December 2012

PROJECT DESCRIPTION

Elizabeth Falls Hydroelectric Project

Submitted to:
Canadian Environmental Assessment Agency
Suite 101 - 167 Lombard Ave.
Winnipeg, MB R3B 0T6

Environmental Assessment Branch
Saskatchewan Ministry of Environment
3211 Albert Street
Regina, SK S4S 5W6

Report Number: 10-1365-0004/DCN-051

REPORT

EXECUTIVE SUMMARY

1.0 INTRODUCTION

1.1 Project overview

The proposed Elizabeth Falls Hydroelectric Power Project (Project) will be a 42 to 50 megawatt (MW) water diversion type electrical generating station. The Project is centred approximately 7 kilometres (km) from the community of Black Lake, within the Chicken Indian Reserve No. 224, adjacent to the Fond du Lac River between Black Lake and Middle Lake (Latitude: 59° 10' 48" N, Longitude: 105° 32' 12" W) (Figure 1.1-1). The hamlet of Stony Rapids is located about 25 km northwest of the Project site.

The objective of this Project is to develop additional power generation capacity in northern Saskatchewan to assist with accommodating the growing energy requirements of northern Saskatchewan communities, and to support continued northern economic development.

1.2 Project Proponent

The Proponent for the Project is the Black Lake First Nation (BLFN) together with Saskatchewan Power Corporation (SaskPower), a Crown corporation incorporated under *The Power Corporation Act* of Saskatchewan (SaskPower). Black Lake First Nation's interest in the Project is being held through their development arm, Elizabeth Falls Hydro Limited Partnership (EFHLP).

Elizabeth Falls Hydro Limited Partnership (EFHLP) and SaskPower will be negotiating various agreements to establish the terms and conditions for the Project structure, and development of the Project. These agreements must be concluded prior to the start of construction.

1.2.1 Proponent Contact Information

On behalf of the EFHLP, the principal contact for environmental assessment of the Project is:

Stan Saylor
Environmental Supervisor
Business Development
SaskPower
2025 Victoria Avenue
Regina, Saskatchewan
S4P 0S1
Phone: 306-566-2879
Fax: 306-566-2575
E-mail: ssaylor@saskpower.com

The contacts for the Project who are representatives of EFHLP and SaskPower are:

Ted de Jong
CEO, Elizabeth Falls Hydro Development Corporation
Box 478
Prince Albert, Saskatchewan
S6V 5R8
Phone: 306-922-0099
Fax: 306-922-5075
E-mail: tdejong@padc.ca

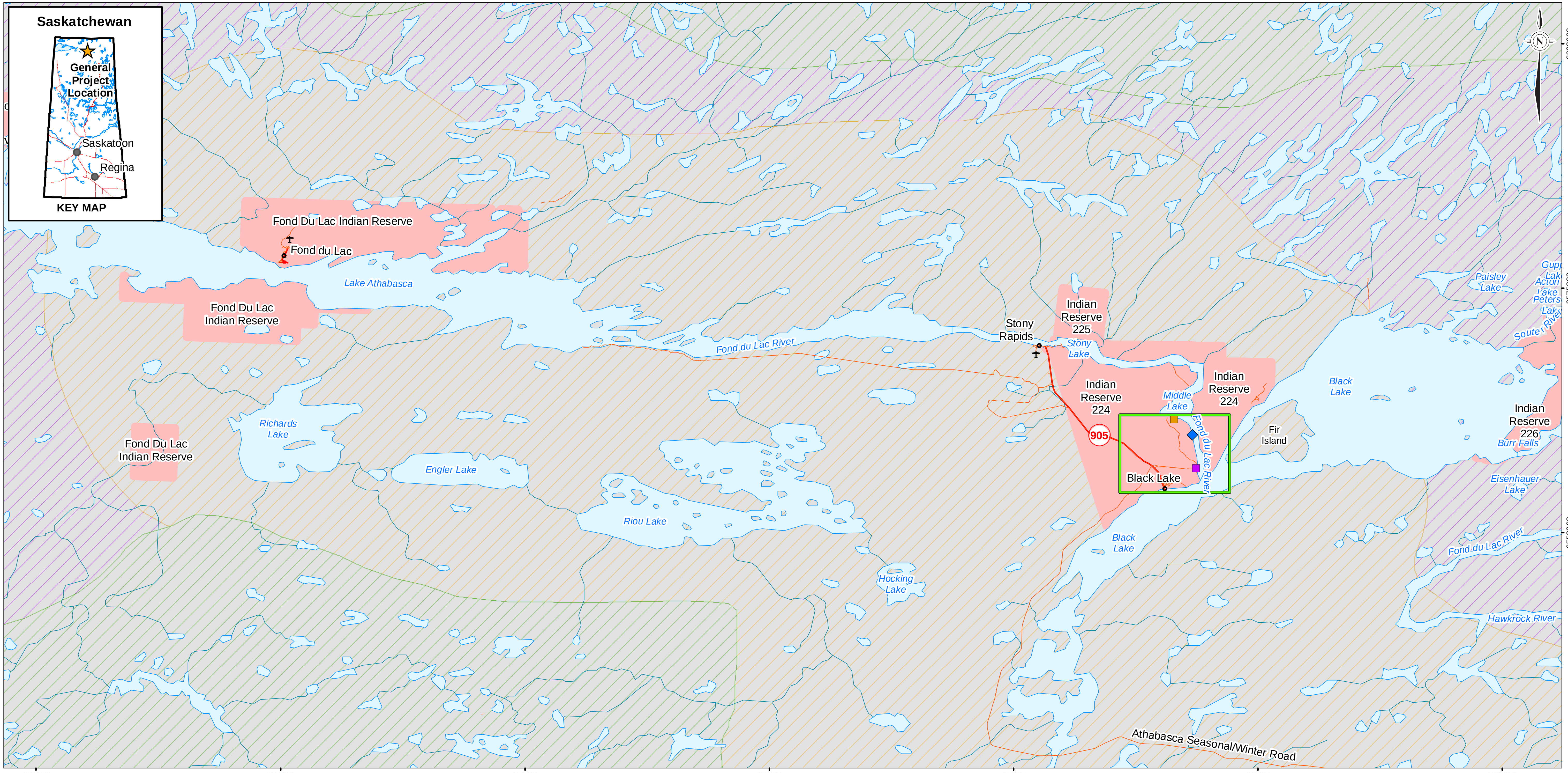
Mark Peters
Project Manager
Business Development
SaskPower
2025 Victoria Avenue
Regina, Saskatchewan
S4P 0S1
Phone: 306-566-2993
Fax: 306-566-2575
E-mail: mpeters@saskpower.com

1.3 Public Engagement

Over the past three years, prior to SaskPower considering involvement in the Project as a Proponent with the BLFN, EFHLP and the BLFN undertook several community engagement initiatives with respect to the Project. The Proponent is committed to keeping Project stakeholders informed about the project, and to fostering good relations with communities located near the Project, the general public and relevant regulatory agencies. Accordingly, the Proponent has developed a public involvement program to provide information to stakeholders and engage with First Nations and Métis communities, the public, and regulatory agencies. A list of the stakeholders identified as potentially having an interest in the Project has been provided below. This list is not meant to be exhaustive; it is anticipated that additional stakeholders may be identified as the project proceeds through the planning and development phases.

First Nations and Métis Communities and Groups:

- Chief and Council Black Lake First Nation;
- Chief and Council Fond du Lac First Nation;
- Prince Albert Grand Council – Athabasca Region; and
- Metis Local Northern Region 1.



10 0 10

SCALE 1:400,000 KILOMETRES

LEGEND

- INDIAN RESERVE
- WATERBODY
- RIVER
- HIGHWAY
- ROAD
- VILLAGE
- RUNWAY
- GENERAL PROJECT LOCATION
- NORTHERN ADMINISTRATION DISTRICT
- ATHABASCA LAND USE PLAN - STAGE 1
- ATHABASCA LAND USE PLAN - STAGE 2
- ATHABASCA LAND USE PLAN - STAGE 3
- ELIZABETH FALLS
- CAMP GRAYLING
- RESIDENCE

REFERENCE

DMTI Highways and Roads
NTS Mapsheet 74I, 74J, 74O, 74P
DATUM: NAD 83 PROJECTION: UTM ZONE 13

PROJECT

SaskPower

ELIZABETH FALLS HYDROELECTRIC POWER PROJECT

TITLE

GENERAL PROJECT LOCATION

Golder Associates
Saskatoon, Saskatchewan

PROJECT	10-1365-0004.22000		FILE No.	
DESIGN			SCALE AS SHOWN	REV. 1
GIS	JRC	12/12/12		
CHECK	MT	12/12/12		
REVIEW	BC	12/12/12	FIGURE: 1.1-1	

G:\CLIENTS\SASKPOWER\Elizabeth Falls Power Project\Figures\10-1365-0004 SaskPower Elizabeth Falls EA\22000 Project Description\10-1365-0004 General Project Location.mxd Date: 12/12/2012 2:21:28 PM

Public Stakeholders and Stakeholder Groups:

- Mayor and Council Northern Hamlet of Stony Rapids;
- Athabasca Land Use Planning;
- Athabasca Health Authority;
- New North;
- Northern Labour Market Committee (NLMC);
- Athabasca Basin Development - Board of Directors;
- Athabasca Keepers of the Water;
- Canadian Parks and Wilderness Society, Saskatchewan (CPAWS);
- Saskatchewan Environmental Society (SES);
- local outfitters and resource users;
- regional suppliers;
- uranium industry;
- regional educations and training institutes; and
- relevant government departments and ministries.

1.4 Regulatory Framework

Both federal and provincial environmental assessment legislation may apply to this Project. The federal requirements are detailed within the *Canadian Environmental Assessment Act* (*CEAA*) (Government of Canada 2012). Provincial requirements are specified under the *Environmental Assessment Act* (*EAA*) (Government of Saskatchewan 2010).

1.4.1 Federal

Under Section 8 of the *CEAA, 2012*, a Project Description is required to initiate the screening process through which the Canadian Environmental Assessment Agency (the Agency) will determine if a federal environmental assessment is required for all designated projects. Designated projects are defined under the Regulations Designating Physical Activities (2012). The information requirements for a Project Description are provided in the Prescribed Information for the Description of a Designated Project Regulations and summarized in the Guide to Preparing a Description of a Designated Project under the *Canadian Environmental Assessment Act*, 2012 (CEAA-July 2012).

1.4.2 Provincial

Similar to the federal process, the provincial environmental assessment process begins with the submission of a Technical Proposal to the Environmental Assessment Branch (EAB) of the Ministry of Environment (MOE) to determine if the Project is considered a ‘development’.

The information requirements for a Technical Proposal are provided in the Technical Proposal Guidelines – A Guide to Assessing Projects and Preparing Proposals Under the *Environmental Assessment Act*, 2010 (MOE 2012).

1.4.3 Regulatory Permitting

Regulatory permitting (i.e., licensing) occurs after environmental assessment approval and includes the submission of specific applications and supporting design and project management documentation seeking specific construction and operating approvals. A number of federal and provincial permits, licences, approvals and authorizations may also be required depending on the specifics of the Project (Table 1.4-1).

Table 1.4-1: Federal and Provincial Acts and Regulations Relevant to the Project

Jurisdiction	Related Regulations	Permits Required
	Federal Acts	
Canadian Emission Reduction Incentives Agency Act, S.C., 2005, c. 30	▪ n/a	▪ n/a
Canadian Environmental Assessment Act, 2012, S.C., 2012, c.19, s.52	▪ Regulations Designating Physical Activities, SOR/2012-147 ▪ Prescribed Information for the Description of a Designated Project Regulations, SOR/2012-148 ▪ Cost Recovery Regulations, SOR/2012-146	▪ Environmental Assessment Approval
Canadian Environmental Protection Act, 1999, C-15.1	▪ Environmental Emergency Regulations, SOR/2003-307 ▪ Federal Above Ground Storage Tank Technical Guidelines, P.C. 1996-1233 ▪ Federal Halocarbon Regulations, 2003 SOR/2003-289 ▪ Federal Underground Storage Tank Guidelines ▪ Inter-provincial Movement and Hazardous Waste Regulations, SOR/2002-301 ▪ National Pollutant Release Inventory and Municipal Wastewater Services May 2003 ▪ Ozone-depleting Substances Regulations, 1998 SOR/99-7	▪ n/a
Canadian Water Act, R.S.C., 1985, c. C-11	▪ Guidelines for Canadian Drinking Water Quality	▪ n/a
Canadian Wildlife Act, R.S.C., 1985, c. W-9	▪ Wildlife Area Regulation, C.R.C., c. 1609	▪ n/a
The Fisheries Act, R.S.C., 1985, c. F-14 (amended 2012)	▪ *n/a*	▪ Authorization For Harmful Alteration or Disruption, or the Destruction of fish habitat (Section 35) ▪ As well as requirements under other sections of the act (may include Sections 20, 30, 32, and 36 as final 2012 changes come into force)

Table 1.4-1: Federal and Provincial Acts and Regulations Relevant to the Project (continued)

Jurisdiction	Related Regulations	Permits Required
Federal Acts		
Indian Act R.S.C. 1985, c.I-5	▪ Indian Reserve Waste Disposal Regulations, C.R.C., c.960 ▪ Indian Timber Regulations C.R.C., c.961	▪ Permit to use land in a reserve for the disposal or storage of waste, or to burn waste on any land in a reserve ▪ Licence to cut timber on surrendered lands or on reserve land ▪ Lease of Land (Section 53) ▪ Access Permit (Section 20)
Migratory Birds Convention Act, S.C., 1994, c. 22	▪ *Migratory Bird Regulations, 2010 C.R.C., c. 1035*	▪ n/a
*Navigable Waters Protection Act, R.S., 1985, C. N-22**	▪ *n/a*	▪ Work Approval
Species at Risk Act, S.C. 2002, c. 29	▪ n/a	▪ n/a
Transportation of Dangerous Goods Act, 1992, C.34	▪ Transportation of Dangerous Goods Regulations, SOR/2001-286	▪ n/a
Provincial Acts		
The Clean Air Act, S.S. 1986-87-88, C-12.1	▪ The Clean Air Regulations, R.R.S c. C-12.1 Reg 1	▪ Permit to Construct ▪ Permit to Operate
The Environmental Assessment Act, S.S. 1979-80, E-10.1	▪ n/a	▪ Environmental Assessment Approval
Environmental Management and Protection Act, R.R.S. 2010, c. E-10.22	▪ The Environmental Spill Control Regulations, R.R.S c.D-14 Reg 1 ▪ The Hazardous Substances and Waste Dangerous Goods Regulations, R.R.S., c. E-10.2, Reg 3 ▪ The Water Regulations, 2002, R.R.S. c. E-10.21 Reg 1 ▪ Halocarbon Control Regulations, c. E-10.21 Reg 2 ▪ Used Oil Collection Regulations, R.R.S., c. E-10.2 Reg 8	▪ Hazardous Substances and Waste Dangerous Goods Permit to Construct (Section 10) ▪ Hazardous Substances and Wastes Dangerous Goods Permit to Operate (Approval to Store - Section 9) ▪ Approval to Construct - Water Works ▪ Approval to Operate – Water Works ▪ Permit to Construct - Aquatics Habitat Protection Permit
Forest Resources Management Act, 1996, F-19.1	▪ The Forest Resources Management Regulations, 1999, F-19.1 Reg 1	▪ Forest Product Permit
Fire Prevention Act, S.S. 1992, F-15.001	▪ The Saskatchewan Fire Code Regulations, F-15.001 Reg 1 ▪ The Fire Insurance Fees and Reporting Regulations, F-15.001 Reg 2	▪ n/a
Fisheries Act (Saskatchewan), S.S. 1994, F-16.1	▪ The Fisheries Regulations, 1994, F-16.1	▪ n/a

Table 1.4-1: Federal and Provincial Acts and Regulations Relevant to the Project (continued)

Jurisdiction	Related Regulations	Permits Required
Provincial Acts		
The Heritage Property Act, S.S. 1979-80, H-2.2	▪ The Heritage Property Regulations, Sask. Reg 279-80	▪ n/a
Highways and Transportation Act, S.S. 1987, H-3.01	▪ The Controlled Access Highways Regulations, H-3 Reg 7 ▪ The Highways and Transportation Regulations, H-3.01 Reg 1 ▪ The Erection of Signs Adjacent to Provincial Highways Regulations, 1986	▪ Approach Permit ▪ Oversize / Overweight permits ▪ Roadside Permit ▪ Off-premise Sign Application ▪ On-premise Sign Application
The Northern Municipalities Act, 2012, N-5.2	▪ The Northern Municipalities Regulations, 2011, N-5.2 Reg 1	▪ Road Maintenance Agreement
Occupational Health and Safety Act, S.S. 1993, O-1.1	▪ Occupational Health and Safety Regulations, 1996, R.R.S., c. O-1 Reg 1	▪ n/a
Provincial Lands Act, S.S. 1978, P-31	▪ Saskatchewan Wetland Conservation Corporation Land Regulations, 1993, P-31, Reg 14 ▪ Crown Resource Land Regulations, P-31, Reg 17 ▪ Provincial Lands Regulations, SR145/68	▪ n/a
Saskatchewan Watershed Authority Act, S.S. 2005, c. S-35.03	▪ Saskatchewan Watershed Authority Regulations, R.R.S., c. S-35.03 Reg1	▪ Approval to Construct - Industrial Wastewater Works ▪ Water Rights Licence & Approval to Construct and Operate Works ▪ Water Rights Licence
Weed Control Act, 2010, S.S. W-11.1	▪ Weed Control Regulations, W-11.1, Reg 1	▪ n/a
Wildlife Act, S.S. 1998, c. W-13.12	▪ Wildlife Regulations, W-13.1, Reg 1 ▪ Wildlife Management Zones and Special Areas Boundaries Regulations, 1990, W-13.1 Reg 45 ▪ Wildlife-Landowner Assistance Regulations, 1981, W-13.1, Reg 48 ▪ Wild Species at Risk Regulations, W-13.1 Reg 1	▪ n/a

*Act is currently being revised. Changes to the Act had not come into force at the time this table was generated. Changes to the Act will have to be reviewed in context of the Project once additional information is available.
n/a = not applicable

1.5 Environmental Studies within the Proposed Project Area

A number of environmental studies have been undertaken by the Proponent in the general Project area specific to baseline data collection and feasibility planning for the Project. The Proponent is not aware of any federal regional environmental studies, as described in Section 73-77 of *CEAA, 2012* that are taking place, or have previously taken place, in the region.

The Project is located within the Stage I planning area of the Draft Athabasca Land Use Plan (ALUP) for the Athabasca region. The draft land use plan was released in March 2006. As part of this plan, land use zoning is used as a planning tool to guide management and development within the Stage I planning area

(ALUP 2006). The Project is located in the community and infrastructure area. The planning focus for this area is on maintaining existing community and public infrastructure uses, and allows for future improvements to access and infrastructure (ALUP 2006).

2.0 PROJECT INFORMATION

2.1 Project Components

The Project will be a 42 to 50 MW water diversion type electrical generating station. The gross head of the Project will be approximately 36 metres (m), capitalising on the long term annual average river flow of 305 cubic metres per second (m^3/s). No impoundment of Black Lake will be required. When completed, the principal components of the proposed Project will consist of:

- an approximately 8.5 km long connecting gravel access road to the proposed Project site from the all-season road between Stony Rapids and Black Lake communities;
- a bridge over the Fond du Lac River;
- a powerhouse and associated infrastructure;
- an approximately 2.65 km tunnel from Black Lake to the powerhouse, using a portion of the water that would typically flow down the Fond du Lac River from Black Lake to Middle Lake;
- an approximately 1,100 m long tailrace channel between the powerhouse and its re-entry into the Fond du Lac River upstream of Middle Lake;
- a submerged weir in the Fond du Lac River at the outlet of Black Lake, to maintain water levels and fish habitat in Black Lake; and
- an approximately 20 km transmission line and switching station to connect the energy produced into the northern Saskatchewan electrical grid.

2.2 Designated Activity

Under the *CEAA 2012*, an environmental assessment may be required for "designated projects". A designated project is one that includes one or more physical activities that are set out in the Regulations Designating Physical Activities (2012). Pursuant to Section 7 of the Schedule to the federal Regulations Designating Physical Activities (2012), a project involving the construction, operation, decommissioning, and abandonment of a structure for the diversion of 10,000,000 cubic metres per year (m^3/y) or more of water from a natural water body into another natural water body is a designated project. The Project, as currently proposed, will require the construction of a structure that will divert up to approximately 5,000,000,000 (5.0 billion) to 5,900,000,000 (5.9 billion) m^3/y depending on the generating capacity of the powerhouse selected, and on the frequency and extent of planned and unplanned outages. As the Project will exceed the criteria listed in the regulations, it is considered a designated project and, therefore, will be subject to the provisions of the *CEAA, 2012*.

2.3 Project Footprint

The arrangement of proposed structures for the Project was influenced by BLFN's requirements that the Project minimize the environmental impact to Black Lake and the Fond du Lac River. To take full advantage of the gradient in this section of the Fond du Lac River, water from Black Lake will be conveyed from an intake structure via a power tunnel excavated through rock to the powerhouse, and finally will be returned to the Fond du Lac River upstream of Middle Lake via a tailrace.

The results of the site investigations and development of the design concept considering cost and potential environmental effects determined the final proposed structure locations. Because the Project design has not yet been finalized, minor refinements are expected (e.g., changes to component locations to accommodate site conditions) during the final design phase (start early 2013), pursuant to final engineering design and input from the general contractor.

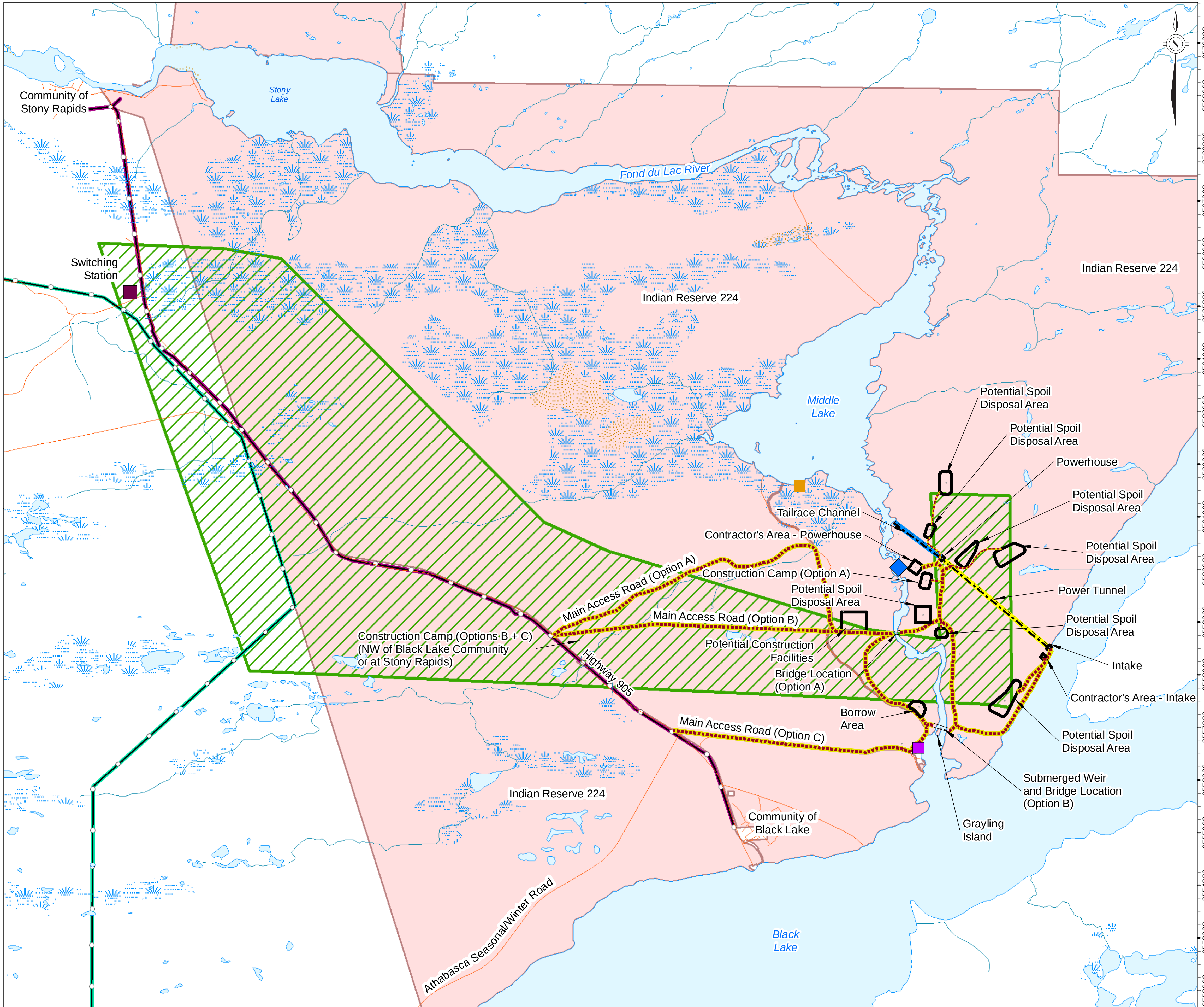
The footprint of the proposed Project will include the area between Black Lake and Middle Lake that extends approximately 2 to 3 km on either side of the Fond du Lac River (Figure 2.3-1). The proposed location of the powerhouse coordinates are 59° 10’ 48” N and 105° 32’ 12” W. Within this area, footprint impacts will be localized to the immediate vicinity of Project components (e.g., bridge, water intake, powerhouse, tailrace and outfall, submerged weir, access roads, staging/material storage areas, construction camp, transmission lines and waste rock disposal areas).

The majority of Project activities will take place on Chicken Indian Reserve No. 224. Portions of the Project proposed at this time that may be partially located off of Reserve land include segments of the main access road, transmission line corridor, and an area of Camp Grayling. In addition to the communities of Black Lake and Stony Rapids, there is one known residence on Middle Lake.

3.0 PROJECT DESCRIPTION

The proposed Project is comprised of a water intake located on Black Lake, a 2.65 km power tunnel excavated through rock to a powerhouse containing electricity generating turbines, and a tailrace extending for approximately one kilometre from the powerhouse to the Fond du Lac River. The tailrace will discharge into the Fond du Lac River approximately 600 m downstream of Elizabeth Falls, which consists of a series of rapids over a 600 m long section of the river. Several smaller rapid sections are located on the river upstream of Elizabeth Falls towards Black Lake. The difference in elevation between Black Lake and Middle Lake is approximately 36 m, which is considered to be the gross head of the development.

Other components of the proposed Project include an electrical switchyard located immediately adjacent to the powerhouse, and an interconnecting transmission line, together with the associated access roads and a bridge across the Fond du Lac River connecting the Project site to Highway 905 and the communities of Black Lake and Stony Rapids. The proposed Project will also include a construction work camp, waste rock disposal areas, and a submerged weir near the outlet of Black Lake (Figure 2.3-1). Some aspects of the project design may be modified subject to final engineering and design.



LEGEND

- INDIAN RESERVE
- WATERBODY
- WETLAND
- RIVER
- ROAD
- 138 KV TRANSMISSION LINE
- 25 KV DISTRIBUTION LINE
- INTERCONNECTION STUDY AREA
- ELIZABETH FALLS
- SWITCHING STATION
- CAMP GRAYLING
- RESIDENCE

NOTE: LOCATIONS OF POTENTIAL OR OPTIONAL FACILITIES ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY. FINAL LOCATIONS WILL BE DETERMINED DURING FINAL ENGINEERING AND DESIGN, TAKING INTO CONSIDERATION STAKEHOLDER INPUT.

REFERENCE

DATUM: NAD83 PROJECTION: UTM ZONE 13
SITE PLAN PROVIDED BY HATCH ENGINEERING

2 0 2
SCALE 1:75,000 KILOMETRES

PROJECT
SaskPower
ELIZABETH FALLS HYDROELECTRIC POWER PROJECT

TITLE
CONCEPTUAL SITE LAYOUT

Golder Associates
Saskatoon, Saskatchewan

PROJECT		10-1365-0004	FILE No.
DESIGN			SCALE AS SHOWN REV. 2
GIS	JRC	12/12/12	
CHECK	MT	12/12/12	FIGURE: 2.3-1
REVIEW	BC	12/12/12	

G:\CLIENTS\SASKPOWER\Elizabeth Falls Power Project\Figures\10-1365-0004 SaskPower Elizabeth Falls EA\22000 Project Description\10-1365-0004 Site Plan 2012-08-14.mxd Date: 12/12/2012 2:22:40 PM

3.1 Construction

The key components of the Project, which will comprise the majority of site construction activities, require the construction of the proposed water intake, tunnel, powerhouse, switchyard and tailrace. The powerhouse will require the installation of turbines and generators as well as other electrical and mechanical systems.

3.1.1 Access Roads and Bridge

The main access road will provide all-season permanent access to the Project areas during construction and operations (Figure 2.3-1). The location of the main site access road from Highway 905 to the proposed bridge over the Fond du Lac River will be selected following local First Nations and public engagement. Currently, three possible alignments are being presented for community discussion; two alignments follow existing vehicle trails while the third alignment crosses undisturbed terrain. Beyond the Fond du Lac River bridge, the main access road will turn north and travel along the right bank of the Fond du Lac River passing near the proposed location of the contractor's work area and ending at the location of the powerhouse. The approximate length of the proposed main access road alignment from Highway 905 to the powerhouse is about 8.5 km.

Various other roads will be required in addition to the main access road (Figure 2.3-1). The east access road will branch off of the main access road just east of the proposed bridge location, and will provide access to the water intake area located at Black Lake. The length of the proposed east access road is approximately 2.7 km. If the construction camp is located at the Project site, a third road will be constructed from the main access road to the construction camp.

Temporary roads will be required to access waste rock and overburden disposal areas, and other areas that require access during construction. Temporary roads will not be built to provide all-season access. The number of temporary roads will be kept to a minimum to reduce impact on the local environment and the possibility of encroachment onto previously unknown heritage sites. After Project construction is completed temporary roads will be removed and the terrain returned, as near as possible, to its original preconstruction condition. As the locations of the waste rock and overburden disposal areas will not be finalized until the final design phase, the route of temporary access roads is uncertain at this stage. However, all significant components of the final Project design will be determined prior to submitting the Environmental Impact Statement (EIS) for the Project.

Two alternate access bridge locations across the Fond du Lac River are proposed. One site is located approximately 1.8 km downstream of Grayling Island at a point where the width of the river is narrowest. A second location would be parallel to the axis of the proposed submerged weir at the downstream end of Grayling Island. In addition to engineering and cost considerations, public consultation on the location of the access bridge will be used to determine the preferred bridge location.

3.1.2 Powerhouse

An optimization study is currently underway to determine the specific generating capacity of the proposed Project (i.e., between 42 MW and 50 MW). The Project will operate as a water diversion type plant using approximately 36 m of gross head between Black Lake and Middle Lake, at discharge rates between 160 m^3/s (42 MW facility) and 190 m^3/s (50 MW facility).

While the number of generating units has not yet been finalized, it is estimated that up to four units could be used. A multiple unit generating plant was selected because of its flexibility of operation and more easily managed scheduling of maintenance outages compared to a single unit power plant.

The type of turbine units selected for the Project will be determined in the design process and will be described in more detail in the EIS. Turbine specific characteristics such as fixed versus variable pitch blades, runner diameter, synchronous speed, number of units, and individual unit output will be determined subsequent to a formal solicitation for equipment proposals from turbine manufacturers. An example of a typical turbine and generator installation layout is provided in Figure 3.1-1.

3.1.2.1 Flow Bypass

In order to maintain downstream flows and water levels during a sudden change in turbine load such as a load rejection, the station will be equipped with features to ensure that the change in operation does not negatively affect downstream flows or water levels.

3.1.3 Water Intake

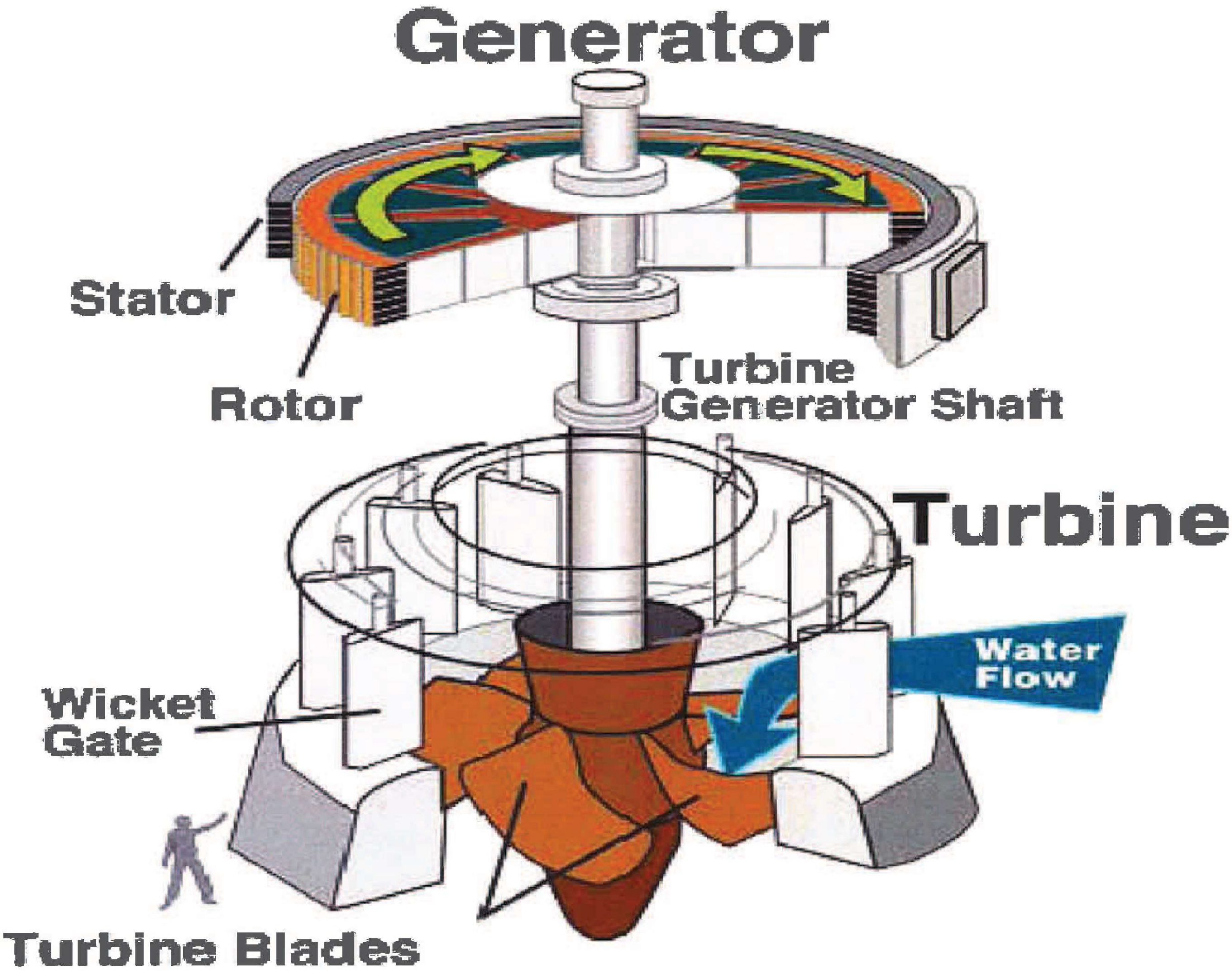
The purpose of the proposed water intake is to direct water into the power tunnel from Black Lake under controlled conditions. It establishes the transition between the free water surface of the lake and the closed conduit flow within the power tunnel. The water intake structure will be designed and located to divert water from well below the surface of the lake (i.e., greater than 2 to 5 m below the lake surface). The water intake will be constructed of reinforced concrete with provisions for steel stoplogs and trashracks. The trashracks are intended to prevent debris and ice from entering the water passages of the plant and potentially damaging the turbine generating equipment. To minimize entrance hydraulic losses, the intake water passage will be streamlined to direct the flow from Black Lake into the power tunnel. The intake channel and structure will be designed to draw the required power plant design discharge from Black Lake over the full range of anticipated lake levels.

The proposed water intake will be sized to deliver the full plant discharge capacity of 160 m^3/s (42 MW facility) or 190 m^3/s (50 MW facility) into the power tunnel. The size and shape of the intake water passage will be designed to minimize hydraulic losses, to ensure the formation of a competent ice cover at the intake channel entrance during winter operation, and to ensure compliance with industry and regulatory standards.

3.1.3.1 Cofferdam for Water Intake in Black Lake

Construction of the water intake structure will require construction of a coffer dam to prevent water flowing into the active work area. Natural features will be used where appropriate to aid with the coffer dam design. The proposed water intake structure will be located adjacent to a rock outcrop approximately 90 m from the shore of Black Lake. There is a plateau between the rock outcrop and the shoreline of the lake that is underlain by up to 20 m of sand, gravel, boulders and cobbles (Hatch 2002, 2012).

A steel sheet pile cut-off wall will be installed to control seepage through this sand layer during construction of the water intake. This option involves driving sheet piles to form a low permeability barrier. The sheet pile wall will be about 250 m long and extend 17 m below grade. A sand plug between the sheet pile and the excavation will be left to ensure stability of the sheet pile wall. Water seepage through and beneath the sheet pile wall will be managed with dewatering wells or sumps. The sheet piles will be removed prior to excavation of the sand plug, but after completion of the water intake and power tunnel construction activities.



G:\CLIENTS\SASKPOWER\Elizabeth Falls Power Project\Figures\10-1365-0004 SaskPower Elizabeth Falls EA\22000 Project Description\10-1365-0004 Process Diagram C.mxd

REFERENCE

PROCESS DIAGRAMS PROVIDED BY SASKPOWER

PROJECT

SaskPower

ELIZABETH FALLS
HYDROELECTRIC
POWER PROJECT

TITLE

GENERATOR
PROCESS DIAGRAM

Golder Associates
Saskatoon, Saskatchewan

PROJECT		10-1365-0004	FILE No.	
DESIGN			SCALE AS SHOWN	REV. 0
GIS	JRC	12/12/12	**FIGURE: 3.1-1**	
CHECK	MT	12/12/12		
REVIEW	BC	12/12/12		

3.1.4 Tunnel

The current preferred power tunnel arrangement consists of a 2.65 km long tunnel with a 9.1 m wide horseshoe shaped (∩) cross-section. The tunnel is expected to be constructed using the drill-and-blast method. Approximately 315,000 cubic metres (m^3) of waste rock is expected to be created by the tunnel excavation, assuming an overbreak of 0.5 m along the entire length of the tunnel.

Due to the geology of the area, the drill-and-blast method is expected to be the preferred method of construction. Tunnelling will be done from a single active work face. It is assumed that initially about 150 m length of the tunnel will be excavated from the powerhouse end, with the remaining length (approximately 2,500 m) of the tunnel being excavated from the water intake side. This sequencing of tunnelling allows for construction of the tunnel to steel penstock transition at the powerhouse to proceed independent of the remainder of tunnel construction. The access for installation of the steel penstocks will be via the tunnel end that enters the upstream wall of the powerhouse excavation. The access to the tunnel for mucking and general traffic during construction from the Black Lake water intake end will be via the intake excavation.

3.1.5 Tailrace

Downstream of the powerhouse, the water from the turbine discharge enters the tailrace channel. The tailrace channel is located within a broad flat valley sloping gently to the northwest. The proposed tailrace channel (approximately 1,100 m long) will be excavated in rock with varying depths of overburden. After the water from Black Lake is used to generate power, the tailrace returns the water back to the Fond du Lac River at a location upstream of Middle Lake.

As the power plant is expected to operate at full discharge capacity approximately 90 percent (%) of the time, the design of the tailrace channel has been based on the full plant discharge. For an installed capacity of 42 MW and full plant discharge of 160 m^3/s, the optimum tailrace channel cross-section was determined to have a width of 25 m and a flow depth of 5.5 m resulting in an average flow velocity of 1.1 metres per second (m/s). The resultant hydraulic loss in the tailrace channel due to friction was estimated to be 0.27 m at the full plant discharge.

3.1.5.1 Cofferdam for Tailrace Outlet into Fond du Lac River

To keep water out of the active work area and permit working in the dry during tailrace channel excavation, a rock and overburden plug will be left at the downstream end of the tailrace channel until the excavation is complete. The cofferdam would be constructed by placing the two rockfill sections first, then depositing semi-impervious material between them to minimize the release of fines into the river. The cofferdams would be removed following completion of the tailrace exit excavation for hydraulic improvements at the river. Turbidity curtains will be used during construction to minimize the amount of silt entering the river.

3.1.6 Black Lake Outlet (Grayling Island) Water Control Structure

To maintain historic water levels in Black Lake following construction of the generating station, the flow through the natural outlet of Black Lake will need to be restricted by constructing a submerged rockfill weir spanning the Fond du Lac River. The proposed weir will be constructed across the Fond du Lac River at the outlet of Black Lake at the location indicated in Figure 2.3-1. The Fond du Lac River is approximately 200 m wide at the location of the proposed weir, including the 35 m wide Grayling Island, which the weir will intersect. The length of weir to the west of Grayling Island will be approximately 85 m, while the length of weir to the east of the island is approximately 80 m. The final weir configuration will be designed to facilitate fish passage at all lake levels and discharges.

3.1.7 Transmission Line

A transmission line will be required to connect the Project to the existing northern Saskatchewan electrical grid through the existing Stony Rapids Switching Station, or potentially a new station in the area. The general corridor, through which potential transmission line rights-of-way will be identified, is shown in Figure 2.3-1. The transmission line connecting the powerhouse to the Stony Rapids Switching Station is still in the design phase and an exact location has not yet been determined. SaskPower, separate from the Project Proponent, will build, own, operate, and maintain the transmission line. SaskPower plans to discuss the transmission line right-of-way location with Black Lake and Stony Rapids community members prior to finalizing a route.

3.2 Operation

Operational planning for the Project is in the early design stages; adjustments to the description provided herein may be made after further evaluation, including consulting with local community members and regulators.

3.2.1 Powerhouse

The proposed powerhouse and service bay complex will be located in a rock excavation to the east of Elizabeth Falls as shown in Figure 2.3-1. Adjacent to the powerhouse will be the parking/vehicle manoeuvring area and the switchyard.

It is anticipated that the powerhouse structure will house two to four generating units, for a total rated plant capacity of between 42 and 50 MW. A multi-unit plant was selected because of its flexibility of operation and scheduling of outages compared to a single unit plant. While a single unit plant may cost less, a multi-unit powerhouse will result in less lost generation of energy due to forced and planned outages. Equipment components will also be smaller and easier to handle.

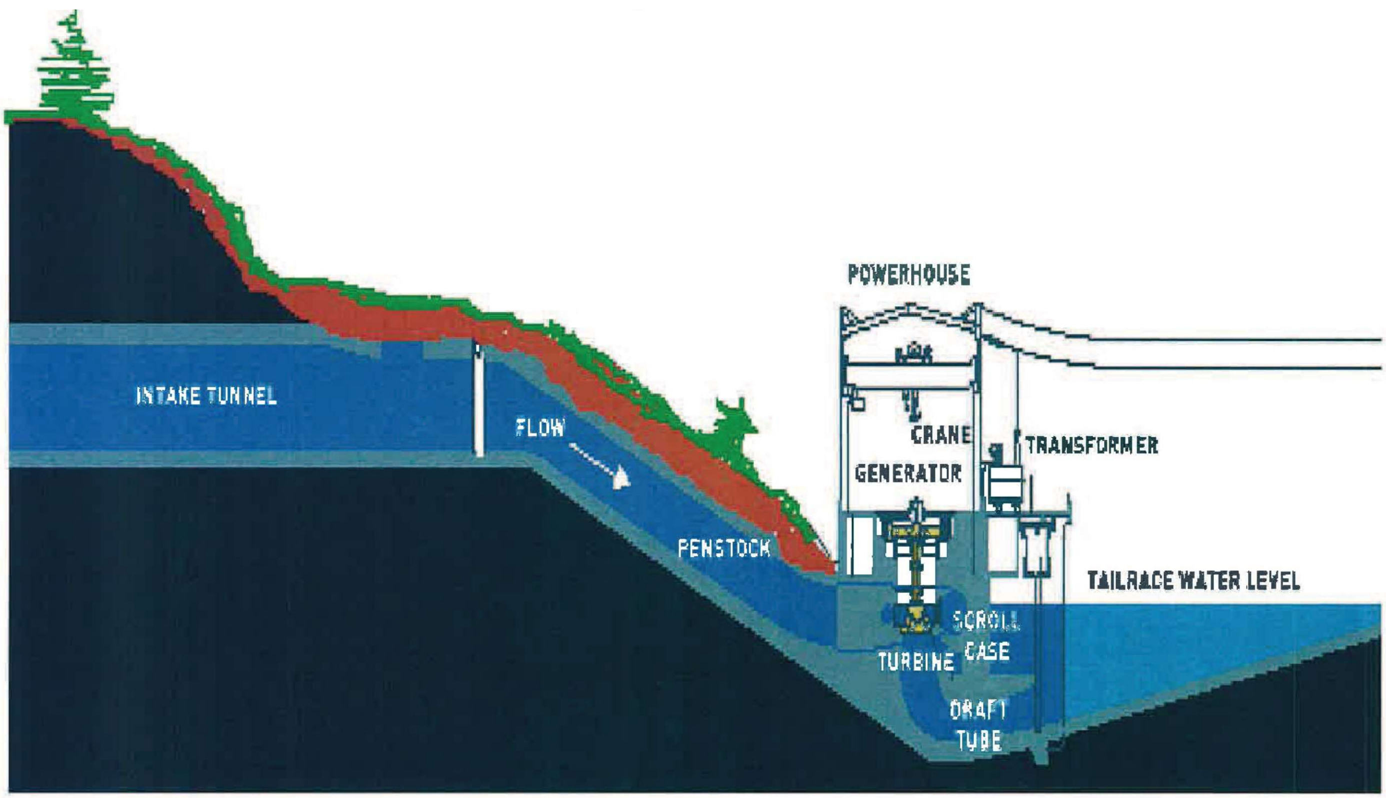
3.2.2 Powerhouse Complex

Design of the powerhouse complex is conceptual at this time. The design characteristics proposed are based on what would typically be expected for a facility of this nature. Final design characteristics will be determined by mid-2013. A conceptual drawing of what the powerhouse complex may look like is provided in Figure 3.2-1.

3.2.3 Water Intake Structure

The proposed intake will consist of a reinforced concrete structure with provision for steel stoplogs and trashracks, and a streamlined water passage to direct the flow to an excavated tunnel. The intake channel and structure will be designed to withdraw the required plant discharge from Black Lake over the full range of anticipated lake levels.

The size of the intake will be sufficient to ensure the formation of a stable ice cover in Black Lake in the vicinity of the water intake during winter operation. The soffit (ceiling) of the water passage will be set low enough to prevent entrainment of air into the tunnel. The level of the intake deck will be set so that sufficient rock thickness remains above the tunnel soffit to maintain the integrity of the rock.



REFERENCE

PROCESS DIAGRAMS PROVIDED BY SASKPOWER

PROJECT

SaskPower

ELIZABETH FALLS
HYDROELECTRIC
POWER PROJECT

TITLE

EXAMPLE POWERHOUSE
PROCESS DIAGRAM

Golder Associates
Saskatoon, Saskatchewan

PROJECT		10-1365-0004	FILE No.	
DESIGN			SCALE AS SHOWN	REV. 0
GIS	JRC	12/12/12	**FIGURE: 3.2-1**	
CHECK	MT	12/12/12		
REVIEW	BC	12/12/12		

G:\CLIENTS\SASKPOWER\Elizabeth Falls Power Project\10-1365-0004 SaskPower Elizabeth Falls EA\22000 Project Description\Figures\10-1365-0004 Process Diagram A.mxd

3.2.3.1 Black Lake Water Levels with Project Operation

Using 40 years of recorded flows and Black Lake water levels, a model was developed to simulate water levels in Black Lake under natural conditions, and with the power generating station in operation. Water levels were estimated in the model using the stage discharge relationship developed from flow records obtained from the Water Survey of Canada Gauging Station near the outlet of Black Lake.

Black Lake water levels are controlled by a natural rock outcrop at the lake outlet where the Fond du Lac River resumes its course. From the results of the simulation of natural conditions over the period of record, the analysis indicated that Black Lake water levels typically fluctuate approximately 0.7 m over the course of an average year. Over the 40 year period of record, the maximum annual water level fluctuation was determined to be approximately 1.6 m.

As previously stated, with the added flow capacity in the power tunnel, a submerged rockfill overflow weir will be installed at the outlet of Black Lake to restrict the flow, and maintain lake levels within their historic range. The model that was used for the natural conditions was modified to simulate the operation of the power plant over the same historical period of record.

The post-Project Fond du Lac River discharge downstream of the Black Lake outlet will vary throughout the year. However, depending on the time of year, a minimum riparian flow varying between 50 and 100 m^3/s will be maintained through the natural river reach to retain existing fisheries habitat and natural river regimes as much as possible. Most of the time however, these minimum flows will be exceeded.

3.3 Supporting Infrastructure

3.3.1 Construction Camp

It is anticipated that a construction camp will be required to accommodate 100 to 150 workers. Features of a construction camp of this nature would typically include: dormitories with washroom and laundry facilities, kitchen and dining facility, office space, recreational and commissary complex, water and sewage storage units, parking spaces and electrical generator units. Three alternative locations are currently being considered (Figure 2.3-1).

3.3.2 Contractors Work Areas

Contractors' work areas will be used to store materials, maintain and assemble equipment and administer work on the Project. It is expected that two such areas will be required, one near the powerhouse and one near the water intake. At this stage of design the exact size and details of the contractors' work areas are not known. However, two potential locations have been selected as shown on Figure 2.3-1.

3.3.3 Construction Facilities Area

At this time it is anticipated that only one construction facilities area will be required. This area will be used for contractor's laydown areas, work areas, storage areas, services areas, and garages. One potential location has been identified on the southwest side of the Fond du Lac River (Figure 2.3-1). The final location(s) will be determined during final design.

3.3.4 Water Supply and Fire Protection Water Services

During construction and operations, potable water will be provided at various locations throughout the contractors' work areas. It is expected that treated water will be hauled from an existing water treatment facility to site via water trucks from either BLFN or Stony Rapids. Untreated water will be pumped directly from Black Lake or the Fond du Lac River for use in fire protection. Pump intakes will be screened to prevent entrainment of fish in accordance with Fisheries and Oceans Canada's (DFO's) "Freshwater Intake End-of-Pipe Fish Screen Guideline (DFO 1995).

3.3.5 Power

Construction power will be supplied to the site from the SaskPower grid using temporary 25 kilovolt (kV) distribution lines to the contractor's work area, certain construction facilities, and the construction camp during construction of the principal structures. A temporary pole line will distribute power throughout the Project site and will provide mounting for exterior lighting, cable television and telephone line distribution as required. It is expected that the power requirements of the Project during operations can be accommodated through the 25 kV distribution line put in place for construction, with diesel powered generators for backup.

3.3.6 Telecommunications

A telecommunication system will be required for construction of the Project, as well as for the eventual management and integration of the energy produced by the Project into the SaskPower grid system. Given the remote location of the proposed Project, telecommunications is one of the key aspects of the Project. At this time, the optimal telecommunications technology has not yet been determined. Options include satellite and fibre optic network technologies.

3.3.7 Waste Rock Disposal Areas

The location of potential disposal areas for the waste rock and overburden materials excavated from the water intake, power tunnel, powerhouse, and tailrace channel is currently under consideration (refer to Figure 2.3-1 for options being considered). Factors being considered for determining their location include proximity to the main access roads, potential ability to accommodate disposal of a significant amount of excavated materials, and suitable topographical features.

At this time it is estimated that the total potential disposal volume after excavation will be approximately 3,000,000 m^3. This represents a post-excavated volume for disposal consisting of approximately 1,860,000 m^3 of rock and 1,120,000 m^3 of overburden. A relatively small volume of the excavated rock may be used as road topping, riprap to armour the walls of the portion of tailrace channel excavated in overburden, and to construct the submerged weir across the Fond du Lac River at Grayling Island. Similarly, portions of the overburden, comprised of sand and gravel, may be used as aggregate for the production of concrete if suitable.

Some portion of the waste rock excavated from the power tunnel could be potentially acid generating, high in various metals or contain uranium mineralization, particularly waste rock from the section of tunnel within, or in close proximity to, the Black Lake Shear Zone. As such, a waste rock chemical management plan will be prepared. This plan will outline the methods to visually identify and classify the waste rock, including the rock type, the waste unit designation, and the acid rock drainage (ARD) and uranium potential. This plan will also include the preparation of standard operating procedures and a site geological manual to direct on-site characterization.

It is expected that a designated spoil area would be set aside to isolate materials deemed to be potentially ARD generating or that may contain uranium. In addition, drainage from the areas used to dispose of the different waste units will be monitored to confirm that water quality is acceptable for discharge to the environment, and also to provide information for use in reclamation planning. Water samples will be collected regularly and analyzed for general water quality parameters and total metals.

3.4 Decommissioning and Reclamation

The construction phase of the Project is expected to be relatively short (i.e., 4 years) compared to the operational life of the Project which may extend up to 100 years or more. A conceptual Decommissioning and Reclamation (D&R) Plan for the construction phase will be written as a component of the environmental assessment process associated with the Project.

The operational life of the Project is expected to extend up to 100 years or more. The exact life expectancy of the Project cannot be determined at this time as hydroelectric projects of this type can operate almost indefinitely with ongoing equipment maintenance and upgrades. It is currently anticipated that decommissioning and reclamation of the Project will take approximately one year following cessation of power production operations. A conceptual D&R Plan will be written as a component of the environmental assessment process associated with the Project.

Decommissioning, when it occurs, would be done in compliance with all federal and provincial acts, regulations and standards applicable at the time, and in consultation with the BLFN. Abandoned properties will be left in a condition that meets or exceeds regulatory requirements. In general, it is anticipated that equipment and material that would no longer be viable would be removed from the site and/or disposed of in an approved manner. It is anticipated at this time that usable materials and equipment will be removed from the site and returned to central stores and/or used at other power generation facilities. Alternatively, some reusable material and equipment may be made available for acquisition by the local communities.

3.5 Project Schedule

The Project schedule has been defined by major Project phases. If the Project is given regulatory approval, the major Project phases and their estimated timelines are as follows:

- construction: September 2014 to December 2017;
- operations: January 2018 to approximately January 2118; and
- D&R: duration of approximately one year following cessation of operations.

4.0 EMISSIONS, DISCHARGES AND WASTE

The emissions, discharges and waste that have that may be generated by the Project along with proposed mitigation for each are provided in Table 4.0-1.

Table 4.0-1: Emissions, Discharges and Waste Generated by the Project

Emission, Discharge or Waste		Mitigation Plan
Emission	Operation of motorized equipment (e.g., engine exhaust)	▪ Efforts will be made to minimize build-up of harmful airborne pollutants in the power tunnel. ▪ Vehicles and equipment will be inspected regularly and properly maintained to reduce emissions.
	Increased dust from increased use of access roads	▪ Dust abatement measures will be put in place as necessary.
	Increased noise levels	▪ Air compressors will be housed in insulated enclosures to act as effective sound barriers. ▪ Tunnel ventilation fans will be equipped with silencers.

Table 4.0-1: Emissions, Discharges and Waste Generated by the Project (continued)

Emission, Discharge or Waste		Mitigation Plan
Discharge	Hazardous and non-hazardous substances	▪ Fuel storage and re-fuelling will occur at a designated location in the work camp. ▪ Appropriate secondary containment will be in place. ▪ The compressors used for tunnel ventilation will be oil free rotary screw compressors. ▪ Non-petroleum based oils and greases will be used wherever practical. ▪ Backup generators and their associated diesel fuel tanks will we set upon concrete foundations equipped with catch sumps to prevent any accidental oil spills getting to the soil surface. ▪ Site drainage with a potential for containing oil will be directed to an oil interceptor/separator system.
	Hazardous and non-hazardous substances spills	▪ Spill response procedures will be in place. ▪ Double walled heat exchangers will be used for the turbine and generator cooling systems to reduce the risk that cooling coil failure will discharge oil into the water.
	Groundwater seepage into power tunnel during construction	▪ Water will be collected in sumps and pumped out of the tunnel. ▪ Tunnel seepage water will be discharged into a sediment pond to allow suspended solids to settle out before water is released to the environment.
Discharge	Site drainage/Surface runoff	▪ Road construction will incorporate erosion control methods (e.g., ditch blocks, silt fences) to ensure overland flow does not direct sediment-laden water into natural watercourses. ▪ A network of swales, culverts, and ditches within and around the Project will be put in place. ▪ Ditches will be sized to accommodate extreme daily rainfall events. ▪ Surface runoff will be directed into natural drainage courses via the drainage network put in place for the site.
	Increased erosion and scouring from site drainage	▪ Water flow volumes and velocities will be kept low. ▪ Riprap energy dissipaters and ditch lining will be installed in areas where runoff velocities may be high.
Waste	Sanitary	▪ Contractors will provide portable toilet facilities and holding tanks for the construction camp. ▪ Sewage will be collected regularly and hauled to an existing sewage treatment facility (e.g., Stony Rapids or Black Lake) for treatment and final disposal.
	Domestic	▪ During construction and operations, domestic waste (e.g., food refuse, construction materials) will be collected and hauled to an existing permitted waste disposal site. ▪ Only the burning of scrap wood and paper products, and the burial of scrap metal will take place at the construction site.
	Industrial	▪ Options for disposal are still being evaluated. ▪ Locations for disposal of waste rock and overburden are still being evaluated.

5.0 PROJECT LOCATION AND EXISTING ENVIRONMENTAL SETTING

5.1 Project Location

The proposed Project site is located approximately 7 km from the community of Black Lake (Figure 1.1-1), within the Chicken Indian Reserve No. 224 (AANDC 2011). The hamlet of Stony Rapids is located about 25 km northwest of the Project site. All-season road access in the area is limited to the length of Highway 905 between Black Lake and Stony Rapids communities. Transportation to southern Saskatchewan involves the use of the Athabasca Seasonal/Winter Road (i.e., Highway 905), or flights from the airport in Stony Rapids. A recreational sport fishing camp (i.e., Camp Grayling) is located at the outlet of Black Lake in close proximity to the Project. Both the surface and subsurface of the Reserve are set aside for the use and benefit of the BLFN members. Black Lake, Fond du Lac River and Middle Lake are the major waterbodies and watercourses in the vicinity of the Project. Elizabeth Falls, a well-known area of cataracts and rapids is located on the Fond du Lac River between Black Lake and Middle Lake. Figure 5.1-1 shows the environmental and heritage sensitivities identified in the Project area to date.

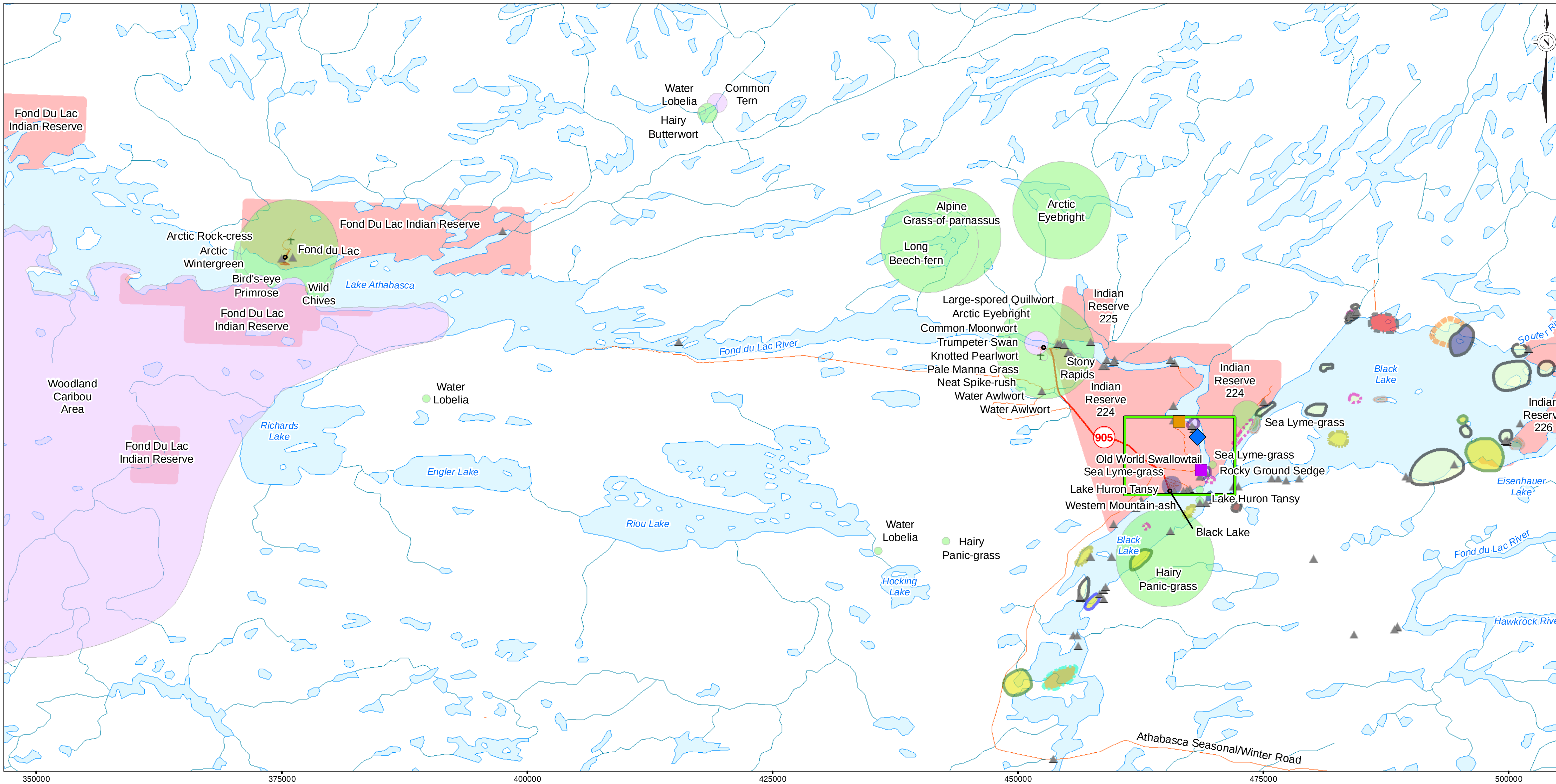
The legal description of the land where the Project is located is Chicken Indian Reserve No.224 as designated under the *Indian Act* (Government of Canada, 1985). Project components located outside of the Chicken Indian Reserve No.224 are located on land administered by the Northern Administration District in accordance with the *Northern Municipalities Act* (2012) (Figure 1.1-1).

5.2 Existing Environment

5.2.1 Climate, Atmospheric and Acoustic Environment

The Project area has a subarctic continental climate with long, very cold winters, and short cool summers. The Project area is located in the Northern Saskatchewan airshed. Regional background air contaminant concentrations are monitored at the MOE station located at La Loche, 370 km to the southwest. Air contaminants measured at La Loche include carbon monoxide (CO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), particulate matter smaller than 2.5 micrometers in aerodynamic diameter ($PM_{2.5}$), and particulate matter smaller than 10.0 micrometers in aerodynamic diameter (PM_{10}). Potential Project-related effects to the atmospheric environment are being assessed with a desktop study of these monitoring data.

As a remote location far from any urban/industrial sources of noise, the acoustic environment in the study area can likely be classified as a quiet rural location. Potential Project related effects to the acoustic environment are being assessed using an acoustic baseline study, including noise monitoring in the Project study area.



