DEER CREEK ENERGY LIMITED

THE JOSLYN NORTH MINE PROJECT

Section A

PROJECT INTRODUCTION

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A. PROJECT INTRODUCTION

Deer Creek Energy Limited ("DCEL") is applying for regulatory approval to construct, operate and reclaim the proposed Joslyn North Mine Project located in the Regional Municipality of Wood Buffalo in north-eastern Alberta (Figure A.1.0-1). The project is located on the Joslyn Lease (which consists of Oil Sands Leases 7280060T24 (OSL 24), 7404110452 (OSL 452, formerly Permit 70) and 7405070799 (OSL 799), which is approximately 70 km north of Fort McMurray located in Townships 94, 95, 96, Ranges 11, 12, 13 W4M (Figure A.1.0-2).

This application for regulatory approval for the Joslyn North Mine Project is a continuing step in the Joslyn Lease development plan, as outlined in the *Public Disclosure Document* (PDD) released by DCEL in June 2004.

Development of the Joslyn Lease includes staged implementation of mining operations and steam assisted gravity drainage (SAGD). The SAGD and Mine operations will share common infrastructure and optimize the recovery of the bitumen resource. The recoverable resource allocations for the lease are predominantly for mining operations but contain approximately 25% for SAGD. The proposed mining development will occur in two phases (Phase 1 and 2) and is referred to as the "Joslyn North Mine", 50,000 bbl/cd (barrels per calendar day) in Phase 1, starting in 2010 followed by Phase 2 with an increase in production of another 50,000 bbl/cd in 2013. SAGD operations commenced in the first quarter of 2004 and has the potential to produce approximately 40,000 bbl/cd of bitumen.

A.1 THE PROJECT

The Joslyn Lease covers approximately 23,000 ha which are described in Table A.1.0.1 and the Joslyn Lease is bounded Oil Sand Leases (Figure A.1.0-2) and by the following land uses:

- Lease 18 (which is held by the Canadian Natural Resources Limited ("CNRL") Horizon Project) to the north;
- the Athabasca River and CNRL Lease 7 and the Joslyn Energy Development Incorporated (JEDI) Leases 2 and 366 to the east;
- Syncrude Lease 22 and CNRL Lease 6 to the south;
- Petro-Canada Leases 51 and 01 to the south-west; and
- three leases held by Value Creation Ltd. to the west

Table A.1.0.1 Legal Land Description, Joslyn Lease

Township and Range West of 4th Meridian	Section
Twp. 94 Rge. 11	31; E33; 34; W35.
Twp. 95 Rge. 11	1; 2; 3; 4; 5; 6; 7; 8; 9; 16; 17; 18; 19; 20; W21; SE 21; (LSD 9, 10) - 21; 26 (west of river); E27; (LSD 3, 6) - 27; N28; (LSD 4, 5, 6, 7) - 28; 29; 30; 31; 32; 33; 34; 35 (west of river).
Twp. 96 Rge. 11	2 (west of river); 3; 4; 5; 6.
Twp. 94 Rge. 12	31; 32; 33; 34; 35; 36.

Table A.1.0.1 Legal Land Description, Joslyn Lease	
Township and Range West of 4th Meridian	**Section**
Twp. 95 Rge. 12	All (1; 2; 3; 4; 5; 6; 7; 8; 9; 10; 11; 12; 13; 14; 15; 16; 17; 18; 19; 20; 21; 22; 23; 24; 25; 26; 27; 28; 29; 30; 31; 32; 33; 34; 35; 36).
Twp. 96 Rge. 12	1; 2; 3; 4; 5; 6.
Twp. 95 Rge. 13	12; 13; 24; 25; 36.
Twp. 96 Rge. 13	1

The Joslyn Lease is currently accessed by the CNRL access road which bypasses the community of Fort McKay. All existing lease development activities are shown on Figure A.1.0-3. .

The Joslyn North Mine Project will encompass approximately 5400 ha of the Joslyn Lease, which will consist of the following components (Figure A.1.0-4):

- Pit 1 area – approximately 2200 ha
- External Tailings Pond (Pond 1) – approximately 600 ha
- External Disposal Areas (EDA 1 to 5) – approximately 1650 ha
- Plant-site and maintenance facility – approximately 450 ha
- Miscellaneous facilities – approximately 500 ha (includes Joslyn Creek diversion, Athabasca River intake, pipeline and dewatering wells)

Regulatory approval is being requested for the planning, construction, and operation of the following facilities:

- an open pit, truck and shovel mine;
- ore handling and slurry preparation facilities;
- a bitumen froth production plant, using hydrocyclone technology for bitumen separation, followed by contact cells for froth concentration;
- a Bitumen froth treatment plant, using high temperature paraffinic solvent technology to remove solids and water from froth to produce a fungible bitumen product;
- tailings processing facilities, using thickening and filtered tailings technology for a dryer tailings byproduct;
- a co-generation plant consisting of an 85MW gas turbine generator fitted with a heat recovery steam boiler;
- facilities for storing and transporting bitumen product; and
- utilities and off-site facilities to support the mining and processing operations.
- external thickener underflow and froth treatment tailings pond (Pond 1) for the first 9 years of operation;
- in-pit tailings pond (Pond 2) for the remaining years of operation;
- external and in-pit disposal areas for the placement of mine overburden, interburden, and dry tailings (filter cake);
- polders and freeze/thaw ponds to manage some of the thickener underflow;

- diversion of Joslyn Creek;
- utilities systems for process water, potable water, air, steam, and natural gas;
- facilities to supply and store raw water requirements for the operation from the Athabasca River;
- on-site facilities for offices, laboratories, warehousing, security, health and safety, fire hall, landfill, and waste storage;
- facilities for supply and distribution of electric power; and

Discussion of the bitumen production processes is described in detail in Section B.6.

Project execution plans include:

- initial and ongoing consultations with stakeholders;
- a plan to mitigate environmental impacts during construction and operation of the facilities;
- a plan to manage all tailings materials generated during bitumen separation and froth treatment operations;
- a life cycle water management plan;
- a surface water management plan to divert water away from mine workings or to collect water in disturbed areas;
- a plan to manage air emissions;
- a plan to manage all waste materials; and
- a mine closure plan, and a 10-year *Conservation & Reclamation Plan* (for the first 10-year Alberta Environment approval operating period).

On July 5, 2004, Alberta Environment confirmed that the Joslyn North Mine Project was a mandatory activity pursuant to Schedule 1(j) of the Environmental Assessment (Mandatory and Exempted Activities) Regulation. Deer Creek Energy Limited (DCEL) is required, pursuant to Section 44(1)(a) of the Environmental Protection and Enhancement Act (EPEA), to prepare and submit an Environmental Impact Assessment (EIA) report for the proposed development of the Joslyn Project.

Since 1998, DCEL has been conducting geological, environmental and socio-economic assessments for the regulatory applications required for its SAGD development. Much of the work and knowledge gained during this time formed the basis for the additional field work conducted for the Joslyn North Mine development. An important component of the lease development has been the ongoing contact with the local and regional stakeholders. DCEL has been engaged in ongoing consultation with regulators and stakeholders for approximately five years. During this time, relationships have been established and those involved have developed an understanding of the company and the potential lease development opportunities.

This document comprises the application for approval of the Joslyn North Mine Project under the *Oil Sands Conservation Act*, the *Environmental Protection and Enhancement Act* and the *Water Act*. DCEL believes that Federal approvals are required due to the requirement to divert Joslyn Creek and installation of an intake structure on the Athabasca River.

A.2 THE PROPONENT

Deer Creek Energy Limited (DCEL) was a publicly traded Calgary based oil sands development company and operator. On December 12, 2005 DCEL became a wholly owned subsidiary of Total E&P Canada Ltd. ("Total Canada").

DCEL is committed to a high level of health, safety and environmental protection for employees, contractors, suppliers and the public. This is a key component guiding our operations and is central to the Company's success. Deer Creek promotes safe work practices with policies and procedure for field operations. The Company has established programs for health and safety and loss control performance.

DCEL recognizes the important environmental and socio-economic issues surrounding oil sands development. Environmental protection is a prominent and integral component of Deer Creek's operations.

DCEL remains committed to investing in local involvement and community partnerships, our emphasis on safety and the effort to build the best project with the best technology economically available to minimize footprints and reclaim the land as quickly as possible. Partnerships with local communities and stakeholders are critical components of our success.

Total S.A. is an international company operating in 130 countries with more than 110,000 employees. To ensure that oil operations are well integrated into the environment, Total S.A. monitors their impact on local lifestyles and participate in socio economic development projects, preferably deployed by the communities we impact and their representatives. Total S.A. encourages its subsidiaries to purchase products from the host country and implement training and skill transfer initiatives to increase the number of local people working on Total's projects.

At Total Canada and DCEL, Ethics, Safety, Health, Environment, Human Resources and Local Development are all priorities of equal importance. Total Canada and DCEL place a great emphasis on tracking these priority areas and continuous improvement is a goal we all strive to achieve.

The development of the Joslyn Project is of great importance to Total Canada's success in Alberta. Total Canada expects to play a major role in the development of the oil sands and invest in the future of our neighbouring communities and to the economy of Alberta and Canada through taxation, royalties and local involvement.

DCEL currently operates a SAGD operation which is expected to produce 400 - 600 bbl/cd of bitumen. DCEL has an 84% interest in the SAGD operation and other mining assets, which are principally on Oil Sands Lease 24, Lease 452 and Lease 799. For the purpose of this application, the leases are referred to as the "Joslyn lease". EnerMark Inc., a wholly owned subsidiary of Enerplus Resources Fund, owns the remaining 16% interest in the operation. This lease development is known as the Joslyn North Mine Project.

A.3 THE NEED FOR THE PROJECT

Oil industry projections show that conventional crude production opportunities are declining. Additional heavy oil production is needed to replace this decline. The oil sands reserves in the Joslyn North Mine Project area can be produced in two phases, ultimately at a rate of 15,875 m3/d (100,000 bpd) operation for over 27 years.

The Joslyn North Mine Project will be a positive addition to the Alberta economy, both during construction and operations. Some of the highlights are as follows:

- the installed capital cost of Phase 1 and 2 will be approximately $2 billion over a seven-year period (2007 through 2013);
- the Joslyn North Mine Project will pay an estimated $7.5 billion in taxes and royalties to the Federal and Alberta governments;

- the site will employ up to 1,650 workers for Phase 1 construction, and 600 for Phase 2 working an estimated 4.4 million person hours, and about 700 permanent employees for the operation of the mine for 27 years;
- related infrastructure, product bitumen pipeline facilities ($75 million) and a co-generation plant ($95 million) are also required for the Project;
- contractors may be engaged to perform some of the mining operation;
- a mining contractor will be engaged for initial pre-stripping, overburden removal and site clearing activities; and
- a contractor will be engaged to haul filtered tails to disposal areas.

DCEL has worked closely with local communities to identify opportunities for local businesses and employment, and is confident that project development will bring direct benefits to those communities.

A.4 APPLICATION FOR APPROVAL

The regulatory review of oil sands developments in Alberta are required by the *Oil Sands Conservation Act* and the *Alberta Environmental Protection and Enhancement Act*. Co-ordination of the regulatory review of the Joslyn North Mine Project Application will be undertaken by two Alberta regulatory agencies, the Energy and Utilities Board (EUB) and Alberta Environment (AENV).

A.4.1 Applicant Information

The name of the applicant is "**Deer Creek Energy Limited**".

The address of the applicant is:

Deer Creek Energy Limited
Dome Tower
Suite 1900, 333 - 7th Ave. SW
Calgary, Alberta T2P 2Z1

Correspondence about this application should be directed to the above address to the attention of:

Ray Reipas, Vice President Mining
Phone: (403) 571-7599 or 1-866-371-7599
Fax: (403) 264-3700
Email: TEPC.Communication@total.com

A.4.2 Existing Approvals

In 2004, DCEL began its first commercial development of OSL 24 with the construction and operation of Phase I of the SAGD operations. Since then DCEL has solidified further expansion plans including government approval of Phase II of the SAGD development. Development approvals granted to date are listed in Table A.4.2.1.

The existing approvals for the Joslyn Lease pertain mostly to the SAGD operations and have been included in Appendix 6.

Table A.4.2.1 Deer Creek Energy Limited - Existing Approvals			
Approval Number	**Description**	**Issue Date**	**Expiry Date**
Energy and Utilities Board			
No. 8466	Phase I	January 7, 1999	
No. 8466A	Phase I	November 1, 1999	
No. 8466B	4 Vertical wells, 1 observation well	July 13, 2000	
No. 8466C	Miscellaneous	September 14, 2000	
No. 8722	Phase I	May 24, 2002	June 30, 2007
No. 8722A	Phase I	December 13, 2001	
No. 8722B	Phase I	May 24, 2002	
No. 9272	Phase I	January 25, 2003	
No. 9272A	Phase I	December 23, 2003	
No. 9272B	Phase II	May 20, 2004	
No. 9272B	Phase II amendment	January 2005	
No. 8583	Water Disposal Wells	December 21, 1999	
No. 8583A	Water Disposal Wells	May 19, 2000	
No. 9797	Water Disposal Wells	March 17, 2005	Rescinds 8583
No. 9833	Water Disposal Wells	April 16, 2004	Rescinds 9797
No. 9856	Water Disposal Wells	May 7, 2004	Rescinds 9833
Environmental Protection and Enhancement Act			
No. 147283-00-00	Phase I	May 2002	April 30, 2012
No. 147283-00-01	Relocate from Pilot Plant location to the current Phase I (Sec 33-95-12-W4M)	December 13, 2002	April 30, 2012
No. 147283-00-02	Phase II	April 2004	April 30, 2012
No. 147283-00-03	Phase II amendment	January 2005	April 30, 2012
Water Act			
No. 204317-00-00	Water Source Wells (182,500 m^3 annually)	January 16, 2004	January 25, 2009
No. 204317-00-01	Amendment to add standby WSW	March 1, 2004	January 25, 2009
00198976-00-00	Divert from Athabasca & storm water pond (190725 m^3 annually)	March 10, 2004	March 9, 2014
00198991-00-00	Construction of intake, storm water pond & reservoir	March 15, 2004	March 14, 2014

A.4.3 Request for Approval

This document is an integrated application to the Alberta Energy and Utilities Board (EUB), Alberta Environment (AENV) and Federal Agencies (i.e. Canadian Environmental Assessment Agency, Department of Fisheries and Oceans) for approval of the Joslyn North Mine Project. DCEL will require approvals for the following regulatory components during the project:

Provincial requirements

- *Oil Sands Conservation Act* (OSCA), an application to the EUB
- *Environmental Protection and Enhancement Act* (EPEA)
- *Water Act*:
  - increase water allocation from Athabasca River for use in the process
  - undertake surface drainage necessary for plant site and mine infrastructure
  - undertake subsurface dewatering in the mine area for geotechnical stability
  - construct mine dykes and waste areas (Dam and Canal Safety)
  - diversion of Joslyn Creek including construction of Joslyn Lake, polishing pond, diversion channel and spillway
  - an environmental impact assessment (EIA) under EPEA
- *Hydro and Electric Energy Act*:
  - construct on-site electrical substation and distribution facilities
  - designate the electrical transmission and distribution facilities that form part of the Joslyn Project as an industrial system
- *Pipeline Act*:
  - for the construction of a products pipeline from the Joslyn Project site
  - construct a water pipeline from the Athabasca River to the Joslyn Project site
- *Oil and Gas Conservation Act*, to inject and dispose of water from mine pit depressurization
- *Public Lands Act*, for surface rights
- *Forests Act*, for the clearing and harvesting of timber within the Joslyn Lease
- *Historical Resources Act*, for clearance to construct the facilities

Municipal Requirement

- *Municipal Government Act, Part 17*, for a development permit from the Regional Municipality of Wood Buffalo for the construction and operation of the Joslyn Project and related infrastructure

Alberta Energy and Utilities Board

With this application, DCEL is seeking approval from the EUB for the following aspects of the Joslyn Project:

- construction, operation and reclamation of a surface mine to produce 100,000 bbl/cd (Phases 1 and 2 at 50,000 bbl/cd each) of bitumen with the associated mine and extraction facilities, earth structures, and support infrastructure;
- construction of a water intake and water pipeline from the Athabasca River to the Joslyn Project site; and
- reclamation plan for the surface mining operations.

DCEL requests that the following specific operating criteria be accepted by the EUB as appropriate for the Joslyn Project:

- an ore grade cutoff of 7%;
- a minimum mining selectivity of 3 m;
- a pit limit based on TV:BIP of 12:1 (as described in Section B.3); and
- overall bitumen recovery per AEUB recovery equations.

Specifically, DCEL applies to the EUB for a new approval of the proposed scheme for the recovery of oil sands as described in the Project Application, pursuant to:

- Section 10 of the Oil Sands Conservation Act ("OSCA") and ss. 3, 24 and 26 of the Oil Sands Conservation Regulation ("OSCR"), for approval for the mining, lease development, on-site waste management and reclamation activities to be carried out on the Joslyn Lease;
- Sections 10 and 11 of OSCA and ss. 3 and 48 of the OSCR, for approval of an oil sands processing plant for the recovery of bitumen and treatment of bitumen froth; and
- Section 11 of the Hydro and Electric Energy Act ("HEEA"), for approval to construct and operate a co-generation plant.

