ASSESSMENT METHODS

The scope of the Social Aspects assessment follows the *Guide to Preparing Environmental Impact Assessment Reports in Alberta* (AENV 2011) and incorporates the Project TOR (AESRD 2012; [Volume 3, Appendix 1A](#)) within a framework that includes the collection of baseline information, assessment of the potential Project effects on selected indicators, and mitigation measures for those potential affects.

The information obtained provides a description of social aspects within the study areas. Quantitative information was used when available. Many of the indicators are closely linked with other sections of the EIA and quantitative data collected by those disciplines is used. For the remainder of the indicators, semi quantitative or qualitative analysis was conducted to assess potential effects.

15.5.1 Effects Criteria

Assessment criteria consistent with the *Responsible Authority's Guide to the Canadian Environmental Assessment Act* (FEARO 1994) were used to describe and evaluate the predicted residual effects (impacts remaining after mitigation) for the Application Case and the PDC, for the selected indicators. The effects criteria are defined in general terms in [Volume 3, Section 1.4.7](#) (Introduction to EIA). Due to the differences amongst the broad range of socio-economic and biophysical factors, the effects criteria for social aspects disciplines were refined and are described within the relevant discipline section.

15.6 MITIGATION AND MONITORING

Due to the differences in the Social Aspects assessments, mitigation measures and monitoring for these components are discussed in the individual assessments.

15.7 REFERENCES

Alberta Environment (AENV). 2011. *Guide to Preparing Environmental Impact Assessment Reports in Alberta – Updated February 2011*. Alberta Environment, Environmental Assessment Team, Edmonton, Alberta. EA Guide 2009-2. 26 pp.

Alberta Environment and Sustainable Resource Development (AESRD). 2012. *Terms of Reference Environmental Impact Assessment Report for Cenovus FCCL LTD.'s Proposed Foster Creek Thermal Project – Phase J Expansion, Approximately 90 km from Cold Lake, Alberta*. Issued by Alberta Environment and Sustainable Resource Development, Edmonton, Alberta. September 19, 2012. 16 pp.

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16 SOCIO-ECONOMIC IMPACT ASSESSMENT

16.1 INTRODUCTION

The Socio-Economic Impact Assessment component of the environmental impact assessment (EIA) analyzes potential Project effects on socio-economic conditions, along with the potential effects of existing, approved and planned development, within the socio-economic study area, as appropriate. Potential socio-economic effects resulting from the construction and operation of the Project include economic and fiscal benefits, employment and population growth, and associated effects on regional infrastructure and services. Information on mitigations and monitoring are provided in [Sections 16.10](#) and [16.11](#), respectively.

16.1.1 Overview and Scope

The Socio-Economic Impact Assessment follows the Alberta Environment and Sustainable Resource Development (AESRD) *Guide to Preparing Environmental Impact Assessment Reports in Alberta* (AENV 2011) and addresses the terms of reference (TOR) established for the Project EIA by Alberta Environment and Sustainable Resource Development (AESRD 2012; [Volume 3, Appendix 1A](#)). A concordance table for the TOR is provided in [Volume 3, Appendix 1B](#).

Cenovus FCCL Ltd. (Cenovus) who currently own and operate the Foster Creek Thermal Project (FCTP) located in Improvement District No. 349, approximately 90 km north of the Town of Bonnyville, are proposing a further expansion of the FCTP to increase the productive capacity by 54,448 bbl/d to a total of 295,165 bbl/d. The FCTP Phase J Expansion (the Project) will be located to the east, west, and south of phases F, G, and H, and is designed to utilize existing facilities and infrastructure.

Actual timing of construction will depend on the timing of regulatory approvals and market conditions. For the purpose of this assessment, it is assumed that construction will begin in Q1 2015 and operations (first steam) will begin in Q1 2018. If approved, the Project is expected to operate for approximately 35 years.

The capital costs of the Project will be refined as detailed engineering takes place. For the purpose of this analysis, and based on preliminary engineering estimates, the construction capital costs are expected to total \$1.46 billion. This includes:

- the expansion of the existing central processing facility (CPF);
- initial well pad, pipeline, and road construction; and
- the drilling of initial well pairs.

Bitumen recovered by the Project will be diluted and transported by an existing pipeline for upgrading elsewhere.

16.2 ASSESSMENT APPROACH

The Socio-Economic Impact Assessment (SEIA) evaluates the impacts of the construction and operation of the Project on the communities in the regional study area (RSA). The potential socio-economic impacts of the construction and operation of the Project include economic and fiscal benefits as well as demands on regional services and infrastructure.

The SEIA draws on and refers to ongoing consultation by Cenovus in the context of the Project and other initiatives. The SEIA approach includes:

- identifying and screening potential socio-economic issues;
- selecting key indicators of socio-economic conditions; and
- defining temporal and spatial boundaries.

16.2.1 Key Issues

The SEIA draws on the following sources for identifying the key socio-economic issues:

- [Section 7](#) of the TOR for the Project EIA, as issued by Alberta Environment and Sustainable Resource Development (AESRD 2012);
- discussions with regional service providers;
- recent SEIAs for other oil sands projects;
- the responses by the Energy Resources Conservation Board (ERCB), other stakeholders, and interveners, to recent oil sands SEIAs during the course of the regulatory review process, including public hearings; and
- socio-economic studies and reports prepared by government, industry, or regional service providers.

These sources indicate that the key socio-economic issues to be considered in this analysis fall into the following categories:

- regional and provincial economic benefits, including:
 - personal and business income; and
 - government tax and royalty income;
- employment effects;
- traditional land use effects;
- population effects; and
- effects on regional infrastructure and services, including:
 - housing,
 - policing and emergency services;
 - health services;
 - social services;
 - education services;

- recreation activities;
- municipal infrastructure and services; and
- traffic.

16.2.2 Temporal Boundaries

The SEIA covers the life of the Project from the beginning of construction through to the end of operations. Particular attention will be paid to the time period between 2015 and 2018, reflecting that:

- on-site construction of the Project is expected to take place between the first quarter (Q1) of 2015 and Q1 2018; and
- operation of the Project is expected to begin in 2018 and the subsequent operational impacts will remain at, or near, those levels for the duration of the Project.

The 2015-2018 period captures the maximum socio-economic effects of the Project. It will also capture the maximum cumulative effects, noting that all projects included under the Planned Development Case (PDC) are assumed to reach full operations employment by 2018. Other projects might come forward beyond those considered in the PDC. These projects will be subject to separate applications, including a cumulative effects assessment of industry development as it is known then.

16.2.3 Spatial Boundaries

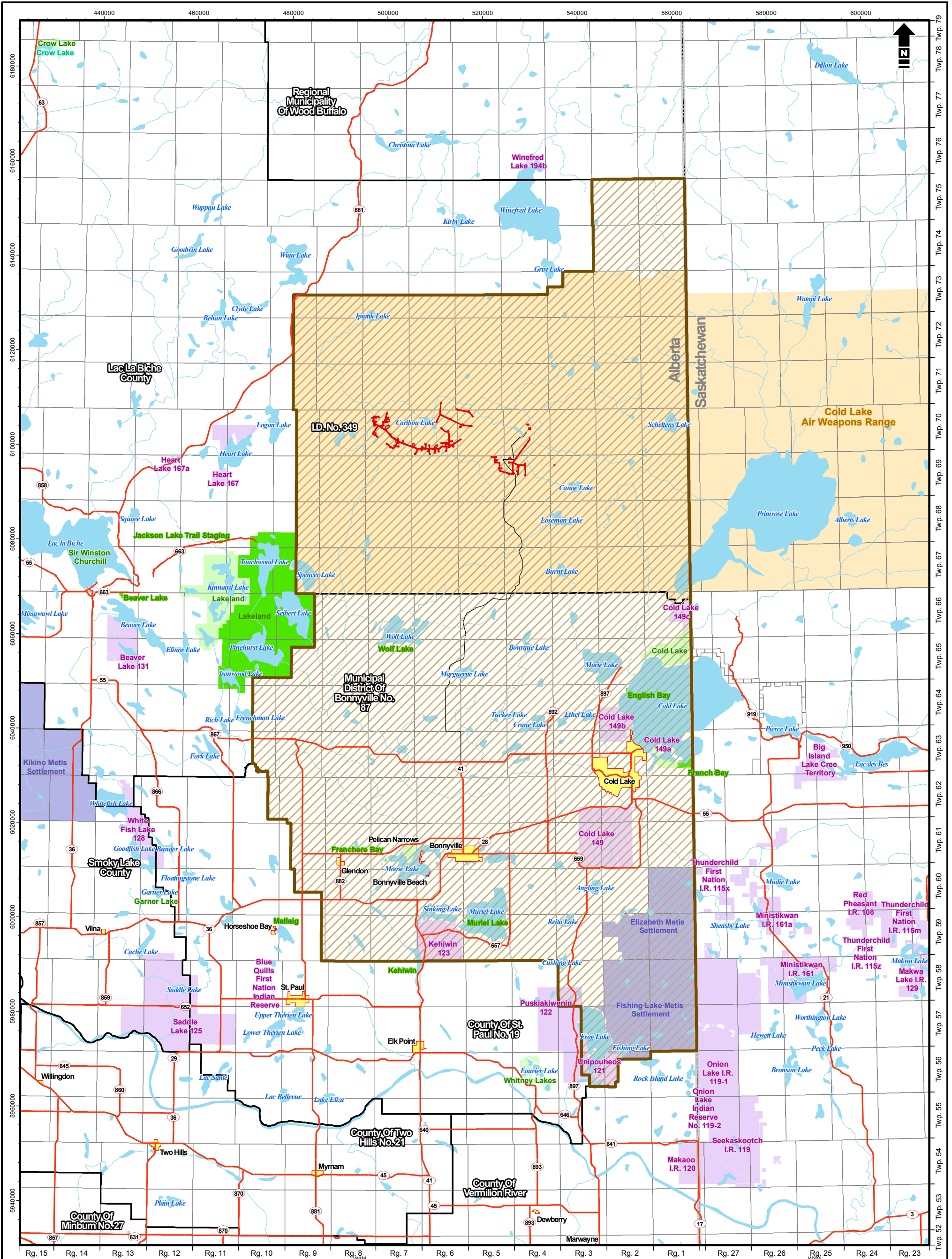
The boundaries of the RSA have been defined based on the following considerations:

- existing trading patterns and traffic flows in the region;
- existing distribution of service providers and infrastructure in the region;
- Cenovus's experience with its existing phases (A to E) of the FCTP;
- experience of other industrial projects in the region;
- land use concerns that are focused on the lands nearby the Project; and
- availability of statistical data to adequately measure the impacts of the Project.

The socio-economic regional study area for the SEIA ([Figure 16.2-1](#)) consists of:

- City of Cold Lake;
- Town of Bonnyville;
- Municipal District (M.D.) of Bonnyville;
- Village of Glendon;
- Improvement District (I.D.) No. 349; and
- Aboriginal communities including the Cold Lake First Nations (CLFN) reserves.

Particular attention is paid to the City of Cold Lake and the Town of Bonnyville since they are the largest urban service areas in the RSA and are the hubs of commercial and public services directly affected by the Project. For analytical purposes, the Village of Glendon is considered as part of the M.D. of Bonnyville unless explicitly stated otherwise.



- ▬ Project Footprint
- Socio-Economic Impact Assessment RSA
- Community
- Cold Lake Air Weapons Range
- Ecological Reserve
- Indian Reserve
- Métis Settlement
- Municipal District
- Provincial Park
- Provincial Recreation Area
- Wildland Park
- Water Body
- Watercourse
- Highway
- Road



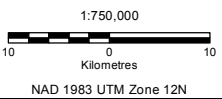
Foster Creek Thermal Project Phase J Expansion

Socio-Economic Impact Assessment Regional Study Area

Date: 19 Feb 2013 Project: 11029-514 Technical: P.Shewchuk Reviewer: R.Lauzon Drawn: C.Jackson

Disclaimer: Prepared solely for the use of Cenovus FCCL Ltd. as specified in the accompanying report. No representation of any kind is made to other parties with which Cenovus FCCL Ltd. has not entered into contract.

Figure 16.2-1



Reference: Data obtained from AltaLIS, GeoBase and GeoGratis. Used under license.

Where appropriate, the SEIA will consider Project effects beyond the study area. For example, the SEIA considers the effect of Phase J on the provincial and national economies as well as royalties and taxes paid to the provincial and federal governments.

16.2.4 Key Indicators

The key indicators used to assess the effects of the Project on communities in the study area are:

- workforce;
- income;
- population change;
- effects of population changes on service providers and physical infrastructure;
- traditional land use and culture; and
- traffic conditions.

The key indicators used to assess the Project's income and taxation consequences for governments are:

- municipal taxes;
- provincial corporate income tax and resource royalty income; and
- federal corporate income tax.

Many of these key indicators are well suited for quantification and provide an easy-to-interpret measure for potential effects. Effects on service providers are based, in part, on key respondent interviews and are, for the most part, presented in qualitative terms.

16.2.5 Assessment Cases

The assessment cases used for the SEIA are consistent with the AESRD EIA guidelines (AENV 2011) and are discussed in detail in [Volume 6, Section 15](#), Social Aspects Introduction. The SEIA defines three assessment cases to evaluate key socio-economic issues and associated key indicators. They are:

- Baseline Case, consisting of all of the current economic activity in the RSA, plus those large industrial projects that are currently under construction or have regulatory approval;
- Application Case, consisting of all economic activity assumed under the Baseline Case, plus the Project; and
- PDC, consisting of all of the economic activity assumed under the Application Case, plus those large industrial projects that were disclosed as of August 31, 2012, but had not yet received regulatory approval.

16.2.6 Analytical Approaches

The characterization of the Baseline Case and the estimation of effects under the Application Case and PDC are conducted using a variety of methods, ranging from extensive quantitative analysis to qualitative approaches, including:

- economic input-output modelling of the Alberta economy to determine the impact of the Project in terms of total employment impacts and the impact on the provincial gross domestic product (GDP);
- labour market analysis that relates the construction workforce demands to the availability of workers in light of other anticipated heavy industrial construction in the province;
- population projections to determine the Project's impact on regional population growth and on future social infrastructure demands;
- quantification of select social infrastructure effects in order to illustrate the general effect on regional services and infrastructure;
- key respondent interviews and analysis of historical performance to gauge the capacity of education, health, police and other systems to respond to future demands;
- data analysis and key respondent interviews with regard to local social, housing and infrastructure issues; and
- review and consideration of input received through Cenovus's ongoing consultations with the Cold Lake First Nations and available traditional land use studies.

The choice of assessment methodology depends on the issue and the availability of data. The assessment of Project and PDC effects in [Sections 16.3 to 16.9](#) are based on residual effects, after the implementation of mitigation and enhancement measures outlined in [Section 16.10](#).

16.3 ECONOMIC AND FISCAL EFFECTS

16.3.1 Overview

This section provides an overview of the current economic and labour market conditions in the RSA. It also analyzes the economic and fiscal effects of the Project. The traditional economy based on traditional land use is addressed in [Section 16.4](#).

16.3.2 Setting

16.3.2.1 Wage Economy

Resource extraction has played a prominent role in the regional economy for some time. Historically, agricultural production formed much of the economic base in the RSA and movements by agricultural producers away from conventional cattle and grain towards specialized livestock, greenhouses, and niche crops suggests that agriculture will remain a part of the local economy for years to come.

In recent years, the economic driver of the region has been, and will likely continue to be, the development of conventional heavy oil and oil sands resources. Cold production and thermal in situ oil sands projects within the RSA currently produce an estimated 500,000 bbl/d, and output is expected to increase to approximately 1,000,000 bbl/d by 2030. The development of oil extraction projects has resulted in the growth of several related industries, including:

- the emergence of roughly 50 oil field service companies focused largely in the Town of Bonnyville; and
- an estimated 60 contractor and sub-contractor firms who are engaged in the construction of the projects and related infrastructure (Beale 2012, pers. comm.).

In addition to benefiting from oil development, the economy of the City of Cold Lake is also driven, in large part, by the nearby Canadian Forces Base Cold Lake (CFBCL). The CFBCL is estimated to contribute approximately one third of the City's population and have a local spending impact of approximately \$2 billion annually (Forces 2012). Major military events also contribute to the local economy. The annual Maple Flag Exercises cause an influx of approximately 5,000 NATO pilots and support crews for six weeks each year, resulting in an increased amount of activity in the accommodation and hospitality industry.

16.3.2.2 Labour Force

The prominent role of resource extraction and the military base in the regional economy is reflected in the composition of the labour force that is resident within the RSA. Data from the 2006 federal census indicate that 20% of the RSA labour force works in agriculture and the oil and gas sectors, nearly double the provincial average of 12% (Statistics Canada 2006). The percentage of the population employed by the government, which includes the military, is three-and-a-half times the provincial average of 5% (Statistics Canada 2006).

The expansion of conventional heavy oil and oil sands recovery projects has created employment growth in the RSA. For example:

- An increase in the level of construction employment is required in order to build new, or expand existing, oil extraction projects. This spawns further construction employment including new residential, commercial, and institutional buildings and the associated infrastructure.
- Oil sands industry operations employment is created when production volumes increase and, as a result, additional workers and contractors are required for operations and sustaining maintenance.
- Employment is created in the general economy (primarily retail, service and government sectors) as the wages paid to construction and operations workers are circulated through the economy.

In mid-2012, the Wood Buffalo-Cold Lake region had the highest labour force participation rate (80.8%) of all of Alberta's economic regions (MER 2012). The region's unemployment rate for the same period was 4.5%, slightly below the provincial average of 4.6% (MER 2012). Taken together, these statistics suggest a highly engaged local labour force with a limited number of people who are able to enter the workforce and fill newly created jobs. While it became somewhat easier to attract and retain semi-skilled and unskilled workers during the recent economic recession, attracting and retaining skilled workers was, and remains, a challenge for many employers.

In addition to the resident workforce of the RSA, there are approximately 3,600 mobile workers living temporarily in camps, hotels, motels and campgrounds throughout the region. The use of mobile workers is standard practice in the construction and operation of heavy industrial projects and these workers are likely to continue to be present in the RSA for the foreseeable future.

Aboriginal Employment

Unemployment rates tend to be higher among Aboriginal people as compared to the rest of the population. In July 2011, unemployment among off-reserve Aboriginal people in Alberta was about 13.7%. The corresponding estimate for the areas outside Edmonton and Calgary was 12.9% (ABEAE 2012).

The CLFN is actively engaged in the oil and gas industry; nearly one third of the on-reserve labour force is employed in the oil and gas or related industries (Statistics Canada 2006). However, the unemployment rate of 16.7% and participation rate of 60% are above and below the provincial average respectively (Statistics Canada 2006).

The relatively high unemployment rate amongst all off-reserve Aboriginals, as well as those CLFN members on reserve, suggests that some who want to work are still facing challenges in finding employment (ABEAE 2011; Statistics Canada 2006). Other First Nations in close proximity to oil sands development elsewhere in Alberta have identified the following barriers to employment:

- lower levels of education;
- a lack of transportation to the worksite;
- fewer employability skills and reduced training levels; and
- alcohol and drug related challenges (ATC 2006).

Aboriginal Business Ventures

The Aboriginal people in the RSA are actively engaged in the oil and gas industry. For example, the CLFN currently owns and operates several companies that service the sector, including:

- Dechen Corporation;
- Nu Nennè-Stantec – a joint-venture company with Stantec;

- Primco Dene Group of Companies:
 - Primco Dene;
 - Primco Dene Catering;
 - Primco Dene (EMS);
 - Primco Commercial;
 - Primco Security Services;
 - Primco Dene Royal Camp;
 - Primco Dene Canada North;
 - Primco Dene Northgate Industries;
 - Primco Dene Bee-Clean;
 - Seven Lakes Oilfield Services;
 - Arrowhead Industrial;
 - Comec Industrial Services; and
 - Denecorp Construction Ltd.

Local Aboriginal businesses face challenges related to a limited capacity to successfully bid on large scale contracts. In some cases, Aboriginal businesses may be qualified and willing to engage in a particular task, but lack the equipment and manpower necessary to complete the work on the scale needed and cannot borrow the needed capital as assets on reserves cannot be offered as collateral on loans.

16.3.2.3 Income

Income data ([Table 16.3-1](#)) for the City of Cold Lake, the Town of Bonnyville, the M.D. of Bonnyville, and the Cold Lake First Nation show:

- a wide range of income levels across communities in the RSA as well as across family types;
- incomes are above the provincial average for all family types in the City of Cold Lake;
- income levels are below the provincial average for all family types in the Town of Bonnyville;
- income levels are below the provincial average for all family types in the M.D. of Bonnyville; and
- income levels on the CLFN reserve are roughly half of the provincial average for all families.

Table 16.3-1 Median Family Income in Selected Regional Study Area Communities

Geography	All Families	Married Couple Families	Lone Parent Families
	CAD \$ (2005)		
City of Cold Lake	\$83,536	\$91,034	\$52,323
Town of Bonnyville	\$66,288	\$75,592	\$24,687
M.D. of Bonnyville	\$72,294	\$81,002	\$29,135
Cold Lake 149	\$31,680	\$54,144	\$22,336
Alberta	\$73,823	\$83,046	\$40,397

Source: Statistics Canada 2006 Federal Census

The median family income for all families in the RSA is between 1.6 and 2.7 times higher than that of lone parent families across the RSA communities. The corresponding provincial average is 1.8. A high level of income inequality within a community has the potential of reducing social cohesion. It also tends to affect women more since lone parent families are more often headed by women.

16.3.3 Income Effects

16.3.3.1 Construction Expenditure by Region

Total initial capital expenditure for the Project is estimated at \$1.46 billion (\$ 2012). Construction capital expenditures include wages and salaries paid to construction workers, professional engineering and environmental services, and the direct purchase of goods and services, such as equipment, modules and structural elements. Capital outlays will likely begin before the construction period for engineering design and the purchase of long lead-time equipment.

Table 16.3-2 provides a breakdown of the estimated construction expenditure by region, based on published supply ratios by industry, information provided by Cenovus, and the past experiences of similar project operators in the region (AF 2011). The table indicates that approximately 48% of the total expenditure will accrue to Alberta, including the RSA. An additional 29% will accrue to the rest of Canada, and the balance to foreign suppliers. The latter is related primarily to the purchase of machinery and equipment.

Table 16.3-2 Construction Expenditure by Region

Expenditure	RSA	Other Alberta	Other Canada	International	Total
	CAD \$ Millions (2012)				
Engineering	-	90	30	10	130
Labour	60	270	300	-	630
Materials and Equipment	-	280	100	320	700
Total	60	640	430	330	1,460
Total	4%	44%	29%	23%	100%

Note: Totals may not add to 100% due to rounding.

- Not significant, RSA = regional study area

16.3.3.2 Sustaining Capital and Ongoing Drilling Expenditures by Region

Once operational, the Project will incur costs in the form of ongoing drilling and sustaining capital expenditures. These expenditures include wages and salaries for drilling/completions contractors; expenditures for well pad, tie-ins, road and plant related materials; and equipment required to maintain the designed productive capacity of the plant. Sustaining capital and ongoing drilling expenditures will total approximately \$5 billion (\$ 2012) over the life of the Project, averaging approximately \$133 million (\$ 2012) per operating year. This is in addition to the initial capital expenditure needed to bring the project on-stream.

Table 16.3-3 shows a breakdown of the average annual sustaining capital and ongoing drilling costs by region based on published supply ratios (AF 2011). Approximately 76% of the average annual sustaining capital and ongoing drilling expenditures will accrue to Alberta, including the RSA. Approximately \$1 million of the expenditures in Alberta will accrue to the RSA, primarily as drilling and maintenance wages.

Table 16.3-3 Sustaining Capital and Ongoing Drilling Expenditures by Region

Expenditure	RSA	Other Alberta	Other Canada	International	Total
	CAD \$ Millions (2012)				
Labour	1	33	2	-	36
Materials and Equipment	-	68	7	22	97
Total	1	101	9	22	133
Total	1%	76%	7%	17%	100%

Note: Totals may not add to 100% due to rounding.

- Not significant, RSA = regional study area

16.3.3.3 Operations Expenditure by Region

Once fully constructed, the operations expenditure over the life of the Project, excluding fuel and utilities, is expected to total an estimated \$5.6 billion (\$157 million annually). These costs

are in addition to the total sustaining capital and ongoing drilling expenditures over the Project life of approximately \$5 billion (\$133 million per year).

Table 16.3-4 provides a breakdown, by region, of the annual operations expenditure based on the published supply ratios by industry (AF 2011). An estimated 76% of the expenditures will accrue to Alberta, including the RSA, and an additional 10% to the rest of Canada.

Table 16.3-4 Operations Expenditure by Region

Expenditure	RSA	Other Alberta	Other Canada	International	Total
	CAD \$ Millions (2012)				
Labour	29	4	3	-	36
Materials and Equipment	-	87	13	21	121
Total	29	91	16	21	157
Total	18%	58%	10%	13%	100%

Note: Totals may not add to 100% due to rounding.
- Not significant, RSA = regional study area

An estimated 18%, or \$29 million, of the operations expenditure is expected to accrue to local area workers and contractors.

16.3.4 Total Income Effects

The construction expenditures associated with the Project will constitute income for contractors, suppliers, and workers. These primary recipients will, in turn, spend a portion of this income on goods and services, thus circulating the expenditures throughout the economy, compounding the income effect of the Project.

16.3.4.1 Construction

Based on published statistics, the Project's direct, indirect and induced impact in terms of provincial Gross Domestic Product (GDP) and household income is approximately \$1 billion and \$600 million, respectively (AF 2011).

16.3.4.2 Operations

The total (direct, indirect and induced) provincial GDP impact of operating, ongoing drilling and sustaining capital expenditures is estimated at \$250 million. The total labour income effect of the Project's operating and sustaining capital, and ongoing drilling expenditures is estimated at \$130 million. These estimates represent averaged annual impact over the life of the Project and are based on published multipliers (AF 2011).

16.3.5 Fiscal Effects

When operational, the Project will contribute:

- property taxes to I.D. No. 349;
- oil sands royalties to the provincial government; and
- corporate taxes to the provincial and federal government.

Project tax and royalty payments expand the ability of the different levels of government to fund programs and initiatives in the RSA and elsewhere.

The Project is located in I.D. No. 349, an improvement district created by the province in January 2012 that consists of land previously within the jurisdiction of Lac La Biche County and the Regional Municipality of Wood Buffalo (RMWB). The newly created I.D. is administered by Alberta Municipal Affairs (AMA) and contains the air weapons range for CFBCCL as well as several oil and gas projects.

In 2011, \$19 million was collected by Lac La Biche County and the RMWB in municipal tax revenue from industrial assessment in areas now making up I.D. No. 349. The amount of tax collected by AMA is expected to be similar in 2012 and to decrease slightly over time (Sandberg 2012, pers. comm.).

Since the I.D. has no permanent residents or service centres, the industrial activity taking place on its territory increases the demand for municipal infrastructure provided by neighbouring municipalities. The provincial government has implemented a revenue sharing formula in order to address the costs borne by neighbouring municipalities. It is as follows:

- Alberta Municipal Affairs collects municipal taxes from industrial development in I.D. No. 349 and retains between \$500,000 and \$1 million annually as an administrative fee;
- Lac La Biche County receives \$5 million in 2012, with that amount decreasing by \$1 million each subsequent year until it is phased out entirely by 2017;
- the M.D. of Bonnyville will receive \$600,000 in 2012, with that amount increasing by \$100,000 annually over the next five years; and
- the City of Cold Lake receives the balance, which is estimated to be \$12.4 million in 2012.

16.3.5.1 Municipal Fiscal Effects

The amount of municipal property taxes that the Project will pay is uncertain, as both the actual assessment of the facility and the tax rates in effect when it becomes operational are unknown. Furthermore, since the Memorandum of Understanding drafted by Alberta Municipal Affairs setting out the revenue sharing formula is set to expire in five years, the precise disbursement of the Project's revenue among neighbouring municipalities is also unknown.

A preliminary estimate of the annual municipal taxes related to Phase J, assuming a discount rate of 8% and that the 2012 tax rate and disbursement schedule remain in effect, is \$4 million. Tax payments will commence in 2018 upon the completion of construction. Approximately \$3.6 million will be disbursed to the City of Cold Lake and the remaining \$400,000 will be evenly divided between Alberta Municipal Affairs and the M.D. of Bonnyville. The Town of Bonnyville will not receive any funds from the Project or any other industrial assessment in I.D. No. 349. Over the life of the Project, it is expected to pay property taxes with a 2012 net present value (NPV 2012) of \$30 million in property taxes to I.D. No. 349.

16.3.5.2 Provincial Fiscal Effects

Once the Project is fully operational, royalties will be paid to the provincial government. Future royalty payments are uncertain since they are directly related to the prevailing market price of oil, the Canadian-U.S. dollar exchange rate, and the price differential between light and heavy crude oil. Production costs, including fuel, also impact the calculation of royalties.

Assumptions for this analysis include:

- a discount rate of 8%;
- an average long-term WTI price of US\$ 104.8/barrel;
- an average Canadian/US dollar exchange rate of \$1.01;
- the Project is a single, fully integrated entity; and
- the 2008 Alberta government royalty framework is in effect for the life of the Project.

Under these assumptions, the Project is estimated to pay royalties of \$3 billion (NPV 2012) over the life of the Project.

Cenovus will also pay provincial and federal corporate income taxes on income derived from the Project. Under the same assumptions described above, and assuming the present tax framework applies over the life of the Project, Cenovus will pay corporate income taxes of approximately \$1.3 billion (NPV 2012).

These provincial and federal fiscal benefits are not net of potential costs to the province and to a lesser extent, the federal government, of social and physical infrastructure investment driven by oil sands industry expansion. These costs notwithstanding, oil sands are a net contributor to the fiscal position of Alberta and Canada. Bitumen royalties paid to the province were estimated at \$5.7 billion in the 2012-2013 fiscal year and are projected to rise to \$9.9 billion by 2014-2015 (AF 2012). Most of the bitumen royalties are paid by projects in the Wood Buffalo area, but some are paid by projects in the Cold Lake and Peace River areas.

16.3.6 Employment Effects

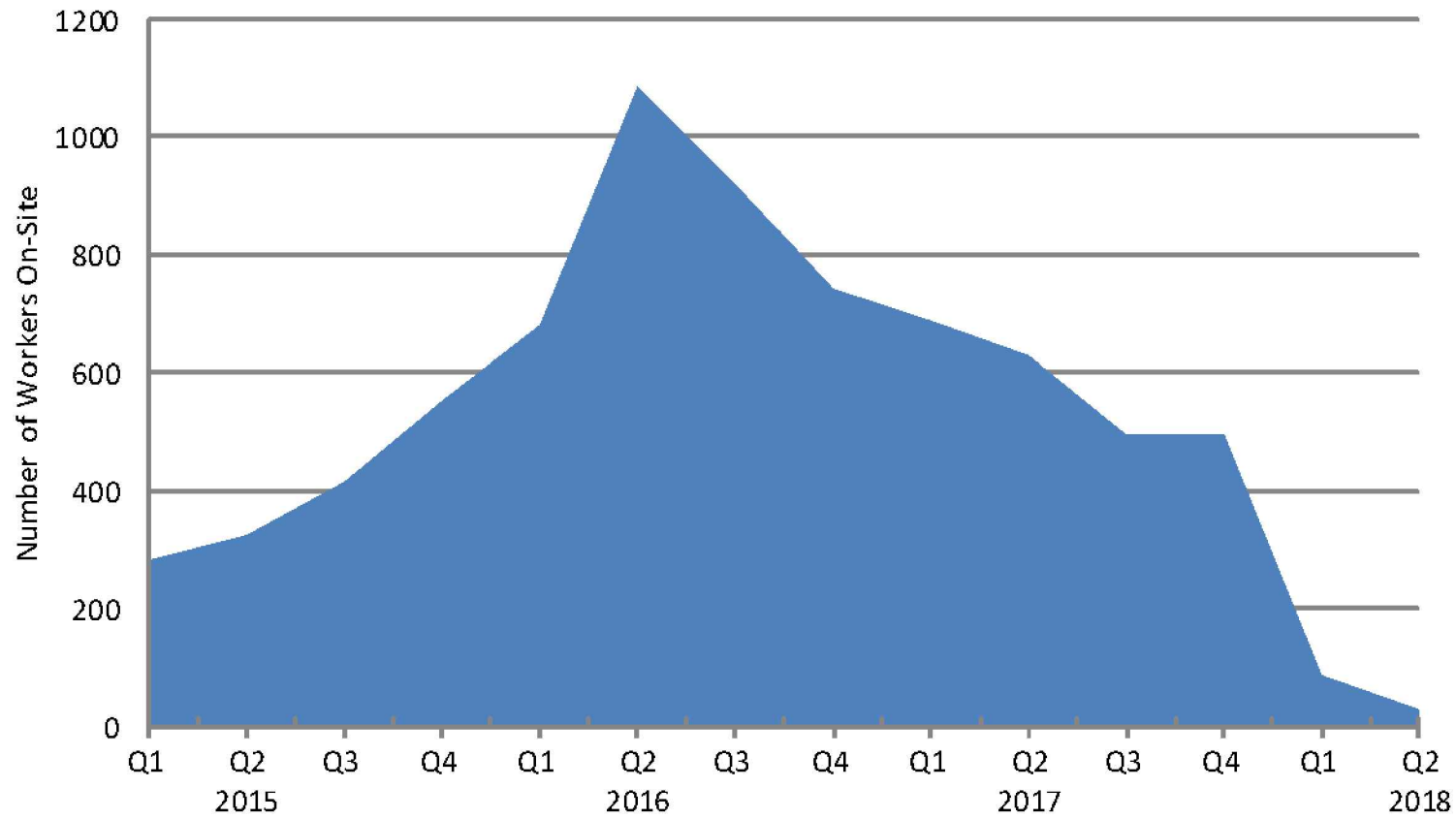
16.3.6.1 On-Site Construction Employment

Construction of the Project is expected to require 1,561 person years of labour on-site during the 2014 to 2018 period, including initial drilling and completions activity. In addition to the expansion of the CPF, there will be well pad, road and pipe building activity, which is expected to generate an additional 340 person years of on-site employment between 2016 and 2018.

All together, and under the assumed schedule, the expansion of the CPF, construction of field facilities, and the drilling of wells will create close to 1,901 person years of on-site employment over the construction period, with a peak of roughly 1,086 workers on-site in 2016 ([Figure 16.3-1](#)).

16.3.6.2 Off-Site Construction Employment

The construction of the Project will create work in fabrication shops and construction yards outside the RSA, mostly in the Edmonton and Nisku area. The total off-site construction is estimated to be 800 person years between 2015 and 2017. [Figure 16.3-2](#) shows that the off-site workforce is expected to peak and plateau at approximately 500 workers between Q3 of 2015 and Q2 of 2017, given the assumed construction schedule.



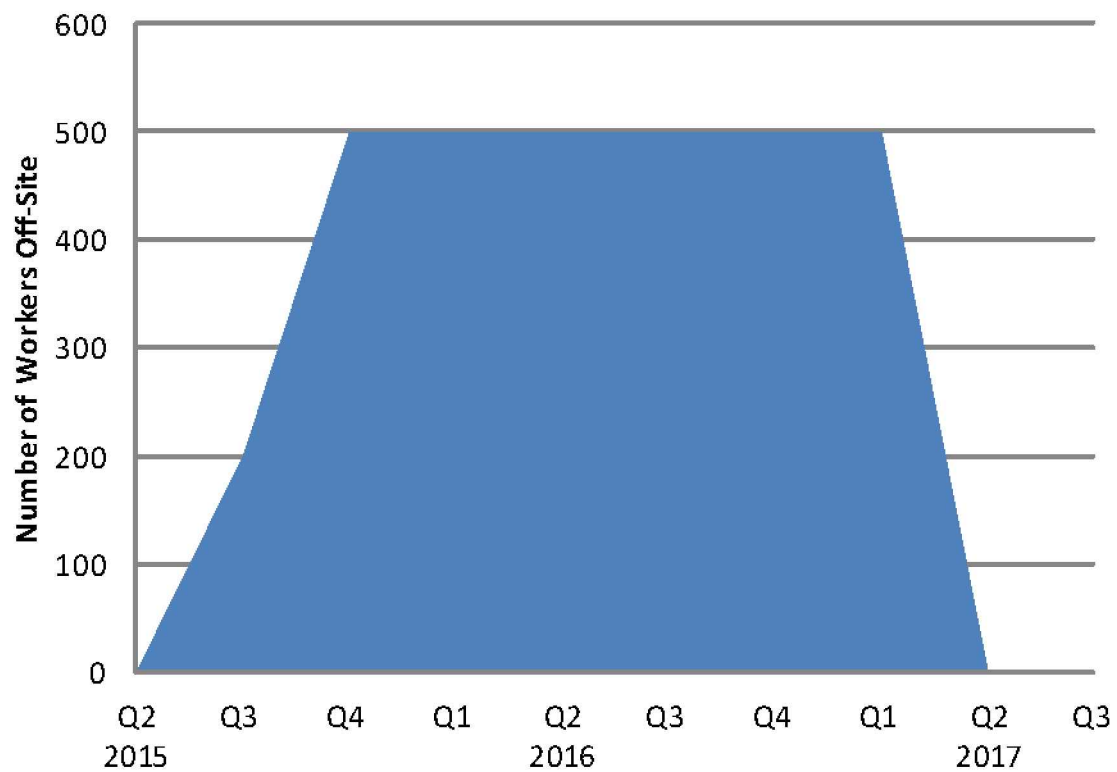
Foster Creek Thermal Project Phase J Expansion

ON-SITE CONSTRUCTION EMPLOYMENT

Date:	11 Feb 2013	Project:	307074-00143	Technical:	P. Shewchuk	Reviewer:	M. Bartlett	Drawn:	L. Pedersen
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Disclaimer: Prepared solely for the use of Cenovus FCCL Ltd. as specified in the accompanying report. No representation of any kind is made to the other parties with which Cenovus FCCL Ltd. has not entered into contract.