LEGEND

INDIAN RESERVE	GENERAL PROJECT LOCATION
WATERBODY	ARGR - ARCTIC GRAYLING
RIVER	LKTR - LAKE TROUT
HIGHWAY	LKTR - LAKE TROUT FALL SPAWNING
ROAD	LKTR* - LAKE TROUT (CAMP GRAYLING)
VILLAGE	LKWH - LAKE WHITEFISH
RUNWAY	NRPK* - NORTHERN PIKE (CAMP GRAYLING)
	NRPK/WALL - NORTHERN PIKE AND WALLEYE

NET FISHING	LISTED WILDLIFE LOCATION
WALL - WALLEYE	LISTED INVERTEBRATE LOCATION
WALL* - WALLEYE (CAMP GRAYLING)	LISTED PLANT LOCATION
WALL*/WHSC - WALLEYE AND WHITE SUCKER SPAWNING	KNOWN HERITAGE RESOURCE
WALL/LKTR - WALLEYE AND LAKE TROUT	ELIZABETH FALLS
WHSC - WHITE SUCKER	CAMP GRAYLING
HISTORICAL FISHING SPOT - WINTER	RESIDENCE
HISTORICAL SUCKER FISHING	

10 0 10

SCALE 1:400,000 KILOMETRES

REFERENCE

DMTI Highways and Roads
NTS Mapsheet 74I, 74J, 74O, 74P
DATUM: NAD 83 PROJECTION: UTM ZONE 13

PROJECT

SaskPower

ELIZABETH FALLS HYDROELECTRIC POWER PROJECT

TITLE

ENVIRONMENTAL AND HERITAGE SENSITIVITIES

Golder Associates
Saskatoon, Saskatchewan

PROJECT	10-1365-0004.22000		FILE No.	
DESIGN			SCALE AS SHOWN	REV. 2
GIS	JRC/LR	12/12/12	FIGURE: 5.1-1	
CHECK	MT	12/12/12		
REVIEW	BC	12/12/12		

G:\CLIENTS\SASKPOWER\Elizabeth Falls Power Project\Figures\10-1365-0004 SaskPower Elizabeth Falls EA\22000 Project Description\10-1365-0004 Environmental and Heritage Sensitivities.mxd Date: 12/12/2012 2:21:01 PM

5.2.2 Geology

The topography surrounding Elizabeth Falls is primarily bedrock controlled with low to moderate relief. The area forms part of the Lake Athabasca drainage basin. Prominent landforms in the study area are a result of glacial action.

The bedrock in the Project area consists of Precambrian age crystalline gneiss complex and the Athabasca Formation (conglomerates and sandstones) to the east and west of the Fond du Lac River, respectively. Structural features within the area include foliation (most prominent), shear zones (Black Lake Shear Zone), faulting and jointing. The Black Lake Shear Zone is comprised of mylonitic and cataclastic amphibole gneiss and felsic gneiss. The zone strikes northeast parallel to the shore of Black Lake. This zone is the result of faulting cataclysmic milling that produced re-healed rock mass with deformed and stretched mineral grains.

5.2.2.1 Mineralization

It is estimated at this time that over 1.3 million m^3 of rock and 860,000 m^3 of consolidated overburden will be excavated during the construction of the proposed tunnel, powerhouse site, tailrace channel, and water intake. The total disposal volume of the unconsolidated deposits after removal will be larger, as identified in Section 3.3.7. One of the potential environmental concerns with projects that involve the excavation of large quantities of bedrock and overburden materials is that the excavated materials could have potential for metal leaching and acid rock drainage as a result of precipitation falling on the excavated material. Given that there are several known uranium deposits within five to ten km of the Project area, an assessment of the potential for exposure of uranium mineralization during the tunnel and surface excavations is on-going.

The bedrock cores from boreholes drilled during the 2012 geotechnical investigation program located within, or in close proximity to, the Black Lake Shear Zone, were scanned using a scintillometer to obtain an indication of the background radiation levels to provide an indication as to whether the core contained uranium. The Black Lake Shear zone hosts known uranium deposits in the area. The radiation levels obtained were generally less than 150 counts per second (cps), typical of ordinary background levels, and well below the 100,000 cps previously documented for known uranium showings in the general area (Hatch 2012). No evidence of uranium mineralization was visually observed in the drill core or in the core sampled for petrographic analyses. Nonetheless, given the proximity of known uranium deposits in the Project area, additional testing of the drill core has been undertaken. Should this testing indicate that uranium mineralization is present, a risk analysis will be carried out and appropriate management plan developed for inclusion in the EIS.

5.2.3 Surface Water Environment

The Project is located on the Fond du Lac River in the Athabasca River basin of Northern Saskatchewan, between upstream Black Lake and downstream Middle Lake. The Fond du Lac River originates at the outflow of Wollaston Lake, and flows approximately 275 km northwestward before reaching Lake Athabasca approximately 50 km downstream of the Project. At the outlet of Black Lake, the Fond du Lac River has an upstream drainage area of 50,700 square kilometres (km^2).

5.2.3.1 Water Quality

Water and sediment quality samples and limnology profiles or *in situ* surface measurements were collected from Black Lake, Fond du Lac River, and Middle Lake in different seasons throughout 2010 and 2011. Sediment chemistry samples were collected during spring and summer at two locations each in Middle Lake and Black Lake. Limnology profiles were recorded at two locations on the Fond du Lac River during the fall season, at four locations in Middle Lake during all four seasons, and at three locations in Black Lake during all four seasons.

The objectives of the water and sediment quality baseline programs were to collect site-specific information to document baseline conditions within the study area, and to evaluate potential spatial and temporal trends. Water chemistry samples were analyzed for physical parameters, major ions, nutrients, total metals, and radionuclides. Sediment quality samples were analyzed for nutrients, total metals, and radionuclides.

5.2.3.2 Fish and Fish Habitat

Fish and fish habitat surveys were completed in Black Lake, Fond du Lac River (between Black Lake and Middle Lake), and Middle Lake. Fish sampling was completed several times between June 2010 and July 2012. Objectives of fish sampling included obtaining seasonal estimates of fish species composition and relative abundance, and to identify important habitat (e.g., shallow water spawning habitat).

In 2011, DFO requested that a radio-tagging study be carried out to monitor Arctic grayling movement patterns within the Fond du Lac River between Black Lake and Middle Lake. This study began in October 2011 and ran for a full year until October 2012.

Fish habitat assessments in Black Lake and Middle Lake consisted of bathymetric surveys, shoreline habitat assessments, and tributary assessments. The Fond du Lac River was separated into reaches based on the dominant channel type. Detailed habitat measurements describing spawning habitat were collected in association with Arctic grayling egg searches. Fish collection methods included gill nets, boat electrofishing, backpack electrofishing, trap-nets, and angling. Table 5.2-1 provides a list of fish species identified in Black Lake, Middle Lake, and the Fond du Lac River.

Table 5.2-1: Fish Species Identified in Black Lake, Middle Lake and the Fond du Lac River

Common Name	Scientific Name
Arctic grayling	*Thymallus arcticus*
burbot	*Lota lota*
cisco	*Coregonus artedi*
lake chub	*Couesius plumbeus*
lake trout	*Salvelinus namaycush*
lake whitefish	*Coregonus clupeaformis*
longnose sucker	*Catostomus catostomus*
ninespine stickleback	*Pungitius pungitius*
northern pike	*Esox lucius*
round whitefish	*Prosopium cylindraceum*
slimy sculpin	*Cottus cognatus*
spottail shiner	*Notropsis hudsonius*
trout-perch	*Percopsis omiscomaycus*
walleye	*Sander vitreus*
white sucker	*Catostomus commersonii*
yellow perch	*Perca flavescens*

5.2.4 Terrain and soils

Glaciofluvial deposits varying from homogeneous deposits of fine sand to heterogeneous deposits of sand and cobble were observed on the west side of the Fond du Lac River. Typically, Brunisolic soils (i.e., forest soils with brownish coloured B horizons) were found on these glaciofluvial deposits. Gleyed Brunisolic soils, Gleysolic soils (i.e., water saturated mineral soils), and Organic soils (i.e., peat soils) were found in low-lying and poorly-drained areas.

Steep bedrock outcrops characterize the terrain on the east side of the Fond du Lac River. When present, mineral and Folisols (i.e., upland organic soils) generally occurred on nearly level undulating bedrock surfaces and in mid to lower slope positions of gently inclined bedrock faces. Folisols were observed on boulder glacial till and bedrock. Brunisolic soils were observed on thin deposits of sand and boulder glacial till and were underlain by bedrock. Gleysolic soils and Organic soils were found in low lying and poorly drained areas.

5.2.5 Vegetation

Regionally, vegetation communities classified as burn and regenerating burn vegetation are common and tend to be dominated by jack pine (*Pinus banksiana*) in both upland and wetland sites. Vegetation communities in the regional study area (RSA) areas are slow to regenerate after fire. One reason for the dominance of jack pine is that cones of mature jack pine trees are serotinous, which means the cones are covered with a resin that must be melted for the cone to open and release seeds. They require an environmental trigger to open for seed dispersal; in this case fire is the mechanism.

In the RSA, upland forests are dominated by mixed stands of trembling aspen and birch, with black spruce occurring on the slopes in transitional areas. Bedrock outcrops are common in the area and are typically sparsely vegetated, with jack pine or jack pine-black spruce communities. Wetland communities in the poorly-drained lowland areas between bedrock outcrops include shrubby and graminoid bogs. In lowland areas with better drainage, treed and shrubby swamp communities dominate.

Federally and provincially tracked plant species with the potential to occur in the RSA and local study area (LSA) were identified through searches of previously listed sources prior to field programs. Of the species listed, 16 have been historically documented within the RSA. One provincial tracked plant species, Alaskan clubmoss (*Lycopodium sitchese*), was encountered twice during early season surveys; however these locations are not within the Project footprint. This species is not listed under the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), the *Species at Risk Act* (*SARA)*, or the *Wildlife Act*. Additional provincially tracked species were collected during the early season field program, however the identification of these species is pending. If any of the samples are positively identified as tracked species, they will be identified in the final baseline report and EIS.

5.2.6 Wildlife

Baseline wildlife data were collected in 2012. Winter track counts, ungulate and waterbird aerial surveys, and upland breeding bird, raptor stick nest, and amphibian surveys were completed. Table 5.2-2 lists the species observed during the 2012 wildlife surveys.

Prior to carrying out baseline wildlife surveys, a list was compiled of federal (COSEWIC 2012; SARA 2012) and provincial (SKCDC 2012a) species at risk that have the potential to occur in the RSA. Of these potential species, two were identified during the baseline wildlife surveys, Wolverine (*Gulo gulo*), and Olive-sided flycatcher (*Contopus cooperi*).

Table 5.2-2: Wildlife Species Observed During 2012 Surveys

Common Name	Scientific Name	Common Name	Scientific Name
Mammals			
American marten	*Martes americana*	Muskrat	*Ondatra zibethicus*
Beaver	*Castor canadensis*	Ptarmigan species	*Lagopus muta or L. lagopus*
Black bear	*Ursus americanus*	Red fox	*Vulpes vulpes*
Canada lynx	*Lynx canadensis)*	Red squirrel	*Tamiasciurus hudsonicus*
Fisher	*Martes pennanti*	River otter	*Lontra canadensis*
Grey wolf	*Canis lupus*	Snowshoe hare	*Lepus americanus*
Grouse species	*Bonasa umbellus,Tympanuchus phaisianellus, or Falcipennis canadensis*	Vole species	*Microtus spp.*
Mink	*Neovison vison*	Weasel species	*Mustela spp.*
Moose	*Alces alces*	Wolverine	*Gulo gulo*
Mouse species	*Peromyscus spp.*	-	-
Upland Breeding Birds			
Alder flycatcher	*Empidonax alnorum*	Northern flicker	*Colaptes auritus*
American crow	*Corvus brachyrhynchos*	Northern waterthrush	*Seiurus noveboracensis*
American redstart	*Setophaga ruticilla*	Olive-sided flycatcher	*Contopus cooperi*
American robin	*Turdus migratorius*	Orange-crowned warbler	*Vermivora celata*
Bay-breasted warbler	*Dendroica castanea*	Palm warbler	*Dendroica palmarum*
Black-backed woodpecker	*Picoides arcticus*	Pine siskin	*Carduelis pinus*
Black-capped chickadee	*Poecile atricapilla*	Red crossbill	*Loxia curvirostra*
Blackpoll warbler	*Dendroica striata*	Red-eyed vireo	*Vireo olivaceus*
Blue-headed vireo	*Vireo solitarius*	Ruby-crowned kinglet	*Regulus calendula*
Boreal chickadee	*Poecile hudsonica*	Savannah sparrow	*Passerculus sandwichensis*
Cape May warbler	*Dendroica tigrina*	Song sparrow	*Melospiza melodia*
Cedar waxwing	*Bombycilla cedorum*	Swainson's thrush	*Catharus ustulatus*
Chipping sparrow	*Spizella passerina*	Swamp sparrow	*Melospiza georgiana*
Common redpoll	*Carduelis flammea*	Tennessee warbler	*Vermivora peregrina*
Dark-eyed junco	*Junco hyemalis*	Tree swallow	*Tachycineta bicolor*
Fox sparrow	*Passerella iliaca*	Vesper sparrow	*Pooecetes gramineus*
Gray jay	*Perisoreus canadensis*	White-throated sparrow	*Zonotrichia albicollis*
Hairy woodpecker	*Picoides villosus*	Wilson's warbler	*Wilsonia pusilla*
Hermit thrush	*Catharus guttatus*	Winter wren	*Troglodytes troglodytes*

Table 5.2-2: Wildlife Species Observed During 2012 Surveys (continued)

Common Name	Scientific Name	Common Name	Scientific Name
Least flycatcher	*Empidonax minimus*	Yellow warbler	*Dendroica petechia*
Lincoln's sparrow	*Melospiza lincolnii*	Yellow-bellied sapsucker	*Sphyrapicus varius*
Magnolia warbler	*Dendroica magnolia*	Yellow-rumped warbler	*Dendroica coronata*
Nashville warbler	*Vermivora ruficapilla*	-	-
Waterbird Species			
American widgeon	*Anas americana*	Mallard	*Anas platyrhynchos*
Belted kingfisher	*Megaceryle alcyon*	Merganser species	*Mergus merganser* or *M. serrator*
Blue-winged teal	*Anas discors*	Northern pintail	*Anas acuta*
Bonaparte's gull	*Larus philadelphia*	Northern shoveler	*Anas clypeata*
Bufflehead	*Bucephala albeola*	Sandhill crane	*Grus canadensis*
Canada goose	*Branta canadensis*	Surf scoter	*Melanitta perspicillata*
Common goldeneye	*Bucephala clangula*	Swan species	*Cygnus buccinator or C. columbianus*
Common tern	*Sterna hirundo*	White-winged scoter	*Melanitta fusca*
Gull species	*Larus canus*, *L. delawarensis*, *L. californicus*, or *L. argentatus*	-	-
Raptors			
Bald eagle	*Haliaeetus leucocephalus*	Osprey	*Pandion haliaetus*
Merlin	*Falco columbarius*	Red-tailed hawk	*Buteo jamaicensis*
Northern harrier	*Circus cyaneus*	Sharp-shinned hawk	*Accipiter striatus*
Amphibians			
Boreal chorus frog	*Pseudacris maculata*	Wood frog	*Rana sylvatica*

5.2.7 Traditional Land and Resource Use

The Project area has been used traditionally by the Aboriginal people of the region for generations. Traditional land and resource use information and Aboriginal traditional knowledge (ATK) were collected in discussion with community members and resource users within the Black Lake First Nation. Information was collected through interviews and mapping exercises undertaken with individual resource users and Elders in the community of Black Lake, in addition to review of other ATK-related materials held by the community. Eleven interviews were conducted in the community of Black Lake regarding resource use in the Elizabeth Falls area. As the Project is located within the Chicken Indian Reserve No. 224, the focus of traditional land and resource use and ATK information gathered to date has been with members of this community.

Traditional resource use by the people of this area is a defining feature of their culture and identity. While barren-ground caribou is considered a very important species hunted by residents of the region, moose, black bear, and waterfowl, such as ducks and geese, also are hunted. Woodland caribou are not a food source used by the people of this area as the species has not been observed in recent memory of the area residents. The effects of successive forest fires over the last few decades have limited hunting and other resource uses in the area around Middle Lake and Elizabeth Falls. However, these burned areas produce berries that are gathered by community members for domestic use. Fish have been a vital part of traditional life in the region and continue to be an important food source for members of the local community.

5.2.8 Non-traditional Land and Resource Use

Activities such as trapping, commercial fishing, and gathering and using forest products create approximately 4,000 seasonal jobs and generate important seasonal income to residents of northern Saskatchewan. Income from resource harvesting remained fairly stable between the 1980s and early 2000s, at about $6 to $7 million annually (Northlands College et al. 2004). No mining activities are taking place in the area around Elizabeth Falls. However, numerous mineral deposits have been identified in the area, including uranium, gold, base metals, and other minerals. Twenty-six outfitting lodges operate in the Athabasca region, with three lodges and outfitters offering sport fishing and hunting services within a 50 km radius of the proposed Project site around Black Lake and Stony Rapids communities.

5.2.9 Socio-Economic Environment

Two communities have been the focus of the socio-economic characterization near the Project, Black Lake First Nation, (the community of Black Lake) and the northern hamlet of Stony Rapids (Stony Rapids). Black Lake First Nation is a Dene First Nation with members residing throughout Saskatchewan and in other locations. Black Lake First Nation has three registered reserve locations: Chicken Indian Reserve No. 224 (25,819 hectares [ha]; populated); Chicken Indian Reserve No. 225 (2,193 ha; no resident population); and Chicken Indian Reserve No. 226 (4,217 ha; no resident population; Aboriginal Affairs and Northern Development Canada [AANDC] 2012). According to Saskatchewan Health, the community of Black Lake had a population of 1,417 residents in 2011. Aboriginal Affairs and Northern Development Canada (AANDC) placed the total First Nation membership, including members who live off-reserve, at 2,028 in 2011. In comparison, according to Saskatchewan Health, Stony Rapids had a population of 158 residents in 2011.

Residents of the communities of Black Lake and Stony Rapids have access to the Athabasca Health Authority (AHA) health facility located outside of Stony Rapids on Black Lake reserve land. The Dene name for this facility is Yutthe Dene Nakohoki, which means “a place to heal northern people”. The AHA health facility is unique because it is a joint provincial-federal initiative. Patients requiring emergency services that are unavailable at the AHA health facility typically are flown to La Ronge, Prince Albert, or Saskatoon, depending on their needs.

The communities of Black Lake and Stony Rapids each have schools. The school in the community of Black Lake is federally funded and the school in Stony Rapids is provincially funded. Father Porte School in the community of Black Lake is a First Nation operated facility covering Pre-Kindergarten to Grade 12. There are no post-secondary institutions in the Athabasca region, although Northlands College offers training and adult education programs throughout northern Saskatchewan (Cameco 2011).

The communities of Black Lake and Stony Rapids have a variety of community-based businesses (e.g., taxi services and local contractors) (Keewatin Career Development Corporation 2012). Additionally, both communities actively seek to build capacity and expand their business holdings. While average income in the Athabasca Basin communities, including Black Lake and Stony Rapids, is generally lower than the provincial average income, many of the everyday costs of living in northern Saskatchewan (e.g., prices of groceries and fuel) are higher than in Saskatchewan as a whole (Public Health Nutritionists of Saskatchewan 2010).

6.0 FEDERAL INVOLVEMENT

6.1 Financial Support

The Proponent is not aware of any federal funding available to construct and operate the Project, and as a result will not be making an application to the federal government for purposes of enabling the physical activities of the Elizabeth Falls Hydroelectric Project to proceed. If a source of funding becomes available in the future to assist EFHLP/BLFN for their equity participation in the project, then EFHLP/BLFN would pursue that option.

EFHLP/BLFN has in the past received, and currently receives, a small amount of funding (less than $100,000 per year) from AANDC for project development work under the Communities Economic Opportunities Program (CEOP) initiative. Assuming partnership discussions between SaskPower and EFHLP/BLFN are successful, then additional funding under CEOP will not be available in the future.

6.2 Federal Lands

The proposed Project site is located approximately 7 km from the community of Black Lake (Figure 2.3-1), within the Chicken Indian Reserve No. 224 (AANDC 2011). Both the surface and subsurface resources of the Reserve are set aside for the use and benefit of the BLFN members. In 2009, an Order in Council (P.C.2009-305) was approved by the Governor General in Council, pursuant to paragraph 39(1)(c), and Section 40 of the *Indian Act* (Government of Canada, 1985), designating portions of the Chicken Indian Reserve No. 224, 225, and 226 for exploration and development of minerals, development of a hydroelectric facility, and commercial leasing purposes.

6.3 Federal Legislative or Regulatory Requirements

Under Section 5 of the CEAA 2012, effects or changes that may be caused to the following as a result of the Project must be considered:

- fish and fish habitat, as defined in the *Fisheries Act*;
- aquatic species, as defined in the SARA;
- migratory birds, as defined in the *Migratory Birds Convention Act*, 1994;
- effects to Aboriginal peoples that may result in effects to health and socio-economic conditions, physical and cultural heritage, the current use of lands and resources for traditional purposes, or any structure, site or thing that is of historical, archaeological, paleontological, or architectural significance.

This Project is a designated project under the Regulations Designating Physical Activates, 2012, and therefore, the Agency would be considered the federal responsible authority for the Project. However, other federal agencies such as DFO, Transport Canada (TC), and Health Canada may have a regulatory interest in this project. Potential permits, licences, approvals or authorizations that may be required from a federal agency have been identified in Table 1.4-1.

7.0 ENVIRONMENTAL EFFECTS

The greatest amount of environmental disturbance associated with the Project is expected to occur during the construction phase in terms of the Project's overall development footprint and the workforce on-site. However, construction activities will occur over a relatively short period of time.

A preliminary site screening process was completed to identify anticipated potential effects from the interaction of the proposed Project with the various components of the biophysical and socio-economic environment. Because the Project is a designated project, the environmental effects the Project may have on components of the environment listed in paragraph 5(1)(a) of CEAA, 2012 must be assessed. These components include fish and fish habitat, aquatic species and migratory birds. However, the Project is located on, and therefore will have an effect on, federal lands administered by AANDC under the *Indian Act*. As a result, all potential effects resulting from a project located on federal land must be assessed subject to paragraph 5(1)(b) of the CEAA, 2012, A matrix of anticipated Project-environment interactions for the biophysical and socio-economic environments is provided in Table 7.1-1.

Table 7.1-1: Potential Interactions between the Project and the Biophysical and Socio-economic Environments

Project Component/Activity	Expected Project Phase for Project Component/Activity	Potential Effects to Environmental Components	Biophysical Environment							Socio-economic Environment						
			Atmospheric Environment	Groundwater	Hydrology	Surface Water Quality*	Fish and Fish Habitat*	Soils and Terrain	Vegetation	Wildlife and Wildlife Habitat*	Heritage Resources*	Traditional Land and Resource Use*	Non-Traditional Land and Resource Use	Economy*	Infrastructure and Community Services	Population and Health*
■ Infrastructure Footprints ▪ Temporary infrastructure – work camp area – overburden and waste rock piles – construction area and materials laydown area ▪ Operational infrastructure – power generation station – water intake structure – power tunnel – tailrace channel – weir – bridge – transmission line – water diversion structures around the Project footprint – potable water and wastewater intake and discharge structures – site access roads (including source material)	Construction	■ Loss or alteration of permafrost can change terrain and affect soil, vegetation, wildlife habitat, and human activities.						•	•	•		•	•			
	Construction	■ Direct loss or alteration of local soil and vegetation from the Project footprint can affect vegetation and human activities.						•	•			•	•			
	Construction	■ Direct loss and fragmentation of wildlife habitat from the Project footprint can affect wildlife and human activities.								■		■	■			
	Construction	■ Site clearing, contouring, and excavation can cause admixing, compaction, and erosion to soils, and change soil quality.						•								
	Construction	■ Soil salvage, stockpiling and transport can change physical, biological, and/or chemical properties of soils, and increase erosion potential.						•								
	Construction	■ Site clearing, contouring, and excavation can cause soil erosion, which can change surface water quality and affect fish habitat, vegetation, wildlife habitat, and human activities.				•	•	•	•	•		•	•			
	Construction	■ Ground disturbance can alter or destroy heritage resources.									•					
■ General Construction and Operation of Project	Construction, Operations, and Decommissioning and Reclamation	■ Introduction of weed species can affect plant community composition, and listed and traditional use plant species.							•							
	Construction, Operations, Decommissioning and Reclamation, and Post-Decommissioning and Reclamation	■ Physical hazards (e.g., blasting activities, tailrace channel, buildings, wasterock piles) from the Project can cause injury or mortality to wildlife and affect wildlife populations and human activities.								•		•	•			

Table 7.1-1: Potential Interactions between the Project and the Biophysical and Socio-economic Environments (continued)

Project Component/Activity	Expected Project Phase for Project Component/Activity	Potential Effects to Environmental Components	Biophysical Environment								Socio-economic Environment					
			Atmospheric Environment	Groundwater	Hydrology	Surface Water Quality*	Fish and Fish Habitat*	Soils and Terrain	Vegetation	Wildlife and Wildlife Habitat*	Heritage Resources*	Traditional and Non-Traditional Land and Resource Use	Non-Traditional Land and Resource Use	Economy *	Infrastructure and Community Services	Population and Health*
■ General Construction and Operation of Project (continued)	Construction, Operations, Decommissioning and Reclamation, and Post-Decommissioning and Reclamation	■ Site infrastructure (e.g., tailrace) may restrict wildlife movement and increase risk of mortality from predation or hunting, which can affect wildlife and human activities.								●		●	●			
	Construction, and Operations, and Decommissioning and Reclamation	■ Collisions with Project vehicles can cause injury or mortality to wildlife and affect wildlife populations and human activities.								■		■	■			
	Construction	■ Construction of site infrastructure can affect local and regional economies, employment levels, and quality of life for people.												♦		♦
	Operations	■ Operation of the Project can affect local and regional economies, employment levels, education and training of people, and quality of life for people.												♦		♦
	Construction, Operations, Decommissioning and Reclamation, and Post-Decommissioning and Reclamation	■ Construction of site roads and bridge can change traffic levels and access to areas on the east side of the Fond du Lac River, which can affect wildlife and human activities.					●		●	■		■	■	■	●	
	Construction and Operations	■ Attraction of birds to Project infrastructure for roosting and nesting sites can affect bird populations and human activities.								●		●	●			
	Construction, Operations, and Decommissioning and Reclamation	■ Sensory effects (e.g., presence of buildings, lights, smells, noise, blasting activity, and vehicles) can wildlife, human activities, and quality of life for people.	●							■		●	●			■
	Construction, Operations, and Decommissioning and Reclamation	■ Change in energetic costs from disturbance or displacement can affect wildlife and human activities	●							■		■	■			
	Construction	■ Destruction of migratory bird nests can affect wildlife populations and human activities								■		■	■			

Table 7.1-1: Potential Interactions between the Project and the Biophysical and Socio-economic Environments (continued)

Project Component/Activity	Expected Project Phase for Project Component/Activity	Potential Effects to Environmental Components	Biophysical Environment								Socio-economic Environment					
			Atmospheric Environment	Groundwater	Hydrology	Surface Water Quality*	Fish and Fish Habitat*	Soils and Terrain	Vegetation	Wildlife and Wildlife Habitat*	Heritage Resources*	Traditional and Non-Traditional Land and Resource Use	Non-Traditional Land and Resource Use	Economy *	Infrastructure and Community Services	Population and Health*
■ Construction of In-water Works ▪ power tunnel ▪ water intake structure ▪ tailrace ▪ weir structure ▪ bridge	Construction	■ Construction of the power tunnel and intake structure may disturb sediment, which can change surface water quality, and affect fish and fish habitat.				•	•					•	•			
	Construction and Operations	■ Direct loss or alteration of fish habitat from the Project footprint can affect fish and human activities.					■					■	■			
	Construction	■ Use of explosives near fish-bearing water can cause injury or mortality to fish, which can affect fish populations and human activities.					■					■	■			
	Construction	■ Use of explosives near surface waterbodies can change surface water quality and affect soils, vegetation, wildlife habitat, fish habitat, and human activities.	•			■	•	•	•	•		■	■			
▪ Air Emissions and Noise Levels ▪ emission of dust from blasting activities and hauling waste rock to storage piles. ▪ emission of standard pollutants from vehicles and heavy equipment operation	Construction, Operations, and Decommissioning and Reclamation	■ Air emissions from site can change the chemical properties of surface water and soil, which can affect vegetation, fish habitat, wildlife habitat, and human activities.	•			•	•	•	•	•		•	•			•
	Construction, Operations, and Decommissioning and Reclamation	■ Air emissions from site can change the chemical properties of surface water and soil, which can affect the health of vegetation, fish, wildlife, and people.	•			•	•	•	•	•		•	•			•
	Construction, Operations, and Decommissioning and Reclamation	■ Dust deposition from Project vehicles and blasting activities can change the chemical properties of surface water, soil, and vegetation, which can affect fish habitat, wildlife habitat, and human activities.	•			•	•	•	•	•		•	•			•
	Construction, Operations, and Decommissioning and Reclamation	■ Dust deposition from Project vehicles and blasting activities, may cover aquatic substrates, soils, and vegetation, which can affect the fish, fish habitat, wildlife habitat, and human activities.	•			•	•	•	•	•		•	•			•
	Construction, Operations, and Decommissioning and Reclamation	■ Dust deposition from Project vehicles and blasting activities can change the chemical properties of surface water and soil, which can affect the health of vegetation, wildlife, fish, and people.	•			•	•	•	•	•		•	•			•

Table 7.1-1: Potential Interactions between the Project and the Biophysical and Socio-economic Environments (continued)

Project Component/Activity	Expected Project Phase for Project Component/Activity	Potential Effects to Environmental Components	Biophysical Environment								Socio-economic Environment					
			Atmospheric Environment	Groundwater	Hydrology	Surface Water Quality*	Fish and Fish Habitat*	Soils and Terrain	Vegetation	Wildlife and Wildlife Habitat*	Heritage Resources*	Traditional Land and Resource Use*	Non-Traditional Land and Resource Use	Economy *	Infrastructure and Community Services	Population and Health*
■ Power Generation Activities ▪ water withdrawal for power generation ▪ diversion of water through the power tunnel to the powerhouse ▪ discharge of tailrace flows	Operations	■ Water withdrawal from Black Lake may cause injury, impinge, or entrain fish and affect fish populations and human activities.					■					■	■			
	Operations	■ Withdrawal, diversion, and discharge of water for power generation may change hydrology, which can affect fish habitat, soils, vegetation, wildlife habitat, and human activities.			■		■	•	•	•		■	■			
	Operations	■ Withdrawal and discharge for power generation may change the temperature of the water which can affect fish habitat, wildlife habitat, and human activities.				■	•			•		■	■			
	Operations	■ Withdrawal and discharge for power generation may change the temperature of the water and therefore ice safety in Black Lake and Middle Lake, which can affect wildlife and human activities.			•					•		•	•			
	Operations	■ Withdrawal, diversion, and discharge of water for power generation may change groundwater, surface water, and soil quality, and affect the health of vegetation, fish, wildlife, and people.				■	•	•	•	•		■	■			•
	Operations	■ Diversion of water through the power tunnel may change groundwater quantity, which can change hydrology, and affect soils, terrain, vegetation, fish habitat, wildlife habitat, and human activities.		•	•	•	•	•	•	•		•	•			
■ Waste Management	Construction, Operations, and Decommissioning and Reclamation	■ Consumption of waste materials (e.g., food waste, oil products) may affect wildlife health and, therefore, human health.								■						■
	Construction, Operations, and Decommissioning and Reclamation	■ Attraction to the Project (e.g., food waste, oil products) may increase human-wildlife interactions and mortality risk to individual animals, which can affect wildlife populations and human activities.								■		■	■			
	Construction, Operations, and Decommissioning and Reclamation	■ Attraction to the Project (e.g., food waste, oil products) may increase predator numbers and predation risk, which can affect prey populations and human activities.								■		■	■			

Table 7.1-1: Potential Interactions between the Project and the Biophysical and Socio-economic Environments (continued)

Project Component/Activity	Expected Project Phase for Project Component/Activity	Potential Effects to Environmental Components	Biophysical Environment								Socio-economic Environment					
			Atmospheric Environment	Groundwater	Hydrology	Surface Water Quality*	Fish and Fish Habitat*	Soils and Terrain	Vegetation	Wildlife and Wildlife Habitat*	Heritage Resources*	Traditional Land and Resource Use*	Non-Traditional Land and Resource Use	Economy *	Infrastructure and Community Services	Population and Health*
■ Site Water Management ▪ collection and treatment of surface runoff within the project footprint ▪ withdrawal of potable and industrial water ▪ discharge of wastewater ▪ collection and treatment of groundwater in the tunnel	Construction and Operations	■ Water withdrawal for domestic (e.g., potable water) and industrial (e.g., dust suppression) purposes can change hydrology which can affect soils, vegetation, wildlife, fish and fish habitat and, therefore, human activities.			●		●	●	●	●		●	●			
	Construction and Operations	■ The interception and collection of direct precipitation and surface runoff within the Project footprint may change hydrology which can affect soils, vegetation, wildlife habitat, fish, fish habitat, and human activities.			●		●	●	●	●		●	●			
	Construction and Operations	■ The interception and collection of direct precipitation and surface runoff within the Project footprint may drawdown the local groundwater table and change hydrology and soils which can affect vegetation, wildlife habitat, fish, fish habitat, and human activities.		●	●		●	●	●	●		●	●			
	Construction and Operations	■ Surface water diversions (e.g., berms, ditches, waste rock piles) around the Project footprint can change drainage areas, runoff characteristics, and local and downstream hydrology, which can affect soils, vegetation, wildlife habitat, fish habitat, fish, and human activities.			●		●	●	●	●		●	●			
	Construction and Operations	■ Discharge of wastewater can change hydrology and surface water quality, which can affect soils, vegetation, wildlife habitat, fish habitat, and human activities.			●		●	●	●	●		●	●			
	Construction and Operations	■ Discharge of wastewater can affect surface water quality, which can affect the health of vegetation, wildlife, fish, and people.				■	●		●	●						■
	Construction, Operations, and Decommissioning and Reclamation	■ Seepage from waste rock piles can change surface water, groundwater, and soil quality, and affect vegetation, wildlife habitat, fish habitat, and human activities.		●		●	●	●	●	●		●	●			
	Construction, Operations, and Decommissioning and Reclamation	■ Seepage from waste rock piles can change surface water, groundwater, and soil quality and affect vegetation, wildlife, fish, and human health.		●		■	●	●	●	●		●	●			■

Table 7.1-1: Potential Interactions between the Project and the Biophysical and Socio-economic Environments (continued)

Project Component/Activity	Expected Project Phase for Project Component/Activity	Potential Effects to Environmental Components	Biophysical Environment: Atmospheric Environment	Groundwater	Hydrology	Surface Water Quality*	Fish and Fish Habitat*	Soils and Terrain	Vegetation	Wildlife and Wildlife Habitat*	Socio-economic Environment: Heritage Resources*	Traditional Land and Resource Use*	Non-traditional Land and Resource Use	Economy *	Infrastructure and Community Services	Population and Health*
■ Decommissioning and Reclamation of Temporary Infrastructure ▪ site grading, contouring, reclamation, and re-establishment of natural drainage characteristics ▪ waste rock management ▪ cessation of potable water withdrawal and wastewater discharge	Construction	■ Long-term contaminant transport from waste rock and the diversion tunnel can change surface water, groundwater, and soil quality, and affect vegetation, wildlife habitat, fish habitat, and human activities.		•		•	•	•	•	•		•	•			
	Construction	■ Long-term contaminant transport from waste rock and the diversion tunnel can change surface water, groundwater, and soil quality, and affect the health of vegetation, wildlife, fish, and people.		•		•	•	•	•	•						•
	Construction and Operations	■ The waste rock piles will alter terrain and may affect wildlife, human activities, and quality of life for people (i.e., visual aesthetics).						•		•		•	•	•		
■ Decommissioning and Reclamation of Power Production Infrastructure ▪ site grading, contouring, reclamation, and re-establishment of natural drainage characteristics ▪ waste rock management ▪ cessation of potable water withdrawal and wastewater discharge ▪ cessation of power generation activities including the withdrawal, diversion, and discharge of water ▪ weir	Decommissioning and Reclamation and Post-Decommissioning and Reclamation	■ Cessation of power generation activities, including the withdrawal, diversion, and discharge of water, can change hydrology and surface water quality, which can affect soils, vegetation, fish, fish habitat, wildlife, wildlife habitat, and human activities.			■		■	•	•	•		■	■			
	Post- Decommissioning and Reclamation	■ Direct loss or alteration of local soil and vegetation from residual ground disturbance from portions of the site facilities can cause permanent loss and alterations to soil and vegetation, and affect human activities.						•	•			•	•			
	Post- Decommissioning and Reclamation	■ Direct loss and fragmentation of wildlife habitat from residual ground disturbance from portions of the site facilities can affect wildlife and human activities.								■	•	■	■			
	Post- Decommissioning and Reclamation	■ Residual ground disturbance from portions of the site facilities can cause permanent alterations to hydrology and surface water quality, which can affect soils, vegetation, fish habitat, wildlife habitat, and human activities.			•		•	•	•	•		•	•			
	Decommissioning and Reclamation	■ Redistribution of material in the waste rock piles for use in the decommissioning and reclamation of power production infrastructure can change air and surface water quality, which can affect soils, vegetation, fish habitat, fish, wildlife habitat, and human activities.	•			•	•	•	•	•		•	•			
	Decommissioning and Reclamation	■ Alteration or destruction of heritage resources if areas outside original footprint are disturbed during reclamation process (e.g., new borrow source).									•					
	Decommissioning and Reclamation and Post-Decommissioning and Reclamation	■ Cessation of power generation activities can affect local and regional economies, employment levels, and quality of life for people.												•	•	•

Table 7.1-1: Potential Interactions between the Project and the Biophysical and Socio-economic Environments (continued)

Project Component/Activity	Expected Project Phase for Project Component/Activity	Potential Effects to Environmental Components	Biophysical Environment								Socio-economic Environment					
			Atmospheric Environment	Groundwater	Hydrology	Surface Water Quality*	Fish and Fish Habitat*	Soils and Terrain	Vegetation	Wildlife and Wildlife Habitat*	Heritage Resources*	Traditional Land and Resource Use*	Non-traditional Land and Resource Use	Economy *	Infrastructure and Community Services	Population and Health*
■ Accidents and Malfunctions ▪ emergency shutdowns of power turbines ▪ hazardous materials spills	Operations	■ Emergency shutdown of power generation activities can change surface hydrology, which can affect soils, vegetation, wildlife, wildlife habitat, fish, fish habitat, and human activities.			■		■	●	●	●		■	■			
	Construction, Operations, and Decommissioning and Reclamation	■ Release or spills of hazardous substances (e.g., fuel, oil) can change surface water and soil quality, which can affect vegetation, fish habitat, wildlife habitat, and human activities.				●	●	●	●	●		●	●			
	Construction, Operations, and Decommissioning and Reclamation	■ Release or spills of hazardous materials (e.g., fuel, oil) can change surface water and soil quality, which can affect the health of vegetation, fish, wildlife, and people.				●	●	●	●	●		●	●			●

■ Key Adverse Interaction
● Potential Adverse Interaction
♦ Key Positive Interaction
Blank cell – no Interaction anticipated
*Represents a biophysical or socio-economic component identified under Section 5 of the CEAA, 2012.
-Surface Water Quality, and Fish and Fish Habitat: includes fish and fish habitat, as defined in the *Fisheries Ac*t, and aquatic species, as defined in the SARA.
-Wildlife and Wildlife Habitat: includes migratory birds, as defined in the *Migratory Birds Convention Act*, 1994.
-Heritage Resources, Traditional and Non-traditional Land use, Quality of Life, and Economy, Employment, and Training: includes effects that may be caused on the environment that may effect aboriginal health and socio-economic conditions, physical and cultural heritage, the current use of lands and resources for traditional purposes, and any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

8.0 ABORIGINAL, PUBLIC, AND REGULATORY ENGAGEMENT

As the majority of the Project is located on the Chicken Indian Reserve No. 224, engagement with stakeholders, especially Aboriginal engagement, is particularly important for the Project. The EFHLP has been taking the lead on the Project's Public Involvement Plan (PIP). The plan is being used to conduct engagement activities with stakeholders in the area. The purpose of the PIP is to inform stakeholders about the Project, and to provide an opportunity for these stakeholders to ask questions and share their concerns about the Project and the environmental assessment and review process. SaskPower has also been engaging with various regulatory agencies that may have an interested in the Project. All engagement activities are being tracked using Staketracker, a software system designed for engagement data storage.

The PIP is currently being modified for activities in 2013 and beyond. Specific dates for public engagement activities have not been scheduled, however they likely will correspond with the following Project milestones:

- submission of Project Description;
- prior to submission of the EIS; and
- following the receipt of technical review comments from regulatory reviewers.

8.1 Aboriginal

In terms of Aboriginal engagement, BLFN has been the main target and focus of engagement for the Project to date. Documentation of engagement with BLFN for the purpose of the environmental assessment began in 2010. Three formal meetings were held on the BLFN, including one Community Information Session held in 2010.

A list of the stakeholders identified as potentially having an interest in the Project has been provided below.

- Chief and Council Black Lake First Nation;
- Chief and Council Fond du Lac First Nation;
- Prince Albert Grand Council – Athabasca Region; and
- Metis Local Northern Region 1.

8.2 Public

In terms of public engagement to date, Stony Rapids and Black Lake communities have been the main target and focus of engagement for the Project. Documentation of engagement with Stony Rapids for the purpose of the environmental assessment began in 2010. Two formal meetings were held in Stony Rapids, including one Community Information Session held in 2010.

A list of the stakeholders identified as potentially having an interest in the Project has been provided below.

- Mayor and Council Northern Hamlet of Stony Rapids;
- Athabasca Land Use Planning;

- Athabasca Health Authority;
- New North;
- Northern Labour Market Committee (NLMC);
- Athabasca Basin Development - Board of Directors;
- Athabasca Keepers of the Water;
- Canadian Parks and Wilderness Society, Saskatchewan (CPAWS);
- Saskatchewan Environmental Society (SES);
- local outfitters and resource users;
- regional suppliers;
- uranium industry;
- regional educations and training institutes; and
- relevant government departments and ministries.

8.3 Regulatory Engagement

Engagement with regulatory authorities is an important aspect of the Project's overall engagement approach. The Proponent will keep regulatory agencies (identified as having a regulatory or permitting interest in the Project) informed of the status of the Project. Engagement with regulatory authorities will provide an opportunity to seek a deeper understanding from the environmental assessment and regulatory community about potential concerns and requirements for the Project.

9.0 REFERENCES

Athabasca Land Use Plan (ALUP) – Stage I DRAFT. March 2006. Athabasca Interim Advisory Panel. Available from:http://www.environment.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=691,683,621,247,94,88,Documents&MediaID=299&Filename=Athabasca+LUP+stage+1.pdf&l=English

DFO (Fisheries and Oceans Canada) 1995. Freshwater intake End-of-Pipe Fish Screen Guideline.

Hatch Ltd. (formerly Acres International Ltd.) 2002. Elizabeth Falls Hydroelectric Development. Site Investigation Program. Prepared for the Black Lake First Nation.

Hatch Ltd. 2012. Elizabeth Falls Hydroelectric Project. Geotechnical Drilling Data Report. Prepared for SaskPower.

LIST OF ACRONYMS

Term	Definition
AANDC	Aboriginal Affairs and Northern Development Canada
AHA	Athabasca Health Region
ALUP	Athabasca Land Use Plan
ANFO	ammonium nitrate/fuel oil
ARD	acid rock drainage
ATK	Aboriginal traditional knowledge
AUC	Alberta Utilities Commission
B.P.	Before Present
BLFN	Black Lake First Nation
CEAA	*Canadian Environmental Assessment Act*
CEOP	Communities Economic Opportunities Program
CO	carbon monoxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
cps	counts per second
D&R	Decommissioning and Reclamation
DEM	Digital Elevation Model
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
EAA	*Environmental Assessment Act*
EAB	Environmental Assessment Branch
EFHDC	Elizabeth Falls Hydro Limited Partnership
EFHLP	Elizabeth Falls Hydro Limited Partnership
EIS	Environmental Impact Statement
ELC	ecological land classification
GDP	gross domestic project
Golder	Golder Associates Ltd.
GPS	Global Positioning System
HBC	Hudson's Bay Company
HRIA	Heritage Resource Impact Assessment
INAC	Indian and Northern Affairs Canada
IP	Internet Protocol
IPCC	Intergovernmental Panel on Climate Change
LiDAR	Light Detection and Ranging
LSA	local study area

Term	Definition
MFNMR	Ministry of First Nations and Metis Relations
MOE	Saskatchewan Ministry of Environment
MOE-EAB	Saskatchewan Ministry of Environment – Environmental Assessment Branch
MOU	Memorandum of Understanding
NO_2	nitrogen dioxide
NTS	National Topographic System
NWPA	*Navigable Waters Protection Act*
PAG	potentially acid generating
ppm	parts per million
Project	Elizabeth Falls Hydroelectric Power Project
RMR	Rock Mass Rating
RSA	regional study area
SARA	*Species at Risk Act*
SaskPower	Saskatchewan Power Corporation
SE-EAB	Saskatchewan Environment – Environmental Assessment Branch
SKCDC	Saskatchewan Conservation Data Centre
SMDI	Saskatchewan Mineral Deposit Index
SO_2	sulphur dioxide
TC	Transport Canada
TOR	Terms of Reference
VC	valued component
WSC	Water Survey of Canada

LIST OF UNITS

Term	Definition
%	percent
°C	degrees Celsius
cm/h	centimetres per hour
GWh	gigawatt hours
ha	hectare
kg/m^3	kilgrams per cubic metre
km	kilometre
km^2	square kilometres
kV	kilovolt
kW	kilowatt
mm	millimetre
m	metre
m^3	cubic metre
m^2	square metre
m/s	metres per second
m^3/s	cubic metres per second
m^3/y	cubic metres per year
MPa	megapascal
MW	megawatt
MWh	megawatt hours

Table of Contents

1.0 INTRODUCTION 1

1.1 Project Overview 1

1.2 Project Proponent 1

1.2.1 Proponent Contact Information 3

1.3 Regulatory Framework 3

1.3.1 Federal 3

1.3.2 Provincial 4

1.3.3 Regulatory Permitting 4

1.4 Environmental Studies within the Proposed Project Area 7

1.5 Report Organization 8

2.0 PROJECT INFORMATION 8

2.1 Project Components 8

2.2 Designated Activity 8

2.3 Project Footprint 9

2.4 Project Need 9

2.5 Project Benefits 9

3.0 PROJECT DESCRIPTION 11

3.1 Construction 12

3.1.1 Site Preparation in Advance of Project Construction 12

3.1.1.1 Access Development 12

3.1.1.2 Site Clearing 12

3.1.1.3 Development of Borrow Sources 13

3.1.2 Site Infrastructure 13

3.1.2.1 Powerhouse 13

3.1.2.2 Water Intake 15

3.1.2.3 Tunnel 17

3.1.2.4 Tailrace 21

3.1.2.5 Access Roads and Bridge 23

3.1.2.6 Black Lake Outlet (Grayling Island) Water Control Structure 25

Table of Contents (continued)

3.1.2.7 Transmission Line 28
3.2 Operation 29
3.2.1 Power Plant Operations 29
3.2.1.1 Historic Fond du Lac River Flows 29
3.2.1.2 Power Generation 29
3.2.1.3 Energy Potential 30
3.2.1.4 Black Lake Water Levels with Project Operation 31
3.2.1.5 Upset Conditions 32
3.2.2 Site Infrastructure During Operations 33
3.2.2.1 Powerhouse 33
3.2.2.2 Powerhouse Complex 33
3.2.2.3 Other Permanent Buildings/Structures 37
3.3 Supporting Infrastructure 38
3.3.1 Construction Camp 38
3.3.1.1 Alternative Locations for the Construction Camp 38
3.3.2 Contractors Work Areas 39
3.3.3 Construction Facilities Area 39
3.3.4 Water Supply and Fire Protection Water Services 39
3.3.5 Power 40
3.3.6 Telecommunications 40
3.3.7 Waste Rock Disposal Areas 40
3.3.8 Access Road Maintenance 41
3.3.9 Site Access, Safety and Security Facilities 41
3.4 Decommissioning and Reclamation 42
3.4.1 Construction 42
3.4.2 Operations 42
3.4.2.1 Site Specific Decommissioning Activities 43
3.5 Project Schedule 43
3.5.1 Construction Schedule 45

Table of Contents (continued)

4.0 EMISSIONS, DISCHARGES AND WASTE 45

4.1 Sources of Atmospheric Emissions 45

4.1.1 Power Tunnel 45

4.1.2 Access Roads 45

4.2 Sources and Location of Liquid Discharges 46

4.2.1 Power Tunnel 46

4.2.2 Tailrace Area 46

4.2.3 Site Drainage 46

4.2.4 Access Roads 46

4.2.5 Sewage Collection and Treatment 47

4.3 Project Solid Wastes and Disposal Plans 47

4.3.1 Domestic and Industrial Waste Management 47

4.3.2 Hazardous Substance Storage and Management 47

4.3.2.1 Explosives Storage 47

4.3.2.2 Oil Spill Prevention and Containment 47

4.3.2.3 Self-Lubricated Bushings and Environmentally Safe Oils and Greases 48

5.0 PROJECT LOCATION AND EXISTING ENVIRONMENT 48

5.1 Project Location 48

5.2 Existing Environment 51

5.2.1 Climate, Atmospheric and Acoustic Environment 51

5.2.1.1 Overview of Existing Information 51

5.2.2 Geology 53

5.2.2.1 Overview of Existing Conditions 53

5.2.3 Surface Water Environment 54

5.2.3.1 Overview of Existing Conditions 54

5.2.4 Terrestrial Environment 59

5.2.4.1 Overview of Existing Conditions 59

5.2.5 Heritage Resources 65

5.2.5.1 Culture History 65

Table of Contents (continued)

5.2.5.2 Overview of Existing Conditions ... 66

5.2.6 Traditional and Non-Traditional Land and Resource Use ... 67

5.2.6.1 Overview of Existing Conditions ... 67

5.2.6.2 Additional Baseline Studies ... 68

5.2.7 Socio-Economic Environment ... 68

5.2.7.1 Overview of Existing Conditions ... 68

6.0 FEDERAL INVOLVEMENT ... 70

6.1 Federal Financial Support ... 70

6.2 Federal Lands ... 71

6.3 Federal Regulatory Requirements ... 71

7.0 ENVIRONMENTAL EFFECTS ... 71

7.1 Potential Effects ... 71

7.1.1 Changes to Hydrology and Water Quality from Power Generation Activities (Including Withdrawal, Diversion, and Discharge) and Consequent Effects to Fish and Fish Habitat ... 80

7.1.2 Effects to Wildlife from the Project Footprint, Vehicle Traffic, Sensory Effects, and Domestic and Industrial Waste ... 82

7.1.3 Effects to Traditional and Non-traditional Land and Resource Use as the Result of Potential Effects to the Terrestrial and Aquatic Environments from the Project ... 83

7.1.4 Economy ... 83

7.1.5 Effects to Infrastructure and Community Services Associated with the Project ... 84

7.1.6 Effects to Population and Health Resulting from Changes Associated with the Project ... 84

7.2 Valued Components ... 84

7.2.1 Introduction ... 84

7.2.2 Selection of Valued Components ... 85

7.2.2.1 Atmospheric Environment ... 86

7.2.2.2 Groundwater ... 86

7.2.2.3 Hydrology ... 86

7.2.2.4 Surface Water Quality ... 86

7.2.2.5 Fish and Fish Habitat ... 87

7.2.2.6 Soils and Terrain ... 87

Table of Contents (continued)

7.2.2.7 Vegetation 87

7.2.2.8 Wildlife 87

7.2.2.9 Heritage Resources 88

7.2.2.10 Traditional and Non-traditional Land and Resource Use 88

7.2.2.11 Economy 89

7.2.2.12 Infrastructure and Community Services 89

7.2.2.13 Population and Health 90

8.0 ABORIGINAL, PUBLIC, AND REGULATORY ENGAGEMENT 90

8.1 Introduction 90

8.2 Aboriginal Engagement 90

8.3 Public Engagement 91

8.4 Regulatory Engagement 93

9.0 REFERENCES 95

TABLES

Table 1.3-1: Federal and Provincial Acts and Regulations Relevant to the Project 5

Table 3.1-1: Summary of Rock Support Classes 18

Table 3.2-1: Minimum Riparian Flow Scenarios Being Investigated 31

Table 3.2-2: Average Annual Net Energy Potential 31

Table 5.2-1: Fish Species Captured in Black Lake from May 2010 to February 2011 57

Table 5.2-2: Fish Species Captured in the Fond du Lac River from May to October 2010 and in July 2012 58

Table 5.2-3: Fish Species Captured in Middle Lake from May 2010 to February 2011 59

Table 5.2-4: Listed Plant Observations from Elizabeth Falls Project Area 62

Table 5.2-5: Wildlife Species at Risk that have the Potential to Occur in the Regional Study Area 62

Table 5.2-6: Upland Breeding Bird Species Observed during the Breeding Bird Survey, 2012 63

Table 5.2-7: Waterbird Species that were Observed during the Breeding Waterbird Aerial Surveys, 2012 64

Table 7.1-1: Potential Interactions between the Project and the Biophysical and Socio-economic Environments 73

Table 7.2-1: Rationale for Selection of Wildlife Species as Valued Components 88

Table 8.2-1: Record of Stakeholder Meetings 91

Table 8.3-1: Record of Stakeholder Meetings 92

Table of Contents (continued)

FIGURES

Figure 1.1-1: General Project Location 2

Figure 2.3-1: Conceptual Site Layout 10

Figure 3.1-1: Generator Process Diagram 14

Figure 3.2-1: Example Powerhouse Process Diagram 34

Figure 3.5-1: Project Schedule 44

Figure 5.1-1: Environmental and Heritage Sensitivities Map 50

APPENDICES

APPENDIX A
Concordance Tables

APPENDIX B
Photographs

APPENDIX C
Supplementary Project Information

APPENDIX D
Environmental Assessment Approach

APPENDIX E
List of Stakeholders

APPENDIX F
Engagement – Community Information Sessions Summary

1.0 INTRODUCTION

1.1 Project Overview

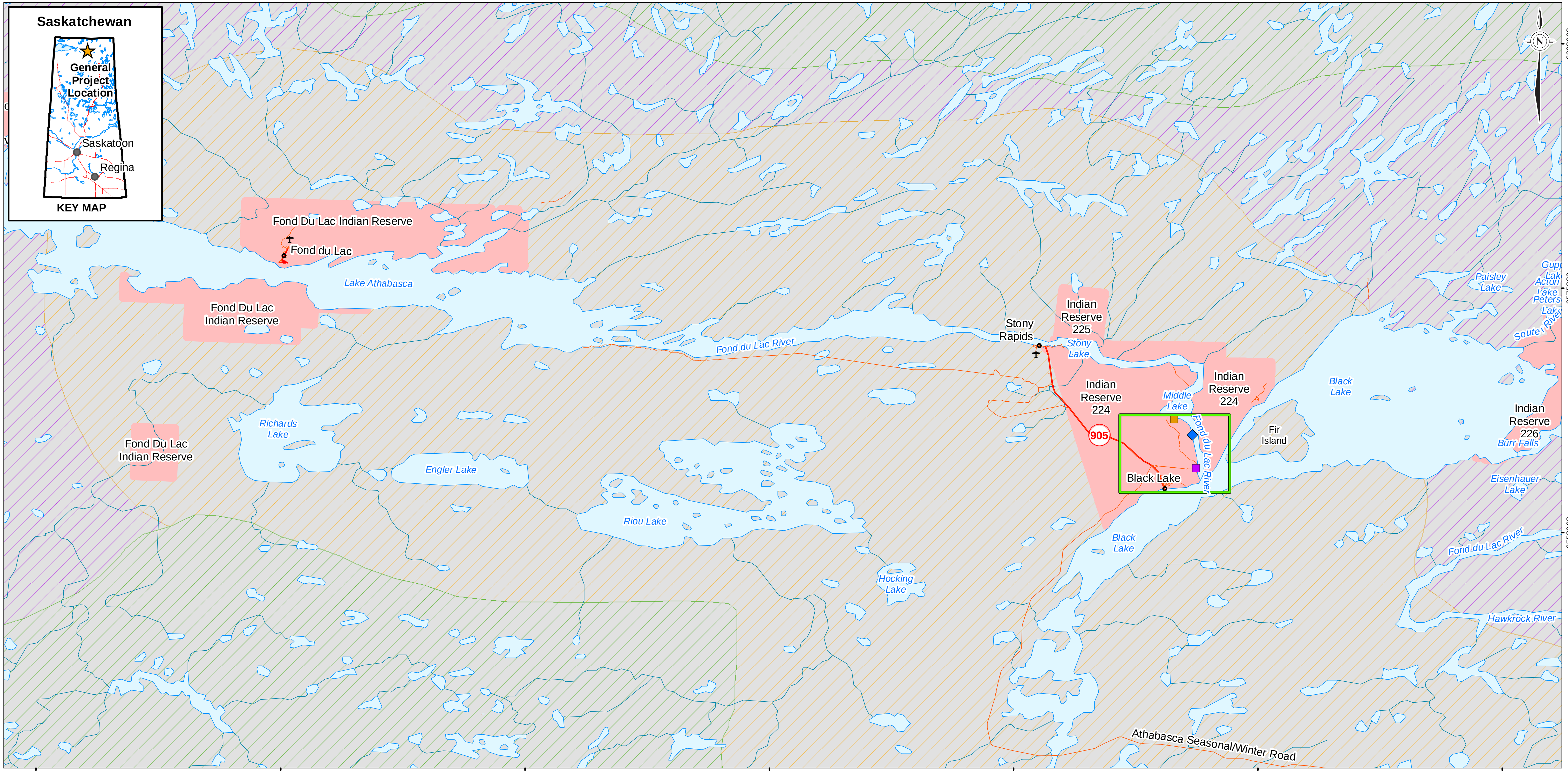
The proposed Elizabeth Falls Hydroelectric Power Project (Project) will be a 42 to 50 megawatt (MW), water diversion type electrical generating station. The Project is centred approximately 7 kilometres (km) from the community of Black Lake, within the Chicken Indian Reserve No. 224, adjacent to the Fond du Lac River between Black Lake and Middle Lake (Latitude: 59° 10' 48" N, Longitude: 105° 32' 12" W) (Figure 1.1-1). The Hamlet of Stony Rapids is located about 25 km northwest of the Project site.

The objective of this Project is to develop additional power generation capacity in northern Saskatchewan to assist with accommodating the growing energy requirements of northern Saskatchewan communities, and to support continued northern economic development. Minimizing the environmental impact of the Project will be a key design and operational component of the Project. All applicable federal and provincial environmental and health and safety Acts, Regulations, Permits and Standards will be adhered to throughout the life of the Project.

1.2 Project Proponent

The Proponent for the Project is the Black Lake First Nation (BLFN) together with Saskatchewan Power Corporation (SaskPower), a Crown corporation incorporated under *The Power Corporation Act* of Saskatchewan. Black Lake First Nations' interest in the Project is being held through their development arm, Elizabeth Falls Hydro Limited Partnership (EFHLP).

Elizabeth Falls Hydro Limited Partnership (EFHLP) and SaskPower will be negotiating various agreements to establish the terms and conditions for the Project structure, and development of the Project. These agreements will be concluded prior to the start of construction.



10 0 10

SCALE 1:400,000 KILOMETRES

LEGEND

- INDIAN RESERVE
- WATERBODY
- RIVER
- HIGHWAY
- ROAD
- VILLAGE
- RUNWAY
- GENERAL PROJECT LOCATION
- NORTHERN ADMINISTRATION DISTRICT
- ATHABASCA LAND USE PLAN - STAGE 1
- ATHABASCA LAND USE PLAN - STAGE 2
- ATHABASCA LAND USE PLAN - STAGE 3
- ELIZABETH FALLS
- CAMP GRAYLING
- RESIDENCE

REFERENCE

DMTI Highways and Roads
NTS Mapsheet 74I, 74J, 74O, 74P
DATUM: NAD 83 PROJECTION: UTM ZONE 13

PROJECT

SaskPower

ELIZABETH FALLS HYDROELECTRIC POWER PROJECT

TITLE

GENERAL PROJECT LOCATION

Golder Associates
Saskatoon, Saskatchewan

PROJECT	10-1365-0004.22000		FILE No.
DESIGN			SCALE AS SHOWN REV. 1
GIS	JRC	12/12/12	
CHECK	MT	12/12/12	FIGURE: 1.1-1
REVIEW	BC	12/12/12	

G:\CLIENTS\SASKPOWER\Elizabeth Falls Power Project\Figures\10-1365-0004 SaskPower Elizabeth Falls EA\22000 Project Description\10-1365-0004 General Project Location.mxd Date: 12/12/2012 2:21:28 PM

1.2.1 Proponent Contact Information

On behalf of the EFHLP, the Principal contact for environmental assessment of the Project is:

Stan Saylor
Environmental Supervisor
Business Development
SaskPower
2025 Victoria Avenue
Regina, Saskatchewan
S4P 0S1
Phone: 306-566-2879
Fax: 306-566-2575
E-mail: ssaylor@saskpower.com

The contacts for the Project who are representatives of EFHLP and SaskPower are:

Ted de Jong
CEO, Elizabeth Falls Hydro Development Corporation
Box 478
Prince Albert, Saskatchewan
S6V 5R8
Phone: 306-922-0099
Fax: 306-922-5075
E-mail: tdejong@padc.ca

Mark Peters
Project Manager
Business Development
SaskPower
2025 Victoria Avenue
Regina, Saskatchewan
S4P 0S1
Phone: 306-566-2993
Fax: 306-566-2575
E-mail: mpeters@saskpower.com

1.3 Regulatory Framework

Both federal and provincial environmental assessment legislation may apply to this Project. The federal requirements are detailed within the *Canadian Environmental Assessment Act* (*CEAA*) (Government of Canada 2012). Provincial requirements are specified under the *Environmental Assessment Act* (*EAA*) (Government of Saskatchewan 2010).

1.3.1 Federal

Under Section 8 of the *CEAA 2012*, a Project Description is required to initiate the screening process through which the Canadian Environmental Assessment Agency (the Agency) will determine if a federal environmental assessment is required for all designated projects. Designated projects are defined under the Regulations Designating Physical Activities (2012). The information requirements for a Project Description are provided in the Prescribed Information for the Description of a Designated Project Regulations and summarized in the Guide to Preparing a Description of a Designated Project under CEAA, 2012 (CEAA-July 2012).

1.3.2 Provincial

Similar to the federal process, the provincial environmental assessment process begins with the submission of a Technical Proposal to the Environmental Assessment Branch (EAB) of the Ministry of Environment (MOE) to determine if the Project is considered a 'development'. According to the *EAA, 2010*, a 'development' is any project, operation or activity or any alteration or expansion of any project, operation, or activity, which is likely to:

- have an effect on any unique, rare, or endangered feature of the environment;
- substantially use any provincial resource and in so doing pre-empt the use, or potential use, of that resource for any other purpose;
- cause the emission of any pollutants or create by-products, residual or waste products which require handling and disposal in a manner that is not regulated by another Act or Regulation;
- cause widespread public concern because of potential environmental changes;
- involve a new technology that is concerned with resource use and that may induce significant environmental change; or
- have a significant effect on the environment or necessitate a further development, which is likely to have a significant effect on the environment.

The information requirements for a Technical Proposal are provided in the Technical Proposal Guidelines – A Guide to Assessing Projects and Preparing Proposals Under the *Environmental Assessment Act, 2010* (MOE 2012).

1.3.3 Regulatory Permitting

Regulatory permitting (i.e., licensing) occurs after environmental assessment approval and includes the submission of specific applications and supporting design and project management documentation seeking specific construction and operating approvals. A number of federal and provincial permits, licences, approvals and authorizations may also be required depending on the specifics of the Project (Table 1.3-1).