Alberta Environment

With this application, DCEL is seeking approval from Alberta Environment for the construction, operation and reclamation of facilities to support the Joslyn Project, which includes the following components:

- development of the Joslyn North Mine Project;
- an external pond for thickener underflow and froth treatment tailings (Pond 1);
- in-pit tailings pond (Pond 2);
- external disposal areas for tailings filter cake and mine overburden and interburden;
- a mine drainage system;
- an ore preparation plant;
- mine maintenance facilities;
- a bitumen extraction plant;
- a bitumen cleaning plant;
- associated pipelines between ore preparation and extraction;
- product delivery pipelines to market (subject to a separate regulatory application);
- emergency flare system;
- a co-generation facility;
- utility and emergency ponds, and associated water release ponds;
- a water intake and water pipeline from the Athabasca River to the Joslyn Project site;
- associated air emission points;
- Class II and III landfills for the disposal of non-hazardous solid waste;
- staging area for hazardous materials prior to transporting off site;
- a potable water system;
- a sanitary waste water (sewage) system.
- a conservation and reclamation plan for mining development for an initial ten-year approval

period;

- a closure plan for the mining, bitumen extraction, bitumen cleaning, and associated facilities;
- a diversion of Joslyn Creek (to prevent runoff water exposed to oil sands from entering the environment) during mine development and operation;
- an allocation to divert water from the Athabasca River to be used in the process; and
- a mine drainage plan that includes:
- diversion of natural surface waters from the mine area; and
- depressurization of subsurface and basal water sands.

DCEL submits the Project Environmental Impact Assessment Report (the "Report") to the Director for his review, pursuant to s. 50 of the Environmental Protection and Enhancement Act ("EPEA") and for a decision, in due course, by the Director that the Report is complete pursuant to s. 53 of EPEA.

DCEL also seeks approval from AENV, pursuant to s. 66 of EPEA and the Approvals and Registrations Procedure Regulation, for the activities as described in the Project Application, including the construction, operation and reclamation of the Project.

DCEL also applies to AENV, pursuant to ss. 37 and 42 of the Water Act ("WA"), for an amendment to WA Approval No. 198991-00-00, as amended, allowing for the construction of a water intake at the Athabasca River and for other oil sands facilities as described in the Project Application. DCEL also applies to AENV for a licence, pursuant to s. 50 of the WA, to divert from the Athabasca River and site surface runoff an additional 29,090 m^3/cd (10,617,000 m^3/year) for a total annual volume of 11,000,000 m^3.

Other applications under provincial and federal statutes will be submitted separately to the agencies having jurisdiction. These applications include provincial approvals for surface dispositions under the Public Lands Act, rulings under the Historical Resources Act and federal authorization under the Fisheries Act.

Federal Requirements

The Joslyn North Mine Project will require a federal authorization under the Fisheries Act and as such, this application was prepared to capture the requirements of the Canadian Environmental Assessment Act and to facilitate review under the Harmonization Agreement with the province. The formal application for the fisheries authorization will be submitted at a later date.

The following are regulatory requirements that will be applied for in subsequent applications to the federal agencies:

- Fisheries Act, for Harmful Alteration Damage or Disturbance (HADD) of habitat in Joslyn Creek due to proposed diversion and the installation of intake on the Athabasca River;
- Radio Communication Act – for communications/radio license; and
- Navigable Waters Protection Act for disturbance/removal of navigable water for Joslyn Creek and construction of intake on the Athabasca River.

A.4.4 Application Guide and Description

Following current practice, the applications for approval to the EUB and EPEA have been integrated to:

- reduce duplication, particularly in the project descriptions; and

- facilitate review of the applications by regulators and the public.

This application is presented in the following format:

Volume 1

- Section A – Introduction
- Section B – Project Description

Volume 2

- Section C – EIA Methodology
- Section D – Environmental Assessment
- Section E – Stakeholder Consultation
- Section F – EPEA Application
- Section G – Water Act Application
- Appendix 1 – Terms of Reference cross-reference (concordance table)
- Appendix 2 – Project Team
- Appendix 3 – Glossary
- Appendix 4 – References
- Appendix 5 – Public Consultation
- Appendix 6 – Existing Approvals
- Appendix 7 – EUB Guide 23 Cross-Reference Table

Volume 3 - Consultant Reports

- CR #1 – Air
- CR #2 – C&R and Closure
- CR #3 – Fisheries
- CR #4 – Groundwater

Volume 4 - Consultant Reports

- CR #5a – Historical Resources
- CR #5b – Palaeontological Resources
- CR #6a – Human Health
- CR #6b – Ecological Health
- CR #6c – Odour
- CR #7 – Hydrology
- CR #8 – Noise
- CR #9 – Socio-economic
- CR #10 – Soils and Terrain

Volume 5 - Consultant Reports

- CR #11 – Surface Water
- CR #12 – TLU and TEK
- CR #13 – Vegetation
- CR #14 – Wildlife

- CR #15 – Biodiversity
- CR #16 – Greenhouse Gas

A.5 REGIONAL SETTING

The Joslyn Lease is located approximately 70 km north of Fort McMurray, to the west of the Athabasca River in the Boreal Mixedwood Ecoregion of the Northern Alberta Plains. The existing SAGD developments are located in the north-west corner of the Joslyn Lease (Figure A.1.0-3).

The area of the Joslyn North Mine Project encompasses portions of the Joslyn Lease which lie to the north of the Ells River and east of the SAGD area. Potential resources west of approximately the 447,000 m easting coordinate line (Twp. 94-96, Range 12) are considered to be part of DCEL in-situ resources and are excluded from the current application.

The community of Fort McKay is located approximately 9 km south-east of the Joslyn North Mine at its closest point.

There are three traplines on the Joslyn Lease:

- TPA # 965 occupies the majority of the lease;
- TPA # 1027 occupies the southern edge of the Joslyn lease; and
- TPA # 2457 occupies the north-east edge of the Joslyn lease.

These traplines are actively trapped and are important considerations in the development of the Joslyn Lease.

The following principal watercourses are located within the Joslyn Lease:

- the MacKay River runs through the south-east corner of the lease and is not located in the Principal Development Area (PDA) (described further in Section A.6.2);
- the Ells River runs from west to east through the centre of the lease and forms the southern boundary of the PDA; and
- Joslyn Creek runs through the PDA and will require a diversion to allow maximum bitumen recovery to occur in the Pit 1 area.

The following all weather access roads exist on the Joslyn Lease:

- a road constructed by CNRL runs from the south-east corner of the lease to CNRL Lease 18 immediately north of the Joslyn Lease. DCEL has an agreement with CNRL for the use of this road to access the Joslyn Lease. The Joslyn North Mine Project will require a few crossings of this road to allow access between the mine and the plant.
- a road from the abandoned DCEL Pilot Project and the Joslyn Lodge on the north-east corner of the Joslyn Lease westward across the CNRL road to the SAGD facilities. This road will require relocation to south of the current alignment for plant site and other infrastructure construction.

Details of land use are included in Section D.17 of this application.

A.6 DEVELOPMENT PLAN

The Joslyn North Mine Project will be developed in phases. This approach enables DCEL to exercise

efficient construction and adaptive management while incorporating technical, geological, stakeholder and environmental data continuously as it is acquired. The design includes the following principal development stages which are described in more detail in Section B.4:

- 2006 to mid 2010 (pre-production), that includes:
  - the pre-production external disposal area (for the management of overburden materials prior to the construction of the Joslyn Creek crossing);
  - Pond 1 (for the management of fluid fine tailings);
  - the plant site (for processing of the mined ore);
  - reclamation material stockpiles (for storage of topsoil and subsoil materials);
  - the Joslyn Creek diversion and associated works (to divert the Joslyn Creek around the North Mine development area);
  - installation of a raw water intake (supplying make-up water from the Athabasca River);
  - Class II and Class III landfills (for the management of non-hazardous solid waste); and
  - the mine opening cut in Pit 1.
- 2010 to 2014, that includes:
  - the progressive mining of Pit 1;
  - the development of Pond 1; and
  - progressive reclamation of Pond 1 dykes and external disposal area slopes.
- 2015 to 2019, that includes:
  - the progressive mining of Pit 1;
  - the ongoing reclamation of Pond 1 dykes;
  - the development of the external disposal area and reclamation of the external disposal area side-slopes;
  - the commencement of in-pit disposal of overburden;
  - interburden and filter cake into Pit 1;
  - construction of Pond 2 in-pit dykes;
  - transference of water from Pond 1 to Pond 2; and
  - start of in-pit disposal of fine fluid tailings into Pond 2.
- 2020 to 2024, that includes:
  - the progressive mining of Pit 1;
  - the ongoing in-pit disposal of overburden;
  - interburden and filter cake materials in-pit;
  - sand cap on Pond 1 in advance of reclamation;
  - the development of a freeze-thaw pond on top of the external disposal area to consolidate thickener underflow; and
  - the ongoing reclamation of the external disposal area side-slopes.
- 2025 to 2029, that includes:
  - the progressive mining of Pit 1;
  - the ongoing in-pit disposal of overburden;
  - interburden and filter cake materials in-pit;
  - the ongoing disposal of froth treatment tailings in Pond 2;
  - the reclamation of Pond 1;

  - on-going development of the freeze-thaw pond on top of the external disposal area; and
  - the ongoing reclamation of the external disposal area side-slopes.
- 2029 to 2036, that includes:
  - the progressive mining and completion of Pit 1;
  - the ongoing in-pit disposal of overburden;
  - interburden and filter cake materials in-pit;
  - the ongoing disposal of tailings in Pond 2; and
  - the ongoing operation of the freeze-thaw pond on top of the external disposal area.

DCEL expects that a phased approach to mine development will reduce the cost pressures that have been encountered with other large-scale oil sands projects. Through a feasible development plan, the smaller scale enables greater ability to control costs, incorporation of newer technologies, and more opportunity to engage the stakeholders.

Development of the Joslyn North Mine Project includes confirmation pilot tests for hydrocyclones for bitumen separation, contact cells for concentration of bitumen, and filtered tailings. These technologies have shown promising results in similar test applications or operations for oil sands processing. In the event that these pilot tests do not demonstrate sufficient confirmation of process viability to meet recovery, product specification or operational objectives, conventional technologies will be re-evaluated and incorporated into the design for the respective process step.

DCEL plans to produce and sell bitumen from the Joslyn operations. The warm bitumen product will be delivered via pipeline transport (45 km) to Enbridge Tar Island Terminal. This application does not include upgrading facilities.

A.6.1 Development Schedule

The first production phase will commence operation in the second quarter of 2010, followed by a second production train commencing operation in 2013. The first production train will have an average availability of 62% for the first year to reflect inefficiencies during the ramp up period. Availability is expected to increase to 75% in 2011 and will operate at this availability until the start of Phase 2 when it should achieve 83% availability.

The second train will commence in 2013, and will have a first year ramp up period similar to the first train. It is expected that by 2014, both trains will operate at 83% availability and operate for 365 days per year.

A.6.2 Principal Development Area

The Principal Development Area (PDA) for the Joslyn North Mine Project is shown on Figure A.1.0-4. The legal description is provided in Table A.6.2.1.

Table A.6.2.1 Principal Development Area Legal Description	
Township and Range West of 4th Meridian	**Section**
Twp. 95 Rge. 11	7; 8; 9; 16; 17; 18; 19; 20; 21; (LSD 12 to 14) - 22; 26 west of Athabasca; 27; 28; 29; 30; 31; 32; 33; 34; 35 west of Athabasca River
Twp. 96 Rge. 11	2 west of Athabasca River; 3; 4; 5; 6; 7, (LSD 1 to 4) - 7; (LSD 1 to 4) - 8; (LSD 1 to 4) - 9; (LSD 1 to 4) - 10
Twp. 95 Rge. 12	(LSD 1, 8, 9, 16) - 9; 10; 11; 12; 13; 14; 15; (LSD 1, 8, 9, 16) - 16; (LSD 1, 8, 9, 16) - 21; 22; 23; 24; 25; 26; 27; (LSD 1, 8, 9, 16) - 28; (LSD 1, 8, 9, 16) - 33; 34; 35; 36
Twp. 96 Rge. 12	1; 2; 3; (LSD 1, 8, 9, 16) - 4; (LSD 1) - 9; (LSD 1 to 4) - 10; (LSD 1 to 4) - 11; (LSD 1 to 4) - 12

A.7 SUMMARY OF STAKEHOLDER CONSULTATION

A.7.1 Stakeholder Strategy

The relationship between stakeholders and DCEL has grown and evolved over the last several years since DCEL first began its development of the Joslyn Lease. As a new industry participant in the oil sands industry, DCEL began its consultation with its stakeholders by asking them how best to engage them and their communities.

With input from stakeholders, Deer Creek Energy Ltd. (DCEL) has developed and implemented a Stakeholder Consultation Strategy to ensure that the interests, concerns and ideas of all relevant stakeholders are considered in the business decisions associated with the development of the Joslyn Lease.

The Strategy is intended to achieve the following objectives:

- to provide effective, and meaningful avenues of consultation to stakeholders that allow them to receive information and share their views about the Project so those views can be considered in Project planning and design; and
- to develop and enhance long-term relationships over time as the company grows.

The Company's consultation processes have been developed with input from stakeholders so that consultation is meaningful to them. For example, the Company follows stakeholder-designed approaches to open houses. It also provides written information for First Nation produced newsletters using a template provided by the First Nation Industry Relation Corporations (IRCs) and works within the framework and processes developed within each first nation community to facilitate review and understanding of company business activities and plans and identify, negotiate and resolve issues of importance to the communities and their members. Similarly, with non-aboriginal stakeholders, the company works within the processes that best suit the individual stakeholder to facilitate their understanding and seek resolution of issues arising from their understanding of DCEL's business plans.

Consistent with its Consultation Strategy, DCEL's Community Engagement Plan guides the Company's

consultation and stakeholder relations activities over the long term. The Community Engagement Plan includes the following Good Neighbour Principles:

1. *We work to engage our stakeholders in timely, transparent consultation processes designed to meet our needs and those of our stakeholders.*

2. *We provide our stakeholders with timely, accurate information to assist them in understanding our company, our projects, their impacts and the opportunities they provide.*

3. *We treat our stakeholders with respect and ask for the same in return.*

4. *We work hard to hear and understand the perspective, requests, recommendations and concerns of our stakeholders, consider them in light of our business requirements, and provide our stakeholders with feedback on how their input will be incorporated in our plans and operations.*

A.7.2 Stakeholder Activities

DCEL has been actively engaged with stakeholders for several years. Through three separate regulatory application processes associated with the SAGD development of the lease, DCEL has developed strong, ongoing consultative relationships with its stakeholders. The foundation established with these previous (and ongoing) regulatory processes has laid the groundwork for engaging these communities in connection with the Joslyn North Mine Project.

DCEL and its stakeholders have successfully identified stakeholder issues with existing, approved and currently proposed SAGD development by employing the open and transparent and respectful principals of consultation which they have jointly developed and agreed to. Those same principals and approaches are being used to advance discussions regarding the Joslyn North Mine Project.

DCEL is a member of each of the IRC's of the northern First Nation groups / communities, the community of Fort McKay, Mikisew Cree First Nation and Athabasca Chipewyan First Nation. Consultation with the communities is facilitated through the IRC. In addition to numerous meetings between DCEL staff and the respective IRC's and their consultants, DCEL has also met directly with the community leadership.

A.7.3 Fort McKay Community:

The community of Fort McKay is the home of the Fort McKay First Nation and Métis peoples and is the community closest to the Joslyn North Mine Project. DCEL has built a positive relationship with Fort McKay since the company began resource development activities on the Joslyn Lease in 1998. DCEL is a member and funder of the Fort McKay IRC. Senior executives of DCEL have met with Chief and Council to discuss matters of interest to both parties and has met with groups of traditional land users and Elders to discuss traditional land use matters related to this Project.

A.7.4 Mikisew Cree First Nation (MCFN):

In the last quarter of 2005, DCEL amended its IRC Agreement with MCFN to facilitate additional consultation between the company and the community. Senior executives of DCEL have met with MCFN's new Chief and Council. DCEL is awaiting direction of MCFN IRC as to how to design open house and consultation activities for its members.

A.7.5 Athabasca Chipewyan First Nation (ACFN):

An agreement is in place between ACFN IRC and DCEL to facilitate consultation between the company and the community. Senior executive of DCEL have met with ACFN's Chief and Council..

A.7.6 Métis Peoples:

DCEL has consulted with Local # 1935 and Métis Local #124 in Fort Chipewyan. These meetings, too, have involved the senior executive of DCEL. DCEL is currently organizing open houses for which special effort will be made to invite members of these Locals. The Company has also signed a Good Spirit Agreement with Métis Local #1935.

Métis Local #124 has expressed a concern that they lack the organization to operate effectively as an organized body and to consult with its stakeholders. To assist with these matters, DCEL has developed a report designed to identify the Local's organizational needs. The report, which has been submitted to the Local, can be used as a proposal to solicit support to solve these issues.

A.7.7 Achievements

Since beginning its business activities in the Regional Municipality of Wood Buffalo (RMWB), DCEL has been able to build successful, constructive relationships with its stakeholders. Some key successes include agreements with the Aboriginal Communities such as:

- agreement to become a member of the three northern IRC's;
- agreements with the northern aboriginal communities to address concerns relating to development of the SAGD operations on the Joslyn Lease;
- contracts and employment for aboriginal businesses and people;
- agreements for updating Traditional Ecological Knowledge (TEK) studies; and
- agreement for supporting local community initiatives.

DCEL is confident that this track record of successfully engaging local communities will continue with the Joslyn North Mine Project.