Figure
16.3-1



Foster Creek Thermal Project Phase J Expansion

OFF-SITE CONSTRUCTION EMPLOYMENT

Date:	11 Feb 2013	Project:	307074-00143	Technical:	P. Shewchuk	Reviewer:	M. Bartlett	Drawn:	L. Pedersen
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Disclaimer: Prepared solely for the use of Cenovus FCCL Ltd. as specified in the accompanying report. No representation of any kind is made to the other parties with which Cenovus FCCL Ltd. has not entered into contract.

Figure 16.3-2

16.3.6.3 Construction Employment by Type

The Project will employ a broad range of construction trades during the on-site CPF, well pad, and pipeline construction activities, the bulk of which will be welders, pipe fitters, and iron workers. The Project will also create significant work for general labourers. Table 16.3-5 provides an approximate breakdown of the construction trades represented in the on-site construction workforce.

Table 16.3-5 On-Site Construction Workers by Occupation

Category	Total [%]
Labourer	33
Pipe fitter	15
Welder	10
Iron worker	10
Concrete finisher	8
Electrician	8
Insulator	8
Heavy equipment operator	4
Instrument tech	4
Total	100

As noted, there will be drilling operations during the construction period. The labour required for this type of work includes the full range of rig workers, including roughnecks, motormen and drillers. Off-site workers, employed in fabrication yards, will include metal fabricators, pipe fitters and welders.

16.3.6.4 Engineering Employment

In addition to on- and off-site construction employment, the Project is expected to create an estimated 478 person years of employment for engineers. The majority of this work will be undertaken by engineering firms outside the RSA in Edmonton and Calgary.

16.3.6.5 On-Site Operations Employment

Once it becomes fully operational, the Project is expected to employ 103 people, all of which are expected to be Cenovus employees.

During the operational phase of the Project, there will be continuous drilling activities to ensure that the productive capacity of the Project is maintained. This ongoing drilling activity and associated field construction is expected to employ approximately 120 person years of labour annually on-site. This estimate is an annual average since the actual volume of drilling will vary from year to year and be performed primarily in the winter months. There are contractors within the RSA who have the ability to perform some of this type of work.

In addition to the permanent operations employment, the Project will employ between 100 and 150 contractors for approximately three weeks every two years for scheduled turnarounds.

16.3.6.6 Off-Site Operations Employment

Some of the well pad construction related to the Project will be performed off-site. For example, well pad equipment will be fabricated in production facilities in the greater Edmonton area. This employment is expected to average 12 person years of employment annually over the life of the Project. Off-site operations employment will consist largely of operators, maintenance workers and contractors, technical and supervisory staff, as well as administrative positions.

16.3.6.7 Total Employment Effects

The economic activity associated with the Project will stimulate employment with suppliers in the general economy since the affected workers spend their income on goods and services, hence creating employment in consumer goods and services sectors. The employment effect of the Project on suppliers is referred to as indirect employment effects and the employment generation effect in the general economy as induced employment effects.

An order-of-magnitude estimate of these indirect and induced employment effects was determined using published multipliers derived from an Input-Output model of the Alberta economy (AF 2011). The total direct employment effect of the construction phase of the Project, including the on- and off-site workforces and engineering, is estimated at 3,180 person years. The total direct, indirect, and induced employment effect is estimated at 7,231 person years over the construction period.

The total direct employment effect of the operations phase includes the regular operations, ongoing maintenance and ongoing drilling workforces. As noted above, the total estimated direct operations employment effect of the Project is approximately 235 full-time equivalent positions. The total direct, indirect and induced employment is estimated at 1,049 person years annually.

16.3.7 Local Hire and Procurement

As was done with earlier phases of the FCTP development, Cenovus will continue to recruit locally and to use Alberta based contractors as often as possible subject to labour availability, cost and quality considerations. Cenovus will also continue to encourage and support the participation of Aboriginals and Aboriginal businesses, such as the PIMCO group of companies, in the construction and operations of the Project.

Cenovus will advertise employment and procurement opportunities related to the Project in local media and provide interested parties with information on educational and professional requirements necessary for permanent employment.

If necessary, Cenovus will support the relocation of skilled operators to the region during the operations phase of the Project.

16.4 TRADITIONAL LAND USE AND CULTURE

16.4.1 Overview

This section addresses the effects of the Project on Traditional Land Use and Culture from a socio-economic perspective.

16.4.2 Setting

The Project is located on lands that have traditionally been used by the Cold Lake First Nations (CLFN), a Dene people and part of Treaty 6. Generally, the engagement of Aboriginal peoples in traditional activities has changed over time:

- during the 18th and 19th centuries, trapping supplemented traditional hunting, fishing and gathering activities as a result of the fur trade;
- during the first half of the 20th century, most Aboriginal people pursued a traditional hunting and gathering lifestyle, even though many of their children attended school and some adults participated in the wage economy; and
- during the 20th century, with the emergence of agriculture and subsequently the oil and gas and oil sands industry and increased wage activities in the region, the economic importance of traditional pursuits in Aboriginal communities has declined.

The establishment of the Cold Lake Air Weapons Range (CLAWR) in 1952 reduced access by members of the CLFN to lands they used for traditional pursuits. Since 2002, access by CLFN members to the CLAWR is governed by the Range Access Agreements that are part of the settlement of the CLFN's specific claim related to the establishment of the CLAWR. CLFN access to the CLAWR for traditional activities requires permission from Range Control and may be limited to defined periods and locations.

16.4.3 Effects

16.4.3.1 Baseline Case

The traditional land use and culture of the CLFN has been and will continue to be affected by a number of external influences, including:

- increased use of traditional lands for non-traditional purposes, whether it be resource development or increased agricultural development and encroaching urbanization;
- government actions (e.g., policies, programs, funding) in a number of areas including governance, land use, education and training and the development and delivery of infrastructure and services; and
- increased access to influences of other cultures through advancements in technology (e.g., television, internet, cell phones).

The relative magnitude of these external influences is not equal and the experience of individual CLFN members might vary.

16.4.3.2 Application and Planned Development Case

The Project will create employment and business opportunities for Aboriginal communities in the RSA. These additional wage economy opportunities may affect traditional land use and culture, as:

- time pressures related to work can limit opportunities for carrying out traditional pursuits and transferring traditional knowledge to Aboriginal youth;
- working conditions are not always sensitive to the particular cultural needs of Aboriginal peoples (e.g., flexible work arrangements that allow Aboriginal workers to take part in traditional activities);
- wage economy opportunities can increase exposure of Aboriginal persons to outside cultural values that might run contrary to traditional values; and
- the requirements of wage-economy jobs have increased the importance of non-traditional education.

Cenovus initiated consultation with CLFN regarding the Project and consultation is continuing ([Volume 1, Section 2](#) – Public Consultation). To date, Cenovus has met with CLFN a number of times and has provided them with detailed Project information. CLFN has expressed concerns about potential Project impacts, in particular, CLFN has advised Cenovus that they do not want any activity in their Wildlife Preservation Area and the proposed Project avoids this area.

With respect to obtaining Traditional Ecological Knowledge (TEK) and Traditional Land Use (TLU) (collectively “TK”) information for the Project, Cenovus has been in discussion with CLFN, and has requested that a TK study be initiated, reviewed, and discussed. To date, CLFN has not provided Cenovus with a clear process for obtaining additional TK information (which would supplement the relevant TK information previously collected for the approved phases of the FCTP). Cenovus continues to have meaningful discussions with CLFN with respect to the potential for conducting a TK study in association with the Project area, and Cenovus continues to support the initiation of a TK study ([Volume 6, Section 17](#)).

Through ongoing consultation between CLFN and Cenovus, including any additional information which may be available in the event that the TK study is completed, Cenovus will address the information required by the TOR with respect to TK.

16.5 POPULATION

16.5.1 Overview

This section presents the population effects associated with the Project on the RSA. The focus is on the City of Cold Lake and the Town of Bonnyville since they are the closest population centres to the Project with open housing markets.

16.5.2 Setting

16.5.2.1 Resident Population

The population of the RSA is estimated at 33,585, distributed throughout the City of Cold Lake, the Town of Bonnyville, the residential communities within the M.D. of Bonnyville, and several aboriginal communities including the CLFN reserves (Table 16.5-1; Statistics Canada 2011, 2001). The closest fully serviced population centre to the Project is the Town of Bonnyville (population 6,216).

Table 16.5-1 Regional Study Area Population 2001 to 2011

Geography	2001	2011	Average Annual Growth Rate [%]
City of Cold Lake	11,520	13,839	1.9
Town of Bonnyville	5,709	6,216	0.9
M.D. of Bonnyville	8,858	10,587	1.8
CLFN Reserves	588	788	3.0
Kehewin Reserve 123	991	1,065	0.7
Elizabeth Métis Settlement	596	654	0.9
Fishing Lake Métis Settlement	478	436	-0.9
RSA Total	28,740	33,585	1.6
Alberta	2,974,807	3,645,257	2.1

M.D. = municipal district, CLFN = Cold Lake First Nation, RSA = regional study area

In the ten-year period between 2001 and 2011, the population within the RSA has increased by nearly 17%, or 1.6% annually. This is below the provincial average growth rate of 2.1% for the same period. Growth was not uniform across all of the communities in the RSA. The CLFN reserves grew by nearly double the RSA average at 3.0% per year followed by the City of Cold Lake, which grew at 1.9% annually. The M.D. of Bonnyville grew at a similar pace to the RSA overall due in part to the continued development of residential sub-divisions in the Moose Lake, Riverhurst, and Cherry Grove areas (Poole 2012, pers. comm.). The Town of Bonnyville lagged behind all municipalities in the RSA with an annualized growth rate of 0.9%.

Approximately one-third of the population of the City of Cold Lake can be attributed to the staff of the nearby military base. The strategies and policies implemented by the federal government and military commanders have the ability to affect the population of the City of Cold Lake.

16.5.2.2 Non-Resident Population

In addition to the permanent population residents within the RSA, there are a number of mobile workers living in camps and motels throughout the region. The mobile worker population varies over time due to the seasonal nature of oil and gas projects as well as the phased nature of large scale industrial construction.

Hotels and motels in the Town of Bonnyville and the City of Cold Lake rely on regular business from work crews. Interviews with several hotel operators indicate an average occupancy rate of 95% and 75% in Bonnyville and Cold Lake, respectively, of which the majority (90%-95%) are rented out to workers. Discussions with area hotel and motel operators indicate that block room bookings for month-long periods is common practice by energy companies in the region.

In late 2012, the capacity of camps in the region is estimated to be 3,000 beds, composed almost entirely of the facilities at the existing FCTP site. When all camps are full, their tenants comprise a contingent roughly equivalent to 9% of the permanent population of the RSA.

16.5.3 Effects

Any estimate of the future population of the RSA is uncertain and is linked to the future oil and gas industry development scenario and workforce housing model, and the availability of housing and services in the RSA.

The level of development in the oil and gas industry is expected to be a major driver of employment creation and population growth within the RSA. For the purposes of this analysis, a Baseline Case, Application Case, and PDC were defined based on available industry plans in late 2012.

16.5.3.1 Baseline Case

The Baseline Case population forecast limits the analysis of population effects only to projects that are under construction or have regulatory approval six months prior to the filing of this Application. Based on industry's growth plans in late 2012, the resident population in the RSA is expected to grow by approximately 2.0% annually, reaching 38,328 by 2018. The expected population growth by municipality is shown in [Table 16.5-2](#).

Table 16.5-2 Baseline Case Regional Study Area Population Growth

Geography	2012	2018	Average Annual Growth Rate [%]	Growth Currently Being Planned For by Municipalities [%]
City of Cold Lake	14,095	16,090	2.3	3.0
Town of Bonnyville	6,269	6,752	1.3	2.0
M.D. of Bonnyville	10,777	12,265	2.3	2.5
CLFN Reserves	811	967	3.0	n/a
Kehewin 123	1,073	1,120	1.0	n/a
Elizabeth Métis Settlement	660	698	1.0	n/a
Fishing Lake Métis Settlement	436	436	0.0	n/a
RSA Total	34,122	38,328	2.0	2.6

M.D. = municipal district, CLFN = Cold Lake First Nation, RSA = regional study area, n/a = not applicable

The precise allocation of future population across communities within the RSA is subject to the availability and price of housing. This is particularly relevant when considering population growth in Aboriginal communities, where the supply of housing is not determined entirely by market forces.

16.5.3.2 Application Case

As with previous phases of the FCTP, Cenovus will build and operate Phase J on a remote camp basis. Past experience suggests that all construction workers will be housed on-site and approximately 10% of its operations staff will live in camp, with the balance living in urban or rural residential communities throughout the RSA.

Given the existing labour market in the region and the low unemployment rate, a sizeable portion of both the direct operations jobs and the indirect and induced jobs will be filled by in-migrants. Resident population growth associated with the Project will begin accruing to the RSA communities in early 2018 prior to the beginning of operations.

Under the Application Case assumptions and taking into account the camp-based model, the local hire policies and the current labour market conditions, the permanent population effect of the Project is expected to be 478 people. The population increase will be distributed across the City of Cold Lake, the Town of Bonnyville and the residential communities within the M.D. of Bonnyville as shown in [Table 16.5-3](#). Since housing in Aboriginal communities, such as the CLFN reserves, is limited to members and not subject to general market forces, it is assumed that the Project will not have a permanent population effect on the reserve.

Table 16.5-3 Application Case Regional Study Area Population Growth

Geography	2012	2018	Application Case Average Annual Growth Rate [%]	Growth Currently Being Planned For by Municipalities [%]
City of Cold Lake	14,095	16,209	2.4	3.0
Town of Bonnyville	6,269	6,885	1.7	2.0
M.D. of Bonnyville	10,777	12,491	2.6	2.5
CLFN Reserves	811	967	3.0	n/a
Kehewin 123	1,073	1,120	1.0	n/a
Elizabeth Métis Settlement	660	698	1.0	n/a
Fishing Lake Métis Settlement	436	436	0.0	n/a
RSA Total	34,122	38,806	2.2	2.6

M.D. = municipal district, CLFN = Cold Lake First Nation, RSA = regional study area, n/a = not applicable

The levels of growth forecast under the Application Case are below the levels currently being planned for by the City of Cold Lake and the Town of Bonnyville, and roughly in line with the growth being planned for by the M.D. of Bonnyville (COCL 2007; MDB 2007; TOB 2005). The level of growth in the Aboriginal communities may be higher than shown in [Table 16.5-3](#) if members currently living off reserve or settlement elect to return to the reserve, subject to the availability of housing.

16.5.3.3 Planned Development Case

Under the PDC assumptions, the population is expected to increase by 806 people above the Application Case, and 1,284 people above the Baseline Case during the 2012-2018 period. The distribution of future population growth is shown in [Table 16.5-4](#). Since housing on the CLFN reserve is limited to Band members and not subject to general market forces, it is assumed that future growth in the PDC will not have a permanent population effect on the reserve.

Table 16.5-4 Planned Development Case Regional Study Area Population Growth

Geography	2012	2018	PDC Average Annual Growth Rate [%]	Growth Currently Being Planned For by Municipalities [%]
City of Cold Lake	14,095	16,477	2.8	3.0
Town of Bonnyville	6,269	7,157	2.4	2.0
M.D. of Bonnyville	10,777	12,757	3.1	2.5
CLFN Reserves	811	967	3.0	n/a
Kehewin 123	1,073	1,120	1.0	n/a
Elizabeth Métis Settlement	660	698	1.0	n/a
Fishing Lake Métis Settlement	436	436	0.0	n/a
RSA Total	34,122	39,612	2.5	2.6

M.D. = municipal district, CLFN = Cold Lake First Nation, RSA = regional study area, n/a = not applicable

The levels of growth forecast under the PDC are consistent with the level of growth currently being planned for by the City of Cold Lake and slightly above the amount of growth being planned for by the Town and the M.D. of Bonnyville (COCL 2007; MDB 2007; TOB 2005).

16.5.3.4 Mobile Worker Effects

During peak construction activity, the Project will increase the number of mobile workers in the existing FCTP camp and the region by approximately 800 (25% and 22%, respectively). The use of mobile workers as part of the construction workforce will:

- allow spouses and family members of camp workers to remain active in the labour force in the community in which they permanently reside; and
- spread the economic benefits of industrial development beyond the RSA communities.

Mobile workers can add to the pressures on the health system in the RSA, especially emergency department, policing, emergency services and transportation infrastructure (NAM 2007). Refer to [Sections 16.8](#) and [16.9](#) for a discussion of the capacity of the social and transportation infrastructure to accommodate additional demands.

16.6 HOUSING

16.6.1 Overview

This section discusses the availability and affordability of housing within the RSA. The estimated demand for housing under the Baseline Case, Application Case, and PDC are presented. Housing in Aboriginal communities is limited to members.

16.6.2 Setting

16.6.2.1 Availability

The RSA has a well-developed housing stock, estimated to be 11,785 private dwellings in 2011, an increase of 1,340 (11%) dwellings since 2006 (Statistics Canada 2011, 2006). The housing stock has increased at an average annual rate of 2.9% in the region in the past five years, faster than the 2.1% average growth rate of the population (Statistics Canada 2011, 2006). Compared to provincial averages, the RSA shows slightly higher ownership tenure than the province as a whole (76% versus 74%) and a similar level of housing density (Statistics Canada 2011, 2006).

The City of Cold Lake

The City of Cold Lake contained approximately 5,150 housing units in 2011 (Statistics Canada 2011). The City manages the release and development of residential lots within its boundaries and has seen an average annual increase of 3.7% (170 units) in the number of private housing units added to the community since 2006 (Statistics Canada 2011, 2006).

Approximately 10% of dwelling units in the City of Cold Lake are apartments, with the balance consisting almost entirely of single- and semi-detached houses (Statistics Canada 2006). Approximately one quarter of all dwellings are rented; however, the rental market in the City of Cold Lake is currently experiencing high demand with a near zero vacancy rate (CMHC 2012). Homeowners are reacting to this market opportunity by developing secondary rental suites (Rogers 2012, pers. comm.). In order to meet some of this demand, the City is considering releasing land for the construction of an operations camp within its boundaries (Rogers 2012, pers. comm.).

The City of Cold Lake has sufficient developable land to accommodate housing developments for several thousand new residents; however, the limited availability of developers and home building trades in the region is constraining the rate at which new houses can be brought on-line (Rogers 2012, pers. comm.).

The Town of Bonnyville

In 2011, approximately 20% of the housing units within the RSA were located in the Town of Bonnyville. The Town has seen an increase of approximately 0.5% (11 units) per year since 2006 up to 2,324 in 2011. Bonnyville has the largest proportion of apartments relative to all

dwelling types (18%) of all municipalities in the RSA, the balance being mainly semi- and single-detached houses and row houses (Statistics Canada 2006). Approximately 35% of all dwellings are rented while 65% are owned. This is a higher rental rate than the RSA and provincial averages of approximately 25%.

As is the case in the City of Cold Lake, the Town of Bonnyville has sufficient land to develop housing for three to four thousand additional residents; however, a shortage of available home building trades in the region limits the rate at which new houses can be brought on-line (Power 2012, pers. comm.).

The M.D. of Bonnyville

The M.D. of Bonnyville contains approximately 32% of all residential units in the RSA (Statistics Canada 2011). The M.D. had 3,820 houses in 2011, an average increase of 4% (86 units) per year since 2006 (Statistics Canada 2011, 2006). Much of that growth has taken place in the residential sub-divisions of Moose Lake, Riverhurst, and Cherry Grove (Poole 2012, pers. comm.). The M.D. does not contain any high-density housing units and an estimated 220 units (5%) are available for rent.

The M.D. has a sizeable portion of land available for residential development and is able to accommodate additional housing construction at a pace of approximately 100 new units per year (Poole 2012, pers. comm.).

Aboriginal Communities

Housing on First Nations reserves is managed by the Band and Aboriginal Affairs and Northern Development Canada (AANDC), and not generally subject to market forces that would otherwise affect the supply of housing in the community.

Factors that affect the availability of housing on reserve include:

- the cost of housing, especially for people not or only partially engaged in the wage economy; and
- federal government policies and funding for on-reserve housing.

16.6.2.2 Price

In 2011, the average home price in each of the three municipalities within the RSA was below the provincial average of \$363,801 (Table 16.6-1). However, the rental cost in both the Town of Bonnyville and City of Cold Lake are above the provincial average.

Table 16.6-1 2011 Housing Prices, Rental Rates, and Vacancy Rates in the Regional Study Area

Geography	Average Monthly Rent (one bedroom apartment)	Rental Vacancy Rate (%)	Average Home Price
City of Cold Lake	\$1,091	0.9	\$339,065
Town of Bonnyville	\$947	13.6	\$330,568
M.D. of Bonnyville	n/a	n/a	\$274,057
Alberta	\$869	3.4	\$363,801

Source: ABHOME 2012, AMA 2012; CMHC 2012.

* Municipal District (M.D.) statistics include all rural sales.

n/a = not applicable

16.6.2.3 Affordability

There is reported to be a shortage of both affordable and senior’s housing units in all of the municipalities within the RSA (Poole 2012, pers. comm.; Power 2012, pers. comm.; Rogers 2012, pers. comm.). In the City of Cold Lake, this shortage was being addressed via a project spearheaded by the Cold Lake Affordable Housing Society that aimed to build 32 units of affordable housing. However, the project was delayed when the contractor responsible went into receivership in 2009. The project has since been taken over by Habitat for Humanity and is scheduled for completion within the next year (Rogers 2012, pers. comm.). As of late 2012, there were no plans in either the Town or M.D. of Bonnyville to specifically address the shortage of affordable housing or senior’s housing (Poole 2012, pers. comm.; Power 2012, pers. comm.).

16.6.2.4 Accommodations for Existing Foster Creek Phases

Cenovus currently houses all construction personnel and approximately 10% of its operations personnel in on-site work camps. During winter months when drilling programs are active, the existing Foster Creek camps may house as many as 3,000 people. The majority of operations staff who do not live in camp reside within the RSA.

16.6.3 Effects

The need for housing is driven by population growth. The housing effects presented assume the use of work camp accommodations by Cenovus and the use of hotels and motels by other operators in the RSA, which is in line with the current practice. The availability of housing in Aboriginal communities is not generally subject to conventional market forces that would otherwise affect the supply of housing. As such, housing effects under the three assessment cases are focused on the City of Cold Lake, the Town of Bonnyville, and the M.D. of Bonnyville.

16.6.3.1 Baseline Case

The housing needed to accommodate Baseline Case population growth in the RSA is estimated at 1,453 units (242/year) for the period between 2012 and 2018. The distribution of new housing units throughout the RSA is shown in [Table 16.6-2](#).

Table 16.6-2 Additional Housing Units Required in the Baseline Case

Community	2012 Housing Stock	Average Number of Units Built Per Year (2006-2011)	Average Number of Units Needed Per Year (2012-2018)
City of Cold Lake	5,319	169	111
Town of Bonnyville	2,335	11	32
M.D. of Bonnyville	3,883	63	90
RSA Total	11,537	243	233

M.D. = municipal district, RSA = regional study area

These estimates reflect historical rates of population growth and densities, and do not allow for any unmet housing demand as of 2018. The actual number of required housing units may vary based on the number of people per dwelling. Some of these units might come in the form of secondary suites and may not necessarily require additional buildings.

The expected demand for housing under the Baseline Case assumptions is consistent with the previous rate of growth in supply for the RSA as a whole. The historic rate of growth in the housing stock in the M.D. and the Town of Bonnyville will not be sufficient to meet the demand for housing in the Baseline Case. However, discussions with municipal officials indicate that the pace of residential development is increasing in the Town of Bonnyville, and the M.D. of Bonnyville is capable of bringing up to 100 units of housing on-line per year (Poole 2012, pers. comm.; Power 2012, pers. comm.).

16.6.3.2 Application Case

The permanent housing need associated with the long-term population effect of the Project is estimated to be approximately 176 units (29 houses/year) by 2018. Including the growth in the Baseline Case, demand is estimated at approximately 1,576 units (262/year) by 2018. The anticipated distribution of new housing units throughout the RSA is shown in [Table 16.6-3](#).

Table 16.6-3 Additional Housing Units Required in the Application Case

Community	2012 Housing Stock	Average Number of Units Built Per Year (2006-2011)	Average Number of Units Needed Per Year Baseline + Application (2012-2018)
City of Cold Lake	5,319	169	119
Town of Bonnyville	2,335	11	40
M.D. of Bonnyville	3,883	63	103
RSA Total	11,537	243	262

M.D. = municipal district, RSA = regional study area

The expected demand for housing under the Application Case assumptions is higher than the previous rate of growth in supply for the RSA as a whole. The recent rate of growth in the housing stock in the M.D. and the Town of Bonnyville will not be sufficient to meet the demand for housing in the Application Case. However, discussions with municipal officials indicate that the pace of residential development is increasing in the Town of Bonnyville and the M.D. of Bonnyville is capable of bringing up to 100 units of housing on-line per year (Poole 2012, pers. comm.; Power 2012, pers. comm.). They also indicate that sufficient land is available to meet the demand for new housing under the Application Case (Poole 2012, pers. comm.; Power 2012, pers. comm.; Rogers 2012, pers. comm.). The responsible authorities will need to engage developers and make them aware of the opportunities to build and sell additional homes in the RSA.

16.6.3.3 Planned Development Case

The permanent population forecast for the PDC is estimated to generate housing demand for 1,874 units (312/year), by 2018. The anticipated distribution of new housing units throughout the RSA is shown in [Table 16.6-4](#).

Table 16.6-4 Additional Housing Units Required in the Planned Development Case

Community	2012 Housing Stock	Average Number of Units Built Per Year (2006-2011)	Average Number of Units Needed Per Year Baseline + Application + PDC (2012-2018)
City of Cold Lake	5,319	169	135
Town of Bonnyville	2,335	11	57
M.D. of Bonnyville	3,883	63	120
RSA Total	11,537	243	312

M.D. = municipal district, RSA = regional study area

The expected demand for housing under the PDC assumptions is higher than the previous rate of growth in supply for the RSA as a whole. The historic rate of growth in the housing stock in the M.D. and the Town of Bonnyville will not be sufficient to meet the demand for housing in the PDC. Municipal officials indicate that sufficient land is available to meet the demand for new housing under the PDC (Poole 2012, pers. comm.; Power 2012, pers. comm.);

Rogers 2012, pers. comm.). The responsible authorities will need to engage developers and make them aware of the opportunities to build and sell additional homes in the RSA.

16.7 MUNICIPAL INFRASTRUCTURE

16.7.1 Overview

This section discusses the existing municipal infrastructure in the RSA as well as the effects associated with the Baseline Case, Application Case, and PDC. The funding of municipal infrastructure is also addressed.

16.7.2 Setting

Each of the three municipalities within the RSA is responsible for the planning, construction, operations, and maintenance of municipal infrastructure within its boundaries. The demand for certain municipal infrastructure and services in the City of Cold Lake and the Town of Bonnyville is driven not only by their respective residents, but also by the needs of individuals living nearby in the M.D. of Bonnyville.

The provincial government commissioned a Cold Lake Oil Sands Area Comprehensive Regional Infrastructure Sustainability Plan (CLOSA CRISP) to understand the current and future infrastructure needs of a larger region that includes the socio-economic RSA. As of December 2012, the CLOSA CRISP was under review by the Government of Alberta. It is anticipated that the CLOSA CRISP considers all of the oil sands projects included in the PDC and forecasts infrastructure needs for that scenario.

16.7.2.1 Existing Infrastructure

The Town of Bonnyville and the City of Cold Lake offer a range of well-developed municipal infrastructure to residents of the RSA. With respect to the future capacity of the existing municipal infrastructure in the RSA, discussions with representatives of the three municipalities indicate that:

- The City of Cold Lake has sufficient capacity in its water and wastewater systems to accommodate a population of approximately 17,000 people, well above the current population of approximately 14,000 (Rogers 2012, pers. comm.).
- The water treatment facility in the Town of Bonnyville is under strain because the input water from Moose Lake is of low quality and requires substantial treatment in order to be made safe for human consumption. Future expansion of the sewer systems is constrained by the local topography on the west side of town. These challenges could be overcome but will require additional funding above current levels (Power 2012, pers. comm.; TOB 2012, Internet site).
- Many residents of the M.D. of Bonnyville are connected to water and wastewater systems. Some residents have water delivered, others have local wells and some have

wastewater trucked out. Major service points for water hauling in the M.D. are reservoirs in the hamlets of Ardmore and Fort Kent (Poole 2012, pers. comm.).

- The three municipalities haul solid waste from local transfer stations to landfills located near the Village of Ryley in Beaver County and the hamlet of Lafond in St. Paul County.

The mobile worker population in the region contributes to the demand for municipal services. Cenovus currently purchases potable water from the M.D. of Bonnyville for its FCTP camps. Water is trucked to site and non-industrial waste is hauled out to M.D. transfer stations.

The City of Cold Lake and the Town of Bonnyville offer a wide range of recreation and social services to residents of the RSA. These services, along with emergency services for which the municipalities are responsible, are discussed in [Section 16.8](#).

16.7.2.2 Funding of Municipal Infrastructure

Generally speaking, municipal governments are responsible for costs associated with the construction and maintenance of infrastructure such as water and sewer systems. As shown in [Table 16.7-1](#), all three municipalities in the RSA show signs of healthy financial positions: They have:

- per capita assessments near or above the provincial average for similar municipalities;
- per capita debt levels below the provincial average for municipalities of their type; and
- total municipal debt levels that are less than:
 - 60% of the allowable limit in the City of Cold Lake;
 - 25% of the allowable limit in the Town of Bonnyville; and
 - 25% of the allowable limit in the M.D. of Bonnyville.

Table 16.7-1 2011 Municipal Financial Indicators

Community	Per Capita Debt	Average Per Capita Debt For Municipality Type	Per Capita Assessment	Average Per Capita Assessment For Municipality Type
City of Cold Lake	\$1,498	\$2,399	\$118,153	\$182,714
Town of Bonnyville	\$649	\$1,042	\$118,246	\$140,407
M.D. of Bonnyville	\$209	\$869	\$455,592	\$359,025

Source: AMA 2012.

M.D. = municipal district

The financial positions of both the City of Cold Lake and the M.D. of Bonnyville are likely to improve further after 2012 as a result of funds being transferred from the recently formed I.D. No. 349 ([Section 16.3.5](#)). The Town of Bonnyville will not directly benefit from these transfers under the current transfer agreement that expires in five years.

There are a number of revenue sharing agreements in place between the RSA municipalities. Most notably, a service sharing agreement is in place between the M.D. of Bonnyville, the Town of Bonnyville, and the City of Cold Lake. Under these agreements, a portion of the M.D.'s revenues are shared with the two urban centres to offset the cost of service delivery to M.D. residents.

16.7.3 Effects

16.7.3.1 Baseline Case

Currently ongoing and planned upgrades to the municipal infrastructure in the RSA are based on expected annual population growth of 2% to 3% (COCL 2007; MDB 2007; TOB 2005). As such, the RSA municipal infrastructure is expected to have sufficient capacity to accommodate the growth inherent in the Baseline Case, which is approximately 2% annual growth between 2012 and 2018.

16.7.3.2 Application Case

The additional population growth under the Application Case, estimated to be 1.6% above the Baseline Case in 2018, represents a marginal increase in municipal infrastructure demand. The municipal infrastructure currently in place combined with planned upgrades and expansions are expected to be sufficient to service the anticipated population under the Application Case assumptions (COCL 2007; MDB 2007; Poole 2012, pers. comm.; Power 2012, pers. comm.; Rogers 2012, pers. comm.; TOB 2005).

The Project will require potable water for construction and operations. The current practice at the existing FCTP facilities is to use a combination of well water and water trucked in from reservoirs in the hamlets of Ardmore and Fort Kent to the FCTP camps. This practice is expected to continue in the near term although Cenovus is committed to having all FCTP facilities using wells for potable water by the end of 2013. Discussions with a representative of the M.D. indicate that formal scheduling of loads might be required to avoid depleting the reservoirs below the levels required for fire-fighting readiness on a day-to-day basis (Poole 2012, pers. comm.). The availability of drinking water to residential users will be unaffected (Poole 2012, pers. comm.).

16.7.3.3 Planned Development Case

Population effects under PDC assumptions are estimated to be 1,284 new residents in the RSA above Baseline Case estimates in 2018. The implied annual population growth rate of 3.1% is slightly above the upper range of the 2% to 3% planning framework used by the RSA municipalities. The municipal infrastructure currently in place combined with planned upgrades and expansions might not be sufficient to service the anticipated population under the PDC assumptions and therefore development plans for the region need to be monitored and plans adjusted as required in order to ensure full services should the PDC materialize.

Future planning decisions regarding industrial and commercial developments might further encourage growth within the RSA. The capacity of local municipal infrastructure will need to be considered as part of any growth plans going forward. The transfer of municipal taxes from I.D. No. 349 to the City of Cold Lake and the M.D. of Bonnyville will increase the ability of those municipalities to address infrastructure needs in the future. The Town of Bonnyville will continue to rely on its tax base to raise the funds necessary to finance future infrastructure expansion.

16.8 SOCIAL INFRASTRUCTURE

16.8.1 Overview

Social infrastructure includes a diverse range of human services and infrastructure including health, education, social, recreation, policing, and emergency services. The Project will have an effect on social infrastructure in the RSA primarily through its population effect. This section discusses those effects and provides order-of-magnitude estimates of select social infrastructure effects under the Baseline Case, Application Case and PDC.

16.8.2 Setting

16.8.2.1 Policing

Police service in the RSA is provided by the Royal Canadian Mounted Police (RCMP) detachments in the Town of Bonnyville and the City of Cold Lake, and is complemented by Peace Officers employed by the M.D. of Bonnyville.

The Cold Lake RCMP detachment consists of 30 regular members, of which 14 are Provincially-funded. The detachment polices the City of Cold Lake, the CLFN reserves, the Elizabeth Métis Settlement and surrounding rural areas of the M.D. of Bonnyville. The detachment has noted an increase in criminal activity including organized crime and drug trafficking (Sawatzky 2012, pers. comm.). The number of motor vehicle collisions has also increased in recent years, likely as a result of increased traffic volumes (Sawatzky 2012, pers. comm.). The detachment is operating within its capacity and there are no plans to increase the size of the detachment at this time (Sawatzky 2012, pers. comm.).

The Bonnyville RCMP detachment is responsible for policing the Town of Bonnyville as well as the western portion of the M.D. of Bonnyville, including the La Corey road (RR 60) up to the CLAWR. The detachment currently consists of 18 regular members, of which 7 are provincially funded. The remaining officers are funded by the Town of Bonnyville.

RCMP officers in the Bonnyville detachment face a number of challenges, including:

- a high volume of dangerous driving and other traffic related offences (Traffic Impact Assessment is included in [Appendix 16A](#));

- a crime rate exceeding the provincial average – for example in 2011, the detachment reported 219 criminal code violations per 1,000 population, as compared to the provincial average of 139; and
- increases in the number of violent crime – for example, the number of assaults has increased 40% between 2006 and 2012 (Gandalfi 2012, pers. comm.).

The detachment also notes some resourcing challenges, including difficulty in attracting experienced staff and challenges in securing additional members for rural policing. As of late 2012, there were no plans to increase the size of the detachment.

16.8.2.2 Emergency Services

The City of Cold Lake

The City of Cold Lake is serviced by the Cold Lake Ambulance Society. It operates three ambulances with advanced life support service using 20 full-time and 20 casual staff who respond to emergencies in the City as well as on nearby industrial sites (CLAS 2012, Internet site).

Industrial and district fire and rescue services in the City of Cold Lake are provided by the Cold Lake Fire-Rescue. Three full-time staff and 60 volunteer members serve the area from two fire stations. The department currently operates 11 firefighting apparatuses, including pumper trucks, tankers, and a ladder truck. Expansion plans are underway to build three new fire stations in 2014, 2017 and 2021 in order to keep pace with anticipated population growth. The department reports no difficulty in recruiting members or retaining volunteer staff (Fallow 2012, pers. comm.).

Town of Bonnyville and Municipal District of Bonnyville

The Town and M.D. of Bonnyville are serviced by Bonnyville Municipal Ambulance (BMA). BMA has five fully equipped ambulances staffed by 31 members, of whom four are full-time, three are part-time, and 24 are casual. In addition to the Town and M.D. of Bonnyville, the BMA service area also includes the Village of Glendon, the hamlets of Iron River, La Corey and Ardmore as well as the Kehewin First Nations reserves (BEMS 2012, Internet site).

The Bonnyville Fire Authority (BFA) provides fire and rescue services in the Town and M.D. of Bonnyville, and has industrial agreements with Imperial Oil and Canadian Natural Resources Limited for on-site firefighting services. The BFA staffs seven fire stations in the area with approximately 160 to 180 volunteer firefighters and has recently built a regional fire training facility. The facility currently trains volunteers to fight non-industrial fires and includes a second phase to be built in 2013 focusing on industrial firefighting. The BFA is adequately staffed and prepared for population growth and plans to add staff in order to maintain the current ratio of firefighters to citizens as the population grows (Welecki 2012, pers. comm.).