Table 1.3-1: Federal and Provincial Acts and Regulations Relevant to the Project

Jurisdiction	Related Regulations	Permits Required
	Federal Acts	
Canadian Emission Reduction Incentives Agency Act, S.C., 2005, c. 30	■ n/a	■ n/a
Canadian Environmental Assessment Act, 2012, S.C., 2012, c.19, s.52	■ Regulations Designating Physical Activities, SOR/2012-147 ■ Prescribed Information for the Description of a Designated Project Regulations, SOR/2012-148 ■ Cost Recovery Regulations, SOR/2012-146	■ Environmental Assessment Approval
Canadian Environmental Protection Act, 1999, C-15.1	■ Environmental Emergency Regulations, SOR/2003-307 ■ Federal Above Ground Storage Tank Technical Guidelines, P.C. 1996-1233 ■ Federal Halocarbon Regulations, 2003 SOR/2003-289 ■ Federal Underground Storage Tank Guidelines ■ Inter-provincial Movement and Hazardous Waste Regulations, SOR/2002-301 ■ National Pollutant Release Inventory and Municipal Wastewater Services May 2003 ■ Ozone-depleting Substances Regulations, 1998 SOR/99-7	■ n/a
Canadian Water Act, R.S.C., 1985, c. C-11	■ Guidelines for Canadian Drinking Water Quality	■ n/a
Canadian Wildlife Act, R.S.C., 1985, c. W-9	■ Wildlife Area Regulation, C.R.C., c. 1609	■ n/a
The Fisheries Act, R.S.C., 1985, c. F-14 (amended 2012)	■ *n/a*	■ Authorization For Harmful Alteration or Disruption, or the Destruction of fish habitat (Section 35) ■ As well as requirements under other sections of the act (may include Sections 20, 30, 32, and 36 as the final 2012 changes come into force)
Indian Act R.S.C. 1985, c.I-5	■ Indian Reserve Waste Disposal Regulations, C.R.C., c.960 ■ Indian Timber Regulations C.R.C., c.961	■ Permit to use land in a reserve for the disposal or storage of waste, or to burn waste on any land in a reserve ■ Licence to cut timber on surrendered lands or on reserve land ■ Lease of Land (Section 53) ■ Access Permit (Section 20)

Table 1.3-1: Federal and Provincial Acts and Regulations Relevant to the Project (continued)

Jurisdiction	Related Regulations	Permits Required
	Provincial Acts	
Migratory Birds Convention Act, S.C., 1994, c. 22	■ *Migratory Bird Regulations, 2010 C.R.C., c. 1035*	■ n/a
*Navigable Waters Protection Act, R.S., 1985, C. N-22**	■ *n/a*	■ Work Approval
Species at Risk Act, S.C. 2002, c. 29	■ n/a	■ n/a
Transportation of Dangerous Goods Act, 1992, C.34	■ Transportation of Dangerous Goods Regulations, SOR/2001-286	■ n/a
The Clean Air Act, S.S. 1986-87-88, C-12.1	■ The Clean Air Regulations, R.R.S c. C-12.1 Reg 1	■ Permit to Construct ■ Permit to Operate
The Environmental Assessment Act, S.S. 1979-80, E-10.1	■ n/a	■ Environmental Assessment Approval
Environmental Management and Protection Act, R.R.S. 2010, c. E-10.22	■ The Environmental Spill Control Regulations, R.R.S c.D-14 Reg 1 ■ The Hazardous Substances and Waste Dangerous Goods Regulations, R.R.S., c. E-10.2, Reg 3 ■ The Water Regulations, 2002, R.R.S. c. E-10.21 Reg 1 ■ Halocarbon Control Regulations, c. E-10.21 Reg 2 ■ Used Oil Collection Regulations, R.R.S., c. E-10.2 Reg 8	■ Hazardous Substances and Waste Dangerous Goods Permit to Construct (Section 10) ■ Hazardous Substances and Wastes Dangerous Goods Permit to Operate (Approval to Store - Section 9) ■ Approval to Construct - Water Works ■ Approval to Operate – Water Works ■ Permit to Construct - Aquatics Habitat Protection Permit
Forest Resources Management Act, 1996, F-19.1	■ The Forest Resources Management Regulations, 1999, F-19.1 Reg 1	■ Forest Product Permit
Fire Prevention Act, S.S. 1992, F-15.001	■ The Saskatchewan Fire Code Regulations, F-15.001 Reg 1 ■ The Fire Insurance Fees and Reporting Regulations, F-15.001 Reg 2	■ n/a
Fisheries Act (Saskatchewan), S.S. 1994, F-16.1	■ The Fisheries Regulations, 1994, F-16.1	■ n/a
The Heritage Property Act, S.S. 1979-80, H-2.2	■ The Heritage Property Regulations, Sask. Reg 279-80	■ n/a
Highways and Transportation Act, S.S. 1987, H-3.01	■ The Controlled Access Highways Regulations, H-3 Reg 7 ■ The Highways and Transportation Regulations, H-3.01 Reg 1 ■ The Erection of Signs Adjacent to Provincial Highways Regulations, 1986	■ Approach Permit ■ Oversize / Overweight permits ■ Roadside Permit ■ Off-premise Sign Application ■ On-premise Sign Application

Table 1.3-1: Federal and Provincial Acts and Regulations Relevant to the Project (continued)

Jurisdiction	Related Regulations	Permits Required
The Northern Municipalities Act, 2012, N-5.2	■ The Northern Municipalities Regulations, 2011, N-5.2 Reg 1	■ Road Maintenance Agreement
Occupational Health and Safety Act, S.S. 1993, O-1.1	■ Occupational Health and Safety Regulations, 1996, R.R.S., c. O-1 Reg 1	■ n/a
Provincial Lands Act, S.S. 1978, P-31	■ Saskatchewan Wetland Conservation Corporation Land Regulations, 1993, P-31, Reg 14 ■ Crown Resource Land Regulations, P-31, Reg 17 ■ Provincial Lands Regulations, SR145/68	■ n/a
Saskatchewan Watershed Authority Act, S.S. 2005, c. S-35.03	■ Saskatchewan Watershed Authority Regulations, R.R.S., c. S-35.03 Reg1	■ Approval to Construct - Industrial Wastewater Works ■ Water Rights Licence & Approval to Construct and Operate Works ■ Water Rights Licence
Weed Control Act, 2010, S.S. W-11.1	■ Weed Control Regulations, W-11.1, Reg 1	■ n/a
Wildlife Act, S.S. 1998, c. W-13.12	■ Wildlife Regulations, W-13.1, Reg 1 ■ Wildlife Management Zones and Special Areas Boundaries Regulations, 1990, W-13.1 Reg 45 ■ Wildlife-Landowner Assistance Regulations, 1981, W-13.1, Reg 48 ■ Wild Species at Risk Regulations, W-13.1 Reg 1	■ n/a

*Act is currently being revised. Changes to the Act had not come into force at the time this table was generated. Changes to the Act will have to be reviewed in context of the Project once additional information is available.
n/a = not applicable

1.4 Environmental Studies within the Proposed Project Area

A number of environmental studies have been undertaken by the proponent in the general Project area specific to baseline data collection and feasibility planning for the Project. The Proponent is not aware of any federal regional environmental studies, as described in Section 73-77 of *CEAA 2012*, that are taking place, or have previously taken place, in the region.

The Project is located within the Stage I planning area of the Draft Athabasca Land Use Plan (ALUP) for the Athabasca region. The draft land use plan was released in March 2006. As part of this plan, land use zoning is used as a planning tool to guide management and development within the Stage I planning area (ALUP, 2006). The Project is located in the community and infrastructure area. The planning focus for this area is on maintaining existing community and public infrastructure uses, and allows for future improvements to access and infrastructure (ALUP 2006).

1.5 Report Organization

This document has been prepared to meet the requirements of both the federal Project Description and the provincial Technical Proposal. The information requirements vary slightly between the federal and provincial guidance documents. As a result, this document has been structured such that the federal Project Description requirements are addressed in the main body of the document and supplementary information required to address the requirements of the provincial Technical Proposal are included in appendices as referenced in the document. For ease of reference, concordance tables have been prepared for both the federal and provincial guidance documents. The concordance tables can be found in Appendix A.

2.0 PROJECT INFORMATION

2.1 Project Components

The Project will be a 42 to 50 MW, water diversion type electrical generating station. The gross head of the Project will be approximately 36 metres (m), capitalising on the long term annual average river flow of 305 cubic metres per second (m^3/s). No impoundment of Black Lake will be required. When completed, the principal components of the proposed Project will consist of:

- an approximately 8.5 km long connecting gravel access road to the proposed Project site from the all-season road between Stony Rapids and Black Lake communities;
- a bridge over the Fond du Lac River;
- a powerhouse and associated infrastructure;
- an approximately 2.65 km tunnel from Black Lake to the powerhouse, using a portion of the water that would typically flow down the Fond du Lac River from Black Lake to Middle Lake;
- an approximately 1,100 m long tailrace channel between the powerhouse and its re-entry into the Fond du Lac River upstream of Middle Lake;
- a submerged weir in the Fond du Lac River at the outlet of Black Lake, to maintain water levels and fish habitat in Black Lake; and
- an approximately 20 km transmission line and switching station to connect the energy produced into the northern Saskatchewan electrical grid.

2.2 Designated Activity

Under the *CEAA* 2012, an environmental assessment may be required for "designated projects". A designated project is one that includes one or more physical activities that are set out in the Regulations Designating Physical Activities (2012). Pursuant to Section 7 of the Schedule to the federal Regulations Designating Physical Activities (2012), a project involving the construction, operation, decommissioning, and abandonment of a structure for the diversion of 10,000,000 cubic metres per year (m^3/y) or more of water from a natural water body into another natural water body is a designated project. The Project, as currently proposed, will require the construction of a structure that will divert up to approximately 5,000,000,000 (5 billion) to 5,900,000,000 (5.9 billion) m^3/y depending on the generating capacity of the powerhouse selected, and on the frequency and extent of planned and unplanned outages. As the Project will exceed the criteria listed in the regulations, it is considered a designated project and, therefore, will be subject to the provisions of the *CEAA 2012*.

2.3 Project Footprint

The arrangement of proposed structures for the Project was influenced by BLFN's requirements that the Project minimize the environmental impact to Black Lake and the Fond du Lac River. To take full advantage of the gradient in this section of the Fond du Lac River, water from Black Lake will be conveyed from an intake structure via a power tunnel excavated through rock to the powerhouse, and finally will be returned to the Fond du Lac River upstream of Middle Lake via a trailrace.

The results of the site investigations, and development of the design concept considering cost and potential environmental effects determined the final proposed structure locations. Because the Project design has not yet been finalized, minor refinements are expected (e.g., changes to component locations to accommodate site conditions) during the final design phase (start early 2013), pursuant to final engineering design and input from the general contractor.

The general zone of influence and footprint of the proposed Project will include the area between Black Lake and Middle Lake that extends approximately 2 to 3 km on either side of the Fond du Lac River (Figure 2.3-1). The proposed location of the powerhouse coordinates are 59° 10' 48" N and 105° 32' 12" W. Within this area, footprint impacts will be localized to the immediate vicinity of Project components (e.g., bridge, water intake, powerhouse, tailrace and outfall, submerged weir, access roads, staging/material storage areas, construction camp, transmission lines and waste rock disposal areas). Photos of the area are presented in Appendix B.

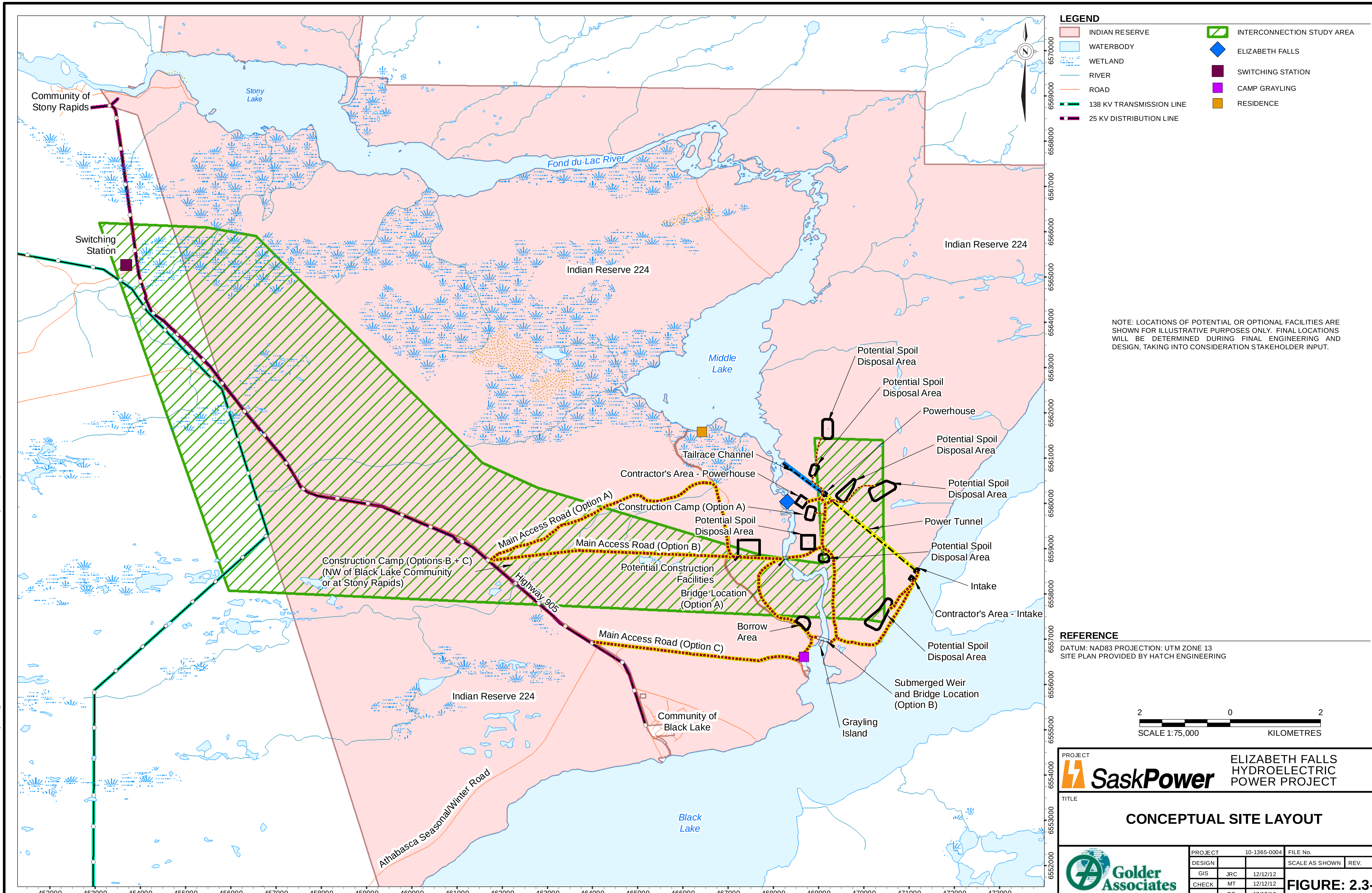
The majority of Project activities will take place on Chicken Indian Reserve No. 224. Portions of the Project proposed at this time that may be partially located off of Reserve land include segments of the main access road and transmission line corridor, and an area of Camp Grayling. In addition to the communities of Black Lake and Stony Rapids, there is one known residence on Middle Lake.

2.4 Project Need

SaskPower provides electrical energy to meet industrial and residential demand on SaskPower's Far North electrical supply system. Transmission and generation facilities have been constructed over the years to meet existing demands for power. However, over the next ten years the demand for power is expected to double in northern Saskatchewan, which the existing Far North electrical facilities will be unable to serve. As a result, SaskPower is implementing upgrades to the existing transmission service, working with BLFN to develop the Elizabeth Falls Hydroelectric Project, and evaluating various additional generation options to ensure Far North load can be served into the future. Supplementary details on the need for the Project as well as a brief history of activities completed to date are provided in Appendix C.

2.5 Project Benefits

The proposed Project is expected to cost in the range of $250 to $300 million to develop, which will generate a number of significant benefits during both the construction and operational phases. The construction phase of the Project will provide local economic and employment opportunities using northern Saskatchewan companies as much as possible. The magnitude and extent of these benefits will be dependent on the capacity and capabilities of the local contracting communities. The proposed public involvement program will be used as one method of communicating employment and contracting opportunities available to northern Saskatchewan contractors.



G:\CLIENTS\SASKPOWER\Elizabeth Falls Power Project\Figures\10-1365-0004 SaskPower Elizabeth Falls EA\22000 Project Description\10-1365-0004 Site Plan 2012-08-14.mxd Date: 12/12/2012 2:22:40 PM

It is anticipated that all or portions of the following proposed construction activities could be completed by local contractors:

- clearing of vegetation (e.g., for the proposed access roads, powerhouse, tailrace, water intake, switching station, transmission line);
- access road and bridge construction;
- tailrace excavation through overburden and rock;
- powerhouse building construction; and
- construction camp set-up and operation.

Due to the specialized nature of some work associated with constructing a hydroelectric power facility, some activities may need to be contracted out to contractors with expertise in areas such as coffer dam construction for the power tunnel intake, power tunnel excavation, powerhouse mechanical and electrical installation, the pouring of concrete and forming of water passages leading to the turbines, and installation and commissioning of turbine and power generation equipment.

In addition to the short- and long-term local business and employment benefits that will result from development of the proposed hydroelectric project, BLFN will receive long-term benefits as a development partner. These include benefits to the local First Nation economy, increased employment, improved quality of life, and enhanced and improved local infrastructure including roads and other facilities.

Larger scale benefits from the Elizabeth Falls Hydroelectric Project include increasing the production of renewable energy in Saskatchewan, as well as enhancing the supply and reliability of electrical energy transmission in northern Saskatchewan using the existing Far North electrical transmission line.

3.0 PROJECT DESCRIPTION

This section of the Project Description provides information on the proposed Project during the construction and operation phase. Supplementary information regarding workforce requirements, and Project alternatives are provided in Appendix C.

The proposed Project is comprised of a water intake located on Black Lake, a 2.65 km power tunnel excavated through rock to a powerhouse containing electricity generating turbines, and a tailrace extending for approximately one kilometre from the powerhouse to the Fond du Lac River. The tailrace will discharge into the Fond du Lac River approximately 600 m downstream of Elizabeth Falls, which consists of a series of rapids over a 600 m long section of the river. Several smaller rapid sections are located on the river upstream of Elizabeth Falls towards Black Lake. The difference in elevation between Black Lake and Middle Lake is approximately 36 m, which is considered to be the gross head of the development.

Other components of the proposed Project include an electrical switchyard located immediately adjacent to the powerhouse, and an interconnecting transmission line, together with the associated access roads and a bridge across the Fond du Lac River connecting the Project site to Highway 905 and the communities of Black Lake and Stony Rapids. The proposed Project will also include a construction work camp, waste rock disposal areas, and a submerged weir near the outlet of Black Lake (Figure 2.3-1). Some aspects of the project design may be modified subject to final engineering and design.

3.1 Construction

The Project will involve the construction of site facilities, a construction camp, site access roads and a bridge crossing to provide access to the key components of the development. The key components of the Project, which will comprise the majority of site construction activities, require the construction of the proposed water intake, tunnel, powerhouse, switchyard and tailrace. The powerhouse will require the installation of turbines and generators as well as other electrical and mechanical systems. Topics discussed in this section include construction details available to date, design information, and environmental design features. Environmental design features will be incorporated into the Project design to prevent or limit negative effects from the Project on the environment.

3.1.1 Site Preparation in Advance of Project Construction

3.1.1.1 Access Development

The proposed Project is located approximately 90 km south of the Saskatchewan-Northwest Territories border. Road access to the site from southern Saskatchewan will be via Highways 102 and 905 from La Ronge to Points North, an all-weather gravel-surface road maintained by the Saskatchewan Ministry of Highways and Infrastructure. Beyond Points North to the Project site, primary access will be by the Athabasca seasonal/winter road. Summer access by this route is difficult, but passable. Because of the condition of the road, it is expected that most of the equipment and materials required for construction will be transported during the winter between late January and late March.

Local access to the proposed Project site will require the construction of permanent and temporary roads, and a bridge. All-season gravel roads will be required during construction to access all of the Project components under construction. The permanent main access road will be constructed in the first year of construction and will extend from Highway 905 over the Fond du Lac River via the access bridge. The main access road and access bridge must be completed first to provide access for contractors to the various key Project components. Further details on the access roads and bridge are provided in Section 3.1.2.5 It is expected that most of the specialized or skilled workers will be mobilized to and from the Project site via plane to the airport located at the community of Stony Rapids. A small number of parking spaces will be provided at the construction camp for personal vehicles.

3.1.1.2 Site Clearing

Site clearing is required for powerhouse and tailrace construction, as well as development of sites for sourcing borrow material and for waste rock disposal. Clearing, grubbing and disposal of timber for the Project will be undertaken in compliance with all governing rules and regulations. Clearing of natural growth in roadway rights-of-way and facility areas will be done to such an extent that all applicable fire, roadway, and electrical (power pole) clearances are met. Any trees or bushes that are cut during the site clearing will be stockpiled, and burned or disposed of in a manner approved by the governing regulatory bodies, and pursuant to consultation with the BLFN.

Organic soils (peat) will be removed in areas where proposed roadways or facilities are to be located, with the exception of permafrost affected areas. Organic soils that are removed will be stockpiled in windrows around the perimeter of the cleared areas and stabilized to prevent erosion by wind and water. Silt fencing or other erosion control measures will be provided as needed to prevent any eroded stockpile material from entering watercourses. Stockpiles will be used upon completion of Project construction in reclaiming disturbed development areas.

3.1.1.3 Development of Borrow Sources

It is anticipated that sources of aggregate will be available locally, particularly from areas west of the Fond du Lac River. Required volumes of material will be determined once final Project design has been completed. Figure 2.3-1 displays the location of one proposed borrow area west of the Fond du Lac River.

3.1.2 Site Infrastructure

The following sub-sections provide construction details for the proposed powerhouse, water intake, tunnel, tailrace, access roads and bridge, Black Lake outlet submerged weir, transmission line and hazardous substance storage. Topics include design information and construction details formulated to date, and options being considered (when relevant).

3.1.2.1 Powerhouse

Generating Capacity

An optimization study is currently underway to determine the specific generating capacity of the proposed Project between 42 MW (160 m^3/s discharge rate) and 50 MW (190 m^3/s discharge rate). The Project will operate as a water diversion type plant using approximately 36 m of gross head between Black Lake and Middle Lake.

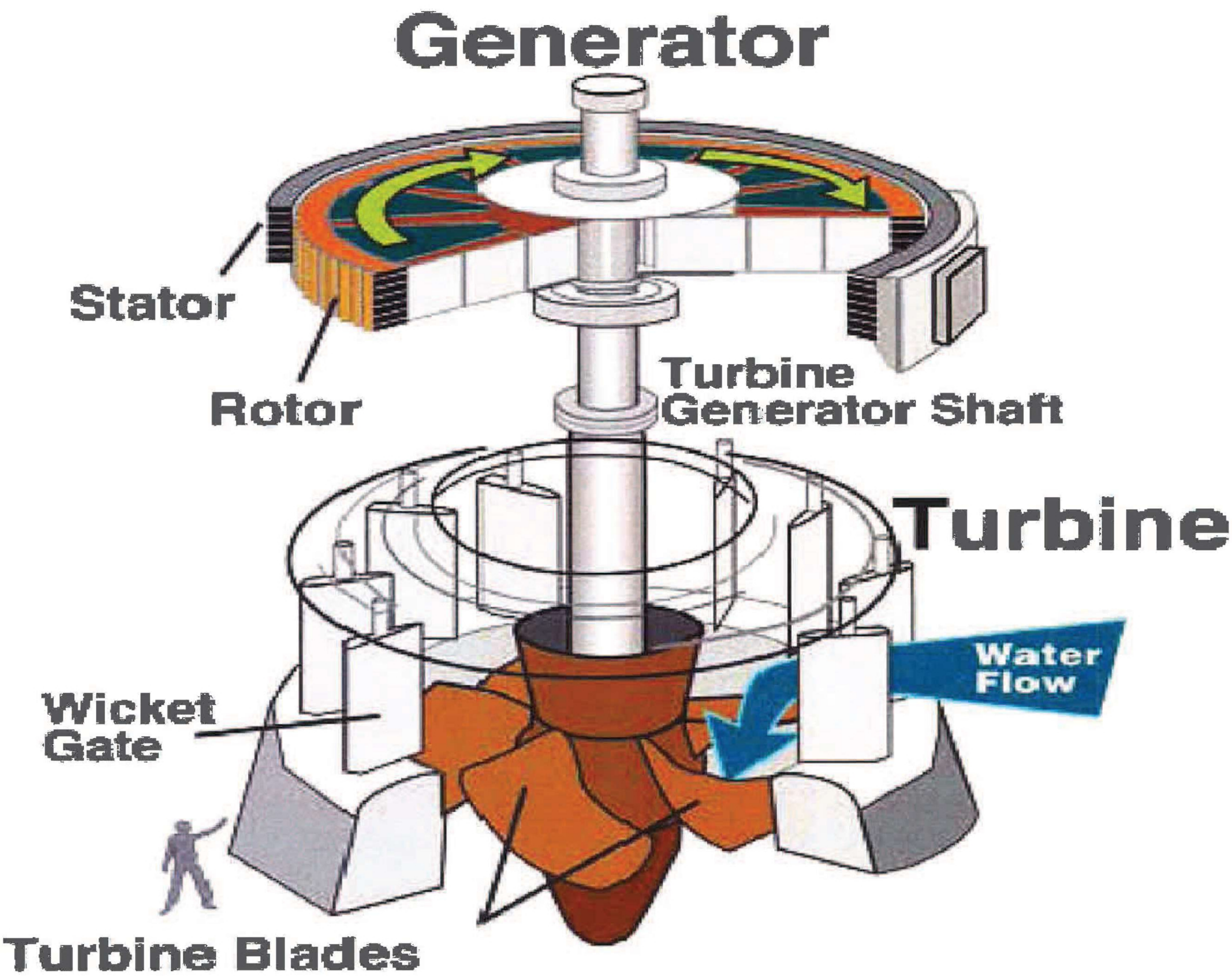
While the number of generating units has not yet been finalized, it is estimated that up to four units could be used. A multiple unit generating plant was selected because of its flexibility of operation and more easily managed scheduling of maintenance outages compared to a single unit power plant. While a single unit plant would cost less to construct, a multiple unit plant results in less lost generation of energy due to forced and planned outages. In addition, equipment components are smaller and easier to handle.

Selection of Turbines

The type of turbine units selected for the Project will be determined in the design process and will be described in more detail in the EIS. Turbine specific characteristics such as fixed versus variable pitch blades, runner diameter, synchronous speed, number of units, and individual unit output will be determined subsequent to a formal solicitation for equipment proposals from turbine manufacturers. An example of a typical turbine and generator installation layout is provided in Figure 3.1-1.

Flow Bypass

In order to maintain downstream flows and water levels during a sudden change in turbine load such as a load rejection, the station will be equipped with features to ensure that the change in operation does not negatively affect downstream flows or water levels. The amount of flow that must be diverted will determine the type of equipment selected. If the ramping rate is moderate, it may be possible to utilize the turbines or an energy dissipating valve. If larger bypass flows are required, a more complex system may be required, possibly employing multiple valves or specially designed units. This will be developed once the ramping rate and associated discharge are confirmed.



REFERENCE

PROCESS DIAGRAMS PROVIDED BY SASKPOWER

PROJECT

SaskPower

ELIZABETH FALLS
HYDROELECTRIC
POWER PROJECT

TITLE

GENERATOR
PROCESS DIAGRAM

Golder Associates
Saskatoon, Saskatchewan

PROJECT		10-1365-0004	FILE No.	
DESIGN			SCALE AS SHOWN	REV. 0
GIS	JRC	12/12/12	**FIGURE: 3.1-1**	
CHECK	MT	12/12/12		
REVIEW	BC	12/12/12		

G:\CLIENTS\SASKPOWER\Elizabeth Falls Power Project\Figures\10-1365-0004 SaskPower Elizabeth Falls EA\22000 Project Description\10-1365-0004 Process Diagram C.mxd

Environmental Design Features

As part of the turbine selection process for the Project, consideration will be given to each turbine design's fish friendliness. Further description of the fish protecting characteristics of the selected turbines will be discussed in the Environmental Impact Statement (EIS).

The power station will be equipped with an oil containment and separation system, which guards against the possible contamination of the waterway in the event of an accidental spill from powerhouse equipment containing oil or other petroleum based liquids.

Drainage from areas within the powerstation with potential for containing oil will be directed to the oil separator system. Drainage from lower levels will be directed to one of the main station sumps and pumped to the separator. The oil separator storage area will have sufficient volume to hold the contents of the largest single oil container within the power station.

The turbine governor pumping systems will be surrounded by trenches or curbs to allow drainage via the trench or sump to the oil separator system. It is expected that the governor hydraulic power units will be high pressure systems to reduce the potential spill hazard by minimizing the total volume of hydraulic oil in the system. Final characteristics of the turbine governor pumping systems will be determined during final design.

Any powerstation rooms with risk of an oil spill will be equipped with containment curbs and door ramps. In general, containment will be located as close as possible to the source of the potential leak or spill.

For this Project, the main transformers will not be located on the tailrace deck, but rather will be located on shore considerably reducing the potential for spilled transformer oil to contaminate the waterway. However, because the transformers will be relatively close to the waterway, oil spill containment walls will be constructed around them.

It is expected that the double walled heat exchangers will be used for the turbine and generator cooling systems to reduce the risk that cooling coil failure will discharge oil into the water. Self-lubricated bushings will be employed throughout the design to eliminate sources of water pollution typical of greased bushings (e.g., greased wicket gate bushings, turbine runner blade bushings). Final design characteristics will be determined during final design.

3.1.2.2 Water Intake

The purpose of the proposed water intake is to direct water into the power tunnel from Black Lake under controlled conditions. It establishes the transition between the free water surface of the lake and the closed conduit flow within the power tunnel. The water intake structure will be designed and located to divert water from well below the surface of the lake (i.e., greater than 2 to 5 m below the lake surface). The water intake will be constructed of reinforced concrete with provisions for steel stoplogs and trashracks. The trashracks are intended to prevent debris and ice from entering the water passages of the plant and potentially damaging the turbine generating equipment. To minimize entrance hydraulic losses, the intake water passage will be streamlined to direct the flow from Black Lake into the power tunnel. The intake channel and structure will be designed to draw the required power plant design discharge from Black Lake over the full range of anticipated lake levels.

Intake Design and Construction

The proposed water intake will be sized to deliver the full plant discharge capacity of 160 m^3/s (42 MW facility) or 190 m^3/s (50 MW facility) into the power tunnel. The size and shape of the intake water passage will be designed to minimize hydraulic losses, to ensure the formation of a competent ice cover at the intake channel entrance during winter operation, and to ensure compliance with industry and regulatory standards. The roof of the water passage has been set to be submerged for the full range of anticipated Black Lake water levels, thereby preventing potential entrainment of air into the power tunnel and surface disturbances near the structure. The level of the water intake deck will be set so that there will be sufficient rock thickness above the roof of the power tunnel to maintain the integrity of the rock during blasting for tunnel excavation. The invert of the intake structure will be set approximately 12 m below the lake level to ensure the intake is sufficiently submerged to prevent air from entering the power tunnel and interfering with the operation of the turbine generating units.

A floating boom and other safety warning devices will be installed on Black Lake around the intake location to ensure safe boat traffic in the area. The steel trashracks located at the entrance of the water intake will also add an additional level of safety. At the trashrack location, the area of the intake will be sized to limit the water velocity through the trashracks to no more than 1.25 metres per second (m/s) under full discharge capacity.

Cofferdam for Water Intake in Black Lake

Construction of the water intake structure will require construction of a coffer dam to prevent water flowing into the active work area. Natural features will be used where appropriate to aid with the coffer dam design. The proposed water intake structure will be located adjacent to a rock outcrop approximately 90 m from the shore of Black Lake. There is a plateau between the rock outcrop and the shoreline of the lake that is underlain by up to 20 m of sand, gravel, boulders and cobbles (Hatch 2002, 2012). A steel sheet pile cut-off wall will be installed to control seepage through this sand layer during construction of the water intake. This option involves driving sheet piles to form a low permeability barrier. The sheet pile wall will be about 250 m long and extend 17 m below grade. A sand plug between the sheet pile and the excavation will be left to ensure stability of the sheet pile wall. Water seepage through and beneath the sheet pile wall will be managed with dewatering wells or sumps. The sheet piles will be removed prior to excavation of the sand plug, but after completion of the water intake and power tunnel construction activities.

The potential disadvantage of this option is the possibility of not being able to drive the sheet piles to the required depth due to the presence of boulders within the sand stratum. In the event that the sheet pile cannot be driven to the desired depths, other options for dewatering the intake area include installing a bentonite slurry trench cut-off, or installing a system of dewatering wells.

Environmental Design Features

Construction of the water intake structure will require excavation of overburden adjacent to Black Lake. This activity has the potential to affect water quality and aquatic habitat at the intake structure location and along the lakeshore near the structure. To reduce these adverse effects, a sheet pile cofferdam is proposed to facilitate the excavation and construction of the intake structure as described in the previous section. A turbidity curtain will also be used to minimize suspended sediments from entering the main body of Black Lake during the excavation and removal of the soil plug.

The design of the intake structure will ensure a smooth and gradual acceleration of the flow so as to minimize the disturbance to the local fisheries habitat. The flow velocity at the upstream face of the trashrack will be limited to 1.25 m/s so as to prevent the entrapment of fish in the immediate intake area. The spacing of the bars will prevent the passage of fish of 50 millimetres (mm) or greater width from entering the power tunnel and turbine water passage ways. During final design, the need for fish screens or a finer trashrack will be assessed on environmental considerations (e.g., during critical periods of fish migration).

3.1.2.3 Tunnel

The current preferred power tunnel arrangement consists of a 2.65 km long tunnel with a 9.1 m wide horseshoe shaped (∩) cross-section. The tunnel is expected to be constructed using the drill-and-blast method. Approximately 315,000 m^3 of waste rock is expected to be created by the tunnel excavation, assuming an overbreak of 0.5 m along the entire length of the tunnel.

Tunnel Design

To minimize the cost of tunnel excavation as much as possible, it is desirable to minimize the tunnel cross-sectional area while at the same time providing optimum hydraulic conditions for the conveyance of the design discharge for the powerhouse turbines. A number of cross-sectional areas were considered for the tunnel and cost estimates prepared for each case. Increasing the cross-sectional area of the tunnel increases energy production, but also results in increased cost of tunnel construction. An economic evaluation was undertaken on the basis of estimating the incremental benefit-cost ratio to determine the optimum tunnel cross-sectional areas for various levels of installed generating capacity in the powerhouse.

In addition, a number of options were considered for the power tunnel construction. These included a horseshoe shaped tunnel excavated by drilling and blasting, a circular tunnel excavated by a tunnel boring machine, and an excavated tunnel with a concrete lining. Of these options, the drill and blast horseshoe shaped tunnel was selected as being the most cost effective.

A number of tunnel alignments connecting various powerhouse and intake alternate locations were reviewed, with power tunnel lengths ranging from 2.65 to 3.3 km. On the basis of an economic evaluation, the current preferred arrangement was selected, consisting of a 2.65 km long power tunnel with a 9.1 m wide horseshoe shaped cross-section. The longer alignment was eliminated due to the presence of a valley with 20 m, or more, of overburden cover overlying bedrock near the downstream end of the alignment. This alignment raised a concern that there would be insufficient bedrock cover over the tunnel to ensure tunnel stability, and that up to 200 m of steel lining would be required to reinforce it (Hatch 2007).

The proposed power tunnel is to be excavated by the drill-and-blast method through Precambrian rock having a compressive strength between 100 and 200 megapascal (MPa). The rock quality for the tunnelling conditions is generally good. For the purposes of rock support, the rock mass has been divided according to the Rock Mass Rating (RMR) system (Bieniawski Geomechanics Classification), and the Norwegian Tunnel Quality Index (Q). However, all classes of rock support are not visible on the surface and poorer quality rock masses are anticipated based on structural geologic features noted on site. Instability of an underground cavern is created by structural discontinuities or stress induced instability. Given the high intact rock strength, and expected low gravitational *in situ* stress level for the shallow depth of the tunnel (maximum 75 m), it is appropriate to use empirically derived ground support measures. Table 3.1-1 displays an estimate of the proportion of the tunnel length that will be comprised of each rock support class.

Table 3.1-1: Summary of Rock Support Classes

Support Class	Description of Support Type	Proportion of Tunnel (%)
Class 1	Spot bolting only, 5% of surface area of Class 1 rock to have 50 mm of unreinforced shotcrete for treatment of weak seams and shears and safety.	65
Class 2	Pattern bolting, 2.5 m x 2.0 m; 5% of surface area of class 2 rock to have 50 mm of unreinforced shotcrete for treatment of weak seams and shears and safety.	28
Class 3	Pattern bolting 1.2 m x 1.2 m; 75 mm of reinforced shotcrete.	5
Class 4	Pattern bolting 1 m x 1 m; 100 mm of reinforced shotcrete, may require installation of steel sets.	2

% = percent; mm = millimetre; m = metre

Support Class 1 is required for the quartzo-feldspathic gneiss, while Class 2 is principally support for the numerous closely to moderately spaced jointed diabase dykes that will cross the tunnel alignment. Rock support Classes 3 and 4 were not observed on the surface and were not encountered in the boreholes. Their extent has been estimated using conservative assumptions. It is expected that the length of the rockbolts will generally be 3 m, although lengths of up to 5 m may be required.

Tunnel Construction

Due to the geology of the area, the drill-and-blast method is expected to be the preferred method of construction. Tunnelling will be done from a single active work face. It is assumed that initially about 150 m length of the tunnel will be excavated from the powerhouse end, with the remaining length (approximately 2,500 m) of the tunnel being excavated from the water intake side. This sequencing of tunnelling allows for construction of the tunnel to steel penstock transition at the powerhouse to proceed independent of the powerhouse and tunnel construction. The access for installation of the steel penstocks will be via the tunnel end that enters the upstream wall of the powerhouse excavation. The access to the tunnel for mucking and general traffic during construction from the Black Lake water intake end will be via the intake excavation. For the purpose of this Project description, all methods and references are made to construction of a 9.1 m wide tunnel having a length of 2.65 km. The various steps used in the tunnelling are described below.

Drilling

Tunnel drilling is proposed using a three boom drill jumbo (e.g., Atlas Copco L3C). The drill jumbo will be electrically powered to reduce pollution inside the tunnel. It is assumed that the booms will permit drilling of 3 m deep holes, which will give an expected pull for each round of 2.8 m. The drill jumbo will be equipped with a charging and scaling platform. The tunnel will be excavated with a full active working face.

Based on the information available it appears that full-face drilling will be possible for the entire length of the tunnel. This method of drilling has been assumed for estimating the cost of the power tunnel excavation. However, if upon further investigation it is found that full-face drilling is not possible for some sections of the tunnel, other alternative methods like heading and benching will be assumed. The heading and benching method of drilling has higher cost implications and would increase the scheduled duration of tunnel construction.

Blasting will be done using emulsion explosives (i.e., water resistant explosives like Unimax® or similar). The average powder factor assumed is 1.1 kilograms per cubic metre (kg/m³). The tunnel contour holes will be charged with less and weaker explosives compared to other holes and will be spaced approximately 500 to 600 mm. Non-electric detonators with the appropriate number of interval delays will normally be used. These detonators are both easy and safe to handle, and provide optimal control of blasting operations. The explosives storage building will be located in the contractor work area immediately adjacent to the proposed powerhouse and intake areas. Two storage locations will likely be required, one in the general contractor work area and the other at the intake work area.

Mucking and Scaling

Mucking (removal of blasted waste rock) will be done with standard front-end wheel loaders equipped with a side tipping bucket. The mucking operations will also use an excavator as required to clear the waste rock from the face of the tunnel. Articulated rock trucks are assumed for hauling units. The trucks will transport the waste rock to the nearest designated spoil dump unless designated to be incorporated in to construction works elsewhere. The loaders will also prepare the roadway on the tunnel floor.

Scaling involves the removal of rock loosened from blasting, but still attached to the tunnel walls and roof. The roof will be scaled during and/or after mucking, and immediately thereafter the required rock support will be installed. In very poor rock a layer of shotcrete may be placed before mucking; in such cases no scaling will be performed. The remaining required rock support will be installed at a later time to prevent delays in the cyclical tunnel face construction work.

Installation of Rock Support

The rock support for the proposed tunnel is planned for two types of tunnels, one for good rock conditions and the other for fractured or poor rock. The rock supports will be in the form of 25 mm diameter, 3 m long rock anchors. Holes for the anchors will be drilled and the anchors placed with the drill jumbo. Grout will be mixed in the tunnel and placed in the holes using a grout pump.

Shotcreting will be normally done by the wet method using a shotcrete robot. The robot is equipped with a hydraulic arm for remote, safe spraying and eliminates the need for scaffolding during shotcreting. To ensure the best possible bond between the rock wall and the shotcrete, the tunnel walls will be thoroughly washed using pressurized air and water, starting at the crown of the tunnel and proceeding downwards. Due to the humid environment in the tunnels, no special curing of the shotcrete is expected to be necessary.

The shotcrete will be reinforced by adding steel fibres into the wet mixture. When reinforcing mesh is to be installed, a layer of un-reinforced shotcrete will first be applied to the rock wall for safety. The mesh will be fixed manually to the rock surface with nails and plastic plugs using a platform truck. Thereafter, the mesh will be held firmly in place by installing permanent rock-bolt plates.

Grouting

Contact grouting will be used to fill any cavities left between concrete and rock during concrete operations at the intake, or during installation of the steel penstocks at the powerhouse end. Pipes will be set in the concrete and contact grouting will be done through these pipes. If required, rock drills will be used to deepen holes or open up clogged pipes. Consolidation grouting will be done where required. The consolidation holes will be drilled with rotary percussion drills. The drilling will be completed with the drill jumbo using extension rods when required. The grout will be placed by a grouting pump; mixing will take place inside the tunnel. Grouting lines will be equipped with manifolds to control and regulate pressure.

Tunnel Dewatering

Generally, the rock along most of the tunnel alignment is unfractured with very low permeability (Hatch 2012). As a result, groundwater inflow is expected to be less than 10 litres per linear metre of tunnel per minute. Dewatering will be done using submersible pumps in sumps; the seepage water will be pumped to the tunnel portal in 100 to 150 mm diameter pipes. The collected seepage water will be discharged into constructed sedimentation basins; seepage water will be discharged to natural watercourses once it meets acceptable water quality standards. It is anticipated that tunnel seepage water may require treatment prior to disposal; therefore, a seepage water quality management plan will be developed. The use of Unimax®, rather than ammonium nitrate/fuel oil (ANFO), explosives during the excavation process is expected to reduce the potential for high levels of ammonia to be released during dewatering.

Ventilation, Lighting, and Other Services

Ventilation will be provided using the forced air method. Plastic coated textile ducts treated to become fireproof will be used as air conduits. The ventilation duct will have a diameter of 1,500 mm; the fan will be provided with a silencer to reduce noise. In between drilling cycles, the drill jumbo will be used to drill holes for fixing hangers to the crown of the tunnel for attaching the ventilation duct.

Water pipes (50 mm diameter) will supply tunnel faces with water for drilling, flushing drill holes, cleaning rock surfaces, and watering of muck piles for dust reduction. Water for most of the tunnel excavation will be pumped from Black Lake. The pump intake will be screened as per Fisheries and Oceans' "Freshwater Intake End-of-Pipe Fish Screen Guideline" to prevent entrainment of fish (Fisheries and Oceans Canada [DFO] 1995). The appropriate water rights licence will also be obtained from the Water Security Agency prior to pumping water for use in the tunnel.

The tunnel will be well lighted with lamps hung from the crown of the tunnel. Between blasting cycles, the drill jumbo will be used for drilling anchors for hanging lights and fixing lamps.

Safety Planning

The underground works will be performed in accordance with requirements of the *Occupational Health and Safety Act* of the Province of Saskatchewan. In addition to general safety regulations to be followed at a construction site, regulations for underground work activities will be followed including: handling of explosives, ventilation, fire proof ventilation ducts, proper illumination, electrical installations with backup generators, communication, radioactivity surveys, scaling of rock surfaces, and providing temporary rock support (e.g., shotcrete) where scaling is not possible due to weak rock conditions.

Environmental Design Features

It is estimated that 315,000 m^3 of excavated rock will be removed from the tunnel. The excavated rock will be disposed of at a number of proposed disposal areas to be located near the tunnel alignment. The identification of waste rock prone to acid generation or metal leaching is described in Section 3.3.7. Waste rock disposal will take place in a manner that is protective of the environment.

Rock mucked from the tunnel that is not designated for use in the construction of access roads and temporary haul roads at the Project site will be deposited in designated disposal areas. Waste rock removed from the water intake portal will be deposited in disposal areas near the intake site; waste rock removed from the powerhouse portal will be deposited in disposal areas nearest the powerhouse. The waste rock will be spread in layers and will be levelled so that disposal areas will merge aesthetically with the existing landscape.

3.1.2.4 Tailrace

Downstream of the powerhouse, the water from the turbine discharge enters the tailrace channel. The proposed tailrace channel (approximately 1,100 m long) will be excavated in rock with varying depths of overburden. After the water from Black Lake is used to generate power, the tailrace returns the water back to the Fond du Lac River at a location upstream of Middle Lake.

The tailrace channel is located within a broad flat valley sloping gently to the northwest. The valley contains scattered outcrops of bedrock. Based on the results of seismic refraction surveys, geological mapping, and geotechnical drilling, it is expected that overburden could be up to 20 m thick in the valley immediately downstream of the powerhouse site. The overburden thickness decreases to between 5 and 10 m as the tailrace alignment approaches the Fond du Lac River.

At the proposed tailrace outlet to the Fond du Lac River, a rock ridge exists that will act as a rock plug preventing the migration of Fond du Lac River water into the excavation during construction. At its highest point, this ridge is approximately seven metres above the water level in the Fond du Lac River. It slopes towards the west where it tapers to the river level. Upstream of this outcrop is an alluvial plane with an elevation of 1 to 1.5 m above the river level. Scattered outcrops of gneiss bedrock are located in the valley as well.

The tailrace channel is expected to remain open over its entire length during winter. Based on limnology information collected during the winter of 2011, winter water temperatures in Black Lake are expected to be between 1 and 2 degrees Celsius (°C) at the depth of the proposed water intake. Therefore, the powerhouse discharge is expected to be about 1.5°C when released from the powerhouse into the tailrace channel. Although this water will begin to cool as it passes along the tailrace channel, it is not predicted to cool sufficiently to allow the formation of a thermal ice cover. The slightly warmer tailrace water temperatures in winter may result in the formation of some ice fog along the tailrace; however, it is not expected to be a serious concern.

Tailrace water temperatures in summer are predicted to be somewhat cooler than water flows in the Fond du Lac River. The Fond du Lac River water temperatures basically track Black Lake near-surface water temperatures (their source), whereas in summer the powerhouse flows will originate from a deeper cooler portion of Black Lake.

The location and discharge from the tailrace is also expected to alter the hydrology and fish habitat in the bay of the Fond du Lac River where the tailrace discharges. This in turn can affect fish spawning and habitat availability in the lower reach of the Fond du Lac River above Middle Lake. There is also potential for fish to access and use the tailrace channel as fish habitat.

Tailrace Design

The size of the tailrace channel has been designed to minimize head loss, while at the same time considering the overall cost to excavate. As the power plant is expected to operate at full discharge capacity approximately 90 percent (%) of the time, the design of the tailrace channel has been based on the full plant discharge.

The optimum size of the channel cross-section was determined on the basis of an economic evaluation. An increase in channel cross-section width increases the cost of channel construction. However, the increased channel cross-section decreases the hydraulic loss with a resultant increase in energy production. For an installed capacity of 42 MW and full plant discharge of 160 m^3/s, the optimum tailrace channel cross-section was determined to have a width of 25 m and a flow depth of 5.5 m resulting in an average flow velocity of 1.1 m/s. The resultant hydraulic loss in the tailrace channel due to friction was estimated to be 0.27 m at the full plant discharge. Similarly, for an installed capacity of 50 MW and corresponding full plant discharge of 190 m^3/s, the tailrace channel cross-section width would be 29.6 m with a flow depth of 5.8 m resulting in an average flow velocity of 1.1 m/s and hydraulic loss of 0.27 m at full plant discharge.

As bedrock ridges and outcrops were observed along the proposed tailrace alignment, it is anticipated that a significant volume of the channel excavation will be in bedrock. The thickness of the overburden along the channel varies from 0 to 5 m in the low lying areas, though it may be up to 10 m thick in some places. The bedrock is of good quality, permitting the excavation of near vertical sides (1 horizontal to 10 vertical). Support of excavated rock faces using rock anchors is not expected to be required.

The overburden is expected to consist of glacio-fluvial material. This material will permit excavated side slopes through the overburden at approximately 3 horizontal to 1 vertical. Slopes excavated in overburden will be protected with rock rip-rap excavated from the channel.

Tailrace Construction

During excavation of the proposed tailrace channel, rock plugs will be used at both ends of the tailrace to prevent the migration of water into and out of the excavation during construction of the powerhouse. The rock plug near the powerhouse will be located a sufficient distance downstream of the powerhouse to permit removal by blasting without damage to the powerhouse. This rock plug will be small in height and is only required to prevent water that has entered the tailrace from getting into the construction area of the powerhouse. Upon completion of the tailrace and powerhouse, the rock plug near the powerhouse will be removed first. The tailrace channel will then be cleaned to confirm proper grade. The rock plug at the Fond du Lac River will then be removed to complete tailrace construction. Waste rock disposal will occur as described in Section 3.3.7.

Cofferdam for Tailrace Outlet into Fond du Lac River

The tailrace begins in a suspected in-filled valley down-stream of the powerhouse. The tailrace area is located within a broad flat valley sloping gently to the northwest toward the Fond du Lac River.

To keep water out of the active work area and permit working in the dry during tailrace channel excavation, a rock and overburden plug will be left at the downstream end of the tailrace channel until the excavation is complete. The elevation of the river bottom downstream of the tailrace outlet to the river is believed to be relatively shallow. Should hydraulic improvements be necessary at the exit of the tailrace channel to the river, a small rock fill cofferdam with a semi-impervious core would be constructed. The cofferdam would be constructed by placing the two rockfill sections first, then depositing semi-impervious material between them to minimize the release of fines into the river. The cofferdams would be removed following completion of the tailrace exit excavation for hydraulic improvements at the river. Turbidity curtains will be used during construction to minimize the amount of silt entering the river.

Run-off and seepage water collected from sumps and/or dewatering wells within the excavation will be pumped into settling ponds and held until water quality is acceptable for release into natural water courses.

Environmental Design Features

Due to the significant depths of excavation associated with the construction of the tailrace channel, the tailrace area may require fencing to prevent humans and/or wildlife from accidently falling into the tailrace channel.

Waste rock disposal will take place in a manner that is protective of the environment (see Section 3.3.7).

3.1.2.5 Access Roads and Bridge

The main access road will provide all-season permanent access to the Project areas during construction and operations (Figure 2.3-1). The location of the main site access road from Highway 905 to the proposed bridge over the Fond du Lac River will be selected following local BLFN and public engagement. Currently, three possible alignments are being presented for community discussion; two alignments follow existing vehicle trails while the third alignment crosses undisturbed terrain. Beyond the Fond du Lac River bridge, the main access road will turn north and travel along the right bank of the Fond du Lac River passing near the proposed location of the contractor's work area and ending at the location of the powerhouse. The approximate length of the proposed main access road alignment from Highway 905 to the powerhouse is about 8.5 km.

Various other roads will be required in addition to the main access road (Figure 2.3-1). The east access road will branch off of the main access road just east of the proposed bridge location, and will provide access to the water intake area located at Black Lake. The length of the proposed east access road is approximately 2.7 km. If the construction camp is located at the Project site, a third road will be constructed from the main access road to the construction camp.

Temporary roads will be required to access waste rock and overburden disposal areas, and other areas that require access during construction. Temporary roads will not be built to provide all-season access. The number of temporary roads will be kept to a minimum to reduce impact on the local environment and the possibility of encroachment onto previously unknown heritage sites. After Project construction is completed temporary roads will be removed and the terrain returned, as near as possible, to its original preconstruction condition. As the locations of the waste rock and overburden disposal areas will not be finalized until the final design phase, the route of temporary access roads is uncertain at this stage. However, all significant components of the final Project design will be determined prior to submitting the Environmental Impact Statement (EIS) for the Project.

Two alternate access bridge locations across the Fond du Lac River are proposed. One site is located approximately 1.8 km downstream of Grayling Island at a point where the width of the river is narrowest. A second location would be parallel to the axis of the proposed submerged weir at the downstream end of Grayling Island. Further details on these two alternatives are presented in Section 3.1.2.6. In addition to engineering and cost considerations, consultation with BLFN and the public on the location of the access bridge will be used to determine the preferred bridge location.

Construction

The precise layout and extent of permanent site access roads is not known at this time and will be determined by the Proponent during final Project design. The design and development of the temporary construction access routes, water crossings, drainage, erosion control and sediment control methods will be developed by the contractor. Permanent roads will be designed to current provincial road design standards. Site drainage, erosion and sedimentation management will be in accordance with the applicable provincial and federal regulations and guidelines. No stream crossings are expected, with the exception of the Fond du Lac River Bridge. The contractor will be required to submit, for approval, plans and details prior to any road construction.

Environmental Design Features

Environmental monitoring during access road and bridge construction will be a fundamental component of construction practices during Project development.

Maintenance of access roads will be on-going for the life of the Project. Access roads, both permanent and temporary, will be gravel surfaced. As such, dust abatement techniques will be employed to minimize the effect on the environment and to maintain safe visibility conditions for driving. Snow removal will also be on-going through the life of the Project to ensure safe winter driving conditions.

Construction materials and supplies will be stored and handled in accordance with established environmental policies and regulations. The transportation of dangerous goods will be carried out as required by legislation/regulation. Road transportation of dangerous goods will only be undertaken by licensed carriers.

The technical specifications within the contract documents will state clearly the requirements for the protection of streams, groundwater, wildlife habitat and adjacent vegetation, during development by the contractor, as well as the nature and methods for the rehabilitation of disturbed areas after usage. Environmental protection measures incorporated as part of the design features will be determined by the Proponent and pursuant to regulatory guidelines and standards.

Appropriate terrestrial, aquatic and heritage resource studies have been completed to identify any areas of concern vis-à-vis terrestrial habitat and heritage resource issues; all sensitive areas will be avoided where feasible when determining the locations of work areas and infrastructure, and when routing site roads. Information on the location of traditional land use areas and traditional ecological knowledge will be collected during public engagement sessions prior to Project development.

Construction activities will incorporate mitigation measures that reduce effects upon the terrestrial environment (e.g., wildlife disturbance, loss of habitat, avoidance of critical periods, avoidance of species at risk locations, avoidance of important areas such as medicinal plant sites and sacred sites) and the aquatic environment (e.g., prevent sediments from entering surface waters, prevent release of deleterious substances, avoid known fishing sites).

The exact location of the bridge over the Fond du Lac River will be dictated by the need to avoid interfering with any possible heritage trails or historic sites in the vicinity of the bridge abutments on the river banks. Preservation of these sites will be ensured by identifying their boundaries and providing clear demarcation on site with the erection of “no access” fences prior to mobilization of the bridge construction contractor. Additional environmental concerns, such as avoiding any sloughing or dumping of deleterious materials into the river and preserving the integrity of possible nearby fish spawning areas, will also be priorities in determining the exact location of the bridge and abutments, and during bridge construction.

Environmental issues associated with access road construction include the previously discussed effects upon the terrestrial ecology, heritage resources, and traditional land uses. Other effects include possible disruption to natural drainages, increased movement of sediments and deleterious substances (e.g., fuel) into drainage channels and the river, and dust.

Proposed mitigation measures include:

- Right-of-way clearing will be minimized and all vegetation will be disposed of according to regulatory requirements.
- Roadway design and construction will include a network of swales, culverts and ditches within and around the roadways and structures. Sizing of ditches and culverts will be designed to accommodate the extreme daily rainfall event, and flow volumes and velocities will be kept low enough to minimize erosion and scouring of the drainage areas.
- Riprap energy dissipaters and ditch lining will be installed in areas where velocities may be excessive.
- Dust abatement methods will be consistent with practices used by Saskatchewan Highways and Infrastructure.
- Surface water will be directed into natural drainage courses by means of swales, culverts and ditches.

Important environmental issues associated with the bridge include:

- adverse effects to aquatic habitat at the bridge location and downstream of the crossing during construction (e.g., loss of habitat, sedimentation, deleterious substances) and during operation (e.g., sediments, deleterious substances);
- interference with sport and subsistence fishing locations; and
- aesthetics.

Proposed mitigation measures include:

- selecting a bridge crossing location that considers slope stability, aquatic habitat, heritage resources, and other environmental issues;
- obtaining advice from Transport Canada or other Transportation Authorities regarding the design, construction and operation of the bridge;
- obtaining advice and permits from regulatory agencies regarding crossing methods, construction scheduling, in stream equipment constraints, and erosion control measures;
- storing fuel and oil more than 100 m away from the river in an area equipped with secondary containment in case of spills; no refueling or servicing of equipment will be allowed within 100 m of the river; and
- using an appropriate combination of erosion prevention and control measures including riprap, silt fences, drainage blocks on approach road ditches, and re-vegetation of disturbed terrain.

3.1.2.6 Black Lake Outlet (Grayling Island) Water Control Structure

Based upon monitoring from 1963 to 2003 by the Water Survey of Canada, Black Lake has a long term average water level of 276.9 m and an average annual discharge of 305 m^3/s into the Fond du Lac River. The proposed generating station would introduce a second outlet on Black Lake discharging 160 m^3/s (42 MW generating station) to 190 m^3/s (50 MW generating station). During operation of the proposed generating station, this second outlet would reduce the long term water level on Black Lake by 0.55 m if no alterations were made at the existing outlet of Black Lake. To maintain historic water levels in Black Lake following construction of the generating station, the flow through the natural outlet of Black Lake will need to be restricted by constructing a submerged rockfill weir spanning the Fond du Lac River.

The proposed weir will be constructed across the Fond du Lac River at the outlet of Black Lake at the location indicated in Figure 2.3-1. The Fond du Lac River is approximately 200 m wide at the location of the proposed weir, including the 35 m wide Grayling Island, which the weir will intersect. The length of weir to the west of Grayling Island will be approximately 85 m, while the length of weir to the east of the island is approximately 80 m. The long term water level of the Fond du Lac River at this point is identical to that of Black Lake at 276.9 m above sea level. The river bed control elevation has been calculated from the discharge as having an average elevation of 275.9 m. Actual river bed elevation, as determined from bathymetric investigations, has a minimum elevation of 274.5 m.

The final weir configuration will be designed to facilitate fish passage at all lake levels and discharges.

Control Structure Design Alternatives

In addition to the submerged rockfill weir, a gated concrete control structure was also considered. This structure would be constructed as a combination of adjustable gates and submerged weirs. The channels to the east and west of Grayling Island would each have six gate bays centered in each channel, with each bay housing a 6 m wide gate. Submerged rock weirs would run from each gated section to the banks of the river. The gated control structure would use slide gates. One advantage of a gated control structure is the ability to manipulate flows in the Fond du Lac River to meet minimum riparian flow requirements, especially during spawning periods or during droughts when outflows may be decreased.

The submerged rockfill weir would be more cost effective in maintaining the historic lake levels as compared to a concrete weir. The submerged rockfill weir also has the advantage of having little visual evidence as compared to the concrete control structure, which would have piers, gates and hoists projecting above the structure altering the appearance of the natural environment at the lake outlet. The BLFN has also expressed a desire that there be no concrete weir construction at the outlet of Black Lake.

Construction

The submerged rockfill weir will have a trapezoidal cross section with a 3H:1V (horizontal distance to vertical height) upstream sloping face, a 3 m wide crest at an elevation of 276.3 m and a 10H:1V downstream sloping face. The weir will be constructed entirely of coarse rock fill, having an average diameter of 500 mm. As the weir is not required to act as a water retention structure a central impervious core will not be required.

Construction of the submerged weir will take place towards the end of work on the Project. At this stage of Project construction, spoil material will be readily available for use in weir construction, site access roads will be complete, and water will begin passing through the generating station. Construction of the weir prior to flow being passed through the new generating station would reduce the net outflow from Black Lake into the Fond du Lac River and may result in a minor increase in lake water levels. It is anticipated that the rock fill used in the weir will be available from the spoil produced during construction of the generating station. Weir material will be appropriately graded and washed to minimize the introduction of fine materials to the river.

At the current stage of project planning, several alternatives for the location of site access roads are under review. As the final location of the site access road and bridge will impact the manner in which the submerged weir is constructed, several alternatives have been considered as described below.

Alternatives for Access Bridge Location in Relation to the Submerged Weir

Two alternate bridge locations across the Fond du Lac River are proposed. One site is located approximately 1.8 km downstream of Grayling Island at a point where the width of the river is narrowest. A second location would be at the downstream end of Grayling Island along the axis of the proposed submerged weir. In addition to engineering and cost considerations, community feedback on the location of the proposed bridge will be used to select the preferred bridge location.

For the first potential crossing location, the site access road would cross the Fond du Lac River approximately 1.8 km downstream of Grayling Island (Figure 2.3-1). Following completion of most Project construction, work would commence on construction of the submerged weir at Grayling Island with the development of temporary access ways to allow heavy equipment to access the submerged weir work area from both the east and the west banks of the Fond du Lac River. Following completion of the access routes, rock trucks would transport properly graded rock from spoil areas to stockpile locations near the east and west banks of the Fond du Lac River near Grayling Island. Hydraulic excavators and/or front end loaders would place the material for the weir into the Fond du Lac River working entirely “in the wet”. It is anticipated that the actual placement of the rock fill for the submerged weir would only take several days due to the small volume of material involved. Following construction of the weir, the temporary access ways and stockpile areas would be rehabilitated to facilitate their return to their natural state.

For the second potential crossing location, the site access bridge/road would cross the Fond du Lac River at the downstream end of Grayling Island (Figure 2.3-1). The primary advantage of this approach as it relates to construction of the submerged weir is that access roads would be constructed much closer to the work area, reducing the scope of work for weir construction. In either case, the submerged weir will be constructed towards the end of the Project.

Environmental Design Features

Grayling spawning habitat has been identified along the east bank of the Fond du Lac River, roughly 55 m upstream of the submerged weir. The distance between the submerged weir and the spawning area has been determined to be sufficient that the presence of the weir should not impact the spawning habitat.

Environmental considerations are likely to play an important role in the construction of the submerged weir. As silt curtains will be ineffective in the rapidly moving river, weir material will have to be appropriately graded to minimize the introduction of fine material into the waterway. Equipment operating in the work area will be required to be free from leaks and clean of any potential contaminants. Fuelling of equipment will happen at a distance of at least 100 m from any waterbody or watercourse, and spill kits will need to be readily available. Finally, temporary access ways and stockpile locations will have to be situated and constructed in such a manner as to minimize the residual footprint.

The submerged weir will be designed and placed to facilitate upstream and downstream movement of Arctic grayling, so they can readily access their traditional spawning habitat.

3.1.2.7 Transmission Line

A transmission line will be required to connect the Project to the existing northern Saskatchewan electrical grid through the existing Stony Rapids Switching Station, or potentially a new station in the area. The general corridor through which potential transmission line rights-of-way will be identified, is shown in Figure 2.3-1. On this figure, the existing switching station is located approximately three km south of the Hamlet of Stony Rapids. The existing 25 kV distribution line, which supplies electrical power to the communities of Black Lake and Stony Raids, is also shown on Figure 2.3-1. The transmission line connecting the powerhouse to the Stony Rapids Switching Station is still in the design phase and an exact location has not yet been determined. SaskPower will be the Proponent for the transmission line, separate from the Project Proponent for the Elizabeth Falls Hydroelectric Project, and will build, own, operate and maintain the transmission line. SaskPower plans to discuss the transmission line right-of-way location with Black Lake and Stony Rapids community members prior to finalizing a route. Additional design and location details will be provided in the EIS.