Through the consultation process, the following Project-specific issues have been identified:

- establishment of relationship/consultation agreements;
- support for and participation in the IRCs;
- local Aboriginal employment and training;
- local Aboriginal business opportunities;
- cultural retention / use of traditional lands;
- support of community initiatives;
- access management;
- trappers communications and compensation;
- localized traffic issues (Fort McKay);
- elder care (Fort McKay);
- air quality; and
- water management.

Consultations with regional stakeholders have also identified regional concerns, including:

- housing availability and housing prices;
- police, medical and emergency services;
- the cumulative social impacts of development on the region's human services including the impact of the shadow population; and
- timing and impact of construction work force on the local municipal infrastructure.

Mitigation strategies intended to address these issues are provided throughout the application and Summarized in Section A.9.

DCEL has also met with representatives of the EUB (Energy and Utilities Board), AENV (Alberta Environment) and CEAA (Canadian Environmental Assessment Agency) and interested federal regulatory agencies to review the regulatory approval process for the Project.

A.8 SUMMARY OF ENVIRONMENTAL, HISTORICAL RESOURCES AND SOCIO-ECONOMIC IMPACT ASSESSMENTS

The Joslyn North Mine Project Environmental Impact Assessment (EIA) and Cumulative Effects Assessment (CEA) have been prepared to comply with all relevant provincial and federal legislation. The EIA methodology and approach was selected to satisfy both Federal and Provincial requirements within the spirit of the Canada - Alberta Agreement on Environmental Assessment Cooperation.

The Joslyn North Mine Project Application was initiated with the main objective of providing a comprehensive and integrated technical and environmental document that would enable an expeditious review and approval process.

Valued Environmental Components (VECs)

The rigorous review of the proposed Joslyn North Mine Project identified a number of environmental aspects that were specific to the project. Each of the various disciplines that were investigated developed a list of Valued Environmental Components (VECs). VECs for the Project are those environmental aspects associated with the proposed project development, which have been identified as a concern by DCEL, the public, government and professional community. VECs consider both biological (i.e. ecosystem) and socio-economic attributes because of the broad-based definition of environmental effect as outlined both in federal and provincial legislation.

The EIA and CEA were focused on the effects that Project would have on the identified VECs, in combination with other activities in the region, over the projected life of the Project. Application of the selected methodology provided the scope for the EIA and CEA.

VECs were assessed using three scenarios:

- Baseline Case – includes existing operations plus all approved projects to mid 2005;
- Application Case – starts with the Baseline case and adds only the Joslyn North Mine Project; and
- Planned (CEA) Case – includes the combined Baseline Case, the Application Case and all planned, announced and reasonably foreseeable projects to mid 2005.

VECs have been identified within each of the following disciplines:

- Air Quality and Greenhouse Gas Management;
- C & R Plan;
- Fisheries Resource;
- Groundwater;
- Historical Resources;
- Human Health;
- Hydrology;
- Noise;
- Socio-economic;
- Soils;
- Surface Water Quality;
- Traditional Environmental Knowledge and Land Use;
- Vegetation and Wetlands;
- Wildlife;
- Biodiversity;
- Land and Resource Use;
- Visual Aesthetics; and
- Timber Resources.

Study Areas

The "footprint" of the Joslyn North Mine Project is 5400 ha. The local and regional study areas varied between different disciplines. All areas, however, addressed the aerial deposition of the emissions associated will all aspects of mine activities. The CEA for this project considered all the existing, approved and reasonably foreseeable projects. The study area boundaries defined within the scope of the EIA are shown on Figures C.6.2-1 and C.6.2-2. The projects considered in the CEA are discussed further in Section C (EIA Methodology) and are shown on Figure C.6.3-1. The reasonably foreseeable and announced projects have very little detail developed for inclusion into the cumulative effects assessment and therefore numerous assumptions were made. All these assumptions were very coarse in nature.

Based on the input received during DCEL's public involvement program, advice from regulatory agencies and the professionals working on the project, DCEL is confident that the approach used for the EIA and CEA for the Joslyn North Mine Project is comprehensive and accurately reflects the impacts of the Project. DCEL believes that the environmental effects assessment presented in the application provides the decision-makers with the necessary information to decide whether the Project is acceptable and in the public interest.

A summary of the EIA is provided in this section. The full EIA information is provided in Section D and the Consultant's Reports which are listed in each sub-section below.

A.8.1 Air Quality

The effects of the Joslyn North Mine Project on Air Quality as determined through the EIA and CEA are described in Section D.1 and Consultant Report #1 (CR #1).

The internal scoping exercise conducted by DCEL, based on stakeholder consultation, identified the

following probable key issues for air quality:

- impacts on air quality in the region;
- impacts of air emissions on deposition of acid-forming compounds and nitrogen and appropriate mitigation/monitoring;
- impacts of changes in air quality on human health; and
- production of greenhouse gases.

A number of potential VECs were identified during the issue scoping process. The VECs selected for further assessment include:

- NO2, SO2, PM2.5, VOCs, PAH;
- Potential Acid Input (PAI) and eutrophication (nitrogen deposition);
- GHG Emissions; and
- O3.

The dispersion model was applied to Baseline, Application and Planned Cases (CEA) scenarios with the assessment of project impacts based on comparison of the results of the first two.

All project related air quality impacts were considered to be local in extent, continuously occurring, long lasting, reversible after project operations ceases, and negative in direction.

The magnitude of most project only impacts was low. Exceptions include a more than 10% increase in CO, benzene and b(a)p concentrations at the nearest community (Fort McKay) (although concentrations were still much less than ambient guidelines), and deposition of nitrogen (increases greater than 5% in the area with more than 5 kg/ha/yr deposition, although applicable guidelines for Alberta have not yet been established).

Confidence ratings were generally high for project contribution predictions with the exception of deposition of PAI and nitrogen which are considered to have higher modelling uncertainties, notwithstanding a tendency for CALPUFF to predict conservatively.

Overall, air quality impacts relevant to the Joslyn North Mine Project were considered to be insignificant.

The cumulative effects assessment of air emissions for the Planned Case found that:

- the magnitude of cumulative regional impacts was generally considered to be high as increases in concentration or deposition were typically greater than 10%. Exceptions were concentrations of NO2;
- all effects were regional and lasted for the length of oil sands operations;
- confidence was generally lower for cumulative effects due to uncertainties in emissions from approved (but not built) and planned facilities; and
- all effects are assumed to be reversible (emissions cease when operations cease).

Significance for the Planned Case was assessed considering that regional emissions cease when Project operations cease, and that when guideline exceedances are predicted during full operations, they occur adjacent to mine pits where the general public does not have access. There may be lingering effects to sensitive ecosystems or receptors from acid or nitrogen deposition or long-term exposure that are addressed by appropriate environmental disciplines. However, after reclamation, regional residual effects

of emissions on air quality are considered not to be significant.

A.8.2 C & R Plan

DCEL has developed a Conservation and Reclamation and Closure Plan for the Joslyn North Mine Project. This plan is described in Section D.2 and Consultants Report #2.

The Conservation and Reclamation (C&R) Plan outlines the vision, goals, approach and detailed plans for reclaiming all areas disturbed through the life of this project. The primary reclamation goal of the Project is to return the lands to a capability that is equivalent to predevelopment conditions and consistent with end land use objectives.

The Conservation and Reclamation (C&R) and Closure Plan for the Joslyn North Mine Project have been prepared to:

- provide information about the planning process for the ongoing reclamation and the ultimate closure of the Joslyn North Mine Project; and,
- provide the goals and endpoints for the development and reclamation of the Joslyn North Mine Project.

DCEL's plan shows that reclaimed lands will feature regionally acceptable vegetation patterns that are capable of ecological succession. The reclamation program will result in lands that are maintenance-free, with self-sustaining ecosystems. Maintenance-free reclamation implies that additional activities will not be required, thus the ecological system will be self-sustaining. This does not mean that an unchanging state will be created, as landforms will experience normal successional processes during the evolution of the reclaimed landscapes. The landscape will evolve through seral states of initial revegetation to self-sustaining ecosystems consisting of mature vegetation communities typical of the region. Minimal management of the reclaimed lands is expected after the establishment of the initial ecosystem.

As part of its corporate policies DCEL will ensure that during the on-going reclamation and closure process:

- end land use objectives are developed in consultation with stakeholders, building on the existing consultation process;
- there will be an on-going consultation process with adjacent oil sands developers to ensure continuity of landforms and drainage systems across lease boundaries; and
- adaptive management of the C&R and Closure plan will be pursued through the incorporation of results of site specific research, regional research by Canadian Oil Sands Network for Research and Development (CONRAD) and regional management systems developed by the Cumulative Environmental Management Association (CEMA).

It is not anticipated that the closure land uses will be exactly the same as those existing prior to the development of the mine. The definition of equivalent land capability (from the Alberta Conservation and Reclamation Regulations) states *"equivalent land capability" means that the ability of the land to support various land uses after conservation and reclamation is similar to the ability that existed prior to an activity being conducted on the land, but that the individual land uses will not necessarily be identical.* DCEL will involve local stakeholders including the aboriginal communities in consultation in an effort to identify acceptable land use options and goals.

A.8.3 Fisheries Resources

The effects of the Joslyn North Mine Project on fisheries as determined through the EIA and CEA, are described in Section D.3 and Consultants Report #3.

Baseline fisheries information was collected during field investigations over a two year period (2003 to 2004). Baseline assessment focused on gathering sufficient data to determine the potential effects of the Project on watercourses on Lease #24 to provide spawning, rearing, feeding and over wintering opportunities for fish species. In addition to field investigations, existing literature was reviewed for historical information regarding the fish and fish habitat potential of watercourses on and adjacent to the Joslyn Lease.

Fisheries inventories and habitat assessments within the Baseline Study Area focused on segments of larger watercourses within the Joslyn Lease boundary as well as smaller tributary watercourses on the Lease. The Baseline Study Area included:

- Ells River and unnamed tributaries;
- Joslyn Creek and unnamed tributaries; and
- unnamed tributaries to the MacKay River.

In addition, baseline habitat inventory and fisheries investigations were conducted on the Athabasca River in a study section extending from approximately 200 m downstream to 3600 m upstream of the Ells River confluence.

The potential impacts to fish and fish habitat were assessed in relation to Valued Ecosystem Components (VECs) within the local study area (LSA) and regional study area (RSA). The rationale for the selection of fish species as VECs included consideration of priority rankings assigned by the CEMA Sustainable Ecosystems Working Group (SEWG), consideration of species identified as sentinel species for the Regional Aquatics Monitoring Program (RAMP), and consideration of "sensitive" status of species potentially present in the LSA and RSA as defined by Species at Risk legislation. In addition, certain VEC species were selected based on availability of species Habitat Suitability Index (HSI) models. These models were deemed key to determining significance of effects on fish species potentially affected by direct habitat impacts associated with the temporary diversion of Joslyn Creek. The VECs selected for the assessment include:

- Arctic grayling;
- Longnose sucker;
- Northern pike;
- Northern redbelly dace;
- Slimy sculpin;
- Walleye; and
- White Sucker.

Impacts on fisheries resources were assessed within the LSA, RSA and cumulative effects study area (CESA).

The project specific impacts related to direct physical disruption or loss of habitat were determined using project development plans and descriptions provided in Section B.8. The plans were examined to determine if the construction or location of facilities would directly impinge on or otherwise affect

physical habitat components in or immediately adjacent to the watercourses in the LSA.

Other project specific impacts related to surface water quality and quantity were addressed by others. The results were then assessed in terms of potential effects on fish habitat and populations, and ultimately in terms of potential effects on VECs.

Cumulative impacts were defined as those that were neither reversible nor mitigable, were medium to long term in duration and operated cumulatively with similar impacts resulting from existing or planned developments in the CESA.

Project-specific effects on fish and fish habitat will be fully mitigated by development of habitat enhancement plans to satisfy "No Net Loss Guiding Principle" of Fisheries and Oceans Canada. As such, there will be no residual impacts to fish and fish habitat associated with direct Project effects. DCEL is proposing to build Joslyn Lake to assist in replacing some of the stream habitat that will be lost in Joslyn Creek when the diversion is constructed. At mine closure, Joslyn Creek will be re-constructed to near its original alignment and will provide equivalent fish habitat to pre-disturbance conditions.

Effects on fish and fish habitat relating to changes in flow regime were considered insignificant and no residual effects were identified. No effects are expected to endure once the Joslyn Creek diversion is decommissioned and the Joslyn North Mine Project is reclaimed.

Residual effects on fish and fish habitat relating to water quality are considered insignificant given that water quality effects can be mitigated by surface water management (Section A.8.11).

A.8.4 Groundwater

The effects of the Joslyn North Mine Project on groundwater as determined through the EIA and CEA are described in Section D.4 and Consultants Report #4.

As a result of the extensive ongoing investigations, DCEL's understanding of the lease hydrogeology and potential impacts of operations continues to grow. This application builds on the knowledge gained from the three previous submissions which were rigorously reviewed to ensure the groundwater resources were understood.

During the scoping process for the Joslyn North Mine Project the following issues were identified:

- effect of removal of surficial aquifer on surface water and ecological systems;
- effect of basal water sands (BWS) depressurization on surface water flows;
- effect of BWS depressurization on shallow groundwater;
- effect of BWS depressurization on other oil sands operations;
- impacts on the Athabasca and Ells Rivers due to injection of water from BWS depressurization;
- potential for contamination of groundwater due to mining operations;
- potential for dissolution of salts and karst formations; and
- interaction between BWS and end pit lakes.

The surficial aquifer in the north-east portion of the Project area will be completely removed by mining. There will be some cumulative effect with the Horizon Project to the north as they will also remove a portion of the aquifer. The aquifer is relatively localized and apparently collects water from the adjacent muskeg. The aquifer thins to the south and is unlikely to contribute to flows in the lower portion of Joslyn Creek. While there will be irreversible impact, the overall impact is judged to be insignificant as

there are no adjacent users and little contribution to Joslyn Creek.

Dewatering of the overburden within the pit is not expected to extend outward to have influence on watercourses outside the footprint because of the low hydraulic conductivity of the glacial till. Excavation and dewatering will therefore have an insignificant impact outside of the operations footprint. There is no expectation of any cumulative effect with any other project in the area.

There is no expectation that planned activities in the BWS will have any effect on the Ells River.

Depressurization of the BWS and re-injection of water may have an effect on the movement of water in and out of the Athabasca River. The confidence that this will occur is rated as moderate. The extent is regional as it could affect flows or water chemistry downstream. It would last for the duration of the depressurization and would be continuous over that time. There are no residual effects as the impact ends with injection or withdrawal.

On a cumulative basis, the increase in dissolved materials caused by the injection from 2010 to 2025 is not a measurable effect and will end in 2025 when injection ceases. The residual and cumulative effects are insignificant.

The potential for contamination of groundwater in the area is low. This is due to the glacial tills overlying oil sands having a very low hydraulic conductivity. The net effect of these conditions is that groundwater contamination is judged to be insignificant at the project and residual levels.

There is no interaction at the groundwater level of this Project with other users and therefore no issues with cumulative effects.

The basal groundwater will seep into the end pit lakes when the depressurization activities are discontinued. The effects on water quality will be minor as DCEL plans to fill the lake with water from the Athabasca River to equalize the hydraulic head of the basal groundwater and minimize the seepage.

A.8.5 Historical and Palaeontological Resources

The effects of the Joslyn North Mine Project on historical and palaeontological resources as determined through the EIA and CEA are described in Section D.5 and Consultants Report #5.

The primary objectives of the HRIA were to:

- inventory historical resource sites within the proposed mine development area;
- evaluate the significance of the individual sites identified;
- forecast the nature and magnitude of site specific impacts;
- design and implement an acceptable site specific mitigation program which would significantly reduce or eliminate adverse impacts to identified sites prior to construction; and
- assess the cumulative effects of the Project on the archaeological site database in the RSA.

The scope of work undertaken for the HRIA included:

- record review;
- ground reconnaissance;
- site evaluation; and
- impact assessment.

The primary objective of the palaeontological assessment was to predict where the Joslyn North Mine Project would disturb strata with high palaeontological potential. The scope of work for the palaeontological assessment included:

- a field assessment; and
- an impact assessment.

The field assessment for the HRIA involved visual inspection and shovel testing, focusing on areas of moderate to high potential for archaeological resources. A total of 15,563 shovel tests were conducted within the proposed Joslyn North Mine Project area. In addition to shovel tests, exposures were examined for the presence of cultural remains.

The field assessment for the palaeontological resources included examining three outcrop areas including MacKay River, Ells River and Joslyn Creek near the confluence with the Ells River. The results from the field assessment were extrapolated to the lease areas in general. Isopach maps of the surficial geology, Clearwater Formation and depth to the Wabiskaw member were reviewed against development plans. This review was used to predict where the Joslyn North Mine Project would disturb strata with high palaeontological potential.

During the HRIA, a total of 27 new precontact period archaeological sites were identified within the mine footprint. Of these, seven sites have already been mitigated by the collection of artifacts, photography and site documentation. Further investigation is required on the remaining 20 sites. After mitigation in the context of the regional level, the effect of the proposed Joslyn North Mine Project will not be significant. Relative to the total number of sites recorded, the number of sites avoided, the site types represented, and the positive effects that site inventory and mitigation contribute to the historical resources database and the projected archaeological potential in the RSA, there will be no significant environmental effect on historical resources.