In addition to the emergency services based in the RSA, the communities of the RSA are also served by STARS air ambulance. STARS provides rapid air transportation of patients with a serious illness or injury to a hospital in Edmonton.

16.8.2.3 Health Services

Health care services in the region are provided by Alberta Health Services through the Cold Lake Healthcare Centre, the Bonnyville Health Centre, and the Cold Lake Community Health Services Centre. Residents of the M.D. of Bonnyville and the CLFN reserves are also serviced by these facilities.

The City of Cold Lake

The Cold Lake Healthcare Centre is a combined acute and continuing care facility. Some of the services provided include:

- a pharmacy;
- rehabilitation medicine;
- obstetrics;
- orthopedic surgery; and
- medical imaging (x-ray, ultrasound, CT scan and MRI).

The Centre has 24 acute care beds, two labour and delivery beds and 33 long-term beds. The Centre can treat most routine and uncomplicated cases, including normal deliveries and some surgeries. More complicated cases are sent to Edmonton.

Health system challenges in the City of Cold Lake include:

- a rising occupancy rate in the acute care unit, from a 50% to 75% historic range to 85% in 2012; and
- a lack of adequate psychiatric facilities to treat mental health patients.

There are currently plans to increase staffing in the acute care unit (Westcott 2012, pers. comm.).

The Cold Lake Community Health Services Centre provides a full range of health services to residents of both the City of Cold Lake and the surrounding county. These include:

- community and adult care, including breast cancer screening, pre-natal and post-natal care;
- dental health;
- early childhood development, immunization clinics;
- health promotion;
- mental health services;
- public health nursing;
- nutrition services; and
- rehabilitation and physical therapy (CLCHS 2012, Internet site).

The Town of Bonnyville

The Bonnyville Health Centre offers emergency, acute, and long-term care. It also offers chemotherapy and other programs in conjunction with the Cross Cancer Institute in Edmonton. The Centre has 33 acute care beds and there is a plan to increase the number of acute care beds to 43. The Bonnyville Health Centre is also planning to increase the number of stretcher bays from 4 to 12 and build 4 operating suites. The Centre currently operates at approximately 70% to 75% capacity and has 16 general practitioners on staff (Smyl 2012, pers. comm.).

16.8.2.4 Education

Public primary and secondary education in the RSA is provided by the Northern Lights School Division No. 69. The Division has seven schools in the City of Cold Lake, and seven schools in the Town of Bonnyville and the M.D. of Bonnyville. School board administration reports the Division has excess capacity, in the range of 500 to 750 desks, to accommodate future growth in the RSA (Ripkens 2012, pers. comm.).

The Lakeland Separate School Division operates six schools servicing the RSA student population; three in the Town of Bonnyville and three in the City of Cold Lake (Unrau 2012, pers. comm.). The East Central Francophone Education Region No. 3 School System operates one school each in the Town of Bonnyville and the City of Cold Lake.

The CLFN have a kindergarten to grade nine school with approximately 96 students. The school is the only school in Alberta that is federally administered and funded by AANDC.

Post-secondary education in the region is provided by Portage College, which operates campuses in the Town of Bonnyville and the City of Cold Lake. College programs include academic upgrading, apprenticeship training, and courses focused on:

- business;
- human services;
- health and wellness;
- environmental sciences; and
- native studies.

The college also has selected programs that allow students to accumulate credits towards university programs elsewhere in the province.

16.8.2.5 Recreation

There is a range of recreational facilities and programming in the RSA. The City of Cold Lake has ice arenas, baseball fields, soccer pitches, a local ski hill, fitness centres, a marina and an indoor multi-use recreation centre (the Energy Centre) (COCL 2012, Internet site). The City also offers opportunities to both residents and tourists for outdoor recreation including golfing, boating, fishing, snowmobiling, and motocross.

The Town of Bonnyville has an arts and recreation centre (the Centennial Centre), several parks and playgrounds, a golf course, a curling club, a swimming pool, and a skating park (TOB 2012, Internet site). The M.D. of Bonnyville offers opportunities for a variety of outdoor pursuits including boating, camping, fishing and bird watching (MDB 2012, Internet site). The M.D. of Bonnyville has an agreement with both the City of Cold Lake and the Town of Bonnyville allowing its residents equal access to recreation facilities in the urban centres (Poole 2012, pers. comm.).

16.8.2.6 Social Services

Social services in the RSA are primarily provided in the City of Cold Lake and the Town of Bonnyville. The M.D. of Bonnyville has funding arrangements with each municipality allowing residents to utilize the available social services in either community (Poole 2012, pers. comm.).

City of Cold Lake

There is a range of social services available in the City of Cold Lake. They include:

- Alberta Alcohol and Drug Abuse Commission;
- Catholic Social Services;
- Cold Lake Community Health Care Services, Mental Health;
- Crisis Centre;
- Family and Community Support Services;
- Pregnancy Problem Centre;
- Tritown Emergency Food Bank;
- Vault Youth Drop In Centre; and
- several regional programs that focus on health and community outreach.

Social service organizations in the community report several challenges, including:

- the need for affordable housing programs;
- the lack of a shelter for men;
- shortage of staff due to higher paying alternatives in the local job market; and
- space and capacity constraints (McWillis 2012, pers. comm.).

CFBCL personnel and family members have access to services provided on the base, but might choose to access select services off-base to allow for privacy that may not be possible in a closely knit community such as the military.

Town of Bonnyville

Social services provided by the Town of Bonnyville include:

- North Central Child and Family Service Authority;
- Bonnyville and District Family and Community Support Services;

- Bonnyville Canadian Native Friendship Centre;
- Bonnyville Indian Métis Rehabilitation Centre;
- Catholic Social Services; and
- several regional programs that focus on addiction prevention and community outreach.

Social service organizations operating in the community report several challenges (Beale 2012, pers. comm.), including:

- the need for affordable housing programs;
- full capacity in child care services;
- problems recruiting and retaining quality workers in the social service sector; and
- overall capacity issues.

Social service organizations operating in the region are currently at or near capacity and are unable to increase services under current staffing levels. The growth of new residents in the community can contribute to service demands, as these residents often lack extended family support and they tend to seek help from community organizations (Beale 2012, pers. comm.; McWillis 2012, pers. comm.).

16.8.3 Effects

The demand for social infrastructure is driven, in part, by changes in the population that access those services. The increase in demand for social infrastructure generally requires additional facilities, programming, and staffing.

The nature of the effects of resource development on local services and infrastructure tend to be as follows:

- Project construction will increase the mobile workforce in the region, placing temporary additional demands on regional social infrastructure, such as health and social services, and policing and emergency response services.
- Project operations will:
 - create stable, well-paying employment that will attract permanent residents to the region who are less likely to draw on social supports or certain social services (e.g., affordable housing, income support) but might create additional demand for certain social services such as addiction services and family counseling;
 - draw operations workers from outside the region who will bring spouses and family members with them, increasing the labour pool and volunteer base on which local service providers can draw; and
 - increase the potential for traffic accidents and industrial accidents that could in turn place demands on policing, emergency response and health services in the region.

While service providers might face challenges in meeting the increased demand, future growth can also help generate opportunities to address this increased demand by:

- increasing funding from the federal and provincial governments (e.g., per capita funding support for certain programs and services);
- increasing the number of businesses in the area that can offer support for community programs and infrastructure used by residents;
- increasing the labour pool and volunteer base on which local service providers can draw; and
- increasing revenues to local government, which can be used to increase investment in public infrastructure and services.

Growth in a community can also help increase the breadth and nature of social infrastructure services available to local residents (e.g., specialized health services and broader educational offerings).

The social infrastructure indicators presented here were selected with a view to generally illustrate the effect of growth in the region, not to conduct a full needs assessment for the social infrastructure areas under consideration. The indicators provide only a proxy of social infrastructure requirements, each of which comprises complex systems and interactions with other areas. Further analysis will be required by the appropriate authorities and service providers for planning purposes.

The indicators are presented for the RSA as a whole as opposed to by individual communities since many of the services and programs are available to people living throughout the region, and not solely those living within a particular municipality.

16.8.3.1 Baseline Case

The demand for social services in the RSA is expected to increase in line with population growth. [Table 16.8-1](#) provides an estimate of the number of additional resources needed to accommodate the estimated additional 4,219 people anticipated to be living in the RSA by 2018 under the Baseline Case assumptions.

Table 16.8-1 Additional Social Infrastructure Required in the Regional Study Area by 2018 in the Baseline Case

Social Service or Program	Selected Indicator	Additional Requirements by 2018
Police Services	Number of Police Officers	3
Fire Services	Number of Staff/Volunteers	3
Health Service	Number of Acute Care Beds	3
Education	Number of Teachers	2

Note: Indicators are based on 2012 staffing levels and assume no change in service levels.

16.8.3.2 Application Case

The Project’s effect on social infrastructure is expected to be in line with a Project-related population increase of approximately 16% (478 people) above Baseline Case levels in the RSA (Table 16.8-2). Project effects will begin with the start of on-site construction in late 2014 and reach their full effect in 2018.

Table 16.8-2 Additional Social Infrastructure Required in the Regional Study Area by 2018 in the Application Case

Social Service or Program	Selected Indicator	Additional Requirements Above the Baseline Case by 2018
Police Services	Number of Police Officers	<1
Fire Services	Number of Staff/Volunteers	1
Health Service	Number of Acute Care Beds	<1
Education	Number of Teachers	<1

Note: Indicators are based on 2012 staffing levels and assume no change in service levels.

A number of service providers indicated that they are well positioned to plan for and address most, if not all, future growth forecasted under both Baseline and Application Case assumptions. Family Community Support Services (FCSS) are an exception. They report that they are currently operating at, or very near, capacity (Beale 2012, pers. comm.; McWillis 2012, pers. comm.).

The extensive use of out-of-region construction workers for Project construction, who are housed on-site and who return to their home communities between shifts, will mitigate Project effects on the social infrastructure of the RSA (Section 16.10). As with previous development at the FCTP, the camp will have emergency and security services on-site that will work with local service providers to meet the demand for services associated with the Project.

16.8.3.3 Planned Development Case

Table 16.8-3 provides an estimate of the number of additional resources needed to accommodate the estimated 1,284 people above Baseline Case levels that is expected in the RSA under PDC assumptions in 2018.

Table 16.8-3 Additional Social Infrastructure Required in the Regional Study Area by 2018 in the Planned Development Case

Social Service or Program	Selected Indicator	Additional Requirements Above the Baseline Case by 2018
Police Services	Number of Police Officers	1
Fire Services	Number of Staff/Volunteers	2
Health Service	Number of Acute Care Beds	1
Education	Number of Teachers	<1

Note: Indicators based on 2012 staffing levels and assume to change in service levels.

A number of service providers indicated that they are well positioned to plan for and address most, if not all, future growth forecasted under the PDC assumptions. FCSS are an exception; they report that they are currently operating at, or very near, capacity (Beale 2012, pers. comm.; McWillis 2012, pers. comm.).

16.9 TRANSPORTATION

16.9.1 Overview

This section discusses transportation issues in the region. The focus is on traffic volumes and safety along the access routes linking the Project and other industrial activity to the major population centres of the Town of Bonnyville and the City of Cold Lake. Specifically, the analysis focuses on the following road segments:

- Highway 55 west of the La Corey intersection, and east to Cold Lake;
- Highway 41 between La Corey and Bonnyville; and
- Range Road (RR) 60 / Ken Baker Road, from Highway 55 to the Project and other resource extraction activity.

A Project-specific traffic impact assessment (TIA) was completed for the Project. Effects estimates by analysis case presented in this section are drawn directly from the findings of the Phase J TIA, which has been included in [Appendix 16A](#).

16.9.2 Setting

16.9.2.1 Regional Road Network

The RSA road network is well-developed and consists of a number of primary and secondary highways. Major roadways include:

- Highway 55 that provides east-west access through the region, connecting the City of Cold Lake with Lac La Biche County to the west, and extending east into Saskatchewan; and,
- Highway 41 that provides north-south travel through the region, connecting the Town of Bonnyville to Highway 16 (the Yellowhead Highway).

The rural segments of both Highway 55 and 41 in the RSA are two-lane undivided roadways. Secondary highways that pass through the RSA include Highways 881, 892, 659 and 897.

The RSA has a number of resource roads that connect industrial operations to the provincial and municipal road network. Key resource roads include:

- RR 60, or the La Corey Resource Road, which connects La Corey at Highway 55 to the Canadian Natural Wolf Lake project to the north and the South Gate of the CLAWR;

- The Ken Baker Road, which is a private roadway extending north from RR 60 (the south gate termination) to oil sands projects including Canadian Natural Primrose, Husky Caribou and FCTP;
- Highway 892 that extends north of Highway 55 to the Husky Tucker, Imperial Oil Cold Lake and Canadian Natural Primrose East operations; and
- Highway 897 that connects the OSUM Taiga project to Highway 55 near Cold Lake.

The industrial workforce in the RSA travels to and from project sites by busses, company operated vans and personal vehicles. Cenovus owns and operates an 1,100 vehicle parking lot on the southwest corner of the intersection of Highways 55 and 41 at La Corey. This parking lot serves as a marshalling point for construction workers, for Cenovus, and periodically, other companies that rent space from Cenovus on a temporary basis. It also serves as a pickup point for Cenovus operations workers who take a bus to site.

16.9.2.2 Traffic Volumes

Traffic volumes in the RSA are increasing as existing heavy conventional oil and oil sands projects expand and new projects come forward. [Table 16.9-1](#) shows the growth in traffic volume on select roadway sections during the 2002-2011 period.

Table 16.9-1 Historic Traffic Volumes on Selected Regional Study Area Roadways

Highway/Roadway	Section Description	AADT		Average Annual Change (%)
		2002	2011	
55	W of 41 at La Corey	1,130	2,140	7.7
	E of 41 at La Corey	1,480	2,820	8.2
41	S of 55 at La Corey	1,880	3,630	7.8

Source: [Appendix 16-A](#).

AADT = average annual daily traffic

Traffic volumes, measured as average annual daily traffic (AADT), in the RSA are highest on the segment of Highway 41 between the Town of Bonnyville and the La Corey intersection. The average annual growth of traffic volume on roadways throughout the RSA varies between 7.7% and 8.2%. This range is higher than the estimated 2% rate of growth experienced across the provincial network as a whole. Industry activity, including construction activities linked to new and existing oil sands facilities has contributed to the growth of traffic in the RSA. Depending on the proponent, project location and duration of construction activity, traffic volumes likely relate to:

- workers commuting daily from Cold Lake, Bonnyville and other population centres in the RSA, including:
 - direct return trips from home to site; or
 - trips to the La Corey parking lot, followed by carpooling or bussing to the site and back;

- camp-based workers commuting to and from their residences in the RSA and beyond at shift rotations.

The types of vehicles generally found on the roads are a mixture of personal and company passenger vehicles, vans, and busses.

Traffic volume patterns on RR 60 and the Ken Baker Road reflect the activity associated with the Canadian Natural, Husky and Cenovus projects. Traffic volumes on the Ken Baker Road are not currently being counted (McRury 2012, pers. comm.).

16.9.2.3 Road Network Improvements

In response to increased traffic generated by industrial projects, RR 60 from La Corey to the south gate was upgraded to the provincial secondary highway standard. Since 2007, Cenovus and Canadian Natural have made substantial investments in upgrading approximately 40 km of the Ken Baker Road in order to improve traffic flow and safety. They include:

- widening and paving the road to provincial secondary highway standards; and
- installing roadside barriers and other safety features.

Paving along the final eight km stretch of the Ken Baker Road between the South Gate and the FCTP is scheduled for completion in 2012/13.

Other recent and ongoing improvements to the RSA road network include:

- installation of a traffic circle (roundabout) at the Highway 892/55 intersection;
- widening a 12 km stretch of Highway 55 west of Highway 41 near Iron River;
- twinning a six km segment of Highway 55 in the City of Cold Lake; and
- vegetation clearing at the La Corey intersection, which currently operates as a four-way stop.

The CLOSA CRISP lays out the infrastructure requirements, including road and highway upgrades, for a realistic future oil sands development scenario in the Cold Lake Oil Sands Area. The CLOSA CRISP was completed in February 2012, and as of September 2012, the document was under review by the Government of Alberta.

16.9.2.4 Traffic Safety

Traffic safety has been an area of focus for RCMP and M.D. Peace Officers along the identified highway segments in the RSA (Gandolfi 2012, pers. comm.). Concerns centre on driving patterns (speed and aggression), congestion during peak hours and high volumes on the roadways.

The frequency and severity of collisions vary across the RSA roadways considered here (Table 16.9-2). During the 2006 to 2010 period, collision frequencies on Highway 55, both east and west of La Corey, have consistently exceeded provincial averages for two-lane undivided primary highways. In 2010, the most recent year for which data are available, the

collision rate was 23% to 28% higher than the provincial average. The collision rate on Highway 41 has been in line with the Alberta average over the past five years. Collision data are not available for RR 60 or the Ken Baker Road.

Table 16.9-2 Collision Rates on Highways 41 and 55

Highway/ Roadway	Control Section	Section Description	Collision Rate per 100 Million Vehicle Km				
			2006	2007	2008	2009	2010
55	16	E of 881 W of Truman to W of 41 at La Corey	154	143	147	140	133
		(% of Prov. Avg.)	129%	123%	129%	128%	123%
	18	E of 41 at La Corey to Cold Lake	153	152	156	152	138
		(% of Prov. Avg.)	129%	131%	137%	138%	128%
41	24	N of 28 W Bonnyville to S of 55 at La Corey	123	117	116	106	113
		(% of Prov. Avg.)	111%	101%	101%	97%	104%

Note: Collision rates are calculated using five-year rolling averages.
Source: AT 2012a and Nichols Applied Management Inc.

The Regular Members (Constables) of the RCMP detachments based in the City of Cold Lake and the Town of Bonnyville conduct highway traffic enforcement as part of their regular patrols. They are supported by the RCMP regional highway unit based in St. Paul and by M.D. of Bonnyville Peace Officers who are responsible for patrolling M.D. roads.

Industry efforts, including alcohol-free camps and mandatory workforce bussing, help to mitigate, but not eliminate, some of these traffic issues in the region (Gandolfi 2012, pers. comm.).

16.9.2.5 Air and Rail

There is currently no rail access in the RSA. Some previously de-commissioned lines have been converted into regional trail networks. Public airports in the region include small civilian operations at Bonnyville and Cold Lake. There is currently no regularly scheduled public air service in the region. Cold Lake is also the location of the CFB Cold Lake military air base.

16.9.2.6 Baseline Case

Under the Baseline Case assumptions, traffic volumes on regional highways are expected to increase between 2012 and 2018. [Table 16.9-3](#) presents volume estimates for the relevant RSA roadways under the Baseline Case assumptions.

Table 16.9-3 Baseline Case Traffic Volumes on Selected Regional Study Area Roadways

Highway/ Roadway	Section Description	AADT		Change (AADT) 2011-16	Change (%) 2011-16	Average Annual Change (%)
		2011	2016			
55	W of 41 at La Corey	2,140	2,645	505	23.6	4.3
	E of 41 at La Corey	2,820	3,485	665	23.4	4.3
41	S of 55 at La Corey	3,630	4,430	800	22.0	4.1

Note: Numbers have been rounded.

Source: [Appendix 16A](#) and Nichols Applied Management Inc.

AADT = average annual daily traffic

Between 2012 and 2016, traffic volumes along regional roadways are expected to increase by:

- 505 AADT (24%) on Highway 55 east of La Corey;
- 665 AADT (23%) on Highway 55 west of La Corey; and
- 800 AADT (22%) on Highway 41 south of La Corey.

The estimates provided above suggest growth along these highway segments is expected to remain higher than the average growth rate over the provincial network, but lower than the rates experienced in the 2002 to 2011 period on these same roadways.

16.9.2.7 Application Case

Project-related traffic is expected to peak at 400 AADT during the construction period. These estimates represent volumes from the Project gate to the La Corey intersection. The extent to which the various highway segments south of RR 60 will be impacted depends upon the origin and destination of construction and operations workers in personal vehicles.

[Table 16.9-4](#) presents estimated volumes associated with Project traffic during peak construction in 2016.

Table 16.9-4 Application Case Traffic Volumes on Selected Regional Study Area Roadways

Highway/ Roadway	Section Description	Project Traffic Effect (AADT) 2016	Application Case Traffic Levels (AADT)	Project Effect (%) Above Baseline Case
55	W of 41 at La Corey	20	2,665	0.8
	E of 41 at La Corey	150	3,635	4.2
41	S of 55 at La Corey	260	4,690	5.5

Note: Numbers have been rounded.

Source: [Appendix 16A](#) and Nichols Applied Management Inc.

AADT = average annual daily traffic

During peak construction activity in 2016 and under Application Case assumptions, traffic volume is expected to be:

- 150 AADT (4.2%) higher than in the Baseline Case on Highway 55 east of La Corey and 20 AADT (0.8%) higher west of La Corey; and
- 260 AADT (5.5%) higher than in the Baseline Case on Highway 41 south of La Corey.

The detailed intersection analysis as described in [Appendix 16-A](#) states that increased traffic associated with the Project would have an impact on some turning movements at the La Corey intersection, specifically Highway 41 northbound and the left turn to Highway 55, where traffic is either heading toward the Project or the La Corey parking lot to the west.

Traffic effects are expected to be reduced in part by the mitigation measures proposed by Cenovus. Based on the analysis, it has been determined that the Project would not have a substantial impact on the transportation corridor ([Appendix 16A](#)). Once construction is completed and the operations phase begins, Project traffic volumes will decrease.

16.9.2.8 Planned Development Case

The PDC analysis considers two projects: Devon Walleye and OSUM Taiga. Osum Taiga is located south of Cold Lake, and is expected to have minimal effect on segments under analysis. Devon Walleye is located on RR 60, and if it proceeds, will have some overlapping effect with the Project. Specific project details are not yet available.

The traffic associated with a typical project of that size (7,000 bpd) is estimated to average roughly 50 AADT during the construction phase, and less once operations begin. The effect of this additional volume in conjunction with Application Case traffic levels is felt to be minimal. As such, the results of the TIA analysis are expected to remain unchanged.

Construction of the traffic circle should address some of the congestion issues at the Highway 897/55 intersection. With a different configuration (four-way stop), the La Corey intersection appears to have avoided the same levels of peak congestion as seen at the Highway 897/55 intersection, with peak traffic reportedly being able to clear the intersection within a matter of minutes (McRury 2012, pers. comm.).

Efforts by industry, including extensive use of bussing and safe driving, help to reduce traffic issues. Continued support of current practices including driver education and workforce bussing will be required in order to mitigate traffic concerns.

16.10 MITIGATIONS AND BENEFIT ENHANCEMENT

16.10.1 Introduction

The Project will have a number of positive effects, such as the creation of employment and business opportunities, additional tax and royalty income for all levels of government and investments in community programs, including supports to Aboriginal peoples. Along with these positive effects, the Project is also expected to contribute to increased demands on local infrastructure and services. This section discusses a number of activities and measures that

Cenovus plans to undertake, or continue with, in order to enhance the positive, and mitigate the negative, socio-economic effects of the Project.

16.10.2 Project-Specific Mitigations and Benefit Enhancements

Since beginning operations at Foster Creek in 1996, Cenovus has developed and refined specific measures to mitigate and manage project-related effects. [Table 16.10-1](#) outlines a number of mitigation and management measures pertaining to the Project. Cenovus will continue to develop and refine these measures, with input from local stakeholders, including Aboriginal communities. The effectiveness of mitigation and management measures vary, depending on the issue, area and operating context.

Table 16.10-1 On-going and New Mitigation and Enhancement Measures

Issue Area	Project Mitigation/Management Measure	Rationale and Intended Effects
Hiring and Procurement	<ul style="list-style-type: none"> • Where businesses are competitive and workers have the required skills, Cenovus will continue to prioritize the hiring of local workers and businesses. • Cenovus will continue to encourage the participation of Aboriginal businesses in the competitive bidding process by providing information to First Nation communities on contracting opportunities. • Cenovus will continue to engage the local workforce, with a particular focus on Aboriginals. 	<ul style="list-style-type: none"> • Increase the participation of local, especially Aboriginal, workers and businesses in the construction and subsequent operations of the Project. • Cenovus has been successful at hiring up to 80% of its operations workers locally, and the company expects this success to continue for the life of the Project.
Population, Housing and Accommodation	<ul style="list-style-type: none"> • Cenovus will continue to operate on-site camps, to accommodate: <ul style="list-style-type: none"> ○ all construction workers and contractors; ○ the proportion of operations workers not living permanently in the region; and ○ turnaround contractors. 	<ul style="list-style-type: none"> • Substantially reduces the housing and fixed-roof accommodation demands associated with Project construction, which would otherwise be in the order of 400 to 800 rooms at peak construction. • Reduce the permanent population increase as a result of operations workers relocating to the region.
Traffic	<ul style="list-style-type: none"> • Cenovus will continue to operate a workforce bussing system that includes daily and weekly (shift change) bussing to company-operated parking lots in La Corey, Cold Lake and Bonnyville. This service will also be available to contractors. • Cenovus will construct the Project on a remote camp basis which minimizes the need for workers to travel in personal vehicles in the RSA. • Scheduling construction deliveries during off-peak hours, and using the La Corey parking lot for load marshalling. • Enforcing traffic rules and educating the workforce, contractors and deliveries in safe driving practices. 	<ul style="list-style-type: none"> • Reduces daily traffic associated with Project construction, operations and sustaining maintenance. • Reduces incidents of dangerous driving.

Table 16.10-1 On-going and New Mitigation and Enhancement Measures (continued)

Issue Area	Project Mitigation/Management Measure	Rationale and Intended Effects
Emergency and Health Services	<ul style="list-style-type: none"> • Maintaining on-site emergency response facilities and services that meet Alberta’s Occupational Health and Safety requirements. This includes first aid facilities with trained medical personnel, emergency transportation vehicles and fire-fighting equipment. Cenovus is currently in the process of constructing an on-site fire hall which will be staffed by full-time personnel. • Maintaining a corporate Emergency Response Plan (ERP) including notification and cooperation with appropriate local emergency response agencies. • Continuing participation in mutual aid agreements between other industrial sites in the region and the M.D. of Bonnyville. • Maintaining explicit and enforced lodging, workplace and driving policies with regards to the use of alcohol, drugs, and illegal activities. • Utilizing on-site security services to assist the RCMP and Range Patrol on any issues both within and adjacent to the Project. • Preventing and treating health and safety related incidents (e.g., injuries) among the Project workforce: 	<ul style="list-style-type: none"> • Ensures adequate and timely response to potential emergencies during both the construction and operational phases of the Project; a factor due to the distance to major population centres. • Provides a safe on-site work environment during both construction and operations. • Minimizes potential workload impacts on regional emergency (police, fire, ambulance) and health services.
Education	<ul style="list-style-type: none"> • Supporting apprenticeship and employment readiness programs, particularly for local Aboriginals, with an aim to increasing local employment by the Project. 	<ul style="list-style-type: none"> • Assists local, especially Aboriginal, workers in obtaining meaningful employment during both construction and operation of the Project.

Table 16.10-1 On-going and New Mitigation and Enhancement Measures (continued)

Issue Area	Project Mitigation/Management Measure	Rationale and Intended Effects
Social and Recreation Infrastructure and Services	<ul style="list-style-type: none"> • Offering a comprehensive employee assistance plan. • Operating shift schedules that provide workers with sufficient time off to enjoy leisure activities in their home communities. • Providing on-site facilities for camp-based employees, including recreation, entertainment, social and communication. 	<ul style="list-style-type: none"> • Provides support to workers and their families who might experience difficulty dealing with personal, family, or work-life issues that can affect one's health and well-being, including those working remotely. • Reduces costs borne by social agencies to the extent that some of the required services are provided under the employee assistance plan. • Minimizes the potential effects of Project construction on regional recreation infrastructure and services, and on daily traffic volumes.
Municipal Infrastructure and Services	<ul style="list-style-type: none"> • Treating sewage on-site. • Use wells to meet all potable water needs at FCTP facilities. 	<ul style="list-style-type: none"> • Limit the increase in the demand for municipal waste-water infrastructure.
Traditional Land Use and Culture	<ul style="list-style-type: none"> • Coordinating with individuals/Aboriginal groups with respect to access across the FCTP site, as necessary. • Ensure appropriate staff training with respect to cross-cultural interactions (respect, communication, etc.). This will include discouraging camp residents from fishing, hunting, and driving recreational vehicles on traditional lands. • The Project is located within CLFN traditional territory and Cenovus will continue to work with the CLFN. 	<ul style="list-style-type: none"> • Minimizes Project effects on the traditional land use and culture of local Aboriginal groups.

Cenovus supports local community initiatives (e.g., financial and in-kind contributions), where appropriate in three core areas – learning, safety, and well-being and sustainable communities. Some examples include:

- primary and secondary education initiatives such as long term support of the Northern Lights School Division and the Art Smith academy located on 4 Wing Cold Lake;
- investments in post-secondary education and employment programs such as the Aboriginal Employment Initiative (AEI), scholarships to encourage post-secondary education in Aboriginal youth, and Skills Canada Alberta;
- health initiatives, including support of the Lakeland Centre for Fetal Alcohol Spectrum Disorder, and various fundraising initiatives focused on increasing the quality of regional healthcare;
- recreation and cultural projects, including the Bonnyville Centennial Centre as well as the Cold Lake Energy Centre; and
- initiatives centred around the CLFN focusing on education and training as well as overall elder and community engagement, such as the LeGoff School hot-lunch program and Heritage Days.

Cenovus will continue to consult with stakeholders in the area to increase its understanding of socio-economic issues in the region and what specific actions it can take to mitigate or enhance socio-economic effects related to the Project.

16.10.3 Collaborative Mitigation

In addition to the Project-specific mitigation measures and enhancements outlined in [Table 16.10-1](#), Cenovus will continue to engage with the RSA communities and residents in an effort to improve the quality of life in the region. Cenovus currently works with social infrastructure service providers, government departments and other industrial operators in the region to assist in addressing cumulative effects of oil sands development by:

- communicating its development and operational plans with the appropriate agencies;
- participating in regional multi-stakeholder groups and research initiatives; and
- working with the provincial and municipal governments on the implementation of relevant planning initiatives, as needed.

16.11 MONITORING

16.11.1 Cenovus Specific

Cenovus continuously monitors its performance using a number of socio-economic indicators specifically for its operations in the RSA. These indicators include:

- project construction execution strategy (adherence to budget and schedule);
- the percentage of local hiring and procurement in construction and operations, including Aboriginal workers and companies; and

- participation in community investment programs.

In addition to Project specific indicators, Cenovus monitors its performance as a corporation overall. It does this in a number of different ways, including through:

- the company's performance on the Dow Jones Sustainability Index; and
- the company's annual Corporate Responsibility report.

These approaches have proved effective, as Cenovus has been recognized by a number of organizations for its social responsibility performance, including:

- Top 50 Socially Responsible Corporations in Canada (Maclean's 2012, Internet site); and
- Best 50 Corporate Citizens in Canada (Corporate Knights) (CK 2011, Internet site).

Cenovus endeavors to understand and address public and stakeholder concerns, when possible. An example of the company reacting to stakeholder concerns is the recently implemented bussing system for all workers destined for the FCTP that seeks to address concerns related to traffic issues on RR 60/Ken Baker Road.

Cenovus welcomes an open dialogue with the RSA communities and residents regarding the FCTP operations, including the Project, and will continue to engage with regional stakeholders to maximize the benefits, and minimize any negative effects associated with its operations.

The company will continue to report its social and economic performance via a number of different platforms. Locally, periodic presentations and meetings are held with regional stakeholders, including municipal governments, Aboriginals, and local business representatives. Cenovus focuses on direct engagement with the leadership and citizens of the many local communities potentially impacted by current and future development. This dialogue provides Cenovus with timely and direct feedback on company performance.

16.11.2 Broader Monitoring Activities

There is a broad range of socio-economic monitoring that occurs in the region. The following provides some non-exhaustive examples of monitoring systems that are publicly available:

- Periodic population counts:
 - Statistics Canada census, every five years, latest conducted in 2011; and
 - The Town of Bonnyville, City of Cold Lake, and M.D. of Bonnyville Municipal Census, periodic, latest conducted in 2012.
- Reporting by school boards within their organizational structures, as well as the Government of Alberta on a variety of indicators, such as student enrollment, dropout rate, high school completion rate, and satisfaction with education quality. These indicators are reported to Alberta Education and provided on-line in Alberta Education's Student Population by Authority System.

- Reporting by the Alberta Health Services North Zone within its organizational structures and to the public on a variety of indicators, such as the performance measures instituted by Alberta Health Services;
- Traffic counts conducted by Alberta Transportation and reported on its website under *Traffic Volume at points on the Highway*.
- Crime statistics gathered and published by Statistics Canada, based on both self-reported data from crime victimization surveys and police-reported data. An example of one such publication is the Statistics Canada, Canadian Centre for Justice Statistics, Crime Severity Index.

There is also on-going data gathering and monitoring of industry activity. Examples include information gathered by the Canadian Association of Petroleum Producers and published in its Statistical Handbook. This data source includes bitumen production and industry spending. Other industry-focused sources include a listing of oil sands projects published periodically by the Oil Sands Review and the Alberta Government's Quarterly Update.

16.12 CONCLUSIONS

The Project will create positive economic and fiscal effects throughout the RSA and beyond. The Project is estimated to create:

- 478 person years of engineering employment;
- 2,701 person years of direct on- and off-site employment related to the expansion of the CPF, the field facilities, and the drilling of initial well pairs between 2015 and 2018;
- 103 operations positions to be hired in early 2018; and
- 120 person years of employment annually linked to ongoing drilling.

Once fully operational, the Project will add an estimated \$4 million annually in municipal property taxes to I.D. No. 349, which will amount to \$30 million (NPV 2012) over the life of the Project, assuming no changes in mill rates. The Project will also contribute an estimated \$793 million (NPV 2012) and \$529 million (NPV 2012) to provincial and federal corporate income taxes respectively and \$3 billion (NPV 2012) in provincial royalties over its 36 year operating life.

As with previous development at the FCTP, Cenovus will continue to use local contractors and workers where appropriate and assist the CLFN in building capacity to engage with long-term operations employment opportunities.

The effects of the Project on many regional services and infrastructure will be muted due to the continued use of an on-site camp for construction and operations supported by a bussing program for on-site workers. The long term population effect of the Project, estimated at 478 people, will have a marginal effect on regional services and infrastructure.

The recent pace of residential construction within the City of Cold Lake is likely sufficient to meet the demand anticipated as a result of the Project. The historic rate of growth in the housing stock in the M.D. and the Town of Bonnyville will not be sufficient to meet the demand for housing in the Application Case. However, discussions with municipal officials indicate that the pace of residential development is increasing in the Town of Bonnyville and the M.D. of Bonnyville is capable of accommodating the housing growth expected under the Application Case.

Cumulatively, the population in the RSA is expected to reach 39,612 by 2018 under the PDC assumptions, along with a mobile workforce that is expected to reach between 4,000 and 5,500, an increase above the current levels of 3,600. The additional population will place pressures on social and municipal infrastructure as well as increase the demand for housing in the region.

A number of social service providers indicated that they are well positioned to plan for and address most, if not all, future growth forecasted under the PDC assumptions. FCSS are an exception. They report that they are currently operating at, or very near, capacity (Beale 2012, pers. comm.; McWillis 2012, pers. comm.).

The municipal infrastructure currently in place combined with planned upgrades and expansions might not be sufficient to service the anticipated population under the PDC. Development plans for the region need to be monitored and plans adjusted as required in order to ensure full services should the PDC materialize.

Although there is ample land available for development, the current pace of residential construction within the RSA is not sufficient to meet the demand anticipated under PDC assumptions. The responsible authorities will need to engage developers and make them aware of the opportunities to build and sell additional homes in the RSA.

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16A.1 TRAFFIC IMPACT ASSESSMENT

16A.1.1 Purpose and Scope

The Traffic Impact Assessment (the TIA) was completed to understand, evaluate and potentially lessen any transportation issues associated with the construction and operation of the Foster Creek Thermal Project (FCTP) Phase J Expansion (the Project). Specifically, the purpose of the TIA is to identify and evaluate the transportation and traffic impacts associated with the Project, both during construction and operation.

The scope of the TIA was selected to address [Section 2.5](#) Transportation Infrastructure, of the final terms of reference (TOR; [Volume 3, Appendix 1A](#)). The TIA scope includes:

- Assess traffic impacts created by the Project to the provincial highway(s) and determine any necessary access improvements.
- Provide a summary of traffic impact assessments in the area and incorporate their recommendations into the traffic assessment for the Project.
- Describe the anticipated changes to traffic (e.g., type, volume) during all stages of the Project (e.g., construction, operation, maintenance, expansion) and assess their impacts, considering the cumulative effects of other existing and planned uses of the same access(es).

The TIA followed the guidelines set forth in the *Alberta Infrastructure and Transportation, Traffic Impact Assessment Guideline* (Stantec 2005), with the exception of the pedestrian warrant analysis. A pedestrian warrant analysis is typically conducted for urban and semiurban areas; however, as this Project was classified as an isolated rural development within the Cold Lake Air Weapons Range (CLAWR), such pedestrian movements are not likely to occur.