Transmission line details that will be determined following future study by SaskPower through its interconnection process are:

- structure design, including span length;
- conductor type;
- right-of-way width, and the amount of vegetation clearing required;
- construction and maintenance access; and
- construction scheduling.

As previously mentioned, SaskPower plans to discuss the transmission line right-of-way location in consultation with Black Lake and Stony Rapids community members, as part of the aboriginal and public engagement process. However, some community and environmental issues associated with the transmission line can be identified at this time. The following is a list of community identified constraints or considerations associated with the transmission line location that have already been taken into consideration.

- Information received thus far from the community of Black Lake indicates that the transmission line location should be to the north of the community, and avoid areas that are commonly used for community activities.
- A residence is situated on the southwest side of Middle lake where the Fond du Lac River enters Middle Lake; the transmission line would likely be sited to the south of this residence.
- Camp Grayling, an outfitting operation, is situated east-northeast of the Black Lake community, on the west side of the Fond du Lac River where the river exits from Black Lake. With respect to aesthetics and operation of the facility during tourism seasons, the transmission line location would likely be to the north of Camp Grayling.

Constraints associated with the local terrain have also been identified as part of the evaluation of the transmission line corridor. To the immediate south of the Fond du Lac River and to the north-northwest of Middle Lake, the terrain is low, soils are wet and vegetation is characteristic of marshy terrain. Vegetation outside of these two areas is characterized primarily by jack pine stands intermixed with black spruce and deciduous tree species. As such, the potential for environmental effects would increase if the transmission line was located substantially northwest of Middle Lake, in comparison with a transmission line location on the drier, upland soils immediately west of the proposed powerhouse location, after it crosses the Fond du Lac River. A transmission line route proceeding west and/or northwest from the powerhouse after crossing the Fond du Lac River would have the advantage of construction and maintenance access from several existing trails on dry upland areas, and potentially from the permanent access road connecting Highway 905 to the bridge over the Fond du Lac River. This would reduce also reduce the potential for environmental effects in comparison with having to construct all new access trails for the transmission line. Additional environmental design considerations are discussed in Appendix C.

Construction

The new transmission line for the Project will be designed to operate at 138 kilovolts (kV). The line may be double-circuited (meaning two lines or sets of circuits on the same structure) within a single right-of-way.

3.2 Operation

The following section provides Project description information relating to the operations phase of the Project. Information presented includes power plant operations (e.g., historic Fond du Lac River flows, power generation, power produced, Black Lake water levels, and upset conditions), and site infrastructure during operations. Operational planning for the Project is in the early design stages; adjustments to the description provided herein may be made after further evaluation, including consulting with local community members and regulators.

3.2.1 Power Plant Operations

3.2.1.1 Historic Fond du Lac River Flows

Flows in the Fond du Lac River have been recorded since 1963 at Water Survey of Canada gauging station 07LE002, located at the outlet of Black Lake. The Fond du Lac River emerges in north-eastern Saskatchewan and flows west-northwest to Lake Athabasca. The two main flow sources include Wollaston Lake to the east-southeast and Cree Lake to the south. Natural outflows from Wollaston Lake are routed to two major river systems, the Fond du Lac River to the north and west, and the Churchill River via the Cochrane and Reindeer Rivers to the east and south.

Based on Water Survey of Canada records, the long term average annual flow for the Fond du Lac River is 305 m^3/s. The recorded minimum average monthly flow was 125 m^3/s in March 1982, and the recorded maximum average monthly flow was 786 m^3/s which occurred in October 1997. The wettest year on record was 1977 with an average annual flow of 445 m^3/s. The driest year on record was 1970 with an average annual flow of 232 m^3/s. The maximum daily flow recorded was 860 m^3/s (in October 1997), and the minimum daily flow recorded was 122 m^3/s (in March 1982).

3.2.1.2 Power Generation

The construction of the Project will result in the creation of a second flow outlet for Black Lake. Without mitigation, the added flow capacity would lead to a small reduction in the long term Black Lake water levels. To offset this level reduction, a submerged rockfill weir is proposed to be installed at the outlet of Black Lake to retain the historic range of natural lake levels.

The Fond du Lac River at the Black Lake outlet has a long-term annual outflow of 305 m^3/s. To produce 42 MW of power, a flow of 160 m^3/s would normally pass through the power plant, and the remaining 145 m^3/s would pass through the natural Black Lake outlet into the Fond du Lac River. For the 50 MW power generation alternative, a flow of 190 m^3/s would normally pass through the power plant, with the remaining 115 m^3/s passing into the Fond du Lac River through the existing Black Lake outlet. Powerhouse flows will be released back into the Fond du Lac River upstream of Middle Lake, restoring the total average flow of 305 m^3/s entering Middle Lake and areas downstream of the powerhouse tailrace channel exit location. The Project will be managed such that a minimum riparian flow (between 50 and 100 m^3/s) would always be maintained in the Fond du Lac River between the Black Lake outlet and the tailrace exit. More specifically, the proposed minimum riparian flows would be managed to be higher (i.e., 100 m^3/s) in the spring and lower (i.e., 50 m^3/s) during the winter season. A RIVER2D flow model will be used to determine the long term impact of power production and riparian flow management on velocities and flow depths within the Black Lake outlet, the Fond du Lac River channel downstream of the submerged rockfill weir, the Fond du Lac River downstream of the tailrace outlet, and in Middle Lake when the Project is in operation.

3.2.1.3 Energy Potential

An energy model was set up to simulate daily operation of the plant over the available historical flow record extending from 1963 through to 2010. The headpond for the Project, Black Lake, will vary in elevation depending on overall inflow from its upstream watershed. The submerged weir at the lake outlet will be designed to maintain the historic water levels on Black Lake.

The tailwater relationship for the plant is based on the estimated stage discharge relationship for Middle Lake. This relationship has been estimated based on recent bathymetric information obtained at the entrance and outlet of Middle Lake, together with available water level elevations collected as part of the field investigation. The large storage volume of Black Lake will give the powerhouse outflows a high thermal inertia, which will likely prevent ice cover forming over the powerhouse tailrace channel.

The energy model assumed two generating units, 2 x 21 MW for the 42 MW installed capacity and 2 x 25 MW for the 50 MW installed capacity alternative. Hydraulic losses included losses at the water inlet, intake structure, trashrack, power tunnel, transition/penstock bifurcation, butterfly valves and tailrace channel.

A total of seven flow scenarios were investigated as shown in Table 3.2-1:

- four scenarios assumed constant minimum riparian flows throughout the year of 50, 70, 100 and 125 m^3/s; and
- three scenarios assumed varying minimum riparian flows over the course of the year.

Table 3.2-1: Minimum Riparian Flow Scenarios Being Investigated

Minimum Riparian Flow Scenario	January	February	March	April	May	June	July	August	September	October	November	December
IFR = 50 m^3/s	50	50	50	50	50	50	50	50	50	50	50	50
IFR = 70 m^3/s	70	70	70	70	70	70	70	70	70	70	70	70
IFR = 100 m^3/s	100	100	100	100	100	100	100	100	100	100	100	100
IFR = 125 m^3/s	125	125	125	125	125	125	125	125	125	125	125	125
Seasonal IFR 1	50	50	50	70	100	100	100	70	70	70	70	50
Seasonal IFR 2	70	70	70	70	100	100	100	70	70	70	70	70
Seasonal IFR 3	70	70	70	100	125	125	125	100	100	100	100	70

m^3/s = cubic metres per second

Table 3.2-2 provides a summary of the calculated average annual net energy potential as a function of the installed capacity and the assumed riparian flow scenario.

Table 3.2-2: Average Annual Net Energy Potential

Minimum Riparian Flow Scenario	Average Annual Net Energy Potential (MWh)	
	Installed Capacity 42 MW	Installed Capacity 50 MW
IFR = 50 m^3/s	341,000	387,000
IFR = 70 m^3/s	329,000	369,000
IFR = 100 m^3/s	305,000	339,000
IFR = 125 m^3/s	280,000	305,000
Seasonal IFR 1	336,000	378,000
Seasonal IFR 2	328,000	366,000
Seasonal IFR 3	319,000	351,000

MWh = megawatt hours; MW = megawatt; m^3/s = cubic metres per second

Power generation potential is sensitive to the value assumed for minimum riparian flow. Average annual generation may be as high as 341,000 megawatt hours (MWh) per year if minimum riparian flow requirements are limited to 50 m^3/s, and as low as 280,000 MWh per year if these requirements rise to 125 m^3/s. As a base case, the estimated long term average annual energy generation for the proposed 42 MW (160 m^3/s) plant will be 329,000 MWh per year and 369,000 MWh per year for the proposed 50 MW (190 m^3/s) plant, assuming a constant riparian flow requirement of 70 m^3/s.

3.2.1.4 Black Lake Water Levels with Project Operation

Using 40 years of recorded flows and Black Lake water levels, a spreadsheet model was developed to simulate water levels in Black Lake under natural conditions, and with the power generating station in operation. Water levels were estimated in the model using the stage discharge relationship developed from flow records obtained from the Water Survey of Canada Gauging Station near the outlet of Black Lake.

Black Lake water levels are controlled by a natural rock outcrop at the lake outlet where the Fond du Lac River resumes its course. From the results of the simulation of natural conditions over the period of record, the analysis indicated that Black Lake water levels typically fluctuate approximately 0.7 m over the course of an average year. Over the 40 year period of record, the maximum annual water level fluctuation was determined to be approximately 1.6 m.

As previously stated, with the added flow capacity in the power tunnel, a submerged rockfill overflow weir will be installed at the outlet of Black Lake to restrict the flow and maintain lake levels within their historic range. The model that was used for the natural conditions was modified to simulate the operation of the power plant over the same historical period of record.

Specific operational details and assumptions incorporated into the spreadsheet model included:

- maximum design flow for the generating station is 160 m^3/s for a plant capacity of 42 MW and 190 m^3/s for a plant capacity of 50 MW; and
- a minimum riparian flow varying over the course of a year from 50 to 125 m^3/s as per the riparian flow scenarios listed in Table 3.2-1.

The post-Project Fond du Lac River discharge downstream of the Black Lake outlet will vary throughout the year. However, depending on the time of year, a minimum riparian flow varying between 50 and 100 m^3/s will be maintained through the natural river reach to retain existing fisheries habitat and natural river regimes as much as possible. Most of the time however, these minimum flows will be exceeded.

3.2.1.5 Upset Conditions

When the generating station is in operation, there will be times when the plant must be shut down and flow through the powerhouse diverted. In general, these occasions will be for scheduled maintenance. For example, annual inspections would be scheduled to avoid spawning periods, and would be expected to last for periods of up to two weeks. Generally, only one unit would be shutdown at a time so as to minimize the affect to water levels on Black Lake and Middle Lake.

If for some reason there is a load rejection in the transmission system due to transmission line failure, the power plant will be shut down without advance notice. While maintenance activities can be scheduled in order to mitigate the impacts of river flow and lake level changes, a load rejection situation is not planned. These unplanned shutdowns are anticipated to be infrequent and relatively brief, typically ranging from a few minutes to four or five hours. On these occasions, the bypass facility at the powerhouse would immediately begin releasing flow to minimize drawdown effects on the Fond du Lac River below the tailrace outlet and upstream of Middle Lake, and in Middle Lake. During these periods, flows through the natural outlet would gradually increase as water levels in Black Lake increase.

The turbines for the proposed station will be equipped with wicket gates to deal with the occurrence of a sudden requirement to stop flow. These will act as the “spigot” at the end of the power tunnel, and control the flow into the powerhouse. The wicket gates will be designed to close at a rate that will avoid undesirable increases in water pressure in the power tunnel. The sudden curtailment of flow within the tunnel will trigger a pressure surge, or transient condition within the tunnel. Although the pressure will rise in the tunnel as the pressure wave migrates upstream toward the water intake, it will dissipate rapidly once it reaches the open water of Black Lake. Minor disturbances (small waves and local surging) are expected at the entrance, which will be limited to a small localized area in the immediate vicinity of the intake structure. Owing to the depth of the lake in this area, the increase in water level is expected to be local, extending in a radial pattern for approximately 50 to 100 m and dissipating quickly in the open water.

A RIVER2D computer model will be used to simulate and assess the impact of the Project on the Fond du Lac River and Middle Lake downstream of the location where the tailrace channel returns flow from the powerhouse back into the Fond du Lac River. The model assesses impacts on water depths and velocities, factors to which fish and fish habitat may be sensitive. Water depth and velocity are important parameters in assessing fish habitat. By comparing the results for the two regimes, it is possible to assess the potential overall impacts/changes resulting from powerplant construction and operation.

Preliminary modelling has been completed to simulate a worst case scenario wherein both units suddenly shut down for an extended period of time. This scenario is considered to be a rare event, but would result in the most severe impact on Middle Lake water levels. For this scenario, it was assumed that total inflow to Black Lake would be 305 m^3/s (average annual flow). It was also assumed that a flow of 160 m^3/s would pass through the power plant, and that the remaining 145 m^3/s would pass through the natural Black Lake outlet into the Fond du Lac River. The model was then run initially to establish steady state conditions throughout the reach for this typical operating scenario. Following this, the flow to/from the powerhouse was suddenly curtailed to simulate a sudden unit shutdown. It was assumed that the powerhouse flows would be shut down quickly over a two minute period. During this time interval the bypass facility at the powerhouse would release up to 50% of power generation flows into the downstream tailrace channel. The modelling results suggest the sudden shutdown of both power generation units and subsequent bypass of 50% of power generation flows would subject Middle Lake to a maximum drop in water level of approximately 0.4 m. The maximum rate of water level drop was determined to be approximately 5 centimetres per hour (cm/h).

3.2.2 Site Infrastructure During Operations

This section describes site infrastructure such as the powerhouse; other permanent buildings and structures; hazardous substances storage; water supply; power; and telecommunications. Information is also provided on activities associated with continued operation of the Project, such as maintenance of access roads and domestic and industrial waste management.

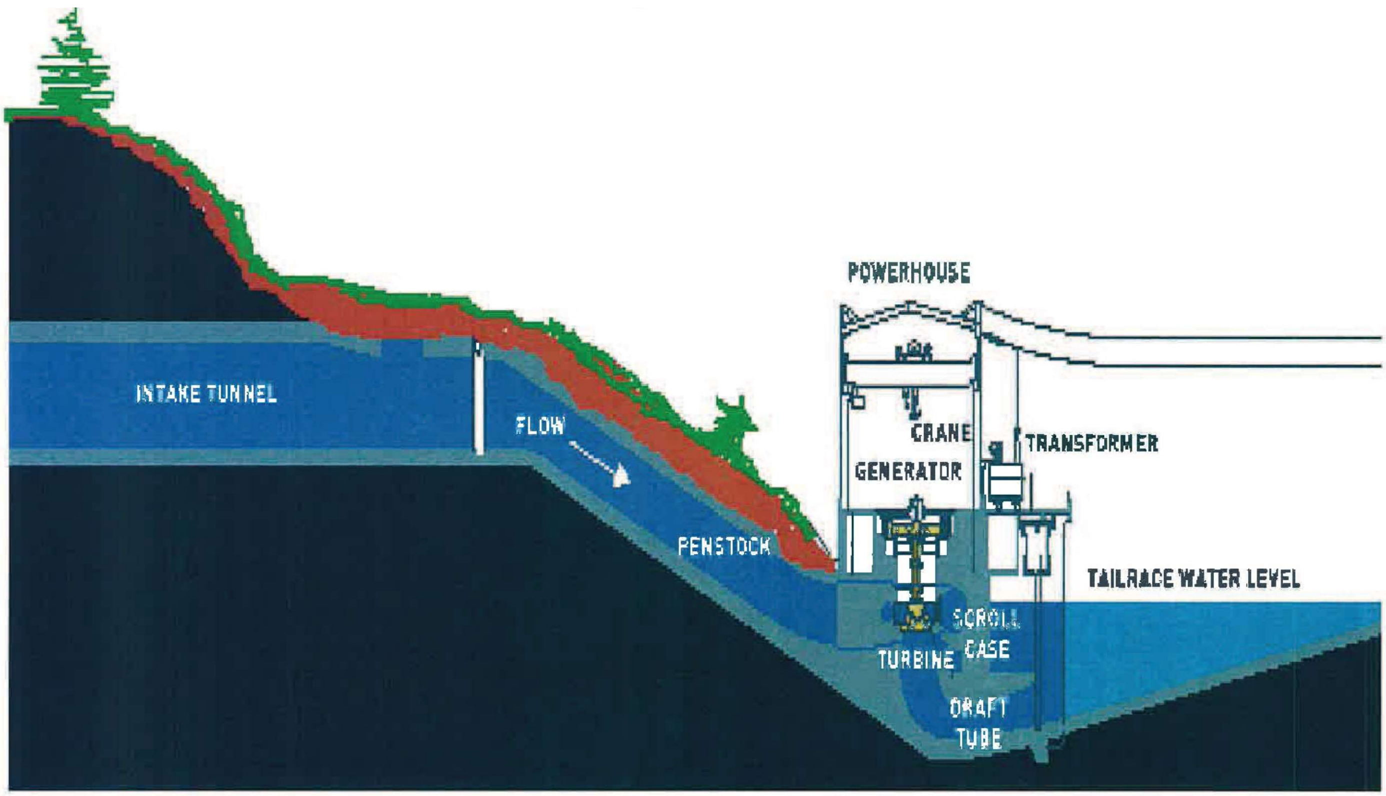
3.2.2.1 Powerhouse

The proposed powerhouse and service bay complex will be located in a rock excavation to the east of Elizabeth Falls as shown in Figure 2.3-1. Adjacent to the powerhouse will be the parking/vehicle manoeuvring area and the switchyard.

It is anticipated that the powerhouse structure will house two to four generating units, for a total rated plant capacity of between 42 MW and 50 MW. A multi-unit plant was selected because of its flexibility of operation and scheduling of outages compared to a single unit plant. While a single unit plant may cost less, a multi-unit powerhouse will result in less lost generation of energy due to forced and planned outages. Equipment components will also be smaller and easier to handle.

3.2.2.2 Powerhouse Complex

Design of the powerhouse complex is conceptual at this time. The design characteristics proposed are based on what would typically be expected for a facility of this nature. Final design characteristics will be determined by mid-2013. A conceptual drawing of what the powerhouse complex may look like is provided in Figure 3.2-1.



REFERENCE

PROCESS DIAGRAMS PROVIDED BY SASKPOWER

PROJECT

SaskPower

ELIZABETH FALLS
HYDROELECTRIC
POWER PROJECT

TITLE

EXAMPLE POWERHOUSE PROCESS DIAGRAM

Golder Associates
Saskatoon, Saskatchewan

PROJECT		10-1365-0004	FILE No.
DESIGN			SCALE AS SHOWN / REV. 0
GIS	JRC	12/12/12	
CHECK	MT	12/12/12	**FIGURE: 3.2-1**
REVIEW	BC	12/12/12	

The steel penstock leading from the power tunnel will pass through the upstream wall of the powerhouse into chambers containing butterfly valves, which will be used as emergency closures to shut off the flow to each unit. The steel penstock then transition into the steel lined spiral scroll cases, which will direct the flow through the stay vanes, wicket gates and down through the turbines into the draft tubes. Having passed through the turbines, the water will be discharged into the tailrace channel where it is carried to re-enter the Fond du Lac River via the trailrace to downstream of Elizabeth Falls.

A reinforced concrete powerhouse substructure will encase and support all the electrical and mechanical equipment associated with the generating units in the central area of the main powerhouse floor level. Governor equipment used to control the generating units and other mechanical equipment would be installed in areas adjacent to the generator enclosures. Upstream of this, above the valve chambers, will be a gallery containing electrical equipment and covered hatches. A section of floor along the downstream side of the units at the service bay slab level will accommodate electrical panels and cubicles, and near the service bay, an oil/water separator.

On the downstream side of the powerhouse, steel guides will facilitate installation of draft tube gates in order to dewater the draft tubes for inspection and maintenance. A monorail crane cantilevered from the downstream face of the powerhouse and service bay enclosure will handle the draft tube gates. A dewatering and drainage sump will be located at the lowest elevation of the powerhouse. The dewatering system will consist of a set of pumps and associated controls that will operate to completely dewater the power tunnel, steel penstocks, turbine water passageways and draft tubes for inspection. Initial dewatering will be done by draining the power tunnel by gravity to tailwater level. Valves installed in the sump will permit filling of the turbine water passageways and a portion of the power tunnel up to tailwater elevation by gravity. Final filling will be achieved via manual valves in the intake stoplogs.

Other auxiliary mechanical systems will include fire protection, service water, compressed air and heating and ventilation.

Located immediately adjacent to the west side of the powerhouse, a service bay will serve as an erection area for assembly and maintenance of the larger turbine and generator components. Rooms for station control equipment, servicing and maintenance, storage areas, and washrooms will be located along the southwest side of the service bay.

An insulated steel-framed structure will enclose the powerhouse generator floor and service bay erection area, and support an over-head travelling crane of sufficient capacity to lift the heaviest of the assembled turbine/generator components. A large overhead door and man door will be located in the southwest wall of the service bay.

Adjacent to the service bay will be a levelled area for manoeuvring large delivery vehicles and for parking. The switchyard will be located on the southwest bank of the tailrace channel, where concrete pads will support the main transformers, from which transmission lines will run approximately 20 km to the west to connect with the existing north transmission line at the Stony Rapids Switching Station. A concrete slab and containment walls around the transformer pads will contain any possible leaks of transformer oil. Concrete blast walls will be constructed between transformers to limit damage from an explosion and/or fire to one transformer only.

Penstock Transition and Bifurcation

A concrete-backed steel-lined penstock section will be constructed at the downstream end of the power tunnel where the cross-sectional area of the tunnel reduces before entering the powerhouse. The initial transition section will transform the inverted U-shape cross section of the tunnel to a circle and reduce its area. This will lead to the bifurcation where the penstock will split into two conduits, one for each turbine generator unit, before entering the upstream wall of the powerhouse. The interfaces between the rock tunnel and the concrete lining, and between the concrete lining and the steel lining, will be injected with non-shrink grout under pressure to seal any gaps created by shrinkage of the curing concrete. This will mitigate the potential for seepage of water under pressure from the tunnel into the powerhouse valve chambers.

Powerhouse Equipment

Turbine Inlet Valve

At each turbine unit, a turbine inlet valve will be positioned upstream of the turbine spiral case. The valve will provide emergency closure capability to shut down the turbine in the event that control of the unit is lost. The valve may also be used to isolate the unit during dewatering. It will be hydraulically operated and provided with a counter-weight as a back-up in the event of a hydraulic system failure.

Each valve will have bypass piping to allow the hydraulic head across the valve to be balanced before operation.

Powerhouse Heating and Ventilation

The powerhouse will be equipped with a roof mounted heating and ventilation system. Heat from the generating units will be used to heat the powerhouse area. Ventilation details, such as exhaust fans, will be finalized during the detailed design phase.

Drainage and Dewatering Systems

Drainage from the roof top will be collected in scuppers and drained by gravity through downspouts to the tailrace. Drainage within the powerhouse will be collected in a sump in the lower section of powerhouse. From there, float operated pumps will transfer the drainage to an oil-water separator before it is released to the tailrace. The drainage system will be sized to handle the largest combination of drain loads, including fire protection discharges and rain.

Dewatering of the powerhouse will be accomplished through lines and valves connecting the water passages to a sump and pumping system. The units will be dewatered to tailwater level by gravity. The dewatering sump will be connected to the lowest point in the draft tube by an embedded line that will allow for complete dewatering of the units. The sump discharge will be directed to the tailrace via embedded lines.

Sewage and Grey Water

The sewage and grey water system will be comprised of piping, pumps and a sump that is accessible for the pumped removal of waste by a sewage disposal service for treatment offsite.

Station Service Water

A line from the bifurcation will supply pump station service water for the cooling water, service water supply (e.g., shaft seal water), and domestic water supply (non-potable).

Fire Protection

A pressurized water distribution system will be provided to protect the generator governors and electrical equipment. Details of the fire protection system will be determined during the final design phase for the powerhouse and will follow applicable codes and standards.

Station Service Air

An air cooled compressor will be supplied to provide approximately 700 kPa service air to the power station. A pressurized distribution system will ensure that service air is delivered to work areas such as the service bay, turbine pit and draft tube access door.

3.2.2.3 Other Permanent Buildings/Structures

Water Intake Structure

The proposed intake will consist of a reinforced concrete structure with provision for steel stoplogs and trashracks, and a streamlined water passage to direct the flow to an excavated tunnel. The intake channel and structure will be designed to withdraw the required plant discharge from Black Lake over the full range of anticipated lake levels.

The size of the intake will be sufficient to ensure the formation of a stable ice cover in Black Lake in the vicinity of the water intake during winter operation. The soffit (ceiling) of the water passage will be set low enough to prevent entrainment of air into the tunnel. The level of the intake deck will be set so that sufficient rock thickness remains above the tunnel soffit to maintain the integrity of the rock.

The upstream portion of the water passage will be divided into two bays by a central concrete pier. This will avoid imposition of an excessively long single span and associated loads on the reinforced concrete base slab and roof, and on the steel stoplogs and trashracks. The water passage will taper at its downstream end to match the width of the power tunnel. The trashracks will prevent entry into the tunnel of debris and ice, which could result in blockage of the water passages and damage to the powerhouse turbines. The stoplogs will be required for dewatering the intake, power tunnel and downstream water passageways for inspection and maintenance work. The stoplogs will incorporate valves to facilitate rewatering of the power tunnel.

The deck of the intake structure will be large enough to allow a mobile crane to be positioned adjacent to the stoplog and trashrack slots to facilitate handling. A permanent crane or lifting device for removal and installation of stop logs is also being considered. The stoplogs will be stored in an adjacent area when not in use. The access road to the intake will lead directly onto the deck and to the storage area. The concrete roof of the downstream portion of the water passage will be overlaid with compacted fill and road topping to bring it up to the same level as the access road. A hatch will be provided immediately downstream of the stoplogs to gain access into the power tunnel for inspection and maintenance. Air intake/vent pipes will be provided downstream of the stoplogs to stabilize air pressure in the tunnel during dewatering/rewatering.

Trashracks

The spacing between bars will be determined by debris passage allowance criteria, structural considerations and head loss assessments. It is assumed that spacing will be 50 mm. However, this will be reviewed during the final design. The trashracks will be designed in sections to be handled by a mobile crane from the intake deck.

Intake Stoplogs

Sectional stoplogs will be provided for the two openings at the water intake to isolate the tunnel for inspection and repairs. The stoplog sections will only be installed or removed under balanced head conditions, which is when the tunnel is full of water but not flowing with the wicket gates closed in the Powerhouse. The stoplogs will be designed to be handled by a mobile crane equipped with a manual follower from the intake deck. The stoplogs will be stored in an area adjacent to the intake deck.

Intake Stoplog Bypass

A small slide gate or embedded filling line will be provided in the intake structure to allow for gradual filling of the tunnel. The size and location will be determined during final design based on required fill rate criteria.

Fish Screens

A fish screening system and/or other fish exclusion technologies will be installed at the Black Lake water intake to prevent or reduce the entrainment of fish into the power tunnel and turbines. The final design of the fish screening system will be determined by mid-2013 during the final Project design phase.

3.3 Supporting Infrastructure

The following section provides details on supporting infrastructure required during the construction period. This infrastructure includes the construction camp; contractors work area; construction facilities area; water supply and fire protection water services; temporary power supply; telecommunications; explosives storage; and waste rock disposal areas. Information is also provided on site access, safety and security facilities during construction, and air emissions, liquid waste and solid waste management.

3.3.1 Construction Camp

At this time, it is contemplated that the construction camp will be constructed in two phases. The first phase will involve the construction of a temporary camp that will house workers involved in main access road and bridge construction, as well as site preparation and setting up the main construction camp.

It is anticipated the construction camp will be able to accommodate 100 to 150 workers. Features of a construction camp of this nature would typically include: dormitories with washroom and laundry facilities, kitchen and dining facility, office space, recreational and commissary complex, water and sewage storage units, parking spaces and electrical generator units.

When construction of the Project is complete, the construction camp and all associated infrastructure will be removed from the construction site. Decommissioning will be done in consultation with BLFN, and will involve removal of all support infrastructure, including power lines, poles, transformers, roads and buildings, waste collection and disposal facilities, recyclable and hazardous materials, and reclamation of disturbed areas back to near-natural pre-construction conditions in compliance with provincial and federal requirements.

3.3.1.1 Alternative Locations for the Construction Camp

Three alternative locations are being considered as potential locations for the main construction camp area (Figure 2.3-1). At this time, the camp location is still under review, and requires input from the BLFN before the location is finalized. One potential option is located on the northeast side of the Fond du Lac River near the Project area. A second option is to locate the camp near the community of Stony Rapids. The third option is to locate the camp near the community of Black Lake. The second and third options would take advantage of available water, sewer, and other facilities from those communities. The construction camp area will need to be relatively flat with good drainage. The total camp area would be approximately 90,000 square metres (m^2) which is sufficient to accommodate facilities for 100 to 150 workers.

3.3.2 Contractors Work Areas

Contractors' work areas will be used to store materials, maintain and assemble equipment and administer work on the Project. It is expected that two such areas will be required, one near the powerhouse and one near the water intake. At this stage of design the exact size and details of the contractors' work areas are not known. However, two potential locations have been selected as shown on Figure 2.3-1. The exact location and size of the work areas will be determined by the contractor. The construction tender documents will require specific details in the bids, and final contract documents will bind the contractor to comply with all provincial and federal regulations dealing with workplace health and safety, as well as requirements to address social and environmental issues.

The contractors' work area at the proposed powerhouse will be the largest of the two work areas. The powerhouse work area will include office trailers, concrete batch plant, aggregate processing area (for crushing, washing, screening and stockpiling of aggregate), aggregate wash water settling pond, ware-housing, outdoor storage areas, carpentry and reinforcement bending shops, toilet facilities, maintenance buildings, and a fuel storage and vehicle fueling facility. Provincial and federal regulations, guidelines and special considerations related to the storage and transportation of fuels and explosives, and the handling and storage of other hazardous or dangerous goods, will be strictly enforced.

It is expected that the work area at the proposed water intake site will be considerably smaller than the powerhouse work area. The water intake work area will include small storage and lay down areas, a site office, and fuel storage. Concrete reinforcing and fuel supplies will likely be sourced from the main work area near the powerhouse.

The anticipated total footprint of the contractors' work areas will be approximately 80,000 m^2. Granular material, to a depth of 200 mm, will be used for surface topping and grading. The areas will be graded for proper drainage and fenced for security. A fuel storage shed or other small building(s) may be constructed, with the exact location(s) to be determined at a later time. The Project specifications will require that the work areas must be as small as practicable to minimize their effect on the environment.

When the Project is completed, the contractor will be required to remove fencing and other structures, and clean up the areas returning them as close to original conditions as possible.

3.3.3 Construction Facilities Area

At this time it is anticipated that only one construction facilities area will be required. This area will be used for contractor's laydown areas, work areas, storage areas, services areas, and garages. One potential location has been identified on the southwest side of the Fond du Lac River (Figure 2.3-1). The final location(s) will be determined during final design.

3.3.4 Water Supply and Fire Protection Water Services

During construction and operations, potable water will be provided at various locations throughout the contractors' work areas. It is expected that treated water will be hauled from an existing water treatment facility to site via water trucks from either BLFN or Stony Rapids.

Untreated water will be pumped directly from Black Lake or the Fond du Lac River for use in fire protection. Pump intakes will be screened to prevent entrainment of fish in accordance with DFO's "Freshwater Intake End-of-Pipe Fish Screen Guideline" (DFO 1995). The appropriate water rights licence will also be obtained from the Water Security Agency prior to pumping water to the site.

3.3.5 Power

It is expected that construction power from the SaskPower grid will not be available until approximately six months after a decision has been made to proceed with construction of the Project. Initial construction power will be provided by diesel generators at various locations throughout the Project site.

Construction power will be supplied to the site from the SaskPower grid using temporary 25 kV distribution lines to the contractor's work area, certain construction facilities, and the construction camp during construction of the principal structures. A temporary pole line will distribute power throughout the Project site and will provide mounting for exterior lighting, cable television and telephone line distribution as required.

Power supplied to the construction camp from the SaskPower grid will be backed up by 130 kilowatt (kW) diesel generator sets. Construction power during construction of the water intake and during power tunnel excavation will be provided by SaskPower with diesel powered generators for backup. Diesel powered generators will be primarily used for powering the drill jumbo used for tunnel excavation.

It is expected that the power requirements of the Project during operations can be accommodated through the 25 kV distribution line put in place for construction, with diesel powered generators for backup.

3.3.6 Telecommunications

A telecommunication system will be required for construction of the Project, as well as for the eventual management and integration of the energy produced by the Project into the SaskPower grid system. Given the remote location of the proposed Project, telecommunications is one of the key aspects of the Project. At this time, the optimal telecommunications technology has not yet been determined. Options include satellite and fibre optic network technologies.

It is anticipated that the powerhouse will be built with a modern control system and switching station configuration. Data will be communicated through Internet Protocol (IP) based technology, thereby reducing the amount of wiring and conduits inside the powerhouse and switching station compared with other alternatives.

3.3.7 Waste Rock Disposal Areas

The location of potential disposal areas for the waste rock and overburden materials excavated from the water intake, power tunnel, powerhouse, and tailrace channel is currently under consideration (refer to Figure 2.3-1 for options being considered). Factors being considered for determining their location include, proximity to the main access roads, potential ability to accommodate disposal of a significant amount of excavated materials, and suitable topographical features.

At this time it is estimated that the total potential disposal volume after excavation will be approximately 3,000,000 m^3. This represents a post-excavated volume for disposal consisting of approximately 1,860,000 m^3 of rock and 1,120,000 m^3 of overburden. A relatively small volume of the excavated rock may be used as road topping, riprap to armour the walls of the portion of tailrace channel excavated in overburden, and to construct the submerged weir across the Fond du Lac River at Grayling Island. Similarly, portions of the overburden comprised of sand and gravel may be used as aggregate for the production of concrete if suitable.

Some portion of the waste rock excavated from the power tunnel could be potentially acid generating, high in various metals or contain uranium mineralization, particularly waste rock from the section of tunnel within, or in close proximity to, the Black Lake Shear Zone. As such, a waste rock chemical management plan will be prepared. This plan will outline the methods to visually identify and classify the waste rock, including the rock type, the waste unit designation, and the acid rock drainage (ARD) and uranium potential. This plan will also include the preparation of standard operating procedures and a site geological manual to direct on-site characterization.

On-site geochemical characterization will occur using simple visual techniques that can be learned and implemented by site personnel with little or no geological background. It is anticipated that the waste rock will be classified into one of three materials types with respect to ARD potential or radioactivity: negligible, low, or uncertain potential. The results of the on-site visual classification will be recorded along with the blast designation, the waste unit designation, and the disposal location. Representative samples of waste rock from within or in close proximity to, the Black Lake Shear zone, or displaying evidence of uranium mineralization, will be screened using a scintillometer. Off-site confirmatory analyses will be carried out to confirm the visual classification. Confirmatory sampling of waste units with negligible or low potential for ARD or uranium will occur at a considerably lower frequency than waste units with uncertain potential. Regular visual inspections of the waste rock disposal areas will also take place during active periods of tunnel excavation.

It is expected that a designated spoil area would be set aside to isolate materials deemed to be potentially ARD generating or that may contain uranium. In addition, drainage from the areas used to dispose of the different waste units will be monitored to confirm that water quality is acceptable for discharge to the environment, and also to provide information for use in reclamation planning. Water samples will be collected regularly and analyzed for general water quality parameters and total metals.

In the event that drainage from specific portions of the waste rock disposal area cannot be monitored separately, or does not occur as a defined flow, field monitoring bins could be constructed with leachate from the waste rock being collected and monitored in the same manner as would occur with direct sampling of waste rock disposal area drainage.

3.3.8 Access Road Maintenance

Regular maintenance of the roadway will enhance driving safety. Maintenance will include snow removal, grading and dust abatement measures as necessary. Dust abatement methods will be consistent with practices carried out by the Saskatchewan Ministry of Highways and Infrastructure.

3.3.9 Site Access, Safety and Security Facilities

Access to the construction site will be limited to construction personnel. One security building and gate will be required for the Project, with the building located at the intersection of the camp access road and the existing access road to Highway 905. The gate and security building is intended to control and limit access to the Project site to construction personnel, and material and equipment deliveries. It would also control access between the construction camp and construction areas.

During the construction period security officers will also carry out roving security and fire watch patrols throughout the work areas and related facilities. These personnel will operate access gates for approved personnel and vehicles, and maintain surveillance using a remote monitor on a 24-hour basis.

No firearms will be allowed on the Project site. All firearms will be declared and checked-in at the security gatehouse. For safety reasons, a no hunting zone is proposed for a buffer zone around the Project site and within access road right-of-ways. The location of this no hunting zone will be developed in consultation with BLFN.

First aid stations will be located on site at each Contractor's work area. A site ambulance and first aid attendant will also be provided for the Project

3.4 Decommissioning and Reclamation

3.4.1 Construction

The construction phase of the Project is expected to be relatively short (i.e., 4 years) compared to the operational life of the Project which may extend up to 100 years or more.

A conceptual Decommissioning and Reclamation (D&R) Plan for the construction phase will be written as a component of the environmental assessment process associated with the Project. However, it can be anticipated that the D&R Plan will include activities such as the decommissioning and removal of portions of the temporary construction infrastructure (e.g., construction camp, contractors' work areas, site roads) not required during the operation of the Project. These areas would be cleaned up after Project construction is complete and these temporary facilities are no longer required.

Decommissioning could also include dismantling electrical services set up for the contractors' work areas, including power lines, poles and transformers. The dismantling of buildings covers disconnection of all services, pack furniture as necessary, haul refuse, and prepare the buildings for transportation to their next destination. Any components of the contractors' work areas and infrastructure that are not salvageable will be disposed of in existing disposal areas near the Project site.

3.4.2 Operations

The operational life of the Project is expected to extend up to 100 years or more. The exact life expectancy of the Project cannot be determined at this time as hydroelectric projects of this type can operate almost indefinitely with ongoing equipment maintenance and upgrades. It is currently anticipated that decommissioning and reclamation of the Project will take approximately one year following cessation of power production operations. A conceptual D&R Plan will be written as a component of the environmental assessment process associated with the Project.

Decommissioning, when it occurs, would be done in compliance with all federal and provincial acts, regulations and standards applicable at the time, and in consultation with the BLFN. Abandoned properties will be left in a condition that meets or exceeds regulatory requirements. In general, it is anticipated that equipment and material that would no longer be viable would be removed from the site and/or disposed of in an approved manner. It is anticipated at this time that usable materials and equipment will be removed from the site and returned to central stores and/or used at other power generation facilities. Alternatively, some reusable material and equipment may be made available for acquisition by the local communities.

At the end of the facility's operating life-span, considerations regarding decommissioning of the bridge and access roads would be discussed with the BLFN. Decommissioning of the bridge and road, should it occur, would be done in compliance with all federal and provincial Acts and Regulations applicable at the time.

3.4.2.1 Site Specific Decommissioning Activities

This section will provide a conceptual overview of the decommissioning planning considered during Project planning. Methods used and the time frame considered for decommissioning and reclamation will depend on the type of Project infrastructure being decommissioned. Reclamation would be conducted in accordance with federal and provincial Acts and Regulations applicable at the time, and in consultation with BLFN. However, the following provides conceptual details on the activities required to decommissioning components of the Project.

- The submerged weir at the outlet of Black Lake will be removed to allow re-establishment of natural pre-development flow regimes down the Fond du Lac River.
- The power tunnel will be closed by backfilling and sealing a section of the tunnel at the water intake end, and backfilling a section of the tunnel at the powerhouse end.
- The tailrace channel will be decommissioned by recountouring to make it safe for wildlife.
- All buildings and equipment will be demolished to grade. Equipment and materials will be removed from the site and either salvaged for other use, recycled or disposed of in an approved facility.
- Concrete foundations and pilings will be removed to one meter below grade. Concrete will be recycled or disposed of at a licenced landfill.
- Waste rock piles that were capped and covered with top soil after construction will remain in place. Monitoring of runoff for water quality in the future may be warranted.
- The disturbed landscape will be restored to approximately its original contour. This includes stabilisation of the landscape to prevent erosion, re-vegetation with plant species native to the region, and control of invasive plant species. Reclamation success will be monitored, with remedial action taken if necessary.

3.5 Project Schedule

The Project schedule has been defined by major Project phases. If the Project is given regulatory approval, the major Project phases and their estimated timelines are as follows:

- construction: September 2014 to December 2017;
- operations: January 2018 to approximately January 2118; and
- D&R: duration of approximately one year following cessation of operations.

This information has been illustrated in Figure 3.5-1, together with several of the more important construction tasks. The operational life of the Project is expected to extend up to 100 years or more. The exact life expectancy of the Project cannot be identified at this time as hydroelectric projects of this type can operate almost indefinitely with ongoing equipment maintenance and upgrades.

Figure 3.5-1: Project Schedule

Project Phase	Tasks	2014				2015				2016	2017	2018	2018, plus 100+ years	Shutdown, plus one year
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4					
Construction														
	Contractors mobilization / temporary facilities / construction camp													
	Access roads / bridge													
	Intake / tunnel / tailrace excavations													
	Powerhouse													
	Turbine / generator													
	Commissioning													
Operations														
Decommissioning and Reclamation														

3.5.1 Construction Schedule

Construction of the proposed Project is expected to occur between September 2014 and December 2017 (Figure 3.5-1). The earliest component of the construction phase involves the ordering, off-site fabrication and manufacture, delivery, and installation of the turbines and generators, with the anticipated timeline extending the full duration of the construction phase. Contractor mobilization and setting up the construction camp are tentatively scheduled for the period from September 2014 to April 2015. Access road and bridge construction is scheduled from September 2014 to January 2015 in order to meet delivery and installation requirements. Construction of the powerhouse will take place from April 2015 to December 2017, while the water intake, tunnel, and tailrace excavations are scheduled from January 2015 to October 2017.

4.0 EMISSIONS, DISCHARGES AND WASTE

4.1 Sources of Atmospheric Emissions

4.1.1 Power Tunnel

In consideration of the Project's commitment to be environmentally responsible, the construction methodology developed for the power tunnel has considered best practices and environmentally friendly construction methods. Following is a description of the environmental aspects considered during preparation of the construction methodology for the power tunnel.

Efforts will be made to minimize the build-up of harmful airborne pollutants in the power tunnel resulting from the operation of motorized equipment through engine exhaust (e.g., carbon monoxide, hydrocarbons, nitrogen oxides and particulates). Motorized equipment used in the tunnel for hauling and mucking operations will operate using diesel fuel with a minimum practicable octane number and a sulphur content between 50 and 350 parts per million (ppm). Drilling will be done with an electric powered hydraulic drill jumbo which produces no air emissions. The forced air method of ventilation will be used for clearing dust, gases and fumes from inside the tunnel. Mucking operations will commence approximately 30 minutes after each blast to allow for settling of dust and venting of fumes generated by the blasting operation. Water conveyed into the tunnel through water pipes running along the tunnel wall will be used for cleaning the active face of the tunnel and spraying the waste rock after each blast to reduce dust during mucking. The used water will be collected in sumps and pumped out of the tunnel into sedimentation ponds; discharge water will meet required water quality standards before being released to the environment.

Noise in the tunnel will be kept to acceptable levels by housing the air compressors in insulated enclosures to act as effective sound barriers. Tunnel ventilation fans will be equipped with silencers to reduce noise levels.

The hauling units for removing waste rock from the power tunnel to the designated disposal areas will only be re-fueled at a designated area in the working camp. Fuel trucks will not be allowed inside the tunnel for re-fueling of equipment. This practice will minimize the potential for accidental oil spills inside the tunnel during construction.

4.1.2 Access Roads

Regular maintenance of roadways will enhance driving safety. Maintenance will include snow removal, grading and dust abatement measures as necessary. Dust abatement methods will be consistent with practices carried out by the Saskatchewan Ministry of Highways and Infrastructure.

4.2 Sources and Location of Liquid Discharges

4.2.1 Power Tunnel

The additives used in grouting and shotcrete materials will be non-toxic so that any accidental seepage into water bodies will not be harmful to aquatic life.

The explosives proposed for use in the excavation of the power tunnel are expected to be nitro-glycerine based Unimax®; this explosive is water resistant, considered more environmentally friendly, safer to handle and transport, and has lower levels of ammonium nitrate by-product than less expensive alternatives (e.g., ANFO). The resulting waste rock will be safe for use as aggregate in road construction and in concrete production.

The compressors used for tunnel ventilation will be oil free rotary screw compressors. Backup generators and their associated diesel fuel tanks will we set upon concrete foundations equipped with catch sumps to prevent any accidental oil spills getting to the soil surface.

Water from groundwater seepage into the tunnel or resulting from construction activities will be collected in sumps and pumped out of the tunnel through pipes running along the side wall of the tunnel. The tunnel seepage water will be discharged into a sedimentation pond to allow suspended solids to settle out before it is released into the environment. Regular sampling of the sedimentation ponds will be undertaken to ensure that release water is discharged in accordance with all applicable environmental water quality standards and guidelines. Water treatment options will be considered if ongoing rock sample testing results indicate that seepage water is likely to contain elevated levels of toxic elements such as arsenic, selenium, ammonia, etc.

4.2.2 Tailrace Area

To keep water out of the active work area and permit working in the dry during tailrace channel excavation, a rock and overburden plug will be left at the downstream end of the tailrace channel until the excavation is complete. Turbidity curtains will be used during construction to minimize the amount of silt entering the river. Run-off and seepage water collected from sumps and/or dewatering wells within the excavation will be pumped into settling ponds and held until water quality is acceptable for release into natural water courses.

4.2.3 Site Drainage

Site drainage will be achieved by means of a network of swales, culverts and ditches within and around Project roadways and structures. Ditch capacities will be sized to accommodate the extreme daily rainfall event. Flow volumes and velocities will be kept low enough to minimize erosion and scouring of the drainage area. Riprap energy dissipaters and ditch lining will be installed in areas where runoff velocities are deemed to be excessive. Surface runoff will be directed into natural drainage courses by means of swales, culverts and ditches designed to maintain low runoff velocities to minimize erosion potential.

4.2.4 Access Roads

Road construction will incorporate erosion control methods (e.g., ditch blocks, silt fences) to ensure overland flow does not direct sediment-laden water into natural watercourses. Culverts will be incorporated into the design where necessary to ensure local drainage patterns are not adversely affected. Site drainage, erosion prevention and control, and sedimentation management will be carried out in accordance with applicable federal and provincial regulations and guidelines.

4.2.5 Sewage Collection and Treatment

Contractors will provide temporary portable toilet facilities with holding tanks for the construction camp. The sewage will be collected regularly and hauled to an existing sewage treatment facility (i.e., Stony Rapids or Black Lake) for treatment and final disposal.

4.3 Project Solid Wastes and Disposal Plans

In terms of solid waste disposal, the preliminary Project design has assumed that only the burning of scrap wood and paper products, and the burial of scrap metal will take place at the construction site. The remaining solid waste resulting from construction, including food refuse and similar material, will be hauled to an existing permitted waste disposal site for final disposal.

Provincial and federal regulations, guidelines and special considerations related to the storage and transportation of fuels and explosives, and the handling and storage of other hazardous or dangerous goods will be strictly adhered to.

Disposal of waste rock (i.e., rock and overburden) was described in Section 3.3.7.

4.3.1 Domestic and Industrial Waste Management

It is expected that domestic waste generated during the construction and operations phases will be collected and hauled to an existing permitted waste disposal site for final disposal. Options for disposing of industrial waste produced during operations are still under consideration.

4.3.2 Hazardous Substance Storage and Management

4.3.2.1 Explosives Storage

Explosives will be transported to site by qualified carriers, stored in locked facilities, and transported and handled in accordance with the applicable regulations as per Natural Resources Canada requirements. An explosives storage facility will be required on site; however, the exact location of the facility will be determined in 2013 as part of the final project design.

4.3.2.2 Oil Spill Prevention and Containment

An oil containment system guards against the possible contamination of the waterway and adjacent terrain in the event of an accidental spill from powerhouse equipment containing oil or other petroleum based liquids.

The Project will be equipped with an oil containment and separation system, which is typically comprised of:

- station sumps and a primary interceptor;
- an efficient oil-water separator;
- containment curbs and drip trays; and
- a waste oil sump tank.

Drainage with a potential for containing oil will be directed to an oil interceptor/separator system. Drainage from lower levels will be directed to one of the main station sumps and then pumped to the interceptor/separator.

The oil storage area will have containment of sufficient volume to hold the contents of the largest single container. An inverted drain trap will allow draining of the area to the oil interceptor/ separator system. Pipes to and from the area will terminate at dry disconnect hose connections to further reduce the risk of spills.

Governor pumping systems will be surrounded by trenches or curbed to allow drainage via the trench or sump to the oil interceptor/separator system. The governor pumping systems will be high pressure systems to minimize the spill hazard by minimizing the total volume of hydraulic oil in the systems.

Any rooms with risk of an oil spill will have containment curbs or door ramps installed. In general, containment will be located as close as possible to the potential source of a leak or spill.

Water leaving the separator will be monitored for oil contamination. In the event of contamination, an alarm will be activated and the water will not be discharged to the environment.

The main transformers will not be located on the tailrace deck, but rather will be located on shore considerably reducing the potential for spilled transformer oil to contaminate the waterway. Because the transformers will be relatively close to the waterway, oil spill containment walls will be constructed around them.

Double walled heat exchangers will be used for the turbine and generator cooling systems to reduce the risk that cooling coil failure will discharge oil into the water.

4.3.2.3 Self-Lubricated Bushings and Environmentally Safe Oils and Greases

Self-lubricated bushings will be employed throughout the design to eliminate minor sources of water pollution typical of greased bushings (e.g., greased wicket gate bushings, turbine runner blade bushings).

The use of environmentally safe oils and greases (non-petroleum based) will be used wherever practical. However, due to the northerly location of the proposed development, and current performance characteristics of commercially available biodegradable oils and greases, their application may be limited. However, research and development in this field continues and is expected to advance. The suitability of the latest offerings in biodegradable oils and greases will be reviewed during the final design stage.

5.0 PROJECT LOCATION AND EXISTING ENVIRONMENT

The following section provides details on the existing environment at and near the proposed Project site. Topics include air quality and the acoustic environment, geology and hydrogeology, the surface water environment, the terrestrial environment, heritage resources, traditional and non-traditional land use, and the socio-economic environment. Baseline environmental studies for the proposed Project were carried out between 2010 and 2012. The scopes of the various baseline studies carried out in support of the Project were based on obtaining a solid understanding of the biophysical and socio-economic environment of the Project area, or adjacent areas that may be affected by some aspect of the proposed development. As information about specific aspects of the environment was obtained, and as the Project design evolved, baseline studies were modified and additional studies carried out to obtain a solid understanding of the existing environment in the Project area. Information obtained during the various baseline studies was also used to revise and refine the valued components (VCs) selected early in Project development.

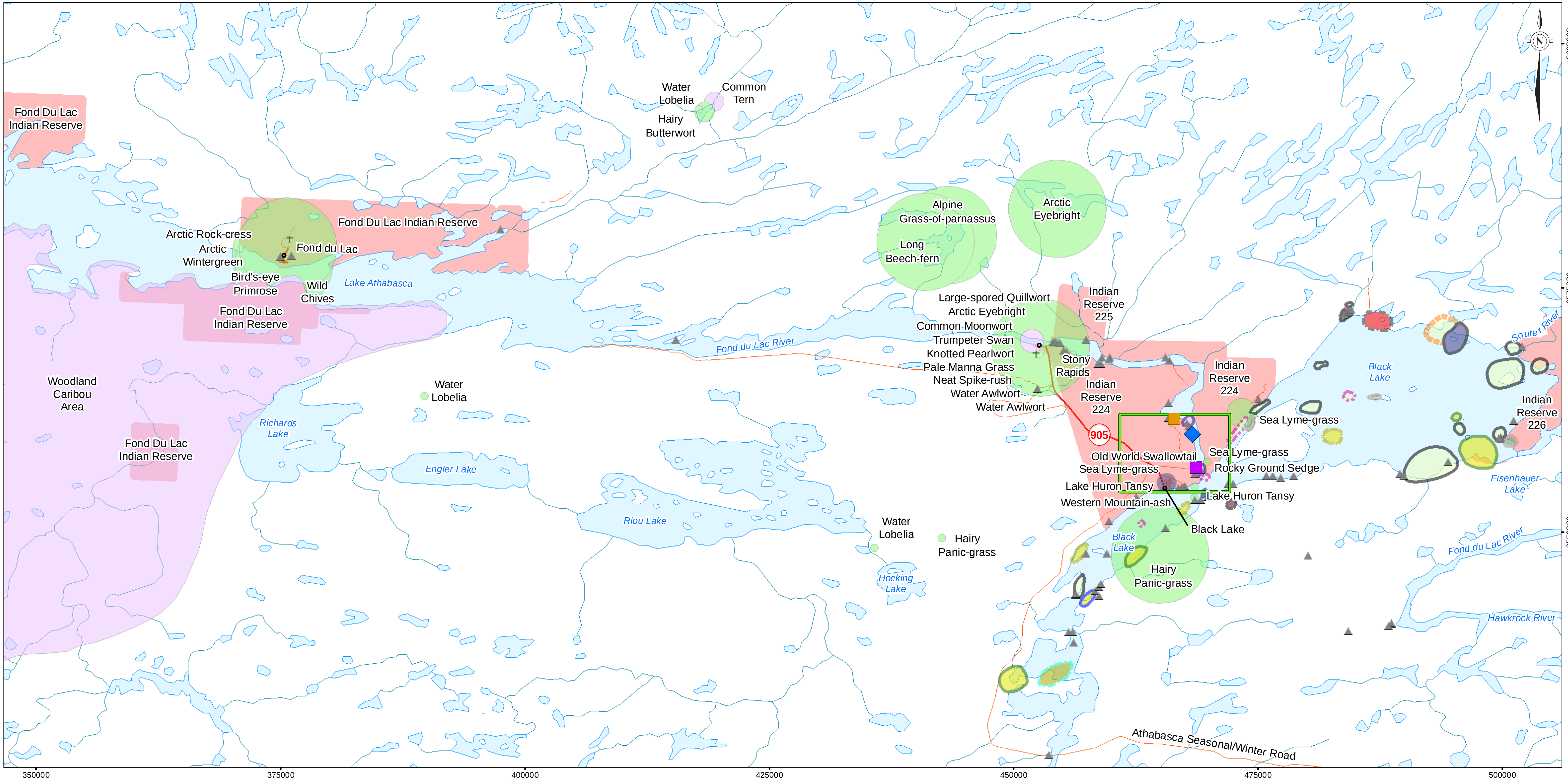
5.1 Project Location

The proposed Project site is located approximately 7 km from the community of Black Lake (Figure 1.1-1), within the Chicken Indian Reserve No. 224 (AANDC 2011). The hamlet of Stony Rapids is located about 25 km northwest of the Project site. All-season road access in the area is limited to the length of Highway 905 between Black Lake and Stony Rapids communities. Transportation to southern Saskatchewan involves the use of the Athabasca Seasonal/Winter Road (i.e., Highway 905), or flights from the airport in Stony Rapids. A recreational sport fishing camp (i.e., Camp Grayling) is located at the outlet of Black Lake in close proximity to the Project. Black Lake, Fond du Lac River and Middle Lake are the major waterbodies and watercourses in the vicinity of the Project. Elizabeth Falls, a well-known area of cataracts and rapids is located on the Fond du Lac River between Black Lake and Middle Lake. Figure 5.1-1 shows the environmental and heritage sensitivities identified in the Project area to date.

The legal description of the land where the Project is located is Chicken Indian Reserve No.224 as designated under the *Indian Act* (Government of Canada 1985). Project components located outside of the Chicken Indian Reserve No.224 are located on land administered by the Northern Administration District in accordance with the *Northern Municipalities Act* (2012) (Figure 1.1-1).

The Project is located within two ecoregions separated by the Fond du Lac River. The Athabasca Plain Ecoregion occurs on the west side of the Fond du Lac River and the Tazin Lake Upland Ecoregion occurs on the east side. The landscape areas associated with the Project within the Athabasca Plain generally include sandy glaciolacustrine plains, with well-drained slope positions having forest soils containing brownish-coloured B horizons (i.e., Brunisolic soils) (Acton et al. 1998). The landscape area within the Tazin Lake Upland associated with the Project is characterized by steep bedrock ridges. Brunisolic soils form in a thin layer of glacial till between bedrock outcrops. Both ecoregions are characterized by short, cool summers and long, very cold winters, indicative of the subarctic climate of the area (Acton et al. 1998).

The Project area has been used traditionally by the Aboriginal people of the region for generations. Traditional resource use by the people of this area is a defining feature of their culture and identity. While barren-ground caribou is considered a very important species hunted by residents of the region, moose, black bear, and waterfowl, such as ducks and geese, also are hunted. Woodland caribou are not hunted currently as the species has not been observed in recent memory of the area residents. The effects of successive forest fires over the last few decades have limited hunting and other resource uses in the area around Middle Lake and Elizabeth Falls. However, these burned areas produce berries that are gathered by community members for domestic use. Fish have been a vital part of traditional life in the region and continue to be an important food source for members of the local community.



LEGEND

- INDIAN RESERVE
- WATERBODY
- RIVER
- HIGHWAY
- ROAD
- VILLAGE
- RUNWAY
- GENERAL PROJECT LOCATION
- ARGR - ARCTIC GRAYLING
- LKTR - LAKE TROUT
- LKTR - LAKE TROUT FALL SPAWNING
- LKTR* - LAKE TROUT (CAMP GRAYLING)
- LKWH - LAKE WHITEFISH
- NRPK* - NORTHERN PIKE (CAMP GRAYLING)
- NRPK/WALL - NORTHERN PIKE AND WALLEYE
- NET FISHING
- WALL - WALLEYE
- WALL* - WALLEYE (CAMP GRAYLING)
- WALL*/WHSC - WALLEYE AND WHITE SUCKER SPAWNING
- WALL/LKTR - WALLEYE AND LAKE TROUT
- WHSC - WHITE SUCKER
- HISTORICAL FISHING SPOT - WINTER
- HISTORICAL SUCKER FISHING
- LISTED WILDLIFE LOCATION
- LISTED INVERTEBRATE LOCATION
- LISTED PLANT LOCATION
- KNOWN HERITAGE RESOURCE
- ELIZABETH FALLS
- CAMP GRAYLING
- RESIDENCE

10 0 10
SCALE 1:400,000 KILOMETRES

REFERENCE

DMTI Highways and Roads
NTS Mapsheet 74I, 74J, 74O, 74P
DATUM: NAD 83 PROJECTION: UTM ZONE 13

PROJECT
SaskPower
ELIZABETH FALLS HYDROELECTRIC POWER PROJECT

TITLE
ENVIRONMENTAL AND HERITAGE SENSITIVITIES

Golder Associates
Saskatoon, Saskatchewan

PROJECT	10-1365-0004.22000		FILE No.	
DESIGN			SCALE AS SHOWN	REV. 2
GIS	JRC/LR	12/12/12	FIGURE: 5.1-1	
CHECK	MT	12/12/12		
REVIEW	BC	12/12/12		

G:\CLIENTS\SASKPOWER\Elizabeth Falls Power Project\Figures\10-1365-0004 SaskPower Elizabeth Falls EA\22000 Project Description\10-1365-0004 Environmental and Heritage Sensitivities.mxd Date: 12/12/2012 2:21:01 PM

5.2 Existing Environment

5.2.1 Climate, Atmospheric and Acoustic Environment

5.2.1.1 Overview of Existing Information

The Project area has a subarctic continental climate with long, very cold winters, and short cool summers. Records of temperature and precipitation from 1986 to 2010 are available from the Environment Canada meteorology station at the Stony Rapids Airport. Long term climate records (1971-2000) for a full suite of meteorology measurements are available from three Environment Canada meteorological stations within approximately 225 km of the Project. Aggregated results from 24 global climate models participating in the Intergovernmental Panel on Climate Change (IPCC) indicate significant potential for climate change in the region by 2071-2099. Potential Project-related effects are being assessed using a desktop study of the current climate conditions and projections of future climate for the region.

The Project area is located in the Northern Saskatchewan airshed. Regional background air contaminant concentrations are monitored at the MOE station located at La Loche, 370 km to the southwest. Air contaminants measured at La Loche include carbon monoxide (CO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), particulate matter smaller than 2.5 micrometers in aerodynamic diameter ($PM_{2.5}$), and particulate matter smaller than 10.0 micrometers in aerodynamic diameter (PM_{10}). Potential Project-related effects to the atmospheric environment are being assessed with a desktop study of these monitoring data.

As a remote location far from any urban/industrial sources of noise, the acoustic environment in the study area can likely be classified as a quiet rural location. Potential Project related effects to the acoustic environment are being assessed using an acoustic baseline study, including noise monitoring in the Project study area.

Climate

The purpose of compiling the existing climatic condition information is to evaluate the existing climate in the region, to evaluate projections of future regional climate, and to prepare a document describing the baseline climate conditions, which will be used for the assessment of effects of the Project in the EIS.

In the summer, mean maximum daily air temperatures reach a July high of 22.7°C, while January mean minimum temperatures are as low as -30°C. The average total annual precipitation (1986-2010) at Stony Rapids is 424 mm with 66% of the precipitation occurring as rainfall during the spring, summer, and fall.

The observed monthly average temperature records (1971-2000) are well-simulated by climate models and indicate that winter (December, January, February) air temperatures over the 2071-2099 time period may increase 6.0°C +/- 1.8°C. The spring (March, April, May), summer (June, July, August), and fall (September, October, November) increases are predicted to be 3.7, 3.0, and 3.8°C with standard deviations among the simulations of 1.6, 1.3, and 1.3°C. Percentage changes in monthly average precipitation at Stony Rapids over the 2071-2099 time frame were also generated by averaging monthly precipitation data simulated by the same 24 global climate models. The climate model simulations predict an average 21.1% increase in October through March precipitation and a 13.7% increase in April through September precipitation for the Stony Rapids area. This results in an increase in annual average total precipitation from 424 mm to approximately 488 mm with a range of +/- 62 mm, or an annual average increase of 15.1%.

No additional baseline studies of climate are planned as enough regional information is available to assess the potential effects of this Project.

Atmospheric Environment

The purpose of the atmospheric environment baseline study is to evaluate the regional background concentrations of air contaminants in the Project study area, and to prepare a document describing the atmospheric environment baseline conditions that will be used for the assessment of effects of the Project in the EIS.

Air quality in the Project region is good with regional background concentrations of air contaminants that are typically lower than the four other airsheds in Saskatchewan. However, the region experiences large variations in air quality due to the long-range transport of air contaminants into the region (e.g., arctic haze phenomenon), and seasonally high concentrations of air contaminants in the summer due to forest fires common in the boreal forest region.

Data collected at the MOE monitoring station at La Loche has been augmented with analysis of satellite imagery and pre-existing data obtained during *in-situ* airborne measurements in the region. The results of the desktop baseline air quality study will be summarized.

No additional baseline studies of climate are planned as enough regional information is available to assess the potential effects of this Project.

Acoustic Environment

Saskatchewan does not have any specific environmental noise regulations or standard methods for conducting baseline acoustic studies. In particular, Saskatchewan does not provide a method for defining the specific area in which the Project could affect the acoustic environment. In the absence of regulatory guidelines for Saskatchewan, the Proponent may adopt, the Alberta Utilities Commission (AUC) regulation *Rule 012: Noise Control* (*Rule 012*), which identifies the area within 1.5 km of the Project boundary as the appropriate noise study area for the Project (i.e., the area in which the acoustic environment could be affected by the Project) (hereafter “acoustic study area”).

The acoustic study area is effectively a forest wilderness and currently is free of any permanently, or seasonally, occupied dwellings. The nearest human developments are:

- Mary’s Cabin, a traditional use cabin on Middle Lake, owned by a member of the BLFN, which is located outside the acoustic study area to the northwest; and
- Camp Grayling, a fishing lodge on the outlet of Black Lake, which is located outside of the acoustic study area to the south.