Portions of the Joslyn North Mine Project will disturb bedrock of the Wabiskaw Member of the Clearwater Formation. This horizon potentially contains significant Cretaceous marine reptile fossils and impacts to significant palaeontological resources might occur. DCEL will ensure that any new development is reviewed by a palaeontologist and that operators and/or mining geologists are educated on how to deal with palaeontological resources if encountered.

A.8.6 Human Health

The effects of the Joslyn North Mine Project on human health as determined through the EIA and CEA are described in Section D.6 and Consultants Report #6a. A Screening Level Ecological Risk Assessment (SLERA) (CR #6b) and an Odour Assessment (CR #6c) were completed in conjunction with the Human Health Risk Assessment (HHRA).

The HHRA focused on direct and indirect health risks associated with air emissions in the oil sands RSA and liquid effluents in the LSA from the mine developments. Health risks from air emissions were characterized by comparing modelled short- and long-term air concentrations with regulatory guidelines considered protective of the most sensitive individuals. Health risks from the consumption of fish and other country foods were characterized by a detailed multi-media exposure model used to predict long-term exposures from persistent and/or accumulative chemicals. Estimated long-term exposures were compared to recognized exposure limits that are considered protective for sensitive individuals.

The Project's potential impacts, in terms of incremental changes to air quality and health risks, were assessed by comparing the Application Case to the Baseline Case. Cumulative health risks were assessed

by comparing the Planned Case to the Baseline Case.

The HHRA examined both acute (short-term) and chronic (long-term) health risks associated with the Project, and used conservative assumptions in its risk characterization.

The predicted short-term air concentrations met the health-based guidelines for all of the chemicals of concern with the exception of benzene. The predicted one-hour benzene concentrations at the Mannix ambient air monitoring station exceeded Alberta Environments ambient air quality guideline for Baseline, Application and CEA development case. The predicted exceedance was due to conservative assumptions incorporated into the air quality assessment and toxicity assessment for benzene. The differences in acute health risks between the Baseline and Application cases were negligible, signifying the low overall contribution of the Project to short-term health risks in the region.

The predicted chronic health risks were very low for most chemicals of potential concern (COPCs) and below acceptable thresholds for all chemicals of concern with the exception of benzo(a)pyrene (WMM) for Fort McMurray residents and benzo(a)pyrene (IPM) for Fort McKay residents. As was the case for the acute health risks, there were no appreciable differences in the chronic health risks between the Baseline and Application cases. This indicates that the Project's COPC emissions are not expected to increase long-term risks to public health in the area.

The results of the SLERA indicate that adverse effects to wildlife populations are not expected based on estimated wildlife exposures to predicted maximum acute and chronic air concentrations.

The Project's contribution to odour in the area was predicted to be minimal to undetectable, as indicated by the similar predicted maximum air concentrations for the Baseline and Application Cases. For the odour assessment, the predicted short-term peak air concentrations were compared to established average odour thresholds, and were less in all instances.

A.8.7 Hydrology

The effects of the Joslyn North Mine Project on hydrology as determined through the EIA and CEA are described in Section D.7 and Consultants Report #7.

The Principal Development Area is transected by three major watercourses – the Ells River and two major tributaries of the Ells - Joslyn Creek and Tributary 4. A number of other smaller tributaries also cross the development, although many of these water courses are ephemeral and/or simply store surface water without actually conveying it to the major streams. The Joslyn North Mine Project footprint lies almost entirely within the Ells River drainage basin, of which Joslyn Creek is a major tributary.

The potential effects of the Project on valued environmental components (VECs) include the following.

- changes to surface runoff characteristics due to project disturbances;
- changes to stream flows due to project disturbances;
- changes in channel morphology and sediment concentrations due to changes in stream flow and channel disturbances; and
- effect of water withdrawals on minimum flows in the Athabasca River.

The impacts of surface disturbances caused by the development of the Project on the hydrology in the area were investigated and found to be insignificant. The surface disturbances associated with the project will produce some minor changes in runoff volumes and peak flows but these changes are expected to be virtually undetectable in both the local and regional study area. Runoff from the disturbed areas will be

contained within the perimeter of the site and used for process water. Surface water that is not "process affected" will be diverted around the mining areas to polishing ponds, prior to release.

The diversion of Joslyn Creek will eliminate the lower portion of Joslyn Creek and will increase flows in Tributary 4 and in the Ells River between Tributary 4 and Joslyn Creek. Tributary 4 can handle the increase in flows up to 2 m^3/sec. Extreme flows beyond that will be diverted to an overflow channel that will convey water to the Ells River via a spillway and stilling basin. This system is expected to protect the integrity of both Tributary 4 and the Ells River. While these effects are locally significant, they can be mitigated by employing sound engineering practices and ultimately, returning the flows to Joslyn Creek at the completion of mining. The total flows into the Athabasca River will not be affected significantly. After reclamation, the flows in the Ells River and Tributary 4 will be returned to baseline conditions but flows in the reclaimed portion of Joslyn Creek will be altered due to the effects of two end pit lakes. Extreme high flows will be slightly reduced and extreme low flows will occur less frequently.

The flow increases in Tributary 4 will be managed so that no major erosion occurs due to the diversion. Increases in sediment concentrations due to the project disturbances are expected to be insignificant. The design and construction of stream crossings, in-stream structures and channel modifications will be carried out in a way so as to minimize the in-stream disturbances.

Project water requirements will be met by water withdrawals from the Athabasca River. The average withdrawal rate over the year will be 0.35 m^3/s. The total annual water volume required for the project will be 11,000,000 m^3, which is less than 0.05% of the median annual flow volume in the Athabasca River. The cumulative withdrawal rates, including the existing and proposed water users, will be as much as 19% of the minimum monthly 7Q10 flow which could be considered significant if the full amount were taken out of the river at that time. Through CEMA, instream flow needs will be established and will be adhered to by industry, including DCEL. Through this mechanism, all companies will need to assess how their operations would function when withdrawal restrictions are imposed. The cumulative effects with the instream flow needs (IFN) process implemented will ensure sufficient flow in river and will then be deemed insignificant. A raw water storage pond will be constructed with a capacity of approximately 1.2 million m^3 of storage. DCEL will use this water during periods of extreme low flows in the Athabasca River.

A.8.8 Noise

The effects of the Joslyn North Mine Project on noise as determined through the EIA and CEA are described in Section D.8 and Consultants Report #8.

The initial scoping for the Joslyn North Mine Project identified two main receptors that could be affected by noise generated by the project:

- trapper's cabin NW 9-95-11-W4M; and
- community of Fort McKay.

The EUB Directive specifies allowable sound levels for energy industry facilities at designated receptor points including residences. Baseline data collection for a noise assessment determines the existing or background noise levels in the area. From this, Permissible Sound Levels are developed which are factored into the EUB noise guidelines to determine compliance. The permissible sound level at the trapper's cabin is 50.0 dBA L_{eq} in the daytime and 40.0 dBA L_{eq} at night. At Fort McKay the permissible sound levels are 53.0 dBA L_{eq} in the daytime and 43.0 dBA L_{eq} at night.

The results indicate that the allowable daytime sound level limit would be met at both receiver locations.

The results also indicate that the night time allowable sound level limit is met until 2014 at the trapper's cabin and through the Project life at Fort McKay. Sometime between years 2014 and 2019 the sound level of the Project is predicted to exceed the allowable night time sound level at the trapper's cabin through to the end of the Project. This is due primarily to the close proximity of mobile equipment working on external disposal area C (EDA C).

The EUB Directive requires that companies proposing facilities where there is already an energy industry presence need to consider the overall contribution of all energy industry facilities and ensure that the total energy industry sound level does not exceed the allowable levels. As CNRL is currently developing their Horizon Project, which borders the northern edge of the Joslyn Lease, a review is warranted. Cumulatively, the effects of CNRL will be less that DCEL's on the two receptors, primarily due to the distance from CNRL to the receptors.

DCEL will initiate a noise monitoring program in consultation with the community of Fort McKay and will engage in discussions with the owner of the Trapper cabin to conduct a noise survey or to determine the appropriate noise mitigation measures.

A.8.9 Socio-Economic

The socio-economic effects of the Joslyn North Mine Project as determined through the EIA and CEA are described in Section D.9 and Consultants Report #9.

This socio-economic assessment focuses upon issues that are perceived to be important to both stakeholders and regulators. In the case of the Joslyn North Mine Project, these are listed below:

- employment & training;
- contract opportunities;
- onsite accommodation;
- onsite emergency services;
- traplines;
- relationships with Fort McKay;
- transportation;
- effects upon RMWB; and
- cumulative effects.

The majority of expenditures on construction (92%) will occur in Alberta and the total Canadian content is estimated at 94%. When the co-generation electrical/steam plant and bitumen pipeline are added, the total capital cost is estimated at $1.9 billion.

Construction

The majority of the construction workers will travel to the site by air (90%), from areas outside of the RMWB, to a regional airstrip. They will then be transported by bus to the Joslyn Lease. A smaller portion are expected to reside in the region and will be transported by bus from Fort McKay and Fort McMurray (daily). Construction shifts will operate on a 14 days on / 7 days off schedule. On site work will be conducted 10 hours each day. Two construction camps will be provided to house 90% of the workforce on site. The total camp capacity will be 2,000 people and will be shared between a new camp located adjacent to the mine administration/maintenance shop complex and the existing Joslyn Creek Lodge. A total of 4.2 million person-hours of construction will be required on site over seven years.

An additional 150 construction workers will be required during the construction of the Phase 2 co-generation plant.

Operations

The first Phase of production, operating at 50,000 bbls/day is scheduled to commence production in 2010 and the second Phase of equal size in 2013. Phase 1 will require 241 direct employees and 267 contract workers. Phase 2 will require and additional 96 direct employees and 144 contract workers.

The mine and extraction plant will operate 24 hours a day, 365 days a year. Supervisors, shift support staff, and operating personnel will work a 7 days on / 7 days off with 12-hour shifts on a rotational basis. General administrative staff will work five days per week, eight hours per day. It is expected that the general administrative staff (84) on the 5 days per week schedule will commute daily from Fort McKay and Fort McMurray. During operations, it is estimated that initially 90% of the operating workforce will originate outside the RMWB. These people will be mostly shift staff. The balance will commute daily from Fort McKay and Fort McMurray and will be mostly administrative staff.

Shift staff on four crews will initially be flown in to the area on a rotational basis and housed in an operating staff work camp. As the operation matures, operating staff will be given a choice of living within or outside the RMWB. Bussing would be provided from the local air strip, Fort McKay, or Fort McMurray during shift changes every 7 days. The operations work camp will be initially sized for a capacity of 700 people and be located on the west side of the lease near the SAGD operations work camp.

During Phase 2, a co-generation plant will be constructed by a third party to produce power and steam fro an 85 MW facility. An additional 10 jobs associated with this facility will be created during operations.

Project Benefits

Property taxes on the Joslyn Lease are paid each year to the RMWB. These property taxes are payable when facilities become operational. It is estimated that property taxes on the $2 billion Joslyn North Mine Project will be about $8 million / year. This is only a rough estimate since the actual property tax payable will depend upon the assessed value of the facility and associated infrastructure plus the mill rate levied by RMWB in any given year.

The estimated total project costs are $11 billion over the life of the Project. This includes $2 billion to construct Phase 1 and 2 plants, sustaining capital, and mining over the life of the project. The amount of royalties and taxes paid to the Alberta and Federal governments is estimated at $7.5 billion.

The socio-economic benefits of the project include:

- employment and contract opportunities during construction and operation;
- contribution to the property tax base of RMWB;
- DCEL's newly created Community Engagement Plan;
- expenditures on equipment and materials during construction and 27 years of operations;
- extraction, processing, and transportation of bitumen from the Athabasca Oil Sands for further processing into Synthetic Crude Oil; and
- payment of federal and provincial taxes and royalties.

A.8.10 Soils and Terrain

The effects of the Joslyn North Mine Project on soil and terrain as determined through the EIA and CEA

are described in Section D.10 and Consultants Report #10.

In order to evaluate the effects of mining on the soil and terrain in the area the following activities were undertaken:

- map the baseline soil resources of the Joslyn Lease, with emphasis on the LSA covered by the proposed Joslyn North Mine development, and compile a soil map of the RSA;
- test and evaluate the overburden from the Pit 1 area of the mine;
- review mining, operating and closure plans;
- identify valued environmental components (VEC's);
- develop an initial assessment of environmental effects (negative or positive) to the soil and terrain;
- develop the soil salvage and reclamation plan to mitigate adverse effects where possible; and
- evaluate the significance of any residual and cumulative adverse effects to the soil and terrain.

A review of concerns raised by communities, stakeholders, regulators, and technical experts, as well as consultations with specialists preparing EIAs for other environmental components, were used to develop a set of VECs relating to the effects of the Project activities on the soils resource. VECs selected for the soils resources were:

- the soil resources includes topsoil and peat material;
- land capability for preferred, future land uses and soil landscape diversity; and
- overburden (spoil) characteristics function to support water quality and normal trace element concentrations.

Proper construction and reclamation practices will ensure that the impacts on soil resources due to disturbance of the soil profile are insignificant. Approximately 12.7 million m^3 of soil material (both upland and peat:mineral blend) will be salvaged and replaced over the life of the Project with one half this volume being directly placed on recontoured areas. Although newly created landscapes and soils will have different properties than pre-mine landscapes and soil profiles they will be self sustaining and able to support a variety of end land uses. Land capability after reclamation is expected to be significantly improved over pre-disturbance conditions. Even with the conversion of some terrestrial land to lakes, the amount of soil landscapes with Capability Class 1 and 2 is projected to increase from 1,500 ha to approximately 3,600 ha. There will be considerable diversity within Class 1 and 2 soil landscapes in terms of slope, aspect and soil profiles. The amount of land with low capability (Class 4 and 5) is predicted to be much reduced compared to baseline conditions.

Baseline results in the RSA, indicate that soils representing 195,635 ha have received acid inputs exceeding critical load limits prior to project development. The project results indicate that the critical load limit will be exceeded on an additional 14,484 ha (7%). The residual effect is partly reversible in the long-term. Similarly, the potential cumulative contribution of all known current and future projects is an increase of approximately 143,000 ha (73%) above baseline conditions. The magnitude varies according to soil sensitivity and overall is considered moderate for the Application Case and moderate to high for the cumulative case.

While the cumulative effects of oil sands regional development for soil acidification is predicted to be significant, the confidence rating in this determination is low. The key component of this prediction is generated from the predicted air emission estimates from each project. Individually, these are extremely conservative, and when they are all combined likely over estimate the air emissions. Future air

monitoring will determine the accuracy of these predictions. DCEL is a member of WBEA and will participate in the air monitoring programs. The other factor of uncertainty comes from the predictions of effects of acidification on the different soils types. While the theory is well known, the actual effects in this region are not. DCEL is a member of the CEMA which has an initiative to monitor the emissions and deposition, through the NOx/SOx working group to validate the assumptions. If the monitoring information concludes that environmental effects are occurring, industry in the region will need to adjust their operating practices accordingly.

A.8.11 Surface Water Quality

The effects of the Joslyn North Mine project on surface water quality as determined through the EIA and CEA are described in Section D.11 and Consultants Report #11.

Water quality, sediment quality and benthic invertebrate community information was used to develop the environmental setting and the baseline conditions. This information was collected over the past few years and formed part of previous applications as well. Data gathered through the RAMP program was also used to develop the assessment of baseline conditions.

The key issues considered in the assessment are water quality, sediment quality, and benthic invertebrate communities in five drainage areas:

- Tributary 4, including that part of Joslyn Creek that is scheduled to drain into Tributary 4 with the construction and operation of the Joslyn Creek diversion dam, Joslyn Lake, and the channel linking Joslyn Lake and Tributary 4;
- Joslyn Creek from the western edge of the PDA to its confluence with the Ells River;
- Middle Ells River from the western edge of the PDA to the Fort McKay Water Supply Intake;
- Lower Ells River, from the Fort McKay Water Supply Intake to its confluence with the Athabasca River; and
- The Athabasca River from Daphne Island (located immediately opposite the Ells River mouth) to the Athabasca River Delta (ARD).

The focus of the assessment was to determine if there were potential changes to water quality, sediment quality, surface water acidification and benthic invertebrate communities. The various stages of the Project that were included in the assessment included:

- construction;
- operation;
- reclamation; and
- closure.

Tributary 4

Water quality – it was assumed that some minor volumes of tailings water would seep out of Pond 1 into Joslyn Creek. The predictions indicated that minor increases in some parameters of the surface water quality guidelines would be increased as a result. These predicted increases were compared to the naturally occurring exceedances and relative increase in concentration. The conclusions were there would be no statistically significant changes in water quality. Collection ditches will be constructed around Pond 1 which is also located on top of the Clearwater Formation meaning that seepage is unlikely. All water quality variables are predicted to return to baseline Case conditions in the far future.

Sediment quality – some initial flushing of sediment is anticipated as a result of the Joslyn Creek Diversion. A polishing pond will be created along the diversion to remove the additional sediment. Additional sediment accumulations are not expected as a result of the diversion. The overall residual impact is predicted to be insignificant for sediment quality in Tributary 4 at all stages and phases of the Project with a high degree of probability of impact occurrence.

All sediment quality measurement endpoints in Tributary 4 are predicted to return to Baseline Case conditions in the far future.

Benthic invertebrates – there will be an increase in erosional habitat created with the diversion of the Joslyn Creek towards Tributary 4. There will also be an increase in depositional habitat. It is expected that the recovery of benthic communities will occur rapidly after construction is complete thus mitigating the effects of the Project.