16A.2 EXISTING INFRASTRUCTURE AND CONDITIONS

16A.2.1 Project Location and Study Area

The Project is located within the CLAWR. It is approximately 90 km north of Bonnyville, Alberta, and approximately 90 km northwest of Cold Lake, Alberta, in Townships 69 to 71, Ranges 3 to 7, West of the Fourth Meridian (W4M) ([Figure 16A-1](#)). The Project borders the Canadian Natural Resources Limited (Canadian Natural) Primrose/Wolf Lake project and is north of the Imperial Oil Cold Lake thermal in situ projects. The primary access road used for the FCTP is Range Road 60 (RR 60), which is accessed via the intersection of Provincial Highway 55 and Highway 41.

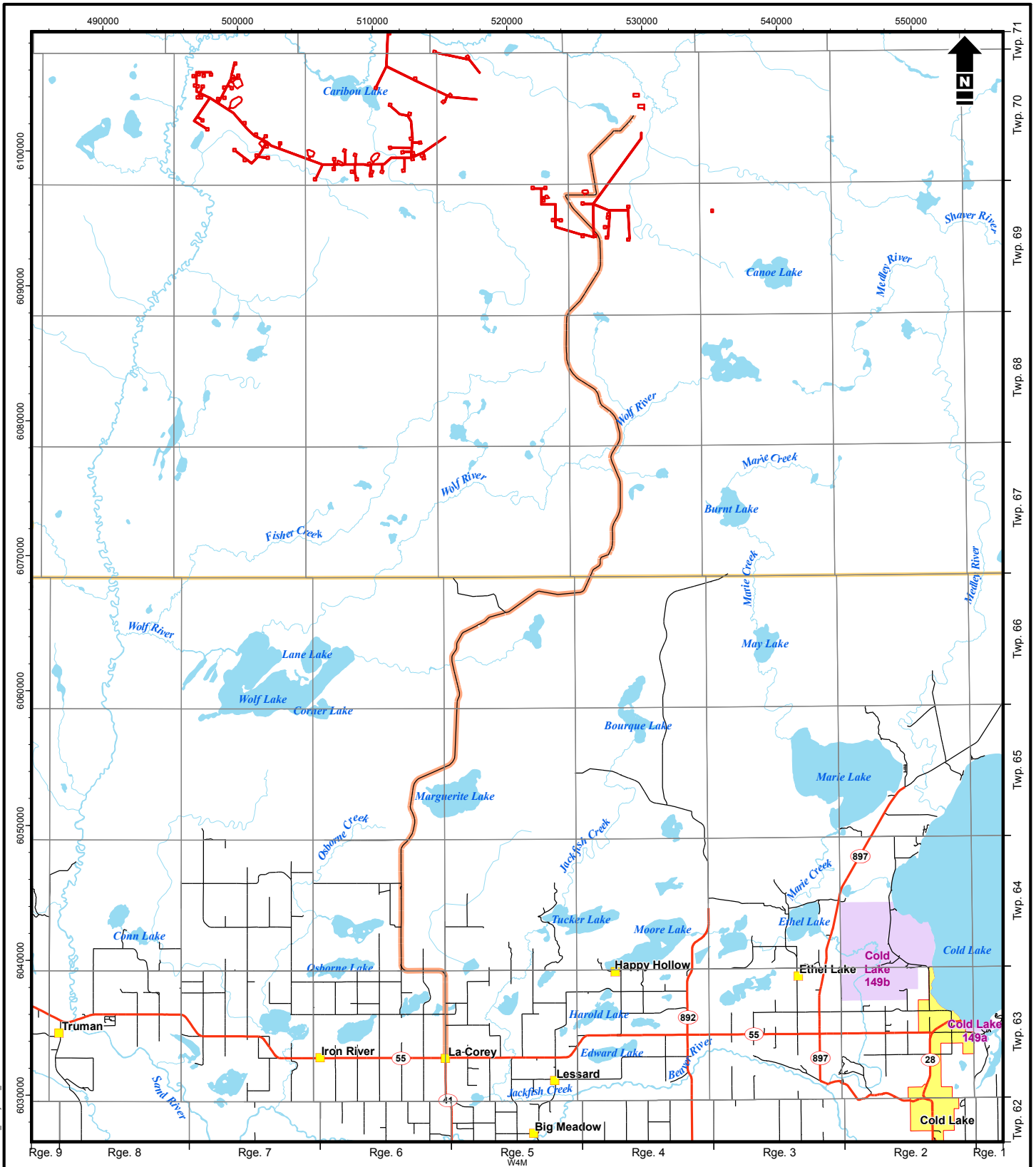
The Study area focused on the intersection of Highway 41 and Highway 55 and the corridor's immediately surrounding this intersection. The primary rationale for focusing the study on the intersection of Highway 41 and Highway 55 is that it is a key indicator of traffic influence

within the area. As the gateway to the Project, this intersection shown, in [Figure 16A-2](#), is of primary significance to this TIA.

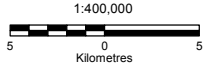
16A.2.2 Existing Transportation Network

The existing transportation infrastructure in the SEIA regional study area (RSA) consists of Primary Provincial Highways and Range Roads upgraded to Resource Development Roads. Provincial Highways 28, 41, 55, 897, and 892 are within the Cold Lake and Bonnyville region ([Figure 16A-3](#)).

Most of the roads in this infrastructure network see mixed use from agriculture, recreational use and resource development. Continuous improvements are being made to the Provincial Highways and their intersections to keep up with the demands and increased use by all sectors (Alberta Transportation 2012b).



- + Project Footprint
- Community
- Cold Lake Air Weapons Range
- Indian Reserve
- Metis Settlement
- Water Body
- ~ Watercourse
- Highway
- Road
- Site Access Road



Foster Creek Thermal Project Phase J Expansion

Traffic Impact Assessment Study Area - Project Access Route

Date: 19 Feb 2013 | Project: 307074-00162 | Technical: F.Freckleton | Reviewer: C.Swidorski | Drawn: T.Graham

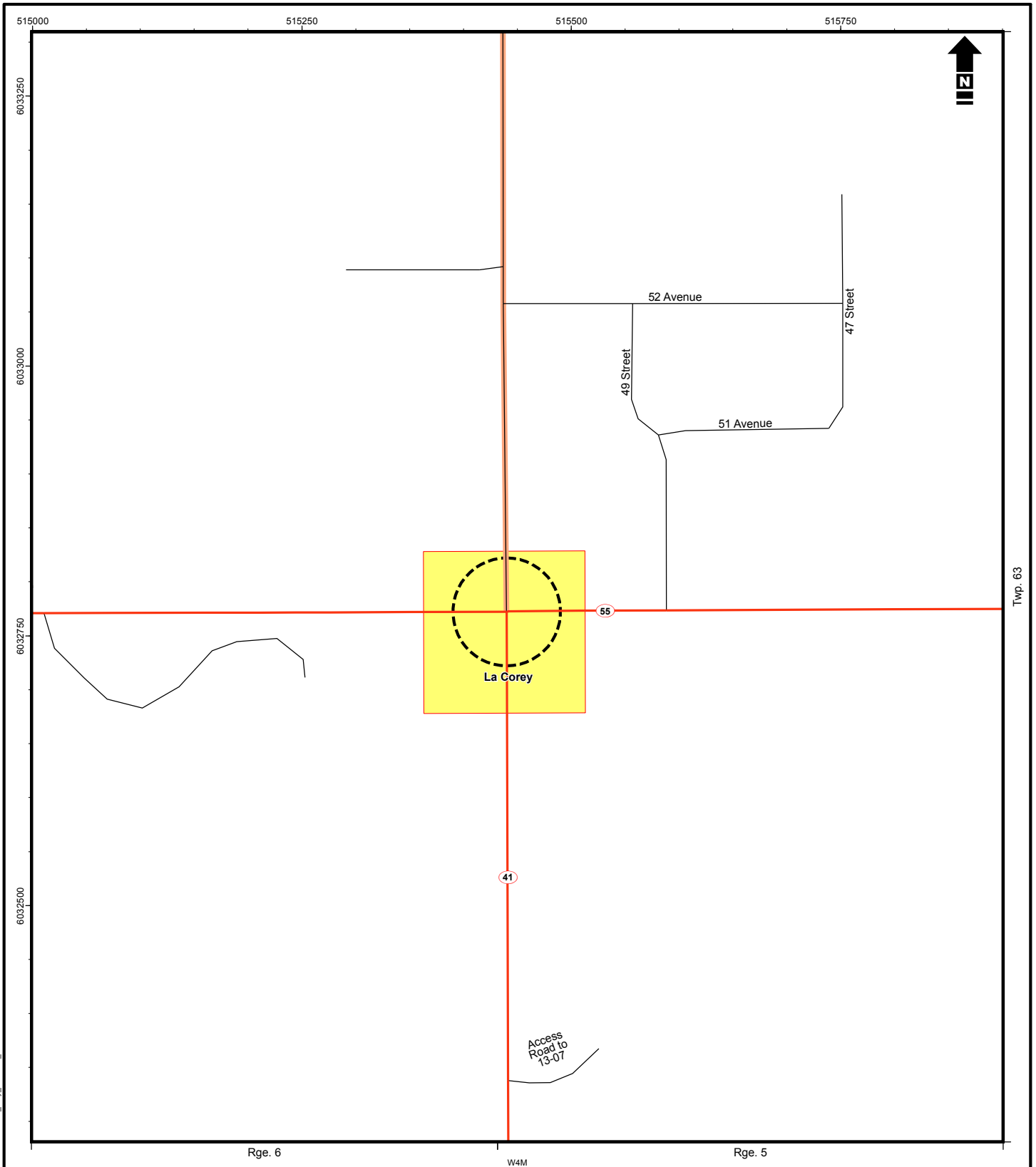
Disclaimer: Prepared solely for the use of Cenovus FCCL Ltd. as specified in the accompanying report. No representation of any kind is made to other parties with which Cenovus FCCL Ltd. has not entered into contract.

Figure 16A-1







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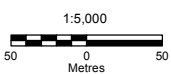
Reference: Data obtained from; AltaLis, Altus, IHS. Used under license.

NAD 1983 UTM Zone 12N



Twp. 63

-  Project Footprint
-  Community
-  Highway
-  Road
-  Observation Location
-  Site Access Road



Reference:
Data obtained from: AltaLis, Altus, IHS. Used under license.



Foster Creek Thermal Project Phase J Expansion

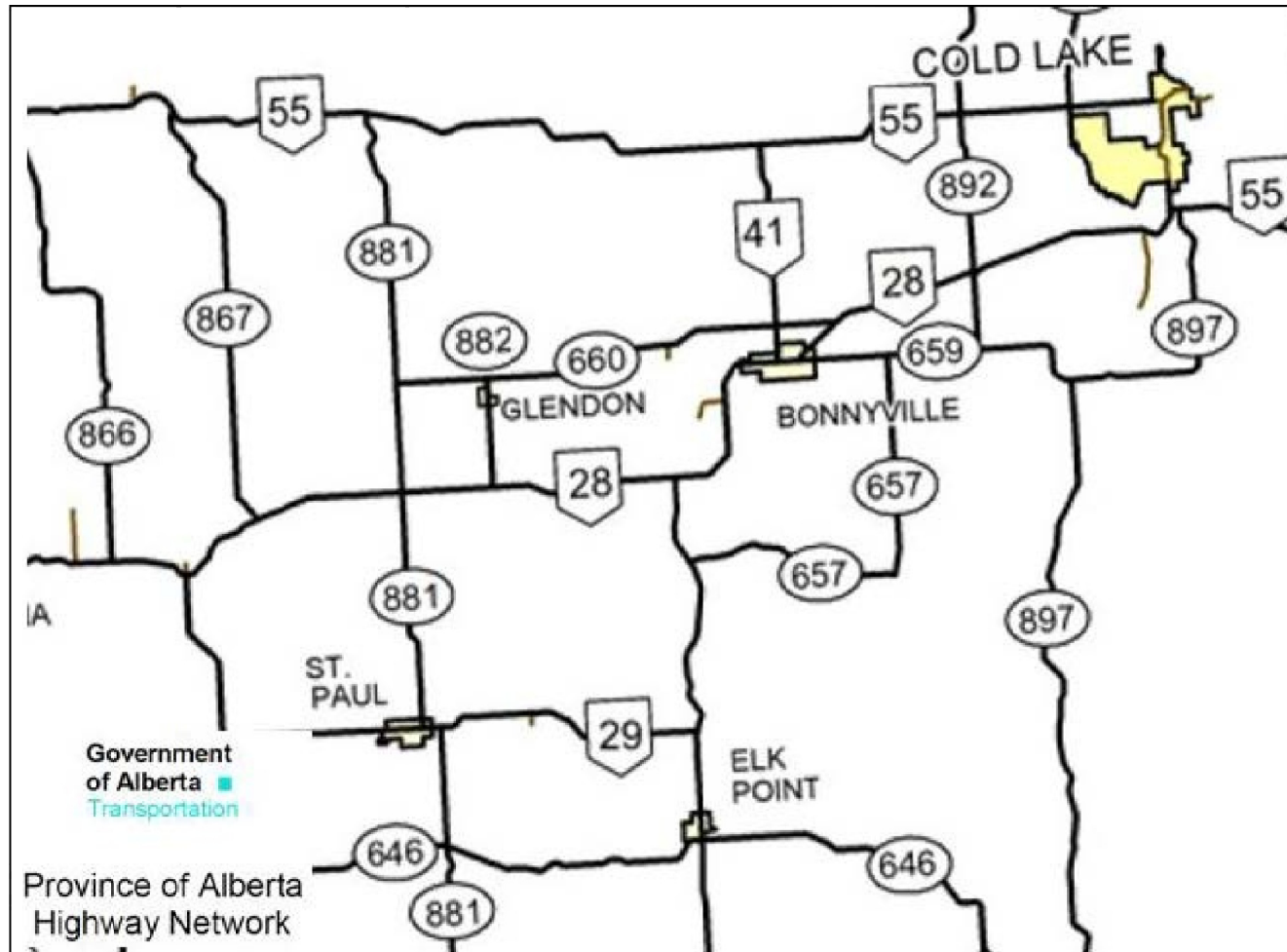
Intersection of Highway 41 and 55

Date: 11 Feb 2013 Project: 307074-00162 Technical: F.Freckleton Reviewer: C.Swidorski Drawn: T.Graham

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Figure
16A-2

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Foster Creek Thermal Project Phase J Expansion

Regional Highway Network (Alberta Transportation)

Date: 11 Feb 2013 Project: 307074-00162 Technical: F.Freckleton Reviewer: C.Swiderski Drawn: T.Graham

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Figure
16A-3

Cenovus is currently using a High - Wide Load Corridor, Highway 41, designated by Alberta Transportation (Figure 16A-4). These corridors contain highways designed to accommodate traffic up to 9 m in height. The width of the vehicle is determined by the load being carried.

16A.2.2.1 Highway 41

Highway 41 is a north/south two-lane paved Primary Provincial Highway that stretches from the Alberta/Montana Border to the intersection of Highway 41 and Highway 55 at La Corey, Alberta. Bonnyville is located at the intersection of Highway 28 and Highway 41 (Figure 16A-5).

Highway 41 is also known as Buffalo Trail. north of Highway 55, Highway 41 becomes RR 60. This is the primary access into the Cenovus FCTP and Canadian Natural Primrose East in situ projects. The posted speed limit on Highway 41 is 100 km/h.

16A.2.2.2 Highway 55

Highway 55 is a west/east, two-lane, paved Primary Provincial Highway that stretches from Athabasca, Alberta to the Alberta/Saskatchewan border. Highway 55 serves as an access to many resource developments (e.g., forestry, oil and gas) along its length. Cold Lake is located at the intersection of Highway 28 and Highway 55. The posted speed limit on Highway 55 is 100 km/h.

Improvements to Highway 55 are currently being completed by Alberta Transportation. The highway is being widened and overlaid with a new topcoat of asphalt from 12 km west of Highway 41 to the intersection of Highway 41 and Highway 55.

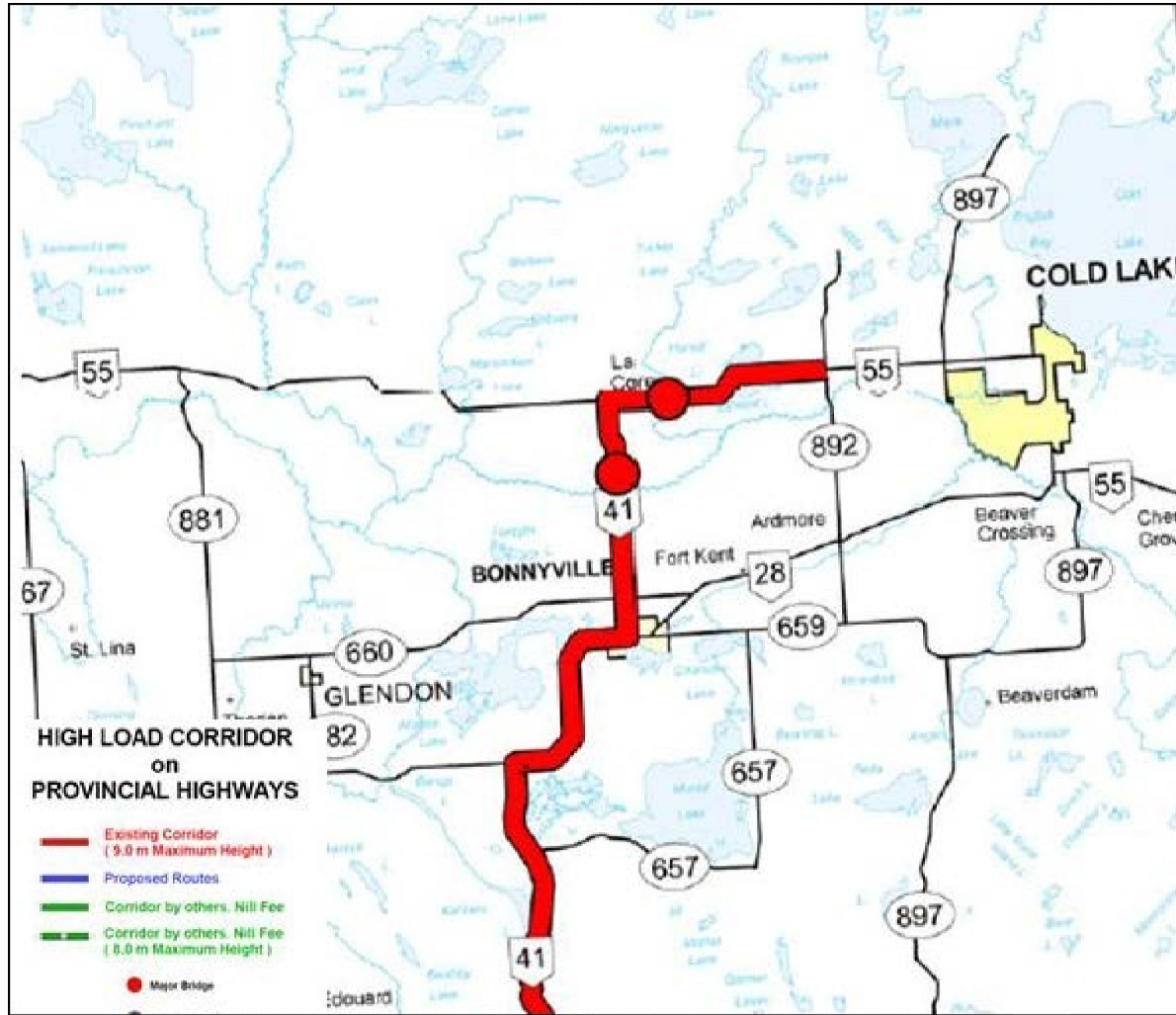
16A.2.2.3 Highway 892

Highway 892 is a north/ south, two-lane, paved Secondary Provincial Highway that stretches from the intersection of Highway 659 to the resource development area north of Highway 55 where it transitions into a Resource Development Road (Figure 16A-4). Highway 892 is the primary access for the following in situ thermal projects: Canadian Natural Primrose East, Imperial Oil Cold Lake, Husky Tucker and Shell Orion. The posted speed limit on Highway 892 is 100 km/h.

16A.2.2.4 Highway 41 and Highway 55 Intersection

The intersection of Highway 41 and Highway 55 is a four-way stop controlled intersection. Right turn bays, with left turn through lanes, are established on all approaches to the intersection along Highway 41 and Highway 55. Right turn acceleration lanes are present along Highway 55, both north and south of Highway 41. This intersection has street lighting.

A truck pullout is located off the southeast corner of the intersection. On the northeast corner of the intersection is an Esso Gas Station and Convenience Store.



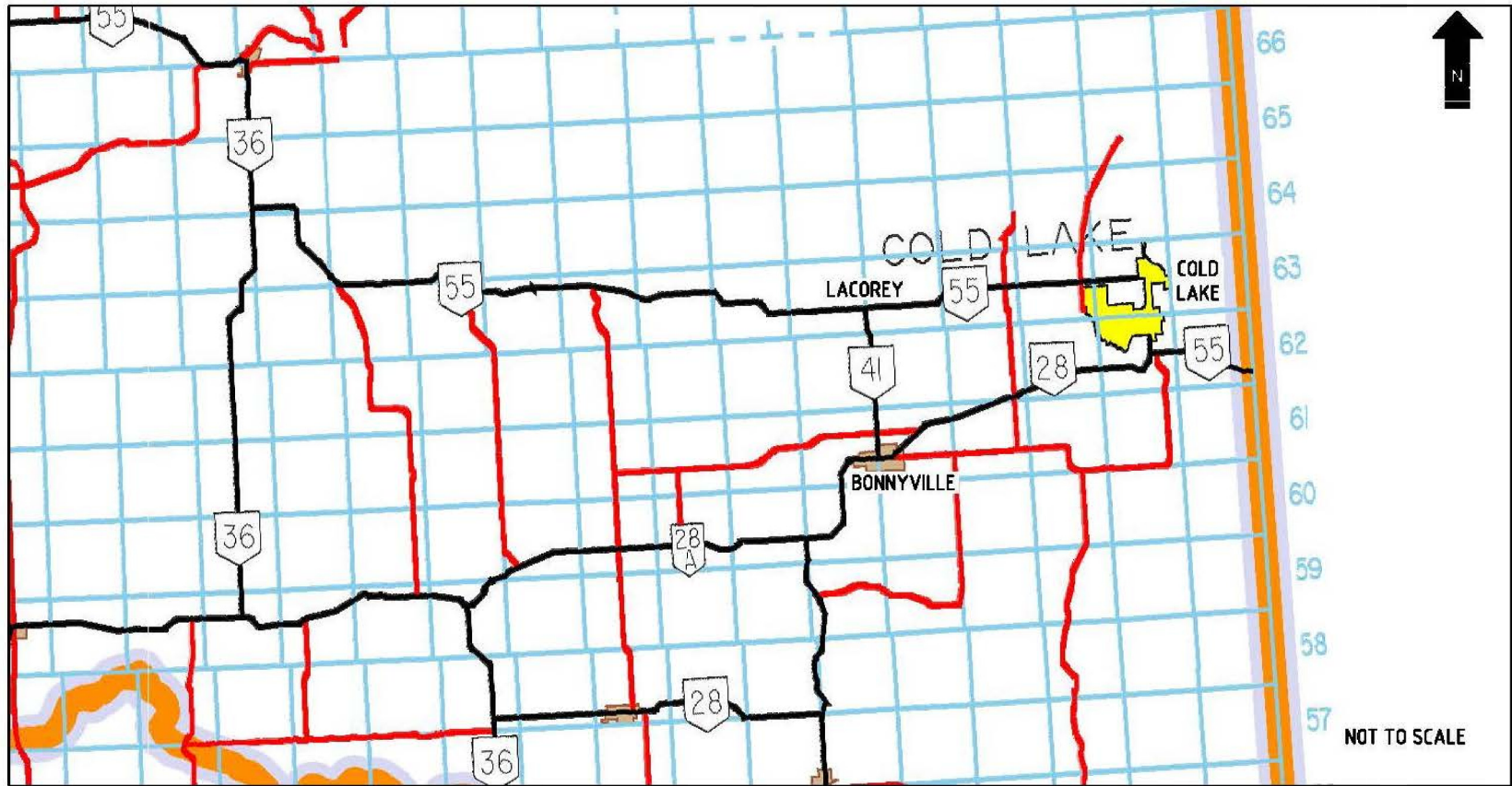
Foster Creek Thermal Project Phase J Expansion

High - Wide Load Corridor (Alberta Transportation)

Date: 11 Feb 2013 Project: 307074-00162 Technical: F.Freckleton Reviewer: C.Swiderski Drawn: T.Graham

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Figure 16A-4



Foster Creek Thermal Project Phase J Expansion

Local Highway Network

Date: 11 Feb 2013 Project: 307074-00162 Technical: F.Freckleton Reviewer: C.Swiderski Drawn: T.Graham

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Figure
16A-5

The Cenovus employee and contractor parking lot and staging area is located off the southwest corner of the intersection of Highway 41 and Highway 55. This area has a capacity for parking for at least 1,100 vehicles. Access to this lot is off of Highway 55, approximately 400 m west of the intersection.

16A.2.2.5 Highway 55 and Highway 892 Intersection

Intersection improvements are currently being undertaken at the intersection of Highway 55 and Highway 892. A roundabout intersection was constructed in late fall 2012.

16A.2.3 Existing/Background Traffic Conditions

16A.2.3.1 Average Annual Daily Traffic

Average annual daily traffic (AADT) volume history was obtained from Alberta Transportation in the document *Alberta Highways 1 to 986 Traffic Volume History 1962 - 2011* (Alberta Transportation 2012a). AADT is defined as the total yearly traffic volume divided by 365 days, in units of vehicles per day.

Highway 41

Historical (2002 to 2011) AADT volumes and the average annual growth for Highway 41 are presented in [Table 16A-1](#).

Table 16A-1 Highway 41 Historical Average Annual Daily Traffic Volumes

Location on Hwy 41	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average Annual Growth
N OF 54 AVE IN BONNYVILLE	4090	4080	4310	4610	4970	6240	6660	6400	6480	6850	6.2%
S OF 660 NW OF BONNYVILLE	2960	3170	3350	3570	3950	4620	4980	4570	4820	5260	6.8%
1.7 KM S OF 41 & 55 LA COREY	1880	2000	2150	2270	2550	2980	3340	3070	3320	3630	7.8%
S OF 55 AT LA COREY	1870	1980	2120	2270	2510	2920	3300	3040	3280	3500	7.4%

Note – The tabulated Average Annual Growth is the average of yearly change from 2002 to 2011.

With the exception of 2008, traffic volumes along Highway 41 have seen an increase of approximately 6% - 7% per annum ([Table 16A-2](#)). In 2008, a downturn in the global economy and postponement of a major project in the Bonnyville area resulted in reduced traffic volumes. If 2008 is removed from the average annual growth, the traffic volume increase is approximately 9%.

Table 16A-2 Highway 41 Annual Percentage Change Historical Average Annual Daily Traffic Volumes

Location on Hwy 41	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	Average Annual Growth
N OF 54 AVE IN BONNYVILLE	-0.2%	5.6%	7.0%	7.8%	25.6%	6.7%	-3.9%	1.3%	5.7%	6.2%
S OF 660 NW OF BONNYVILLE	7.1%	5.7%	6.6%	10.6%	17.0%	7.8%	-8.2%	5.5%	9.1%	6.8%
1.7 KM S OF 41 & 55 LA COREY	6.4%	7.5%	5.6%	12.3%	16.9%	12.1%	-8.1%	8.1%	9.3%	7.8%
S OF 55 AT LA COREY	5.9%	7.1%	7.1%	10.6%	16.3%	13.0%	-7.9%	7.9%	6.7%	7.4%

Highway 55

The range of annual growth or decline in traffic volumes along Highway 55 reflects a variety of broad and localized factors, including the impact of individual projects. In general, there was a range of annual average growth from 2002 to 2011 between 1.8% and 8.9% (Table 16A-3). The average annual growth, tabulated across the links along Highway 55 has seen an increase of approximately 5.5% per annum.

In whole terms, traffic flow along the length of Highway 55 experienced an increase of between 9% and 110% from 2002 to 2011 (Table 16A-4).

Table 16A-3 Highway 55 Historical Average Annual Daily Traffic Volumes

Location on Highway 55	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average Annual Growth
3.1 KM W OF 41 & 55 LA COREY	1040	1120	1110	1220	1560	1750	1970	1810	1940	2140	8.7%
W OF 41 AT LA COREY	1130	1150	1250	1330	1600	1840	2120	1940	2080	2140	7.7%
E OF 41 AT LA COREY	1480	1530	1650	1760	1620	2320	2610	2520	2640	2820	8.2%
W OF HAPPY HOLLOW RD (RGE RD 444)	1030	1050	1130	1200	1430	1800	2060	2060	2060	2160	8.9%
E OF HAPPY HOLLOW RD (RGE RD 444)	990	1010	1090	1160	1390	1740	1980	1980	1980	2060	8.8%
W OF 892 N OF ARDMORE	1250	1140	1100	1180	1400	1610	1840	1840	1840	1930	5.3%
E OF 892 N OF ARDMORE	2750	2000	1960	2090	2250	2610	2910	2910	2890	3010	1.8%
W OF ETHEL LAKE RD	2690	2360	2140	2280	2360	2670	2970	2970	2940	3060	1.8%
E OF ETHEL LAKE RD	2760	2470	2250	2390	2640	2930	3270	3270	3240	3380	2.6%
W OF 897 NW OF MEDLEY	2830	2620	2330	2500	2910	3230	3590	3600	3560	3720	3.4%
E OF 897 NW OF MEDLEY	2850	2700	2480	2630	3040	3380	3780	3780	3740	3920	3.9%
W OF 28 & 55 COLD LAKE	2960	2730	2870	3080	3660	4000	4470	4530	4500	4710	5.5%

Note – Annual Growth is the average yearly growth or decrease from 2002 to 2011.

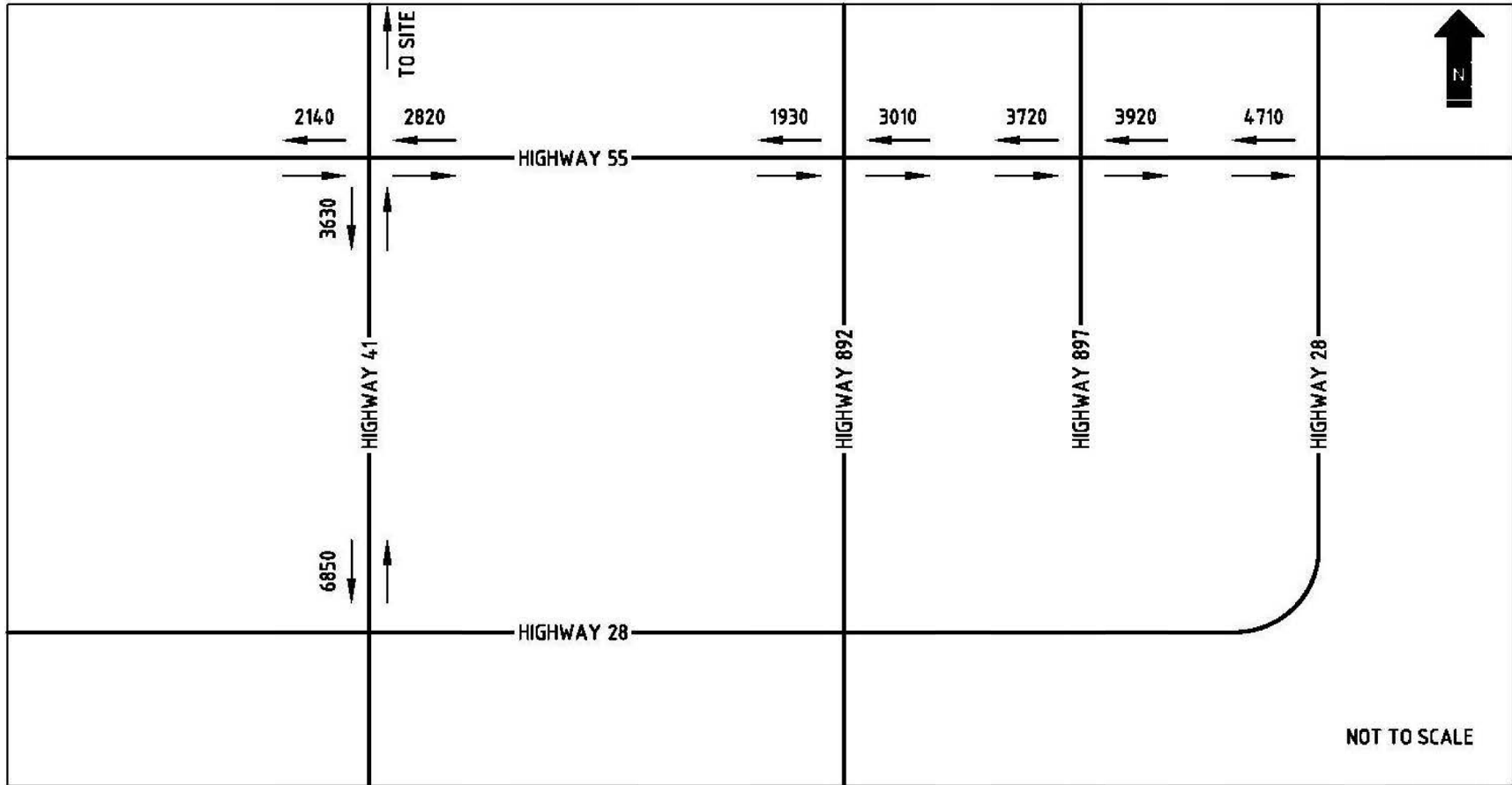
Table 16A-4 Highway 55 Annual Percentage Change Historical Average Annual Daily Traffic Volumes

Location on Highway 55	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	Average Annual Growth
3.1 KM W OF 41 & 55 LA COREY	7.7%	-0.9%	9.9%	27.9%	12.2%	12.6%	-8.1%	7.2%	10.3%	8.7%
W OF 41 AT LA COREY	1.8%	8.7%	6.4%	20.3%	15.0%	15.2%	-8.5%	7.2%	2.9%	7.7%
E OF 41 AT LA COREY	3.4%	7.8%	6.7%	-8.0%	43.2%	12.5%	-3.4%	4.8%	6.8%	8.2%
W OF HAPPY HOLLOW RD (RGE RD 444)	1.9%	7.6%	6.2%	19.2%	25.9%	14.4%	0.0%	0.0%	4.9%	8.9%
E OF HAPPY HOLLOW RD (RGE RD 444)	2.0%	7.9%	6.4%	19.8%	25.2%	13.8%	0.0%	0.0%	4.0%	8.8%
W OF 892 N OF ARDMORE	-8.8%	-3.5%	7.3%	18.6%	15.0%	14.3%	0.0%	0.0%	4.9%	5.3%
E OF 892 N OF ARDMORE	-27.7%	-2.0%	6.6%	7.7%	16.0%	11.5%	0.0%	-0.7%	4.2%	1.8%
W OF ETHEL LAKE RD	-12.3%	-9.3%	6.5%	3.5%	13.1%	11.2%	0.0%	-1.0%	4.1%	1.8%
E OF ETHEL LAKE RD	-10.5%	-8.9%	6.2%	10.5%	11.0%	11.6%	0.0%	-0.9%	4.3%	2.6%
W OF 897 NW OF MEDLEY	-7.4%	-11.1%	7.3%	16.4%	11.0%	11.1%	0.3%	-1.1%	4.5%	3.4%
E OF 897 NW OF MEDLEY	-5.3%	-8.1%	6.0%	15.6%	11.2%	11.8%	0.0%	-1.1%	4.8%	3.9%
W OF 28 & 55 COLD LAKE	-7.8%	5.1%	7.3%	18.8%	9.3%	11.8%	1.3%	-0.7%	4.7%	5.5%

Note – Annual Growth is the average growth of the yearly growth or decrease from 2002 to 2011.

16A.2.3.2 Summary of AADT

The AADT volumes on the highways surrounding the intersection of Highway 41 and Highway 55 at La Corey are shown in [Figure 16A-6](#). [Figure 16A-6](#) represents existing traffic flow from the two major centres in the area to the intersection at La Corey. The highest volume on Highway 41 is immediately north of Bonnyville and the highest volume on Highway 55 is directly west of Cold Lake.



Foster Creek Thermal Project Phase J Expansion

2011 Average Annual Daily Traffic Volumes

Date: 11 Feb 2013 | Project: 307074-00162 | Technical: F.Freckleton | Reviewer: C.Swidorski | Drawn: T.Graham

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Figure 16A-6

16A.2.4 Intersection Count at La Corey

In order to obtain the daily traffic volume at the intersection of Highway 41 and Highway 55, a traffic count was completed on Tuesday February 7, 2012, between 6:30AM and 6:30 PM. Mid-week was selected to miss any holidays and assure regular daytime traffic volume would be observed.

Weather conditions were favourable for traffic counting. It was sunny with a daytime high temperature of -10°C and a low temperature of -24°C . The sunrise was at 8:00AM and sunset was at 5:00PM. The intersection has ten light standards, three of which were not functional at the time of the count.

A house is located in the northwest corner of the intersection, with an approximate setback of 20 m from the adjacent highways (Photo 16A-1). A church is located in the northeast corner of the intersection, with an approximate setback of 20 m from the adjacent highways (Photo 16A-2). The entrance to the Esso gas station is located just east of the church.