Human activities within the acoustic study area currently consist of recreational fishing by patrons of Camp Grayling, as well as traditional First Nations hunting and fishing by members of the Black Lake community.

Golder is not aware of any existing studies characterizing the acoustic environment in the study area. Based on the human land uses described above and satellite imagery of the area, it is predicted that the existing acoustic environment would be characterized by noise from:

- power boats used for fishing on Middle Lake and Black Lake;
- aircraft noise from flights in/out of the Stony Rapids airport;
- off-road vehicles (e.g., ATVs and Argos) used for hunting; and

- natural sounds such as moving water, wind in trees/vegetation, birds, insects, and other wildlife.

Golder has completed baseline sampling of the existing acoustic environment in the area. The baseline study quantifies existing noise levels in the area and identifies the most dominant existing noise sources. This information will be presented in the EIS.

5.2.2 Geology

5.2.2.1 Overview of Existing Conditions

Surficial Geology

The Elizabeth Falls area is located within the southern portion of the National Topographic System (NTS) 74 P topographic map sheet (Gilboy 1978). The topography surrounding Elizabeth Falls is primarily bedrock controlled with low to moderate relief. The area forms part of the Lake Athabasca drainage basin. Prominent landforms in the study area are a result of glacial action. To the east of Fond du Lac River, well rounded erosion-resistant exposed bedrock and to the west, significant areas of glacial deposits consisting of lacustrine sand, silt, and till were produced by glaciations. Glacial deposits extend westward (approximately 13 km) forming an esker of sand and gravel that is used as a source of aggregate and construction materials in the area. The esker varies in lithology and grain size from east to west; the esker varies from sub-rounded boulders comprised of Precambrian-aged crystalline rocks near the outlet to the Fond du Lac River to pebbles and cobbles of sandstones farther to the west. A terrace deposit on the west side of Black Lake (approximately 100 m wide and 2.5 km in length) is characterized by talus and glacial sand deposits.

Bedrock Geology

The bedrock in the Project area consists of Precambrian age crystalline gneiss complex and the Athabasca Formation (conglomerates and sandstones) to the east and west of the Fond du Lac River, respectively. The gneiss complex is comprised of quartzo-feldspathic gneiss that is medium to coarse-grained, crystalline, and light-coloured. Mineralogy is predominantly quart and feldspar with 10% to 20% mafic minerals (primarily biotite and hornblende). This rock unit does not occur at any Project structure other than at the proposed submerged weir in the Fond du Lac River at the outlet of Black Lake. The gneiss complex is intruded by numerous diabase dykes throughout the area. The dykes are generally intruded parallel to foliation but in some cases crosscut the foliation.

Structural features within the area include foliation (most prominent), shear zones (Black Lake Shear Zone), faulting and jointing. The Black Lake Shear Zone is comprised of mylonitic and cataclastic amphibole gneiss and felsic gneiss. The zone strikes northeast parallel to the shore of Black Lake. This zone is the result of faulting cataclysmic milling that produced re-healed rock mass with deformed and stretched mineral grains.

Mineralization

It is estimated at this time that over 1.3 million m^3 of rock and 860,000 m^3 of consolidated overburden will be excavated during the construction of the proposed tunnel, powerhouse site, tailrace channel and water intake. The total disposal volume of the unconsolidated deposits after removal will be larger, as identified in Section 3.3.7. One of the potential environmental concerns with projects that involve the excavation of large quantities of bedrock and overburden materials is that the excavated materials could have potential for metal leaching and acid rock drainage as a result of precipitation falling on the excavated material. Given that there are several known uranium deposits within 5 to 10 km of the Project area, an assessment of the potential for exposure of uranium mineralization during the tunnel and surface excavations is required.

Acid generation occurs when minerals containing sulphide and elemental sulphur are exposed to the weathering effects of oxygen and water. Acidity is generated from the oxidation of sulphur and precipitation of ferric iron. Acid rock drainage occurs when the resulting acidity is entrained by water. High metal solubility and sulphide weathering occurs under acidic conditions. Metal leaching is typically associated with acid rock drainage. Although a neutral pH does not necessarily prevent metal leaching, in many environments metal leaching will only be significant if the drainage pH is less than 5.5 or 6 (Price and Errington 1998).

In 2004, when Hatch (2005) carried out the geological mapping of the entire tunnel alignment, no evidence of uranium mineralization was observed in the surface outcrops along the tunnel alignment between Black Lake and the Fond du Lac River. There was also no evidence of uranium mineralization noted in the drill core obtained in 2002 (Hatch 2002).

The bedrock cores from the boreholes drilled during the 2012 geotechnical investigation program located within, or in close proximity to, the Black Lake Shear Zone, were scanned using a scintillometer to obtain an indication of the background radiation levels to provide an indication as to whether the core contained uranium. The Black Lake Shear zone hosts known uranium deposits in the area. The radiation levels obtained were generally less than 150 counts per second (cps), typical of ordinary background levels, and well below the 100,000 cps previously documented for known uranium showings in the general area (Hatch 2012). No evidence of uranium mineralization was visually observed in the drill core or in the core sampled for petrographic analyses. Nonetheless, given the proximity of known uranium deposits in the Project area, additional testing of the drill core has been undertaken. Should this testing indicate that uranium mineralization is present, a risk analysis will be carried out and appropriate management plan developed for inclusion in the EIS.

During the 2004 geological mapping program, high concentrations of sulphide mineralization were not observed in the surface bedrock outcrops (Hatch 2005). However, petrographic analysis of six samples of drill core was included as a component of the 2012 geotechnical drilling investigations (Hatch 2012). The results of the petrographic analyses indicated that pyrite occurs in concentrations varying from trace amounts up to 1%. In addition, carbonate typically occurs in concentrations less than 1%. As a result, given the generally low level of neutralization capability of the rock, the presence of slightly elevated concentrations of sulphide mineralization could result in the rock being potentially acid generating. Additional testing has been undertaken on the core samples; kinetic tests are ongoing.

5.2.3 Surface Water Environment

5.2.3.1 Overview of Existing Conditions

The Project is located on the Fond du Lac River in the Athabasca River basin of Northern Saskatchewan, between upstream Black Lake and downstream of Middle Lake. The Fond du Lac River originates at the outflow of Wollaston Lake, and flows approximately 275 km northwestward before reaching Lake Athabasca approximately 50 km downstream of the Project. At the outlet of Black Lake, the Fond du Lac River has an upstream drainage area of 50,700 square kilometres (km^2).

Hydrology

The existing hydrological environment is described by stream flow rates in the Fond du Lac River between Black Lake and Middle Lake, and water levels and volumes in the three waterbodies. Topographic data are also used to explore hydrological dynamics in the area.

Stream Flow

The Water Survey of Canada (EC 2012a) has archived historical data for the Fond du Lac River at two sites; 07LE001 is downstream of the Project near Stony Rapids and has a data record for 1946 to 1963 while 07LE002 is at the outflow of Black Lake and has a data record for 1963-present. The data from the two stations were compiled, and years with missing data were removed to produce a baseline stream flow dataset for the Fond du Lac River for the period 1947-1994, 1996-1997, and 2001-2010.

This streamflow dataset for the Fond du Lac River was used to characterise flow characteristics at the Project and derive flood flow and low flow frequency and magnitude statistics. Results indicate a historical mean flow of 301 m^3/s, with an average annual peak flow of 472 m^3/s, and an average annual low flow of 188 m^3/s. The historical daily minimum flow is 115 m^3/s and the historical daily maximum flow is 821 m^3/s. While the hydrograph typically displays low flows during the winter, peak flows in the spring (early June), and a slow receding limb throughout the summer and fall, there is considerable variability in the magnitude and timing of flow events.

Water Levels

A stage-discharge curve for the hydrometric station at the outflow of Black Lake was obtained from the Water Survey of Canada (WSC) (EC 2012b) allowing for the water level at this location to be calculated over the 68 years of discharge record. Although this site is on the Fond du Lac River, its proximity and hydraulic relationship with Black Lake make it a reasonable estimate for historical water levels in Black Lake. To verify this relationship, a continuous water level sensor was installed on Black Lake during the 2010 open water season. Results indicate water level fluctuation in Black Lake of approximately 1.5 m over the 68 years of record, and an average intra-annual fluctuation of 0.85 m.

During the 2010 open water season, four temporary monitoring stations were established along the Fond du Lac River between Black Lake and Middle Lake to monitor water levels along the river. The water level records correlate very well with coincident water level records at the outflow of Black Lake, allowing for extrapolation of these datasets to create 68 years of level data along the river. Water level along the Project section of the Fond du Lac River is estimated to fluctuate an average of approximately 1 m within a year and 2.3 m over the period of record.

A water level sensor was also installed in Middle Lake during the 2010 open water season to produce a relationship with water level at the outflow of Black Lake, and therefore over the 68 years of record. While intra-annual fluctuation is estimated to be approximately 1.2 m, inter-annual variation is calculated to be 2.4 m over the period of record.

Water Body Volumes

Bathymetric data were collected on Black Lake, Middle Lake, and for safely navigable stretches along the Fond du Lac River. These data have been integrated with the Light Detection and Ranging (LiDAR) and NTS data to create a Digital Elevation Model (DEM) of the waterbodies and corresponding upland areas. The DEM can be used in conjunction with water level and flow rates to approximate waterbody volumes over the 68 years of record.

Water Quality

Water and sediment quality samples and limnology profiles or *in situ* surface measurements were collected from Black Lake, Fond du Lac River, and Middle Lake in different seasons throughout 2010 and 2011. More specifically, water chemistry samples were collected at two Middle Lake locations and at three Black Lake locations during all four seasons of the year. Sediment chemistry samples were collected during spring and summer at two locations each in Middle Lake and Black Lake. Limnology profiles were recorded at two locations on the Fond du Lac River during the fall season, at four locations in Middle Lake during all four seasons, and at three locations in Black Lake during all four seasons.

The objectives of the water and sediment quality baseline programs were to collect site-specific information to document baseline conditions within the study area, and to evaluate potential spatial and temporal trends. Water chemistry samples were analyzed for physical parameters, major ions, nutrients, total metals, and radionuclides. Sediment quality samples were analyzed for nutrients, total metals, and radionuclides.

Lower Trophic Communities

Sampling of lower trophic communities was completed during the spring, summer, and fall of 2010. Lower trophic communities sampled in the Fond du Lac River during the fall season included periphyton, benthic invertebrates, and drifting aquatic invertebrates. Lower trophic communities sampled in Black Lake and Middle Lake included phytoplankton and zooplankton in spring and summer, and benthic invertebrates in the fall. Samples were submitted to qualified contractors for analysis of taxonomic abundance and biomass. Results will be used to characterize baseline conditions and to detect potential spatial and/or temporal trends.

Fish and Fish Habitat

Fish and fish habitat surveys were completed in Black Lake, Fond du Lac River (between Black Lake and Middle Lake), and Middle Lake. Fish sampling was completed several times between June 2010 and July 2012. Objectives of fish sampling included obtaining seasonal estimates of fish species composition and relative abundance, and to identify important habitat (e.g., shallow water spawning habitat).

In 2011, DFO requested that a radio-tagging study be carried out to monitor Arctic grayling movement patterns within the Fond du Lac River between Black Lake and Middle Lake. This study began in October 2011 and ran for a full year until October 2012.

Fish habitat assessments in Black Lake and Middle Lake consisted of bathymetric surveys, shoreline habitat assessments, and tributary assessments. The Fond du Lac River was separated into reaches based on the dominant channel type. Detailed habitat measurements describing spawning habitat were collected in association with Arctic grayling egg searches.

Black Lake

Fish sampling in Black Lake was conducted on five different occasions between June 2010 and February 2011. Fish collection methods included gill nets, boat electrofishing, backpack electrofishing, trap-nets, and angling. Sixteen fish species were captured (Table 5.2-1).

Table 5.2-1: Fish Species Captured in Black Lake from May 2010 to February 2011

Common Name	Scientific Name	Total Number Captured
Arctic grayling	*Thymallus arcticus*	46
burbot	*Lota lota*	112
cisco	*Coregonus artedi*	9
lake chub	*Couesius plumbeus*	130
lake trout	*Salvelinus namaycush*	505
lake whitefish	*Coregonus clupeaformis*	272
longnose sucker	*Catostomus catostomus*	267
ninespine stickleback	*Pungitius pungitius*	13
northern pike	*Esox lucius*	45
round whitefish	*Prosopium cylindraceum*	16
slimy sculpin	*Cottus cognatus*	86
spottail shiner	*Notropsis hudsonius*	6
trout-perch	*Percopsis omiscomaycus*	7
walleye	*Sander vitreus*	24
white sucker	*Catostomus commersonii*	372
yellow perch	*Perca flavescens*	6

Fish habitat mapping and assessments in Black Lake consisted of bathymetric surveys, shoreline habitat mapping, and a tributary assessment. Bathymetric surveys were completed near the outflow, potential water intake locations, and other shallow water areas where existing bathymetric data was insufficient or of poor resolution.

Fond du Lac River

The Fond du Lac River between Black Lake and Middle Lake was sampled a number of times in 2010, 2011, and 2012. Survey objectives varied among the years and the seasons of sampling.

Spring fish sampling of the Fond du Lac River was completed in 2010 and 2012. Fish sampling objectives for these surveys included:

- completing Arctic grayling spawning surveys in known spawning areas near the Black Lake outflow and the inflow to Middle Lake;
- completing surveys of Arctic grayling spawning areas in potential spawning habitats in different sections of the Fond du Lac River between the Black Lake outflow and the inflow to Middle Lake;
- completing Arctic grayling egg searches in shallow water spawning habitat where sexually-mature Arctic grayling were captured or observed; and
- collecting detailed habitat information in habitats where Arctic grayling egg searches were conducted.

Summer and fall fish sampling of the Fond du Lac River was completed in 2010. Survey objectives included:

- generating an Arctic grayling population estimate using mark/recapture techniques; and
- obtaining a seasonal estimate of fish species composition and relative abundance (fall).

Winter fish sampling of the Fond du Lac River could not be completed because of unsafe ice conditions.

Fish sampling of the middle section of the Fond du Lac River (between the Black Lake outflow and the Middle Lake inflow) was carried out in summer 2012 to document which other fish species, in addition to Arctic grayling, inhabit that section of the river.

Fish sampling methods included circular trap nets, angling, and backpack electrofishing in 2010 and circular trap nets, angling and short-duration gill net sets in 2012. A total of 12 fish species were captured (Table 5.2-2).

Table 5.2-2: Fish Species Captured in the Fond du Lac River from May to October 2010 and in July 2012

Common Name	Scientific Name	Total Captured		
		Upstream (Black Lake Outflow)	Downstream (Middle Lake Inflow)	Middle Section (Fond du Lac River)
Arctic grayling	*Thymallus arcticus*	1,161	695	5
burbot	*Lota lota*	1	15	0
longnose sucker	*Catostomus catostomus*	1	282	1
white sucker	*Catostomus commersonii*	45	168	1
lake whitefish	*Coregonus clupeaformis*	0	18	1
round whitefish	*Prosopium cylindraceum*	0	0	5
cisco	*Coregonus artedi*	0	24	0
northern pike	*Esox lucius*	0	9	0
walleye	*Sander vitreus*	1	3	2
slimy sculpin	*Cottus cognatus*	1	573	0
spottail shiner	*Notropsis hudsonius*	0	12	0
trout-perch	*Percopsis omiscomaycus*	0	1	0

An Arctic grayling radio telemetry study was initiated in the fall of 2011. Thirty adult Arctic grayling were surgically implanted with VHF radio tags. Ten fish were radio tagged at each of three locations including near the Black Lake outflow, the middle section of the Fond du Lac River, and near the inflow to Middle Lake. Movements of radio tagged fish were monitored by two fixed antenna stations located downstream of the Black Lake outflow, and approximately 400 m upstream of Elizabeth Falls. Seasonal telemetry flights were completed to augment data collected at the fixed antenna stations.

Additional Arctic grayling spawning surveys and egg searches were completed during the spring of 2012. Sampling efforts focused on shallow water habitats in the middle section of the Fond du Lac River. An additional 671 Arctic grayling were captured from shallow water spawning habitat.

The Fond du Lac River between Middle Lake and Black Lake was separated into 23 reaches using satellite imagery available on Google Earth. Reach break delineation was completed by separating sections of the Fond du Lac River that contained similar channel morphological characteristics (i.e., channel width, presence of islands, dominant channel unit type, approximate depth, and general flow pattern). Reach breaks and detailed habitat information were ground-truthed during subsequent field programs.

Middle Lake

Fish sampling in Middle Lake was completed during the spring and summer of 2010 and the winter of 2011. Objectives were to obtain seasonal estimates of fish species composition and relative abundance. Fish collection methods included gill nets and boat electrofishing. Nine fish species were captured (Table 5.2-3).

Table 5.2-3: Fish Species Captured in Middle Lake from May 2010 to February 2011

Common Name	Scientific Name	Total Number Captured
Arctic grayling	*Thymallus arcticus*	7
burbot	*Lota lota*	25
lake chub	*Couesius plumbeus*	4
lake whitefish	*Coregonus clupeaformis*	34
longnose sucker	*Catostomus catostomus*	23
ninespine stickleback	*Pungitius pungitius*	28
northern pike	*Esox lucius*	49
slimy sculpin	*Cottus cognatus*	31
white sucker	*Catostomus commersonii*	50

A bathymetric survey and shoreline habitat mapping was completed for Middle Lake during the summer of 2010, with additional bathymetric and habitat information being collected during the summer of 2012. Middle Lake is characterized by extensive shallow water littoral areas with the exception of the main channel thalweg, which is oriented approximately parallel to the eastern shoreline.

5.2.4 Terrestrial Environment

5.2.4.1 Overview of Existing Conditions

For the purposes of the terrestrial environment baseline surveys and for future assessment of Project-related effects on the terrestrial environment, regional (RSA) and local (LSA) study areas were defined. The terrestrial RSA comprises an area of approximately 1,160 km^2. The terrestrial RSA was selected so that existing environmental conditions could be collected at a scale large enough to capture the maximum predicted spatial extent of the combined direct and indirect effects (i.e., zone of influence) from the Project and other projects in the region. The terrestrial LSA includes the proposed Project footprint and a one-kilometer buffer area around it. The LSA was selected based on the predicted direct and small-scale indirect effects from the Project on terrain and soil, vegetation, and wildlife.

The RSA for the Project is located within two ecoregions separated by the Fond du Lac River. The Tazin Lake Upland Ecoregion occurs on the east side of the Fond du Lac River and the Athabasca Plain Ecoregion on the west of the river. Within the Tazin Lake Upland Ecoregion, the RSA is situated within the Uranium City Upland Landscape Area. Within the Athabasca Plain Ecoregion, the RSA is situated primarily within the Fond du Lac Lowland and Lower Cree River Plain Landscape Areas. A small portion of the Pasfield Lake Plain Landscape Area occurs at the south east corner of the RSA (Acton et al. 1998). Both the Tazin Lake Upland and Athabasca Plain Ecoregions are characterized by short, cool summers and long, very cold winters indicative of the region's subarctic climate.

Terrain and Soils

The purpose of terrain and soils components of the Project is to collect information on terrain and soil baseline conditions in and around the environmental baseline study areas. A soil survey of the RSA and LSA was completed in June 2012 to identify terrain and landscape features, classify soil types, and document thickness of organic and mineral soil horizons. Information from baseline terrain and soil data collected during field studies will be used to determine the characteristics of soil in the RSA and LSA. Qualitative interpretations of soil data will include reclamation suitability, soil sensitivity to acidification, sensitivity to compaction, wind erosion risk, and water erosion potential. This information will be used in the assessment of Project effects in the EIS.

Existing Conditions

Glaciofluvial deposits varying from homogeneous deposits of fine sand to heterogeneous deposits of sand and cobble were observed on the west side of the Fond du Lac River. Typically, Brunisolic soils (i.e., forest soils with brownish coloured B horizons) were found on these glaciofluvial deposits. Gleyed Brunisolic soils, Gleysolic soils (i.e., water saturated mineral soils), and Organic soils (i.e., peat soils) were found in low-lying and poorly-drained areas.

Steep bedrock outcrops characterize the terrain on the east side of the Fond du Lac River. When present, mineral and Folisols (i.e., upland organic soils) generally occurred on nearly level undulating bedrock surfaces and in mid to lower slope positions of gently inclined bedrock faces. Folisols were observed on boulder glacial till and bedrock. Brunisolic soils were observed on thin deposits of sand and boulder glacial till and were underlain by bedrock. Gleysolic soils and Organic soils were found in low lying and poorly drained areas.

Vegetation

The main objective of the vegetation baseline program is to collect vegetation data within the terrestrial study area and prepare an environmental baseline report. Data collected from the field programs will be used to complete a supervised classification of satellite imagery for the purposes of creating an ecological land classification (ELC) map of vegetation communities within the RSA. This ELC map will be used for a qualitative effects assessment for the EIS.

Vegetation surveys were completed in July 2010 and June 2012 in the LSA and RSA. During these surveys, detailed vegetation inventory, Global Positioning System (GPS) ground truthing information, and tracked species surveys were completed.

Detailed vegetation surveys help to obtain site-specific and descriptive information on the nature and characteristics of vegetation within the RSA and LSA. This data also is used to determine the species composition and habitat characteristics of each ELC unit (e.g., ground truth) and will be used to compare the RSA and LSA plant species composition.

Surveys for provincial and federal listed plant species were completed to document their occurrence within the RSA and LSA. The sampling effort focused on habitats with the highest potential to support listed plant species. However, all plot locations (i.e., detailed vegetation inventory plots) were surveyed for the listed species with potential to occur within the RSA as described below.

In Saskatchewan, the most problematic plant species (i.e., weeds) are declared prohibited, noxious, or nuisance under the *Weed Control Act* (2010). Weed species defined under the Act are also documented during the vegetation surveys.

Existing Conditions

Regionally, vegetation communities classified as burn and regenerating burn vegetation are common and tend to be dominated by jack pine (*Pinus banksiana*) in both upland and wetland sites. Vegetation communities in the

RSA areas are slow to regenerate after fire. One reason for the dominance of jack pine is that cones of mature jack pine trees are serotinous, which means the cones are covered with a resin that must be melted for the cone to open and release seeds. They require an environmental trigger to open for seed dispersal; in this case fire is the mechanism.

In the RSA, upland forests are dominated by mixed stands of trembling aspen and birch, with black spruce occurring on the slopes in transitional areas. Bedrock outcrops are common in the area and are typically sparsely vegetated, with jack pine or jack pine-black spruce communities.

Wetland communities in the poorly-drained lowland areas between bedrock outcrops include shrubby and graminoid bogs. In lowland areas with better drainage, treed and shrubby swamp communities dominate.

Listed Plant Species

Tracked plant species for the province of Saskatchewan and federally designated plant species in Canada are protected under provincial and federal conservation legislation. These plant species include those listed under the following:

- Saskatchewan Conservation Data Centre Tracked Species List (SKCDC 2012a);
- *Saskatchewan Wildlife Act* (1998);
- the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2012); and
- the *Species at Risk Act* (*SARA* 2002).

Federally and provincially tracked plant species with the potential to occur in the RSA and LSA were identified through searches of previously listed sources prior to field programs. Of the species listed, 16 have been historically documented within the RSA. The habitat requirements of these species were reviewed and compared to the availability of these habitats in the RSA and LSA. Tracked and listed species searches focused on habitats that had the highest potential to support these species.

One provincial tracked plant species, Alaskan clubmoss (*Lycopodium sitchese*), was encountered twice during early season surveys; however these locations are not within the Project footprint (Table 5.2-4). This species is not listed under COSEWIC, *SARA*, or the *Wildlife Act*.

Additional provincially tracked species were collected during the early season field program, however the identification of these species is pending. If any of the samples are positively identified as tracked species, they will be identified in the final baseline report.

A late season plant survey was conducted in July and August 2012. The two survey times (i.e., early June and late July/early August) help to capture the different flowering times of early and late flowering species.

Table 5.2-4: Listed Plant Observations from Elizabeth Falls Project Area

Location[a]		Species	Ranking[b]	Ecosite[c]	Date
Easting	Northing				
453376	6544796	*Lycopodium sitchense*	S2 G5	BS3: Jack pine/ blueberry lichen	June 4, 2012
471474	6563780	*Lycopodium sitchense*	S2 G5	Transition TS3: Jack pine- black spruce/ lichen/ TS12: Open bog	June 6, 2012

(a) NAD 83, Zone 13V
(b) Saskatchewan Conservation Data Centre (SKCDC 2012a)
(c) Ecosite descriptions from McLaughlan et al. (2010).

Wildlife

Prior to carrying out baseline wildlife surveys, a list was compiled of federal (COSEWIC 2012; *SARA* 2012) and provincial (SKCDC 2012a) species at risk that have the potential to occur in the RSA. Of these potential species, two were identified during the baseline wildlife surveys (Table 5.2-5).

Table 5.2-5: Wildlife Species at Risk that have the Potential to Occur in the Regional Study Area

Common Name	Scientific Name	*SARA* Status[a]	COSEWIC Status[b]	Provincial Status[c]	Potential of Occurrence in the RSA	Species Observed in the RSA
Mammals						
Wolverine	*Gulo gulo*	No Status	Special Concern	S3S4	High – Species densities are higher is areas with a high density of ungulates (COSEWIC 2003). Species population density is moderately high in the area surrounding the RSA.	Yes
Birds						
Olive-sided flycatcher	*Contopus cooperi*	Threatened - Schedule 1	Threatened	Not Tracked	High – Prefers to nest near forest openings or in semi-open to open forests.	Yes

(a) *Species at Risk Act* (*SARA* 2012)
(b) Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2012)
(c) Saskatchewan Conservation Data Centre (SKCDC 2012a)
RSA = regional study area

Baseline wildlife data were collected in 2012. Winter track count transects (n=9) were surveyed twice; once in January 2012 and again in February 2012. Species observed during the winter track count surveys included moose (*Alces alces*), grey wolf (*Canis lupus*), red fox (*Vulpes vulpes*), Canada lynx (*Lynx canadensis*), wolverine (*Gulo gulo*), weasel species (*Mustela* spp.), fisher (*Martes pennanti*), American marten (*Martes americana*), mink (*Neovison vison*), red squirrel (*Tamiasciurus hudsonicus*), snowshoe hare (*Lepus americanus*), mouse species, vole species, muskrat (*Ondatra zibethicus*), grouse species (*Bonasa umbellus*, *Tympanuchus phaisianellus*, or *Falcipennis canadensis*), and ptarmigan species (*Lagopus muta* or *L. lagopus*). No caribou tracks were observed during the winter track count surveys.

Ungulate aerial surveys were completed in January and February 2012. Moose was the only ungulate species observed during the surveys. No woodland or barren-ground caribou were observed during the ungulate aerial surveys.

Upland breeding birds include songbirds, woodpeckers, and corvids, but exclude common raven (*Corvus corax*). A total of 212 upland breeding bird point counts were completed between May 30 and June 9, 2012. Upland breeding bird species that were observed during the survey are listed in Table 5.2-6.

Table 5.2-6: Upland Breeding Bird Species Observed during the Breeding Bird Survey, 2012

Common Name	Scientific Name
Yellow-bellied sapsucker	*Sphyrapicus varius*
Hairy woodpecker	*Picoides villosus*
Black-backed woodpecker	*Picoides arcticus*
Northern flicker	*Colaptes auritus*
Olive-sided flycatcher	*Contopus cooperi*
Alder flycatcher	*Empidonax alnorum*
Least flycatcher	*Empidonax minimus*
Red-eyed vireo	*Vireo olivaceus*
Blue-headed vireo	*Vireo solitarius*
Gray jay	*Perisoreus canadensis*
American crow	*Corvus brachyrhynchos*
Tree swallow	*Tachycineta bicolor*
Black-capped chickadee	*Poecile atricapilla*
Boreal chickadee	*Poecile hudsonica*
Winter wren	*Troglodytes troglodytes*
Ruby-crowned kinglet	*Regulus calendula*
American robin	*Turdus migratorius*
Swainson's thrush	*Catharus ustulatus*
Hermit thrush	*Catharus guttatus*
Cedar waxwing	*Bombycilla cedorum*
Orange-crowned warbler	*Vermivora celata*
Tennessee warbler	*Vermivora peregrina*
Nashville warbler	*Vermivora ruficapilla*
Yellow warbler	*Dendroica petechia*
Magnolia warbler	*Dendroica magnolia*
Cape May warbler	*Dendroica tigrina*
Yellow-rumped warbler	*Dendroica coronata*
Palm warbler	*Dendroica palmarum*
Bay-breasted warbler	*Dendroica castanea*
Blackpoll warbler	*Dendroica striata*
American redstart	*Setophaga ruticilla*

Table 5.2-6: Upland Breeding Bird Species Observed during the Breeding Bird Survey, 2012 (continued)

Common Name	Scientific Name
Northern waterthrush	*Seiurus noveboracensis*
Wilson's warbler	*Wilsonia pusilla*
Chipping sparrow	*Spizella passerina*
Savannah sparrow	*Passerculus sandwichensis*
Vesper sparrow	*Pooecetes gramineus*
White-throated sparrow	*Zonotrichia albicollis*
Fox sparrow	*Passerella iliaca*
Song sparrow	*Melospiza melodia*
Lincoln's sparrow	*Melospiza lincolnii*
Swamp sparrow	*Melospiza georgiana*
Dark-eyed junco	*Junco hyemalis*
Red crossbill	*Loxia curvirostra*
Common redpoll	*Carduelis flammea*
Pine siskin	*Carduelis pinus*

Waterbirds include ducks, geese, swans, loons, grebes, gulls, cranes, rails, herons, and other water-dependent bird species (e.g., belted kingfisher [*Megaceryle alcyon*]). A waterbird aerial survey was completed in May 2012 to identify waterbird species that may breed in the RSA. Waterbird species that were recorded during the survey are listed in Table 5.2-7. A second waterbird aerial survey was completed in July 2012 to obtain an estimate of waterbird productivity (i.e., number of young) in the RSA.

Table 5.2-7: Waterbird Species that were Observed during the Breeding Waterbird Aerial Surveys, 2012

Common Name	Scientific Name
Canada goose	*Branta canadensis*
Mallard	*Anas platyrhynchos*
Northern shoveler	*Anas clypeata*
American widgeon	*Anas americana*
Blue-winged teal	*Anas discors*
Surf scoter	*Melanitta perspicillata*
White-winged scoter	*Melanitta fusca*
Bufflehead	*Bucephala albeola*
Merganser species	*Mergus merganser* or *M. serrator*
Sandhill crane	*Grus canadensis*
Gull species	*Larus canus*, *L. delawarensis*, *L. californicus*, or *L. argentatus*

Incidental observations were made during wildlife baseline surveys of an unknown swan species (*Cygnus buccinator* or *C. columbianus*), northern pintail (*Anas acuta*), common goldeneye (*Bucephala clangula*), Bonaparte's gull (*Larus philadelphia*), common tern (*Sterna hirundo*), and belted kingfisher.

A raptor stick nest survey was completed in conjunction with the waterbird aerial survey. Two bald eagle nests were observed in the RSA. Many observations of bald eagle also were made during other wildlife baseline surveys. Other raptors that were incidentally observed during wildlife baseline surveys were osprey (*Pandion haliaetus*), sharp-shinned hawk, (*Accipiter striatus*) merlin (*Falco columbarius*), northern harrier (*Circus cyaneus*), and red-tailed hawk (*Buteo jamaicensis*).

Amphibian surveys were completed between May 28 and June 10, 2012. Boreal chorus frog (*Pseudacris maculata*) and wood frog (*Rana sylvatica*) were heard during the surveys. No northern leopard frogs were recorded during the amphibian surveys or during other wildlife baseline surveys.

Other wildlife species that were observed incidentally during wildlife baseline surveys include river otter (*Lontra canadensis*), black bear (*Ursus americanus*), and beaver (*Castor canadensis*).

5.2.5 Heritage Resources

5.2.5.1 Culture History

Two cultural regions occur in northern Saskatchewan. The southern zone consists of the boreal forest and is associated with regions that include the Saskatchewan, Beaver, Sturgeon-Weir, Churchill, and Reindeer River systems; while the northern zone is associated with the Athabasca South and Tundra Transition forest sections (Meyer 1999).

By the time the glaciers retreated from northern Saskatchewan, approximately 10,000 years Before Present (B.P.), a newly-exposed landscape with a diversity of flora and fauna was re-established. The northern forest margin was much further to the north than present day and a tundra-like environment characterized the glacial lake environments left by the receding glaciers. The earliest Precontact cultures known to occupy the region were known as the Northern Plano tradition and, in particular, the Agate Basin culture (Minni 1976).

The Arctic Small Tool tradition (3,500 to 2,600 B.P.) is the next clearly distinguishable occupation in the Black Lake area (Minni 1976). It is believed that this culture began on the western and northern Alaska coast, with the inland sites thought to represent a migration inland to hunt caribou. Following the Arctic Small Tool Tradition was a Tradition known as Taltheilei; the ancestors of modern Dene people. The majority of the diagnostic materials that have been recovered from the region are from the Taltheilei Tradition (2,600 B.P. to historic period). The projectile points associated with this tradition are well-flaked and consist of varying lanceolate and stemmed forms. Another tool that is characteristic of this Tradition is the chithos, which can be described as a disc-shaped hide-working tool (Meyer 1999). Other cultural traditions that have been recorded in the area include the Pelican Lake complex, and the Clearwater Lake complex.

Historic archaeological remains can also be expected in northern Saskatchewan. Early travelers, such as Samuel Hearne, Peter Pond, Alexander Mackenzie, David Thompson, Richard King, George Back, Charles Camsell, and Joseph Tyrell, contributed to the survey and mapping of the extreme north of Saskatchewan. In 1769 Samuel Hearne began a journey to northern Saskatchewan. He was on a quest for the Hudson's Bay Company (HBC) for fur, copper, and a northwest passage connecting Fort Prince of Wales (on the Churchill River) to the rest of the north (Gordon 1996). While working for the HBC, Fidler mapped the route from York Factory to the Athabasca and Great Slave Lakes in the winter of 1791. Alexander Mackenzie also chartered portions of northern Saskatchewan. Based on maps provided by Peter Pond, Mackenzie and his entourage set out to find a northwest passage to the Pacific (Rich 1967). Although he did reach the Pacific, the route that was chosen was of little use to the North West Company as it was found to be too difficult and unpractical as a trading route (Rich 1967).

David Thompson also contributed to the knowledge of the geography of northern Saskatchewan as well as much of the Canadian Shield; he is believed to be the first explorer to pass through the Black Lake area (Minni 1976). After a long apprenticeship as a navigator, Thompson was sent by the HBC to find a shorter route to the Athabasca country by way of the Churchill River. After a number of trips and unsuccessful attempts to find a shorter route, Thompson ascended the Churchill and Reindeer Rivers to Reindeer Lake in the spring of 1796, then went across to Wollaston Lake and up the Black River to the east end of Lake Athabasca (Innis 1999). This route was the more direct route to the Athabasca country. Thompson also aided in the establishment of Duck Portage House on the Churchill River and Bedford House on Reindeer Lake (Rich 1967). Many northern communities came into existence following the establishment of the fur trade in this area.

5.2.5.2 Overview of Existing Conditions

To determine the extent and nature of previous archaeological work conducted in the project area, a Survey Area Plot Map, and Archaeological Sites Database search was acquired from the Heritage Conservation Branch. There have been two Heritage Resources Impacts Assessments (HRIAs) conducted in this area on behalf of SaskPower and Saskatchewan Highways and Transportation Projects (SaskPower 1987, Western Heritage Services 2007). Both of these projects were carried out south of the community of Black Lake. The most significant work was carried out as part of a University of Saskatchewan thesis research by Sheila Minni, who assessed the shores of Black Lake over the course of three field seasons from 1972 to 1974 (Minni 1975, 1976). Minni also conducted a reconnaissance of the Fond du Lac River during the summer of 1974, during the early planning stages of this Project (Envirocon Ltd. 1974).

As a result of Minni's (1975) assessment, a total of six heritage resources were recorded in the Project area along the Fond du Lac River between Black Lake and Middle Lake. These sites consist of artifact scatters (n=3), artifact finds (n=2), and a burial site, which is designated a Site of Special Nature (n=1). Sites of Special Nature include heritage resources that have more of a cultural or spiritual significance such as burials or pictographs, and are offered additional protection under Section 64 of *The Heritage Property Act*. None of the recorded sites in the project area contained diagnostic artifacts to indicate a cultural or temporal affiliation.

Additional heritage resource studies were carried out in July 2012 in the LSA to address concerns described in the draft TOR prepared by Saskatchewan Environment and the Agency for the Project. The objective of the 2012 archaeology survey was to identify potential issues of concern related to potential impacts to known and previously unrecorded archaeology sites from proposed Project components including water intake locations; tailrace channel; powerhouse; construction facilities; access bridge and access road; and transmission line.

The collection of heritage baseline information included a review of existing literature; the completion of a field assessment; and the preparation of a standalone permit report summarizing the results as well as providing recommendations arising from the field assessment.

The field component of the HRIA involved a combination of surface reconnaissance and subsurface testing to identify heritage resources. Specific project components were assessed, as well as portions of the Fond du Lac River and the shoreline of Black Lake within the Project area.

Local Black Lake First Nation Elders were contacted during the HRIA process regarding their knowledge of any known or potential heritage resources. Information gathered was incorporated into the HRIA.

5.2.6 Traditional and Non-Traditional Land and Resource Use

5.2.6.1 Overview of Existing Conditions

Traditional Land and Resource Use

Traditional land and resource use information and Aboriginal traditional knowledge (ATK) were collected in discussion with community members and resource users within the Black Lake First Nation. Information was collected through interviews and mapping exercises undertaken with individual resource users and Elders in the community of Black Lake, in addition to review of other ATK-related materials held by the community. Eleven interviews were conducted in the community of Black Lake regarding resource use in the Elizabeth Falls area. As the Project is located within the Chicken Indian Reserve No. 224, the focus of traditional land and resource use information and ATK has been with members of this community.

The Dene ("People of the barrens") and their ancestors have lived in northern Saskatchewan, particularly in the Athabasca region, for an estimated 8,000 years (Meyer 1981). Prior to settlement in contemporary First Nation communities, the Dene had a subsistence economy based on the barren-ground caribou. Following contact with European peoples, HBC encouraged the Dene people to move into the boreal forest so they could assist with the fur trade (Yerbury 1976; Gillespie 1976; Raby 1973).

Today, residents of Black Lake First Nation use an expansive region, including areas of the Northwest Territories, for traditional land and resource use. They have identified Fur Blocks N-24 and N-80, as well as areas north of present-day settlements and the Saskatchewan and Northwest Territories border, as their traditional territory. While their most culturally-important resource use activities, such as hunting caribou, tend to take place in the northern reaches of Saskatchewan and into the Northwest Territories, other resource use activities take place closer to the communities. These activities include domestic fishing and gathering, as well as some trapping and hunting of smaller mammals and birds. Commercial fishing and moose hunting also occur near the communities. Hunting and other resource use activities in the area around Middle Lake and Elizabeth Falls have been limited due to the effects of successive forest fires over the last few decades, including three fires in the area since 2006.

While caribou (traditionally the Beverly herd) were traditionally the main species hunted by residents of the Athabasca region, moose, black bear, and waterfowl, such as geese and ducks, are also hunted. Woodland caribou are not a food source used by the people of this area as the species has not been observed in recent memory of the area residents. Following forest fires around Middle Lake, small mammals and birds have begun to return to the area and some hunting, trapping, and snaring occurs in the region.

Most fishing near the Project area is for domestic use and takes place on Stony Lake, with some fishing on Middle Lake and Black Lake. Black Lake also has a small commercial fishery during the summer. Ice fishing takes place on Black Lake and Stony Lake, but is less prevalent on Middle Lake due to open water and thin ice during the winter months.

Domestic fishing is rarely targeted to specific species due to the use of gillnets in summer, however, lake whitefish is preferred because it is easily smoked. Other species in the area include lake trout, walleye, northern pike, Arctic grayling, and white and longnose suckers. Lake trout fishing occurs near the junctions of the Fond du Lac River and local lakes, particularly in fall, and grayling are prevalent in the Fond du Lac River near Elizabeth Falls.

Traditional uses of forest plant species are numerous. Wood continues to be collected for heating fuel by residents. Some trees and plants may also have cultural significance and are used in medicinal, ceremonial, and spiritual activities. Traditional knowledge of plants for medicinal purposes and the importance of these plants have been transmitted orally from one generation to the next. Recent burn areas around Middle Lake and on Fir Island on Black Lake support several plant species, particularly berries (e.g., blueberries, bog cranberries, moss berries, and strawberries), which are gathered by community members for domestic use. Some other edible vegetation, such as mushrooms, is also available in the area around Middle Lake and south of Black Lake.

Small trails occur throughout the region, most of which are trunk trails connecting larger roads. These trails are used to access cabins and camp sites, and to portage through the area. The area around the proposed Project site historically has been used as a travel corridor when following the caribou herds, as well as a temporary camp site, particularly for spring fishing prior to ice break-up on Black Lake.

An archaeological survey completed in the area in the 1970s identified a number of burial sites and other heritage sites around Black Lake, Middle Lake, Stony Lake, and the Fond du Lac River. Two burial sites are located near the Project area. One burial site is located near Camp Grayling and the outlet of Black Lake. A second burial site is located at Sandypoint, across Black Lake from the community of Black Lake.

Non-traditional Land and Resource Use

Activities such as trapping, commercial fishing, and gathering and using forest products create approximately 4,000 seasonal jobs and generate important seasonal income to residents of northern Saskatchewan. Income from resource harvesting remained fairly stable between the 1980s and early 2000s, at about $6 to $7 million annually (Northlands College et al. 2004).

The only mining activity currently taking place in the Athabasca region is uranium mining. No mining activities are taking place in the area around Elizabeth Falls. However, numerous mineral deposits have been identified in the area, including uranium, gold, base metals, and other minerals.

Twenty-six outfitting lodges operate in the Athabasca region, with three lodges and outfitters offering sport fishing and hunting services within a 50 km radius of the proposed Project site around Black Lake and Stony Rapids communities.

5.2.6.2 Additional Baseline Studies

Additional work to broaden the Aboriginal traditional knowledge base may be required as the Project proceeds. It is suggested that this work be incorporated into the public consultation process with the local Black Lake and Stony Rapids communities, and may also include reaching out to other First Nations and Métis communities such as the Fond du Lac First Nation and the Métis Local Northern Region I.

5.2.7 Socio-Economic Environment

5.2.7.1 Overview of Existing Conditions

Characterization of the existing socio-economic environment near the Project involved the use of both primary and secondary data sources. Data collection began with a review of existing literature and databases from a variety of public sources. When sufficient detail was not available from these secondary data sources, primary data collection interviews were completed to address these gaps. Twenty people were interviewed. The socio-economic environment is described below under the broad categories of population and health, infrastructure and services, and economy.

Two communities have been the focus of the socio-economic characterization near the Project, Black Lake First Nation (the community of Black Lake) and the northern hamlet of Stony Rapids (Stony Rapids). The Project site is located approximately 7 km from the community of Black Lake and about 25 km southeast of Stony Rapids (see Figure 2.3-1).

Black Lake is a Dene First Nation with members residing throughout Saskatchewan and in other locations. Black Lake First Nation has three registered reserve locations: Chicken Indian Reserve No. 224 (25,819 hectares [ha]; populated); Chicken Indian Reserve No. 225 (2,193 ha; no resident population); and Chicken Indian Reserve No. 226 (4,217 ha; no resident population; Aboriginal Affairs and Northern Development Canada [AANDC] 2012). According to Saskatchewan Health, the community of Black Lake had a population of 1,417 residents in 2011. Aboriginal Affairs and Northern Development Canada placed the total First Nation membership, including members who live off-reserve, at 2,028 in 2011. In comparison, according to Saskatchewan Health, Stony Rapids had a population of 158 residents in 2011. Similar to the Athabasca region and northern Saskatchewan, Black Lake and Stony Rapids contain a larger proportion of younger people (i.e., generally under 40 years of age) and a smaller proportion of older people (greater than 40 years) as compared to Saskatchewan as a whole.

Residents of the community of Black Lake participated in the 2001 Aboriginal Peoples Survey, which included several questions related to health. Among participants in the survey, 83% of adults living within the community of Black Lake reported excellent, very good, or good health, with approximately 17% reporting fair or poor health. Approximately 25% reported one or more long-term health condition(s), including high blood pressure, heart problems, effects of stroke, and other long term health conditions (Statistics Canada 2004a). Sixty-nine percent of children in the community of Black Lake were reported to be in excellent or very good health, while 26% were reported to be in good health. About 28% were reported to have one or more long-term health condition(s), approximately half of which were related to ear infections or ear problems (Statistics Canada 2004b). In general, health issues recognized as requiring attention and resources in the community include: tuberculosis, cancer, diabetes (particularly among Elders), alcohol and drug addictions, and lack of housing and overcrowding.

In terms of health and well-being, residents of the community of Stony Rapids would like to see increased mental health, addictions, and healing programs in their community. The following health issues also are recognized as requiring attention and resources in Stony Rapids: cancer, diabetes, tuberculosis, differential access to health care services between First Nation members and non-members, environmental health (especially the effects of forest fires in the area), and prenatal care and support services.

Residents of the communities of Black Lake and Stony Rapids have access to the Athabasca Health Authority (AHA) health facility located outside of Stony Rapids on Black Lake reserve land. The Dene name for this facility is Yutthe Dene Nakohoki, which means “a place to heal northern people”. The AHA health facility is unique because it is a joint provincial-federal initiative. Patients requiring emergency services that are unavailable at the AHA health facility typically are flown to La Ronge, Prince Albert, or Saskatoon, depending on their needs.

The communities of Black Lake and Stony Rapids each have schools. The school in the community of Black Lake is federally funded and the school in Stony Rapids is provincially funded. Father Porte School in the community of Black Lake is a First Nation operated facility covering Pre-Kindergarten to Grade 12. There are no post-secondary institutions in the Athabasca region, although Northlands College offers training and adult education programs throughout northern Saskatchewan (Cameco 2011). Although school enrolment is increasing in northern Saskatchewan, students are still at a disadvantage in completing post-secondary programs due to fewer high school classes in math and science, lower grades, absence of programs located in their home communities, and difficulty in finding qualified instructors (Northlands College et al. 2011).

Road access to the Athabasca region of northern Saskatchewan originates at Highway 102, which extends from La Ronge to its terminus at Southend. Highway 905 branches north off of Highway 102 near Southend. Beyond Points North Landing, Highway 905 continues as a gravel road, known as the Athabasca Seasonal/Winter Road. This road extends from Points North to a point near the community of Black Lake. During the non-winter seasons, Athabasca region communities, including Black Lake and Stony Rapids, do not have road access to the south on a road designed for general traffic use, although some residents of the communities of Black Lake and Stony Rapids continue to use the seasonal gravel road all year. Highway 905 between Black Lake and Stony Rapids is an all-season gravel road. Stony Rapids and Black Lake communities are also served by an airport in Stony Rapids.

The communities of Black Lake and Stony Rapids have a variety of community-based businesses (e.g., taxi services and local contractors) (Keewatin Career Development Corporation 2012). Additionally, both communities actively seek to build capacity and expand their business holdings. The top five industries that employed residents of the community of Black Lake in 2006 were education services industries (23.6%), mining and oil and gas extraction (23.5%), health care and social assistance industries (17.6%), public administration (14.7%), and construction industries (8.8%) (Statistics Canada 2007). The top industries employing residents of Stony Rapids in 2006 were health and social assistance industries (24.0%), mining and oil and gas extraction (20.0%), retail services (16.0%), and education service industries (12.0%) (Statistics Canada 2007).

While average income in the Athabasca Basin communities, including the communities of Black Lake and Stony Rapids, is generally lower than the provincial average income, many of the everyday costs of living in northern Saskatchewan (e.g., prices of groceries and fuel) are higher than in Saskatchewan as a whole (Public Health Nutritionists of Saskatchewan 2010).

The labour force indicators for the community of Black Lake reflect the major trend in Aboriginal labour force participation in Canada. Generally, Aboriginal people are under-represented in the workplace due to systemic and attitudinal barriers. Systemic barriers include non-inclusive dispute-resolution mechanisms. Attitudinal barriers include misconceptions and stereotypes of Aboriginal people. Additionally, location, distance to work sites, and lack of education (which often results in poor qualifications), can impede the participation of Aboriginal people in the labour force (INAC 2005).

6.0 FEDERAL INVOLVEMENT

6.1 Federal Financial Support

The Proponent is not aware of any federal funding available to construct and operate the Project, and as a result will not be making an application to the federal government for purposes of enabling the physical activities of the Elizabeth Falls Hydroelectric Project to proceed. If a source of funding becomes available in the future to assist EFHLP/BLFN for their equity participation in the project, then EFHLP/BLFN would pursue that option.

EFHLP/BLFN has in the past received, and currently receives, a small amount of funding (less than $100,000 per year) from AANDC for project development work under the Communities Economic Opportunities Program

(CEOP) initiative. Assuming partnership discussions between SaskPower and EFHLP/BLFN are successful, then additional funding under CEOP will not be available in the future.

6.2 Federal Lands

The proposed Project site is located approximately 7 km from the community of Black Lake (Figure 2.3-1), within the Chicken Indian Reserve No. 224 (AANDC 2011). Both the surface and subsurface resources of the Reserve are set aside for the use and benefit of the BLFN members. In 2009, an Order in Council (P.C.2009-305) was approved by the Governor General in Council, pursuant to paragraph 39(1)(c), and Section 40 of the *Indian Act* (Government of Canada, 1985), designating portions of the Chicken Indian Reserve No. 224, 225, and 226 for exploration and development of minerals, development of a hydroelectric facility, and commercial leasing purposes.

6.3 Federal Regulatory Requirements

Under Section 5 of the *CEAA, 2012* effects or changes that may be caused to the following as a result of the Project must be considered:

- fish and fish habitat, as defined in the *Fisheries Act*;
- aquatic species, as defined in the *SARA*;
- migratory birds, as defined in the *Migratory Birds Convention Act*, 1994;
- effects to Aboriginal peoples that may result in effects to health and socio-economic conditions, physical and cultural heritage, the current use of lands and resources for traditional purposes, or any structure, site or thing that is of historical, archaeological, paleontological, or architectural significance.

This Project is a designated project under the Regulations Designating Physical Activates, 2012, and therefore, the Agency would be considered the federal responsible authority for the Project. However, other federal agencies such as DFO, Transport Canada (TC), and Health Canada may have a regulatory interest in this project. Potential permits, licences, approvals or authorizations that may be required from a federal agency have been identified in Table 1.3-1.

The proponent is aware of recent changes to the *Navigable Waters Protection Act (NWPA)*. Based on information available, it appears unlikely that a permit under the *NWPA* will be required for construction activity associated with the Fond du Lac River. However, the changes have not yet been proclaimed, and as such, the permit has been identified as a potential requirement; further discussions with Transport Canada – Navigable Waters Protection may be required.

7.0 ENVIRONMENTAL EFFECTS

7.1 Potential Effects

The greatest amount of environmental disturbance associated with the Project is expected to occur during the construction phase in terms of the Project's overall development footprint and the workforce on-site. However, construction activities will occur over a relatively short period of time.

A preliminary site screening process was completed to identify anticipated potential effects from the interaction of the proposed Project with the various components of the biophysical and socio-economic environment. The identification of potential effects builds on the preliminary Project scoping meetings with government, public, and

First Nations and Métis people, and focuses the assessment on the potential interactions that are likely to lead to residual adverse environmental effects. Potential environmental effects related to the proposed Project were identified from a number of sources including:

- review of the Project Description (Section 3) and completion of a site screening study by the environmental and engineering teams for the Project, to identify potential environmental effects;
- socio-economic issues defined during initial scoping and other engagement activities with the public (i.e., local business owners and residents), members of the BLFN, and government and regulatory agencies;
- professional experience and judgment of potential interactions between the Project components and the socio-economic characteristics and structures of the local and regional communities; and
- scientific knowledge and experience with other hydroelectric developments in western and northern Canada.

Because the Project is a designated project, the environmental effects the project may have on components of the environment listed in paragraph 5(1)(a) of *CEAA*, 2012 must be assessed. These components include fish and fish habitat, aquatic species and migratory birds. However, the Project is located on, and therefore will have an effect on, federal lands administered by AANDC under the *Indian Act.* As a result, all potential effects resulting from a project located on federal land must be assessed subject to paragraph 5(1)(b) of the *CEAA*, 2012. A matrix of anticipated Project-environment interactions for the biophysical and socio-economic environments is provided in Table 7.1-1.

Interactions are defined as key adverse interactions, potential adverse interactions, key positive interactions, or no interaction. Key adverse interactions are those interactions identified during the initial Project screening and review process known to have, or thought likely to have, measureable adverse environmental or socio-economic effects within the local Project area. In general, these key adverse interactions have also been identified during the Aboriginal, public and regulatory engagement process. Potentially adverse interactions are identified as interactions with potential to affect the biophysical or socio-economic environments, but require further Project design information, including proposed mitigation measures, to determine whether the potential effect will be realized and what its implications may be for individual VCs. Key positive interactions are those interactions identified as likely having a positive environmental or socio-economic effect within the local Project area. It is also possible for an interaction to have a positive effect on one VC and a negative effect on a different VC.

The screening matrix identifies where interactions between Project activities/components and biophysical or socio-economic components exist, but does not represent the effects of these interactions. The identification of environmental issues and effects interactions is expected to evolve throughout the Project design and environmental assessment process. In addition, potential environmental effects that are identified through the engagement process, or that are contained within the EIS Guidelines prepared by the Agency, or the Terms of Reference (TOR) for the Project prepared by the Proponent at the provincial level, also will be incorporated into the environmental assessment.

Table 7.1-1: Potential Interactions between the Project and the Biophysical and Socio-economic Environments

Project Component/Activity	Expected Project Phase for Project Component/Activity	Potential Effects to Environmental Components	Biophysical Environment								Socio-economic Environment					
			Atmospheric Environment	Groundwater	Hydrology	Surface Water Quality*	Fish and Fish Habitat*	Soils and Terrain	Vegetation	Wildlife and Wildlife Habitat*	Heritage Resources*	Traditional Land and Resource Use*	Non-Traditional Land and Resource Use	Economy*	Infrastructure and Community Services	Population and Health*
■ Infrastructure Footprints ▪ Temporary infrastructure – work camp area – overburden and waste rock piles – construction area and materials laydown area ▪ Operational infrastructure – power generation station – water intake structure – power tunnel – tailrace channel – weir – bridge – transmission line – water diversion structures around the Project footprint – potable water and wastewater intake and discharge structures – site access roads (including source material)	Construction	■ Loss or alteration of permafrost can change terrain and affect soil, vegetation, wildlife habitat, and human activities.						•	•	•		•	•			
	Construction	■ Direct loss or alteration of local soil and vegetation from the Project footprint can affect vegetation and human activities.						•	•			•	•			
	Construction	■ Direct loss and fragmentation of wildlife habitat from the Project footprint can affect wildlife and human activities.								■		■	■			
	Construction	■ Site clearing, contouring, and excavation can cause admixing, compaction, and erosion to soils, and change soil quality.						•								
	Construction	■ Soil salvage, stockpiling and transport can change physical, biological, and/or chemical properties of soils, and increase erosion potential.						•								
	Construction	■ Site clearing, contouring, and excavation can cause soil erosion, which can change surface water quality and affect fish habitat, vegetation, wildlife habitat, and human activities.				•	•	•	•	•		•	•			
	Construction	■ Ground disturbance can alter or destroy heritage resources.									•					
■ General Construction and Operation of Project	Construction, Operations, and Decommissioning and Reclamation	■ Introduction of weed species can affect plant community composition, and listed and traditional use plant species.							•							
	Construction, Operations, Decommissioning and Reclamation, and Post-Decommissioning and Reclamation	■ Physical hazards (e.g., blasting activities, tailrace channel, buildings, waste rock piles) from the Project can cause injury or mortality to wildlife and affect wildlife populations and human activities.								•		•	•			

Table 7.1-1: Potential Interactions between the Project and the Biophysical and Socio-economic Environments (continued)

Project Component/Activity	Expected Project Phase for Project Component/Activity	Potential Effects to Environmental Components	Biophysical Environment								Socio-economic Environment					
			Atmospheric Environment	Groundwater	Hydrology	Surface Water Quality*	Fish and Fish Habitat*	Soils and Terrain	Vegetation	Wildlife and Wildlife Habitat*	Heritage Resources*	Traditional Land and Resource Use*	Non-Traditional Land and Resource Use	Economy *	Infrastructure and Community Services	Population and Health*
■ General Construction and Operation of Project (continued)	Construction, Operations, Decommissioning and Reclamation, and Post-Decommissioning and Reclamation	■ Site infrastructure (e.g., tailrace) may restrict wildlife movement and increase risk of mortality from predation or hunting, which can affect wildlife and human activities.								•		•	•			
	Construction, and Operations, and Decommissioning and Reclamation	■ Collisions with Project vehicles can cause injury or mortality to wildlife and affect wildlife populations and human activities.								■		■	■			
	Construction	■ Construction of site infrastructure can affect local and regional economies, employment levels, and quality of life for people.												♦		♦
	Operations	■ Operation of the Project can affect local and regional economies, employment levels, education and training of people, and quality of life for people.												♦		♦
	Construction, Operations, Decommissioning and Reclamation, and Post-Decommissioning and Reclamation	■ Construction of site roads and bridge can change traffic levels and access to areas on the east side of the Fond du Lac River, which can affect wildlife and human activities.					•		•	■		■	■	■	•	
	Construction and Operations	■ Attraction of birds to Project infrastructure for roosting and nesting sites can affect bird populations and human activities.								•		•	•			
	Construction, Operations, and Decommissioning and Reclamation	■ Sensory effects (e.g., presence of buildings, lights, smells, noise, blasting activity, and vehicles) can wildlife, human activities, and quality of life for people.	•							■		•	•			■
	Construction, Operations, and Decommissioning and Reclamation	■ Change in energetic costs from disturbance or displacement can affect wildlife and human activities.	•							■		■	■			
	Construction	■ Destruction of migratory bird nests can affect wildlife populations and human activities.								■		■	■			

Table 7.1-1: Potential Interactions between the Project and the Biophysical and Socio-economic Environments (continued)

Project Component/Activity	Expected Project Phase for Project Component/Activity	Potential Effects to Environmental Components	Biophysical Environment								Socio-economic Environment					
			Atmospheric Environment	Groundwater	Hydrology	Surface Water Quality*	Fish and Fish Habitat*	Soils and Terrain	Vegetation	Wildlife and Wildlife Habitat*	Heritage Resources*	Traditional Land and Resource Use*	Non-Traditional Land and Resource Use	Economy *	Infrastructure and Community Services	Population and Health*
■ Construction of In-water Works ▪ power tunnel ▪ water intake structure ▪ tailrace ▪ weir structure ▪ bridge	Construction	■ Construction of the power tunnel and intake structure may disturb sediment, which can change surface water quality, and affect fish and fish habitat.				●	●					●	●			
	Construction and Operations	■ Direct loss or alteration of fish habitat from the Project footprint can affect fish and human activities.					■					■	■			
	Construction	■ Use of explosives near fish-bearing water can cause injury or mortality to fish, which can affect fish populations and human activities.					■					■	■			
	Construction	■ Use of explosives near surface waterbodies can change surface water quality and affect soils, vegetation, wildlife habitat, fish habitat, and human activities.	●			■	●	●	●	●		■	■			
▪ Air Emissions and Noise Levels ▪ emission of dust from blasting activities and hauling waste rock to storage piles. ▪ emission of standard pollutants from vehicles and heavy equipment operation	Construction, Operations, and Decommissioning and Reclamation	■ Air emissions from site can change the chemical properties of surface water and soil, which can affect vegetation, fish habitat, wildlife habitat, and human activities.	●			●	●	●	●	●		●	●			●
	Construction, Operations, and Decommissioning and Reclamation	■ Air emissions from site can change the chemical properties of surface water and soil, which can affect the health of vegetation, fish, wildlife, and people.	●			●	●	●	●	●		●	●			●
	Construction, Operations, and Decommissioning and Reclamation	■ Dust deposition from Project vehicles and blasting activities can change the chemical properties of surface water, soil, and vegetation, which can affect fish habitat, wildlife habitat, and human activities.	●			●	●	●	●	●		●	●			●
	Construction, Operations, and Decommissioning and Reclamation	■ Dust deposition from Project vehicles and blasting activities, may cover aquatic substrates, soils, and vegetation, which can affect the fish, fish habitat, wildlife habitat, and human activities.	●			●	●	●	●	●		●	●			●
	Construction, Operations, and Decommissioning and Reclamation	■ Dust deposition from Project vehicles and blasting activities can change the chemical properties of surface water and soil, which can affect the health of vegetation, wildlife, fish, and people.	●			●	●	●	●	●		●	●			●

Table 7.1-1: Potential Interactions between the Project and the Biophysical and Socio-economic Environments (continued)

Project Component/Activity	Expected Project Phase for Project Component/Activity	Potential Effects to Environmental Components	Biophysical Environment								Socio-economic Environment					
			Atmospheric Environment	Groundwater	Hydrology	Surface Water Quality*	Fish and Fish Habitat*	Soils and Terrain	Vegetation	Wildlife and Wildlife Habitat*	Heritage Resources*	Traditional Land and Resource Use*	Non-Traditional Land and Resource Use	Economy *	Infrastructure and Community Services	Population and Health*
■ Power Generation Activities ▪ water withdrawal for power generation ▪ diversion of water through the power tunnel to the powerhouse ▪ discharge of tailrace flows	Operations	■ Water withdrawal from Black Lake may cause injury, impinge, or entrain fish and affect fish populations and human activities.					■					■				
	Operations	■ Withdrawal, diversion, and discharge of water for power generation may change hydrology, which can affect fish habitat, soils, vegetation, wildlife habitat, and human activities.			■		■	●	●	●		■				
	Operations	■ Withdrawal and discharge for power generation may change the temperature of the water which can affect fish habitat, wildlife habitat, and human activities.				■	●			●		■				
	Operations	■ Withdrawal and discharge for power generation may change the temperature of the water and therefore ice safety in Black Lake and Middle Lake, which can affect wildlife and human activities.			●					●		●				
	Operations	■ Withdrawal, diversion, and discharge of water for power generation may change groundwater, surface water, and soil quality, and affect the health of vegetation, fish, wildlife, and people.				■	●	●	●	●		■				●
	Operations	■ Diversion of water through the power tunnel may change groundwater quantity, which can change hydrology, and affect soils, terrain, vegetation, fish habitat, wildlife habitat, and human activities.		●	●	●	●	●	●	●		●				
■ Waste Management	Construction, Operations, and Decommissioning and Reclamation	■ Consumption of waste materials (e.g., food waste, oil products) may affect wildlife health and, therefore, human health.								■						■
	Construction, Operations, and Decommissioning and Reclamation	■ Attraction to the Project (e.g., food waste, oil products) may increase human-wildlife interactions and mortality risk to individual animals, which can affect wildlife populations and human activities.								■		■				
	Construction, Operations, and Decommissioning and Reclamation	■ Attraction to the Project (e.g., food waste, oil products) may increase predator numbers and predation risk, which can affect prey populations and human activities.								■		■				

Table 7.1-1: Potential Interactions between the Project and the Biophysical and Socio-economic Environments (continued)

Project Component/Activity	Expected Project Phase for Project Component/Activity	Potential Effects to Environmental Components	Biophysical Environment								Socio-economic Environment					
			Atmospheric Environment	Groundwater	Hydrology	Surface Water Quality*	Fish and Fish Habitat*	Soils and Terrain	Vegetation	Wildlife and Wildlife Habitat*	Heritage Resources*	Traditional Land and Resource Use*	Non-Traditional Land and Resource Use	Economy *	Infrastructure and Community Services	Population and Health*
■ Site Water Management ▪ collection and treatment of surface runoff within the project footprint ▪ withdrawal of potable and industrial water ▪ discharge of wastewater ▪ collection and treatment of groundwater in the tunnel	Construction and Operations	■ Water withdrawal for domestic (e.g., potable water) and industrial (e.g., dust suppression) purposes can change hydrology which can affect soils, vegetation, wildlife, fish and fish habitat and, therefore, human activities.			•		•	•	•	•		•	•			
	Construction and Operations	■ The interception and collection of direct precipitation and surface runoff within the Project footprint may change hydrology which can affect soils, vegetation, wildlife habitat, fish, fish habitat, and human activities.			•		•	•	•	•		•	•			
	Construction and Operations	■ The interception and collection of direct precipitation and surface runoff within the Project footprint may drawdown the local groundwater table and change hydrology and soils which can affect vegetation, wildlife habitat, fish, fish habitat, and human activities.		•	•		•	•	•	•		•	•			
	Construction and Operations	■ Surface water diversions (e.g., berms, ditches, waste rock piles) around the Project footprint can change drainage areas, runoff characteristics, and local and downstream hydrology, which can affect soils, vegetation, wildlife habitat, fish habitat, fish, and human activities.			•		•	•	•	•		•	•			
	Construction and Operations	■ Discharge of wastewater can change hydrology and surface water quality, which can affect soils, vegetation, wildlife habitat, fish habitat, and human activities.			•		•	•	•	•		•	•			
	Construction and Operations	■ Discharge of wastewater can affect surface water quality, which can affect the health of vegetation, wildlife, fish, and people.				■	•		•	•						■
	Construction, Operations, and Decommissioning and Reclamation	■ Seepage from waste rock piles can change surface water, groundwater, and soil quality, and affect vegetation, wildlife habitat, fish habitat, and human activities.		•		•	•	•	•	•		•	•			
	Construction, Operations, and Decommissioning and Reclamation	■ Seepage from waste rock piles can change surface water, groundwater, and soil quality and affect vegetation, wildlife, fish, and human health.		•		■	•	•	•	•		•	•			■

Table 7.1-1: Potential Interactions between the Project and the Biophysical and Socio-economic Environments (continued)

Project Component/Activity	Expected Project Phase for Project Component/Activity	Potential Effects to Environmental Components	Biophysical Environment								Socio-economic Environment					
			Atmospheric Environment	Groundwater	Hydrology	Surface Water Quality*	Fish and Fish Habitat*	Soils and Terrain	Vegetation	Wildlife and Wildlife Habitat*	Heritage Resources*	Traditional Land and Resource Use*	Non-traditional Land and Resource Use	Economy *	Infrastructure and Community Services	Population and Health*
■ Decommissioning and Reclamation of Temporary Infrastructure ▪ site grading, contouring, reclamation, and re-establishment of natural drainage characteristics ▪ waste rock management ▪ cessation of potable water withdrawal and wastewater discharge	Construction	■ Long-term contaminant transport from waste rock and the diversion tunnel can change surface water, groundwater, and soil quality, and affect vegetation, wildlife habitat, fish habitat, and human activities.		•		•	•	•	•	•		•	•			
	Construction	■ Long-term contaminant transport from waste rock and the diversion tunnel can change surface water, groundwater, and soil quality, and affect the health of vegetation, wildlife, fish, and people.		•		•	•	•	•	•						•
	Construction and Operations	■ The waste rock piles will alter terrain and may affect wildlife, human activities, and quality of life for people (i.e., visual aesthetics).						•		•		•	•	•		
■ Decommissioning and Reclamation of Power Production Infrastructure ▪ site grading, contouring, reclamation, and re-establishment of natural drainage characteristics ▪ waste rock management ▪ cessation of potable water withdrawal and wastewater discharge ▪ cessation of power generation activities including the withdrawal, diversion, and discharge of water ▪ weir	Decommissioning and Reclamation and Post-Decommissioning and Reclamation	■ Cessation of power generation activities, including the withdrawal, diversion, and discharge of water, can change hydrology and surface water quality, which can affect soils, vegetation, fish, fish habitat, wildlife, wildlife habitat, and human activities.			■		■	•	•	•		■	■			
	Post- Decommissioning and Reclamation	■ Direct loss or alteration of local soil and vegetation from residual ground disturbance from portions of the site facilities can cause permanent loss and alterations to soil and vegetation, and affect human activities.						•	•			•	•			
	Post- Decommissioning and Reclamation	■ Direct loss and fragmentation of wildlife habitat from residual ground disturbance from portions of the site facilities can affect wildlife and human activities.								■	•	■	■			
	Post- Decommissioning and Reclamation	■ Residual ground disturbance from portions of the site facilities can cause permanent alterations to hydrology and surface water quality, which can affect soils, vegetation, fish habitat, wildlife habitat, and human activities.			•		•	•	•	•		•	•			
	Decommissioning and Reclamation	■ Redistribution of material in the waste rock piles for use in the decommissioning and reclamation of power production infrastructure can change air and surface water quality, which can affect soils, vegetation, fish habitat, fish, wildlife habitat, and human activities.	•			•	•	•	•	•		•	•			
	Decommissioning and Reclamation	■ Alteration or destruction of heritage resources if areas outside original footprint are disturbed during reclamation process (e.g., new borrow source).									•					
	Decommissioning and Reclamation and Post-Decommissioning and Reclamation	■ Cessation of power generation activities can affect local and regional economies, employment levels, and quality of life for people.												•	•	•

Table 7.1-1: Potential Interactions between the Project and the Biophysical and Socio-economic Environments (continued)

Project Component/Activity	Expected Project Phase for Project Component/Activity	Potential Effects to Environmental Components	Biophysical Environment								Socio-economic Environment					
			Atmospheric Environment	Groundwater	Hydrology	Surface Water Quality*	Fish and Fish Habitat*	Soils and Terrain	Vegetation	Wildlife and Wildlife Habitat*	Heritage Resources*	Traditional Land and Resource Use*	Non-traditional Land and Resource Use	Economy *	Infrastructure and Community Services	Population and Health*
■ Accidents and Malfunctions ▪ emergency shutdowns of power turbines ▪ hazardous materials spills	Operations	■ Emergency shutdown of power generation activities can change surface hydrology, which can affect soils, vegetation, wildlife, wildlife habitat, fish, fish habitat, and human activities.			■		■	●	●	●		■	■			
	Construction, Operations, and Decommissioning and Reclamation	■ Release or spills of hazardous substances (e.g., fuel, oil) can change surface water and soil quality, which can affect vegetation, fish habitat, wildlife habitat, and human activities.				●	●	●	●	●		●	●			
	Construction, Operations, and Decommissioning and Reclamation	■ Release or spills of hazardous materials (e.g., fuel, oil) can change surface water and soil quality, which can affect the health of vegetation, fish, wildlife, and people.				●	●	●	●	●		●	●			●

■ Key Adverse Interaction
● Potential Adverse Interaction
♦ Key Positive Interaction
Blank cell – no Interaction anticipated
*Represents a biophysical or socio-economoic component identified under Section 5 of the CEAA, 2012.
-Surface Water Quality, and Fish and Fish Habitat: includes fish and fish habitat, as defined in the *Fisheries Act*, and aquatic species, as defined in the *Species at Risk Act*.
-Wildlife and Wildlife Habitat: includes migratory birds, as defined in the *Migratory Birds Convention Act,* 1994.
-Heritage Resources, Traditional and Non-traditional Land use, Quality of Life, and Economy, Employment, and Training: includes effects that may be caused on the environment that may effect aboriginal health and socio-economic conditions, physical and cultural heritage, the current use of lands and resources for traditional purposes, and any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

Important issues concerning the Project’s biophysical and socio-economic environments (discussed in the following sections) include:

- potential changes to hydrology and water quality from power generation activities (including withdrawal, diversion, and discharge) and consequent effects to fish and fish habitat as defined in the *Fisheries Act* and aquatic species, as defined in *SARA*;
- potential effects on wildlife from the Project footprint, vehicle traffic, sensory effects, and domestic and industrial waste; this includes migratory birds, as defined in the *Migratory Bird Convention Act, 1994*;
- potential effects on traditional and non-traditional land and resource use as the result of potential effects to the terrestrial and aquatic environments from the Project;
- potential effects on the population and health of those living nearest the Project resulting from changes associated with the Project, and
- potential employment, training, and economic development.