All benthic invertebrate community variables in Tributary 4 are designated as returning to Baseline Case conditions in the Far Future.

Joslyn Creek

Water quality – the flows in Joslyn Creek will cease when the diversion is constructed and diverted to Tributary 4. This will last until the completion of mining when the creek will be reroute back to its original outlet to the Ells River. During the period of the diversion, all water will flow to Tributary 4 and the overall effect on water quality is predicted to be insignificant.

Sediment quality – the existing lower Joslyn Creek drainage will cease to exist with the operation of the Joslyn Creek diversion and there will be no effects on sediment quality. When the creek is rerouted at closure, there is not expected to be any significant effects.

Overall residual impacts on sediment quality in the lower Joslyn Creek are predicted to be insignificant for all stages of the Project.

Benthic invertebrates – the available habitat for benthic communities will be mitigated with construction of additional erosional and depositional habitat during the construction and operation of the Joslyn Creek diversion. When the creek is rerouted at closure, there will be an increase in erosional habitat due to increased stream gradient (between the West Lake and East Lake) as well as depositional habitat created in the two end pit lakes. This is predicted to have a positive effect on the benthic communities.

Middle Ells River

Water quality – there is predicted to be a slight increase in the amount of sedimentation in the middle Ells River reach as a result of the Joslyn Creek diversion, during extreme precipitation and snow melt events. This reach of the river has a higher slope gradient and contains more erosional habitat, so the accumulation of sediment is reduced.

The overall residual impacts for all water quality variables in the middle Ells River during the operation of the Joslyn Creek diversion are predicted to be insignificant.

All water quality variables are predicted to return to Baseline Case conditions in the far future.

Sediment quality – the overall residual impacts are predicted to be insignificant for sediment quality in the middle Ells River for all stages of Project development.

Benthic invertebrates – the overall residual impacts are predicted to be insignificant on benthic invertebrate communities in the middle Ells River for all stages of the Project.

Lower Ells River

Water quality – with the use of polishing ponds around the Project area, there is not expected to be an increase in sedimentation to the lower Ells River as a result of the mining operations. Seepage is expected to be collected and used in the process. At closure, two end pit lakes will be created in the lower Joslyn Creek drainage and will drain into the lower Ells River. The water quality in the lakes is predicted to resemble the quality in Joslyn Creek and will not have an effect on the receiving waters. DCEL will monitor the quality of the water in the lakes as filling is occurring and, if there is a concern with the quality measures will be taken to prevent discharge until it is mitigated.

The overall residual impacts for all water quality variables in the lower Ells River during the operation of the Joslyn Creek diversion and in the far future are predicted to be insignificant.

Sediment quality – the overall residual sediment quality impacts are predicted to be insignificant in the lower Ells River at all stages of Project development.

Benthic invertebrates – the overall residual benthic invertebrate community impacts are predicted to be insignificant in the lower Ells River at all stages of the Project development.

Athabasca River

Water quality – based on raw water intake design characteristics and associated mitigation activities, the residual impacts on water quality in the Athabasca River (between of Daphne Island and the Ells River mouth) are predicted to be insignificant for all phases of the Project.

Sediment quality – the residual impacts on sediment quality in the Athabasca River (between of Daphne Island and the Ells River mouth) are predicted to be insignificant for all phases of the Project.

Benthic invertebrates – the residual impacts on water quality in the Athabasca River (between of Daphne Island and the Ells River mouth) are predicted to be insignificant for all phases of the Project.

Regional Study Area

Water quality – the residual impacts on water quality in the RSA are predicted to be insignificant for all phases of the Project.

Sediment quality – the residual impacts on sediment quality in the RSA are predicted to be insignificant for all phases of the Project.

Benthic invertebrates – the residual impacts on water quality in the RSA are predicted to be insignificant for all phases of the Project.

Acidification

The assessment of potential impacts to RAMP lakes within the AQRSA indicates that acidifying emissions from the Joslyn North Mine Project could potentially contribute to acidification in regional lakes, particularly those currently experiencing acid deposition levels above or near their critical loads. However, predicted increases in regional emissions and predicted PAI due to the Joslyn North Mine Project are small and are unlikely to contribute to decreases in lake pH.

The magnitude of the impact for acidification of surface waters (lakes) is designated as negligible because, while PAI is predicted to increase throughout the AQRSA in the Application Case, no additional lakes are predicted to have a PAI greater than their CL. The magnitude of the impact for episodic acidification of rivers and streams is designated as negligible because of the very small incremental area expected to receive a PAI of greater than 0.25 keq H^+/ha/yr in the Application Case as compared to the Baseline Case.

A.8.12 Traditional Land Use

The effects of the Joslyn North Mine Project on traditional land use as determined through the EIA and CEA are described in Section D.12 and Consultants Report #12.

The Traditional Land Use report contains information obtained through a background literature review and direct discussions with the community of Fort McKay in July 2005 regarding the proposed Project, at which time the proposed mine footprint was presented to the community. A group meeting and individual interviews were held at the Fort McKay Elders' Center. Interviews were led by a traditional land use facilitator and an assistant along with a Fort McKay IRC representative.

Before the traditional land use assessment was completed, summary results from the interviews were presented to Fort McKay participants in a group meeting at the Fort McKay Elders' Centre for review and verification. Changes and suggestions provided by participants were incorporated into the draft report. The final draft report was then submitted to the Fort McKay IRC for their review and acceptance.

A traditional ecological knowledge (TEK) workshop was held with the DCEL EIA team to discuss the TEK collected. This information was incorporated into the EIA.

The majority of concerns expressed by the Fort McKay community center around the level of development in the Fort McMurray area. The general consensus among community members is that any additional development would add to the problems they have seen arise from an ever increasing number of projects surrounding Fort McKay.

Some of the impacts associated specifically with the Joslyn North Mine include:

- concern from some members of the community that the proposed Project is simply 'too close' to the community of Fort McKay. Residents do not want the Joslyn Lease area further disturbed, are opposed to proposed mine development and do not want it to proceed;
- impacts on Ells River. Some members of the community are finding many of their old camping spots overrun, crowded or inaccessible and are concerned about water quality in the Ells River;
- disturbance of an area of Jack pine within the mine footprint. Fort McKay community members value this area not only for pursuing traditional activities but also for its aesthetic value;
- disruption of the traditional Moose Lake trail passes through the area of development; and
- disruption of two traplines will be disrupted by mine activities.

Traditional users feel that they should have a much more active role in resource management in the region. Their traditional knowledge can provide invaluable insight for planning and decision-making.

A.8.13 Vegetation and Wetlands

The effects of the Joslyn North Mine Project on vegetation and wetlands as determined through the EIA and CEA are described in Section D.13 and Consultants Report #13.

The vegetation and wetland VECs and the impact issues selected for detailed assessment follow the Terms of Reference (TOR) of Alberta Environment (AENV 2005). These indicators and impacts also address the issues identified through public consultation and stakeholder interviews, the Regional Sustainable Development Strategy (RSDS) for the Athabasca oil sands area (AENV 1999), and reviews of recent relevant oil sands mine environmental impact assessments (EIAs).

The vegetation and wetland VECs selected for detailed assessment are:

- old growth forests;
- ecosite phases of restricted distribution;
- AWI wetland classes of restricted distribution;
- ecosite phases supporting traditional use plants;
- jack pine communities;
- plant communities of conservation concern;
- rare plants;
- rare plant potential;
- vegetation communities sensitive to Potential Acid Input (PAI); and,
- vegetation communities sensitive to nitrogen deposition.

An ecological land survey (ELC) and wetlands inventory were conducted for the Joslyn North Mine Project. A total of 24 ecosite phases occur in the LSA. Naturally vegetated ecosite phases cover 88% of the LSA. The most common ecosite phase is d1, which covers approximately 20% of the LSA. The next most abundant ecosite phase is d2, which comprises 12% of the LSA. Anthropogenic / disturbed areas including industrial sites, roads, recent clear cuts, pipelines and wellsites cover 10% of the LSA. Water (flooded areas, lakes and ponds, and rivers) comprises approximately 2% of the LSA.

According to the ecosite phase classification wetlands and peatlands occupy approximately 33% of the LSA. Bogs comprise 15%; poor fens comprise 8%; and rich fens comprise 10% of the LSA. According to the AWI classification, wetlands and peatlands also occupy approximately 33% of the LSA. A total of 19 AWI wetland classes were identified. Approximately 16% of the wetlands in the LSA are classified as bogs. Fens occupy 12% of the LSA, swamps comprise 4% of the LSA and marshes and shallow open water together comprise 1% of the LSA.

There are four types of old growth stands consisting of nine different ecosite phases in the LSA. Together, these ecosite phases compose approximately 4% of the LSA. Deciduous old growth forest comprises approximately 1% of the LSA; white spruce old growth forest comprises 0.1% of the LSA; mixedwood old growth forests comprises approximately 2% of the LSA; and pine old growth forest comprises 0.5% of the LSA. No old growth black spruce or tamarack stands occur in the LSA.

Seven ecosite phases are considered to be of restricted distribution occupying less than one percent each of the LSA. In total, these ecosite phases comprise 4% of the LSA. It should be noted that certain ecosite phases of restricted distribution at a local scale are not restricted on a regional scale.

Eight wetland classes are considered to be of restricted distribution occupying less than 1% each of the

LSA. Four of these are bog classes, one is fen, one is marsh, one is swamp, and one is shallow open water. Together they comprise approximately 3% of the LSA. It should be noted wetland classes of restricted distribution on the local scale may not necessarily be restricted on a regional scale.

In the LSA, ecosite phases considered to have moderate to high potential to support these traditional use plants comprise 72% of the LSA. Ecosite phases with the potential to support low-bush cranberries and bog cranberries comprise the majority of this area. Another area of traditional use includes the Jackpine stand in the northeast corner of the DCEL lease.

Several rare plants have been identified on the Joslyn Lease from the numerous surveys conducted. In total, five rare vascular species and five rare non-vascular species were found during these surveys. Of these species, four rare vascular species at eight different locations and four rare non-vascular species at seven different locations were identified in the LSA.

The LSA for this project focussed on the project footprint. To ensure there was some flexibility in the plan, a 500 m buffer was also added around the entire footprint. In this assessment, over half of the LSA (approximately 52%) will be disturbed by mining activities. As such, the effects on the LSA are expected to be extreme and significant at the application stage for vegetation. Tree clearing and mining activities associated with the Joslyn North Mine Project will have a significant effect on VECs within the project footprint, likely for the duration of the Project. Impacts to the following VECs at the local scale (project footprint) and during mine operations (Application Case) are deemed significant:

- Old Growth Forests;
- Ecosite Phases of Restricted Distribution;
- Alberta Wetland Inventory - Wetlands Classes of Restricted Distribution;
- Ecosite Phases Supporting Traditional Use Plants;
- Jack Pine Communities; and,
- Ecosite Phases with Moderate to High Rare Plant Potential.

While the impacts of surface disturbance on these VECs are considered in the RSA and beyond mine closure, only the Ecosite Phases Sensitive to PAI and to nitrogen deposition show an effect beyond the LSA. It must be noted, however, that impacts at a local scale are considered significant mainly due to the small size of the LSA compared to the size of disturbance. As the project footprint takes up approximately 52% LSA, impacts of surface disturbance to vegetation and wetland VECs should also be considered on a regional scale.

There is considerable uncertainty related to the predictions of PAI and nitrogen emissions. A level of conservatism is included for the PAI and nitrogen deposition values for each project considered in the air quality assessment. Additionally, with all the development occurring and projected to occur in the oil sands region, there has been an unquantified level of conservatism factored into each of the assessment scenarios. There will be an increase in air emissions and PAI, but the actual amount remains uncertain. In order to understand this better, there are regional initiatives underway to measure the levels and the effects of acid deposition in the region. DCEL is a member of CEMA and WBEA who are involved in these programs and DCEL will continue to support these initiatives.

A.8.14 Wildlife

The effects of the Joslyn North Mine Project on wildlife as determined through the EIA and CEA are described in Section D.14 and Consultants Report #14.

Wildlife issues identified for the detailed assessment include concerns and issues brought forward by the Fort McKay community and various stakeholders in the area. These issues are consistent with those identified in the Regional Sustainable Development Strategy (RSDS) for the Athabasca oil sands area (AENV 1999), other environmental impact assessments (EIAs) produced for relevant oil sands projects, and those identified through the Traditional Land Use Study.

Major issues associated with the Project development and effects on wildlife include:

- impacts to habitat availability resulting in habitat loss and alteration as well as reduced habitat effectiveness;
- impacts to habitat connectivity caused by barriers to wildlife movements;
- impacts resulting in direct mortality risk; and,
- impacts resulting in indirect mortality risk.

VECs, chosen to focus the wildlife assessment, are species considered most vulnerable to Project effects, and are species of concern for stakeholders and regional management strategies. The VECs chosen for this assessment include:

- Canadian toad
- waterfowl
- ruffed grouse
- great gray owl
- mixedwood forest bird community
- old growth forest bird community;
- snowshoe hare
- beaver
- fisher
- lynx
- black bear
- moose

During operation of the mine, most of the vegetation within the project footprint (LSA) will be removed eliminating the wildlife habitat. The effects of this clearing will have a significant local effect on the ability of wildlife to use the area which is typical of mining projects. The areas adjacent to the mine footprint were assessed to determine the regional effect of this clearing. It was determined there is sufficient wildlife habitat available in the RSA to reduce the effects of the Joslyn North Mine Project.

Once mining activities are completed, reclamation activities can begin, thereby replacing habitat within the footprint. This is one of the key mitigation measures to reduce the long term impact to wildlife in the area. With appropriate mitigation and monitoring DCEL will endeavour to minimize the impact on wildlife wherever possible.

The Joslyn North Mine Project closure plan has incorporated a variety of end land uses into the closure landscape including areas for wildlife habitat. In the long term, after closure the impact on wildlife VECs will be insignificant.

A.8.15 Biodiversity

The effects of the Joslyn North Mine Project on biodiversity as determined through the EIA and CEA are described in Section D.15 and Consultants Report #15.

Biodiversity issues identified for the detailed assessment follow the TOR (AENV 2005), and include concerns and issues brought forward by the Fort McKay community and various stakeholders in the area. These issues are consistent with those identified in the RSDS for the Athabasca oil sands area (AENV 1999), and other environmental impact assessments (EIAs) produced for relevant oil sands projects.

The main issues concerning biodiversity include:

- direct loss of native species diversity (measured for selected taxonomic groups);
- changes in the composition or distribution of natural terrestrial or aquatic habitat;
- changes in the structure of natural terrestrial or aquatic habitat (i.e., through habitat fragmentation or increased access for non-native or opportunistic species into natural habitat); and
- changes in landscape-level diversity at the regional scale (measured as changes in landscape habitat composition and structure).

Impacts of the proposed project are evaluated from a project-specific and cumulative perspective by undertaking comparisons. These generally include comparison of the environmental characteristics occurring in the Baseline Case with environmental conditions predicted to occur with the Application Case and Planned Case.

Activities within any mining footprint are expected to have significant local effects on the vegetation resource thus affecting wildlife habitat and biodiversity. These typically last only during the active mining operation period and can be mitigated at the reclamation stage. There are some items such as removal of old growth forest that is not replaceable, except with time, usually well beyond the closure of the operation. In these situations, it is important to understand the effects of the activities from a regional perspective as well. Ecosites with high plant species richness will not be reclaimed to baseline levels after closure. However, DCEL will endeavour to incorporate new, innovative reclamation technology into their reclamation plans as it becomes available in an effort to help mitigate this impact.

Tree clearing and mining activities associated with the Joslyn North Mine Project will have a significant effect on the wildlife and vegetation resources within the project footprint, likely for the duration of the project. The following impacts to biodiversity in the project footprint during mine operations (Application Case) will be deemed significant:

- number of patches;
- mean patch size;
- total edge;
- plant species richness;
- unique vegetation species;
- overall vegetation species diversity index;
- wildlife species richness;
- sensitive wildlife species potential;
- unique wildlife species;
- overall wildlife species diversity index; and
- aquatic features.

When these biodiversity indicators are considered on the regional level, only the plant species richness will be affected at a local scale beyond closure. None of the other biodiversity indicators are affected at the regional level or beyond the mine closure. DCEL will monitor the reclaimed sites to determine if the assumptions were correct and will also incorporate new, innovative reclamation technology in an effort to help mitigate this impact.

A.8.16 Visual Aesthetics

DCEL completed a visual aesthetics assessment to assist with the planning of current and future lease development. The visual aesthetics assessment is discussed in Section D.16.

Visual aesthetics has been recognized as a concern among the local residents and recreational users of the area. The focus was to determine which of the project components would be visible from selected view points at two points in time (2019 and at closure).

To assess the visual impacts in the area, a review of the current land use patterns was completed and potential view points (receptor locations) were identified within a 25 km radius of the Joslyn North Mine Project. The potential receptor locations were then plotted on a 1:250,000 topographic map and reviewed. The key receptor locations as well as time sequences through to completion of the project were identified.

The locations of these receptors include:

- Fort McKay;
- Trapper Cabin (J. Grandjambe);
- CNRL Road;
- Mouth of the Ells River;
- Athabasca River Upstream
- Hwy 63 – East of Athabasca;
- Hwy 63;
- Bitumont Historic Site; and
- Clausen's Landing Remote Provincial Park Recreation Area.