Photo 16A-1 La Corey Intersection Looking Northwest

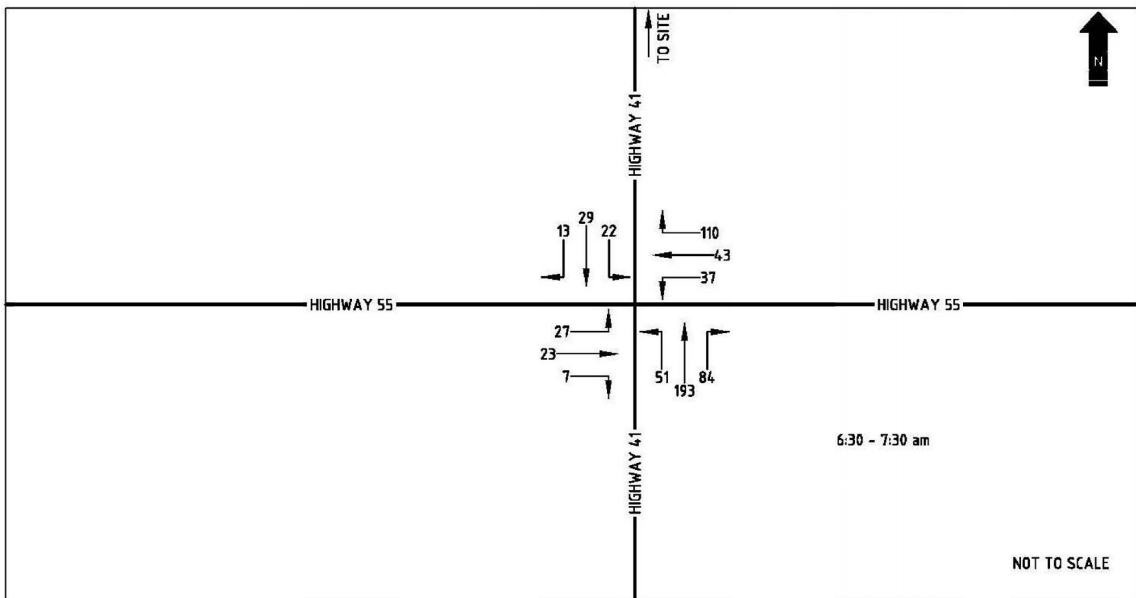
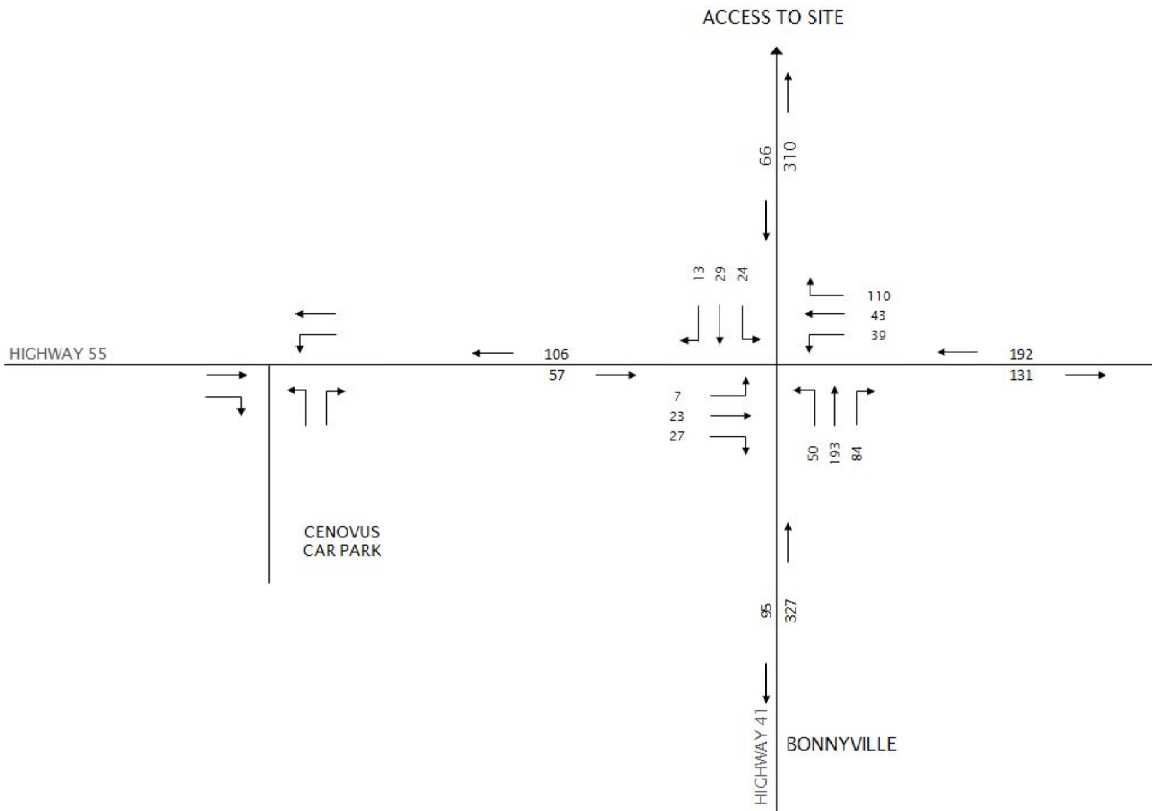


Photo 16A-2 La Corey Intersection Looking North

The observed peak hours were between 6:30–7:30 AM and 5:00–6:00 PM. The AM Peak Hour traffic flow is summarized in [Figure 16A-7](#). The PM Peak Hour traffic flow is summarized in [Figure 16A-8](#). No accidents were observed. For the daily total of 5,076 vehicles, passenger vehicles (1 tonne trucks and less) made up 70% of the traffic volume, trucks (greater than 1 tonne) accounted for 29% of the traffic volume, and buses were 1% ([Table 16A-5](#)).

Table 16A-5 La Corey Intersection Total Traffic Observation Counts

Direction	Passenger Vehicle	Truck	Buses	Other	Total
South Bound Left	66	52	2	1	121
South Bound	669	229	7	0	905
South Bound Right	339	70	8	0	417
West Bound Right Turn	297	78	5	0	380
West Bound	262	111	4	0	377
West Bound Left Turn	312	117	2	0	431
East Bound Right Turn	280	176	5	3	464
East Bound	223	86	5	1	315
East Bound Left Turn	56	33	3	0	92
North Bound Right Turn	291	132	6	0	429
North Bound	496	203	4	0	703
North Bound Left Turn	273	164	3	2	442
Totals	3564	1451	54	7	5076
(Percentage of Total)	70.2%	28.6%	1.1%	0.1%	



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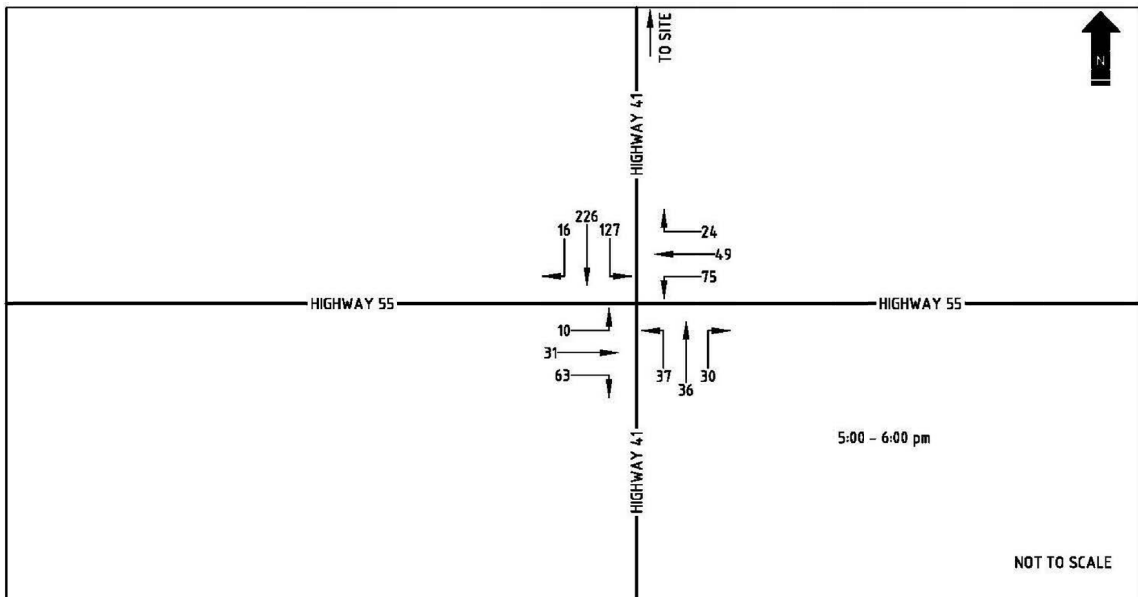
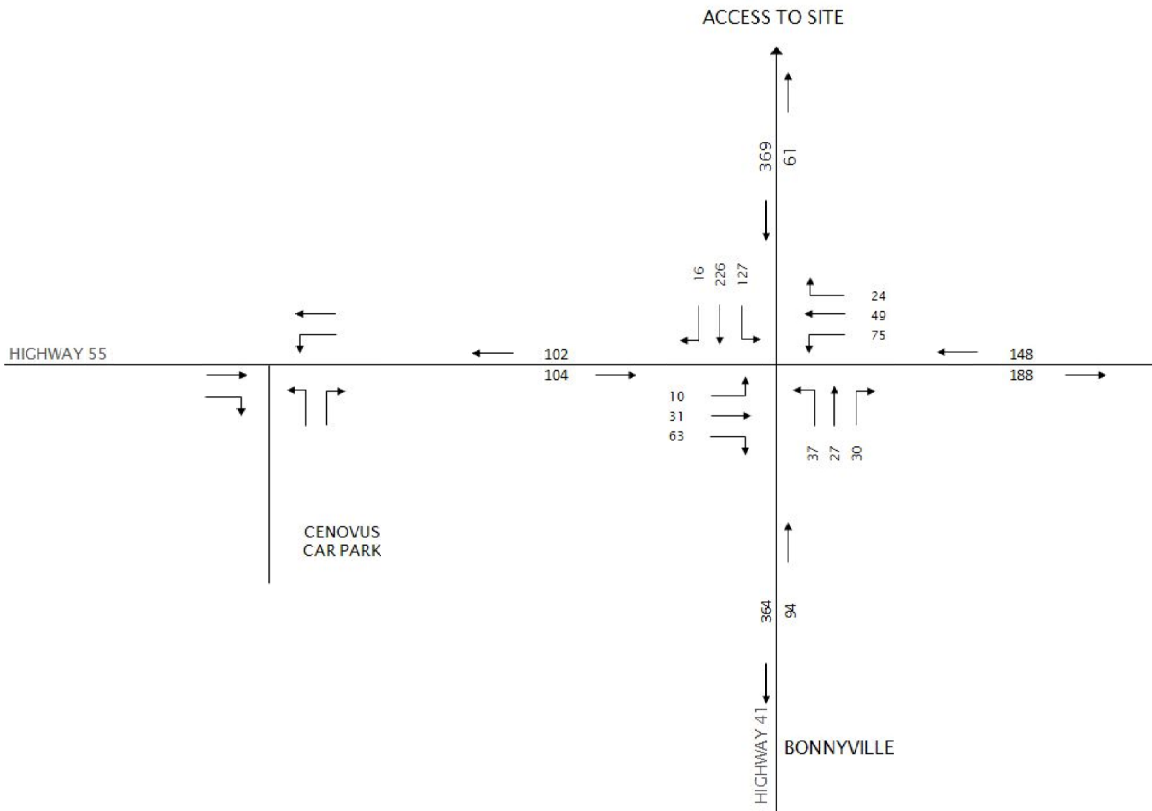
Foster Creek Thermal Project Phase J Expansion

**AM Peak Traffic Volumes
February 7, 2012**

Date: 11 Feb 2013 Project: 307074-00162 Technical: F.Freckleton Reviewer: C.Swidorski Drawn: T.Graham

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Figure 16A-7



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Foster Creek Thermal Project Phase J Expansion

**PM Peak Traffic Volumes
February 7, 2012**

Date: 11 Feb 2013 Project: 307074-00162 Technical: F.Freckleton Reviewer: C.Swidorski Drawn: T.Graham

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Figure 16A-8

16A.2.5 Traffic Growth rates

Growth rates were calculated based on historic traffic count data provided by Alberta Transportation (Tables 16A-2 and 16A-4). Table 16A-6 represents this data. The longer term growth rate of 2.5% has been taken from the Alberta Transportation Traffic Impact Assessment Guidelines. Given the traffic impact of the development is focused on the construction phase, longer term growth rates have not been applied in the analysis.

Table 16A-6 Growth Rates

Highway	5 Year	10 Year	Long Term
Highway 41	4.4%	6.5%	2.5%
Highway 55	4.7%	4.8%	2.5%

16A.2.5.1 Traffic Growth at La Corey Intersection

Background traffic volumes for the peak construction time frame of the Project and the Project completion date (Table 16A-7), were estimated by applying the 5 and 10 year growth rates (Table 16A-6).

Table 16A-7 Background Daily Traffic Volumes

Location on Highway	Existing	Q2 – 2016	Q4 - 2018
1.7 KM S OF 41 & 55 LA COREY	3630	4429	4901
HWY 55 W OF 41 AT LA COREY	2140	2643	2848
HWY 55 E OF 41 AT LA COREY	2820	3483	3753

Future daily traffic volumes were calculated based on the highest estimated daily site generated traffic discussed in Section 16A.3.3.

16A.2.6 Highway Service Classification

Highways 41 and 55 are classified as Level 2 roadways, based on the current *Provincial Highway Service Classification Map 50 Year Horizon*, produced by the Highway Geomatics Section (Transportation and Civil Engineering Division) of Alberta Transportation (Alberta Transportation 2008a). Level 2 roadways accommodate the movement of people and goods, mainly inter-provincially. Level 2 roadways are also typically used for long trips.

Using the Highway Geometric Design Guides, Figure A-32i – *Guidelines for Desirable Standards for Rural Highways* (Alberta Transportation 2008b), it was determined that both Highway 41 and Highway 55 are operating within guidelines, based on current geometry.

16A.3 SITE TRAFFIC

16A.3.1 Background Traffic

The baseline traffic details used for the assessment of forecast traffic volumes are provided in [Section 16A-2](#). The background AM and PM peak hour network movements for 2016 are provided in [Figure 16A-9](#) and [Figure 16A-10](#). These forecast movements were generated by applying the growth outlined in [Table 16A-6](#) to the 2012 observed traffic movements.

16A.3.2 Project Traffic

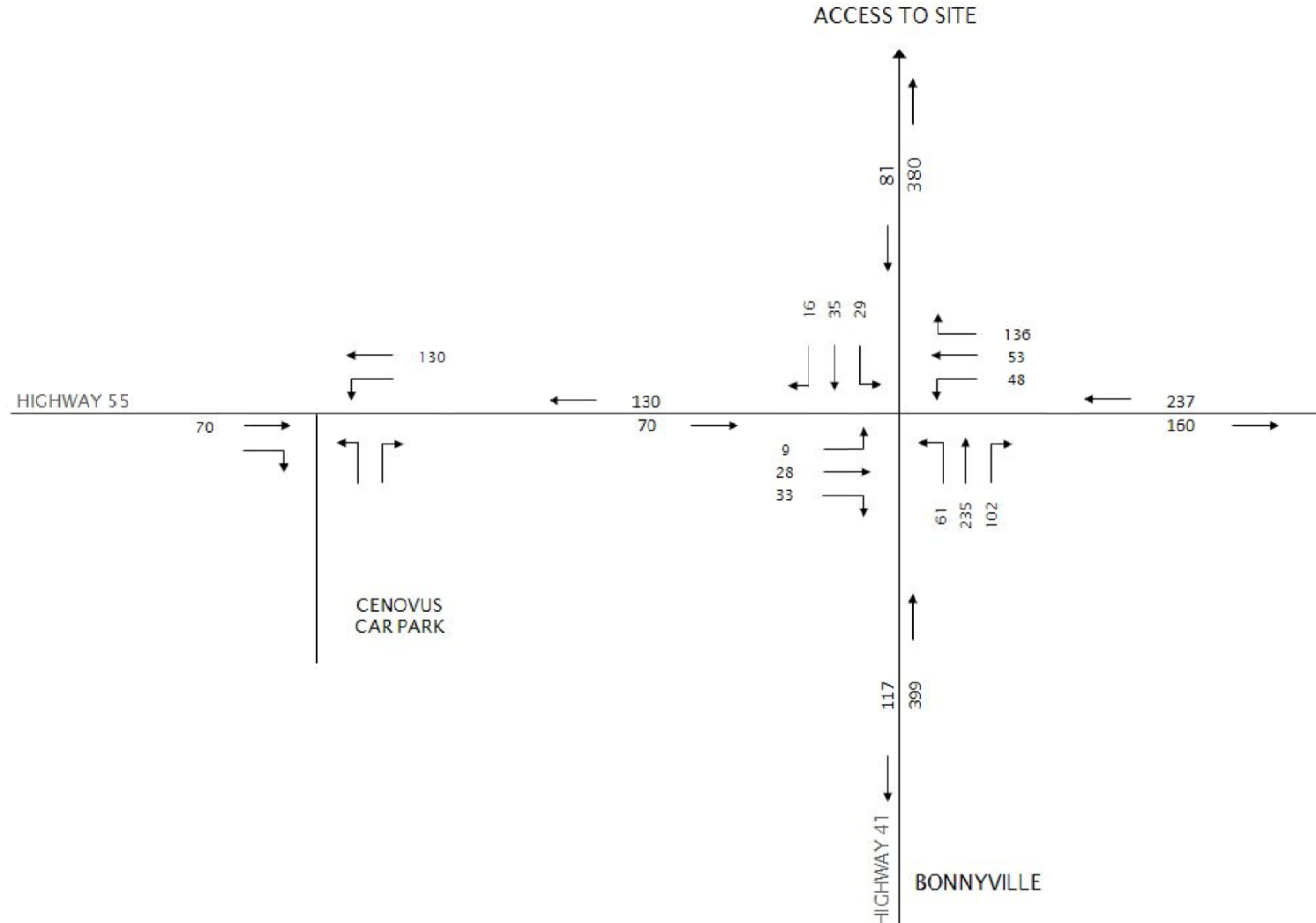
The Project will have two critical stages in which the profile of movement to and from the Project, through the La Corey Intersection, will have broadly different impacts. These two stages are construction and operational stages. The projected traffic from each of these stages is provided in [Volume 6, Section 16.9](#).

16A.3.3 Trip Generation

16A.3.3.1 Vehicle Composition of Construction Related Traffic

During the course of the analysis for the TIA, the following trip generation characteristics were used:

- while on shift, 90% of construction personnel will stay in Cenovus camps on site. The remaining 10% will comprise mainly of the Cenovus construction management team who are primarily local to the area and live in the surrounding municipalities;
- Cenovus is proposing that construction personnel work a 12 hour shift from 7:00 AM and 7:00 PM maintaining a 9 days on and 5 days off rotation;
- just west of the intersection of Highway 41 and Highway 55 at La Corey, Cenovus has developed the La Corey Parking Lot;
- Cenovus will continue to operate a workforce bussing system that includes daily and weekly (shift change) bussing to company-operated parking lots in La Corey, Cold Lake and Bonnyville. This service will also be available to contractors;
- Cenovus is projecting 100 to 200 construction vehicles on site per day, depending on the stage of the Project;
- bus occupancy rates of 30 people per bus, and a passenger vehicle occupancy rate of 1.2 people per vehicle, will be used for construction workforce and operations personnel not staying on site;
- Cenovus has projected 380 permitted loads and 500 – 1000 non-permitted loads of material delivery truck trips to site. This does not account for drilling and operations truck traffic, which should not vary from existing conditions and will not be factored as it is represented in the existing AADT;
- most loads will be staged at the La Corey Parking Lot for marshaling before being shipped to site during off peak hours. Therefore, no truck traffic will be added to existing AM and PM Peak Hours; and



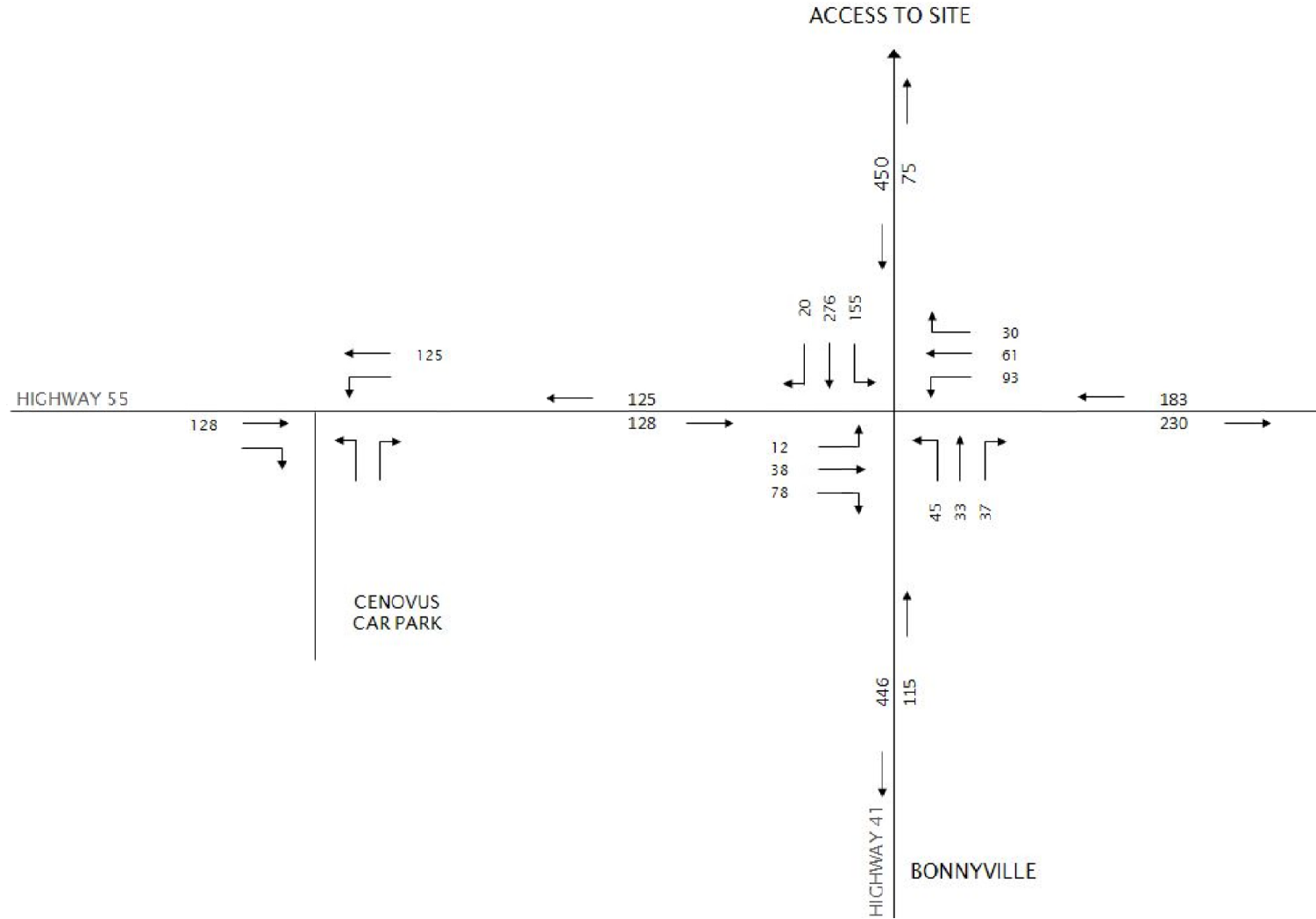
Foster Creek Thermal Project Phase J Expansion

2016 AM Peak Hour Background Movements

Date: 11 Feb 2013 Project: 307074-00162 Technical: F.Freckleton Reviewer: C.Swiderski Drawn: T.Graham

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Figure 16A-9



Foster Creek Thermal Project Phase J Expansion

2016 PM Peak Hour Background Movements

Date: 11 Feb 2013 | Project: 307074-00162 | Technical: F.Freckleton | Reviewer: C.Swiderski | Drawn: T.Graham

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Figure 16A-10

- in 2017, when additional Operations personnel are expected to begin work on site, buses from both Bonnyville and Cold Lake will be used to reduce traffic volumes and fatigue of operations staff that may be working 12 hour shifts. Existing camps may be utilized by non-local personnel.

16A.3.3.2 Daily Project Generated Traffic

Cenovus is expecting up to 200 construction vehicles on site during peak construction. Therefore, 200 (two-way) passenger vehicle movements have been assumed.

16A.3.3.3 Peak Hour Project Generated Traffic

As set out in section [16A.2.4](#), peak hours at the La Corey Intersection were recorded as being 6:30 to 7:30 AM and 5:00 to 6:00 PM. With 90% of the construction personnel staying in camp onsite, it has been assumed that the remaining 10% will be travelling during the peak morning hour, as shifts are assumed to start at 7:00 AM and finish at 7:00 PM. For operations personnel, it has been assumed that 50% will bus to site from the surrounding municipalities, while the remaining personnel will drive to the parking lot in La Corey.

For the purposes of the TIA, it has been assumed in 2016 that there are 12, two-way, bus movements in the peak construction time. Heavy truck traffic will be scheduled around peak hours. This has been factored into the trip generation where there are 5, two-way, truck trips reflected during peak construction.

16A.3.4 Trip Distribution

Trip distribution for the purposes of the TIA has been taken from the existing distribution patterns for the site, as well as from assumptions set out in relation to the movement of workers to and from site during construction and operational stages of development.

It has been assumed that vehicles not already reflected in the background traffic would be distributed as follows:

- 5% of traffic flow west of Highway 41; west to east direction on Highway 55;
- 35% of traffic flow east of Highway 41; east to west direction on Highway 55; and
- 60% of traffic flow south of Highway 55; south to north direction on Highway 41.

16A.3.5 Combined Project Generated and Background Traffic

The combined background and Project Generated traffic flows have focussed on the 2016 AM peak hour because, as set out in the previous section, the movement of vehicles from the site will avoid the PM peak period.

16A.3.5.1 AM Peak Hour

The combined background and development flows for the AM peak hour are set out in [Figure 16A-11](#). The anticipated AADT figures for Highway 55 and Highway 41 are provided in [Table 16A-8](#).

Table 16A-8 Total Daily Traffic Volumes with Project Traffic

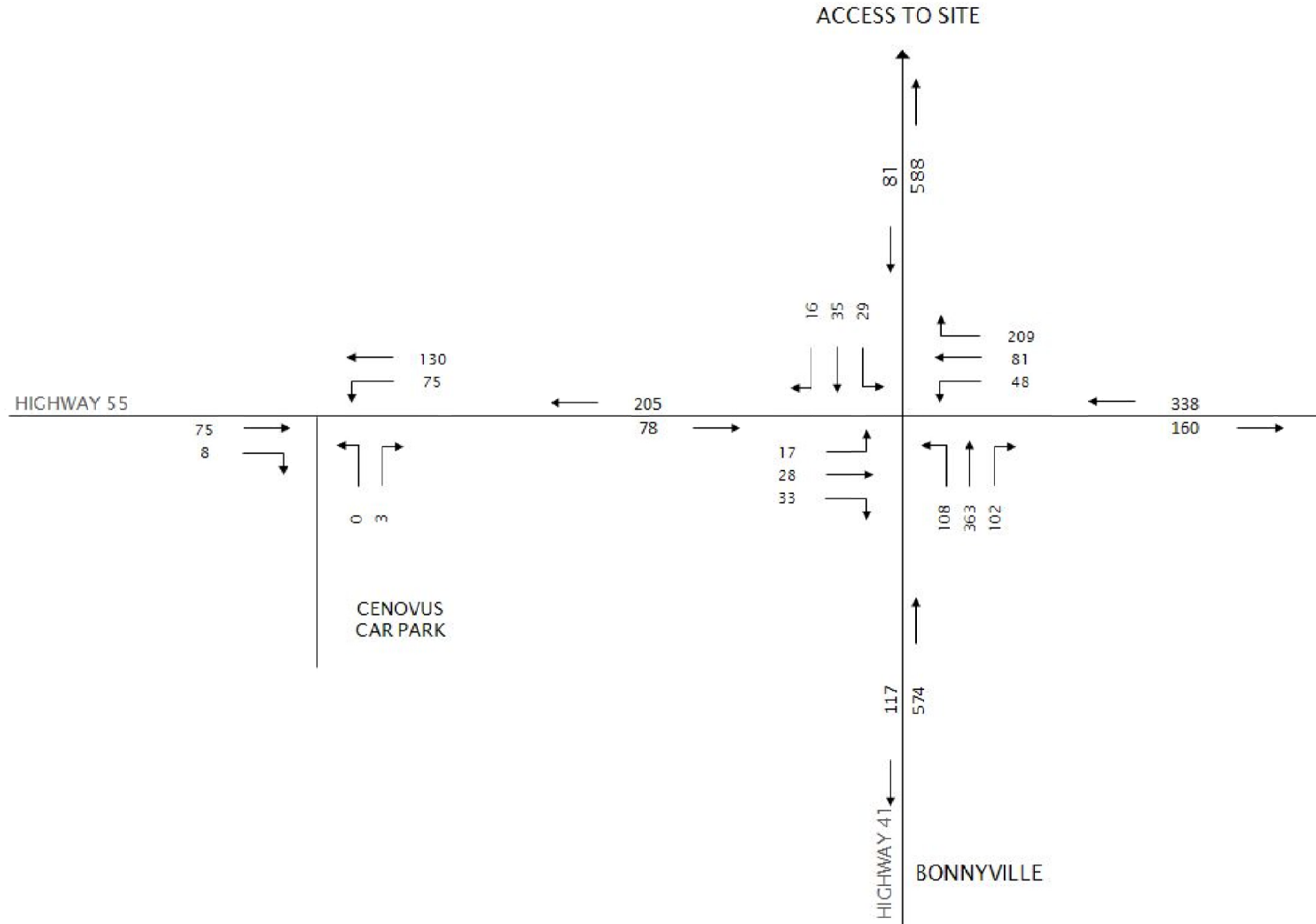
Location on Highway	Total AADT Q2, 2016	%of AADT (Project Traffic)
1.7 km south of 41 & 55 at La Corey	4689	5.5%
HWY 55 west of 41 at La Corey	2665	0.8%
HWY 55 east of 41 at La Corey	3635	4.2%

AADT = annual average daily traffic

Project generated traffic accounts for a small increase in total projected average annual daily traffic volumes ([Table 16A-8](#)).

16A.3.5.2 PM Peak

Due to the movement of vehicles from site outside of the PM Peak Hour, there will be minimal impact of Project generated vehicles through the La Corey Intersection. The combined volumes anticipated in 2016, with background and development traffic, are shown in [Figure 16A-12](#).



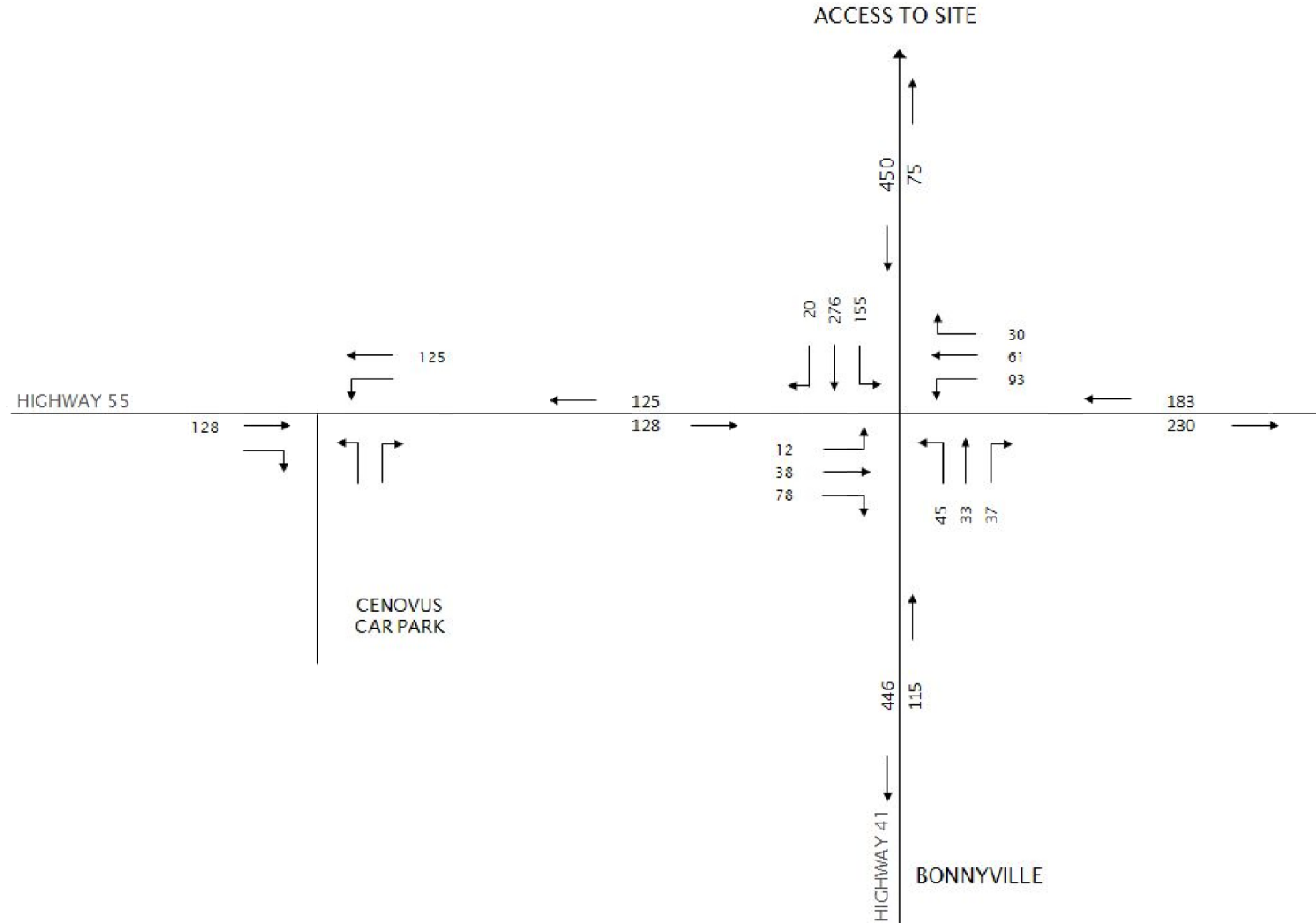
Foster Creek Thermal Project Phase J Expansion

**2016 AM Peak Hour Flows -
Background + Project Generated traffic**

Date: 11 Feb 2013 Project: 307074-00162 Technical: F.Freckleton Reviewer: C.Swiderski Drawn: T.Graham

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Figure
16A-11



Foster Creek Thermal Project Phase J Expansion

2016 PM Peak Hour Flows - Background + Project Generated traffic

Date: 11 Feb 2013 | Project: 307074-00162 | Technical: F.Freckleton | Reviewer: C.Swiderski | Drawn: T.Graham

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Figure
16A-12

16A.4 ANALYSIS

16A.4.1 Introduction

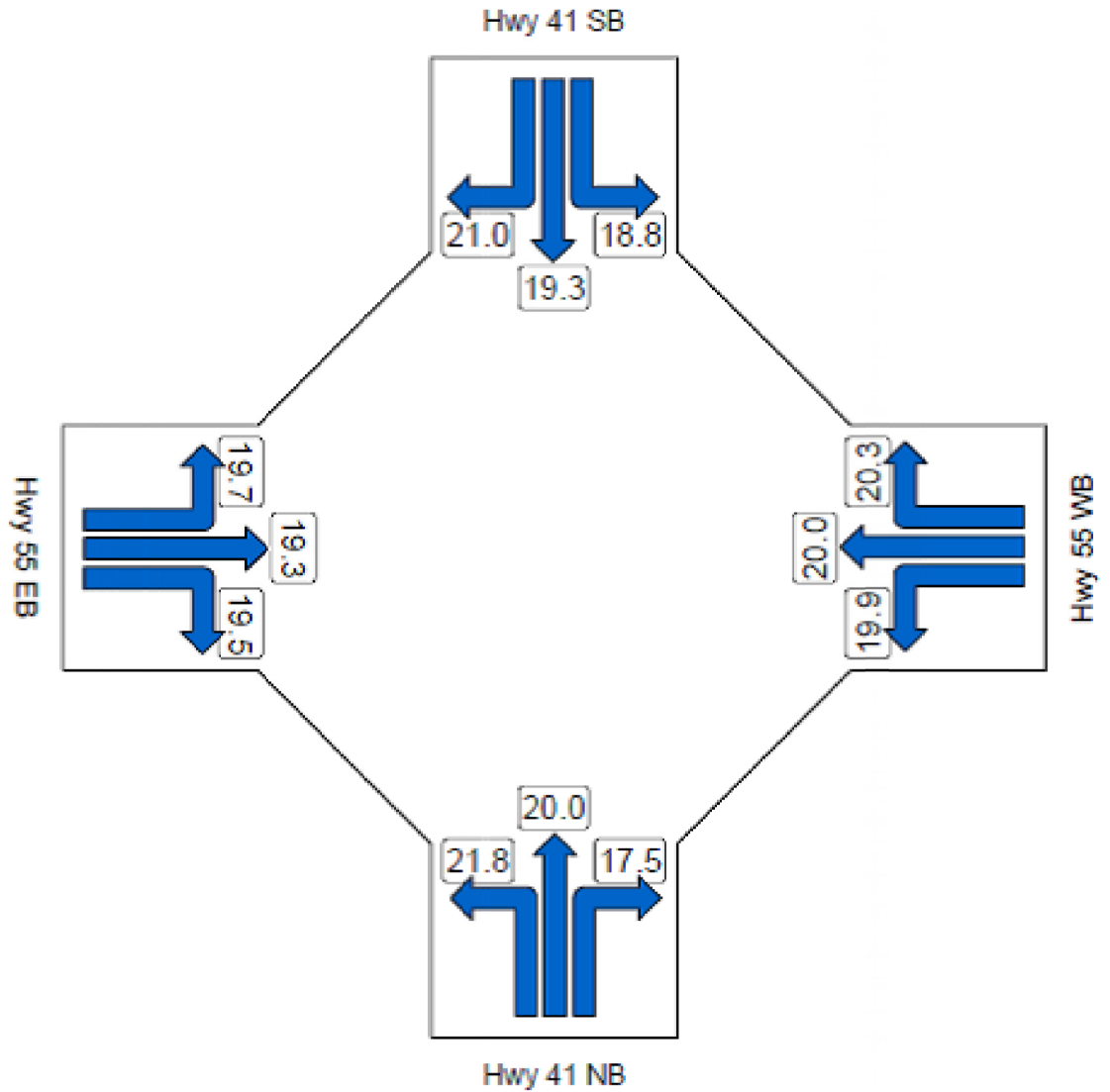
The La Corey Intersection was analyzed using the Signalised and unsignalised Intersection Design and Research Aid (SIDRA) model platform to obtain all of the relevant performance measurements for the intersection, in the background and development scenarios. These scenarios are discussed in the following sections. Input data included explicit levels of truck movements on each arms, intersection configuration and known and forecast traffic volumes.