7.1.1 Changes to Hydrology and Water Quality from Power Generation Activities (Including Withdrawal, Diversion, and Discharge) and Consequent Effects to Fish and Fish Habitat

Power generation activities include the activities directly associated with the operation of power turbines. This included the withdrawal of water from Black Lake, the diversion of water through the power tunnel, and the discharge of this water through the tailrace channel upstream of the inflow to Middle Lake. Hydrological and aquatic effects of these activities in the LSA are predicted to occur in three areas: Black Lake, the bypassed section of the Fond du Lac River, and the inflow to Middle Lake and Middle Lake.

Black Lake

Water withdrawal from Black Lake for power generation has potential to affect water levels in the lake. Under maximum operating conditions, the outflow structure associated with the power facility will withdraw water from Black Lake at 160 to 190 m^3/s. While inflow to Black Lake will remain at natural rates, withdrawal and diversion will create a secondary outflow, consequently altering the water balance and equilibrium state of the lake. A weir structure is proposed at the outflow of Black Lake to reduce the resulting effects to water levels and to manage riparian flow and water diversion volumes in response to environmental conditions. The weir structure will reduce riparian flow through the bypassed section of the Fond du Lac River. This reduction of the amount of water leaving Black Lake and the management of water through the powerhouse tunnel will facilitate the maintenance of close to natural water levels in Black Lake and long-term equilibrium with inflow rates.

Despite mitigation, water levels in Black Lake likely will be affected, but are expected to remain within their historical range. There is potential for changes to the average water level and the seasonal variation in water level of Black Lake. These changes to hydrological conditions may affect fish and fish habitat in the lake. The changes also may affect soils by exposing riparian sediments if water level drops or eroding shorelines if water level increases. Changes to soil may affect corresponding vegetation which, in conjunction with changes to fish populations, can affect the wildlife that relies on these. Nonetheless, these changes can also occur naturally, and have likely occurred historically.

Water withdrawal from Black Lake has potential to entrain fish with water flows entering the power tunnel at the water intake. Under maximum operating conditions, the water velocities associated with the water intake are projected to be 1.25 m/s at the trash rack face, with trash rack spacings of 50 mm. The invert (floor) of the 9.1 metre diameter tunnel is designed to be approximately 12 metres below the water surface, so water will be drawn into the tunnel from water depths between approximately 3.0 and 12.0 m depth. The design of the intake structure will ensure a smooth and gradual acceleration of the flow. The flow velocity at the upstream face of the trashrack will be limited to 1.25 m/s. The spacing of the bars will prevent the passage of fish of 50 millimetres (mm) or greater width from entering the power tunnel and turbine water passage ways. During final design, the need for fish screens, other deterant or barrier devices, or a finer trashrack will be assessed on environmental considerations (e.g., during critical periods of fish migration).The final design of the fish screening system will be assessed by mid-2013 during the final Project design phase, and information included with the EIS.

Fond du Lac River

During the operation of the Project, water flows and levels in the middle section of the Fond du Lac River will be altered by the withdrawal of 160 to 190 m^3/s from upstream Black Lake for use in the hydroelectric power facility. Under baseline conditions mean annual flow in the Fond du Lac River is 305 m^3/s with an average annual peak flow of 472 m^3/s, and an average annual low flow of 188 m^3/s. Potential changes to the water balance (inflow rate to outflow rate) in Black Lake will result in corresponding changes in riparian flow rates through the Fond du Lac River. In addition, the operation of a weir structure at the outflow of Black Lake will affect the quantity of water flowing through the Fond du Lac River as riparian flow. During the operation of the hydroelectric power facility, the Project has committed to maintaining a minimum riparian flow of 50 to 125 m^3/s, depending on which instream flow requirement scenario is selected (Table 3.2-1). Although riparian flows will be reduced from natural conditions, flows may remain considerably higher than the minimum rate for a considerable portion of the year.

A reduction in riparian flow and corresponding water level and volume reduction in the Fond du Lac River will lead to a loss or alteration of fish habitat along the reach. The expected effects, in comparison with present conditions, include a reduction in fish spawning, overwintering, rearing, and foraging habitat along the bypassed section of the river, and potentially, increasing or decreasing movement of fish through different sections of the river. However, flow management strategies, such as limiting changes during dry years and/or sensitive periods such as spring spawning, will help to mitigate these effects. As well, certain portions of the river not presently characterised as potential fish spawning or rearing habitat due to high flow, may become suitable habitat.

The reduced water levels also may expose riparian sediments, which can affect soil characteristics and vegetation. Potential loss of aquatic habitat and reduction in fish populations, and changes to vegetation may affect wildlife species in the area. In addition, the reduced flows and water levels may change the river's physical appearance and aesthetic qualities.

Middle Lake Inflow and Middle Lake

Although few effects are anticipated to occur in Middle Lake, some changes may be measurable and will be evaluated. Diverted water will re-enter the Fond du Lac River upstream of the inflow to Middle Lake. At this location, flow into Middle Lake and corresponding water levels in Middle Lake will be a function of the volume of riparian flow in the Fond du Lac River and the volume of water diverted through the power turbines. The total volume is likely to differ from natural discharge rates, thus potentially affecting water levels and flow rates and, their seasonal variations. The small volume of Middle Lake means that it would respond quickly to changes in inflow. In addition, the outflow through the tailrace channel will alter the hydraulics at the inflow to Middle Lake and in Middle Lake. This potential change will be evaluated in more detail in the EIS document.

Changes to hydrological and hydraulic conditions in the inflow to Middle Lake and in Middle Lake may affect fish spawning, overwintering, rearing, foraging habitat, and riparian areas.

Development and implementation of a Fish Habitat Compensation Plan will be one of the mitigations measures proposed to reduce the effect of the Project on fish and fish habitat in Black Lake, the Fond du Lac River, and potentially Middle Lake. A conceptual Fish Habitat Compensation Plan will be submitted with the EIS.

7.1.2 Effects to Wildlife from the Project Footprint, Vehicle Traffic, Sensory Effects, and Domestic and Industrial Waste

Ground disturbance associated with the Project footprint, (i.e., powerhouse, tailrace channel, power tunnel corridor, and access roads) could cause a direct loss or fragmentation of wildlife habitat, which could affect wildlife populations in the LSA and RSA. Potential changes to the physical and chemical characteristics of soil and vegetation from the physical footprint of the Project also could affect wildlife habitat quality.

Several Project activities have potential to cause injury to wildlife or affect wildlife health, including physical hazards such as blasting activities, the tailrace channel, waste rock piles, roads, and other infrastructure. For example, mammals species (e.g., wolverine [*Gulo gulo*], black bear [*Ursus americanus*], moose [*Alces alces*], and marten [*Martes americana*]) potentially could be injured attempting to cross access roads or the tailrace channel. In addition, the Project is expected to increase traffic volume at the Project site, and on local access roads and trails. This change in traffic volume may increase the potential for wildlife collisions with vehicles, which may cause injury or mortality to individual animals.

Sensory effects from blasting activities, as well as the presence of buildings, people, and lights also may affect wildlife. For example, elevated noise levels can influence songbird mating success in spring by interrupting communication between mates. Domestic and industrial waste from Project construction activities may attract wildlife to the Project and increase human-wildlife interactions, which can affect wildlife health. Air and dust emissions generated during Project construction activities (i.e., from blasting, vehicles, and heavy equipment) can cause changes to the chemical properties of soils, affecting vegetation, wildlife habitat, and wildlife health.

Effects of surface flow diversion associated with operation of the Project have the potential to affect components of the terrestrial environment. Direct loss of riverine habitat in the mid-section of the Fond du Lac River is expected to affect aquatic and semi-aquatic wildlife, including riverine mammals (e.g., river otter [*Lontra canadensis*]), waterfowl (e.g., ducks and geese), and amphibians (e.g., frogs). Birds and mammals that feed on fish from the river (e.g., osprey [*Pandion haliaetus*], bald eagle [*Haliaeetus leucocephalus*], and mink [*Neovison vison*]) may be affected by reduced availability of fish prey resources in the mid-reach section of the river. Changes to hydrology, including altered flow regimes and changes to local lake and river levels can cause changes to soils and vegetation, possibly influencing wildlife habitat conditions in the LSA. Finally, the potential for a rapid reduction in outflow from the Project (i.e., associated with a loss of electrical power) may influence the terrestrial environment near the Fond du Lac River below the tailrace discharge outflow as well as in Middle Lake.

Two federally-listed species (wolverine and olive-sided flycatcher [*Contopus cooperi*]) (COSEWIC 2012; *SARA* 2012) and two provincially-tracked species (bald eagle and sandhill crane [*Grus canadensis*]) (SKCDC 2012a) were recorded during wildlife baseline surveys. The presence of these species is not expected to be a key issue for wildlife as wolverine, sandhill crane, and olive-sided flycatcher were not recorded within the LSA. Bald eagle foraging habitat may improve with the development of the Project.

Implementation of the Project's environmental design features and mitigation are expected to decrease potential Project interactions with components of the terrestrial environment. For example, land clearing will be completed outside of the breeding bird season to reduce disturbance to local species. The tailrace channel structure will be fenced to keep wildlife away from potentially hazardous areas. Speed limits will be enforced on local roads and trails to reduce potential for wildlife-vehicle collisions. Finally, the installation of the weir in the Fond du Lac River combined with the management of flows through the Project is expected to reduce effects on wildlife species that use the mid-reach section of the Fond du Lac River.

7.1.3 Effects to Traditional and Non-traditional Land and Resource Use as the Result of Potential Effects to the Terrestrial and Aquatic Environments from the Project

The proposed Project area has been used traditionally for generations by the Aboriginal people of the region. Traditional resource use by the people of this area is a defining feature of their cultures and identities. In addition to hunting/trapping of various wildlife species, traditional land use also includes fishing and gathering of plants and berries for domestic use. Non-traditional activities, such as commercial fishing, and using forest products create approximately 4,000 seasonal jobs and generate seasonal income to residents in northern Saskatchewan. Tourism is another non-traditional land use activity that occurs near Elizabeth Falls.

Project activities with the potential to have a negative effect on populations and habitats of plants, wildlife, and fish species in the LSA and RSA also have the potential to affect traditional and non-traditional land and resource use activities. However, implementation of the Project's environmental design features and mitigation to decrease potential Project-environment interactions with aquatic and terrestrial components would reduce potential effects to traditional and non-traditional land and resource use activities.

7.1.4 Economy

Construction and operation of the Project will create jobs and contribute to local and regional economies. Based on the feasibility study, it is estimated that the Project will create approximately 145 jobs and the construction camp population could range from 100 to 150 people during the construction period. It is anticipated that between four and six people will be required to maintain and operate the plant upon completion of construction.

Employment and business opportunities are valued by individuals who may benefit directly or indirectly from income generated by the Project. Changes in the level of employment and business activity will affect the standard of living of individuals. These changes will likely be observed in the communities directly affected by the Project's activities. The Project also may affect taxation and the cost of living for some communities.

Changes to education and training opportunities can be measured in terms of proponent investments in training, and available training and educational facilities in the region. For example, if the presence of the Project increases training options in the local area, the effect or "benefit" may be that local residents can take advantage of the nearby training. Consequently, local residents could capture more of the employment opportunities and would not need to relocate to obtain the necessary skills training.

To this end, it is the intent of the Proponent to maximize the use of local contractors who employ people from local First Nation and Mètis communities. The Proponent will develop training programs and provide funding to prepare local community members for Project jobs and contracting opportunities so that the economic benefits of the Project to the local community are realized during construction and Project operation. Training programs are anticipated to be available sufficiently in advance so that workers are trained and prepared to work when construction begins.

7.1.5 Effects to Infrastructure and Community Services Associated with the Project

Construction and operation of the Project will result in an increase in use of local infrastructure and community services. During construction there will be an increase in traffic volume on the local access roads, particularly in the number of larger vehicles used to transport equipment and materials to the Project site. This will become less frequent during operations; however there still will be increased road use by employees required to travel to and from the site. An increased use of local access roads will result in an increased need for road maintenance. During construction there will be an increase in the number of people using the local health care services and facilities for routine health care and potentially to handle work related incidents.

Depending on the location of the construction camp, there is also the potential for increased dependence on local infrastructure such as sewer and water utilities and solid waste disposal. The proponent will work with the BLFN, and the community of Stony Rapids to address any potential infrastructure constraints in advance of the Project.

7.1.6 Effects to Population and Health Resulting from Changes Associated with the Project.

Through various activities, the Project has the potential to affect the quality of life, on personal, family, and community levels, for people living near the Project site. For example, construction and operation have the potential to change water and air quality, aesthetics, and noise levels in the Project area, which can affect people.

The quality and capacity of services in a community contribute to the overall standard of living and quality of life for residents. Project employment will result in increased household incomes and potentially increase demand for community services. Increased household incomes and demand for services may influence patterns of family and community life, which is a component of overall quality of life.

7.2 Valued Components

7.2.1 Introduction

The selection of biophysical and socio-economic VCs is an important step in the environmental assessment for this Project. It is a process that reflects a balanced and knowledgeable synthesis of a wide range of information including the Project design, the environmental setting where the Project is located, and an understanding of concerns and issues associated with the development of the Project.

Valued components represent physical, biological, cultural, social, and economic properties of the environment that are considered to be important to society. The interrelationships between components of the biophysical and human environments provide the structure of a social-ecological system (Walker et al. 2004; Folke 2006). The concept of using VCs as a fundamental aspect of environmental assessment in Canada and elsewhere was established approximately 30 years ago (Beanlands and Duinker 1983). The selection of VCs is an important step in the environmental assessment process as it enables the detailed environmental effects analysis to focus on key elements of the environment and the Project. It is not practical to study and evaluate all aspects of the biophysical and human environments to the same level of detail, so a properly selected list of VCs is critical to the functionality and success of the environmental assessment.

In the natural environment, VCs can be found at the beginning, middle, or end of Project-environment interactions, or analogously, at the bottom, middle, or top trophic level of food chains. Cultural and socio-economic VCs typically enter at the middle and top levels of interactions. For example, people hunt moose (*Alces alces)* that occur in the middle of the food chain, and fish for northern pike (*Esox lucius*), which occur at the top of food chains. Exceptions include the drinking of water, as well as harvesting berries and medicinal plants, which occur at the lower trophic levels.

A variety of information is used in the selection of VCs to reflect the scope and the scale of the Project, including environmental baseline studies, potential Project-environment interactions, and engagement with public, First Nations, Métis people, government, and regulatory agencies. In addition, professional judgment and experience, and current environmental assessment practices also are used in the selection of VCs.

7.2.2 Selection of Valued Components

Upon completion of the potential effects scoping, the VC selection process considered feedback from ongoing regulatory, public, and First Nations and Métis engagement activities, professional judgment and experience, and current environmental assessment practices. The VCs selected at this point in the environmental assessment process include components and sub-components of the biophysical and socio-economic environments:

- atmospheric environment (air and noise);
- hydrogeology (groundwater quality and quantity);
- hydrology;
- surface water quality;
- fish (whitefish, lake trout, northern pike, walleye, Arctic grayling, and sucker species) and fish habitat;
- soils and terrain;
- vegetation (wild blueberries, bog cranberries, wild strawberries, moss berries and caribou moss);
- wildlife (moose, marten, beaver, upland breeding birds, waterbirds);
- heritage resources;
- traditional and non-traditional land and resource use;
- economy;
- infrastructure and community services; and
- population and health.

The selected VCs were chosen because of their ecological, social, cultural, and/or economic value, and their potential sensitivity to adverse environmental effects from the Project. The identification and rationalization for some VCs is more straightforward than for others. For example, common nighthawk (*Chordeiles minor*) was selected as a representative species for wildlife because it is a federally-listed species under *SARA* (2011) and COSEWIC (2012). Changes in some VCs are critical to understanding the potential for causing adverse residual environmental effects on other VCs (e.g., changes in air and water quality have the potential to cause further changes in the terrestrial and/or aquatic ecosystem).

The following section provides the rationale for the selection of each VC. The VCs are presented in the order of discussion and are not ranked in terms of importance. Additional information on the environmental assessment approach that will be used for the Project is provided in Appendix D.

7.2.2.1 Atmospheric Environment

Air quality predictions, including ground level concentrations and deposition rates of some compounds, are linked closely to other disciplines such as surface water quality, fish habitat, soils, vegetation, wildlife, and people. Similarly, changes in noise levels from the Project can have local influences on people and wildlife. Air quality and noise have been identified as concerns by local communities and residents. However, these concerns are related more directly to how changes in air quality or noise levels will affect the quality of life of people living near the Project. As a result, the atmospheric environment is considered as an interaction VC.

7.2.2.2 Groundwater

Changes to groundwater can affect groundwater-surface water dynamics, which result in strong connections between groundwater quantity and quality and components of the surface water and terrestrial environments, and people that use these resources. Due to the important role groundwater can play in an ecosystem; the protection of groundwater is commonly a concern of local people, First Nations and Métis, and regulatory agencies. The key role water plays in the success of this Project inherently makes groundwater an important consideration.

7.2.2.3 Hydrology

The availability of surface water to sustain aquatic life was identified as a concern by the public, First Nations and Métis, and regulatory agencies in the Project region. The healthy functioning and maintenance of aquatic ecosystems relies on continual interaction amongst climate, atmospheric conditions, the hydrological cycle, water properties, and aquatic species. Natural and human-related disturbances can alter the timing and nature of the interaction between physical and biological components of the surface water environment. Changes in hydrology can also influence components of the terrestrial environment (e.g., soil, vegetation and wildlife) and the availability of natural resources for traditional and non-traditional human use.

7.2.2.4 Surface Water Quality

Surface water quality is important to community members, provincial and federal government regulators and resource managers, as well as others in northern Saskatchewan. Surface water quality is considered an interaction VC. Therefore, the potential adverse environmental effects of the Project on various surface water quality components and other biophysical and socio-economic features of the environment that depend on surface water quality, are considered.

7.2.2.5 Fish and Fish Habitat

During interviews conducted for the socio-economic baseline investigations, local Aboriginal people identified several fish species as VCs: lake whitefish, lake trout, northern pike, walleye, Arctic grayling, and sucker species. Fish habitat is critical to the growth and development of the various life stages of fish species, and is therefore also considered a VC for the aquatic environment. Fish and fish habitat can be influenced by Project related changes in other VCs, including water quality, hydrology, and air quality (i.e., dust deposition). Effects to fish and fish habitat and effects to aquatic species as defined in the Species at Risk Act are areas of federal jurisdiction; as such, potential effects also will be evaluated pursuant to Section 5 of the *CEAA, 2012*.

7.2.2.6 Soils and Terrain

Strong links exist among terrain, soils, vegetation, wildlife, and wildlife habitat that constitute the landscape. The terrestrial ecosystem function relies on the interactions among climate, soils, the hydrological cycle, vegetation, and wildlife species. Natural and human-related disturbances can change the interactions between the physical and biological components of the terrestrial environment. Changes in the terrestrial environment can also influence the opportunity for traditional and non-traditional human use of natural resources (e.g., hunting, trapping), and can affect socio-economic components (e.g., accommodation services).

7.2.2.7 Vegetation

Vegetation is valued by people both intrinsically and for its ability to provide food, fuel, medicines, construction material, and economic opportunities. Vegetation also provides food and habitat for wildlife. Tracked plant species for the province of Saskatchewan and the federal designations for plant species at risk in Canada are protected under provincial and federal conservation legislation and documents. Consequently, vegetation was selected as a VC to include plant populations and communities (e.g., wetlands), tracked plant species, and traditional use plants. Plant species considered to be VCs by local Aboriginal people include: wild blueberries, bog cranberries, wild strawberries, moss berries and caribou moss.

7.2.2.8 Wildlife

Wildlife includes a diverse group of species that are a potential food source for people and other wildlife. Listed wildlife species are protected according to federal and provincial legislation. Consequently, representative receptors were chosen based on their potential for interaction with the Project, socio-economic and cultural importance (e.g., hunting, trapping), sensitivity (i.e., listed species), knowledge of the species, life history, and ecological importance. The wildlife VCs also were selected to include animals that are considered to be representative of the different trophic levels in the local terrestrial and wetland ecosystems.

The rationale behind the selection of individual wildlife species as VCs is provided in Table 7.2-1. The Bathurst Barren-ground caribou (*Rangifer tarandus groenlandicus*) herd historically has traveled within 70 km of the northern boundary of the RSA (in 1997, 1999, 2000, and 2001; Stimson et al. 2009). However, the nearest this herd has been to the Project since 2001 is 260 km north of the RSA. The closest the Ahiak caribou herd has been recorded to the Project is 70 km north of the RSA. The closest the Beverly caribou herd has been recorded to the Project is 90 km north of the RSA. Similarly, the nearest known woodland caribou (*Rangifer tarandus caribou*) conservation unit is located approximately 30 km south of the Project (SKCDC 2012b). The only sign of caribou found during terrestrial baseline surveys was decades-old caribou antlers. Therefore, neither barren-ground nor woodland caribou are considered VCs for the Project.

Table 7.2-1: Rationale for Selection of Wildlife Species as Valued Components

Common Name	Scientific Name	Rationale
Moose	*Alces alces*	large home range; important subsistence and cultural species; prey species for large carnivores
Marten	*Martes americana*	most commonly harvested furbearer; middle predator in ecosystem
Beaver	*Castor canadensis*	prey species for many carnivores in northern environments; tolerant of human activities, but may be affected by habitat loss
Upland Breeding Birds		small territory size and high bird density means large numbers of upland birds may be affected by habitat loss; migratory birds are susceptible to population declines as a result of changing environmental conditions on breeding and overwintering habitats; includes some federal and provincial listed species (COSEWIC 2012; *SARA* 2012) such as common nighthawk (*Chordeiles minor*), rusty blackbird (*Euphagus carolinensis*), and olive-sided flycatcher (*Contopus cooperii*)
Waterbirds		Includes ducks, loons, and grebes; waterbirds may be affected by loss of shoreline habitat for breeding; important staging habitat may also be lost; sensitive to noise disturbance and human activity; some species are important for subsistence; includes the horned grebe (*Podiceps auritus*) (listed as a species of special concern by COSEWIC [2012]). A number of waterbird species are also migratory birds protected under the *Migratory Bird Convention Act, 1994*; therefore, potential effects to these species will be evaluated pursuant to Section 5 of the *CEAA, 2012*.

COSEWIC = Committee on the Status of Endangered Wildlife in Canada; *SARA* = *Species at Risk Act*; SKCDC = Saskatchewan Conservation Data Centre

7.2.2.9 Heritage Resources

In Saskatchewan, heritage resources include all historical and pre-contact archaeological sites, architecturally significant structures, and paleontological resources. Heritage resources are important because they reveal past and present land use, cultural identity, and relationships with other cultures and the social and biophysical environments. Historical resources represent archival information from the past; the Project may result in the alteration or loss of such information which in turn may have an effect on Aboriginal people. In accordance with Section 5 of the CEAA 2012, the potential loss of heritage resources and the potential effect this may have on Aboriginal people needs to be evaluated. Heritage resources also are property of the Provincial Crown and are protected under *The Heritage Property Act*. A HRIA was initiated in 2012 for the area near the Project to identify historic and archaeological sites. Several known sites already had been identified near the Project prior to the HRIA including a burial site. Consequently, heritage resources have been identified as a VC.

7.2.2.10 Traditional and Non-traditional Land and Resource Use

While caribou was traditionally the main species hunted by residents of the region, moose, black bear, and waterfowl, such as ducks and geese, also are hunted. Hunting and other resource uses in the area around Middle Lake and Elizabeth Falls have been limited due to the effects of successive forest fires over the last few decades. However, these burned areas produce berries that are gathered for domestic use by community members. Fish have been a vital part of traditional life in the region and continues to be prepared for consumption based on local cultural practices. Pursuant to section 5 of the *CEAA, 2012*, the potential to affect the ability of aboriginal people to maintain traditional land and resource use must be evaluated. Based on interviews with Aboriginal people residing near the Project, the following animals and plants have been identified as valued species in relation to hunting, trapping, fishing, and gathering for domestic and/or commercial use:

- birds: Canada geese; grouse (“chicken”); ptarmigan; ducks;
- mammals: barren-ground caribou; moose; marten; muskrat; beaver; rabbit; otter; fox; bear; wolf; lynx;
- fish: lake whitefish; lake trout; northern pike; walleye; Arctic grayling; suckers; and
- vegetation: wild blueberries; bog cranberries; wild strawberries; moss berries; caribou moss.

7.2.2.11 Economy

During engagement sessions held to date for the Project, local Aboriginal groups and community members expressed interest in economic and employment opportunities that will be generated by the Project. Construction and operation of the Project has the potential to change positively the local, regional, and provincial economy. The potential effect of these changes on Aboriginal people will be evaluated as specified by Section 5 of *CEAA 2012*. Direct effects involve the initial expenditures made for the Project. Indirect effects measure the secondary business transactions that result from the initial expenditures. Induced effects are third round effects from the spending of incremental labour income in the economy after removing a portion for taxes and savings. For example, although a substantial portion of direct activity for the Project is expected to occur within the construction industry, further effects should occur within the professional, scientific, and technical services industry. Indirect effects due to the Project are expected to be observed in industries providing inputs to construction. Induced effects, which represent the additional changes from consumer spending of wages earned, will likely be concentrated within the retail trade and services industries. The results of direct, indirect, and induced effects are typically expressed in terms of gross output, gross domestic product (GDP), labour income (included in GDP), and employment (number of jobs).

Education is important to career outcomes as higher levels of education increase the likelihood of participation and employment in the workforce. The Proponent is planning to establish programs to train local community members in advance of Project construction so that economic benefits to the local community are realized during both construction and operations. The result of increasing the availability of skilled labour in the Project region may be measured through changes to employment and business opportunities.

7.2.2.12 Infrastructure and Community Services

Infrastructure and community services involve consideration of the infrastructure in the local communities near the Project (i.e., transportation infrastructure) and various social, health, and security services. For example, access to the Project area is a topic of interest for local Aboriginal groups. The Project is expected to increase traffic volume on-site and on local access roads and trails, especially during the construction phase.

It is proposed at the present time that the main access road for the Project would extend from Highway 905 to the potential bridge location that would provide access over the Fond du Lac River. The proposed alignment of the main access road could follow one of two existing trails, or be an entirely new alignment depending on the results of community engagement. After crossing the river, the road will travel north towards the powerhouse location. A branch from the main access road will travel in an easterly direction providing access to the intake facility located along the shore of Black Lake. The main access road will provide all-weather permanent access to the Project areas during construction and plant operation. Additional temporary construction access roads will link the Project work areas to the various selected waste rock disposal areas. These roads will be temporary in nature and will not be built to provide all-weather access. It is anticipated that fences and gates will be used to limit public access to the Project site.

In addition to changes to transportation infrastructure, the Project will yield benefits of employment and increased incomes. Project-related incomes and revenues typically result in a higher personal standard of living and provide opportunities for communities to enhance their health and social support infrastructure and services. However, increased employment and economy also can cause increased demands on community services and infrastructure. The potential effect of these changes on Aboriginal people will be evaluated as per Section 5 of *CEAA, 2012*.

7.2.2.13 Population and Health

For the purpose of this assessment, the VC "population and health" is defined by objective measures of the "outer" aspects of quality of life, for example, the livability of the environment as opposed to "inner" aspects of quality of life, such as a subjective appreciation of life or perceived general health (Veenhoven 2000). The definition of quality of life is not limited to standard of living or tax base, but includes aesthetics or visual disturbances, as well as effects from changes to noise levels, air and water quality, and other features of the environment that may or may not affect one's health and enjoyment of their community (e.g., perceived changes in traffic safety or noise from trucks).

The livability of the environment during construction and throughout operation of the Project is a concern of residents located closest to the Project. For example, concern over aesthetics was identified by local residents as an issue that would affect their quality of life; therefore, this concern has been captured under this VC.

Quality and capacity of services in a community contribute to the overall standard of living and quality of life provided to residents. Project employment will result in increased household incomes for some. These changes will influence patterns of family life, which is a component of overall population and health.

8.0 ABORIGINAL, PUBLIC, AND REGULATORY ENGAGEMENT

8.1 Introduction

Engagement with stakeholders early in the planning and design phase of a project can benefit the project. As the majority of the Project is located on the Chicken Indian Reserve No. 224, engagement with stakeholders, especially Aboriginal engagement, is particularly important for the Project. The EFHLP has been taking the lead on the Project's Public Involvement Plan (PIP). The plan is being used to conduct engagement activities with stakeholders in the area. The purpose of the PIP is to inform stakeholders about the Project, and to provide an opportunity for these stakeholders to ask questions and share their concerns about the Project and the environmental assessment and review process. SaskPower has also been engaging with various regulatory agencies that may have an interested in the Project. All engagement activities are being tracked using Staketracker, a software system designed for engagement data storage. A list of stakeholders identified for the Project to date, including contact information is provided in Appendix E. The following sections outline stakeholder identification, early engagement activities, and proposed future stakeholder engagement activities. Documentation of stakeholder engagement activities for the purposes of the environmental assessment has been undertaken starting in 2010.

8.2 Aboriginal Engagement

The PIP has identified a stakeholder as anyone living within the Project area, or who may be interested or potentially affected by the Project. In terms of Aboriginal engagement, BLFN has been the main target and focus of engagement for the Project to date.

Documentation of engagement with BLFN for the purpose of the environmental assessment began in 2010. As outlined in Table 8.2-1, three formal meetings were held with the BLFN, including one Community Information Session held in 2010.

Table 8.2-1: Record of Stakeholder Meetings

Meeting Date	Location	Purpose of Meeting
May 17, 2010	Black Lake First Nation Reserve	Present the current Project status, as well as provide information on the environmental baseline work to be conducted by Golder in 2010.
November 5, 2010	Black Lake First Nation Reserve	Present the Project and discuss the Media Kit.
December 6, 2010	Black Lake First Nation (School)	Provide an update on the Project to community members of Black Lake First Nation at a community information session.

Feedback from the meetings was generally positive and showed the community's interest in the Project. The majority of the questions and concerns were related to employment and effects on water levels. A summary of the Community Session is provided in Appendix F.

The PIP is currently being structured for activities in 2013 and beyond. Groups that have been identified for future engagement activities include:

- Chief and Council Black Lake First Nation;
- Chief and Council Fond du Lac First Nation;
- Prince Albert Grand Council – Athabasca Region; and
- Metis Local Northern Region 1.

The methods of engagement will minimally encompass open house meetings, workshops, and one-on-one communication. As appropriate, translation will be provided. The PIP will maintain a strong focus on the engagement of Aboriginal people, in particular those resident in the Athabasca Region of northern Saskatchewan. It is important to note that the population of this region of northern Saskatchewan is 90+ % aboriginal, so many of the participants targeted for public engagement activities would also have strong aboriginal representation.

8.3 Public Engagement

The PIP has identified a stakeholder as anyone living within the Project area, or who may be interested or potentially affected by the Project. In terms of public engagement to date, the community of Stony Rapids has been the main target and focus of engagement for the Project. However, a list of the stakeholders identified as potentially having an interest in the Project has been provided below.

- Mayor and Council Northern Hamlet of Stony Rapids;
- Athabasca Land Use Planning;
- Athabasca Health Authority;
- New North;
- Northern Labour Market Committee (NLMC);

- Athabasca Basin Development - Board of Directors;
- Athabasca Keepers of the Water;
- Canadian Parks and Wilderness Society, Saskatchewan (CPAWS);
- Saskatchewan Environmental Society (SES);
- local outfitters and resource users;
- regional suppliers;
- uranium industry; and
- regional educations and training institutes.

Documentation of engagement with Stony Rapids for the purpose of the environmental assessment began in 2010. As outlined in Table 8.3-1 two formal meetings were held in Stony Rapids, including one Community Information Session held in 2010.

Table 8.3-1: Record of Stakeholder Meetings

Meeting Date	Location	Purpose of Meeting
November 24, 2010	Stony Rapids	Provide an update on the Project
December 7, 2010	Stony Rapids (Waterfront Lodge)	Provide an update on the Project to community members of Stony Rapids at a community information session

Although few people turned out for the community information session, numerous questions were raised. The majority of questions were about the environmental assessment and the impacts the Project could have on the environment. A summary of the Community Information Session is provided in Appendix F.

The PIP is currently being modified for activities in 2013 and beyond. The PIP will focus on four primary methods of engagement:

- general Project information (e.g., print media, fact sheets and brochures, internet and radio);
- community information meetings and events;
- Project specific technical workshops; and
- informal communication and feedback.

Specific dates for public engagement activities have not been scheduled; however, they likely will correspond with the following Project milestones:

- submission of Project Description;
- prior to submission of the EIS; and
- following the receipt of technical review comments from regulatory reviewers.

It is expected that once the environmental assessment process has significantly advanced, the PIP will be modified to also encompass specific meetings and/or workshops pertaining to economic opportunities associated with the Project.

8.4 Regulatory Engagement

Engagement with regulatory authorities is an important aspect of the Project's overall engagement approach. The Proponent will keep regulatory agencies (identified as having a regulatory or permitting interest in the Project) informed of the status of the Project. Engagement with regulatory authorities will provide an opportunity to seek a deeper understanding from the environmental assessment and regulatory community about potential concerns and requirements for the Project.

Federal regulators identified as having a key role or interest in this project include:

- the Agency;
- DFO;
- AANDC (previously known as Indian and Northern Affairs Canada [INAC]); and
- TC.

Provincial regulators identified as having a key role or interest in this Project include the following:

- Ministry of Environment – Environmental Assessment Branch;
- Ministry of Environment – Fish and Wildlife Branch;
- Ministry of First Nation and Métis Relations (MFNMR);
- Ministry of Economy (previously known as Ministry of Industry and Resources); and
- Water Security Agency (previously known as Saskatchewan Watershed Authority).

On-going and regular communication with regulatory agencies is an important part of the Project development process and has occurred early in the environmental assessment process. Appropriate officials were identified for each of the regulatory agencies and a number of meetings were arranged. A record of meetings held with regulatory agencies to date is presented in Table 8.4-1.

These meeting have allowed for good communication of potential issues and topics to be researched during baseline studies.

Table 8.4-1: Record of Regulatory Meetings

Meeting Date	Location	Purpose of Meeting	Agencies Present
June 24, 2010	Ramada Hotel, Regina Saskatchewan	To review the environmental assessment activities occurring on the Project and discuss the draft CEAA TOR.	■ the Agency ■ DFO ■ AANDC ■ MOE ■ EFHLP ■ Hatch ■ SaskPower ■ Golder
December 3, 2010	DFO Office, Prince Albert, Saskatchewan	To discuss environmental assessment activities and potential impacts and concerns regarding fish habitat.	■ DFO ■ EFHLP ■ SaskPower ■ Golder
January 7. 2011	Golder Office, Saskatoon	To provide an update on 2010 field programs.	■ DFO ■ MOE ■ SaskPower ■ Golder
April 11, 2011	Conference Call	To discuss the technical memo prepared by Golder including: whether future recapture surveys are required to establish Arctic grayling populations and whether fish habitat preference curves will be required for all of the fish identified in the draft TOR.	■ DFO ■ EFHLP ■ Hatch ■ SaskPower ■ Golder
June 8, 2011	DFO Office, Prince Albert, Saskatchewan	To discuss Project potential effects on fish and fish habitat.	■ DFO ■ MOE ■ SaskPower ■ Hatch ■ EFHLP ■ Golder
November 20, 2012	Golder Office, Saskatoon	To discuss the Project Description comments received from CEAA, and to provide an update on project status.	■ SaskPower ■ Golder ■ CEAA ■ DFO ■ MOE

TOR = Terms of Reference; *CEAA* = *Canadian Environmental Assessment Act*; DFO = Fisheries and Oceans Canada; AANDC = Aboriginal Affairs and Northern Development Canada (formerly INAC); TC = Transport Canada; MOE = Saskatchewan Ministry of Environment; SWA = Saskatchewan Watershed Authority; EFHLP = Elizabeth Falls Hydro Limited Partnership; the Agency = Canadian Environmental Assessment Agency.

Continued engagement with regulatory agencies is considered a key aspect of the overall engagement approach for the Project. Project update meetings will continue to be held with regulatory agencies as the Project progresses. While specific dates for regulatory engagement meetings have not been scheduled, these meetings likely will occur at the following Project milestones:

- submission of Project Description;

- prior to submission of the Environmental Assessment and conceptual Fish Habitat Compensation Plan;
- following the receipt of technical review comments from the regulators; and
- ongoing discussions regarding finalization and approval of the Fish Habitat Compensation Plan.

9.0 REFERENCES

Aboriginal Affairs and Northern Development Canada [AANDC]. (2011). First Nation Detail: Black Lake. . Available from http://pse5-esd5.ainc-inac.gc.ca/fnp/Main/Search/FNMain.aspx?BAND_NUMBER=359&lang=eng [accessed March 26, 2012].

AANDC. (2012). First Nation Profiles: Reserves/Settlements/Villages. Available from http://pse5-esd5.ainc-inac.gc.ca/FNP/Main/Search/FNReserves.aspx?BAND_NUMBER=359&lang=eng [accessed March 24, 20122].

Acton, D.F., Padbury, G.A., and Stushnoff, C.T. 1998. The Ecoregions of Saskatchewan. Saskatchewan Environment and Resource Management and Canadian Plains Research Centre: Regina, SK.

Athabasca Land Use Plan (ALUP) – Stage I DRAFT. March 2006. Athabasca Interim Advisory Panel. Available from:http://www.environment.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=691,683,621,247,94,88,Documents&MediaID=299&Filename=Athabasca+LUP+stage+1.pdf&l=English

Beanlands and Duinker 1983 – An ecological framework for environmental impact assessment in Canada. Institute for Resource and Environmental Studies, Dalhousie University, Halifax, NS, and Federal Environmental Assessment Review Office, Hull, QC. 132 pp.

Cameco Corporation. 2011. Annex V: Socio-Economic Environment Baseline in Cigar Lake Water Management Project Environmental Impact Statement. . Prepared by InterGroup Consultants Ltd.

Canadian Environmental Assessment Agency. 2012. Basics of Environmental Assessment. Website: http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=B053F859-1#agency01 Accessed: August 2012.

Canadian Environmental Assessment Agency. July 2012. Guide to Preparing a Description of a Designated Project under the *Canadian Environmental Assessment Act, 2012*. Government of Canada. 12 pp. Available at: http://www.ceaa-acee.gc.ca/63D3D025-2236-49C9-A169-DD89A36DA0E6/Guide_to_Preparing_a_Description_of_a_Designated_Project_under_CEAA_2012.pdf

COSEWIC. 2003. COSEWIC Assessment and Update Status Report on the Wolverine Gulo gulo in Canada. Canadian Species at Risk. Ottawa, Ontario. iii + 41 pp. Available at: http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_wolverine_e.pdf. Accessed: 9 April 2010.

COSEWIC. 2012. Status of Endangered Wildlife in Canada. Available at: http://www.cosewic.gc.ca/eng/sct1/index_e.cfm. Accessed: October 2012.

DFO (Fisheries and Oceans Canada). 1995. Freshwater Intake End-of-Pipe Fish Screen Guideline.

EC (Environment Canada). 2012a. HYDAT. Available at: http://www.wsc.ec.gc.ca/applications/H2O/index-eng.cfm. Accessed: September 2012.

EC (Environment Canada). 2012b. Rating Curve for the Fond du Lac River at Outlet of Black Lake (07LE002). Regina, SK.

Envirocon Ltd. 1974. Elizabeth Falls: Fisheries Resources and Environmental Overview.

Folke, C. 2006. Resilience: The emergence of a perspective for social–ecological systems analyses. Global Environmental Change 16:253-267.

Gilboy, C.F. 1978. Reconnaissance Geology, Stoney Rapids Area (Part of NTS Area 74 P), in Summary of Investigations 1978, Saskatchewan Geological Survey, Saskatchewan Mineral Resources, Misc. Report 78-10, p. 35- 42.

Gillespie, B. C. 1976. Changes in territory and technology of the Chipewyan. . Arctic Anthropology 13(1): 6-11. Available from http://www.jstor.org/stable/40315884 [accessed July 23, 2010].

Gordon, B.C. 1996. People of the Sunlight, People of the Starlight: Barrenland Archaeology in the Northwest Territories of Canada. Mercury Series, Archaeological Survey of Canada Paper No. 154. Canadian Museum of Civilization, Ottawa.

Government of Canada. 2012. *Canadian Environmental Assessment Act, 2012*.

Government of Canada. 1985. *Indian Act*. R.S.C, 1985., c.I-5.

Government of Saskatchewan. 2010. The Environmental Assessment Act.

Hatch Ltd. (formerly Acres International Ltd.) 2002. Elizabeth Falls Hydroelectric Development. Site Investigation Program. Prepared for the Black Lake First Nation

Hatch Ltd. (formerly Acres International Ltd.) (2005): Elizabeth Falls Hydroelectric Project. Geological Mapping and Geotechnical. . Prepared for the Black Lake First Nation.

Hatch Ltd. (formerly Acres International Ltd.) (2007): Elizabeth Falls Hydro-Electric Project, Volume I – The Report & Volume II – Supporting Study Memoranda. Prepared for the Black Lake First Nation.

Hatch Ltd. 2012. Elizabeth Falls Hydroelectric Project. Geotechnical Drilling Data Report. Prepared for SaskPower.

Indian and Northern Affairs [INAC]. (2005). Backgrounder – Aboriginal Workforce Participation Initiative. . Available from http://www.aadnc-aandc.gc.ca/aiarch/mr/nr/j-a2005/02594bk-eng.asp [accessed on January 13, 2011].

Innis, H.A. 1999 The Fur Trade in Canada: An Introduction to Canadian Economic History. University of Toronto Press, Toronto.

Keewatin Career Development Corporation. (2012). Business Directory Listings. . Available from http://career.dev.kcdc.ca/bus/reports/BusinessDirectoryListings.pdf [accessed March 8, 2012].

McLaughlan, M.S., R.A. Wright, and R.D. Jiricka. 2010. Field guide to the ecosites of Saskatchewan's provincial forests. Saskatchewan Ministry of Environment, Forest Service. Prince Albert, SK. 338 pp.

Meyer, D. (1981). Overview of Chipewayan Ethnohistory and Organization. In: Stony Rapids Community and Resource Access Road, Stage 2: Environmental Evaluation of Alternative Corridors. MacLaren Plansearch, ALUPIAP, 2003.

Meyer. David 1999 Precontact Archaeology of Northern Saskatchewan. In Atlas of Saskatchewan, edited by Ka-iu Fung, pp. 22-24, Saskatoon.

Minni, Sheila Joan. 1975 The Prehistoric Occupations of Black Lake, Northern Saskatchewan. Unpublished Master's thesis, Department of Anthropology and Archaeology, University of Saskatchewan, Saskatoon.

Minni, Sheila, J. 1976 The Prehistoric Occupation of Black Lake, Northern Saskatchewan. National Museum of Man Mercury Series. Archaeological Survey of Canada Paper No. 53. National Museums of Canada, Ottawa.

Northlands College, Northern Labour Market Committee, Saskatchewan Learning, and Saskatchewan Social Services. (2004). Northern Saskatchewan Regional Training Needs Assessment Report.

Northlands College, Northern Labour Market Committee, & Ministry of Advanced Education, EmploymentEmployment, and Immigration. (2011). Northern Saskatchewan Regional Training Needs Assessment Report, 2011-2012: Making the Connection to Training and Employment Opportunities in Northern Saskatchewan. . Available from http://career.kcdc.ca/index.php/labour-market [accessed November 23, 2011].

Price and Errington 1998 – Guidelines for metal leaching and acid rock drainage at minesites in British Columbia. British Columbia Ministry of Energy and Mines, Victoria, BC.

Public Health Nutritionists of Saskatchewan. (2010). Thethe cost of healthy eating in Saskatchewan 2009: Impact on food security. . Available from http://www.rqhealth.ca/programs/comm_hlth_services/pubhealth/pdf_files/food_cost2009.pdf [accessed March 9, 2012].

Raby, S. (1973). An Historic and Ethnographic Account to the 1920‗s‖ Mawdsley Memoir 1: The Chipewyan of the Stony Rapids Region. R.M. Bone (ed.) Saskatoon, SK: Institute for Northern Studies, University of Saskatchewan, p.12-15.

Rich, E.E. 1967. The Fur Trade and The NorthWest to 1857. McClelland and Stewart Limited, Toronto.

SARA (Species at Risk Act) S.C. 2002, c.29. 2002. Government of Canada.

SARA Public Registry. 2011. Accessed at: http://www.sararegistry.gc.ca/search/default_e.cfm

SARA Public Registry. 2012. Accessed at: http://www.sararegistry.gc.ca/search/default_e.cfm

SKCDC (Saskatchewan Conservation Data Centre). 2012a. Tracked Species List for Vertebrates. Available at: http://www.biodiversity.sk.ca/Docs/vertstrak.pdf. Accessed: July 4, 2012.

SKCDC. 2012b. Sensitive Species Web Site – Interactive Map. Saskatchewan Ministry of Environment. Available at: http://gisweb1.serm.gov.sk.ca/wildlifelogin/form.asp. Accessed: July 4, 2012.

Saskatchewan Mineral Deposit Index (SMDI) 2012. Government of Saskatchewan 2012; http://www.er.gov.sk.ca/SMDI)

SaskPower Corporation. 1987. SaskPower's Uranium City - Rabbit Lake - Wollaston Lake Electrical Transmission Line Heritage Resource Impact Assessment, Permit No. 87-023. Report on file with the Heritage Conservation Branch, Regina, SK.

Statistics Canada. (2004a). Aboriginal Peoples Survey, Community Profiles: Adult Highlights and Themes for Chicken, Saskatchewan. . Available from http://www12.statcan.ca/english/profil01aps/highlights.cfm [accessed March 27, 2012].

Statistics Canada (2004b) Aboriginal Peoples Survey, Community Profiles: Child Highlights for Chicken, Saskatchewan. Available from http://www12.statcan.ca/english/profil01aps/highlights.cfm?component=2&community=RES_068 [accessed March 27, 2012].

Statistics Canada. (2007). Census. Census of Canada 2006. . Government of Canada.

Stimson, H., Golder Associates Limited, and Department of Environment and Natural Resources, Government of the Northwest Territories. 2009. Caribou Migration Animation in Google Earth.

Veenhoven, R. (2000) The four qualities of life: ordering concepts and measures of the good life. Journal of Happiness Studies 1:1-19.

Walker, B., C.S. Hollin, S.R. Carpenter, and A. Kinzig. (2004) Resilience, adaptability, and transformability in social-ecological systems. Ecology and Society 9(2):5. Available at: http://www.ecologyandsociety.org/vol9/iss2/art5/. Accessed: January 14, 2010.

Western Heritage Services Inc. 2007 Heritage Resource Impact Assessment of the Proposed Upgrade of the Athabasca All Weather Road from Points North to Stony Rapids (Permit No. 07-217). Report on file with the Heritage Conservation Branch, Regina SK.

The Wildlife Act W-13.12. 1998. Government of Saskatchewan.

Yerbury, J. C. (1976). The post-contact Chipewyan: Trade rivalries and changing territorial boundaries EthnohistroyEthnohistory 23(3): 237-263. . Available from http://www.jstor.org/stable/481254 [accessed July 23, 2010].

APPENDIX A

Concordance Tables

Table A-1: Project Description Guidelines – Concordance Table

Required information	Prescribed Information for the Description of a Designated Project Regulations - Section Reference	Project Description Section Number
1. General information and contact(s)		
1.1 Describe the nature of the designated project, and proposed location (2–3 paragraphs; note that additional location details are to be provided in section 3).	Section 1	Section 1.1
1.2 Proponent contact information	Section 2	Section 1.2.1
1.2.1 Name of the designated project	Section 1	Section 1.1
1.2.2. Name of the proponent	Section 2	Sections 1.2 and 1.2.1
1.2.3 Address of the proponent	Section 2	Section 1.2.1
1.2.4 Chief Executive Officer or equivalent	Section 2	Section 1.2.1
1.2.5 Principal contact person for purposes of the project description (include name, official title, email address and telephone number).	Section 2	Section 1.2.1
1.3 Provide a list of any jurisdictions and other parties including Aboriginal groups and the public that were consulted during the preparation of the project description. (A description of the result of any consultations undertaken is to be provided in sections 7 and 8).	Section 3	Sections 1.3 and 8.0
1.4 Other relevant information:		
1.4.1 Provide information on whether the designated project is subject to the environmental assessment and regulatory requirements of another jurisdiction(s).	Section 4 (a)	Section 1.3
1.4.2 Provide information on whether the designated project will be taking place in a region that has been the subject of a regional environmental study. Proponents are advised to contact the Agency during the preparation of the project description for information regarding any regional environmental studies that may be relevant.	Section 4 (b)	Section 1.4

Table A-1: Project Description Guidelines – Concordance Table (continued)

Required information	Prescribed Information for the Description of a Designated Project Regulations - Section Reference	Project Description Section Number
2. 0 Project information		
Provide the following information to the extent that it is available or applicable.		
2.1 Provide a general description, including the context and objectives of the project	Section 5	Sections 1.1, 2.1, 2.3, 2.4 and 2.5
2.2 Indicate the provisions in the *Regulations Designating Physical Activities* setting out the designated activities that describe the project in whole or in part.	Section 6	Section 2.2
2.3 Components and activities		
Provide a description of the components associated with the proposed project, including:	Section 8, and 9	Section 3.0
2.3.1 Physical works associated with the designated project (e.g., large buildings, other structures, such as bridges, culverts, dams, marine transport facilities, mines, pipelines, power plants, railways, roads, and transmission lines) including their purpose, approximate dimensions, and capacity. Include existing structures or related activities that will form part of or are required to accommodate or support the designated project.	Section 7	Section 3.0
2.3.2 Anticipated size or production capacity of the designated project, with reference to thresholds set out in the *Regulations Designating Physical Activities*, including a description of the production processes to be used, the associated infrastructure, and any permanent or temporary structures.	Section 8	Sections 2.1 and 2.2
2.3.3 If the designated project or one component of the designated project is an expansion, the percent of increase in size or capacity from the existing project (relative to the thresholds set out in the *Regulations Designating Physical Activities*).	Section 6, and Sections 3, 4, 6, 7, 8, 13, 16, 17, 19, 20, 23, and 31 of the annex to the *Regulations Designating Physical Activities*	N/A
	*(*This information is required in order to verify whether the project meets the threshold for expansion that would make it a designated project.)	*N/A*

Table A-1: Project Description Guidelines – Concordance Table (continued)

Required information	Prescribed Information for the Description of a Designated Project Regulations - Section Reference	Project Description Section Number
2.3.4 A description of all activities to be performed in relation to the designated project.	Section 9	Section 3.0
2.4 Emissions, discharges and waste Provide a description of any solid, liquid, gaseous or hazardous wastes likely to be generated during any phase of the designated project and of plans to manage those wastes, including the following:	Section 10	Section 4.0
2.4.1 Sources of atmospheric contaminant emissions during the designated project phases (focusing on criteria air contaminants and greenhouse gases, or other non-criteria contaminants that are of potential concern) and location of emissions.	Section 10	Section 4.1
2.4.2 Sources and location of liquid discharges.	Section 10	Section 4.2
2.4.3 Types of wastes and plans for their disposal	Section 10	Section 4.3
2.3 Construction, operation, and decommissioning and abandonment phases and scheduling. *Provide a description of the timeframe in which the development is to occur and the key project phases, including the following:*	Section 11	Section 3.5
a. Anticipated scheduling, duration and staging of key project phases, including preparation of the site, construction, operation, and decommissioning and abandonment.	Section 11	Section 3.5
a. Main activities in each phase of the designated project that are expected to be required to carry out the proposed development (e.g. activities during site preparation or construction might include, but are not limited to, land clearing, excavating, grading, de-watering, directional drilling, dredging and disposal of dredged sentiments, infilling, and installing structures).	Section 9	Section 3.0
3.0 Project Location *Provide a description of the designated project's location including:*	Section 12	Sections 2.1 and 5.0
3.1.1 Coordinates (i.e. longitude/latitude using international standard representation in degrees, minutes, seconds) for the centre of the facility or, if for a linear project, provide the beginning and end points.	Section 12 (a)	Sections 1.1 and 2.3

Table A-1: Project Description Guidelines – Concordance Table (continued)

Required information	Prescribed Information for the Description of a Designated Project Regulations - Section Reference	Project Description Section Number
3.1.2 Site map/plan(s) depicting location of the designated project components and activities. The map/plan(s) should be at an appropriate scale to help determine the relative size of the proposed components and activities.	Section 12 (b)	Figure 2.3-1
3.1.3 Map(s) at an appropriate scale showing the location of the designated project components and activities relative to existing features, including but not limited to:	Section 12 (b)	
· watercourses and waterbodies with names where they are known;		Figures 1.1-1, 2.3-1 and 5.1-1
· linear and other transportation components (e.g., airports, ports, railways, roads, electrical power transmission lines and pipelines);		Figures 1.1-1, 2.3-1 and Figure 5.1-1
· other features of existing or past land use (e.g., archaeological sites, commercial development, houses, industrial facilities, residential areas and any waterborne structures);		Figures 1.1-1, 2.3-1 and 5.1-1
· location of Aboriginal groups, settlement land (under a land claim agreement) and, if available, traditional territory;		Figures 1.1-1, 2.3-1 and 5.1-1
· federal land including, but not limited to National parks, National historic sites, and reserve lands;		Figures 1.1-1, 2.3-1 and 5.1-1
· nearby communities;		Figures 1.1-1, 2.3-1 and 5.1-1
· permanent, seasonal or temporary residences;		Figures 1.1-1, 2.3-1 and 5.1-1
· fisheries and fishing areas (i.e., Aboriginal, commercial and recreational);		Figure 5.1-1
· environmentally sensitive areas (e.g., wetlands, and protected areas, including migratory bird sanctuary reserves, marine protected areas, National Wildlife areas, and priority ecosystems as defined by Environment Canada); and,		Figure 5.1-1
· provincial and international boundaries.		Figure 1.1-1 (Saskatchewan Key Map)
3.1.4 Photographs of work locations to the extent possible.	Section 12 (b)	Appendix B

Table A-1: Project Description Guidelines – Concordance Table (continued)

Required information	Prescribed Information for the Description of a Designated Project Regulations - Section Reference	Project Description Section Number
3.1.5 Legal description of land to be used for the designated project, including the title, deed or document and any authorization relating to a water lot.	Section 12 (c)	Section 5.1
3.1.6 Proximity of the designated project to: · any permanent, seasonal or temporary residences; · traditional territories, settlement land (under a land claim agreement) as well as lands and resources currently used for traditional purposes by Aboriginal peoples; and, · any federal lands.	Section 12 (d),(e),(f)	Figures 1.1-1, 2.3-1 5.1-1 Sections 5.1 and 6.2
3.2 *Land and Water Use* *To the extent that is known at this time, describe the ownership and zoning of land and water that may be affected by the project, including the following:*	Section 12 (c)	
3.2.1 Zoning designations.	Section 12 (c)	Section 5.1
3.2.2. Current land ownership, including sub-surface rights.	Section 12 (c)	Section 5.1, and Section 6.2
3.2.3 Any applicable land use, water use (including ground water), resource management or conservation plans within and near the project site.	Section 12	Section 1.4, and Figure 5.1-1
3.2.3 For the proposed construction, operation, decommission and abandonment of a marine terminal, state whether or not the lands are routinely, and have been historically, used as a marine terminal, or are designated for such use in a land use plan that has been the subject of public consultation.	Section 6 and 27 (c) annex to the *Regulations Designating Physical Activities*	N/A
3.2.5 If the project is to take place within the waters or lands administered by a Canada Port Authority under the *Canada Marine Act* and its regulations. Describe applicable land status and zoning under the Port Land Use Plan.	Section 14	N/A

Table A-1: Project Description Guidelines – Concordance Table (continued)

Required information	Prescribed Information for the Description of a Designated Project Regulations - Section Reference	Project Description Section Number
3.2.6 If the designated project is going to require access to, use or occupation of, or the exploration, development and production of lands and resources currently used for traditional purposes by Aboriginal peoples.	Section 12 (e)	Sections 5.1 and 6.2
4.0 Federal Involvement – Financial Support, Lands and Legislative Requirements		
4.1 Describe if there is any proposed or anticipated federal financial support that federal authorities are, or may be, providing to the designated project.	Section 13	Section 6.1
4.2 Describe any federal lands that may be used for the purpose of carrying out the designated project. This is to include any information on any granting of interest in federal land (i.e., easement, right of way, or transfer of ownership).	Section 14	Section 6.2
4.3 Detail any federal legislative or regulatory requirements that may be applicable, including a list of permits, licences or other authorizations that may be required to carry out the designated project.	Section 15	Sections 1.3 and 6.3
5.0 Environmental Effects		
The information to be provided in this section is meant to be a brief assessment of the environmental interactions of the project. A detailed examination of the potential environmental effects of the project does not need to be included in the project description.		
Using existing knowledge and available information provide an overview of the following:		
5.1 A description of the physical and biological setting, including the physical and biological components in the area that may be adversely affected by the project (e.g., air, fish, terrain, vegetation, water, wildlife, including migratory birds, and known habitat use).	Section 16	Section 5.2
5.2 A description of any changes that may be caused as a result of carrying out the designated project to:	Section 17 (a),(b),(c)	Section 7.0, Table 7.1-1
a. fish and fish habitat, as defined in the *Fisheries Act*;		
b. aquatic species, as defined in the *Species at Risk Act*; and,		
c. migratory birds, as defined in the *Migratory Birds Convention Act, 1994*.		