Of these nine potential receptors, it was determined that three of them would have little visual impacts primarily due to their significant distance from the development, topography and local vegetation obstructing the view and have not been considered further in this assessment. Clausen's Landing and Bitumont are located in the valley of the Athabasca River and as such, will be buffered by natural topography and vegetation from any adverse visual impacts. The highway 63 river crossing is also in a low elevation and of enough distance that view will be obstructed by vegetation and natural topography. The main visual impact is predicted to occur along the CNRL road approximately two kilometres from the project and is minor in nature. The amount of the Project visible from this point (in 2019) is predicted to be 2.1 km^2 if the treed buffer is maintained and 9.4 km^2 if the trees are removed. All other view points had considerably less visible area.

There is a correlation between the amount of visible development and the amount of vegetation present. In order to reduce the visual aesthetic impacts of the Project, DCEL will attempt to minimize tree clearing during the operation so that treed buffers will be available to obstruct the view of the mine. DCEL will also utilize mine closure techniques that will blend the mine facilities into the natural landscape. This will include incorporating the engineered slopes into the natural topography and establishing a variety of vegetation types.

DCEL predicts the visual impact of the Joslyn North Mine Project will be minor in nature and the effect will be long term and will persist into the future. Reclamation and revegetation will assist to minimize the effect by creating natural looking landforms.

A.8.17 Land and Resource Use

The effects of the Joslyn North Mine Project on land and resource use as determined through the EIA and CEA, are described in Section D.17.

DCEL will work with adjacent lease holders to ensure that boundary issues are dealt with to ensure efficient and maximum bitumen recovery.

The entire Project area is located on crown lands. DCEL holds most of the dispositions in the area and will require a mineral surface lease to commence mining. Dispositions that are held by others are in a position to provide service for the DCEL activities. Surface dispositions held by other users that will be impacted by development include:

- relocation of a high voltage transmission line, owned by ATCO, running along the north boundary of the lease;
- removal of a forestry road held by the Municipality;
- partial disturbance of an access road held by EnCana; and
- numerous crossing and minor relocations of the CNRL access road which runs through the middle of the DCEL operations.

There are three trapping agreements (TPA's) on the Joslyn Lease, of which two are directly affected by the Joslyn North Mine Project. DCEL has had discussions with all three trappers and will enter into a compensation program to mitigate the effect of the development on the trapline holders. DCEL will also work with the trappers to allow access onto lands that are not part of the Project development.

There are no commercial fishing opportunities on the Joslyn Lease and only limited opportunities for recreational fishing. These opportunities are confined to the Ells River which will not be affected by the Joslyn North Mine Project.

DCEL will control access and restrict hunting activity within the vicinity of the Project. The remainder of the lease will be available to those who wish to pursue hunting activities.

DCEL will establish a construction and operation camps for workers who are expected to commute from areas outside the RMWB. This will help reduce the amount of traffic on the regional highways.

A strategy for development of metallic and industrial mineral resources in the area will be discussed with other lease holders. Removal of the bitumen does not preclude the development of the limestone resource below it. The issue will be integrating the mining schedules of both limestone and oil sand mining activities.

The Joslyn North Mine Project development is located completely within the confines of Al-Pac's FMA and Northland Forest Products Limited timber licence. DCEL will work with both companies to ensure that all merchantable timber located within the PDA is salvaged and made available to these two operators. DCEL is currently working with Al-Pac to develop a joint timber harvest plan where they would complete all timber harvesting ensuring maximum utilization of the resource.

All of the sand and gravel development on the DCEL lease is currently found east and south-east of the mine area. There will be no impact on sand and gravel exploration or development. DCEL will work closely with future aggregate extraction programs to ensure the impacts on DCEL and the developers will be minimized. DCEL will actively pursue the location and development of sand and gravel resources in advance of mining to ensure this resource is utilized.

Through its public consultation program, DCEL will continue to work with local stakeholders to ensure that potential impacts on land and resource use are minimized.

A.8.18 Timber

The Joslyn North Mine Project will result in the removal of approximately 5,400 ha of timber resource. It is estimated that approximately 234,519 m^3 of deciduous timber, 7.7% of the total annual allowable cut (AAC) for Al-Pac which is 3,027,204 m^3 will be salvaged. For coniferous timber, approximately 153,740 m^3 will be salvaged and is approximately 41.4% of the AAC which is 371,650 m^3.

The Project footprint encompasses 0.4% of the A15 Forest Management Unit (FMU) that is 1,436,492.1 ha and approximately 0.09% of the total FMA area.

The effects of the Project on the timber resource will be minimized as all merchantable timber will be salvaged prior to start of mining. DCEL is currently working with Al-Pac to develop a joint timber harvesting agreement that would have Al-Pac harvest the timber. Northland Forest Products will receive all of the coniferous wood that is generated from within the Al-Pac cut areas on the Joslyn North Mine Project.

DCEL will need to acquire a Mineral Surface Lease (MSL) for the development area. The process requires that the land be withdrawn from the Al-Pac FMA and compensation provided through the Timber Damage Assessment process which is described in more detail in Section D.18.6.

With the implementation of the mitigation measures, the impacts of the project are expected to be insignificant. Confidence in the quality of the AVI and disturbance data used in this assessment is high. The preliminary timber volumes that were provided by Al-Pac also have a high confidence level.

A.9 SUMMARY OF MITIGATION AND MONITORING

This section is a summary of the proposed mitigation and monitoring commitments that DCEL has made in this application. Mitigation is proposed to try to neutralize the effects from activities associated with Project development and operation. The effectiveness of the proposed mitigation is considered before the significance of the effect is determined. To confirm the mitigation is effective a summary of the proposed monitoring programs is also summarized.

A.9.1 Air Quality

Mitigation

DCEL has committed to the following management approaches for air emissions from the Joslyn North Mine Project:

- sulphur recovery will meet EUB requirements;
- there will be no continuous flaring;
- mine fleet vehicles will be regularly maintained to reduce emissions and maximize fuel efficiency;
- mine fleet haul routes will be optimized for operational efficiencies and to minimize fuel consumption, and will be adjusted as needed during the life of the project;
- vapour recovery systems will be installed;
- dust from haul routes will be managed by applying water or approved dust suppressants during dry periods; and
- emissions from point (e.g., stack) sources will meet Best Available Technology Economically Achievable (BATEA) standards.

DCEL will minimize NO_x emissions, through the following measures:

- the selection of low NOx emissions technology as required by the CCME National Emission Guideline for Commercial / Industrial Boilers and Heaters as part of general a commitment to use Best Available Technology Economically Achievable (BATEA) for its Project emissions;
- promoting the use of bus transportation for employees and contractors;
- committing to use mine fleet vehicles that meet applicable emission standards at the time of purchase;
- considering NOx emissions as a criterion in future facility upgrades; and
- energy conservation initiatives such as managing haul routes for energy efficiency.

DCEL will manage volatile organic compound (VOC) emissions through the following measures:

- treatment of froth treatment plant tailings in a Solvent Recovery Unit to recover a high proportion of the diluent in these tailings;
- the use of diluent in the froth treatment plant that has a narrow boiling point range with reduced benzene and light ends;
- the use of process designs that reduce VOC emissions;
- plant-wide fugitive emissions identification and control using the protocol recommended by the CCME guideline "Environmental Code of Practice for the Measurement and Control of Fugitive Emissions from Equipment Leaks";
- the use of a dry tails approach to minimize the potential for methanogeneiss in the tailings pond and dump area;
- a vapour recovery unit (VRU) to condense and recover emissions; and
- floating roofs on storage tanks, where appropriate.

Monitoring

DCEL is a member of the regional air quality management initiatives in the oil sands and will maintain an active role as appropriate for its operation. The most significant regional initiatives that effect the management of air emissions in the region include the following:

- AENV Regional Sustainable Development Strategy (RSDS) for the Athabasca oil sands (AENV 1999);
- Cumulative Environmental Management Association (CEMA);
- Wood Buffalo Environmental Association (WBEA), a collaboration of communities, industry and government in the RMWB. WBEA consists of the following key activities:
  - Regional Air Monitoring Network;
  - Terrestrial Environmental Effects Monitoring (TEEM) Program; and
  - Human Exposure Monitoring Committee.
- Canadian Oil Sands Network for Research and Development (CONRAD).

DCEL will conduct an emissions test for NO_x from one of the steam generators after project start-up, and once-a-year testing of NO_x emissions from the cogenerator, decreasing in frequency after two years of constant results.

DCEL will contribute to regional monitoring through support of the TEEM air monitoring program.

Greenhouse Gas Management

The Joslyn North Mine Project greenhouse gas management plan will take continuous improvement into account in three ways:

- The Project will continue to monitor technology developments that will improve energy efficiency and, where economically viable, will implement process changes to improve energy efficiency and reduce greenhouse gas emissions.
- The Project will implement a program of monitoring and measuring methane emissions from the mine face, tailings pond and disposal areas. Based on the results from these studies, the Project will evaluate and, where economically feasible, implement changes in the way these facilities are operated or managed in order to reduce greenhouse gas emissions.
- The Project will implement a program of monitoring and measuring fugitive emissions. Based on the results from these studies, the Project will evaluate and, where economically feasible, implement changes in the way these facilities are operated or managed in order to reduce greenhouse gas emissions.

A.9.2 C & R Plan

The Conservation and Reclamation (C&R) Plan for the Joslyn North Mine Project outlines the vision, goals, approach and detailed plans for reclaiming all areas disturbed through the life of this project. The primary reclamation goal of the Project is to return the lands to a capability that is equivalent to predevelopment conditions and consistent with end land use objectives.

The key components of the reclamation plan that will ensure these goals are met include:

- the Project has sufficient coversoil to achieve equivalent land capability;
- salvaging and replacing both upland soil material and a peat:mineral mixture will add diversity to the reclaimed mine soils;
- incorporating a general conversion of the disturbed area to upland, with the inclusion of several wetlands and two end pit lakes;
- direct placement of a significant amount of coversoil is a key aspect of maintaining ecological diversity on reclaimed landscape;
- vegetation patterns will be similar to what existed prior to development with early seral stages that are capable of ecological succession;
- progressive reclamation allowing for approximately two thirds of entire disturbed area to be reclaimed by the time mining is completed;
- end pit lakes that will tie into the Ells River through the original Joslyn Creek outlet and provide opportunity for enhanced fish habitat; and
- incorporating and adaptive management strategy into all development activities.

A.9.3 Fisheries Resources

Mitigation

- conduct all instream work in accordance with the Code of Practice for Watercourse Crossings (AENV 2000);
- update existing Emergency Response Plan to incorporate actions to take in case of a release due to mine activities;
- design habitat enhancement measures;

- construct off stream storage reservoir which will store enough water for 30 days of operation in case of low flows in the Athabasca River;
- construct a surface water management system to control runoff from the mine and surrounding area; and
- construct the Joslyn Creek diversion and associated components with suitable replacement fish habitat to ensure no net loss is achieved.

Monitoring

- participate in the Regional Aquatics Monitoring Program;
- assess effectiveness of fish habitat enhancements;
- reclaim disturbed areas as soon as possible; and
- undertake additional erosion control measures in areas of high potential for erosion.

A.9.4 Groundwater

Mitigation

There is a potential for DCEL to be injecting water in the north-east corner of the Joslyn Lease as CNRL is dewatering their mine. DCEL and CNRL will continue to discuss the timing and scheduling of activities to determine the future monitoring and subsequent mitigation that may be required.

DCEL and CNRL are working cooperatively to develop plans to deal with depressurization of the SAGD reservoir should they occur as a result of the Horizon Project. DCEL is also working independently on contingency plans in the event that depressurization at the Joslyn North Mine Project spreads west to the SAGD area. These mutual and independent plans include the following:

- planning of monitoring networks to give warning of impending problems; and
- remedial measures, such as water curtains, to cut off the effects of hydraulic head decline in the BWS.

The BWS water has high TDS in the north-east portion of the Joslyn Lease. In order to minimize the amount of saline water entering the end pit lakes, DCEL will:

- continue to dewater these wells until the water level in the lakes is of sufficient elevation to minimize inflow into the lakes; and
- pump water from the Athabasca River to the East Lake to accelerate filling and minimize the BWS dewatering.

Monitoring

- a network of monitoring wells is already present covering the BWS and the Quaternary deposits on the Joslyn Lease. Both water levels and water chemistry have been collected from the monitoring wells for several years, hence background conditions to both SAGD and mining are well established;
- portions of this system will be used for hydrogeological monitoring that has become a routine part of AEPEA approvals for industrial projects. This will also function as a lease-scale monitoring system;
- current practice in AEPEA approvals also calls for groundwater monitoring programs for the approved operations. A proposal for such a contamination monitoring system will be part of any ensuing approval. This system will focus on monitoring shallow groundwater since the oil sands

lying underneath the plant will act as a barrier for migration of plant-based contaminants to the BWS;

- a monitoring system for the basal water sand is currently under discussion between DCEL, CNRL and EUB as part of the Joslyn SAGD Phase II approval. This system, once agreed to and established, will function as the warning system of the DCEL SAGD operations for changes in water pressure in the basal water sand. Mitigation will be planned as required; and
- monitoring systems for the interaction of injection to or withdrawal from, the BWS is problematic with respect to the Athabasca River. Direct effects within the river are unlikely to be observable within the context of flow volumes and chemistry. As well, there may also be injection of water by CNRL to the north along the river. One possibility would be to plan observation well(s) on one or more of the islands in the Athabasca River north-east of the DCEL lease.

A.9.5 Historical and Palaeontological Resources

Mitigation

There were 35 precontact sites identified during the current HRIA, 27 sites are within the LSA and will be impacted by the Joslyn North Mine Project. In order to mitigate impacts on historical resources in the area DCEL will:

- excavate or avoid if possible one site (HhOw 16); and
- excavate 19 sites with moderate and high heritage value.

DCEL will undertake the following to ensure protection of palaeontological resources:

- palaeontologist will review any changes to the development plans to ensure additional areas of disturbance of the Wabiskaw Member will not occur.
- a palaeontological education program will be developed in order to teach operators and mining geologists how to recognize fossils and what to do when a fossil is discovered in the mine.

Monitoring

In order to monitor the impacts of mining activities on historical and palaeontological resources DCEL will:

- conduct auditing of operations as lease development progresses; and
- develop a palaeontological monitoring program for activities having a high probability of disturbing fossils.

A.9.6 Human Health

Mitigation

- relies on other disciplines such as air and groundwater to provide appropriate mitigation to reduce effects on the different human pathways.

Monitoring

- DCEL will continue to participate in and support the monitoring program currently being conducted by the Wood Buffalo Environmental Association (WBEA), Regional Aquatic Monitoring Program (RAMP), Cumulative Environmental Management Association (CEMA) and Regional Infrastructure Working Group (RIWG). Ambient air monitoring conducted by WBEA will help reduce uncertainties associated with environmental exposures and risks and

allow DCEL to verify its impact predictions;

- air, soil, and water monitoring over time is being planned by DCEL. If COPC concentrations rise above levels where potential environmental effects could occur then steps will be taken to manage these effects; and
- DCEL will work with the local stakeholders, particularly the community of Fort McKay to develop programs to track complaints such as odours.

A.9.7 Hydrology

Mitigation

- surface runoff from disturbed areas will be collected in ditches and used in the process reducing the amount of diversion required from the Athabasca River;
- diversion ditches will collect and divert runoff from undisturbed areas around the disturbed areas into the natural streams;
- surface runoff from drainage ditches will be routed through polishing ponds to reduce suspended sediment before the water is released into the natural streams;
- changes in channel morphology will be controlled limiting the flow increases in peak flows in natural channels due to the Joslyn Diversion. The Joslyn Diversion has been designed to minimize the negative effects of increased flows in Tributary 4. Extreme high flows will be diverted through a separate channel and spillway so that the flows in the natural portion of Tributary 4 are not altered significantly during these events. However, increased low flows in Tributary 4 will reduce the time periods when undesirable extreme low flows occur;
- channel modifications will be provided to protect the channel from increased erosion due to higher flows;
- Joslyn Creek will be returned to the original location upon completion of mining returning original flow patterns;
- the Ells River valley will be left undisturbed so that the entire valley side slopes can provide a buffer for the river and to eliminate uncontrolled runoff into the Ells River from disturbed areas;
- a polishing pond will be constructed for the Joslyn Diversion flows to reduce suspended sediment entering the Ells River;
- a raw water storage pond will be constructed to store enough water to operate for 30 days without requiring withdrawal from the Athabasca River;
- disturbed areas will be reclaimed as soon as possible; and
- CEMA will establish minimum flow requirements for protection of fish and aquatic resources in the Athabasca River. DCEL will work within the future framework as it is established.

Monitoring

- stream flows and sediment concentrations in both the Joslyn Creek and Ells River will be monitored routinely by DCEL, likely through participation in the Regional Aquatics Monitoring Program (RAMP);
- flow monitoring of the Athabasca River is presently carried out by WSC and is available on a real time basis; and
- diversion ditches will be monitored and maintained to ensure they are operating as designed and that runoff from the disturbed areas is not entering the natural streams.

A.9.8 Noise

Mitigation

- Prior to 2019 DCEL will engage in discussions with the owner of the Trappers Cabin to conduct a noise survey or to determine the appropriate noise mitigation measures.

Monitoring

- DCEL will initiate a noise monitoring program in consultation with the community of Fort McKay and the owner of the Trappers Cabin.

A.9.9 Socio-Economic

Mitigation

Construction:

- local contracts will be submitted for bids from local contractors. Contracts may include clearing, stripping, road construction, camp operation, security, transportation, and fuel oil;
- Aboriginal participation during construction will be maximized through direct contracting by DCEL to Aboriginal businesses and by DCEL encouraging its prime contractors to hire Aboriginal workers; and
- local purchases during construction will be encouraged where price, quality, and deliverability are equal to that available outside the local area.