16A.4.2 2012 AM Peak Analysis

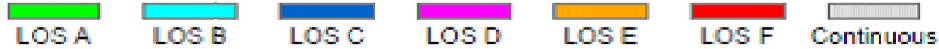
The 2012 AM Peak Hour analysis of the La Corey Intersection (Table 16A-9), indicates that the intersection operates at an acceptable level of operation. All arms operate at a Level C. The delay and level of service information is provided in Figure 16A-13.

Table 16A-9 2012 AM Peak Analysis

Movement Performance Vehicles											
Mov ID	Turn	Demand Flow (veh/h)	HV (%)	Deg. Satn (v/c)	Average Delay (sec)	Level of Service	95% Back of Vehicles	Queue Distance (m)	Prop. Queued	Effective Stop Rate (per veh)	Average Speed (km/h)
South: Hwy 41 NB											
1	L	50	54.0	0.556	21.8	LOS C	1.6	11.2	0.68	1.40	40.4
2	T	193	21.0	0.556	20.0	LOS C	1.6	11.2	0.68	1.40	40.4
3	R	84	31.0	0.207	17.5	LOS C	0.4	2.8	0.61	1.24	42.8
Approach		327	28.6	0.557	19.7	LOS C	1.6	11.2	0.66	1.36	41.0
East: Hwy 55 WB											
4	L	39	18.0	0.298	19.9	LOS C	0.6	5.1	0.78	1.29	40.6
5	T	43	21.0	0.297	20.0	LOS C	0.6	5.1	0.78	1.29	40.6
6	R	110	18.0	0.356	20.3	LOS C	0.8	6.7	0.79	1.28	40.3
Approach		192	18.7	0.356	20.2	LOS C	0.8	6.7	0.79	1.29	40.4
North: Hwy 41 SB											
7	L	24	13.0	0.127	18.8	LOS C	0.4	3.7	0.81	1.17	41.3
8	T	29	24.0	0.127	19.3	LOS C	0.4	3.7	0.81	1.17	41.3
9	R	13	54.0	0.126	21.0	LOS C	0.4	3.7	0.81	1.17	41.2
Approach		66	25.9	0.127	19.5	LOS C	0.4	3.7	0.81	1.17	41.3
West: Hwy 55 EB											
10	L	7	29.0	0.108	19.7	LOS C	0.2	1.8	0.80	1.21	41.2
11	T	23	22.0	0.108	19.3	LOS C	0.2	1.8	0.80	1.20	41.2
12	R	27	22.0	0.113	19.5	LOS C	0.2	1.8	0.80	1.24	41.0
Approach		57	22.9	0.113	19.5	LOS C	0.2	1.8	0.80	1.22	41.1
All Vehicles		642	24.9	0.557	19.8	LOS C	1.6	11.2	0.80	1.31	40.9



Colour code based on Level of Service



Level of Service Method used in this display: Delay (HCM)



Foster Creek Thermal Project Phase J Expansion

Delay and Level of Service 2012 AM Peak Analysis

Date: 11 Feb 2013 Project: 307074-00162 Technical: F.Freckleton Reviewer: C.Swidorski Drawn: T.Graham

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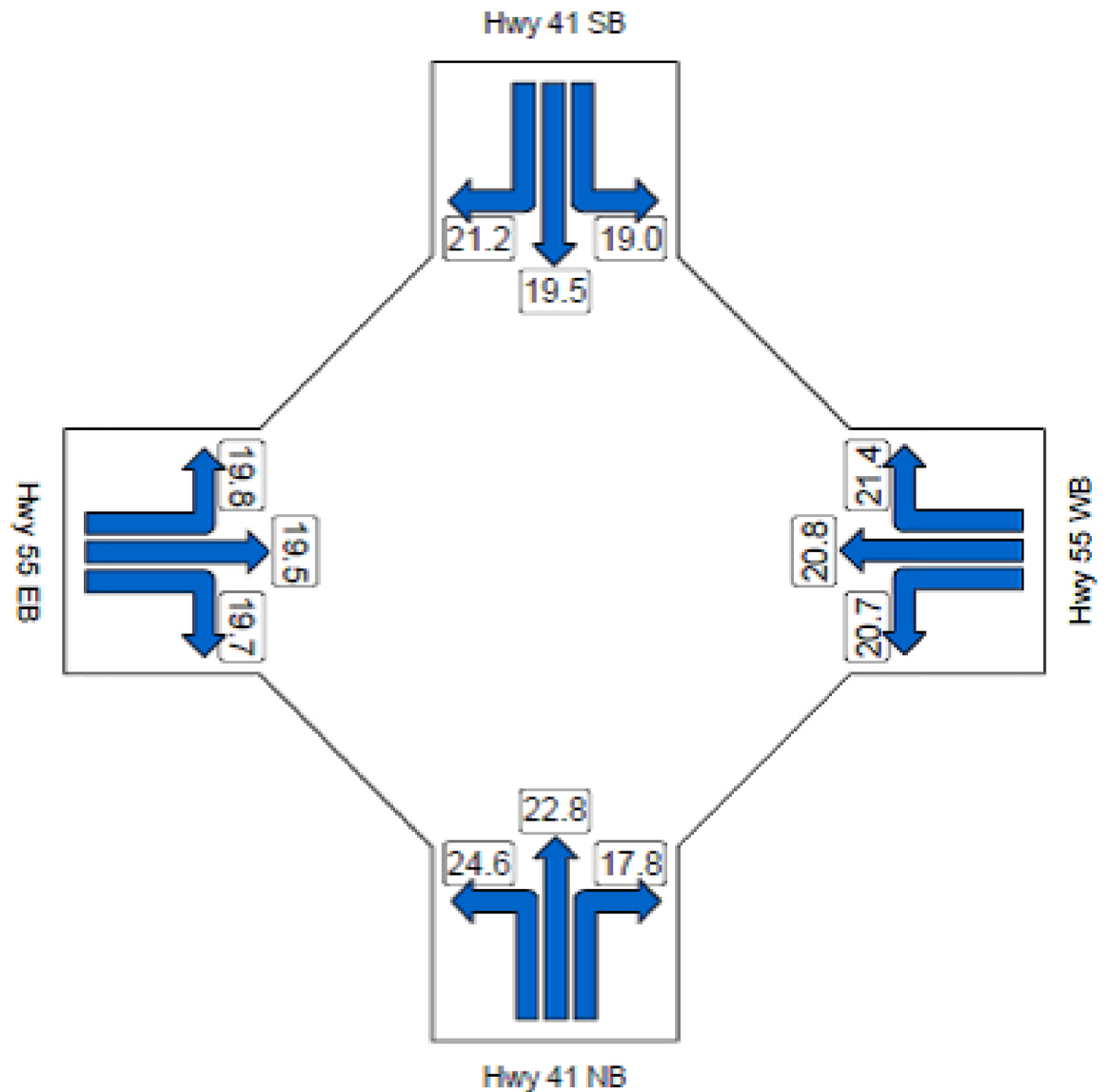
Figure
16A-13

16A.4.3 2016 AM Peak Analysis

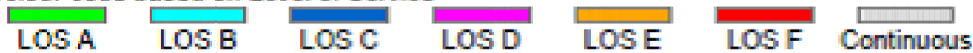
The 2016 AM Peak Hour analysis (Table 16A-10), shows a marginal difference between the existing 2012 AM Peak Hour intersection performance and the 2016 intersection performance. The delay and level of service information is provided in Figure 16A-14.

Table 16A-10 2016 AM Peak Analysis

Movement Performance Vehicles											
Mov ID	Turn	Demand Flow (veh/h)	HV (%)	Deg. Satn (v/c)	Average Delay (sec)	Level of Service	95% Back of Vehicles	Queue Distance (m)	Prop. Queued	Effective Stop Rate (per veh)	Average Speed (km/h)
South: Hwy 41 NB											
1	L	61	54.0	0.678	24.6	LOS C	2.4	17.3	0.70	1.54	38.5
2	T	235	21.0	0.679	22.8	LOS C	2.4	17.3	0.70	1.54	38.5
3	R	102	31.0	0.252	17.8	LOS C	0.5	3.6	0.62	1.26	42.6
Approach		398	28.6	0.680	21.8	LOS C	2.4	17.3	0.68	1.47	39.4
East: Hwy 55 WB											
4	L	48	18.0	0.366	20.7	LOS C	0.8	6.7	0.79	1.32	40.0
5	T	53	21.0	0.366	20.8	LOS C	0.8	6.7	0.79	1.32	40.0
6	R	136	18.0	0.440	21.4	LOS C	1.1	9.1	0.80	1.32	39.5
Approach		237	18.7	0.440	21.1	LOS C	1.1	9.1	0.80	1.32	39.7
North: Hwy 41 SB											
7	L	29	13.0	0.154	19.0	LOS C	0.5	4.6	0.82	1.18	41.1
8	T	35	24.0	0.154	19.5	LOS C	0.5	4.6	0.82	1.18	41.2
9	R	16	54.0	0.154	21.2	LOS C	0.5	4.6	0.82	1.17	41.1
Approach		80	26.0	0.154	19.7	LOS C	0.5	4.6	0.82	1.18	41.1
West: Hwy 55 EB											
10	L	9	29.0	0.132	19.8	LOS C	0.3	2.3	0.80	1.22	41.1
11	T	28	22.0	0.133	19.5	LOS C	0.3	2.3	0.80	1.21	41.1
12	R	33	22.0	0.138	19.7	LOS C	0.3	2.2	0.80	1.24	40.9
Approach		70	22.9	0.138	19.6	LOS C	0.3	2.3	0.80	1.23	41.0
All Vehicles		785	24.8	0.680	21.2	LOS C	2.4	17.3	0.74	1.37	39.8



Colour code based on Level of Service



Level of Service Method used in this display: Delay (HCM)



Foster Creek Thermal Project Phase J Expansion

Delay and Level of Service 2016 AM Peak Analysis

Date: 11 Feb 2013 Project: 307074-00162 Technical: F.Freckleton Reviewer: C.Swidorski Drawn: T.Graham

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Figure
16A-14

16A.4.4 2016 AM Peak Analysis with Project Generated Traffic

The 2016 AM Peak Hour analysis, including Project development traffic, is provided in [Table 16A-11](#). The delay and LOS details are set out in [Figure 16A-15](#).

In comparison to the performance of the 2012 existing and 2016 without the Project AM Peak Hour, the additional traffic movements associated with the Project has an impact on a number of movements at the La Corey Intersection. These movements result in increased delays for some turning movements and impacts on the overall intersection assessment.

The actual percentage of Project related traffic compared to the background traffic is minor ([Table 16A-11](#)). This indicates that the intersection can be impacted by a small increase in vehicles and that the level of background traffic is approaching a point where intersection performance would be constrained.

From the analysis, the primary issue in terms of movement relates to traffic heading northbound along Highway 41 from Bonnyville, either turning left to access the Cenovus site parking and marshaling area, or going through the intersection heading towards the Project site. Both of these movements experience increased delays and queuing.

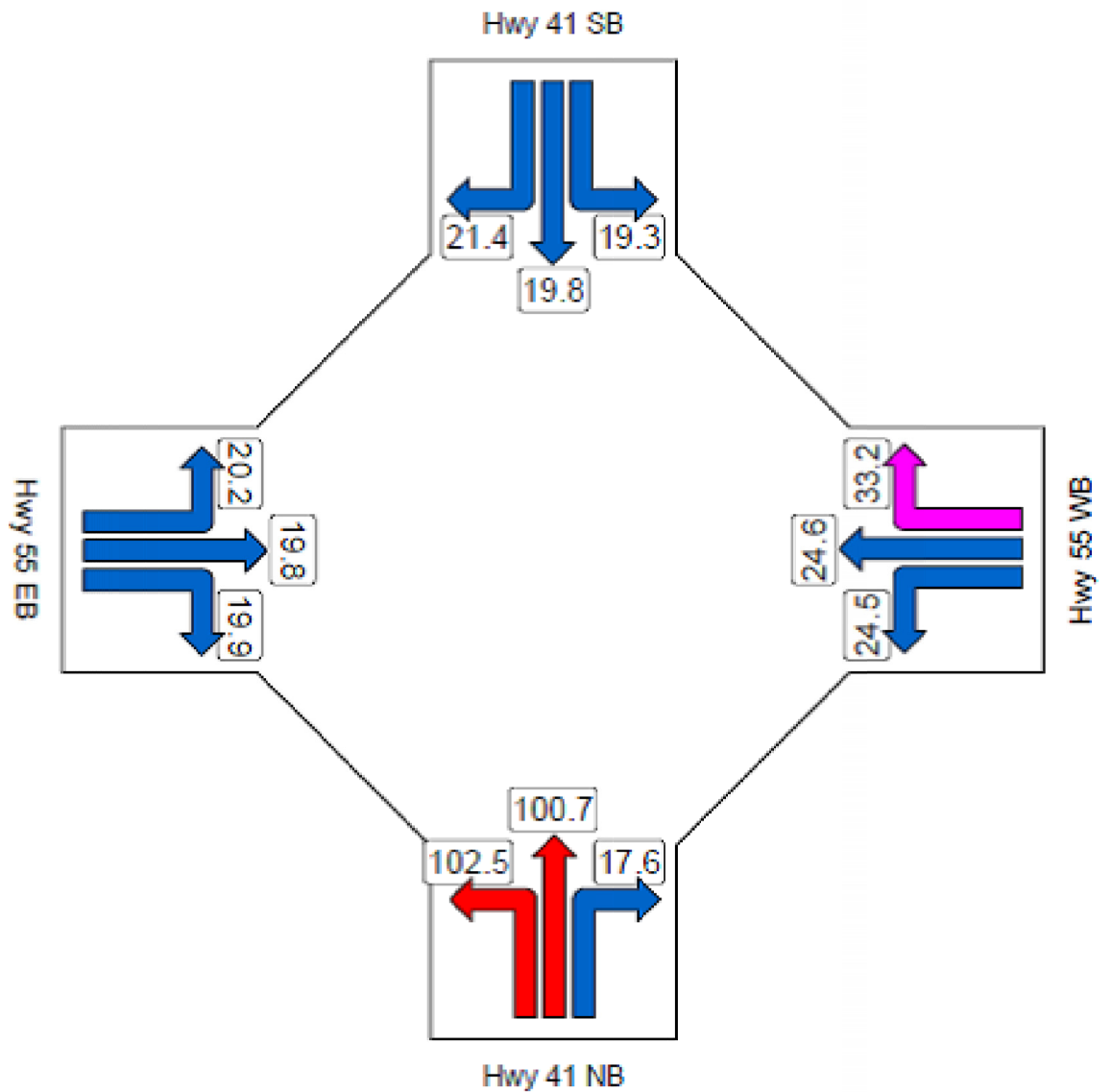
Table 16A-11 2016 AM Peak Analysis with Project Generated Traffic

Movement Performance Vehicles											
Mov ID	Turn	Demand Flow (veh/h)	HV (%)	Deg. Satn (v/c)	Average Delay (sec)	Level of Service	95% Back of Vehicles	Queue Distance (m)	Prop. Queued	Effective Stop Rate (per veh)	Average Speed (km/h)
South: Hwy 41 NB											
1	L	108	54.0	1.059	102.5	LOS F	20.6	150.1	1.00	5.46	16.2
2	T	363	21.0	1.055	100.7	LOS F	20.6	150.1	1.00	5.46	16.2
3	R	102	31.0	0.245	17.6	LOS C	0.5	3.4	0.61	1.26	42.7
Approach		573	29.0	1.054	86.3	LOS F	20.6	150.1	0.93	4.71	18.3
East: Hwy 55 WB											
4	L	48	18.0	0.516	24.5	LOS C	1.4	11.6	0.84	1.42	37.4
5	T	81	21.0	0.519	24.6	LOS C	1.4	11.6	0.84	1.42	37.4
6	R	209	18.0	0.752	33.2	LOS D	3.3	26.4	0.88	1.69	32.6
Approach		338	18.7	0.752	29.9	LOS D	3.3	26.4	0.86	1.59	34.3
North: Hwy 41 SB											
7	L	29	13.0	0.158	19.3	LOS C	0.6	4.8	0.83	1.18	40.9
8	T	35	24.0	0.159	19.8	LOS C	0.6	4.8	0.83	1.18	41.0
9	R	16	54.0	0.158	21.4	LOS C	0.6	4.8	0.83	1.18	40.9
Approach		80	26.0	0.159	19.9	LOS C	0.6	4.8	0.83	1.18	40.9
West: Hwy 55 EB											
10	L	17	29.0	0.165	20.2	LOS C	0.3	2.9	0.81	1.22	40.8
11	T	28	22.0	0.165	19.8	LOS C	0.3	2.9	0.81	1.22	40.8
12	R	33	22.0	0.140	19.9	LOS C	0.3	2.2	0.80	1.25	40.8
Approach		78	23.5	0.165	19.9	LOS C	0.3	2.9	0.81	1.23	40.8
All Vehicles		1069	25.1	1.054	58.6	LOS F	20.6	150.1	0.89	3.21	23.7

The right hand turn movement from Highway 55 westbound also experiences an increase in delay. This is caused by the additional traffic turning onto RR 60. All other movements perform similar to the 2016 AM Peak without the Project.

16A.4.5 Highway 41 and Highway 55 Intersection Signalization

As signalization is the last resort on an at-grade rural intersection, other options were evaluated to maintain a good level of service in the capacity assessment. A signalization review was not completed as it was not warranted at this time. With the potential for an increase in delays at the La Corey intersection for some turning movements, the reconfiguration of the intersection, or provision of priority movements, could result in an improvement in the overall level of performance.



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Foster Creek Thermal Project Phase J Expansion

Delay and Level of Service 2016 AM Peak With Development

Date: 11 Feb 2013 Project: 307074-00162 Technical: F.Freckleton Reviewer: C.Swidorski Drawn: T.Graham

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Figure
16A-15

16A.4.6 Highway 41 and Highway 55 Intersection Illumination

The La Corey intersection is already illuminated to required standards. It was observed that some bulbs were not functional in February 2012.

16A.4.7 Highway 41 and Highway 55 Intersection Pedestrian Analysis

There is no significant pedestrian movement that warrants analysis at this intersection.

16A.5 PLANNED DEVELOPMENT ACTIVITY

The two other projects considered in the Planned Development Case include Devon Walleye and Osum Taiga projects. Osum Taiga is located north of Cold Lake, and is expected to have minimal effect on the highway segments in the Study Area. Devon Walleye is located on RR 60, and if it proceeds, will have some overlapping effect with the Project. Specific project details are not yet available.

The traffic associated with a typical project of that size (7,000 bbl/d) is estimated to be roughly 50 AADT during construction, and less in the operations phase. This additional traffic to the Project, including baseline traffic, is minimal. As such, the results of the TIA analysis are expected to remain unchanged.

16A.6 CONCLUSIONS

Based on the data collected and the assessment completed, it has been determined that the Project will not have a substantial effect on the transportation corridor.

The detailed intersection analysis has indicated that the increase in traffic associated with the Project may have a potential effect on some turning movements at the La Corey intersection, specifically Highway 41 northbound and the left turn to Highway 55, where traffic is either heading toward the Project or the La Corey Parking Lot to the west.

Cenovus is mitigating potential Project generated increases in traffic flow during peak times by putting the following policies in place:

- contractor personnel will stay in camp accommodations provided by Cenovus;
- approximately Ten percent of Cenovus staff will reside in the local area and will travel daily. The remaining 90% will stay in camp accommodations provided by Cenovus. Busing is and will be available from local municipalities for Cenovus staff;
- parking for contractor personnel residing in camp accommodations will be at the La Corey parking lot located west of the intersection of Highway 41 and Highway 55. Busing of contractor personnel will be used for travel from the La Corey parking lot to the Project;
- shift change will occur mid-week; and
- material deliveries will be scheduled in off-peak hours, and the La Corey parking lot will be utilized.

- staged personnel departures during shift change to reduce traffic from the La Corey parking lot.

The remaining turning movements are modelled to operate with minimal delay and at a reasonable Level of Service.

Any future improvements to the intersection would be the decision of local municipalities and their transportation consultant, and be based on potential intersection safety concerns over the traffic volumes.

16A.7 REFERENCES

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17 TRADITIONAL LAND USE

17.1 INTRODUCTION

This section presents the background for and status of the Traditional Land Use (TLU) and Ecological Knowledge (TEK) studies for the proposed Cenovus Foster Creek Thermal Project – Phase J Expansion (the Project). The Project is located within the Cold Lake Air Weapons Range (CLAWR), approximately 90 km north of Cold Lake, Alberta, in Townships 69 to 71, Ranges 3 to 7, West of the Fourth Meridian (W4M).

Traditional knowledge (TK) has two components: TLU and TEK. The TLU component focuses on sites and areas of cultural and historical significance and historical and/or current use of the land (i.e., settlement locations and gathering sites, resource harvesting sites and locales, trails and spiritual areas) that could overlap with the Project. Traditional use activities that may be conducted in an area include trapping, hunting, fishing as well as spiritual practices such as ceremonies. The TEK component focuses on Aboriginal communities' understanding of the natural environment, which might be used to enhance analyses of a project's environmental effects and project planning. TEK includes information about the variety of plants and animals harvested for dietary or medicinal uses. Oral traditions connect family histories and stories to the geographical locations that support these resources and activities, as well as cabins, trails, campsites, burials, settlements and culturally used landscape features.

As part of the Project, Cenovus plans to incorporate TK information in relation to Aboriginal communities who may be potentially impacted by the Project, and to progress the Project in a manner that minimizes potential impacts to their traditional uses and resources. Once it was determined through discussions with Alberta Environment and Sustainable Resource Development (AESRD) that one Aboriginal community, Cold Lake First Nations (CLFN), was to be engaged for the proposed Project, Cenovus initiated consultation with CLFN with respect to the Project.

17.2 CONSULTATION TO DATE

Consultation began in April 2012, and is continuing. To date, leadership and representatives from both Cenovus and CLFN have met several times in person, as well as through email and telephone, to exchange information about the Project. Meetings with the CLFN Chief and Council to present the Project information were held in 2012 and in early 2013, and Project meetings were also held with CLFN and Cenovus subject matter experts.

Cenovus provided CLFN with detailed information about the Project, in particular, the proposed terms of reference, maps of the Project, and a Plain Language Document.

In addition to the information provided by Cenovus in these meetings, and discussions regarding potential Project impacts, CLFN provided Cenovus with their concerns about the Project. In particular, CLFN has advised Cenovus of their concern with respect to the proximity of the Project to their Wildlife Preservation Area located to the southeast of the

proposed development area. CLFN explicitly indicated that they do not want any activity to occur in this area, and the proposed Project avoids this area.

List of Key Meetings (includes key meetings directly related to the Project but does not include ongoing meetings):

- April 30, 2012 – consultation work plan submitted to CLFN for consideration as it pertains to consultation for the Project;
- May 9, 2012 – request made to CLFN to initiate the TK study process as it pertains to the proposed development area;
- May 11, 2012 – request from Chief and Council to meet in order to discuss a course of action on the consultation for the Project;
- June 20, 2012 – meeting with the Chief and legal representatives to discuss the path forward on consultation for the Project;
- August 16, 2012 – meeting with Chief and Council to discuss the Phase J Expansion Project and discuss issues of concern from the community; and
- December 13, 2012 – meeting with Chief and Council to discuss further concerns associated with the Phase J Expansion Project and the identification of potential socio-economic impacts.

For several years, Cenovus has engaged CLFN directly to discuss and become involved in community led TK studies. As part of these collective efforts, Cenovus has worked with CLFN to gather TK information that is relevant to their TLU areas and the existing and approved phases of the Foster Creek Thermal Project.

With respect to obtaining additional TK information for the Project, Cenovus has been in discussion with CLFN, and has requested that a TK study be initiated, reviewed, and discussed, but to date CLFN has not provided Cenovus with a clear process for obtaining additional TK information. Cenovus continues to have meaningful discussions with CLFN with respect to the potential of conducting a TK study in association with the Project area, which would supplement the considerable, relevant TK information obtained previously, and referred to above. Cenovus continues to support the initiation of a TK study, and has retained a consultant to facilitate the TK study with CLFN. Initiation of the TK study is pending the completion of ongoing discussions between Cenovus and CLFN with respect to the TK study.

17.3 TERMS OF REFERENCE

Through ongoing consultation between CLFN and Cenovus, including any additional information which may be available in the event that the TK study is completed, Cenovus will address the following information from the terms of reference (TOR) for the Project,

subject to any disclosure requirements mutually agreed to between CLFN and Cenovus with respect to TK.

A. Provide:

- a) a map and description of traditional land use areas including fishing, hunting, trapping and nutritional, medicinal or cultural plant harvesting by affected aboriginal peoples (if the aboriginal community or group is willing to have these locations disclosed);
- b) a map of cabin sites, spiritual sites, cultural sites, graves and other traditional use sites considered historic resources under the *Historical Resources Act* (if the aboriginal community or group is willing to have these locations disclosed), as well as traditional trails and resource activity patterns; and
- c) a discussion of:
 - i) the availability of vegetation, fish and wildlife species for food, traditional, medicinal and cultural purposes in the identified traditional land use areas considering all Project related impacts,
 - ii) access to traditional lands in the Project Area during all stages of the Project, and
 - iii) aboriginal views on land reclamation.

B. Describe how TK information was incorporated into the Project, EIA development, the conservation and reclamation plan, monitoring and mitigation.

C. Determine the impacts of the Project on traditional, medicinal and cultural purposes and identify possible mitigation strategies.

17.4 POTENTIAL TRADITIONAL KNOWLEDGE STUDY

Project activities have the potential to affect the environment, including resources used by CLFN. The nature and extent of any potential effects to TK resources are typically assessed through reviewing TK, which may include a Project-specific TK study program. The consideration of potential effects of the Project on traditional lands is of cultural, environmental and socio-economic relevance, because it pertains to the well-being of Aboriginal peoples and communities. Both the Project area as a whole and the Project footprint are relevant to TK.

Potential Project effects to TK are to be further identified in association with CLFN. In addition to potential Project impacts identified through consultation, Cenovus will continue to support the development of the TK study with CLFN which may identify further potential Project impacts. If CLFN decides to engage in a TK study, the study will be designed to address the needs of CLFN and Cenovus. Any recommendations for mitigation to potential effects to TK that arise from the TK study will form part of the community TK report.

In the event the TK study is completed, it will be submitted as a supplemental filing by Cenovus. The format for release of TK information, and whether it is to be released publically

or provided confidentially to Cenovus for regulatory purposes and project planning, will be determined as agreed to between CLFN and Cenovus.

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18 LAND USE AND MANAGEMENT

18.1 INTRODUCTION

The Land Use and Management Assessment component of the environmental impact assessment (EIA) analyzes the effects of the Cenovus FCCL Ltd. (Cenovus) Foster Creek Thermal Project Phase J Expansion (the Project) on land and resource use, along with existing, approved and planned developments, within the Land Use regional study area (RSA) and local study area (LSA). The Land Use and Management Assessment also includes a description of how the Project will comply with resource use legislation.

Potential environmental effects are considered in a cumulative manner by assessing them in the context of existing and approved developments (Baseline Case), the Project (Application Case) and planned developments (Planned Development Case [PDC]) that are also located in the RSA or LSA. A description of the Project and a listing of existing and approved developments considered in the Baseline Case and the proposed developments considered in the PDC are provided in [Volume 6, Section 15: Social Aspects Introduction](#). The Project will be located within the area covered by Cenovus's oil sands leases in Townships 69 to 71, Ranges 3 to 7, West of the Fourth Meridian (Lease Area). Construction and operation of the Project may result in a change to the accessibility and availability of land and resource use in the area. Changes may include a reduction or increase in access, change to timing of resource use, change in resource use and displacement of other activities.

18.1.1 Overview and Scope

The scope of the Land Use and Management Assessment follows Alberta Environment and Sustainable Resource Development's (AESRD) *Guide to Preparing Environmental Impact Assessment Reports in Alberta* (AENV 2011) and incorporates the Terms of Reference (TOR) established for the Project EIA by AESRD (AESRD 2012; [Volume 3, Appendix 1A](#)). The assessment is conducted within a framework that includes the collection of baseline information, assessment of the potential Project effects on selected indicators, and mitigation measures for those potential affects.

The evaluation of the potential effects of the Project on land and resource use considers interactions among:

- existing land use plans and zoning;
- changes to the accessibility and availability of land and resource uses; and
- changes in workforce and population, and effects on land and resource use and users.

The key issues and indicators considered in the Land Use and Management Assessment are derived from the TOR included in [Volume 3, Appendix 1A](#) (AESRD 2012), any concerns identified during Cenovus's public consultation ([Volume 1, Section 2](#), Application to ESRD),

and the indicators identified in other land use and management assessments for oil sands development EIAs.

The key resource use issues that have been included are:

- management planning for aggregate resources;
- management planning for forest harvest;
- increased access to formerly remote areas, which may affect hunting, trapping, fishing and/or berry picking;
- effects on hunting, trapping and fishing due to habitat disturbance or constraint, or increased access; and
- effects on non-consumptive recreation from increased population in the region.

The Resource Use Assessment focuses on the above issues as they relate to non-traditional land and resource users. [Volume 6, Section 17](#) (Traditional Ecological Knowledge and Land Use) provides an assessment of the effects of the Project on traditional land use.

18.2 ASSESSMENT APPROACH

The objectives of the Land Use and Management Assessment are to:

- identify current land and resource uses in the defined study area;
- identify regulatory conditions and policy governing the various land uses;
- identify trends in use;
- determine impacts to land and resource uses resulting from the Project; and
- determine impacts from the Project in combination with other existing, approved and planned projects and activities.

The indicators used in the Land Use and Management Assessment include:

- land use policies and resource management initiatives;
- environmentally important areas;
- access;
- surface interests (e.g., surface disposition holders);
- subsurface interests (e.g., mineral lease holders);
- aggregate resources;
- forestry;
- berry picking;
- hunting;
- trapping;
- fishing; and
- non-consumptive outdoor recreation.

The Land Use and Management Assessment focuses on the above indicators as they relate to non-traditional land and resource users. These indicators are closely linked with other sections of the EIA in which traditional uses and the resource itself is described and assessed

for impact. The Baseline Case and potential effect to the resource users is coordinated with those assessments, specifically:

- traditional land and resource uses and issues are addressed in the Traditional Land Use section ([Volume 6, Section 17](#));
- forestry and berry picking are linked to Vegetation ([Volume 5, Section 12](#));
- hunting, trapping and outfitting are linked to Wildlife ([Volume 5, Section 13](#));
- fishing is linked to Aquatic Ecology ([Volume 4, Section 9](#));
- formal recreational facilities found in each community are discussed in the Socio-Economic Impact Assessment ([Volume 6, Section 16](#)). The Land Use section includes the less formal outdoor recreation pursuits; and
- traffic is addressed in the Socio-Economic Impact Assessment ([Volume 6, Section 16](#)).

18.2.1 Information Sources

The information sources used for the Land Use and Management Assessment include the following:

- personal communication with selected individuals (e.g., provincial government, consumptive and non-consumptive recreation organizations);
- review of EIAs submitted for other projects in the region including:
 - Canadian Natural Resources Limited (Canadian Natural) Kirby Expansion Project (Canadian Natural 2011);
 - Osum Oil Sands Corp. Taiga Project (Osum 2009);
 - Canadian Natural Kirby In-Situ Oil Sands Project (Canadian Natural 2007);
 - Canadian Natural Primrose East Expansion Project (Canadian Natural 2006); and
 - Cenovus Energy (formerly EnCana FCCL Ltd.) Foster Creek Commercial Project Phase II & III (EnCana 2001).
- review of published material relating to land and resource use activities;
- review of reports posted on various government and non-government websites;
- review of Land Status Automated System (LSAS) information, a database operated by Alberta Energy through the Crown Land Data Support, obtained from a search conducted September 2012;
- review of the industry and government management plans relevant to the Project; and
- information provided by other Project EIA disciplines following field investigations.

18.2.2 Data Collection

The information obtained provides a description of land uses within the study areas. Quantitative information was used when available. No formal surveys of land users were conducted as part of this assessment.

18.2.3 Analysis of Potential Effects

Effects of the Project were evaluated for key indicators. Any residual effect remaining following mitigation was rated using the effects criteria described in [Volume 6, Section 15](#).

18.2.4 Temporal Boundaries

Activities associated with the Project vary during the lifespan of the Project. The temporal scope of the EIA reflects the timing and nature of the Project phases as well as information available on other proposed projects. The temporal boundary is set by the life span of the Project, which is estimated to be 38 years, between 2015 and 2053. The 38-year time frame includes the construction, continued drilling and operation stages of the Project.

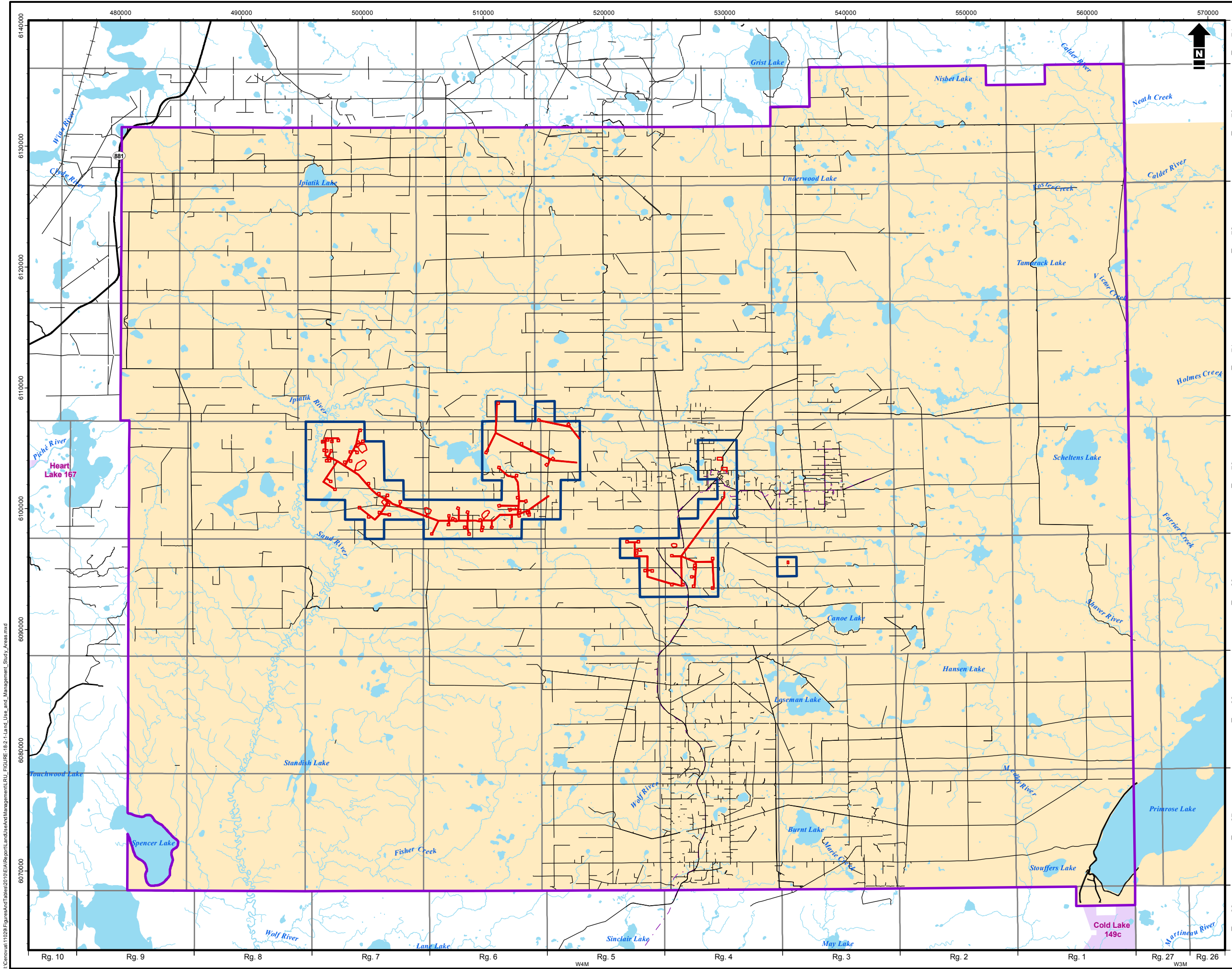
Decommissioning and reclamation will follow to 2059. Project and cumulative effects are assessed for the construction, operations, decommissioning and reclamation stages of the Project. The temporal scope is further described in [Volume 6, Section 15](#).