Table A-1: Project Description Guidelines – Concordance Table (continued)

Required information	Prescribed Information for the Description of a Designated Project Regulations - Section Reference	Project Description Section Number
5.3 A description of any changes to the environment that may occur, as a result of carrying out the designated project, on federal lands, in a province other than the province in which the project is proposed to be carried out, or outside of Canada.	Section 18	Section 7.0, Table 7.1-1
5.4 A description of the effects on Aboriginal peoples of any changes to the environment that may be caused as a result of carrying out the designated project, including effects on health and socio-economic conditions, physical and cultural heritage, the current use of lands and resources for traditional purposes, or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.	Section 19	Section 7.0 Table 7.1-1
6.0 Proponent Engagement and Consultation with Aboriginal Groups		
Experience has shown that engagement by proponents with Aboriginal groups early in the planning and design phases of a proposed project can benefit all concerned. By learning about Aboriginal interests and concerns and identifying ways to avoid or mitigate potential impacts, proponents can build these considerations into their project design, reducing the potential for future project delays and increased costs.		
Provide the following information to the extent that it is available or applicable:		
6.1 A list of Aboriginal groups that may be interested in, or potentially affected by, the designated project, including contact information (location, name, mailing address, email address, and fax and telephone numbers).	Section 19	Section 8.2, Appendix E
6.2 A description of the engagement or consultation activities carried out to date with Aboriginal groups, including:	Section 19	Sections 8.2 and 8.3, Appendices E and F
· names of Aboriginal groups engaged or consulted to date with regard to the project;		
· date(s) each Aboriginal group was engaged or consulted; and,		
· means of engagement or consultation (e.g., community meetings, mail or telephone).		

Table A-1: Project Description Guidelines – Concordance Table (continued)

Required information	Prescribed Information for the Description of a Designated Project Regulations - Section Reference	Project Description Section Number
6.3 An overview of key comments and concerns expressed by Aboriginal groups identified or engaged to date, including any responses provided to these groups.	Section 3	Sections 8.2 and 8.3 Appendix F
6.4 An overview of information on current use of lands and resources for traditional purposes by Aboriginal groups or peoples (e.g., information provided verbally or in writing, and past or present studies).	Section 19	Sections 5.2.5, 5.2.6 and 5.2.7
6.5 A consultation and information-gathering plan that outlines the ongoing and proposed Aboriginal engagement or consultation activities, the general schedule for these activities and the type of information to be collected (or, alternatively, an indication of why such engagement or consultation is not required).	N/A	Section 8.0, Appendix F
The proponent is encouraged to provide background information on Aboriginal groups' potential or established Aboriginal or treaty rights. The proponent is also encouraged to provide information on the impact area of the designated project and how it overlaps with uses by Aboriginal groups that have potential or established Aboriginal or treaty rights.		
This information will be used to facilitate the Agency's understanding of the scope of Aboriginal interests in relation to the designated project, including the potential for impacts on Aboriginal rights and issues of concern.		
7.0 Consultation with the Public and Other Parties (other than Aboriginal consultation included above)		
Provide the following information to the extent that it is available or applicable:		
7.1 A list of stakeholders that may be interested and potentially affected by the carrying out of the designated project. In addition, please describe consultation activities carried out to date with stakeholders, including:	Section 3	Sections 8.3 and 8.4, Appendices E and F
· names of stakeholders previously consulted;		
· date(s) each stakeholder was consulted; and,		
· means of consultation (e.g., community meetings, mail or telephone).		

Table A-1: Project Description Guidelines – Concordance Table (continued)

Required information	Prescribed Information for the Description of a Designated Project Regulations - Section Reference	Project Description Section Number
7.2 An overview of key comments and concerns expressed to date by stakeholders and any responses that have been provided.	Section 3	Appendix F
7.3 An overview of any ongoing or proposed stakeholder consultation activities.	Section 3	Section 8.0
7.4 A description of any consultations that have occurred with other jurisdictions that have environmental assessment or regulatory decisions to make with respect to the project.	Section 3	Section 8.4
8.0 Executive Summary	*Section 20*	*Executive Summary (ES) Document*
Proponents are to include as part of the project description an executive summary that summarizes the information identified in Sections 1 to 7 of this Guide.		
Under CEAA 2012, the Agency is required to consult the public on a summary of the project description that has to be posted on the Agency's Internet site in both of Canada's official languages as required under the Official Languages Act. As a result, in order to be in a position to initiate the screening phase in a timely manner, the executive summary is to be prepared and submitted to the Agency in both English and French.		English and French Versions provided.
1. The project's name, nature and proposed location.	Section 20	ES Section 1.1
2. The proponent's name and contact information and the name and contact information of their primary representative for the purpose of the description of the project.	Section 20	ES Sections 1.2 and 1.2.1
3. A description of and the results of any consultations undertaken with any jurisdictions and other parties including Aboriginal peoples and the public.	Section 20	ES Sections 1.3 and 8.0
4. Other relevant information, including	Section 20	ES Section 1.4
(a) the environmental assessment and regulatory requirements of other jurisdictions; and		
(b) information concerning any environmental study that is being or has been conducted of the region where the project is to be carried out.	Section 20	ES Section 1.5
5. A description of the project's context and objectives.	Section 20	ES Sections 1.1, 2.1 and 2.3
6. The provisions in the schedule to the Regulations Designating Physical Activities describing the project in whole or in part.	Section 20	ES Section 2.2

Table A-1: Project Description Guidelines – Concordance Table (continued)

Required information	Prescribed Information for the Description of a Designated Project Regulations - Section Reference	Project Description Section Number
7. A description of the physical works that are related to the project including their purpose, size and capacity.	Section 20	ES Sections 2.1, 2.2 and 2.3
8. The anticipated production capacity of the project and a description of the production processes to be used, the associated infrastructure and any permanent or temporary structures.	Section 20	ES Sections 2.1 and 3.0
9. A description of all activities to be performed in relation to the project.	Section 20	ES Section 3.0
10. A description of any solid, liquid, gaseous or hazardous waste that is likely to be generated during any phase of the project and of plans to manage those wastes.	Section 20	ES Section 4.0
11. A description of the anticipated phases of and the schedule for the project's construction, operation, decommissioning and abandonment.	Section 20	ES Section 3.5
12. A description of the project's location, including (a) its geographic coordinates;	Section 20	ES Section 1.1
(b) site maps produced at an appropriate scale in order to determine the project's overall location and the spatial relationship of the project components;	Section 20	ES Figures 1.1-1, 2.3-1 and 5.1-1
(c) the legal description of land to be used for the project, including the title, deed or document and any authorization relating to a water lot;	Section 20	ES Section 5.1
(d) the project's proximity to any permanent, seasonal or temporary residences;	Section 20	ES Sections 1.1, 2.3, and 5.1 Figures 1.1-1, 2.3-1 and 5.1-1
(e) the project's proximity to reserves, traditional territories as well as lands and resources currently used for traditional purposes by Aboriginal peoples; and	Section 20	ES Sections 5.1, 5.2.6 and 6.2 ES Figures 1.1-1, Figure 2.3-1 and 5.1-1
(f) the project's proximity to any federal lands.	Section 20	ES Sections 5.1 and 6.2 ES Figure 1.1-1
13. A description of any financial support that federal authorities are, or may be, providing to the project.	Section 20	ES Section 6.1
14. A description of any federal land that may be used for the purpose of carrying out the project.	Section 20	ES Section 5.1 and 6.2

Table A-1: Project Description Guidelines – Concordance Table (continued)

Required information	Prescribed Information for the Description of a Designated Project Regulations - Section Reference	Project Description Section Number
15. Any federal legislative or regulatory requirements that may be applicable including a list of permits, licences or other authorizations that may be required in order to carry out the project.	Section 20	ES Section 1.4 and 6.3
16. A description of the physical and biological setting.	Section 20	ES Section 5.2
17. A description of any changes that may be caused, as a result of carrying out the project, to	Section 20	ES Sections 6.3 and 7.0 ES Table 7.1-1
(a) fish as defined in section 2 of the Fisheries Act and fish habitat as defined in subsection 34(1) of that Act;		
(b) aquatic species, as defined in subsection 2(1) of the Species at Risk Act; and	Section 20	
(c) migratory birds, as defined in subsection 2(1) of the Migratory Birds Convention Act, 1994.	Section 20	
18. A description of any changes to the environment that may occur, as a result of carrying out the project, on federal lands, in a province other than the province in which the project is proposed to be carried out or outside of Canada.	Section 20	ES Section 7.0 ES Table 7.1-1
19. Information on the effects on Aboriginal peoples of any changes to the environment that may be caused as a result of carrying out the project, including effects on health and socio-economic conditions, physical and cultural heritage, the current use of lands and resources for traditional purposes or on any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.	Section 20	ES Sections 5.2.7, 5.2-9 and 7.0 ES Table 7.1-1

Table A-2: Provincial Technical Proposal Guideline – Concordance Table

Technical Proposal Guidelines - Required information	Project Description Section Number
Technical Proposal Requirements	
Application form and attachments (attachments include a technical proposal and maps).	Application form included with submission
Optional: cover letter, site plans/'as-builts', engineering or architectural drawings and schematics, legal land surveys, certification/assurance documents, qualification verification documents, legal documents, or any other information that supports an accurate and complete project submission.	Figures contained throughout the text
Administrative Requirements	
The application form is available on the EA Branch website (click here) and should be submitted electronically with the technical proposal to EA.applications@gov.sk.ca.	Application form included with submission
Map with township fabric and/or coordinates of the site with graphic scale, north arrow and a clear legend to allow a full understanding of the map's purpose.	Figures contained throughout the text
Diagrams of proposed facilities and project components may also be helpful.	Figures 2.3-1, 3.1-1 and 3.1-2
GIS shapefile, in NAD 1983 CSRS98 UTM zone 13N, of the project's spatial boundaries; a CAD file would be acceptable, but is not preferred.	Included
Application Form	
Proponent, contact information and general corporate structure.	Section 1.2
Key project personnel, their experience with similar projects and the technical expertise used in planning and design.	Section 1.2
Project type (e.g., development, expansion/change to development).	Section 1.1
Project description.	Sections 1.1 and 2.1
Industry sector.	Sections 1.1 and 2.2
Location (attach maps).	Figure 1.1-1
Previous response from the ministry (i.e., the response, when it was provided, and any previous file number/s if appropriate).	Appendix C
Executive Summary	Refer to Executive Summary and following sections of the Project Description
Project summary, with proponent's name and corporate structure.	Sections 1.1 and 1.2
Key project personnel, their experience with similar projects and technical expertise used in the planning and design.	Section 1.2

Table A-2: Provincial Technical Proposal Guideline – Concordance Table (continued)

Technical Proposal Guidelines - Required information	Project Description Section Number
Length, schedule and location of the project.	Sections 1.1, 2.1, 2.3 and 3.5
Key environmental impacts and mitigation.	Section 7.0
Number and type of people to be employed.	Appendix C
Need for and benefits of the project.	Sections 2.4 and 2.5 Appendix C
Demand for the project (potential impact to local communities in terms of jobs and contracts).	Section 2.4 Appendix C
Project Description	
Project details - size, length (for linear projects), layout, capacity, production rates, process information, dimensional characteristics and life span of the project (accompanied by site and regional maps, flow charts, diagrams, graphs and photographs).	Sections 2.1 and 2.3 Figure 2.3-1 Appendix B
Project details - best management practices incorporated into construction, operation and decommissioning.	Section 3.0
Project details - itemize permits required.	Section 1.3 Table 1.3-1
Location - detailed description of the location; maps to show the location of the proposed project relative to other land uses, developments and communities.	Sections 1.1 and 2.3 Figures 1.1-1 and 2.3-1
Socioeconomics - possible impact on local communities in terms of potential jobs and contracts; types of jobs and contracts, the inputs that will be purchased locally, and the proponent's policy on the hiring of local employees for both labour and managerial positions.	Sections 5.2.7 and 7.1 Appendix C
Inputs and outputs - quantities and sources of inputs (e.g., water, other natural resources, electricity, process chemicals, hazardous substances, etc.). Description and quantity of outputs (eg. services or products).	Section 3.0
Byproducts - amount and type of all byproducts and wastes including: recyclable materials, hazardous and nonhazardous wastes, waste water, air emissions and domestic waste.	Section 4.0
Byproducts - the means by which byproducts and wastes will be treated, stored, contained, transported, used and/or disposed should be described.	Section 4.0
Byproducts - ancillary projects necessary to deal with wastes (e.g., new pipelines, treatment plants, landfills or other disposal facilities)	Sections 3.3 4.0
Alternatives considered feasible during project planning (e.g., location, process, route) and the rationale for rejecting explained.	Sections 3.1.2.6 and 3.3.1.1 Appendix C

Table A-2: Provincial Technical Proposal Guideline – Concordance Table (continued)

Technical Proposal Guidelines - Required information	Project Description Section Number
Ancillary projects - description of ancillary projects associated or related projects whose planning, construction and/or operation are outside the scope of the technical proposal and may be proposed by another proponent (e.g., pipelines, borrow pits, roads, treatment plants).	Section 3.3
Description of the Environment	
Vegetation type.	Section 5.2.4
Aquatic habitats.	Section 5.2.3
Wildlife in the project area.	Section 5.2.4
Value of the project area as wildlife habitat.	Section 5.2.4
Fish and fish habitat, if surface water bodies will be affected.	Section 5.2.3
Rare species (plants and animals) and their habitat.	Section 5.2.4
Physical conditions, including unique landforms, slopes, runoff characteristics and soil types as well as proximity to streams or waterbodies.	Sections 5.2.2, 5.2.3 and 5.2.4
Subsurface stratigraphy and depth to groundwater (if applicable).	Section 5.2.2
Surface and ground water quality.	Section 5.2.3
Climate and weather parameters that may impact the project.	Section 5.2.1
Social and economic conditions, including land use at and around the project area, special land use designations (e.g., parks, local zoning) and existing infrastructure (e.g., roads, utilities).	Sections 5.1 and 5.2.7 Figures1.1-1 and 2.3-1
Existing contamination or disturbances.	N/A
Nearby residents and communities.	Sections 2.3 and 2.1 Figures 1.1-1 and 2.3-1
Sites that may have significant cultural or heritage value.	Section 5.2.5 Figure 5.1-1
Potential Impacts and Mitigation Measures	
Positive and negative effects that the project may have on environmental features.	Section 7.1 Table 7.1-1
Potential for impacts to occur in different locations and at different geographical scales, including on-site, above or below ground; on adjacent properties; in the local neighbourhood or community; in other regions within the province; and province-wide.	Sections 7.1 and 7.2 Table 7.1-1 Appendix D
Mitigation measures for each impact. Magnitude, geographic extent, duration, reversibility, frequency and probability of occurrence of the impact, along with the methods or best management practices that will be used to mitigate.	Section 3.0
Changes or mitigation implemented in response to public concern.	Appendix F

Table A-2: Provincial Technical Proposal Guideline – Concordance Table (continued)

Technical Proposal Guidelines - Required information	Project Description Section Number
Justification of residual impacts that cannot be mitigated.	Appendix D
Monitoring	
Monitoring programs for minimizing impacts during the construction and operation phases.	Appendix D
Decommissioning and Reclamation	
Conceptual plans for project decommissioning and description of how the area affected by the project will be reclaimed or restored.	Section 3.4
Stakeholder, First Nation and Métis Engagement	
Documentation of any public engagement, planned or undertaken.	Section 8.0 Appendix F
Documentation (e.g., news articles, meeting minutes, etc.) illustrating any community acceptance, public interest, or concern.	Appendix F
Information about future engagement planned to deal with public issues.	Section 8.0
Discussion activities, including groups involved, and dates and means of engagement.	Section 8.0 Appendices E and F
Summary of all comments and concerns, and responses.	Appendix F
Ongoing or proposed discussions.	Section 8.0
Information on First Nations and Métis communities' traditional or heritage uses in the area.	Sections 5.2.5 and 5.2.6

APPENDIX B

Photographs

Photo 1: Black Lake Water Intake Location. South-east Facing View

Photo 2: Black Lake Water Intake Location. North-west Facing View

Photo 3: Black Lake Outlflow. Upstream of Grayling Island. Downstream-facing view. East Bank of the Fond du Lac River.

Photo 4: Black Lake Outlflow. Upstream of Grayling Island. Downstream-facing view. West Bank of the Fond du Lac River.

Photo 5: Downstream view of the Fond du Lac River observed from the west bank of Grayling Island.

Photo 6: Upstream facing view from West bank of Grayling island. Camp Grayling in the back ground. Photo take from near the downtream end of the island close to the location of the proposed submerged weir.

Photo 7: Upstream facing view from the downstream end of the East shore of Grayling Island.

Photo 8: Upstream facing view from the East middle shore of Grayling Island.

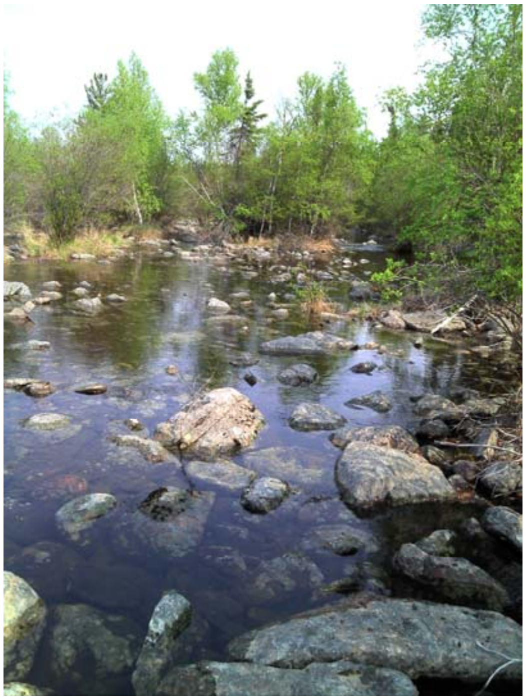


Photo 9: Downstream View of a Flooded Side Channel on Grayling Island in June, 2012. This area was completely dry in 2010.

Photo 10: View of the Downstream End of Grayling Island from the West Shore Approximately at the Submerged Weir Location

Photo 11: Downstream facing view from the Downstream End of of Grayling Island.

Photo 12: Elbow Bend of the Fond du Lac River facing upstream (east)

Photo 13: Hoopnet Set in the Middle Section of the Fond du Lac River Observed from the West Shore.

Photo 14: Middle Section of the Fond du Lac River Facing East, Approximately 1 km Upstream of Elizabeth Falls.

Photo 15: Middle Section of the Fond du Lac River facing downstream Observed from the East Shore, Just Upstream of Elizabeth Falls.

Photo 16: Elizabeth Falls from West Shore.

Photo 17: Rock Out-crop Situated Mid-channel in the Elizabeth Falls Canyon.

Photo 18: Fond du Lac River Immediately downstream of the Elizabeth Falls Canyon.

Photo 19: Proposed Location of Tail Race Outfall in Lower Section of Fond du Lac River.

Photo 20: Downstream View of the Fond du Lac River Observed from the Tail Race Outfall Bay.

Photo 21: Hoopnet Set in the Tail Race Outfall Bay.

Photo 22: Winter Aerial View of Middle Lake Outflow Facing Downstream towards Woodcock Rapids.

Photo 23: Maturing seral mixedwood forest (in area of 1989 fire) adjacent to well vegetation bedrock outcrop. Close to intake location.

Photo 24: East side of bridge location 1 in regenerating mixedwood (1989 fire).

Photo 25: At power house location in regenerating mixedwood habitat (1989 fire)

Photo 26: Along tailrace channel in regenerating Jack Pine habitat (1989 fire). This is the dominant upland vegetation in this area.

Photo 27: End of tailrace channel in Regenerating Fen habitat ('depressional' area containing poor fen). 1989 fire. Adjacent to unburned area by river. The area in the photo is burned.

APPENDIX C

Supplementary Project Information

1.0 PROJECT INFORMATION

1.1 Project Need

Saskatchewan Power Corporation (SaskPower) provides electrical energy to meet industrial and residential demand on SaskPower's Far North system. Northern transmission and generation facilities have been constructed over the years to meet existing demands for power. However, the demand for power is expected to double in northern Saskatchewan over the next ten years, which the existing electrical facilities will be unable to serve. As a result, SaskPower is implementing upgrades to the existing transmission service, working with Black Lake First Nation (BLFN) to develop the Elizabeth Falls Hydroelectric Project, and evaluating various other generation options so that the Far North load can continue to be served in the future.

The SaskPower Far North system has no direct connection to the southern Saskatchewan system, but is supported by inter-ties with Manitoba near Flin Flon. The Far North system includes the transmission line from SaskPower's Athabasca power plants west of Uranium City to the Manitoba border near Flin Flon.

The Far North system is currently supplied by the Island Falls Power Station and the Athabasca power stations at Waterloo, Wellington and Charlot River. Plant maximum capacities and median energy production capabilities are listed in Table 1.1-1, totaling approximately 124 megawatts (MW) and 892 gigawatt hours (GWh), respectively.

Units 4 to 6 at Island Falls are being refurbished over the next three years and will see an incremental increase in capacity of approximately 11 MW in total.

Table 1.1-1: SaskPower Generating Capacity on the Far North System (as of January 1, 2012)

Generating Station	Capacity (Net MW)	Median Energy (GWh)	Firm Energy* (GWh)	Comments
Island Falls	101	775	697	Island Falls capacity will increase by approx. 11 MW by 2013.
Wellington	4.8	117	84	Median and Firm Energy values are combined for the three Athabasca facilities
Waterloo	8			
Charlot River	10			
Total	**123.8**	**892**	**781**	

* Firm Energy represents the energy available during the year with the lowest water flow on record.
MW = Megawatt; GWh = gigawatt hours

These power stations are connected by over 800 kilometres (km) of 138/115 kilovolt (kV) transmission line. The SaskPower Far North system also includes two 110 kV transmission lines that connect with the Manitoba Hydro system at the Border Station near Flin Flon.

SaskPower is projecting significant increases in demand for power in northern Saskatchewan as a result of predicted population growth, increased production at existing uranium mines, and to accommodate the development of new mines. Currently the total peak demand for power is about 80 MW, projected to increase to 135 MW by 2021. Similarly, demand for energy is expected to increase from 530 to

930 GWh. The proposed Project is an important component of a larger strategy to provide a reliable power supply for current needs, and to support future power requirements in northern Saskatchewan.

The SaskPower Far North system is exclusively supplied by hydroelectric power generation, backed up at times through the Manitoba Hydro interface at the Border Station. This system is dependent on precipitation and surface water runoff to produce power. To manage a reliable supply of power, firm hydrological conditions need to be considered. Firm hydrological conditions are those that are expected during the worst historical flow conditions over SaskPower's recorded data (approximately 50 years). SaskPower is able to supply 781 GWh of energy under firm hydrological conditions, which is less than the predicted demand for power in the coming years. As a result, SaskPower proposes to add generation capacity in the near future to maintain a reliable electrical power supply in the North.

1.2 Project Activities to Date

The hydroelectric potential of Northern Saskatchewan has been recognised for a number of years. The interest in a facility specifically at Elizabeth Falls, Fond du Lac River on BLFN - Chicken Indian Reserve No. 224 land dates back at least to the early 1970s. Project characteristics at that time considered the demand for power in the North (at that time, substantially lower than the current demand), the remoteness of the location, and potentially having a dam to create a large storage area out of Black Lake. Over the following two decades or more, the hydro facility concept was not actively pursued, however the concept was never dismissed from future consideration.

In 2001, BLFN and Acres International Ltd. discussed the feasibility of proceeding with a hydroelectric project that would have minimal environmental impact on First Nation Land, and in particular would not entail a dam being constructed at the outlet of Black Lake. Acres conducted a field reconnaissance of the site, reviewed historic water flow records, and conducted analysis such that it was concluded the concept warranted further study. A key component of having a project with minimal impact to Black Lake was that a power tunnel could be constructed from Black Lake to a point downstream in the Fond du Lac River, with a portion of the river's flow being diverted through the tunnel. The capacity of a facility was estimated at that time to be not less than 25 MW.

Acres conducted a pre-feasibility evaluation, resulting in preparation of a Strategic Planning Study report issued in April 2002. In the fall of 2002, subsurface exploratory drilling (5 holes) was completed, and information indicated that the rock would likely be suitable for tunnel excavation. The project planning was then taken to the next level, that being preparation of a formal Feasibility Study.

SaskPower expressed interest in buying power from a project of this scope and output, through a long term purchase agreement. SaskPower expressed support for the project by providing assistance during preparation of the Feasibility Study.

In February 2004, BLFN was given approval to proceed with the Feasibility Study by Indian and Northern Affairs Canada (INAC), through INAC's Economic Development Partnership Program. The feasibility study was completed between February 2004 and September 2005. The Feasibility Study Report draft was completed in 2006 and revised in early 2007. The feasibility study report, encompassing environmental issues as they were understood at that time, was reviewed with federal and provincial regulatory agencies and SaskPower at various times from 2004 through 2006. This report identified that a facility in the 42 to 50 MW range could be considered.

In early 2006 a Project Description, derived primarily from the 2006 Feasibility Study Report, was forwarded to the Canadian Environmental Assessment Agency (the Agency) and Saskatchewan Environment – Environmental Assessment Branch (SE-EAB), now referred to as the Saskatchewan Ministry of Environment – Environmental Assessment Branch (MOE-EAB). The Agency advised that federal review would be required, and that the scope of the project fell within the legal definition of a project requiring a Comprehensive Study. The SE-EAB also advised that the project would be considered a "development" pursuant to the Saskatchewan *Environmental Assessment Act*. In cooperation with SE-EAB pursuant to joint review protocols between the two levels of government, the Agency prepared draft Terms of Reference for a Comprehensive Study / Environmental Impact Statement and posted the Project Description and Terms of Reference for public review in 2007. The draft Terms of Reference were used by Hatch (formerly Acres International Ltd.) and EFHLP for the next several years as a guide to how the environmental assessment and environmental studies should be completed by a proponent, and what additional pre-engineering or design might be required if the project were to proceed.

In November of 2007, the Governor General in Council accepted the request made to Her Majesty by the Black Lake First Nation, to designate portions of the Chicken Indian Reserve No. 224 for the development of a hydro-electric facility.

In September of 2009 the Elizabeth Falls Hydro Limited Partnership (EFHLP) was formed. The General Partner was, and remains to this time, the Elizabeth Falls Hydro Development Corporation (EFHDC) and limited partner was/is the Black Lake Denesuline First Nation.

On April 13, 2010 EFHLP signed a Memorandum of Understanding (MOU) with SaskPower that would allow the environmental and engineering studies to begin in the spring of that year. A component of the MOU was that if the project proved to be an economical supply option, a contract would be negotiated for SaskPower to buy the electricity in order to address the growing need for power in Northern Saskatchewan. SaskPower provided funds to EFHLP to conduct environmental field studies and other information gathering, and field studies commenced in the spring of 2010. Funds were also provided to Hatch for completing pre-engineering design.

By early 2012 considerable time had lapsed without certainty that the project would proceed, or would proceed as described in the Project Description submitted to regulatory agencies in 2006. The EFHLP requested that the Agency withdraw the project from consideration; the EFHLP also advised that it remained their intention that the project proceed, and that a revised Project Description would be submitted later in 2012.

In early 2012 BLFN requested that SaskPower enter into an arrangement with them whereby SaskPower would ultimately become a development partner. The MOU between SaskPower and EFHLP was modified to enable funding by SaskPower for environmental approval. Environmental studies were conducted during the period of May 2010 through October 2012. Preparation of a Project Description pursuant to the new *CEAA, 2012* legislation began in the spring of 2012.

1.3 Workforce

1.3.1 Construction Workforce

Due to the specialized nature of certain portions of constructing a hydroelectric power facility, specific components of the work will need to be completed by skilled trades people and contractors with expertise in areas such as cofferdam construction for the power tunnel intake, power tunnel excavation, powerhouse mechanical and electrical installation, the pouring of concrete and forming of water passages leading to the turbines, and installation and commissioning of turbine and generator equipment.

All work carried out will be done by qualified contractors and personnel. Additionally, other construction activities will require labour and semi-skilled assistance to carry out the following construction activities:

- clearing of vegetation (e.g., for access roads, powerhouse, tailrace, intake, switching station, transmission line);
- access road and bridge construction;
- tailrace excavation through overburden and rock;
- powerhouse building construction; and
- construction camp set up and operation.

It is estimated that during the peak construction period, the Project will create approximately 150 jobs and the camp population could range between 100 and 150 people.

It is the intent of the Proponent to maximize the use of local contractors whenever possible, especially those who employ people from local Aboriginal communities. The Proponent will develop training programs and provide funding to prepare local community members for Project job and contracting opportunities. The objective is to realize the maximum economic benefits of the Project to the local community during the construction period, as well as in the longer term once the Project is in operation. It is anticipated that training programs will be made available sufficiently in advance of Project startup such that workers are trained and ready to begin work when construction begins.

The safety and wellbeing of workers involved in construction is of primary importance to the Project. Contractors that work at site will be required to comply with current provincial and/or federal Health and Safety regulations, as well as SaskPower's ISO 18001 safety system. It is the responsibility of the Proponent of the Project through its Project Manager to ensure that all contractors comply with these requirements.

1.3.2 Operations Workforce

It is the intent of the Proponent to train and employ people from the local community to maintain and operate the plant once it is commissioned. The exact number of people employed will be determined once the design of the powerplant is finalized. Based on similar plants located in remote, northern regions, it is anticipated that between four and six people may be required to operate the plant.

Due to the low number of employees expected to operate the plant, there are currently no plans to have a permanent residential facility for the Project. It is expected that operations employees would already be living in the communities close to the Project.

2.0 PROJECT ALTERNATIVES

2.1 Alternatives to the Project

A number of power generation alternatives exist for supplying the growing energy needs of northern Saskatchewan. They include the following:

1) Diesel Generation – This is a proven technology that involves the combustion of diesel fuel in a reciprocating engine coupled to a generator, which produces electricity. Unit size ranges from 1 to 20 MW and can be easily located where electrical energy is needed. This technology can also be quickly deployed, typically requiring between 18 and 24 months to install. The challenge with diesel generation is that it is costly, requires the transportation of fuel to remote locations, and produces emissions. The use of diesel generation to supply the energy needs of Saskatchewan's north is not preferred as it is a more expensive and less environmentally sustainable alternative.

2) Hydro – There are a number of other locations in northern Saskatchewan that could be developed as hydroelectric power sites. SaskPower will need to consider some or all of these locations in the coming years as it strives to meet the growing demand for power in the north. The Elizabeth Falls Project is the most advanced of all the available options, but will not be able to fully provide the expected demand for power in the north.

3) Wind – The wind regime in northern Saskatchewan is insufficient to economically develop this type of power generation. As well, the intermittent nature of wind power would require backup generation provided by an alternative power source to provide a reliable source of power. This type of power generation is best developed in areas where there is an abundance of wind, interconnected through a robust transmission system that can provide backup power from alternative sources of generation.

4) Purchased Power – Load growth in northern Saskatchewan could be provided through the purchase of capacity and energy from Manitoba Hydro through the transmission line connection to their system at the Border Station. Discussions with Manitoba Hydro on existing and future such arrangements indicate that the purchase of energy cannot be guaranteed long term and is likely to come at a premium cost compared to what the Elizabeth Falls Project cost would be.

5) Transmission Pathway to the North – It is technically possible to transfer up to 75 MW of electricity generated in southern Saskatchewan through the Manitoba Hydro system to serve the load in northern Saskatchewan through the Border Station south of the Island Falls power station. However, Manitoba Hydro will charge a fee to use their system, which makes this a more costly option than developing power stations in northern Saskatchewan. As well, transmission constraints may limit the amount of power that can be transferred in the future or at certain times of the year, which will affect the reliability of electricity supply to the north.

6) Transmission Reinforcements – SaskPower is upgrading the existing transmission line in northern Saskatchewan to increase the transfer capability from the south to the north. These reinforcements will improve the efficiency of the line, but will not provide enough of an improvement to fully serve the load in the north. Additional supply of electricity, either through new generation, purchased power or transfer from the south, will still be required to meet the demand for power in the north.

7) Demand Response – SaskPower is assessing the possibility for large industrial customers to curtail their demand for power during peak periods, and receive payment to reduce their load when needed. However, this solution does not allow for economic growth to occur in northern Saskatchewan as mines are built or expanded. It is not considered a viable, long term solution.

2.2 Options for Project Design

The feasibility phase of the Project is nearing completion with final engineering and design expected to start in early 2013. The project design has not yet been finalized and certain design features (e.g., the locations of the transmission lines, construction camp, and waste rock disposal areas) will be decided after consultation with local community members and regulators, and may be subject to change pursuant to the selection of an engineering and construction contractor early in 2013.

An alternative approach to developing the Elizabeth Falls Project would be to construct a 45 m tall dam and spillway structure across the Fond du Lac River at the downstream end of the falls, just upstream of Middle Lake. This would allow for easier and more precise management of downstream river flows as well as generating additional power. However, this would flood a significant amount of land and erase the presence of the falls themselves, including the Arctic grayling habitat that currently exists. The addition of a dam and spillway would eliminate the need for a power tunnel, but would require a large amount of fill material from the local area for construction, which would impact the terrestrial environment and would likely cost significantly more than the proposed Project arrangement. Perhaps the most significant deterrent to this option is that the community of Black Lake have clearly stated that they are not in favour of this type of project arrangement. As a result, it has not been given detailed consideration.

3.0 REFERENCES

Black Lake First Nation Elizabeth Falls Hydroelectric Development Strategic Planning Study Final Report, June 2002, prepared by Acres International Ltd., Winnipeg, Manitoba

Black Lake First Nation Proposed Elizabeth Falls Hydro-Electric Project Feasibility Study Final Report, Volume 1 Report, March 2007 prepared by Hatch Acres, Oakville Ontario.

APPENDIX D

Environmental Assessment Approach

ENVIRONMENTAL ASSESSMENT APPROACH

Spatial and Temporal Boundaries

Individuals, populations, and communities function within the environment at different spatial and temporal scales. Effects from the Elizabeth Falls Hydroelectric Power Project (Project) on the biophysical environment are typically stronger at the local scale, and larger (regional) scale effects more likely result from other ecological factors and human activities. For the Environmental Impact Statement (EIS), the spatial boundaries of the local study areas (LSAs) will be designed to measure baseline environmental conditions and then to predict direct effects on the valued components (VCs) from the Project footprint and activities. Local study areas will be defined to assess small-scale indirect effects from Project activities on VCs (e.g., changes to soil and vegetation from dust and fuel emissions). The boundaries for regional study areas will be designed to quantify baseline conditions at a scale that is large enough to assess the maximum predicted geographic extent (i.e., maximum zone of influence) of direct and indirect effects from the Project on VCs. Cumulative effects are typically assessed at a regional spatial scale and, where relevant, may consider influences that extend beyond the regional study area.

Spatial and temporal boundaries are tightly correlated because processes that operate at large spatial scales typically occur at slower rates and have longer lag times than processes that operate on smaller spatial scales. The approach used to determine the temporal boundaries of effects from natural and human-related disturbances on VCs is similar to the approach used to define spatial boundaries. In the EIS, temporal boundaries will be linked to two concepts. The first is linked to the development phases of the Project and the second is the predicted duration of effects from the Project on a VC, which may extend beyond closure. Thus, the temporal boundary for a VC is defined as the amount of time between the beginning and the end of a relevant Project activity or stressor, plus the duration required for the effect to be reversed. After removal of the stressor, reversibility is the likelihood and time required for a VC or system to return to a state that is similar to the state of systems of the same type, area, and time that are not affected by the Project.

Interaction Analysis

Interaction analysis identifies and assesses the issues and linkages (or interactions) between the Project components or activities, and the correspondent potential residual effects on VCs (e.g., surface water quality, fish and fish habitat, wildlife, and socio-economics). The first part of the analysis is to produce a list of all potential interactions through which the Project could affect biophysical and socio-economic VCs. Each potential interaction initially is considered to have a linkage to potential effects on VCs. This step is followed by the development of environmental design features and mitigation that can be incorporated into the Project to remove the effect or limit (mitigate) the effects to VCs. Environmental design features include Project designs, environmental best practices, and management policies and procedures. Environmental design features are developed during the Project design phase through an iterative process between the Project's engineering and environmental teams to avoid or mitigate effects. Knowledge of the ecological system and environmental design features and mitigation is then applied to each of the pathways to determine the expected amount of Project-related changes to the environment and the associated residual effects (i.e., after mitigation) on VCs. For an effect to occur there has to be a source (Project component or activity) that results in a measurable environmental change to the environment (pathway), and a correspondent effect on a VC.

Project activity → change in environment → effect on VC

Interaction analysis is a screening step that is used to determine the existence and magnitude of linkages from the initial list of potential effects for the Project. This screening step is largely a qualitative assessment, and is intended to focus the effects analysis on potential interactions that require a more comprehensive assessment of effects on VCs. Interactions are determined to be primary, secondary (minor), or as having no linkage using scientific and traditional knowledge, logic, and experience with similar developments and environmental design features. Each potential interaction is assessed and described as follows:

- no linkage – effect is removed by environmental design features so that the Project results in no detectable (measurable) environmental change and residual effects to a VC relative to baseline or guideline values;
- secondary - interaction could result in a minor environmental change, but would have a negligible residual effect on a VC relative to baseline or guideline values; or
- primary - interaction is likely to result in a measurable environmental change that could contribute to residual effects on a VC relative to baseline or guideline values.

Primary interactions require further effects analysis and effects classification to determine the environmental significance from the Project on VCs. Interactions with no linkage to VCs, or that are considered minor (secondary), are not analyzed further or classified in the EIS, because environmental design features will remove the pathway (no linkage) or residual effects can be determined to be negligible through a simple qualitative or quantitative evaluation of the pathway. Interactions determined to have no linkage to VCs or those that are considered secondary are not predicted to result in environmentally significant effects on VCs.

Project Specific Effects Analysis

General Approach

In the EIS, the effects analysis will consider all primary effects interactions that likely result in measurable environmental changes and residual effects to VCs (i.e., after implementing environmental design features). Thus, the analysis will be based on residual Project-specific (incremental) effects that are verified to be primary in the interactions analysis. Residual changes to VCs will be analyzed using effects statements in the EIS. Effects statements may have more than one primary interaction that link a Project activity with a change in a VC.

Discipline-Specific Approach and Methods

A detailed description of the methods used to analyze residual effects from the Project on VCs will be provided for each discipline. Where possible and appropriate, the analyses will be quantitative, and may include data from field studies, modelling results, scientific literature, government publications, effects monitoring reports, and personal communications. Some analyses will be qualitative and include professional judgement or experienced opinion due to the amount and type of data available.

Air Quality

The assessment is focused on predicting the change in air quality due to the Project's construction, operations (including commissioning), and decommissioning phases. The assessment of air emissions for the Project is completed by:

- establishing existing air quality levels;
- predicting the air emissions from the Project; and

- comparing the predictions to existing federal and provincial criteria to determine effects.

The air quality assessment will use AERMOD to complete dispersion modelling for primary sources of air emissions from the Project. The dispersion model will be used to determine the changes in ambient air quality concentrations due to Project activity from a selected list of pollutants. The following pollutants will be assessed: suspended particulates (including total suspended particulates [TSPs], $PM_{2.5}$, and PM_{10}), SO_2, CO, NO_2, and particulate deposition. Results from the modelling will be used by other disciplines to evaluate the Project's effect on surface water quality, fish and fish habitat, soil, vegetation, and wildlife. The data also will be used to assess effects on the socio-economic environment.

Noise Quality

The amount of noise emitted by the Project will be determined to complete the analysis of noise effects. Project design data, equipment lists, and development plans will be used to establish the major noise emitting activities. Noise levels from these activities will be established using measurements of similar equipment/activities, data from potential vendors, and reference acoustic formulae.

Once the sources of noise have been established, a noise model will be developed that provides a three-dimensional calculation of noise propagation from the Project over a designated study area. The noise model will incorporate Project activities and processes that generate noise. The model will predict noise levels at any identified noise sensitive receptors, which are typically residences. Other receptors may include campgrounds, churches, or any location where there is a reasonable expectation of quiet. Results at the receptors will be compared to selected Project criteria and the incremental change in the acoustic environment near the Project evaluated.

Surface Hydrology

A physically-based hydrology model (RIVER2D) will be developed to simulate and quantify the effects of the Project, as provided by the engineering group, on local and regional flow rates, water levels, and waterbody volumes of lakes and streams that potentially may be affected. The model will incorporate local topographic data and stream and lake morphology. It will be calibrated and validated using measured field data. Water balance components, including precipitation, evapotranspiration, and runoff, also will be determined and used in combination with drainage areas to quantitatively estimate potential effects in upland areas and within the Project footprint.

Surface Water Quality

Surface water quality modeling will be completed using a model that incorporates the estimated water chemistry and corresponding quantities of water released to the environment. The model will include baseline conditions to provide a spatial and temporal representation of predicted Project effects.

Fish and Fish Habitat

Effects assessments pertaining to fish and fish habitat will incorporate baseline data to determine sensitive areas and develop Habitat Suitability Index (HSI) models. The HSI models combine these results with the hydrology River2D model to estimate potential effects and to determine if the Project is likely to result in the Harmful Alteration Disruption and Destruction (HADD) of fish habitat. Project activities will be imposed on baseline conditions to assess, quantitatively and qualitatively, changes to fish habitat. Results from water quality modeling also will be used to determine potential effects to fish health and habitat quality.

Soils and Terrain

The Project's effects on soil quality, quantity, and distribution will be assessed using a combination of approaches. Changes to soil quality from erosion, admixing, compaction, and reclamation suitability will be assessed using baseline soils information. Changes to soil quantity will be assessed with a Geographic Information System (GIS) platform using baseline soil distribution information and the Project footprint. Results from air emission modeling (e.g., NO_2, SO_2) will be compared to thresholds for NO_2 and SO_2 to determine potential effects on soil quality (i.e., acidification sensitivity).

Vegetation

An assessment of the Project's effects on vegetation VCs will be completed using a GIS platform that incorporates the Project footprint and baseline Ecological Landscape Classification (ELC) vegetation maps. Information obtained during vegetation and wildlife baseline surveys will be used to develop the ELC for the Project area. Direct effects to known populations of provincially and federally listed plant species also will be assessed. The indirect effect from air emissions (NO_2, SO_2) will be compared to the thresholds for NO_2 and SO_2 to determine potential for effects to vegetation.

Vegetation (i.e., habitat) fragmentation analysis will be completed using a spatial pattern analysis program (FRAGSTATS) within a GIS platform. This will be completed to determine the change in landscape metrics resulting from the Project. Landscape metrics for each habitat will include total area, number of patches, mean area of patches, mean distance to the nearest similar patch, and coefficient of variation of mean distance to the nearest similar patch.

Wildlife and Wildlife Habitat

Wildlife assessments will be completed using a combination of quantitative and qualitative methods. Potential effects to wildlife VCs from habitat loss and fragmentation that were completed for the vegetation assessment will be used to assess effects to wildlife.

In addition to direct effects on wildlife habitat, changes to habitat quality resulting from changes to air quality, soil and vegetation, alteration of flows, water levels, water quality, and sensory disturbances will be assessed using scientific literature, modelling results, field studies, and professional judgement.

Heritage Resources

The location of the Project footprint was submitted to the Heritage Resources Branch to determine heritage sensitivities in the Project area. The scope of work for the assessment of effects to heritage resources included the completion of an independent HRIA in 2012. The information from the field assessment was documented in the HRIA, and will be included in the EIS as a support document to assess Project-related effects on heritage resources.

Traditional and Non-traditional Land and Resource Use

Residual effects to traditional and non-traditional land and resource use practices (e.g., assessment endpoints including hunting, fishing, plant and berry gathering) will be assessed. For example, analysis of Project-related effects on fish and fish habitat will be used to determine the associated influence on local fishing. Analysis of changes to waterfowl abundance and distribution will be used to assess the effect of the Project on the continued opportunity for harvesting ducks and geese. Therefore, effects to assessment endpoints for traditional and non-traditional land and resource use will be analyzed and assessed within discipline sections that contain the applicable biophysical or socio-economic VC.

Socio-Economics

Residual effects from the Project to the socio-economic environment will be assessed by estimating positive and negative changes to a number of VCs and associated measurement endpoints, including but not limited to:

- Economy:
  - household and business income;
  - results of direct, indirect, and induced impacts expressed in terms of gross output, GDP, labour income (included in GDP), and employment (number of jobs);
  - education and training;
  - opportunities for youth;
- Infrastructure and Community Services; and
  - quality and development of infrastructure and community services.
- Population and Health:
  - livability of the environment (e.g., impacts to people from Project-related changes to air and water quality, noise levels, and aesthetics of the environment);
  - family and community cohesion;
  - potential for recreational activities; and
  - long-term social, cultural, and economic sustainability.

Some of these measurement endpoints can be analyzed quantitatively (e.g., number of jobs created or estimated income levels). Other endpoints, such as community cohesion and traditional land use, are more difficult to quantify, and involve information from public engagement, literature, examples from similar projects under similar conditions, and experienced opinion. The effects analysis considers the interactions among the unique and common attributes, challenges, and opportunities related to social, cultural, and economic VCs. A key aspect of the effects analysis is predicting the influence from the Project on the development and sustainability of socio-economic conditions in the region.

Approach to Cumulative Effects

Cumulative effects represent the sum of all natural and human-induced influences on the physical, biological, cultural, and economic components of the environment through time and across space. Some changes may be human-related, such as industrial development, and some changes may be associated with natural phenomenon such as extreme rainfall or drought events. The goal of the cumulative effects assessment is to estimate the contribution of these types of effects, in addition to Project effects, to the amount of change on the VCs.

Not every VC requires an analysis of cumulative effects. It must be determined if the effects from the Project and one or more additional developments/activities overlap (or interact) within the temporal or spatial distribution of the VC. For some VCs, Project-specific effects are important and there is little or no potential for cumulative effects, because there is little or no overlap with other developments. The analysis of cumulative effects can be necessary and important for other VCs that are distributed or travel over large areas, and can be influenced by a number of developments. Socio-economic components also must consider the potential cumulative effects of the Project and other developments and human activities.

In the EIS, cumulative effects will be identified, analyzed, and assessed in a section that is separate from the Project-specific assessment for those VCs where it is applicable. Similar to Project-specific effects, the analysis of cumulative effects involves pathway and effects analyses, and the classification and determination of significance of residual effects.

Determination of Significance

Environmental significance is used to identify effects that have sufficient magnitude, duration, and geographic extent to cause fundamental changes to a VC. Providing definitions for environmental significance that are universally applicable to each VC assessment endpoint is difficult. Consequently, specific definitions will be provided for each VC in the EIS. The evaluation of significance uses ecological principles, to the extent possible, but also involves professional judgement and experienced opinion.

Uncertainty

Most assessments of effects embody some degree of uncertainty. The uncertainty section of the EIS will identify the key sources of uncertainty and discuss how uncertainty is addressed to increase the level of confidence that effects will not be worse than predicted. Confidence in effects analyses can be related to many elements, including the following:

- adequacy of baseline data for understanding existing conditions and future changes unrelated to the Project (e.g., extent of future developments, climate change, or catastrophic events);
- model inputs (e.g., detailed channel morphology along the Fond du Lac River);
- understanding of Project-related effects on complex ecosystems that contain interactions across different scales of time and space (e.g., how and why the Project will influence wildlife); and
- knowledge of the effectiveness of the environmental design features for reducing or removing effects (e.g., performance of the weir on Black Lake).

Uncertainty in these elements can result in uncertainty in the prediction of environmental significance. Where possible, a strong attempt is made to reduce uncertainty in the EIS so that the level of confidence in effects predictions is increased. Where appropriate, uncertainty also may be addressed by additional mitigation, which would be implemented as required. Each discipline section will include a discussion of how uncertainty has been addressed and will provide a qualitative evaluation of the resulting level of confidence in the effects analyses and determination of significance.

Monitoring and Follow-Up

In the EIS, monitoring programs will be proposed to address the uncertainties associated with the effects predictions and environmental design features. In general, monitoring is used to verify effects predictions and to determine the effectiveness of environmental design features (mitigation). Monitoring is also used to identify unanticipated effects and implement adaptive management. Typically, monitoring includes one or more of the following categories, which may be applied during the development of the Project.

- compliance inspection: for monitoring the activities, procedures, and programs undertaken to confirm the implementation of approved design standards, mitigation, and conditions of approval and company commitments;
- follow-up: programs designed to test the accuracy of effects predictions, reduce uncertainty, determine the effectiveness of environmental design features, and provide appropriate feedback to operations for modifying or adopting new mitigation designs, policies, and practices. Results from these programs can be used to increase the certainty of effects predictions in future environmental assessments; and
- environmental monitoring to track conditions or issues during the development lifespan, and subsequent implementation of adaptive management.

These programs form part of the environmental management system for the Project. If monitoring or follow-up detects effects that are different from predicted effects, or discovers the need for improved or modified design features, then adaptive management will be implemented. This may include increased monitoring, changes in monitoring plans, or additional mitigation.

APPENDIX E

List of Stakeholders

Generated By: Katie Zdunich

Appendix E

10-1365-0004

Generated On: 11/29/2012 12:56:11 PM

Name	Address 1	Address 2	City/Town	Province/State	Postal/Zip Code	Work Phone
Black Lake First Nation	Box 27		Black Lake	Saskatchewan		306.284.2044
Fond du Lac First Nation	Box 211		Fond du Lac	Saskatchewan		306.686.2102
Metis Local Northern Region 1			La Ronge	Saskatchewan	S0J 1L0	306.425.3961
Prince Albert Grand Council	Box 2350		Prince Albert	Saskatchewan	S6V 6Z1	306.953.2498
Athabasca Health Authority			Black Lake	Saskatchewan	S0J 0H0	306.439.2200
Northern Hamlet of Stony Rapids	Johnson Street		Stony Rapids	Saskatchewan	S0J 2R0	306.439.2173
Athabasca Basin Development Limited Partnership	Box 183		Wollaston Lake	Saskatchewan	S0J 3C0	306.633.5672
Athabasca Keepers of the Water			Unknown	Alberta		780.646.6101
Canadian Parks and Wilderness Society - Saskatchewan			Unknown	Saskatchewan		306.469.7876
New North	Box 1018	207 La Ronge Avenue	La Ronge	Saskatchewan	S0J 1L0	1.866.776.5505
North Labour Market Committee	Box 5000		La Ronge	Saskatchewan	S0J 1L0	
Saskatchewan Environmental Society	Box 1372		Saskatoon	Saskatchewan	S7K 3N9	306.665.1915

APPENDIX F

Engagement – Community Information Sessions Summary

Golder Associates

TECHNICAL MEMORANDUM

CELEBRATING 50 YEARS in 2010

DATE January 14, 2011 **PROJECT No.** 10-1365-0004/2200

TO Al Schreiner
Elizabeth Falls Hydro Limited Partnership

FROM Katie Zdunich / Brad Novecosky **EMAIL** kzdunich@golder.com
bnovecosky@golder.com

ELIZABETH FALLS HYDROELECTRIC PROJECT COMMUNITY INFORMATION SESSIONS ROUND ONE

The Elizabeth Falls Hydro Limited Partnership (EFHLP) proposes to construct a 42-50 MW hydroelectric generating station along the Fond du Lac River in northern Saskatchewan. Baseline studies for the environmental assessment (EA) were started in 2010. In December 2010, EFHLP held two community information sessions, one in Black Lake and one in Stony Rapids (Table 1).

Table 1: Schedule of Community Information Sessions

Location of Community Information Session	Date	Time	Attendance
Father Porte Memorial Denesuline School, Black Lake	Monday 6 December, 2010	2 pm to 6 pm	76
Waterfront Lodge, Stony Rapids	Tuesday 7 December, 2010	4 pm to 9 pm	6

Representatives at the community information sessions included Edwin Boneleye (Black Lake First Nation and EFHLP Board Director), Rick Robillard (EFHLP Board Director), Al Schreiner (EFHLP Project Manager), Dave Hamilton (Golder Associates Ltd. [Golder]), Brad Novecosky (Golder), Katie Zdunich (Golder), Wayne Rude (SaskPower), and Ray Dejarlais (SaskPower). Golder representatives were present at the community information sessions to answer any questions about the EA. SaskPower personnel were also present to help answer any questions related to power and how the facilities work.

The purpose of the community information sessions were to introduce the Project and the Project team to the communities as well as address any questions that the public may have with the proposed Project.

Advertising

The community information sessions were advertised on the radio and through posters that were placed around each community.

Radio advertising took place on Missinipi Broadcasting Corporation (MBC). MBC is a radio network with a mandate to preserve Aboriginal culture and to serve the needs of Aboriginal people. MBC is available to listeners in 70 communities across Saskatchewan, although the majority of listeners are in northern Saskatchewan. MBC broadcasts to all the communities in the Athabasca Basin including Uranium City, Fond du Lac, Stony Rapids, Black Lake, Camsell Portage, Hatchet Lake/Wollaston Lake as well as La Ronge, Prince Albert, and Saskatoon. Advertisements for the community information sessions ran from Wednesday 1 December to Sunday 5 December, 2010. Advertisements were in both English and Dene translations (Table 2).

Table 2: Placement of Radio Advertisements on MBC

Dates	Language	Number of Ads
Wednesday 1 December, 2010	English	2
Wednesday 1 December, 2010	Dene	1
Thursday 2 December, 2010	English	3
Thursday 2 December, 2010	Dene	1
Friday 3 December, 2010	English	3
Friday 3 December, 2010	Dene	1
Saturday 4 December, 2010	English	3
Saturday 4 December, 2010	Dene	2
Sunday 5 December, 2010	English	3
Sunday 5 December, 2010	Dene	2
	Total Radio Advertisements	**21**

Along with radio advertising, information posters about the community information sessions were also placed in local businesses, schools, and the town offices in both communities. A copy of the poster is attached.

Black Lake Community Information Session

The Black Lake community information session took place on Monday 6 December, 2010 from 2 pm to 6 pm at the Father Porte Memorial Denesuline School gymnasium. Attendees from the EFHLP board included Edwin Boneleye, Rick Robillard, and Al Schreiner. Dave Hamilton, Brad Novecosky, Katie Zdunich of Golder and Wayne Rude and Ray Dejarlais of SaskPower were also present to assist with the presentation.

Sign in sheets were used at the front entrance to keep track of the number of people attending. People were given a Frequently Asked Questions (FAQ) as well as a feedback sheet to fill out before leaving. People were then encouraged to make their way around the room to read posters on the Project and the EA process and ask questions of the EFHLP, Golder, and SaskPower representatives. A formal presentation was also given that included a PowerPoint on the Project and EA process. This presentation was delivered by Al Schreiner and Dave Hamilton. Edwin Boneleye provided an introduction about the Project in Dene. He was also on hand to translate the remainder of the presentation and answer any questions.

As the community information session was held in the school gymnasium, the majority of attendants were high school students and teachers.

The PowerPoint presentation, posters on the Project and EA, and the question and answer sheet are attached.

Feedback from the Black Lake Community Information Session

Of the 76 signed in attendees, 22 people filled out and left feedback sheets (attached). The feedback was generally positive and showed the community's interest for the Project. The feedback sheet consisted of two questions, an additional questions and comments section, and space to provide your address if they wanted to be added to the Project mailing list. The results are summarized below (Tables 3 through 5).

Photo 1: Edwin Boneleye Presenting at the Black Lake School Gymnasium

Table 3: What was your Main Reason for Attending this Information Session?
To gain more information about the proposed project (Came with grade 12 students).
What it is to have a young kid to have a nice future.
Find out about the time frame.
My teacher made me come to this session.
See how it flows through the hydro.
I knew what the project is and what will occur during the development of the hydro project.
To know about the hydro project, what it's going to be doing to the lake, and the fish, and how it's going to be an effect on the Elizabeth Falls.
Cause my teacher made me to come here.
The lake will be the Black Lake will get some power then power off will be on every day.
To learn more about the project.
The main reason for attending this information session is because it sounded very interesting.
To learn about how the hydro will work for this community.
Part of my class lesson.
Table full of snacks.
My teacher forced me to be here.
Because my teacher told me to come.
As a band member I have a desire to learn more.
Well as long as you give is electricity to community.

Table 4: Are you Satisfied with the Information Provided?

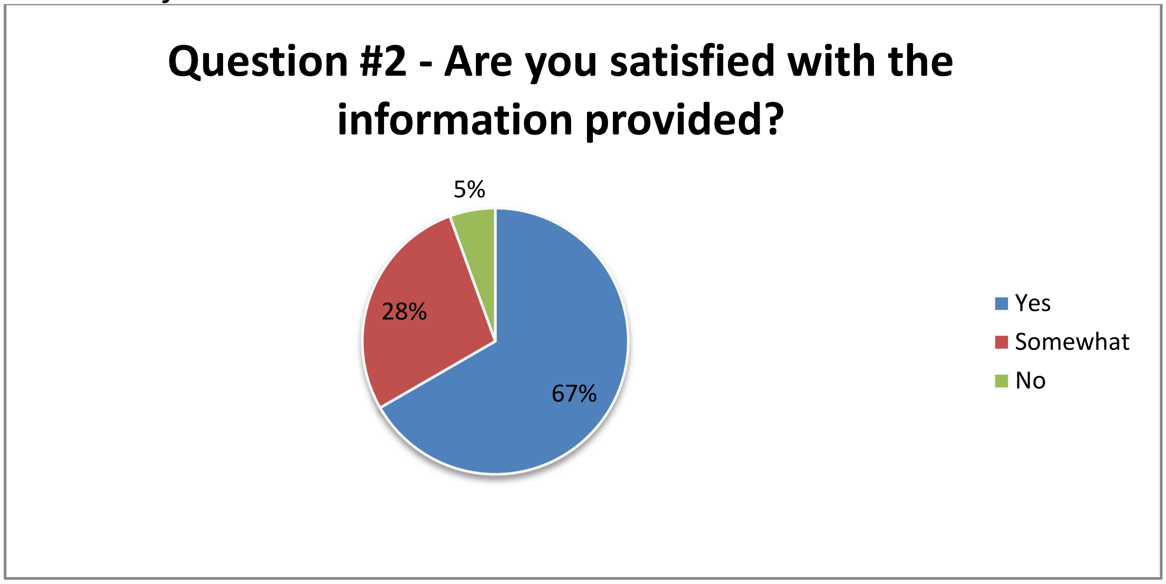


Table 5: What Comments and Questions do you have About this Proposed Project?

Will continue to watch for updates and progression via the web and email.
It is very nice to have this project for young people to have a new life.
In terms of beneficiary will the cost of monthly power bills be reduced in the community of Black Lake?
Hope it goes good with the project.
For our community to have a long term project that'll help the people.
Will the project take effect on the environment?
Will the project take effect on the environment?
None, no question.
The project is located on the Black Lake First Nation Reserve along the Fond du Lac River, between Black Lake and Middle Lake.
I like the project because it's helping the northern communities.
This can be an awesome project.
Why?
Why?
No comments and no questions.
I don't have any comments or questions.
Good idea but the process has to be in consultation with the grass root people. Where were the adults (there was just a room full of students). We need women, youth and elder representatives.
No comments.

Questions and Answers from the Black Lake Community Information Sessions

Although the feedback from Black Lake was predominantly positive there were a few stakeholders with some concerns and questions, mostly related to employment. See Table 6 for a list of all questions and concerns from the Black Lake community information sessions.

Table 6: Questions and Answers from the Community Information Sessions

Question	Response
Jobs	
What about jobs?	At this time, the total number of jobs that will be created has not yet been determined. Construction could require up to 300 people. Operations will require much less (6-10 people?). The types of jobs will include electrician, mechanics, machinist, heavy equipment operators, security, and utilities. The goal is to employ local people during the construction and operations of the Project. Training for these positions will occur on the job, or will be scheduled to take place leading up to the operations of the Project.
How many higher education jobs?	
How many jobs during construction?	
Will there be on the job training?	
Will jobs be from the community?	
About EFHLP	
Who is invested?	The EFHLP is a partnership between the Elizabeth Falls Hydro Development Corporation and Black Lake Denesuline First Nation. SaskPower has also invested funds to help get the EA underway.
Environmental and Social Impact	
Will the project take effect on the environment?	The EA is an important process to determine what types of impacts the project may have on the environment as well as determining ways to mitigate these impacts.
About the Project and Facilities	
What type of equipment is needed for construction, operations and decommissioning? How will this Equipment impact the environment.	Heavy equipment will be required to construct the proposed Project. The EA takes all phases of the Project in to account, which includes construction. The EA will determine what types of impacts this equipment will have on the environment, both on the proposed site as well as transporting it to the site.
Why?	The Elizabeth Falls Hydroelectric Project has been proposed to help provide more power to the north as well as to provide revenue to the Black Lake First Nation and to provide economic growth and benefits to the people who live in the communities.
About the EA	
Concern for vocabulary in presentation and translation.	An accurate translation of the EA will be very important and will be taken into consideration throughout the EA process.
Need a translator, and to translate the material into vocabulary that makes sense.	
Power	
In terms of beneficiary will the cost of monthly power bills be reduced in the community of Black Lake?	With the construction of a new power plant on the Fond du Lac River power rates will not decrease in the nearby communities, however the power will be more reliable and consistent. More power is also required to support the many mines that have been proposed for the north in the coming future.

Stony Rapids Community Information Session

The Stony Rapids community information session took place on Tuesday 7 December, 2010, from 4 pm to 9 pm at the Waterfront Lodge in Stony Rapids. Attendees from the EFHLP board included Rick Robillard and Al Schreiner. Dave Hamilton, Brad Novecosky, Katie Zdunich of Golder and Wayne Rude and Ray Dejarlais of SaskPower were also present to assist with the presentation.

Sign in sheets were used at the front entrance to keep track of attendance, and everybody signed as they entered. People were provided with a FAQ as well as a feedback sheet to fill out before leaving. Attendees were provided with an opportunity to make their way around the room to read posters on the Project and the EA process. A formal presentation was also given that included a powerpoint on the Project and EA and was delivered by Al Schreiner and Dave Hamilton. A total of six people attended the Stony Rapids community information session; only one feedback form was returned.

The PowerPoint presentation, the FAQ, and posters on the Project and EA are attached.

Photo 2: Al Schreiner presenting at the Waterfront Lodge in Stony Rapids

Feedback from the Stony Rapids Community Information Session

Of the six signed in attendees one person filled out and left a feedback sheet (attached). The feedback sheet consisted of two questions and space for additional comments and space to provide your address if they wanted to be added to the Project mailing list. See below for the results (Tables 7 through 9).

Table 7: What was your main reason for attending this information session?

Economic Development

Table 8: Are you satisfied with the information provided?

Yes

Table 9: What comments and questions do you have about this proposed Project?

Have a Dene translator included in your group.

Questions and Answers from the Stony Rapids Community Information Sessions

Although few people turned out for the Stony Rapids community information session, there were still many questions that were raised. The majority of questions were about the EA and the impacts the Project could have on the environment. See Table 10 for a list of all questions and concerns from the Stony Rapids community information sessions.