Operations:

- DCEL will hire as many qualified local people as possible, particularly from Fort McKay, its closest neighbouring community;
- DCEL will have an operating camp located on site. This will eliminate the need for daily commute from Fort McMurray (1 hour away);
- an operating camp will give employees a choice between living in RMWB or elsewhere. During periods of high growth in Fort McMurray, operating employees might choose to live elsewhere when housing costs are high, school spaces are at a premium, and other community services are strained. If growth slows down in Fort McMurray, the community may become more appealing for operating employees to relocate;
- contracts for such activities as transportation, camp, catering, reclamation, maintenance, security, fuel oil, etc. will likely be let out to local businesses; and
- over the life of the project, it is estimated that $210 million will be paid to RMWB for property taxes.

Fort McKay:

- DCEL will continue to maintain a good neighbour policy with the people of Fort McKay;
- DCEL will continue to support community-identified projects, programs and Traditional Land Use Studies at a level in relation to the scale of its industrial activities;
- DCEL will explore, with Fort McKay, other industry partners in the area, RMWB, and the RCMP about establishing a new emergency response centre and RCMP Patrol Cabin to serve the Fort McKay area (to be done through RIWG);
- DCEL will station a qualified nurse and ambulance on site during construction and operation;

- DCEL will continue to allow unhindered access to undeveloped areas of the Joslyn Lease for traditional land use activities such as hunting, fishing, berry picking, gathering of plants, etc. This will include travelling through the Lease to gain access to traditional lands west of the Joslyn Lease;
- DCEL will continue to inform trappers over the Joslyn Lease about ongoing industrial activities and compensate them in accordance with the existing agreement;
- DCEL proposes to operate a camp to house operating employees who reside outside the RMWB until such time as employees choose to move into the region;
- use of the CNRL road will bypass traffic which would otherwise travel through the community of Fort McKay;
- DCEL will consider providing transportation to Fort McKay workers where numbers warrant; and
- DCEL will encourage local contractors to bid on contracts available for both construction and operation phases of the Joslyn North Mine Project.

Fort Chipewyan:

- DCEL will explore the option of offering a fly-in / fly-out service to transport Fort Chipewyan residents to the Joslyn Lease during both construction and operation;
- DCEL will work closely with the community to identify a project or service in the community which the company can help support; and
- DCEL will encourage local contractors to bid on contracts available for both construction and operation phases of the Project.

Aboriginal Relations:

- DCEL will build, enhance, and maintain positive relations with Aboriginal communities, particularly Fort McKay and Fort Chipewyan by:
  - working to engage them in timely, transparent consultation processes designed to meet their needs and those of the stakeholders;
  - providing them with timely and accurate information to assist them in understanding the company, its projects, their impacts and opportunities provided;
  - treating them with respect and asking for the same in return; and
  - working hard to hear and understand their perspectives, requests, recommendations and concerns of them; considering them in light of their business requirements, and providing them with feedback on how their input will be incorporated into plans and operations.
- DCEL's preferred areas of support under its newly created Community Engagement Plan are:
  - Adult Education - education is a life-long endeavour, DCEL will focus on existing gaps in programs and services;
  - Children's Education - children are future community leaders, employees, parents, and Elders they deserve a special focus in DCEL's programs;
  - Aboriginal Heritage Initiatives - the Aboriginal heritage of the region is rich and has much to offer everyone;
  - Environmental Initiatives - while there is much being done to protect the environment in the region, more can be done. Therefore, DCEL will focus on existing gaps in programs and services;
  - Training and Job Creation - DCEL believes economic prosperity begins with well-trained

people making a meaningful contribution to the workplace doing work they enjoy; and
  - Support of DCEL's Long-Term Commitments - DCEL wants those causes and organizations they support to be sustained.
- DCEL will encourage the development of community-based Aboriginal business that benefits both the Aboriginal community and DCEL by:
  - advising local IRC's of DCEL's activities planned on the Joslyn Lease.
  - maintaining vendor lists of local Aboriginal businesses and personnel who are qualified to provide services for use by DCEL.
  - including both qualified Aboriginal and non-Aboriginal businesses on bid request lists for work on the Joslyn Lease. Awarding bid work on a competitive basis having regard for the standard business criteria of acceptable performance record and price.

Wood Buffalo:

- DCEL will continue to work with the RWIG and RMWB to help ensure that infrastructure is available to local residents on a timely basis to address cumulative socio-economic stresses as a result of further development of the Athabasca Oil Sands;
- DCEL will be providing transportation for Fort McMurray workers and others from outside the RMWB;
- DCEL's preference is to fly in workers to a local airstrip, thereby avoiding transporting workers from Fort McMurray on Highway 63. Workers who do commute on a daily basis from Fort McMurray will be transported by bus and private vehicles; and
- DCEL will participate in community and regional initiatives consistent with its Community Investment Policy.

Monitoring

- monitoring will be done through regional initiatives such as RIWG which DCEL will remain an active participant.

A.9.10 Soils and Terrain

Mitigation

The effect of surface mining is the complete disruption of the natural terrain and the natural soil landscape. The key mitigation strategy is the utilization of appropriate conservation and reclamation techniques to create new terrain and new soil landscapes for the intended end land use. Such procedures will include:

- salvaging surface soil prior to sequential mine development;
- when operationally feasible, direct placing mineral soil on reclaimed landscapes;
- replacing coversoil with minimal levelling resulting in soil with low bulk density and excellent porosity. These rough surfaces will catch and hold snow, reduce the risk of erosion and provide a greater diversity of microsites;
- revegetating soil stockpiles and reclaimed areas as soon as possible;
- establishing nurse crops on areas with moderate potential for soil erosion; and
- alternate erosion control measures used in areas of high potential for soil erosion.

Monitoring

The following is a summary of follow-up monitoring that could be done to ensure the long term sustainability of the soils resource:

- ensure experienced personnel supervise all soil salvage activities to ensure maximum quality of soil and sufficient volumes are salvaged;
- monitor soil replacement activities to ensure an appropriate depth of coversoil is placed on recontoured landscapes;
- monitor soil replacement activities to ensure potential for compaction is minimized;
- monitor soil stockpiles to ensure adequate vegetation exists to minimize erosion of soil resource from wind or water and reduce weed establishment;
- monitor reclaimed areas to ensure erosion is kept to a minimum;
- undertake routine sampling and analysis of recontoured areas, prior to coversoil replacement, to ensure replaced soils will provide suitable growing medium;
- undertake ongoing assessment and management of reclaimed areas until reclamation certification is achieved; and
- utilize information gained by CEMA and other regional monitoring initiatives that have established monitoring sites to periodically sample soils and vegetation in areas of high sensitivity to acid deposition. Respond to any adverse findings and incorporate appropriate mitigation strategies.

A.9.11 Surface Water Quality

Mitigation

- implement sediment control methods will include the use of cutoff trenches, silt fences and flow barriers to minimize or eliminate sediment transport from exposed soil areas into receiving waterbodies and watercourse;
- exposed soils will be re-vegetated using accepted reclamation seed mixtures, timing and application methods;
- maintain a company emergency response plan that establishes procedures and identifies responsible parties in the event of an emergency situation at the Joslyn Project site that includes a liquid spill contingency plan;
- polishing pond outlets will be designed to ensure that the portion of Tributary 4 below the polishing pond retains as much of the baseline flow regime as possible;
- major infrastructure will be designed to minimize footprint as much as possible;
- two ditch drainage system will be constructed around Pond 1 and EDA-C. One ditch will collect process affected water and direct it to settling ponds. The other ditch will collect unaffected runoff water and direct it to the Joslyn Creek or Ells River via polishing ponds;
- pilot channels in diversions will be lined with rip rap;
- at closure Joslyn Creek will be reconfigured to baseline conditions;
- at closure baseline flows will be re-established for Tributary 4;
- any water released from the drainage control system will be tested and released only if it meets limits set out in the current guidelines; and
- measures will be taken to minimize acidifying emissions including the use of low NOx burners and ultra-low sulphur diesel.

Monitoring

Three levels of environmental monitoring will be conducted:

- construction monitoring;
- operations monitoring; and
- cumulative environmental effects monitoring.

Monitoring will consist of water quality monitoring, sediment quality monitoring and benthic invertebrate community monitoring.

Construction Monitoring

All construction activities will comply with strict Environmental Management Plans prepared as part of construction agreements that will outline acceptable methods for each activity. Routine audits and associated water quality monitoring will be conducted during construction periods. In particular, suspended sediments will be routinely monitored (upstream and downstream) during construction periods for all instream construction activities. DCEL intends to seek input on construction conditions from other oil sands developers. If novel methods for controlling sediments, or other potential sources of negative effect on aquatic resources, are identified, they will be implemented.

Operations Monitoring

DCEL will conduct water quality monitoring, sediment quality monitoring, and benthic invertebrate community monitoring at specific locations in specific drainages to assess how these VECs conditions are changing with Project implementation and to ensure environmental quality guidelines are being met. Monthly monitoring for TSS and seasonal monitoring for whole water chemistry will be conducted at:

- the mouth of Tributary 4 (Sampling Site W7);
- the Fort McKay water supply intake on the Ells River (Sampling Site W9);
- the mouth of Joslyn Creek (Sampling Site W5);
- the Ells River above the project PDA (Sampling Site W4); and
- a site on Joslyn Creek above all DCEL activities.

Both sediment quality and benthic invertebrate community monitoring will be conducted once per year, in the fall, at these locations as well.

Cumulative Environmental Effects Monitoring

Water quality, sediment quality, and benthic invertebrate community monitoring at the Ells River above the Project PDA (Sampling Site W4) as well as at a site on Joslyn Creek above all DCEL activities, coupled with monitoring of the mouth of the Ells River, will be sufficient to provide the basis for cumulative environmental effects monitoring of the entire Project for the VECs considered. This may be done either independently by DCEL or as part of DCEL's participation in RAMP, which already maintains a water quality monitoring station at the mouth of the Ells River.

A.9.12 Traditional Land Use

Mitigation and Monitoring

The following list describes the mitigation recommendations put forth by Fort McKay participants:

- Fort McKay participants question how the government gives out leases and would like to play a more active role in project planning from the start. They would like to be involved in how Fort McKay traditional territory is leased by the government;
- Fort McKay participants were very worried about community health and ask that further research into the health of Fort McKay residents be undertaken;
- Fort McKay participants would like to see further air and water quality monitoring be conducted;
- Fort McKay participants want the levels of noise and traffic experienced in and around the community to be monitored and managed;
- Fort McKay participants would like a traditional food quality study completed;
- residents would also like to see an access management strategy developed. (The Fort McKay IRC Environmental Coordinator, Jean L'Hommecourt, informed both participants and facilitators that they are working on an access management strategy with DCEL and CNRL.);
- participants would like more employment opportunities for Fort McKay community members in oil and gas companies;
- Fort McKay Elders recommend having a rehabilitation center built in Fort McKay to deal with the high level of drug and alcohol abuse in the community, in order to get residents healthy enough to begin working; and
- in addition to having to accommodate oil and gas development and forestry companies, Fort McKay trappers and hunters compete with bear hunters in the spring and moose and deer hunters in the fall. Participants feel that hunting licences should not be issued on trapline areas.

A.9.13 Vegetation and Wetlands

Mitigation

- use previously disturbed areas where possible to avoid disturbing sensitive vegetation and wetlands;
- accommodate multiple-use areas such as roads, pipelines, and powerlines within the same r-o-w;
- use dust suppression on haulroads;
- clean heavy construction equipment before entering the site to reduce the likelihood of introducing and spreading non-native / invasive species;
- undertake progressive reclamation and revegetation to reduce the time to achieving self sustaining vegetation cover;
- ensure seed mix is certified and does not include non-native / invasive species; and
- control non-native / invasive species infestations using a combination of mechanical and chemical methods.

Monitoring

- inspection of disturbed and reclaimed areas for non-native / invasive species;
- inspect reclaimed areas to determine success of revegetation program;
- determination through consultation with CEMA the appropriate measures to take to reduce impact on rare vascular plant species;
- participate in any appropriate wetland and rare plant monitoring programs through CEMA;
- participating in regional air monitoring programs through the Wood Buffalo Environmental Association (WBEA) and the Terrestrial Environmental Effects Monitoring (TEEM) Committee; and
- continue to participate in regional reclamation monitoring programs through their participation in

the CEMA. DCEL will endeavour to incorporate new, innovative reclamation technology into their reclamation plans as it becomes available.

A.9.14 Wildlife

Mitigation

DCEL will implement the following mitigation measures to reduce impacts to habitat availability and effectiveness:

Operational Measures:

- minimize the Project footprint to the extent possible;
- integrate project developments with other existing and / or proposed land use activities in the area to minimize new disturbance and cumulative habitat loss, including the use of existing access or utility corridors whenever possible;
- avoid sensitive wildlife habitats to the extent possible. The location of linear corridors will be adjusted wherever practicable to avoid clearing or fragmentation of important habitat, especially mature conifer stands, wetland / riparian areas, and sandy habitats;
- avoid clearing during the migratory bird breeding season as per current CWS guidelines (Gregoire 2005, pers. comm.) to minimize clearing activities from May 1 to August 31;
- maintain all drainage patterns outside the main mine area through the installation of culverts and other surface and subsurface flow maintenance measures. The drainage pattern of Joslyn Creek will be diverted to an un-named creek as well as dammed to form a Joslyn Lake;
- implement dust control measures on access roads as needed;
- disallow companion dogs during construction;
- provide environmental supervision during all critical phases (i.e., clearing);
- implement appropriate erosion control measures;
- implement progressive reclamation throughout Project development, including the return of equivalent soil capability;
- incorporate native species in reclamation;
- disallow recreational vehicle use by construction or operations personnel within the Joslyn Lease;
- avoid the riparian habitat of the Ells River by leaving a buffer of undisturbed vegetation of 50 m from the edge of the valley escarpment;
- erect wildlife cautionary signage on access roads;
- foster environmental awareness with speed restrictions on access roads;
- report project-related wildlife mortalities;
- regular trimming of roadside vegetation to discourage roadside foraging by wildlife and prevent visual obstruction of wildlife along roadsides;
- erect bird deterrent systems in tailings areas;
- use vegetation control measures to avoid attracting wildlife to tailings ponds;
- create fuel and chemical spill contingency and response plans;
- ensure no fuel storage within 100 m of a watercourse or waterbody;
- continuous management of food wastes;
- protect wildlife; wildlife shall not be harassed or fed to prevent habituation;
- restrict hunting or use of firearms by personnel, including contractors;

- waste disposal sites, wastewater storage areas and runoff control structures will be monitored and maintained to prevent contamination of surface waters; and
- restrict public access to the development area.

Closure Measures:

- the reclamation plan will restore the developed area with a variety of stable terrain features including various slopes and aspects, drainages, and wetland features to provide a diverse array of habitat types for both terrestrial and aquatic species;
- re-establish early seral stage forest ecosystems capable of ecological succession;
- creation of two end pit lakes that will provide high-quality waterfowl habitat as well as habitat for other aquatic species;
- re-establish Joslyn Creek to near its original alignment; and,
- provide littoral zones for aquatic nesting waterfowl species.

Monitoring

Monitoring of wildlife is planned to assess the effectiveness of mitigation measures, and to ensure that the scale of impacts do not exceed that predicted by the assessment. The mitigation and monitoring program will operate using an adaptive management approach, whereby additional mitigation measures will be implemented or existing mitigation measures adjusted, as necessary, to ensure that Project impacts are minimized. A specific monitoring program will be developed after the Project has been approved. This monitoring program will be developed based on consultation with ASRD, other stakeholders, and possibly other operators in the region.

DCEL is a member of CEMA and the Sustainable Ecosystem Working Group (SEWG). SEWG is developing a management framework for a number of wildlife and vegetation related issues including wildlife movement corridors, habitat fragmentation, species habitat and population modelling for a select group of indicators, and general coarse filter biodiversity management.

A.9.15 Biodiversity

Mitigation

DCEL will utilize the following mitigation measures in order to minimize the impact of the Joslyn North Mine Project on biodiversity in the area.

- reduce footprint where ever possible;
- direct placement of soil materials;
- landform variability and integration;
- mimic natural soil conditions and create a micro-hummocky surface that enhances moisture by using rough mounded coversoil replacement techniques to unevenly spread coversoil on the recontoured surfaces; and
- enhancing biodiversity through the use of special reclamation procedures during all phases of the reclamation process.

Monitoring

The following will be part of the DCEL monitoring program:

- assessment of reclaimed areas to assess the effectiveness of the reclamation program;

- assessing both reclaimed and disturbed areas for erosion and presence of invasive weed species; and
- participating in CEMA, especially the Sustainable Ecosystem Working Group (SEWG). SEWG is developing a management framework for a number of wildlife and vegetation related issues including wildlife movement corridors, habitat fragmentation, species habitat and population modelling for a select group of VECs, and general coarse filter biodiversity management.

A.9.16 Visual Aesthetics

Mitigation

- attempt to minimize tree clearing during the operation so that treed buffers will be available to obstruct view of the mine; and
- DCEL will also utilize mine closure techniques that will blend the mine facilities into the natural landscape. This will include incorporating the engineered slopes into the natural topography and establishing a variety of vegetation types.

Monitoring

- no monitoring is planned.