18.2.5 Spatial Boundaries

The Land Use and Management Assessment considers two study areas: the LSA and the RSA ([Figure 18.2-1](#)).

The LSA consists of the Alberta Township System (ATS) sections that are overlapped by the Project footprint within Township 69 Ranges 3 to 5, Township 70 Ranges 4 to 7 and Township 71 Ranges 5 to 6. The LSA was delineated based on the potential direct Project effects to the selected indicators.

The RSA was delineated to capture indirect Project effects and cumulative effects that may occur beyond the LSA, and is represented by the boundaries of the Cold Lake Air Weapons Range (CLAWR) to the north, west and south, and the provincial boundary between Alberta and Saskatchewan to the east. The CLAWR is designated as a controlled access area under the *National Defence Act*, and public access and land use is strictly controlled. Increased population in the region due to the Project is not expected to affect land and resource uses outside of the CLAWR. Information for aggregate resources is presented extra-regionally due to the lack of locally available resources and the location of quarries.



- Project Footprint
- Land Use LSA
- Land Use RSA
- Cold Lake Air Weapons Range
- Indian Reserve
- Water Body
- Watercourse
- Highway
- Road
- +— Railway
- Powerline

Reference:
Data obtained from AltaLIS, GeoBase, and IHS. Used under license.
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NAD 1983 UTM Zone 12N



Foster Creek Thermal Project Phase J Expansion

Land Use and Management Study Areas

Date: 19 Feb 2013 Project: 11029-514
 Technical: T.Hodgson Reviewer: M.Ullman Drawn: K.Andruchow

Disclaimer: Prepared solely for the use of Cenovus FCCL Ltd. as specified in the accompanying report. No representation of any kind is made to other parties with which Cenovus FCCL Ltd. has not entered into contract.

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18.3 BASELINE CASE

18.3.1 Land Use Policies and Resource Management Initiatives

The CLAWR is designated as a controlled access area under the *National Defence Act*, which strictly limits public access; therefore, there are few land and resource uses in the RSA. The purpose of the CLAWR is to provide a large tract of uninhabited land for the Department of National Defence (DND) to conduct military training exercises. Oil and gas activity is a permitted use, and access for those purposes is under the governance of the DND and the CLAWR Range Control (DND 2012). Through Range Access Agreements between the Cold Lake First Nation (CLFN), the DND and provinces of Alberta and Saskatchewan, members of the CLFN have access to the CLAWR for traditional uses (Canada, CLFN and Alberta 2001). Permission from Range Control is required prior to accessing the CLAWR. Project effects on traditional uses are discussed in [Volume 6, Section 17](#).

The Project is located on Crown lands within Improvement District No. 349 in the publicly administered area of Alberta known as the Green Area. Lands in the Green Area are administered through AESRD and governed by the *Public Lands Act*. AESRD administers surface and subsurface dispositions, promotes forest and wildlife conservation, manages wildfire response and manages hunting and fishing on public lands. Oil sands leases are issued by Alberta Energy, and oil sands operations are regulated by the Alberta Energy Resources Conservation Board (ERCB).

Improvement District No. 349 was created as a means of re-distributing taxes and revenue between Lac La Biche County and the City of Cold Lake. There are no applicable land use policies or resource management initiatives for Improvement District No. 349. The LSA is not positioned within the boundaries of any integrated resource plans (IRPs).

In 2009, the Government of Alberta passed the Alberta *Land Stewardship Act*, which allows for the creation or amendment of regional plans under the Land-use Framework.

The Land-use Framework “*sets out a new approach for managing lands and natural resources to achieve Alberta’s long-term economic, environmental and social goals*” (Government of Alberta 2012, internet site). The LSA and RSA are within the Lower Athabasca Region of the Land-use Framework.

18.3.1.1 Lower Athabasca Regional Plan

As part of the Land-use Framework, the Government of Alberta is currently developing regional plans which “*will identify and set resource and environmental management outcomes for air, land, water and biodiversity, and guide future decisions while considering social and economic impacts*” (AESRD 2012, internet site). The LSA is within the Lower Athabasca Regional Plan (LARP), which came into effect September 1, 2012.

The LARP is designed to establish a long term vision for the region and aligns provincial policies at the regional level to balance Alberta’s economic, environmental and social goals (Government of Alberta 2012). The LARP has identified seven strategic directions:

1. Improving the integration of industrial activities on the landscape;
2. Encouraging timely and progressive reclamation of disturbed lands;
3. Managing air, water and biodiversity through management frameworks that take proactive approaches and set limits and triggers, and minimizing land disturbance in the region;
4. Designating new conservation areas that are large, interconnected and maintain intact habitat to support biodiversity;
5. Strengthening infrastructure planning to support future growth of the region;
6. Designating new recreation and tourism areas to provide diverse recreation opportunities to local residents and tourism products for visitors and the region; and
7. Including aboriginal peoples in land use planning (Government of Alberta 2012).

The LARP proposes a number of new Conservation and Recreation/Tourism areas in the Lower Athabasca Region, none of which are within the RSA.

18.3.2 Land Use Dispositions

Authority to use public land is granted through dispositions issued under the *Public Lands Act*. A disposition is a land use contract that gives specific rights (e.g., lease, license, or permit) to a land or resource user. Records for all surface and subsurface dispositions held on Crown land are archived in the LSAS. This database is maintained by Alberta Energy's Crown Land Data Support division.

Land-based projects in the LSA are exclusively related to resource extraction, particularly gas wells, oil sands projects, access roads, pipelines and transmission lines. There are 13 different surface activity dispositions allocated to various companies and individuals within the LSA ([Table 18.3-1](#)).

Table 18.3-1 Summary of Surface Dispositions within the Local Study Area

Surface Activity Code	Disposition Name	Explanation	Disposition Holder
AOA	Area operating agreement	An agreement between the Land Manager for AESRD and a company. Submitting a single AOA relieves a company from needing to submit multiple environmental field reports (EFRs).	<ul style="list-style-type: none"> Talisman Energy Inc.
CRB	Conservation and reclamation business plan	A CRB is a detailed plan describing how the disposition holder proposes to develop aggregate resources, and resolve and related environmental and/or land use issues. Associated with Surface Materials Leases.	<ul style="list-style-type: none"> Cenovus FCCL Ltd.
CRP	Conservation and reclamation plan	A CRP is a detailed plan describing how the disposition holder proposes to develop aggregate resources, and resolve and related environmental and/or land use issues. Associated with Surface Materials Leases.	<ul style="list-style-type: none"> Cenovus FCCL Ltd.
EZE	Easement	Access roads, anchors (powerline related), railway spur, powerline, drainage ditch or buried/fiber optic/communication cables.	<ul style="list-style-type: none"> ATCO Electric Ltd. Cenovus Energy Inc.
LOC	License of occupation	Usually for roads, also for launches, erosion control, marsh development and reservoirs.	<ul style="list-style-type: none"> Cenovus Energy Inc. Cenovus FCCL Ltd.
MLL	Miscellaneous lease	MLL may be issued for a variety of purposes that are not covered by regulations under the <i>Public Lands Act</i> .	<ul style="list-style-type: none"> Cenovus FCCL Ltd.
MSL	Mineral surface lease	Well sites, flare stacks, mining areas and some access roads.	<ul style="list-style-type: none"> Cenovus Energy Inc. Cenovus FCCL Ltd. Husky Oil Operations Limited
PIL	Pipeline installation lease	Sites associated with pipelines including compressor sites, meter sites and heater sites.	<ul style="list-style-type: none"> Cenovus Energy Inc. Cold Lake Pipeline Ltd.
PLA	Pipeline agreement	Pipelines, flowlines and cathodic protection lines.	<ul style="list-style-type: none"> Cenovus Energy Inc. Cenovus FCCL Ltd. Cold Lake Pipeline Ltd. Enbridge Pipelines (Athabasca) Inc. Nova Gas Transmission Ltd. Pipeline Management Inc.
SML	Surface material lease	Issued for surface excavation and extracting surface materials (e.g., gravel, sand, silt, clay, marl, topsoil, peat) and grant the right to occupy public lands.	<ul style="list-style-type: none"> Cenovus FCCL Ltd.
TFA	Temporary field authorization	Issued for either site preparation or additional workspace, in which case it must be associated with an approved activity.	<ul style="list-style-type: none"> Cenovus Energy Inc. Cenovus FCCL Ltd. Enbridge Pipelines (Athabasca) Inc. Encana Corporation Encana Oil & Gas Co Ltd.
TPA	Trapline area	Indication of a trapline.	<ul style="list-style-type: none"> Cold Lake First Nation
VCE	Vegetation control easement	Agreement between landowner and company to control vegetation.	<ul style="list-style-type: none"> ATCO Electric Ltd.

18.3.3 Access

Primary access into the region is by a paved highway system including Highways 55 and 41 (Figure 18.2-1). Access to the Foster Creek Thermal Project (FCTP) is via the hamlet of La Corey and Range Road (RR) 60, which provides access to the majority of the CLAWR, including the Project. Entry via RR 60 is gate-controlled by CLAWR Range Control (Range Control). There are also a number of cutlines and other linear disturbances within the CLAWR (Figure 18.3-1). Public access into the CLAWR is prohibited by the DND.

Access within the RSA consists of all-season roads operated by the oil and gas industry (Figure 18.3-1). Cenovus FCCL Ltd. and Cenovus Energy Inc. are the only licence of occupation (LOC) disposition holders within the LSA, and together they hold 130 different LOCs within the LSA. One of Husky Oil Operations Limited’s mineral surface leases (MSLs) includes both a well site and an access road. There is no rail service to the RSA, and civilian air traffic approved by the DND is coordinated by Range Control.

18.3.4 Subsurface Interests

Mineral and subsurface materials within the LSA include oil sands, petroleum and natural gas and other industrial metals and minerals (Table 18.3-2).

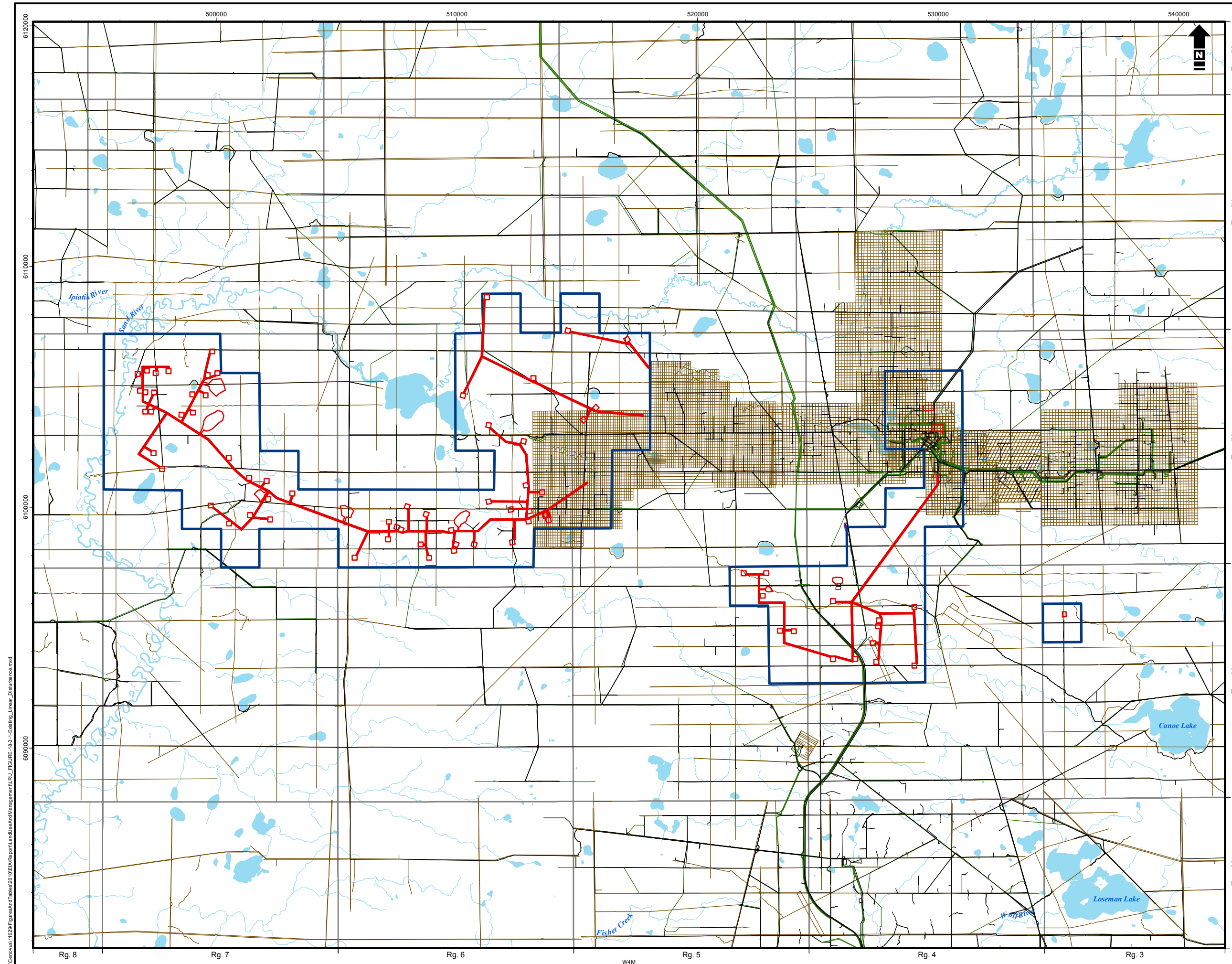
Oil sands lease holders are shown on Figure 1.7-1 (Volume 1), and petroleum and natural gas leases within the RSA are presented on Figure 1.7-2 (Volume 1).

Table 18.3-2 Subsurface Lease Holders in the Local Study Area

Lease Type	Lease Holder
Oil Sands Lease Holders	<ul style="list-style-type: none"> • Husky Oil Operations Ltd. • Cenovus FCCL Ltd.
Petroleum and Natural Gas Lease Holders	<ul style="list-style-type: none"> • Cenovus Energy Inc.
Special Mineral Lease Holders	<ul style="list-style-type: none"> • Cenovus FCCL Ltd.

18.3.5 Aggregate Resources

Aggregate, or granular, resources typically include gravel and sand, and are used in the construction of facilities (concrete) and roads for oil sands and other projects. AESRD governs the permitting of aggregate resource extraction on Crown land. Aggregate resource extraction operations within the CLAWR must have the concurrence of the DND, and there are no active aggregate dispositions within the LSA. Cenovus anticipates aggregate resource needs for the Project will be met by using sources within a 200 km radius of the Town of Bonnyville to the south. This area includes Cold Lake and Lac La Biche.



- Project Footprint
 - Land Use LSA
 - Land Use RSA
 - Indian Reserve
 - Water Body
 - Watercourse
- Existing Linear Disturbances**
- Road
 - Cutline/Seismic Line
 - Pipeline
 - Powerline

Reference:
Data obtained from AltaLIS, GeoBase, and IHS. Used under license.

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Kilometres

NAD 1983 UTM Zone 12N



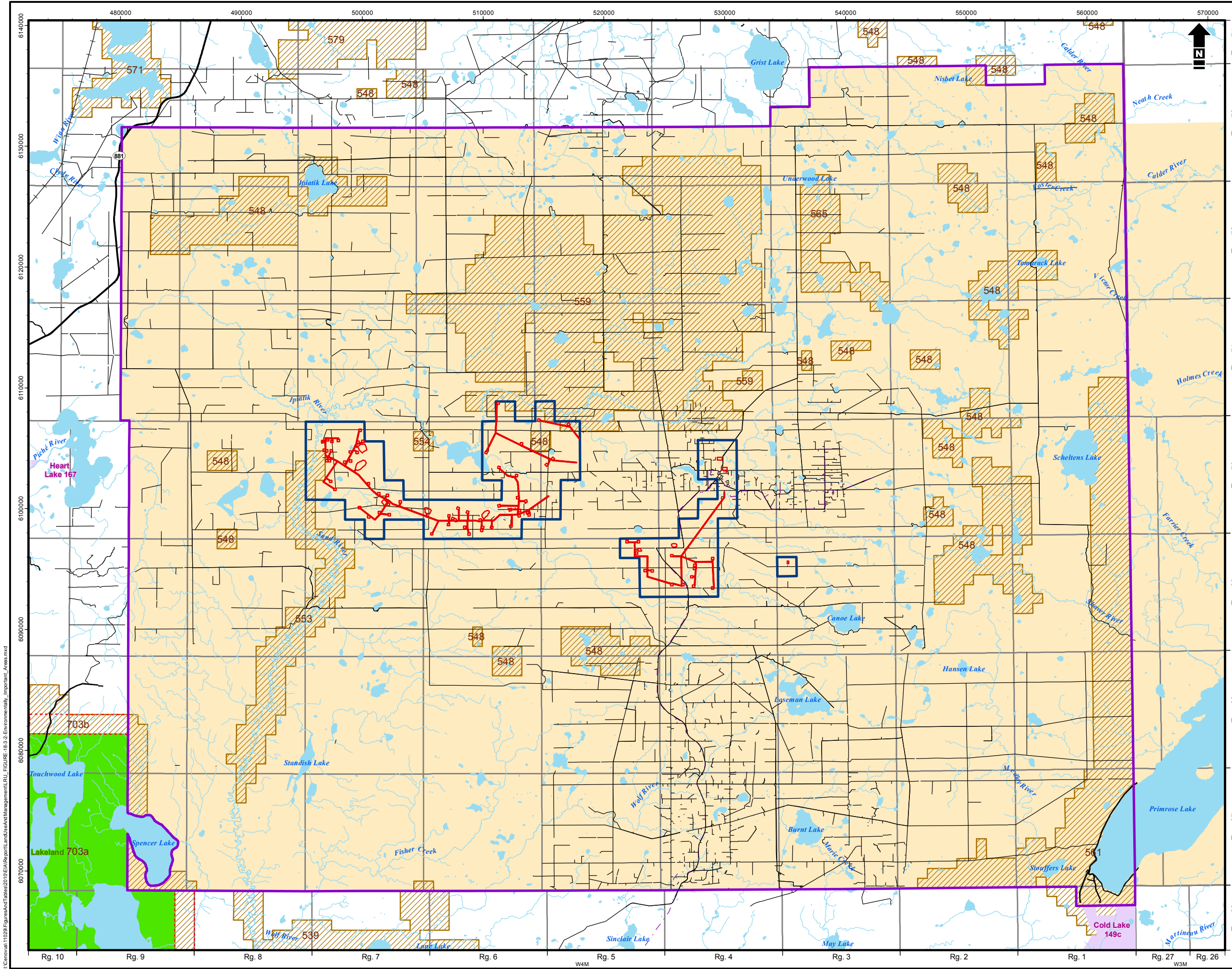
Foster Creek Thermal Project Phase J Expansion

Existing Linear Disturbance

Date: 19 Feb 2013	Project: 11029-514	
Technical: T.Hodgson	Reviewer: M.Ullman	Drawn: B.Sobota

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- Project Footprint
 - Land Use LSA
 - Land Use RSA
 - Cold Lake Air Weapons Range
 - Indian Reserve
 - Water Body
 - Watercourse
 - Highway
 - Road
 - Railway
 - Powerline
- Environmentally Important Areas**
- Environmentally Significant Area
 - Protected Area
 - Provincial Recreation Area
 - Provincial Park

Reference:
Data obtained from AltaLIS, GeoBase, and IHS. Used under license.
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Foster Creek Thermal Project Phase J Expansion

Environmentally Important Areas

Date: 19 Feb 2013 Project: 11029-514
 Technical: T.Hodgson Reviewer: M.Ullman Drawn: K.Andruchow

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In the Cold Lake area, the total aggregate resource is estimated to be 24 million m³ of gravel and 116 million m³ of sand (ASRD 1996). Aggregate volumes for other areas within a 200 km radius of Bonnyville are not known; however, surface material lease (SML) and surface material licence (SMC) dispositions can provide a reasonable estimation of active and potential sand and gravel operations. There are currently 524 SMLs and 172 SMCs issued within a 200 km radius of Bonnyville.

In 2004, the Alberta Geological Survey compiled a series of aggregate potential maps for Alberta. These maps identify 362 individual sites as having confirmed sand or gravel deposits within 200 km of Bonnyville (AGS 2004).

18.3.6 Environmentally Important Areas

Environmentally important areas are places that have been designated or protected for their important environmental features. Some areas are legally protected (e.g., provincial parks), while others are not (e.g., environmentally significant areas). Environmentally important areas can include:

- areas designated as environmentally significant areas (ESAs) in Alberta;
- areas protected under legislation;
- research sample plots;
- ecological benchmark areas;
- historic sites and areas;
- Canadian Heritage Rivers; and
- Ramsar sites.

18.3.6.1 Environmentally Significant Areas

Environmental Significant Areas are not protected by legislation but represent places in Alberta that are important to “the long-term maintenance of biological diversity, soil, water, or other natural processes, at multiple spatial scales” (Fiera Biological Consulting 2009). ESAs are areas containing “rare or unique elements in the province, or areas that include elements that may require special management consideration due to their conservation needs” (Fiera Biological Consulting 2009). The purpose of designating ESAs is to highlight conservation concerns in the area to be considered before development occurs (Allen 2009, pers. comm.). In Alberta, ESAs are identified based on the following criteria:

- areas that contain elements of conservation concern;
- areas that contain rare or unique landforms;
- areas that contain habitat for focal species;
- areas that contain important wildlife habitat;
- riparian areas;
- large natural areas; and
- sites of recognized significance (Fiera Biological Consulting 2009).

Portions of seven ESAs are located in the RSA and portions of three of these areas, 548, 553 and 559, are located in the LSA (Figure 18.2-1). Each ESA is defined by significance, features and elements of conservation concern (Table 18.3-3; Fiera Biological Consulting 2009).

Table 18.3-3 Environmentally Significant Areas in the RSA

Number	Significance	Features	Elements of Conservation Concern
548	Provincial	<ul style="list-style-type: none"> • Contains habitat for focal species • Contains large natural areas • Contains sites of recognized significance 	<ul style="list-style-type: none"> • Woodland caribou – boreal ecotype
553	Provincial	<ul style="list-style-type: none"> • Contains intact riparian areas • Contains large natural areas 	<ul style="list-style-type: none"> • None
554	Provincial	<ul style="list-style-type: none"> • Contains intact riparian areas • Contains large natural areas 	<ul style="list-style-type: none"> • None
559	Provincial	<ul style="list-style-type: none"> • Contains habitat for focal species • Contains intact riparian areas • Contains large natural areas 	<ul style="list-style-type: none"> • Woodland caribou – boreal ecotype
561	International	<ul style="list-style-type: none"> • Contains habitat for focal species • Contains large natural areas • Contains sites of recognized significance 	<ul style="list-style-type: none"> • Woodland caribou – boreal ecotype
565	Provincial	<ul style="list-style-type: none"> • Contains habitat for focal species • Contains intact riparian areas • Contains large natural areas 	<ul style="list-style-type: none"> • Woodland caribou – boreal ecotype
703	International	<ul style="list-style-type: none"> • Contains elements of conservation • Contains important wildlife habitat • Contains large natural areas • Contains sites of recognized significance 	<ul style="list-style-type: none"> • Birds <ul style="list-style-type: none"> ○ Trumpeter swan • Liverworts <ul style="list-style-type: none"> ○ <i>Anastophyllum helleranum</i> ○ <i>Conocephalum conicum</i> ○ <i>Lophozia heterocolpos</i> ○ <i>Pellia endiviifolia</i> ○ <i>Riccardia multifida</i> ○ <i>Scapania apiculata</i> • Mosses <ul style="list-style-type: none"> ○ <i>Pseudoleskeella sibirica</i> • Vascular Plants <ul style="list-style-type: none"> ○ Back's sedge ○ Lakeshore sedge ○ Meadow bitter cress ○ Slender-leaved sundew

Source: Fiera Biological Consulting 2009.

18.3.6.2 Protected Areas

The different types of areas that can be protected by legislation within Alberta are regulated under the *Wilderness Areas, Ecological Reserves, Natural Areas and Heritage Rangelands Act* and the *Provincial Parks Act* (Table 18.3-4; ATPR 2011, internet site). Additionally, areas may be protected through agreement between resource users. There are no provincially protected areas within the RSA.

Table 18.3-4 Alberta Land Classification Descriptions

Ecological Reserves	Samples of functioning ecosystems protected for scientific research, education and heritage appreciation. Road access and facilities are not developed in Ecological Reserves.
Wildland Parks	Encompass large areas of natural landscape where human developments and interference with natural processes are minimized. Wildland Parks accommodate a wider range of outdoor recreation pursuits than Wilderness Areas, including hunting, fishing and the use of horses.
Provincial Parks	Provincially significant natural and historical landscapes and features. A range of facilities along with interpretive and educational programs enhance opportunities for visitors to explore, understand, appreciate and respect the natural environment.
Wilderness Areas	Large areas that retain their primeval character, unaffected by human influences. Visitors travel on foot to experience solitude and personal interaction with nature.
Natural Areas	Protect special and sensitive natural landscapes of local and regional significance while providing opportunities for education, nature appreciation and low intensity recreation. Facilities are limited to staging areas, trails and signs.
Provincial Recreation Areas	Cater to a wide range of intensive recreation pursuits in natural, modified or man-made settings. Most Recreation Areas have little or no preservation value due to the levels of facility development, intensity of visitor use and frequently small size.
Heritage Rangelands	Preserve and protect natural features that are representative of Alberta's prairies; grazing is used to maintain the grassland ecology.

Source: ATPR 2011, internet site.

18.3.6.3 Protective and Consultative Notations

Protective notations (PNTs) are placed by public agencies and identify areas where the land is managed to achieve a particular land use or conservation objective. Notations provide for varying degrees of protection, from complete protection to permitting agricultural, industrial or other uses with land use conditions. Some notations can protect soils, wildlife or landscape features from incompatible land use (ASRD 1997).

Consultative notations (CNTs) are used to identify an interest in the land by a particular agency, and alert potential applicants to the agency's concerns (ASRD 1997). There are no PNTs or CNTs located in the RSA.

18.3.6.4 Industrial, Research and Permanent Sample Plots

Industrial sample plots (ISPs), research sample plots (RSPs) and permanent sample plots (PSPs) are all areas that have been established to provide forest research data over a long time period within a forest management agreement (FMA) area (ASRD 2005). Generally, no disturbance is allowed within the boundaries of these sample plots. There is no FMA holder within the RSA; therefore, there are no ISPs, RSPs or PSPs located in the RSA.

18.3.6.5 Ecological Benchmark Area

Ecological benchmark areas are large, intact protected areas designated by FMA holders to act as an indicator of baseline natural forest in the region. These areas are established to be free of industrial development and road access (AI-Pac 2012, internet site). There is no FMA holder in the RSA; therefore, there are no ecological benchmark areas in the RSA (AI-Pac 2012).

18.3.6.6 Historical Sites and Areas

Provincially designated historical resources include structures, archaeological sites, palaeontological resources and other works of humans or nature that are deemed valuable for their cultural, historical, natural, scientific or aesthetic interest (ACCS 2012, internet site). Under the *Historical Resources Act*, historical resources can be designated as Provincial Historical Resources if preservation is of public interest. A discussion of historical resources is provided in [Volume 6, Section 19](#). A discussion of Traditional Ecological Knowledge and Land Use is provided in [Volume 6, Section 17](#).

18.3.6.7 Canadian Heritage River System

The Canadian Heritage Rivers System (CHRS) is Canada's national river conservation program. The CHRS was established to conserve rivers with outstanding natural, cultural and recreational heritage, to give them national recognition, and to encourage public enjoyment and appreciation (CHRS 2012, internet site). Consultation is required with the Canadian Heritage Rivers Board if a project affects a designated river.

There are no Canadian Heritage Rivers within the RSA.

18.3.6.8 Ramsar Sites

Ramsar sites are based on the Convention on Wetlands treaty signed in the city of Ramsar, Iran, in 1971. The intergovernmental treaty provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources (Ramsar Convention of Wetlands 2012, internet site). There are no Ramsar sites in the RSA (Ramsar Convention of Wetlands 2012).

18.3.7 Forestry

The LSA is in forest management unit (FMU) L9; however, there is no FMA holder for this FMU. Because forestry within the RSA does not occur, the Project will have no effect on the forestry industry and therefore is not discussed in the Application Case.

18.3.8 Hunting

Recreational hunting (excluding traditional use hunters) in Alberta is regulated through AESRD, which separates the province into wildlife management units (WMUs). The RSA is within WMU 726, and is located within the Boreal Hunting Region (Sport Scene Publications

2012a, internet site). WMU 726 is defined by the boundaries of the CLAWR, where hunting is prohibited. Because public hunting within the RSA does not occur, the Project will have no effect on hunting and is therefore not discussed in the Application Case.

18.3.9 Trapping

Trapping in Alberta is governed through the use of a registered trapline system. Under this system, trapline owners are licensed to harvest in a registered fur management area (RFMA). Members of the CLFN have access to the CLAWR for traditional uses, which may include trapping (Canada, CLFN and Alberta 2001). CLFN holds the only RFMA currently licensed within the RSA. Because non-traditional trapping within the RSA does not occur, the Project will have no effect on non-traditional trapping and is therefore not discussed in the Application Case.

18.3.10 Fishing

AESRD regulates all fishing within the Province of Alberta. The province has been divided into three distinct management zones based on ecosystem type (i.e., Eastern Slopes, Parkland-Prairie and Northern Boreal). The ecosystem zones are further divided into watershed units to ensure that fishing regulations meet the specific water bodies and fish population needs for individual areas (Sport Scene Publications 2012b, internet site).

The RSA is located within Fisheries Management Zone 3 (Northern Boreal Zone), Watershed Unit NB1. This area is characterized by low gradient streams draining areas of muskeg, which in turn drain into the larger watersheds of the area (Sport Scene Publications 2012b, internet site). The RSA is primarily located within the Sand River and Wolf River watersheds. It also encompasses the upper reaches of the Piche River watershed to the west, the Clyde River watershed to the northwest, the Winefred River watershed to the North, the Calder River watershed to the northeast, and the Marie Creek, Medley River, and Shaver River watersheds to the southeast. A discussion of aquatic ecology is provided in [Volume 4, Section 8](#).

Access into the CLAWR for recreational fishing is not permitted. Therefore, the Project will not have an effect on recreational fishing within the Land Use RSA and is not discussed in the Application Case. Members of the CLFN have access to the CLAWR for traditional uses, which may include fishing (Canada, CLFN and Alberta 2001).

18.3.11 Berry Picking

The LSA contains habitat suitable for berry-producing plant species, including blueberry and cranberry ([Volume 5, Section 12](#)). However, access to the RSA is restricted by Range Control and recreational berry picking is prohibited. Because recreational berry picking within the RSA does not occur, the Project will have no effect on berry picking and therefore it is not discussed in the Application Case.

18.3.12 Non-Consumptive Recreation

Public access to the CLAWR is not permitted and therefore no public recreational activities occur within the RSA. As such, the Project will have no effect on non-consumptive recreation and is not discussed in the Application Case.

18.4 APPLICATION CASE

Generally, potential effects to land and resource use from in situ oil sands projects are associated with:

- site clearing and infrastructure development (including use of aggregate resources and increased access); and
- increased human population.

Clearing for in situ oil sands projects typically lead to an increase in access within the RSA. This can cause increases in recreational activities within areas that were previously inaccessible. Clearing activities for the Project are described in [Volume 2, Section 6.6.2](#). However, with the restrictions on land use activities imposed by the DND, public consumptive and non-consumptive recreational activities within the CLAWR will not occur and will not be affected by changes in access and are therefore not assessed.

The construction and operations phases of the Project may result in an increase in regional human population. Recreational land uses within the CLAWR are prohibited by the DND; therefore, any increase in population will not result in a proportional increase in recreational and land use activities within the RSA. Therefore this potential issue has not been assessed.

Land Use indicators that may potentially be affected by the Project and assessed in the Application Case include land use policies and resource management initiatives, surface and subsurface interests, aggregate resources and environmentally important areas.

Mitigation measures that will be undertaken to prevent or minimize the effect on the land use indicators are presented in each of the following sections. The residual impact on land and resource use is assessed after mitigation is considered.

18.4.1 Land Use Policies and Resource Management Initiatives

Genovus will follow the relevant FireSmart guidelines (ASRD 2008) including having appropriate setbacks from forest and surface vegetation, and firefighting capability. Genovus will also implement a fire control plan that highlights measures taken to ensure access for firefighters and forest fire prevention, mitigation, detection and reporting. The fire control plan is further described in [Volume 1, Section 9.2](#) (Application to ERCB).

Land use within the RSA is subject to review by the DND. Through an agreement between the Federal and Provincial governments, oil and gas exploration and development is an accepted land use within the CLAWR (Canada, CLFN and Alberta 2001; DND 2012).

Development of the oil sands is in keeping with the principles of the LARP which states “*The economic potential of the oil sands is optimized*” as one of its Regional Outcomes (Government of Alberta 2012). Therefore, the Project is consistent with the LARP and will not affect land use planning in the RSA.

18.4.2 Surface and Subsurface Interests

Surface land users within the RSA include the DND as well as other oil and gas companies. Development of the Project will reduce the area of available land for the DND to conduct its training exercises. Cenovus has been and will continue to consult with the DND regarding development of the Project to mitigate any potential impacts. Should expansion of Project infrastructure preclude military use of an area on the CLAWR, thereby restricting use of a military target, Cenovus will move or replace that target at another location. Cenovus has also used surplus oil field materials to upgrade existing targets as well as provide additional targets for DND use. Cenovus further limits its impact on DND activity by establishing specific safety standards and processes, and also by limiting the height of facility infrastructure.

The surface activity of other oil and gas companies is regulated by AESRD, and is expected to be limited to their subsurface lease areas, except for major transmission pipelines and powerlines. The development of subsurface resources is regulated through the ERCB and Alberta Energy.

The residual effect on surface and subsurface interests is negative due to the reduction of land available to the DND, and the extent is sub-regional because this reduction is limited to the Project footprint in addition to the setbacks established between the DND’s activity and industrial projects. The magnitude is low because the Federal/Provincial agreement that established the CLAWR allows oil and gas development within its boundaries, and other oil and gas producers within the RSA are mainly restricted from surficial expansion by the limits of their subsurface resource holdings. The duration of the effect is long-term as it will continue for the lifetime of the Project. It is considered continuous and reversible in the long-term. The prediction confidence of the final impact rating is considered high because the Federal/Provincial agreement which created the CLAWR, and associated coordination processes between Cenovus and the DND, is well established. The residual impact is negligible.

18.4.3 Aggregate Resources

Aggregate resources are a non-renewable resource and are identified and licensed for use by the provincial government. In total, it is estimated that the Project will require 2,100,000 m³ of aggregate resources. Cenovus anticipates using sources from quarries within a 200 km radius of Bonnyville to meet the needs of the Project. In order to reduce its requirement for aggregate, Cenovus will reuse gravel where possible.

Cenovus’s use of aggregate will permanently decrease the availability for other users; therefore, the residual effect on aggregate resources is negative. The extent is extra-regional

since the source of aggregate will be within a broad area outside of the RSA. The effect magnitude is low because Project aggregate demands are not expected to cause a detectable change in resource availability in the Bonnyville and surrounding region. The duration of the effect is long-term, and is considered isolated and irreversible. The prediction confidence of the final impact rating is considered medium due to the high number of potential aggregate sources within 200 km of Bonnyville, but there is also a lack of information regarding the actual volume of aggregate resources in this area. The residual impact is predicted as low.

18.4.4 Environmentally Important Areas

There are no parks, protected areas or Crown Reservation areas within the RSA. Three ESAs are located in the LSA: 548, 553 and 559. ESAs are not protected by legislation but represent places in Alberta that are important to the long-term maintenance of biological diversity, soil, water, or other natural processes, at multiple spatial scales (Fiera Biological Consulting 2009).

The purpose of designating ESAs is to highlight conservation concerns in the area to be considered before development occurs (Allen 2009, pers. comm.). These areas have been designated as an ESA based on the presence of intact riparian areas (553 and 559) and large natural areas of native vegetation (ESAs 548, 553 and 559; Fiera Consulting 2009). The impacts of the Project on native vegetation and potential mitigation measures are assessed in [Volume 5, Section 12](#). ESAs 548 and 559 are also noted to contain habitat for woodland caribou; however, this area does not represent the total amount of woodland caribou habitat in the RSA. The impacts of the Project on woodland caribou and potential mitigation measures are assessed in [Volume 5, Section 13](#).

The Project will increase disturbance within ESA 548 by 1.4 ha (0.005% of the total ESA 548 area within the RSA), ESA 553 by 3.8 ha (0.05% of the total ESA 553 area) and ESA 559 by 12.0 ha (0.03% of the total ESA 559 area). Cenovus will review its footprint prior to development in these areas to minimize, where practicable, effects on ESAs.

The residual effect of the Project on environmentally important areas is negative as there will be disturbance within ESAs 548, 553 and 559. The extent is local as the disturbance is limited to the Project footprint. The effect magnitude is low as there are no listed elements of conservation concern within ESAs 553, the disturbance to all ESAs due to the Project represents a minor portion of their total area, and disturbance in ESAs is not restricted. The duration of the effect is long-term as it will continue for the lifetime of the Project. It is considered continuous and reversible in the long-term. Confidence in the final impact rating prediction is considered high because of the minimal overall Project disturbance to ESAs. The residual impact is predicted to be negligible.

18.4.5 Summary of Application Case Residual Effects

Definition of the residual impact rating ([Table 18.4-1](#)) is based on the assumption that the mitigation measures have been implemented and are effective. Project-related effects that have a final impact rating of negligible or greater have the potential to act cumulatively with

other existing, approved or planned developments in the RSA and therefore are assessed in the Planned Development Case.

Table 18.4-1 Application Case Residual Effects Assessment

Indicator	Direction	Extent	Magnitude	Duration	Frequency of Occurrence	Permanence	Confidence	Residual Impact Rating
Land use zoning and planning	Not applicable as the Project will not affect land use planning in the RSA.							
Surface and subsurface interests	Negative	Sub-regional	Low	Long-term	Continuous	Reversible in the long-term	High	Negligible
Aggregate resources	Negative	Extra-regional	Low	Long-term	Isolated	Irreversible	Medium	Low
Environmentally important areas	Negative	Local	Low	Long-term	Continuous	Reversible in the long-term	High	Negligible

18.5 PLANNED DEVELOPMENT CASE

The PDC considers the Project’s effects combined with other existing, approved and planned projects and activities predicted to overlap in time and space ([Volume 3, Section 1.4](#), Introduction to the EIA). Application Case effects having a residual impact rating of negligible, low, medium or high are considered as part of the PDC.

Planned projects are projects that have been publicly disclosed (but not approved) as of August 31, 2012. However, in this assessment there are no disclosed projects within the RSA, and the only known planned developments within the RSA are future expansions of the FCTP ([Volume 3, Section 1.4](#), Introduction to the EIA). These projects include additions to the FCTP within the LSA and existing footprint, as well as expansion of production well pads and conceptual oil sands exploration (OSE)/seismic programs to the north, and borrow area, disposal well and associated right-of-way to the east ([Volume 3, Section 1.2.2](#), Introduction to the EIA).

18.5.1 Surface and Subsurface Interests

The planned developments beyond the LSA and existing footprint described above have the potential to disrupt DND training exercises for the life of these projects. Cenovus will continue to consult with the DND regarding future development of the FCTP and implement the same mitigation discussed in [Section 18.4.2](#), as appropriate. Cenovus will obtain the

necessary surface land dispositions through AESRD, and therefore no other impacts to surface interests are expected. Activities associated with the PDC projects will be conducted within Cenovus's lease area, and will not affect other subsurface interests.

The residual effect on surface and subsurface interests is negative due to the reduction of land available to the DND. The extent is sub-regional because this reduction is limited to the extent of 3D seismic and well pad clearing that occurs outside the approved FCTP project area. The magnitude is low because the Federal/Provincial agreement that established the CLAWR allows oil and gas exploration and extraction activities within its boundaries. The duration of the effect is long-term as it will continue for the life of the well pads and borrow area. It is considered continuous and reversible in the long-term. The prediction confidence of the final impact rating is considered high because the Federal/Provincial agreement which created the CLAWR, and associated coordination processes between Cenovus and the DND, is well established. The residual impact is predicted to be negligible.

18.5.2 Aggregate Resources

Aggregate resources are a non-renewable resource and are identified and licensed for use by the provincial government. From an economic point of view, aggregate resource use is positive for the producers but is negative for the industry that requires it.

Planned projects within the RSA require relatively small amounts of aggregate which will not have an effect on aggregate supply within 200 km of Bonnyville. Extra-regionally, aggregate resource supplies within 200 km of Bonnyville are expected to fluctuate as new extra-regional planned construction projects begin and new sources are discovered and developed. As with the Application Case, the PDC impact on aggregate resources is negative and the extent is extra-regional. The effect magnitude is low because aggregate demands are not expected to cause a detectable change in resource availability in the Bonnyville and surrounding region. The duration of the effect is long-term, and it is considered isolated and irreversible. The prediction confidence of the final impact rating is considered low due to the lack of information regarding future construction projects within 200 km of Bonnyville, and the actual volume of aggregate resources in this area. The residual impact is predicted as low.

18.5.3 Environmentally Important Areas

The PDC includes future 3D seismic programs to the north of the existing Project. All other planned projects are not within any ESA boundaries and are not expected to impact ESAs. The seismic program's area will overlap ESAs 553 and 559, affecting an estimated 0.04% of ESA 553 and 0.3% of ESA 559. This disturbance will act cumulatively with the Project, and is estimated to reduce ESA 553's total area by 0.09% and ESA 559's total area by 0.33%. ESAs 553 and 559 include intact riparian areas and large natural areas of native vegetation. ESA 559 also includes habitat for woodland caribou (Fiera Biological Consulting 2009). The impacts of the Project on natural vegetation and woodland caribou and potential mitigation measures are assessed in the Vegetation and Wildlife assessments ([Volume 5, Sections 12](#)

and 13). Cenovus will discuss disturbance of the ESA areas with Alberta Tourism, Parks and Recreation (ATPR), as required.

The potential effects on environmentally important areas in the PDC (Table 18.5-1) are expected to be the same as the Application Case: negative in direction due to the increase in disturbance to ESAs 553 and 559, and the extent is local as the disturbance will be limited to the extent of the seismic area. The 3D seismic will be low impact and mitigation will include measures to reduce access by humans and predators on 3D seismic lines. Therefore, the effect magnitude is low as the disturbance due to the Project represents a minor portion of the total areas of ESAs 553 and 559. Also, ESA 559 does not represent the total amount of woodland caribou habitat in the RSA. The duration of the effect is long-term. It is considered continuous and reversible in the long-term. Confidence in the final impact rating prediction is considered medium as the future 3D seismic program is still conceptual and subject to change. The residual impact is predicted to be negligible.

Table 18.5-1 Planned Development Case Residual Effects Assessment

Indicator	Direction	Extent	Magnitude	Duration	Frequency of Occurrence	Permanence	Confidence	Final Impact Rating
Surface and subsurface interests	Negative	Sub-regional	Low	Long-term	Continuous	Reversible in the long-term	High	Negligible
Aggregate resources	Negative	Extra-regional	Low	Long-term	Isolated	Irreversible	Low	Low
Environmentally important areas	Negative	Local	Low	Long-term	Continuous	Reversible in the long-term	Medium	Negligible

18.6 CONCLUSIONS

The objectives of the Land Use and Management Assessment are to:

- identify current land and resource uses in the Land Use RSA;
- identify regulatory conditions and policy governing the various land uses;
- identify trends in use;
- determine impacts to land and resource uses resulting from the Project; and
- determine impacts from the Project in combination with other existing, approved and planned projects and activities.

The evaluation of the potential effects of the Project on land and resource use considers interactions among:

- existing land use plans and zoning;
- changes to the accessibility and availability of land and resource uses; and
- changes in workforce and population, and effects on land and resource use and users.

The area designated as the CLAWR has been specifically reserved for the Department of National Defense's military training activities, and for safety reasons public activity within this area is restricted. This severely limits the number of potential land and resource uses within the RSA. Due to the presence of oil sands in the region, an agreement has been made between the Federal and Provincial governments to allow for development of these resources within the CLAWR. The development of the Project is, therefore, in keeping with the land use planning applicable to the area.

Due to minimal existing land uses, there are few impacts from the Project within the RSA. Other oil and gas producers hold surface and subsurface interests in the RSA; however, these interests will not be affected by the Project as they are administered and protected by regulatory authorities such as AESRD, the ERCB and Alberta Energy. The residual impact of the Project on surface and subsurface interests is negligible.

The Project footprint will overlap with Environmentally Significant Areas 548, 553 and 559 by approximately 1.4 ha, 3.8 ha and 12.0 ha, respectively. However, this disturbance represents a very small proportion of the total area of these areas within the RSA. The residual impact on environmentally important areas is negligible.

Aggregate resources are a non-renewable resource and are identified and licensed for use by the provincial government. It is expected that aggregate requirements for the Project will be met through off-lease sources, including established quarries in the Cold Lake area. Aggregate use for the Project will permanently decrease the availability for other users; however, Cenovus intends to extract aggregate from a large area which will mitigate the impact to any specific user. The residual impact on aggregate resources is low.

There is no Forest Management Agreement holder within the RSA, so there are no residual impacts to forestry. Due to restricted access, the Project will not have any residual effect on consumptive (trapping, hunting, fishing and berry picking) and non-consumptive recreation within the RSA.

Projects considered in the Planned Development Case include minor additions to the FCTP, expansion of production well pads and conceptual OSE/seismic programs to the north, and a borrow area, disposal well and associated right-of-way to the east. These projects account for a small additional increase in disturbance of Environmentally Significant Areas, but will not affect aggregate use or surface and subsurface interests. Planned Development Case impacts do not differ from the Application Case.

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19 HISTORICAL RESOURCES

19.1 INTRODUCTION

The Historical Resources Impact Assessment (HRIA) analyzes the effects of the proposed Cenovus FCCL Ltd. (Cenovus) Foster Creek Thermal Project Phase J Expansion (the Project) on historical resources. Historical resources are protected and regulated under the Alberta *Historical Resources Act (HRA)* and its regulations, and any effects on historical resources sites must be approved by the Minister of Alberta Culture. The Minister evaluates the effect of the Project on historical resources and issues requirements for appropriate mitigation measures. The Minister also issues *HRA* clearance for the Project to proceed once appropriate mitigation measures have been implemented.

The Project is planned to occur within Cenovus's oil sands leases within the Cold Lake Air Weapons Range (CLAWR) in Townships 69 to 71, Ranges 3 to 7, West of the Fourth Meridian (Lease Area).

19.1.1 Overview and Scope

Historical resources comprise residues of past cultures or societies and fossil remains. These resources represent discrete episodes of past activities. They are non-renewable and therefore susceptible to alteration or removal by modern industrial development. Although the cultural entities responsible for deposition of the archaeological material are unavailable for observation, the preserved context and associations in which the remains functioned can reveal many clues about past behaviour, adaptations and relationships to the natural world. The key to the interpretation of these resources is in their pattern of cultural deposition, which is extremely fragile, ephemeral and the product of unique processes and conditions of preservation. Consequently, once they are disturbed, they cannot be replaced, re-created or restored. Due to the nature of their origin and preservation, historical resources are finite in quantity and therefore increasingly susceptible to destruction and depletion through natural and cultural disturbances.

Historical resources include precontact archaeological sites, historic sites, and palaeontological resources. Precontact archaeological sites include remains (e.g., stone tools, butchered bones, fire-cracked rock) resulting from the traditional occupation of Alberta by Aboriginal people before contact with European traders in the late 1700s. Aboriginal people have lived in northern Alberta since the retreat of glaciers and glacial lakes, likely more than 10,000 years before present.

Historic sites can be Aboriginal and non-Aboriginal, and date from the time of European contact until approximately 1960. Historic sites can include structures (e.g., homesteads, cabins, forts), artifacts (e.g., industrial and folk-manufactured items made of metal, glass, ceramic, stone and other materials) or features (e.g., trails, foundations, campsites).

Palaeontological resources, or fossils, comprise evidence of past multicellular life, including: body fossils (e.g., bones, shells, plant stems), impressions (e.g., leaf imprints) and trace fossils (e.g., dinosaur trackways). They are thousands to hundreds of millions of years old and are often the remains of extinct species. Bedrock and unconsolidated glacial and non-glacial deposits can contain fossils. Fossil sites provide information on ancient forms of animals and plants, past ecosystems, evolution, natural climate change and extinction.

The scope of the HRIA follows all applicable legislation including Alberta Environment and Sustainable Resource Development's (AESRD) *Guide to Preparing Environmental Impact Assessment Reports in Alberta* (AENV 2011) and incorporates the Terms of Reference (TOR) established for the Project EIA by AESRD (AESRD 2012; [Volume 3, Appendix 1A](#)).

As such, this section includes a:

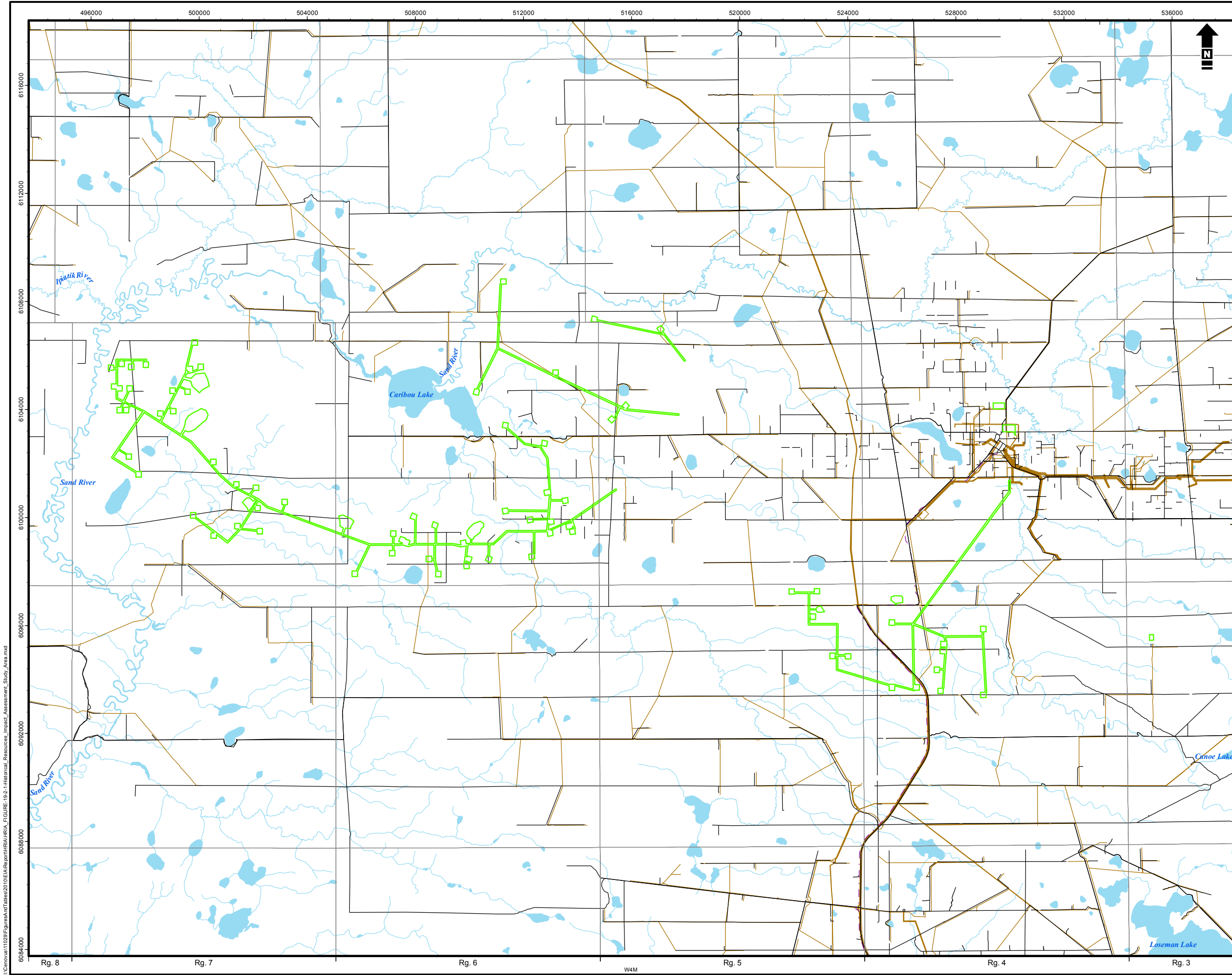
- review of the regional historical resources setting;
- review of known historical resources sites in the area (i.e., within and adjacent to the study area);
- discussion of the study coverage, results for HRIAs conducted in the area, and a summary of *HRA* requirements issued for the Project;
- review of the potential locations in which unrecorded historical resources sites may be present;
- discussion of Project components that have the potential to impact historical resources;
- discussion of the implications of Project impacts on historical resources sites; and
- discussion on relevant mitigation measures.

19.2 ASSESSMENT APPROACH

19.2.1 Spatial Boundary

Vegetation clearing and construction of the Project may affect historical resources by disrupting the sediments that contain archaeological and historic sites, and palaeontological resources. These sites and resources are discrete and immovable, thereby affecting the site contents and context. As such, the Project footprint is the relevant study area for historical resources as it represents the entire area that will be disturbed during construction, operation, and reclamation phases ([Figure 19.2-1](#)). Activities that could affect historical resources sites include:

- vegetation clearing;
- construction of well pads, pipelines, access roads, campsites and other facilities;
- drilling activities; and
- excavation of borrow sources.



- Historical Resources Study Area
- Water Body
- Watercourse
- Road
- Pipeline
- Powerline

Reference:
Data obtained from AltaLIS, Altus and IHS. Used under license.
1:135,000
Kilometres
NAD 1983 UTM Zone 12N



Foster Creek Thermal Project Phase J Expansion

Historical Resources Impact Assessment Study Area

Date: 07 Feb 2013 Project: 11029-514
 Technical: R.Lauzon Reviewer: R.Lauzon Drawn: K. Andruchow

Disclaimer: Prepared solely for the use of Cenovus FCCL Ltd. as specified in the accompanying report. No representation of any kind is made to other parties with which Cenovus FCCL Ltd. has not entered into contract.

I:\Cenovus\11029\Figures\AT\Tables\2010\EA\Report\HRA\HRA_FIGURE_19.2-1_Historical_Resources_Impact_Assessment_Study_Area.mxd

19.2.2 Key Issues

The key issue identified for historical resources is the potential for disturbance or destruction of the contents and context of historical resources sites, resulting in diminished site integrity and the associated loss of interpretive value. The loss of site contents and context results in less information recovered that can contribute to the interpretation of the archaeological record of a region. This potential effect, if not controlled through mitigation (e.g., site documentation and investigation), may result in the permanent loss of the non-renewable historical resources record.

19.2.3 Desktop Review and Consultation with Regulators

Prior to conducting the HRIA field studies, a desktop review was completed and submitted as a statement of justification (SOJ) to Alberta Culture. The SOJ provides a review of the historical resources database in the region and in the study area, and the nature of the archaeological potential. A site file search of recorded historical resources was acquired, and the *Listing of Historical Resources* (Alberta Culture 2011) was consulted. Recommendations were formulated for HRIA studies relative to the Project.

In response to the SOJ, an Alberta *HRA* requirement letter was issued for the Project on September 19, 2011 (Alberta Culture Project File 4751-11-0023). The requirement letter indicated that a HRIA was required for the Project. The letter stated that the HRIA coverage was to minimally include those components of the Project footprint considered to possess high or moderate archaeological potential. It was indicated that sampling of additional high or moderate potential lands outside of the Project footprint, and some sampling of low potential lands, should also be included in the HRIA. The letter further indicated that the HRIA must be undertaken prior to any land surface disturbance activities.

The *HRA* requirement letter also addressed the nature of 'baseline' studies conducted in advance of the finalized Project footprint. Although Alberta Culture supports such studies as a source of information used to develop models of archaeological potential, which can further serve to evaluate the need for future HRIA studies within portions of future Project footprints, such studies are not required. Field studies conducted for the Project in 2011 are considered baseline studies, although efforts during the field assessment were focused on Project footprint areas with moderate and high archaeological potential at the time.

19.2.4 Historical Resources Field Methods

A permit application was submitted to Alberta Culture in order to undertake the 2011 HRIA field studies and Alberta Culture issued Archaeological permit 2011-242. The field studies were conducted in the fall, 2011, focusing on the Project footprint, but also included some areas of high archaeological potential identified within the proximity of the Project footprint.

The target areas selected for assessment were determined using topographic maps, air photo access maps and in-field observations on foot and during helicopter reconnaissance. AVI data was not available at the time of target area selection. The archaeological potential of a target

area is based on attributes considered desirable for habitation and site discovery. Desirable attributes include elevated, well-drained terrain, proximity to current or past water bodies, diversity of vegetation and animal resources, and availability of lithic raw material. During the field studies, a number of areas with moderate to high archaeological potential were observed. These included the open jack pine forest along the Sand River and its tributaries, as well as raised landforms adjacent to watercourses, lakes and wetlands, and in muskeg-dominated terrain away from these landscape features.

At target areas, field methods included inspection of surface exposures and excavation by way of shovel tests in areas deemed to be of moderate to high potential to contain archaeological sites. All fortuitous exposures such as tree throws, vehicle track surfaces, and areas of previous disturbance were examined for evidence of cultural material, including historic sites such as structures or depressions. Excavation of shovel tests (N=680) was conducted in areas of limited exposure or in areas deemed to have potential for buried cultural deposits. All sediments were passed through a 6.0 × 2.9 cm diamond shaped mesh screen.

At identified historical resources sites, assessment included implementing a shovel testing program to determine the size, density, integrity and nature of the site. Mapping and photography were conducted as required for reporting purposes. One representative from Cold Lake First Nations accompanied the crew and participated in the field program.

19.2.5 Palaeontological Review

The study area was screened for potential areas of palaeontological sensitivity using the *Geological Highway Map of Alberta* (Cooper 2000), two surficial geology maps (Andriashek 2002; Fenton and Andriashek 1983), a surficial drift thickness map (Pawlowicz and Fenton 1995) and the *Listing of Historical Resources* (Alberta Culture 2012).

19.2.6 Assessment Methods

The footprint represents the entire area that may be disturbed during construction, operation and reclamation phases. Therefore, the assessment methods for Historical Resources included assessing potential effects to known historical resources sites by comparing the Project footprint with the locations of known historical resources sites.

Project footprint components that were not assessed during the field studies will be reviewed, and an SOJ completed, prior to initiation of Project construction to determine if additional field study coverage is required.

19.3 BASELINE CASE

19.3.1 Archaeology

19.3.1.1 Precontact Period

The Project lies near the southern extent of the boreal forest region of Alberta. Cultural materials from the southern boreal forest share characteristics with the northern plains, as well as with the northwestern boreal forest and the adjacent barren lands to the northeast. Consistencies in cultural materials and dates in these areas bear witness to the movements and cultural influences between these zones through time.

The sequence of cultural development in precontact times in northeastern Alberta is based on temporally diagnostic artifacts, primarily projectile points, although radiocarbon dating has become increasingly important in dating sites in recent years. From those sites that contain diagnostic artifacts or radiocarbon dates in the general oil sands region, it appears that the area has been occupied almost continuously for at least 10,000 years.

The earliest known occupations (during the Early Precontact Period, approximately 10,000 to 8,000 years before present [BP]) in the area relate to deglaciation and the consequent availability of habitable landforms (Unfreed and Fedirchuk 2001a). Such landforms include the southern borders of Glacial Lake McConnell (Great Slave-Lake Athabasca basin). Assuming that the region was occupied soon after the landscape was free of ice, the dramatic rise in water levels and growth of Lake Agassiz would have affected early inhabitants. Similarly, a breach of the morainal dam and subsequent torrential flood of water would have extinguished life in the floodpath. Human occupation of the edges of the spillway during the flood episode is unlikely.

As flow from Glacial Lake Agassiz ebbed and flood waters abated, it is likely that the ice-age hunters returned. They might have hunted isolated mammoth, camel, and horse (extinct *Equusniobrarensis* or *Equusconversidens*), although they probably depended largely on bison, and on caribou, deer, elk, and muskox, where available (Klassen 1989). With decreased velocity and shallower water levels, the lakes would have frozen in winter, enabling hunters and their families to cross freely. By approximately 9,500 years BP when Lake Agassiz ceased flowing northward via the Clearwater Spillway, even the Athabasca River would have frozen each winter, facilitating travel north and south.

The Northern Plano tradition has been used to classify sites in the subarctic and barrenlands that are characterized by large, lanceolate projectile points. Although it is generally accepted that the origin of the parallel flaked lanceolate points characteristic of the Plano tradition is in the southern plains, it is doubtful that the chronology of human occupation represents a unidirectional movement of people from south to north. The archaeological record from the northwest suggests a Northern Plano affiliation, distinct from that found on the northern Plains (Unfreed and Fedirchuk 2001b). Assuming that human use of the general oil sands region was a direct consequence of deglaciation and pro-glacial lake development, the earliest

occupants probably had strong cultural affinities to the northwest. Comparable materials in the early post-glacial period are found in the Middle Mackenzie region (Unfreed and Fedirchuk 2001b).

At the beginning of the Middle Precontact Period, around 8,000 years BP, the climate was warmer and drier than modern conditions and extensive tracts of muskeg were not present. However, by approximately 4,000 years BP, the composition of vegetation and landscape in the study area was similar to the modern boreal forest.

The later phases of the Middle Precontact Period exhibit intensive specialization in bison hunting on the northern Plains and Parkland. Late Middle Precontact Period sites are less common in the boreal forest than the earlier Middle Precontact Period sites, although they are very common in the Parklands (Vickers 1986). Given the expansion of muskeg in the north and intensification of bison hunting to the south, it is possible that seasonal use of the boreal forest by Plains groups decreased markedly during this period.

The transition from the Middle to Late Precontact Period occurs at around 2,000 years BP and is marked by the appearance of two new innovations: the widespread use of the bow and arrow, and ceramic technology. The appearance of ceramic vessels in the archaeological record is a key development as the stylistic elements, decorative techniques, and manufacturing methods of these vessels permit finer distinction between archaeological cultures. The earliest Late Precontact Period arrow points are finely crafted specimens followed later by more utilitarian specimens. The Late Precontact Period is the best-represented archaeological period in Alberta, with hundreds of sites dating to this time. Late Precontact Period sites are much rarer in the boreal forest than on the Plains and Parklands, and their relationship with other sites from the Plains and Parklands is poorly understood.

19.3.1.2 Historic Period

The Historic Period begins with the Contact Period, with the first European influences in the southern boreal forest, relating to the acquisition of the horse and items of the fur trade. Contact Period sites are very rare in Alberta and are strongly concentrated in the southern Plains (Landals 2004; Pyszczyk 1997). The Contact Period saw a great deal of displacement of previous subsistence and settlement patterns as a result of disease, conflict, and new economic opportunities.

The first Europeans to penetrate the vast interior of Canada were French fur traders (Morton 1973). Few written records of these early exploits exist. In 1670, Charles II granted the Hudson's Bay Company (HBC) exclusive trading rights in the area known as Rupert's Land, including all of the area draining into Hudson Bay (Innis 1970). Although the French withdrew from the interior in 1763, aggressive and resourceful independent agents from Montréal and Québec succeeded in enlisting the support of the First Nations and *coureurs des bois* formerly affiliated with the French trade. These agents established themselves inland and successfully intercepted the Aboriginal trade at its source.

The ensuing competition between these independent agents and the HBC resulted in the independents moving even further west and forming alliances with one another to interrupt the HBC trade network. In 1778, Peter Pond established the first trading post in the Athabasca drainage, approximately 60 km south of Lake Athabasca. In 1781, Cold Lake House was established by the Northwest Company (NWC) on the shore of Cold Lake. Angus Shaw of the NWC established Fort Lac d'Original, at Moose Lake, near the present town of Bonnyville. The HBC, to maintain competitiveness, established its posts in the immediate vicinity of these NWC trading houses. This system of frequently paired posts characterized the fur trade in the Saskatchewan District as both companies built new trading locations.

Until 1811, fur traders affiliated with the NWC and HBC maintained very amicable relations to the extent that the rival posts were often enclosed within the same palisades for mutual protection. After 1811, however, competition between the HBC and the NWC became increasingly intense. In 1821, after a decade of strife, the two companies amalgamated. The HBC lost its rights to the fur trade monopoly in 1869 when the territories controlled by the HBC were transferred to the Dominion of Canada.

With the transfer of the former HBC lands, the fledgling Government of Canada was faced with the task of settling the vast area between the Great Lakes and the Pacific Ocean. To this end, measures pertaining to Aboriginal people, the survey of land, the development of a transportation system, the establishment of a law enforcement body, and the encouragement and control of immigration were implemented.

In 1872, the *Dominion Lands Act* was passed. Under the auspices of this Act, free homesteads were offered to heads of households and immigration policies were implemented whereby large land reserves were made available to individuals and societies who would sponsor immigrants. Railway companies were also offered these land tracts as an incentive to establish new lines. Initially, there was a general preference for settlement in the more southerly parkland regions. Until the railway reached Edmonton in 1890, the lands in the vicinity of the North Saskatchewan River remained isolated and sparsely settled. With the expansion of the railways and the development of faster maturing strains of grain, a vast rich agricultural area was established in the area north of the North Saskatchewan River. In 1909, the first European settlers began to arrive and the population continued to grow steadily. By the time the railway reached St. Paul in 1914, most of the arable land south of Athabasca River, east of Lac La Biche, and south of Beaver River had been settled. The southern boreal forest appears to have served as a refuge for Aboriginal and Métis people who wished to maintain a traditional lifestyle.

19.3.1.3 Field Studies

Prior to the 2011 field studies discussed previously, no other historical resources studies had been undertaken for this Project. Some studies in the general area have been undertaken, largely to the east of the Project.

The site file search conducted for the Project indicated several previously recorded historical resources sites near the Project; most of these are located at the eastern portion of the Project and were recorded during field studies associated with previous phases of the Foster Creek Project or other development-related studies. Since these sites are not within close proximity to the footprint, they were not visited during the 2011 field studies. Sites on record near the Project include precontact sites (i.e., isolated finds, artifact scatters, campsites) and historic sites (i.e., camps, cabins). These sites are summarized in [Table 19.3-1](#) along with the Historical Resources Values (HRVs) assigned by Alberta Culture. Note that HRV 0 indicates that Alberta Culture will not require any further studies on the site due to low value, whereas HRV 4 indicates that further studies or ongoing avoidance is recommended.

Table 19.3-1 Summary of Previously Recorded Sites

	Site Type	Borden Number	Historical Resources Value *
Precontact Sites	Isolated Finds	GgOp-2	0
		GgOp-3	0
	Artifact Scatters	GgOp-1	4
		GgOp-11	4
		GgOr-1	4
Campsites	GgOp-8	4	
Historic Sites	Camps	GgOp-4	4
	Cabins	GgOp-5	0
		GgOp-6	4
		GgOp-7	4

*Alberta Culture 2012

In addition, several traditional use sites are present in the general Project area; based on the presence of these historical resources and traditional use sites, some lands within proximity of the Project are found on the *Listing of Historical Resources* (Alberta Culture 2012). There are no recorded palaeontological sites or HRVs related to palaeontological resources in the study area. [Figure 19.3-1](#) illustrates previously recorded site locations and HRVs within proximity of the Project.

During the 2011 field studies, a total of 680 shovel tests were excavated (Youell 2012). Ten newly recorded archaeological sites were identified, including nine precontact sites and one historic period site. These are summarized in [Table 19.3-2](#), including the recommended HRVs. The final HRVs will be determined by Alberta Culture.

Table 19.3-2 Summary of Sites Newly Identified during 2011 Field Studies

	Site Type	Borden Number	Recommended Historical Resources Value
Precontact Sites	Isolated Finds	GgOp-10	0
		GgOq-2	0
		GgOs-1	0
	Artifact Scatters	GfOp-6	4
		GgOq-1	4
		GgOs-2	4
		GgOs-3	4
		GgOs-4	4
		GgOs-5	4
Historic Sites	Cabin/Dwelling	GgOp-9	4

Figure 19.3-1 illustrates the locations of all archaeological sites and shovel test locations from the 2011 field studies, as well as the current HRVs and previously recorded sites from the *Listing of Historical Resources* (Alberta Culture 2012).

19.3.1.4 Archaeological Potential

During the field studies, areas perceived to have high archaeological potential were targeted for assessment. The criteria described in Section 19.2.4 were used to target areas for field assessment. The locations suggested to have the highest archaeological potential were elevated, well-drained landforms, particularly close to rivers and creeks, but also within proximity of more ephemeral drainages, lakes and wetlands, and in muskeg dominated areas. Assessment of such targeted areas within proximity of the Project footprint resulted in the identification of sites, confirming the basic association of such landforms with the presence of archaeological sites.

19.3.1.5 Knowledge Gaps

Shovel test locations from the 2011 field studies are illustrated in Figure 19.3-1. Shovel testing in 2011 focused on assessing target areas within the then proposed Project footprint, as well as selected areas adjacent to the footprint. The entire footprint was not assessed, but targeted areas were sufficiently assessed to HRIA-level studies and should not require further assessment. Areas with moderate to high archaeological potential within the Project footprint that have not been subject to shovel testing may require additional HRIA studies prior to disturbance.

19.3.2 Palaeontology

Bedrock in the development area consists of the Labiche Formation (Cooper 2000), an upper Cretaceous marine clastic unit of grey and brown shale. This formation is situated under very deep till, starting at depths of 90 metres below surface to 150 metres below surface. The

Labiche Formation contains two distinct marker beds: the First and Second White Speckled Shale Units. These two marker beds consist of calcareous shale and mudstone with minor amounts of fissile chalk, bentonite, calcite and siderite. These units are laminated and incorporate coccolithophores (calcareous plankton; Glass 1997). The Labiche Formation has yielded articulated fish specimens (Wilson 2005, pers. comm.) and other vertebrate material including fish scale debris and disarticulated bones (Glass 1997). Shells of the bivalve *Inoceramus* have also been collected from the First and Second White Speckled Shale Units (Glass 1997). Invertebrates including ammonites, baculites, inoceramids, oysters, mussels and brackish water clams and snails from the ammonite zones (*Dunveganoceras*, *Watinoceras*, *Scaphites* and *Baculites*) have been collected from Smoky Group sediments, a laterally equivalent unit of the Labiche Formation (CGKN 2011, Internet site).

Surficial deposits in the development area include glacial till composed of mixed silt, sand and gravel; organic deposits; and glaciofluvial terrace deposits of sand (Andriashek 2002; Fenton and Andriashek 1983). The till and organic deposits occur as discontinuous pockets throughout the development area and range from 90 to 150 m thick, below which bedrock is present (Pawlowicz and Fenton 1995). The glaciofluvial terrace deposits occur along the slopes of the Sand River valley. These glaciofluvial deposits can yield glacial-aged mammals including horse, bison and camel, although these fossils are considered volumetrically rare (Churcher 1972). The till and organic deposits have low palaeontological potential. None of the lands within the development area have HRVs for palaeontology (Alberta Culture 2012), which indicates low palaeontological potential.

19.4 IMPACT ASSESSMENT AND MITIGATION MEASURES

19.4.1 Mitigation Measures

Adverse primary impacts to historical resources sites, identified prior to the construction stage of development, can be significantly reduced or eliminated by avoidance or adequate study. Site avoidance can be achieved through alterations to the Project footprint or by restriction of construction within the development zone. Cenovus has incorporated constraints mapping during footprint planning to avoid known sites. Adequate study of archaeological sites generally involves scientific investigations that are designed to systematically explore and reconstruct the activities that are represented at the site. These investigations may involve the systematic collection of surface sites, detailed mapping, photographic documentation of sites, or the excavation of buried sites. In cases where the interpretive potential of a set of archaeological resources is considered to be low, it may be deemed that photographic documentation, recording, and collection of surface specimens are sufficient mitigation. In cases where the archaeological interpretive potential of a set of historical resources is identified as high, additional mitigation, such as avoidance through revision of the Project footprint, or controlled excavation, may be required by Alberta Culture. Similarly, adequate study of palaeontological sites may include collection and excavation of specimens, as a means of providing information on past species and habitats.

In order to mitigate effects to any unrecorded historical resources sites that may lie within unassessed portions of the Project footprint, these areas will be reviewed, and a statement of justification completed, prior to initiation of Project construction to determine if additional field study coverage is required.

19.4.2 Impact Assessment

19.4.2.1 Archaeology

No historical resource sites are situated within close proximity of the Project; the closest site, GgOq-1, is situated over 100 m from the closest Project component ([Figure 19.3-1](#)). As such, there will be no impacts to known historical resources sites as a result of the Project.

19.4.2.2 Palaeontology

Due to thick overlying surficial deposits, bedrock will not be disturbed by surface construction activities. The glaciofluvial terrace deposits could be disturbed by construction, but as the fossils from this unit are considered rare, it is not expected that there will be impacts to palaeontological resources. It is expected that no further palaeontological work or monitoring will be required.

19.5 CONCLUSION

Historical resources are protected under the Alberta *Historical Resources Act*, which is administered by Alberta Culture. Alberta Culture has issued a *Historical Resources Act*

requirement letter for the Project, indicating that a historical resources impact assessment is required for the Project; the requirements state that the assessment coverage should include those components of the Project footprint that have high or moderate archaeological potential.

Historical resources field studies conducted for the Project in 2011 resulted in the identification of ten new archaeological sites, including precontact isolated finds and artifact scatters, and one historic cabin site. None of these sites are situated within the Project footprint, and no previously identified sites are within proximity of the Project. As such, there will be no impacts to known historical resources sites as a result of the Project.

Based on the presence of thick overlying surficial deposits, bedrock will not be disturbed by surface construction activities. As such, there will be no impacts on palaeontological resources.

Project footprint components that were not assessed will be reviewed, and a statement of justification completed, prior to initiation of Project construction to determine if additional field study coverage is required. Follow-up Historical Resources field studies will be completed as per the Historical Resources requirement letter issued in order to mitigate any potential effects to historical resources.

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