A.9.17 Land and Resource Use

Mitigation

- DCEL will work with Al-Pac and NFPL to ensure that all merchantable timber located within the PDA is salvaged and made available to these two operators;
- DCEL will work closely with future aggregate extraction programs to ensure the impacts on DCEL and those developers will be minimized; and
- DCEL will also work with the trappers to allow access onto lands that are not part of the Joslyn North Mine Project or other current lease development.

Monitoring

- no monitoring is planned.

A.9.18 Timber

Mitigation

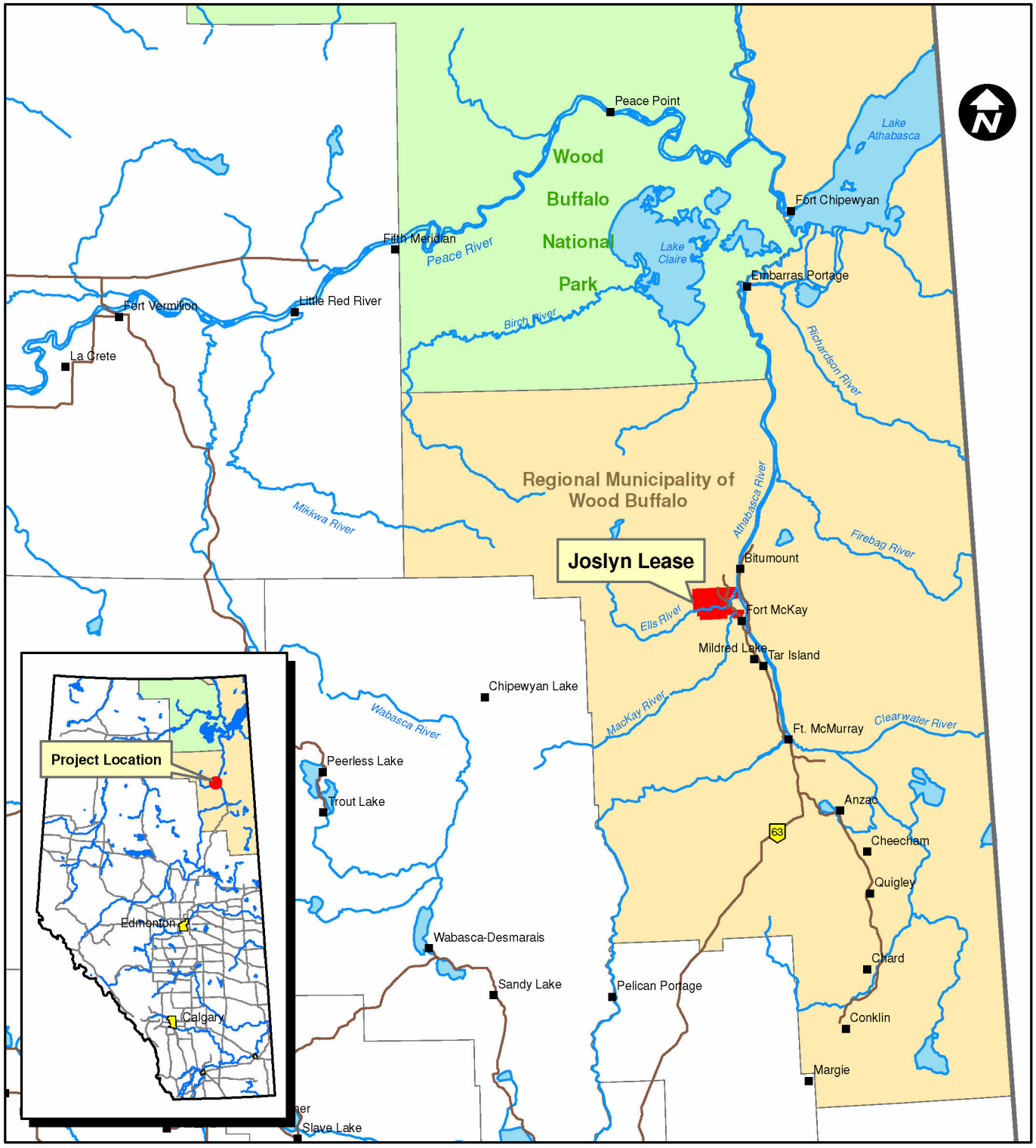
Al-Pac and DCEL are working together to develop an integrated land management (ILM) strategy to manage the forest resource efficiently and effectively. Al-Pac is working with DCEL to develop a harvesting plan that integrates the Joslyn North Mine Project into their AAC requirements. This approach will reduce cumulative forest clearing and fragmentation. The following mitigation measures will be implemented by DCEL to minimize the impacts on the timber resource and Al-Pac:

- joint timber harvesting plan;
- timber damage assessment; and
- progressive reclamation and reforestation.

Monitoring

- DCEL will monitor the timber harvesting along with Al-Pac, to ensure the timber utilization standards are met.

- DCEL will also monitor the progressive reclamation program, particularly the reforestation program and will adjust according to the successful and less successful components.

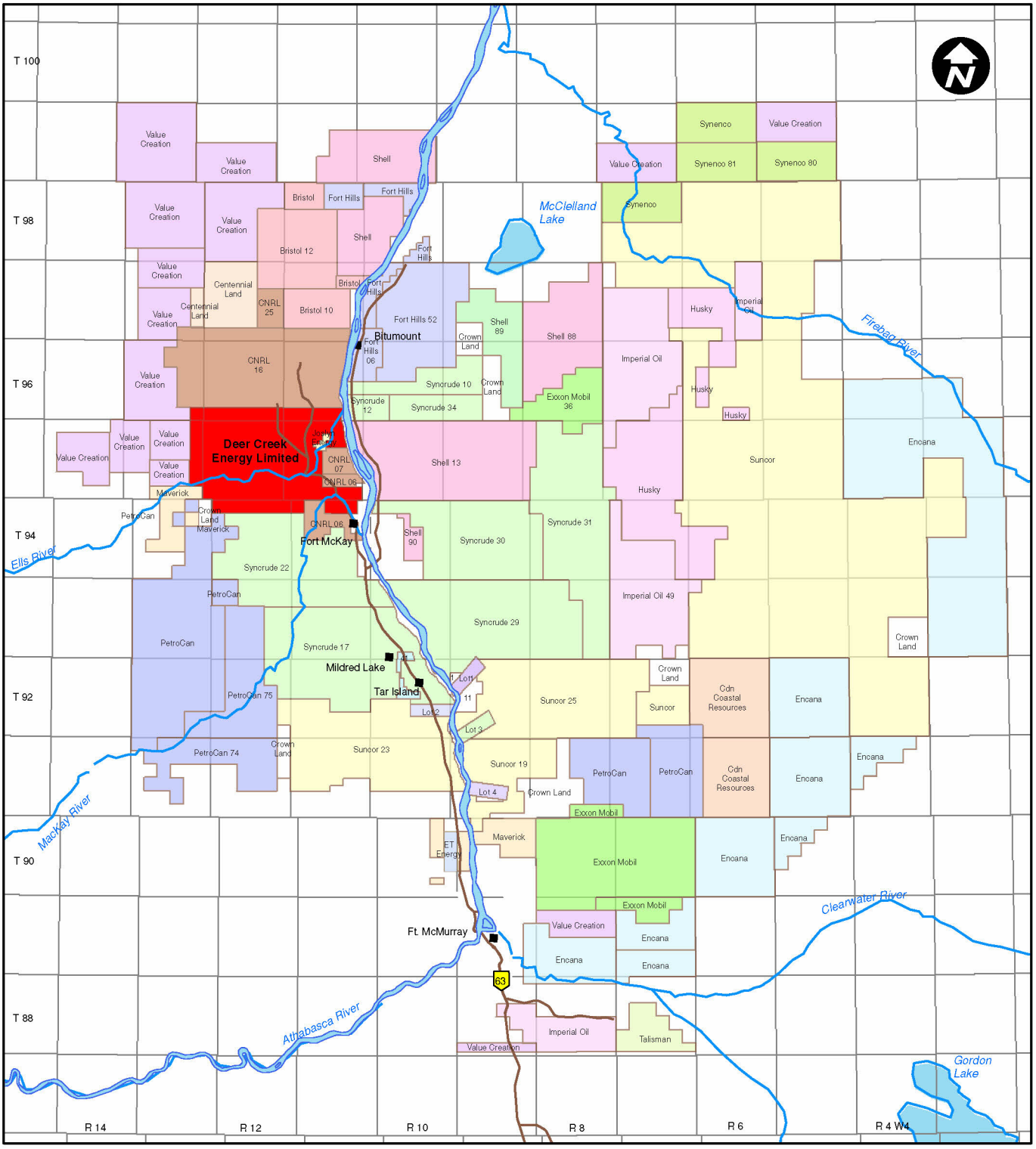


DEER CREEK Energy Limited

TITLE

FIGURE A.1.0-1 PROJECT LOCATION

20 10 0 20 40 60
SCALE IN KILOMETRES



TITLE

FIGURE A.1.0-2 REGIONAL OIL SANDS LEASES

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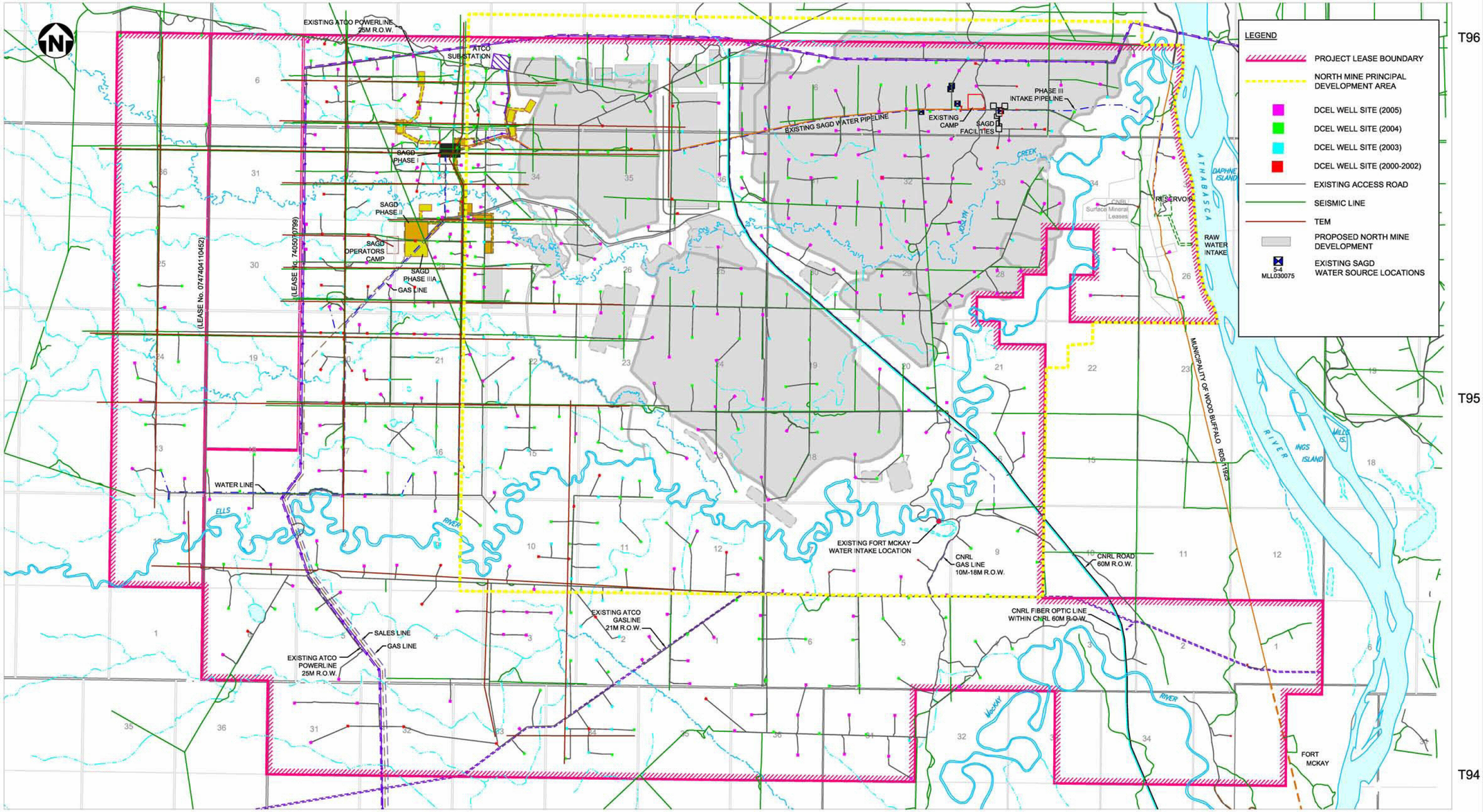
6 3 0 6 12 18
SCALE IN KILOMETRES

C0726-061



DEER CREEK Energy Limited

PROJECT

JOSLYN NORTH MINE PROJECT

TITLE

EXISTING LEASE DEVELOPMENT

0 0.5 1.0 2.0
SCALE IN KILOMETRES

	BY	YY/MM/DD
DRAWN	SM	05/12/05
CHECKED	KY	05/12/05

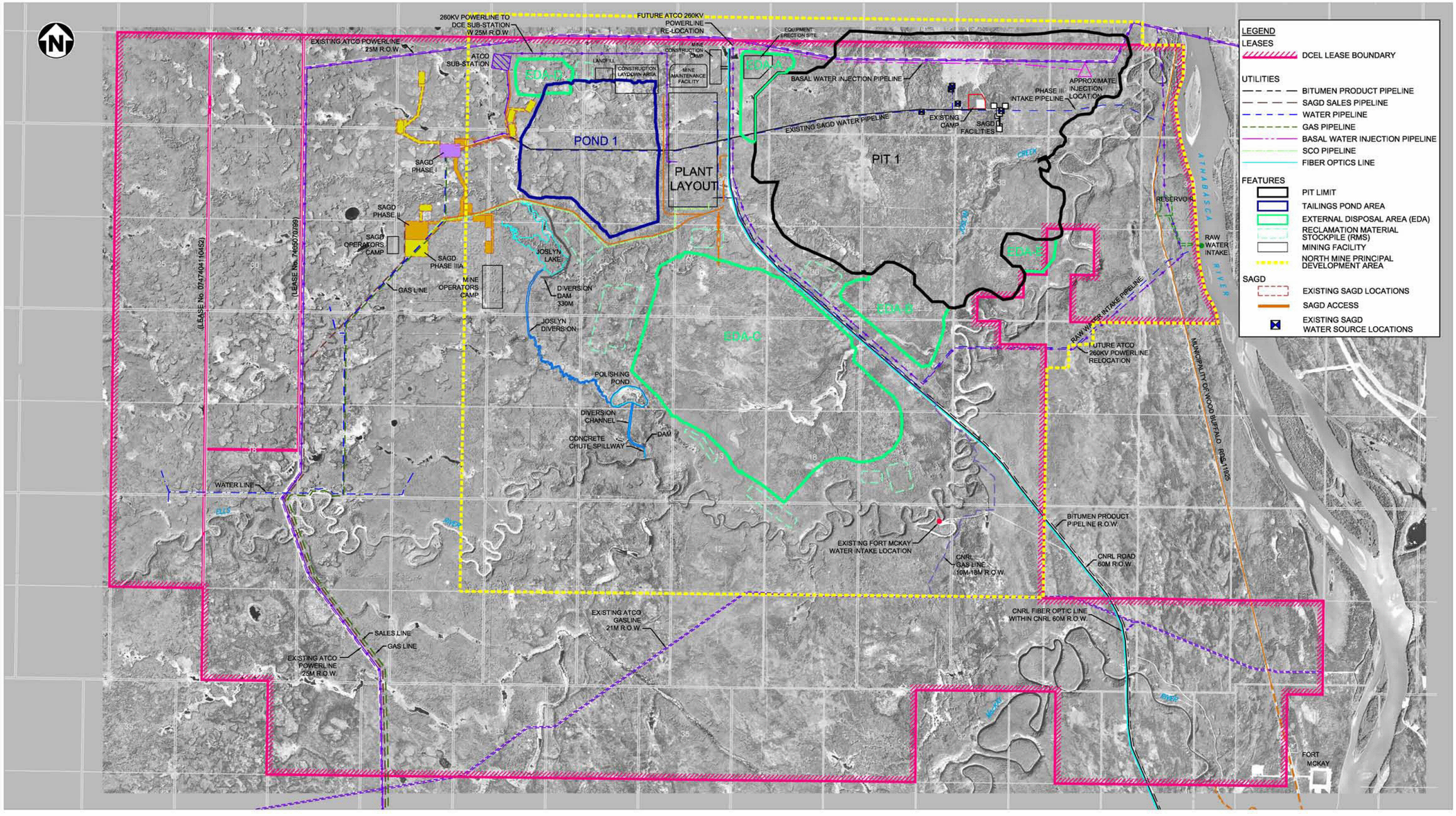
PROJECT NO. -

DRAWING NAME -

SCALE 1:65,000

FIGURE A.1.0-3

C0726-062



DEER CREEK Energy Limited

PROJECT: JOSLYN NORTH MINE PROJECT

TITLE: LEASE ORTHOPHOTO

0 0.5 1.0 2.0
SCALE IN KILOMETRES

	BY	YY/MM/DD
DRAWN	KY	06/01/30
CHECKED	DM	06/01/30

PROJECT NO. -

DRAWING NAME -

SCALE 1:65,000

FIGURE A.1.0-4