Table 10: Questions and Answers from the Community Information Sessions

Question	Response
Jobs	
How many people are required to run the plant?	At this time, the total number of jobs that will be created has not yet been determined. Construction could require up to 300 people. Operations will require much less (6-10 people?). The types of jobs will include electrician, mechanics, machinist, heavy equipment operators, security, and utilities. The goal is to employ local people during the construction and operations of the Project. Training for these positions will occur on the job, or will be scheduled to take place leading up to the operations of the Project.
What types of education are required?	
Is Black Lake First Nation ready to train?	
Concern that this region doesn't have capacity right now.	
About EFHLP	
Who owns the project?	The EFHLP board consists of Ted de Jong, Chief Donald Sayazie, George Davies, Robert Stedwill, Edwin Boneleye, Geoff Gay, Victor Echodh, Rick Robillard, Pauline Toutsaint-Thatcher, Anil Pandila, and Al Schreiner. The EFHLP is a partnership between the Elizabeth Falls Hydro Development Corporation and Black Lake Denesuline First Nation. SaskPower has also invested funds to help get the EA underway.
Who is on the Board?	
Environmental and Social Impact	
Will the water levels in Black Lake go down?	The EFHLP is proposing to construct the Project with minimal impacts to flow or water levels. The EA is an important process to determine what types of impacts the project may have on the environment as well as determining ways to mitigate these impacts.
What about water levels here at Stony Rapids?	
Would the project interfere with spawning?	
Concern for flooding?	
What happens when flow is lower than this year (2010 record low)?	On years when the water levels are too low the power house could be switched off so that no water is taken from the lake.
Will there be a screen so fish don't enter the turbine?	Hydro facilities incorporate fish diversion devices to prevent or reduce the number of fish from entering the power tunnel/turbine.
Concerns about what the falls will look like.	Impacts to aesthetics are an important part of the EA. Visualizations will be created to show the public how the Project will look from different locations along the river and lake.
How is it going to look 20 to 30 years from now?	
Concern for bridge and increased traffic impacting the area, the area has been used to fish, picnic, and camp for a long time.	
What will the intake look like?	
What are tags on the fish for?	During the 2010 field season over 1,000 fish were tagged. The purpose of this process is to gain information on the fish and their habitat; this includes determining where they have travelled since being tagged, how they have grown and their age.
Will the ice be affected by the intake?	Ice around the intake will likely be thin, or not form at all. This area will have to avoided as it could be a hazard especially for snowmobilers crossing the lake.

Table 10: Questions and Answers from the Community Information Sessions (continued)

Question	Response
About the Project and Facilities	
How big is the powerhouse?	The proposed powerhouse will be approximately a 50 MW facility.
Are there any dams proposed for the project?	No.
Are there facilities like this in Canada?	A similar hydro project can be found in British Columbia, however the proposed Project is more of a hybrid project as it will be designed to have minimal impacts to the flow and lake levels.
Can you re-circulate water back to Black Lake?	No, water will continue to flow into Middle Lake.
Where would the camp be located?	The final location for the camp has not been determined at this stage.
Why do you need to construct a bridge?	A bridge is required so that the facilities on the east of the river can be accessed all year round.
When are they going to start drilling?	A contract for drilling has not yet been laid out.
Is the drilling from a few years ago not useful?	More drilling is required to determine how acidic the rock is as well as determining the geological structure of the rock.
Will the bridge and road be accessible to public?	Likely the bridge and road on the east side of the river will be fenced off to keep the public away from the facilities.
What is the submerged weir for?	The weir will be used to help maintain the water levels in Black Lake.
Would acidic rock be a show stopper?	This will be determined through geo-technical studies.
What will happen with the facilities used for the construction camp?	It has not yet been determined what will be done with the facilities for the construction camp, however some options include turning them into a fishing camp, or moving the structures into to one of the communities to use as housing.
About the EA	
Concern for translation	An accurate translation of the EA will be very important and will be taken into consideration throughout the EA process.
Will CEAA complete their own consultations?	Yes, CEAA is required to carry out their own consultation, this will likely occur after the Environmental Impact Statement has been submitted.
Is there enough information for the project to go ahead?	Not at this stage. It takes approximately three years to gather all the necessary data required for the Environmental Impact Statement.
Is the EA similar to the original EA?	Many improvements to technology and computer modelling have occurred since the original EA was carried out. We are better able to predict the impacts that the Project may have today than we did in the past.
Are local people working on the EA?	Yes, local involvement is a very important part of the EA. This includes hiring local assistants as well as getting feedback from the local people on their thoughts and concerns about the Project.
Power	
If flows are high can you guarantee more power?	Approximately 124 MW of power are currently being produced in the north at the Island Falls and Athabasca System Hydroelectric Stations. With the construction of a new power plant on the Fond du Lac River the power in the north will be more reliable and consistent. More power is also required to support the many mines that have been proposed for the north in the coming future.
How much power is produced in the north?	

Summary

EFHLP hosted community information sessions on 6 December, 2010 in Black Lake and on 7 December, 2010 in Stony Rapids. A total of 82 people signed-in at the two community information sessions. A formal presentation was given at each community information session and the attendees were given an opportunity to ask the representatives questions on the Project. The majority of questions and concerns that were raised at the community information sessions were related to employment and the environmental impacts of the proposed Project.

During the community information sessions very little opposition was shown for the Project. From the comments and questions it appeared that while there are some concerns, most people feel that the Project will have a positive economic impact on the northern communities.

Closing

We trust the above information will be beneficial in planning and decision making related to the next phases of the EA for the Elizabeth Falls Hydroelectric Project.

GOLDER ASSOCIATES LTD.

Katie Zdunich, B.A.
Cultural Scientist

Brad Novecosky, M.A.
Biosciences Division Manager

KZ/BN/DH/ldmg

n:\active\2010\1365\10-1365-0004 saskpower elizabeth falls ea\2200 community engagement\community information session round 1\cis summary\10-1365-0004-2200 tech memo elizabeth falls january 13, 2011.docx

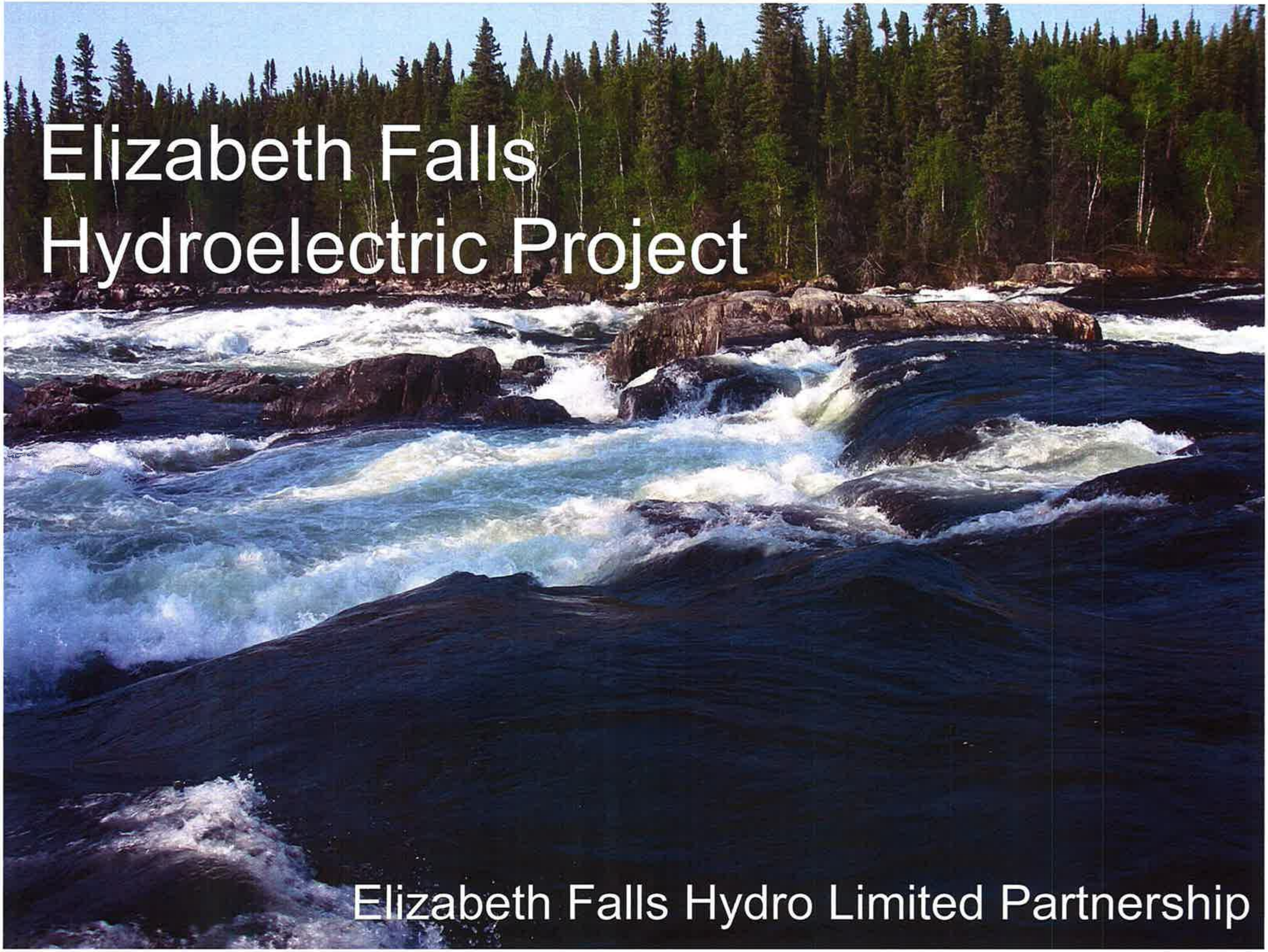
The Elizabeth Falls Hydro Limited Partnership invites you to come and learn about the proposed Elizabeth Falls Hydroelectric Project

Date: December 6, 2010
Time: 2 PM to 6 PM
Location: Black Lake, School Gym

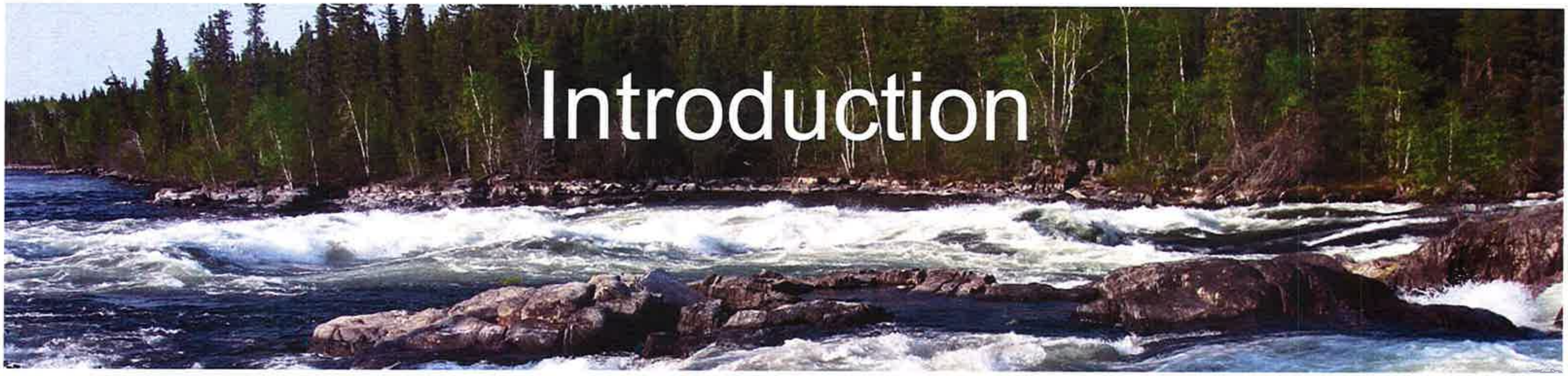
Date: December 7, 2010
Time: 4 PM to 9 PM
Location: Stony Rapids, Waterfront Lodge

Refreshments and snacks will be provided

Elizabeth Falls Hydroelectric Project



Elizabeth Falls Hydro Limited Partnership

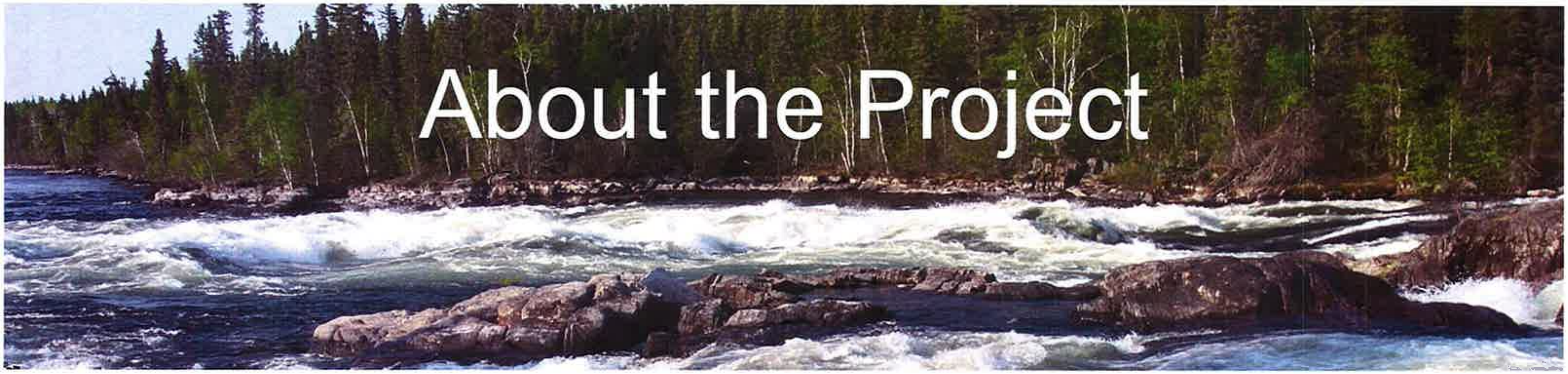


- The EFHLP is proposing to build a hydroelectric generating station located on the Fond du Lac River, between Black Lake and Middle Lake.
- Today we're here to provide information about the project and its current status.
- The project is in the early stages so we may not have all the answers at this time to your questions.
- All questions are welcome and will be recorded to provide documentation as part of the environmental assessment study and for us to follow up on with future meetings.
- We want your feedback – sheets are available at the door

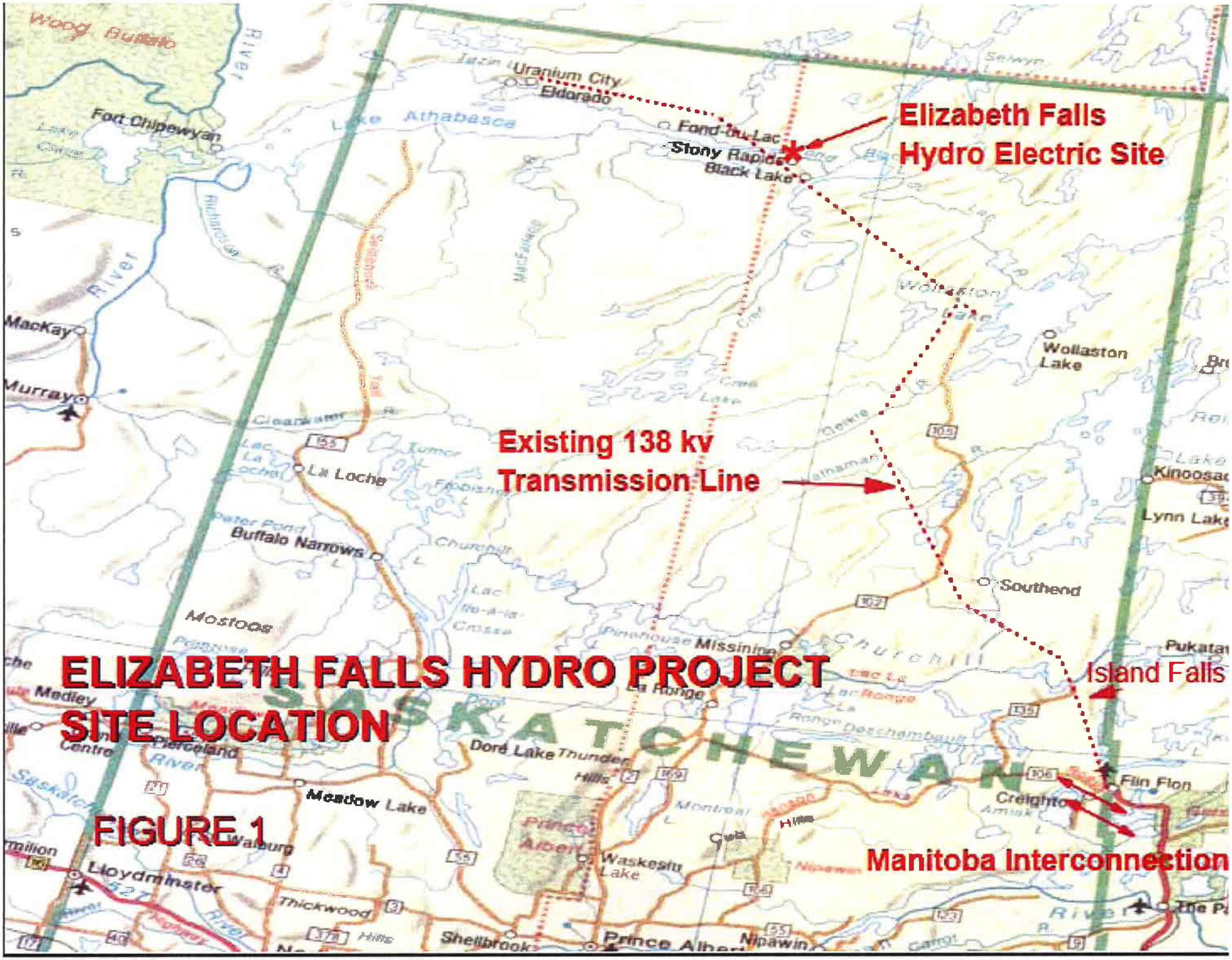
History

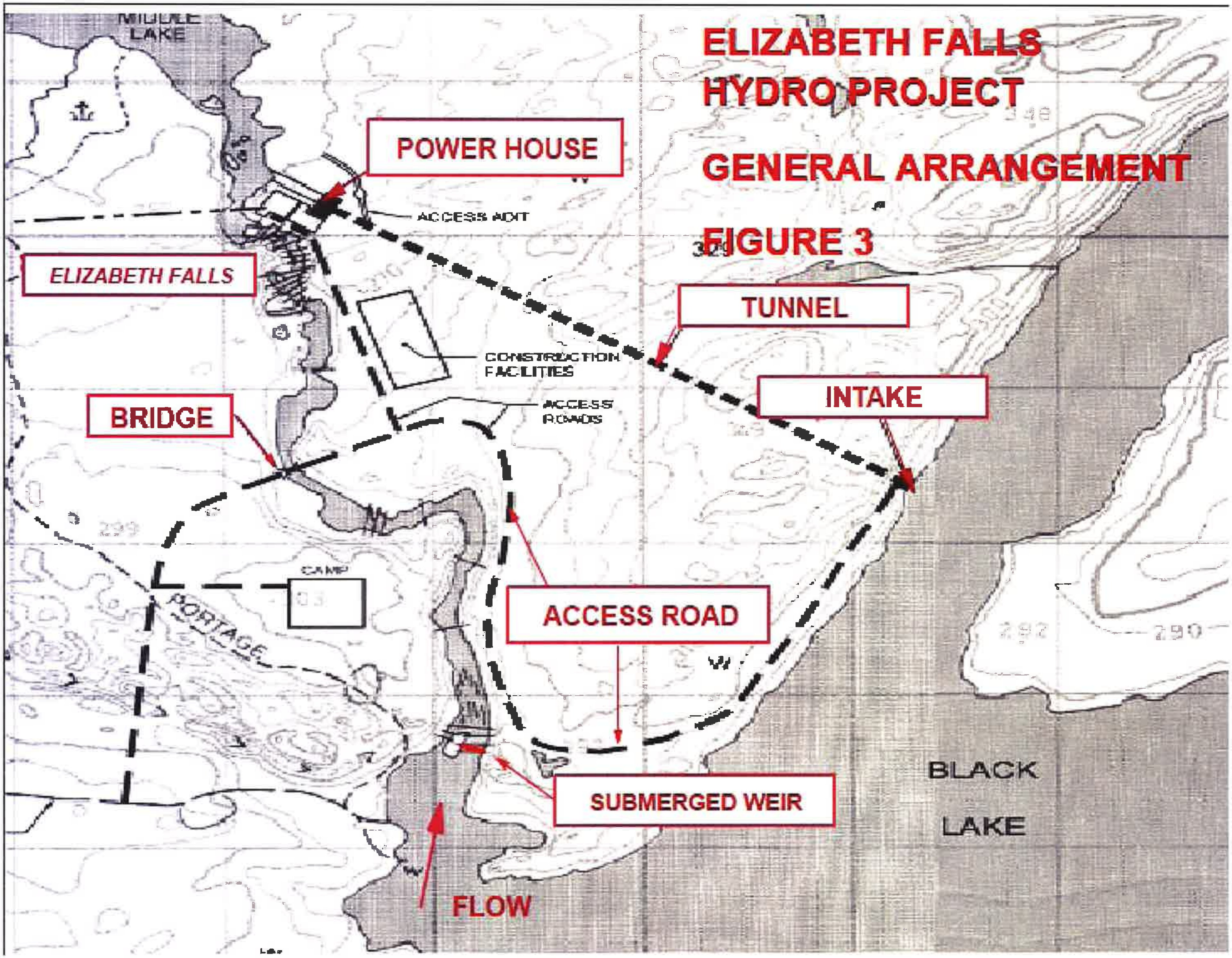
- Interest began in the early 1970’s.
- Lack of demand for power in the north and the cost to reach markets in the south made the development uneconomical.
- In February 2004, a Feasibility Study was initiated.
- In September 2009, the Elizabeth Falls Hydro Limited Partnership (EFHLP) was formed.
- The EFHLP Board has 5 directors from Black Lake First Nation and 6 independent directors from a variety of business and electric utility backgrounds

- Signing of an MOU with SaskPower this spring , provided bridge financing to facilitate the environmental studies, technical and financial feasibility studies and administration.
- SaskPower will be the off taker of the power produced at Elizabeth Falls
- The project schedule is approximately 6 years:
  - 3 years for the environmental and technical feasibility studies
  - 3 years for construction of the facilities
- Our objective is to have a partner in place before the end of 2011

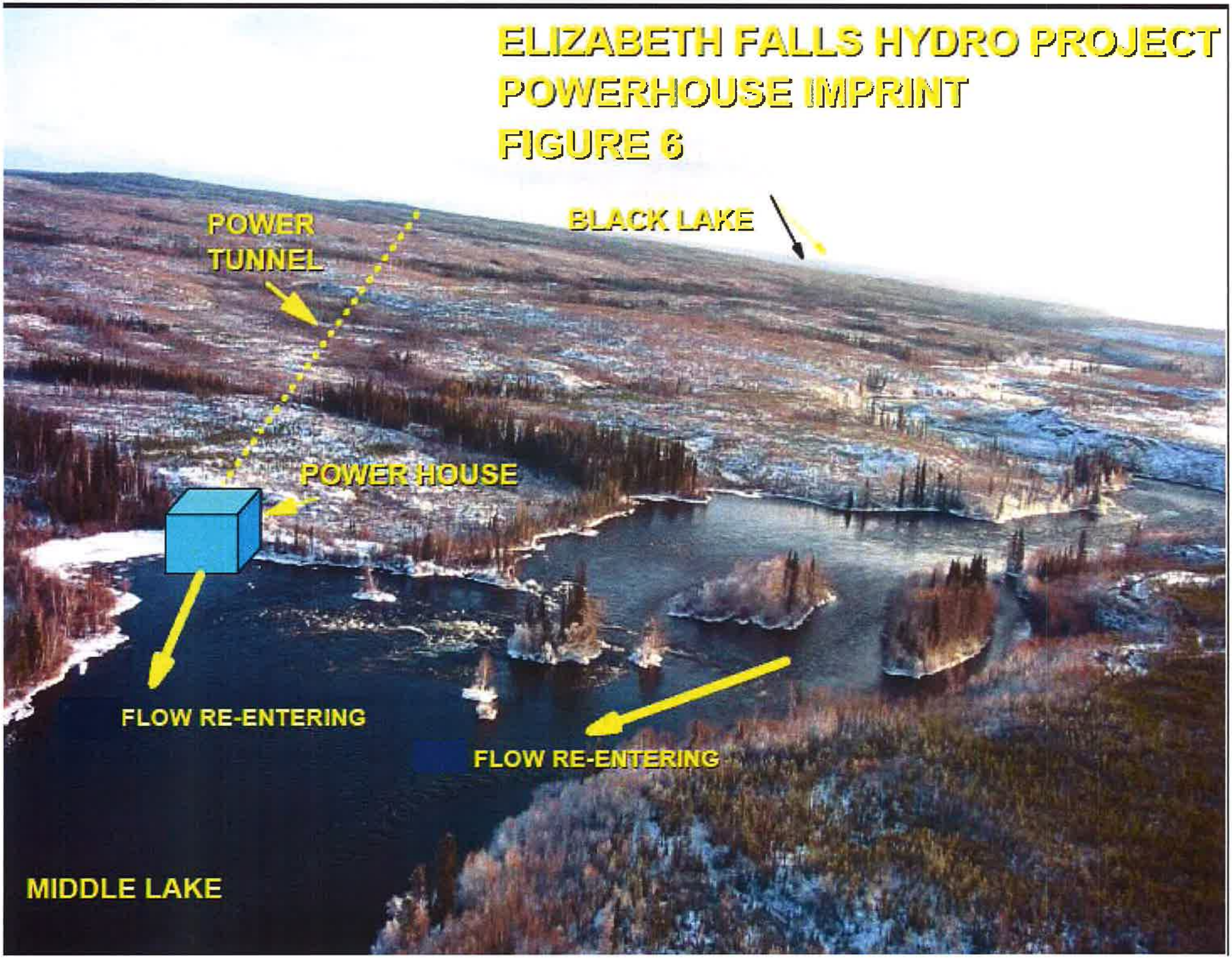


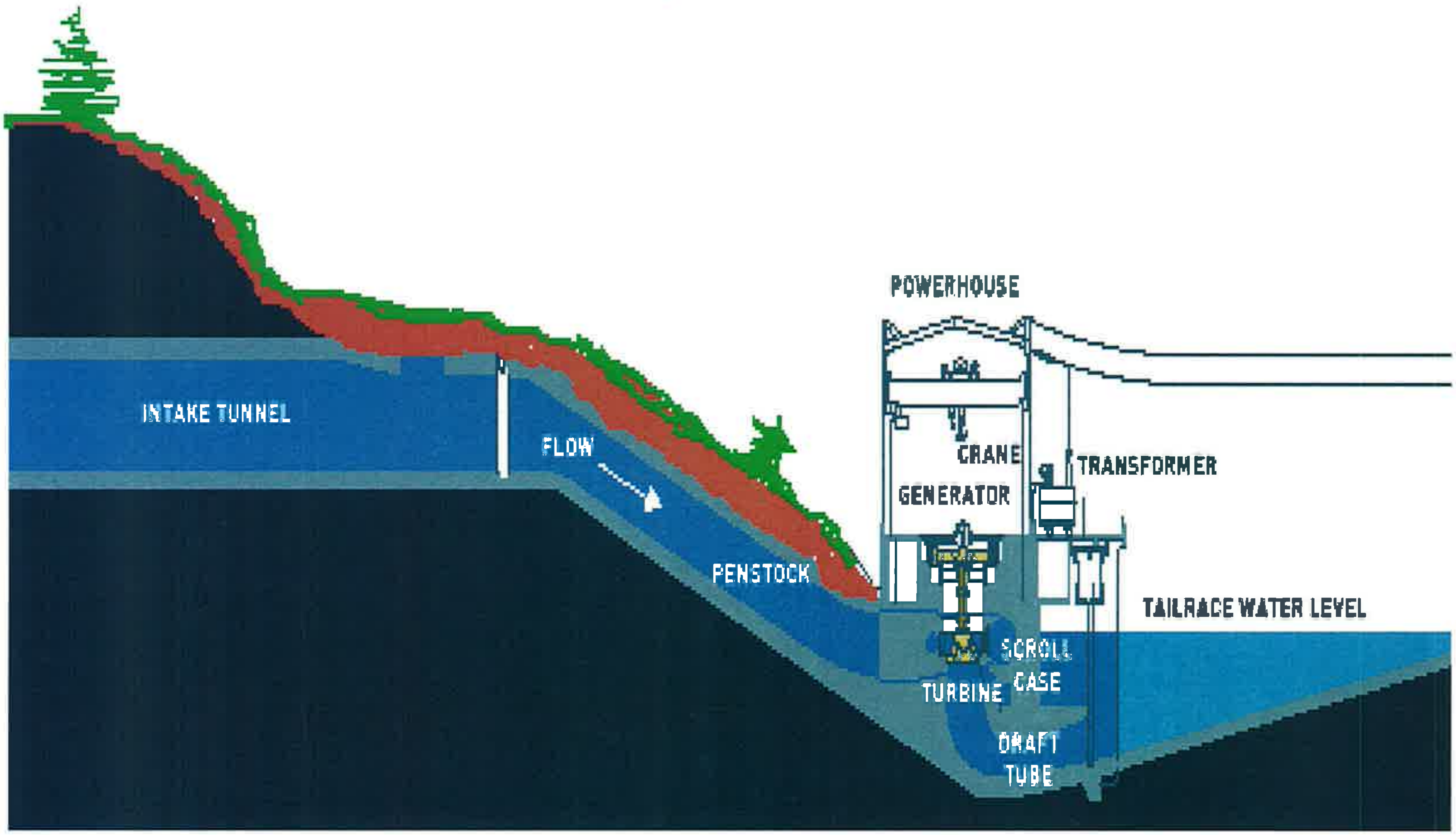
- The Elizabeth Falls Hydroelectric Project is a green power initiative that will help Saskatchewan meet a portion of its renewable energy needs.
- Black Lake First Nation guidelines for the project are, minimum impact:
  - on the water levels of Black Lake
  - on flows in the Fond du Lac River.
- Cost estimate is 250 – 300 million - depends on factors not yet determined.
  - Tunnel rock use/disposal
  - Construction of a weir


Elizabeth Falls
Hydro Electric Site
Existing 138 kv
Transmission Line
Island Falls
Manitoba Interconnection
ELIZABETH FALLS HYDRO PROJECT
SITE LOCATION
FIGURE 1
Uranium City
Eldorado
Fond-du-Lac
Stony Rapids
Black Lake
Lake Athabasca
Fort Chipewyan
Wollaston Lake
Southend
La Loche
Buffalo Narrows
Meadow Lake
Lloydminster
Flin Flon
Creighton
Waskesiu Lake
Prince Albert
Nipawin
Shellbrook
Kinoosao
Lynn Lake
MacKay
Murray
SASKATCHEWAN

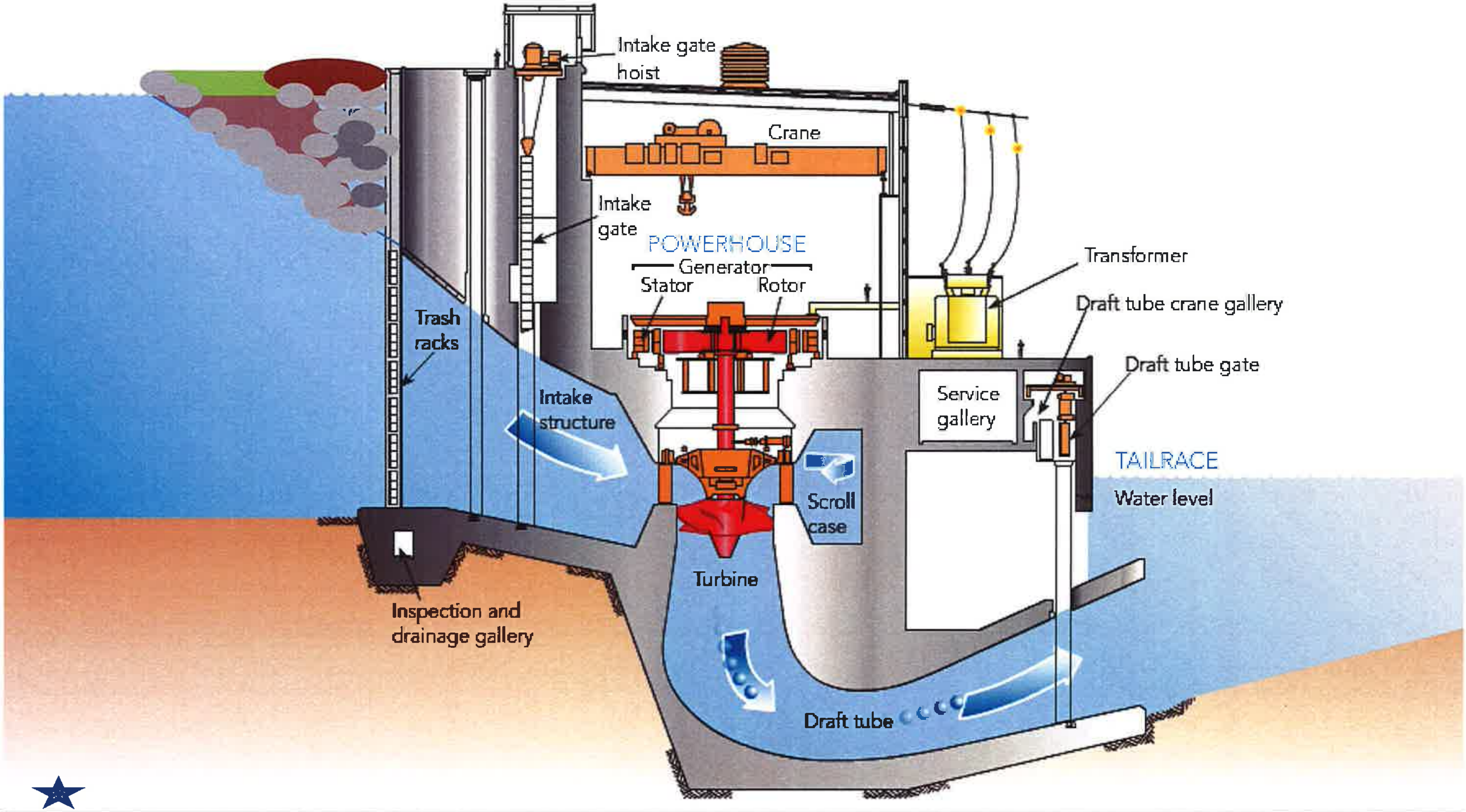


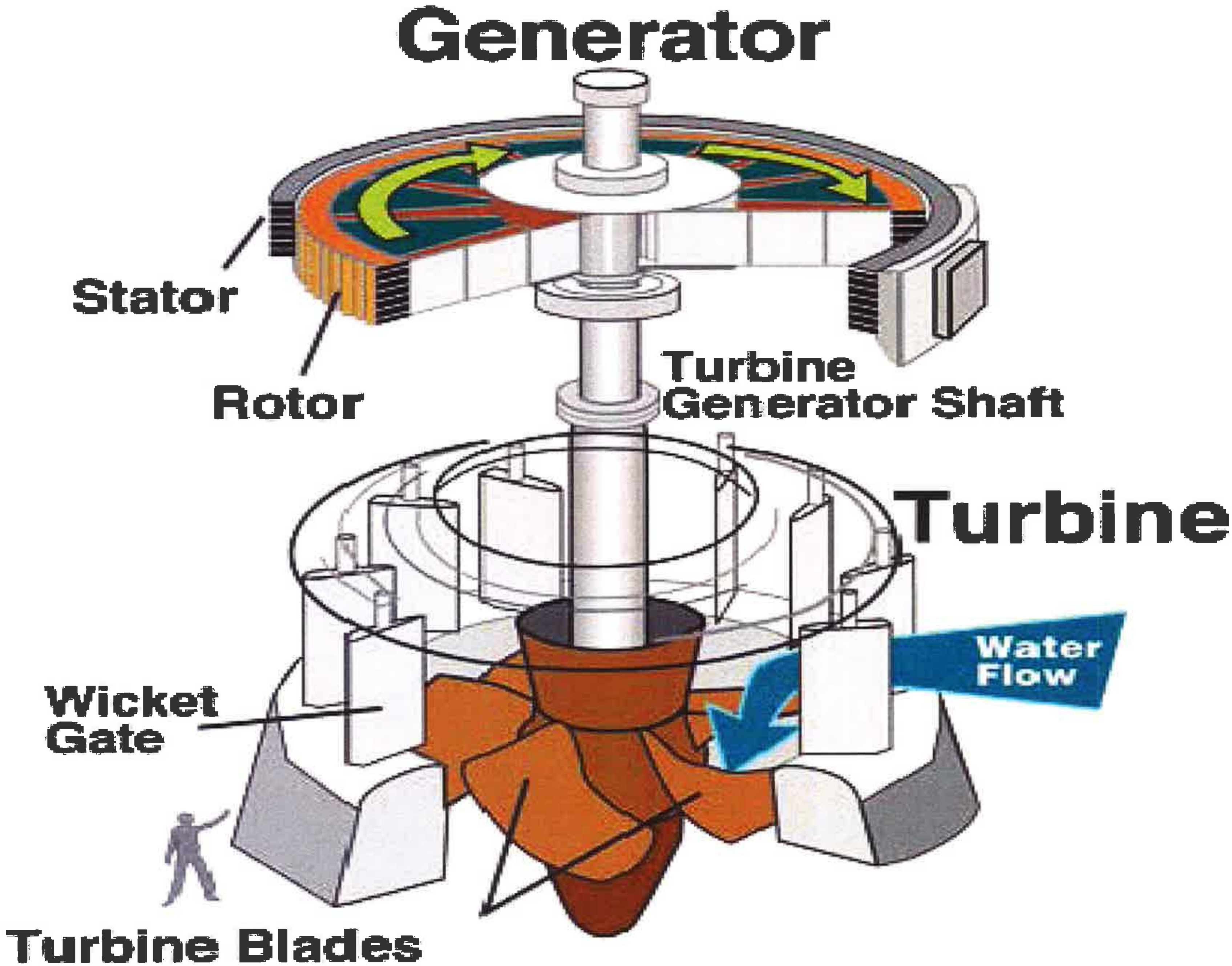
ELIZABETH FALLS
HYDRO PROJECT
GENERAL ARRANGEMENT
FIGURE 3
MIDDLE LAKE
POWER HOUSE
ACCESS ADIT
ELIZABETH FALLS
CONSTRUCTION FACILITIES
TUNNEL
INTAKE
BRIDGE
ACCESS ROADS
CAMP
PORTAGE
ACCESS ROAD
SUBMERGED WEIR
BLACK LAKE
FLOW
292
290


ELIZABETH FALLS HYDRO PROJECT
POWERHOUSE IMPRINT
FIGURE 6
POWER
TUNNEL
BLACK LAKE
POWER HOUSE
FLOW RE-ENTERING
FLOW RE-ENTERING
MIDDLE LAKE



POWERHOUSE
INTAKE TUNNEL
FLOW
CRANE
TRANSFORMER
GENERATOR
PENSTOCK
TAILRACE WATER LEVEL
SCROLL
CASE
TURBINE
DRAFT
TUBE


Intake gate hoist
Crane
Intake gate
POWERHOUSE
Generator
Stator
Rotor
Transformer
Draft tube crane gallery
Draft tube gate
Trash racks
Intake structure
Service gallery
TAILRACE
Water level
Scroll case
Turbine
Inspection and drainage gallery
Draft tube


Generator
Stator
Rotor
Turbine
Generator Shaft
Turbine
Water
Flow
Wicket
Gate
Turbine Blades

Environmental Impact Assessment

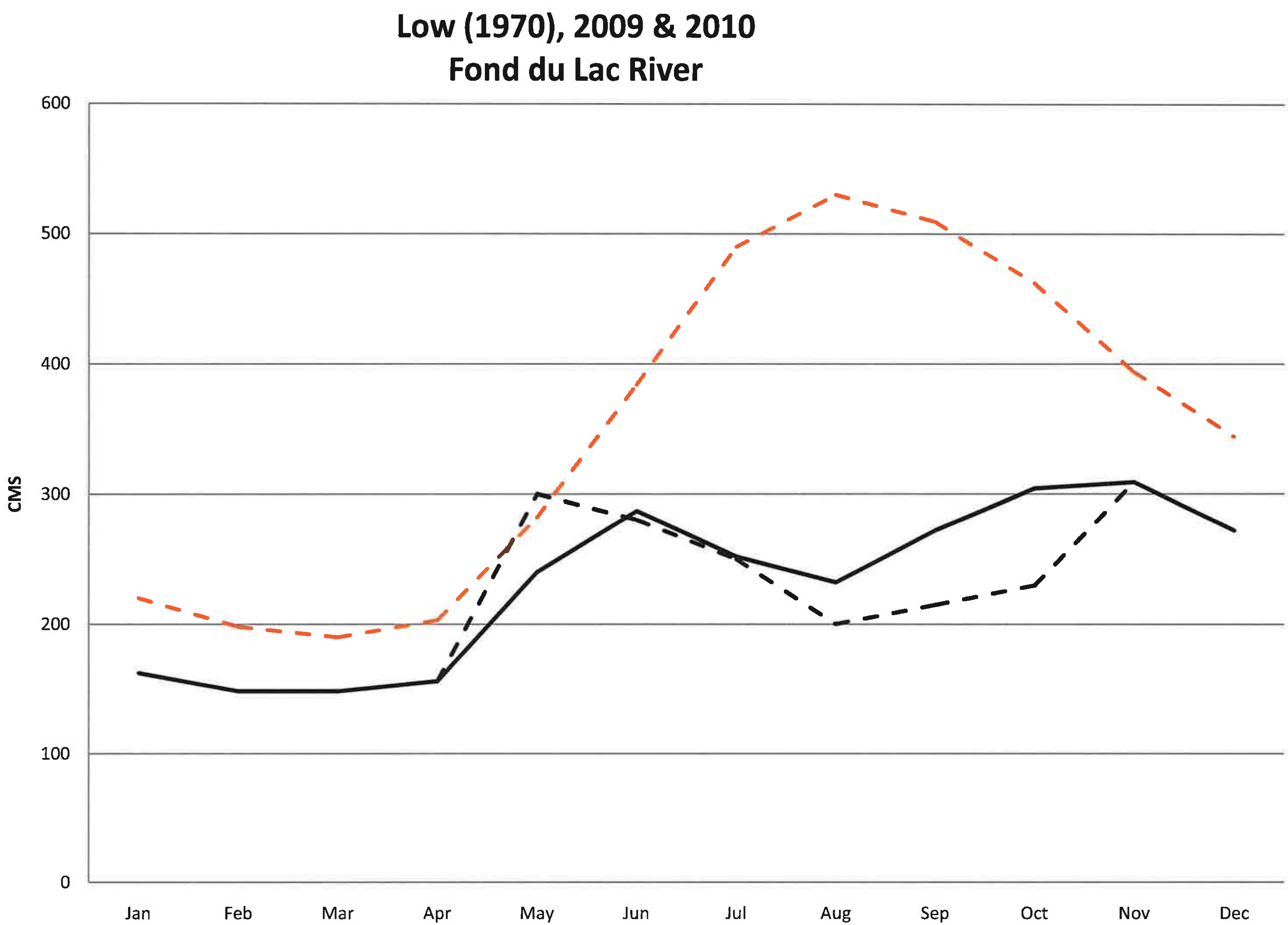
- An Environmental Assessment (EA) is the process by which Project interactions with the existing biophysical and socio-economic environments are evaluated to identify what types of changes may be caused by the Project.
- The EA process involves a number of components including:
  - Issue scoping
  - Engagement with public, First Nations, Métis groups and regulatory agencies
  - Baseline (or existing conditions) data collection and required scientific studies
  - Identifying recommended mitigation practices, procedures and policies
  - Analyzing and predicting positive and negative impacts

Environmental Studies

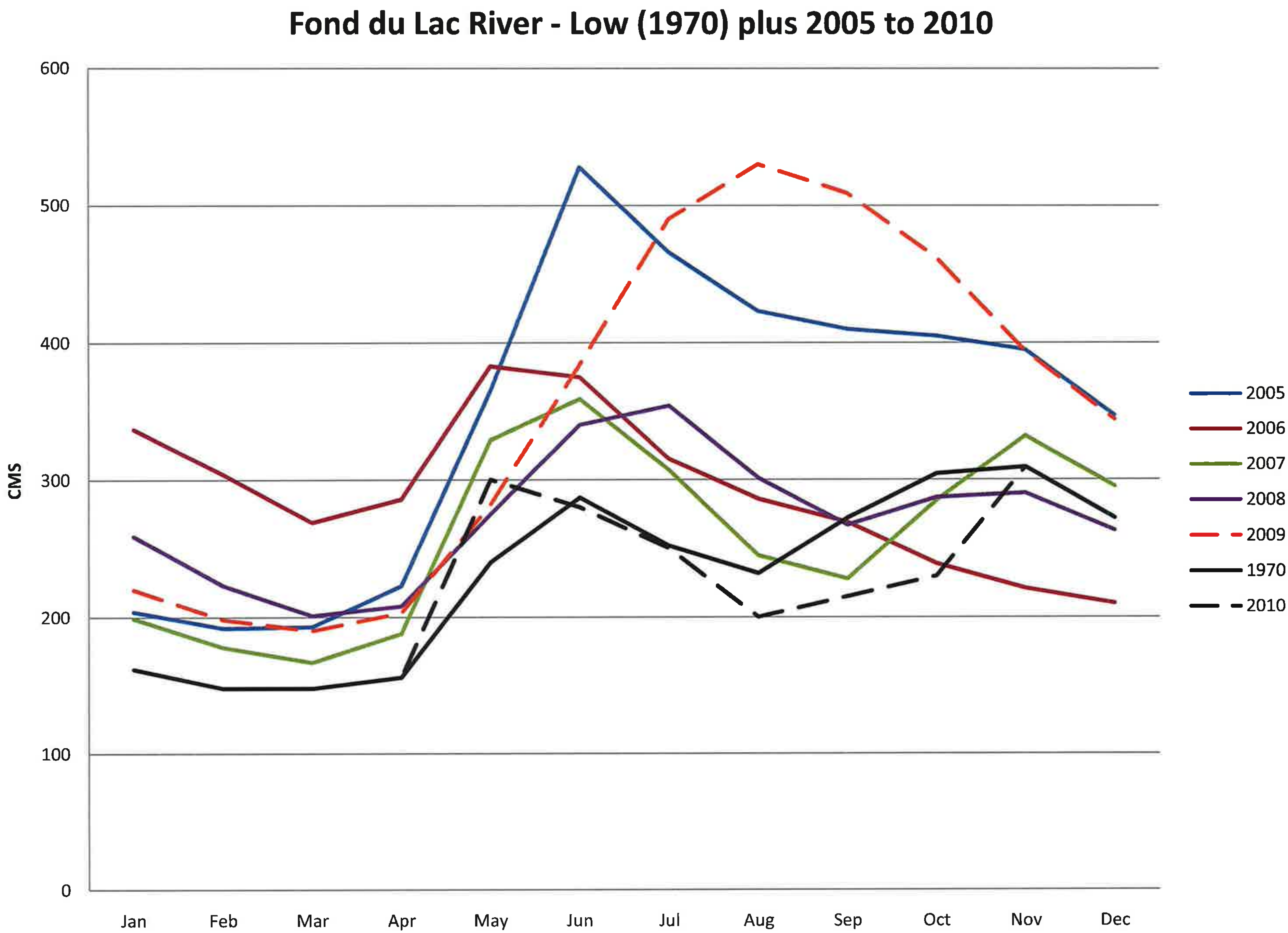
- Baseline studies examine the existing environment and socio-economic conditions.
- The information collected as part of the baseline program includes:
  - Heritage Resources
  - Landscape and Soils
  - Socio-Economic
  - Surface Water
  - Water Quality
  - Fish and Aquatic Life
  - Wildlife and Plants
  - Aesthetics
  - Traditional Knowledge

- Baseline environmental studies were started in 2010.

- Public engagement and involvement is an important part of the EA and permitting process.
- Engagement activities that EFHLP has and will continue to use include:
  - Information sessions/open house meetings
  - Community visits
  - Formal and informal discussions at public meetings
  - Meetings/workshops and targeted discussions with governmental and regulatory agencies and non-governmental organizations



Low (1970), 2009 & 2010
Fond du Lac River
CMS
600
500
400
300
200
100
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec



Fond du Lac River - Low (1970) plus 2005 to 2010
600
500
400
300
200
100
0
CMS
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2005
2006
2007
2008
2009
1970
2010

Community Information Sessions

What was your main reason for attending this information session?

____

____

Are you satisfied with the information you have been provided?

☐ Yes ☐ Somewhat ☐ No - Please, explain ____________________

____

____

____

What comments and questions do you have about the proposed project?

____

____

____

Please provide your name and address if you would like to continue to be informed about this project.

Name		Email	
Address			
Postal code		Tel	

Question and Answers

The Elizabeth Falls Hydro Limited Partnership (EFHLP) proposes to construct a hydroelectric generating station located on Black Lake First Nation Reserve Land along the Fond du Lac River, between Black Lake and Middle Lake in northern Saskatchewan.

How long will construction take and when is power production set to begin?

It is estimated that construction will take approximately 3 years following environmental approval and power production is set to begin in late 2016.

What are the environmental impacts?

The impact assessment is not complete so the specific impacts have not been identified yet. EFHLP is committed to retaining the natural value of the ecosystems of Black Lake, the Fond du Lac River and Middle Lake. The Environmental Assessment Study will evaluate the potential environmental and social effects the project may have.

What are the impacts to the water levels of the lakes and flow of the river?

Environmental studies are being carried out to determine impacts to the water levels of Black Lake and the flows in the Fond du Lac River. The project will be designed and operated to manage any changes to the water levels so they are within an acceptable range.

Where is the location of the Project?

The project is located on the Black Lake First Nation Reserve along the Fond du Lac River, between Black Lake and Middle Lake.

How much power will be generated?

It is estimated that the Elizabeth Fall Hydroelectric project would have a capacity of 42-50 MW. That is enough power to supply a city of 25,000 people (based on published Canadian Statistics).

How are fish impacted by the turbines?

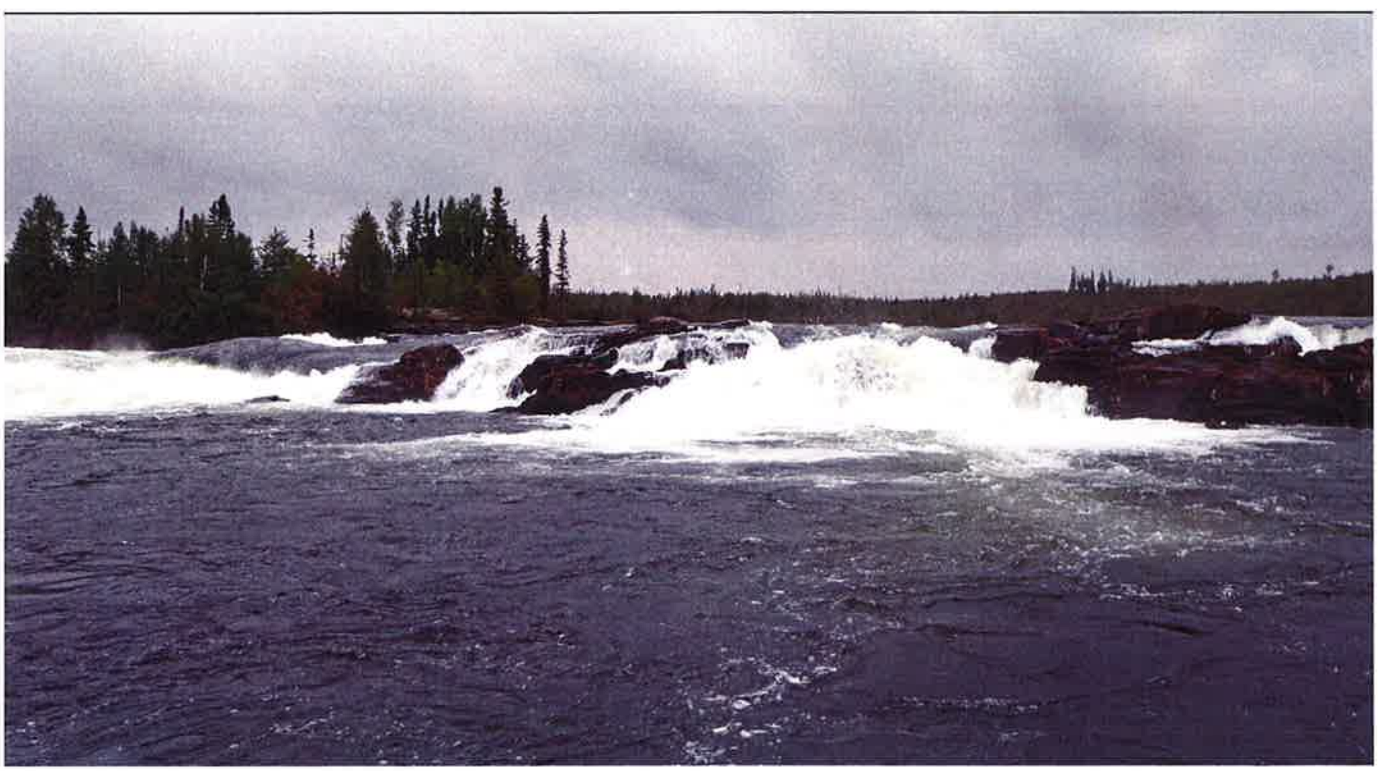
Hydro facilities incorporate fish diversion devices to prevent or reduce the number of fish from entering the power tunnel/turbine. The effectiveness of fish diversion systems and turbine effects will be one of the topics reviewed in the Environmental Assessment.

Are there any impacts to the water temperature after it passes through the turbine?

Passage through the powerhouse and turbine should not affect water temperatures.

Welcome

- Thank you for attending our Community Information Session for the Elizabeth Falls Hydroelectric Project
- We have invited you here to :
  - Introduce ourselves
  - Provide information about the Project
  - Provide information about the Environmental Assessment process
  - Receive your comments and/or questions

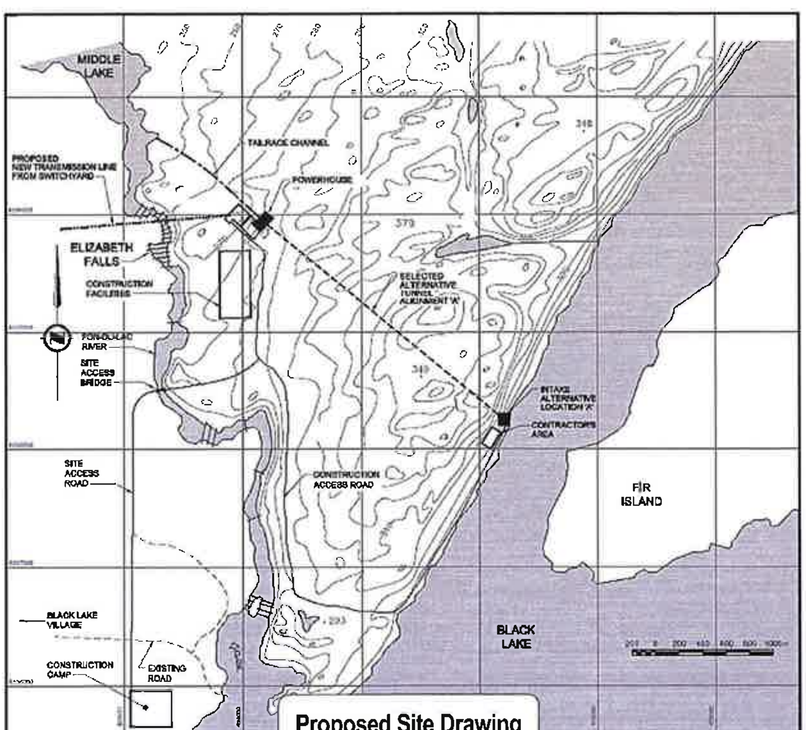


The History of the Project and the Elizabeth Falls Hydro Limited Partnership

- Interest in developing a hydroelectric generating station at Black Lake began in the early 1970's; however, the lack of demand for power in the north and the remoteness of the site from the markets in the south made the development unattractive at that time.
- In 2001, Black Lake First Nation expressed the wish to assess the feasibility of constructing a generating station that would have minimum impact on the water levels of Black Lake and flows in the Fond du Lac River.
- In February 2004, the Black Lake First Nation was given approval by INAC to proceed with a Feasibility Study. The Feasibility Study for the Project was completed in December 2005 and considered the Project to be technically sound and economically viable.
- In September 2009, the Elizabeth Falls Hydro Limited Partnership (EFHLP) was formed. The general partner is the Elizabeth Falls Hydro Development Corporation and the limited partner is the Black Lake Denesuline First Nation.
- A Memorandum of Understanding was signed in April 2010 with SaskPower. If the Project proves to be an economical supply option a contract would be negotiated for SaskPower to buy the electricity provided by the Project, to fulfill a growing need for electricity in northern Saskatchewan.

Elizabeth Falls Hydroelectric Project Overview

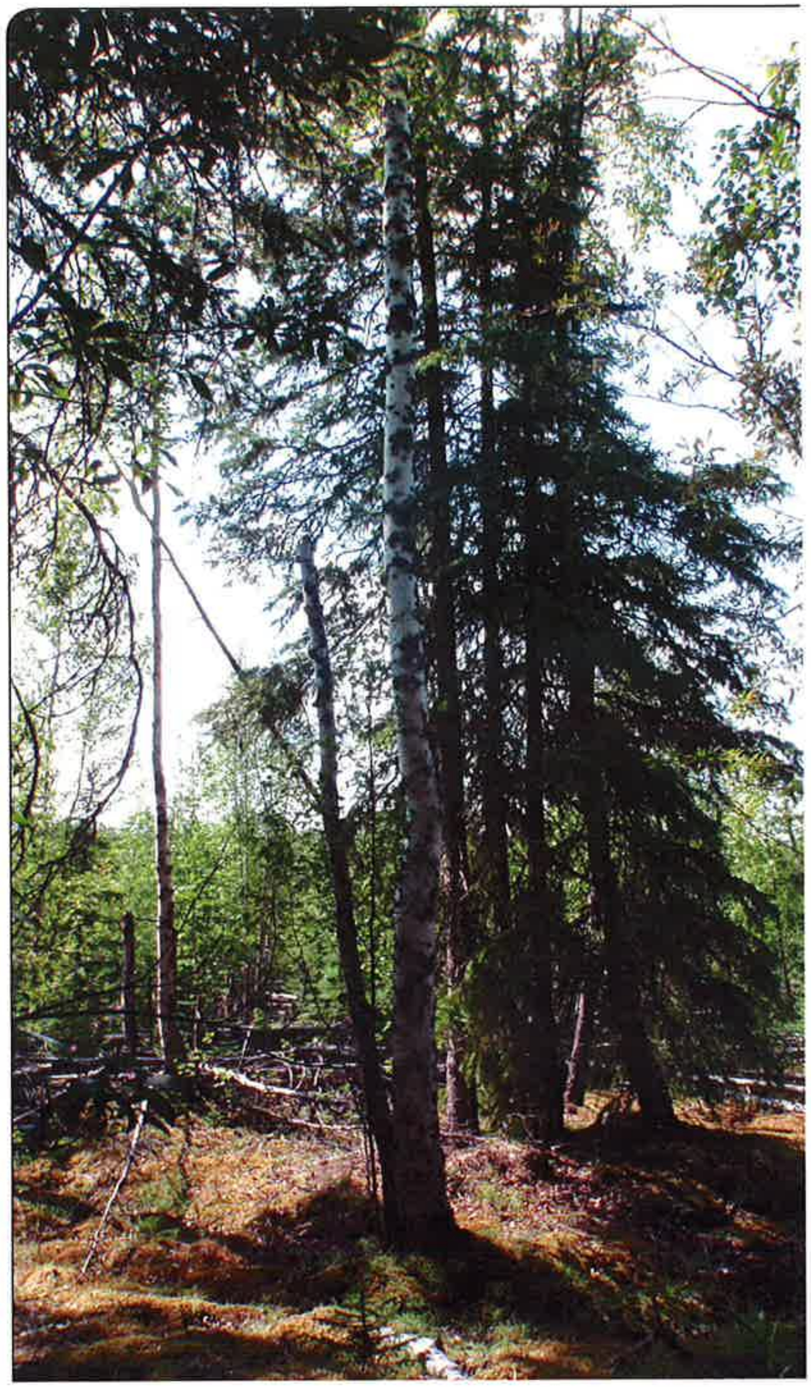
- The Elizabeth Falls Hydroelectric Project is a green power initiative that would allow SaskPower to meet a portion of its long-term supply needs with a renewable energy source.
- The proposed Project includes a hydroelectric generating station located on the Fond du Lac River, between Black Lake and Middle Lake in northern Saskatchewan.
- Following a review of the feasibility study the Black Lake First Nation expressed concern that the levels of Black Lake remain as near as possible to the natural levels existing before construction.



Proposed Site Drawing

The History of the Project and the Elizabeth Falls Hydro Limited Partnership

- The proposed Project includes the construction and operation of a 42-50 MW hydroelectric generating station.
- The feasibility study concluded that the Project could be built using the natural flow regime of Black Lake.
- The concept would use a power tunnel to carry flow from Black Lake to a powerhouse located upstream of Middle Lake.
- The proposed Project will be designed and operated to minimize the impact of the Project on the existing physical and social environment.

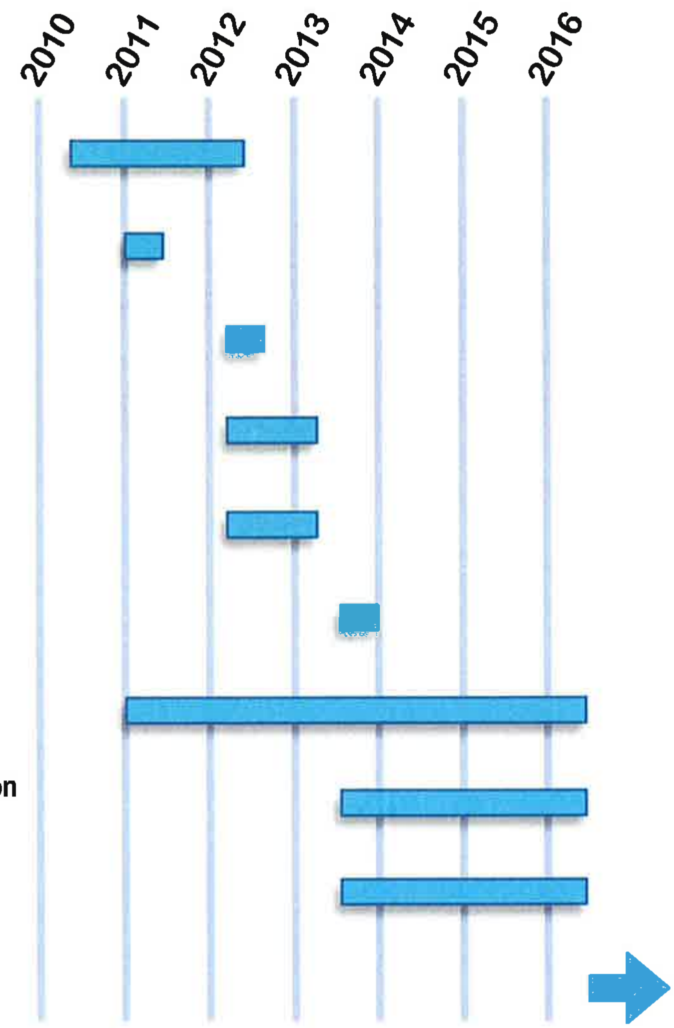


What is an Environmental Assessment?

- An Environmental Assessment (EA) is the process by which Project interactions with the existing biophysical and socio-economic environments are evaluated to identify what types of changes may be caused by the Project.
- The EA process involves a number of components including:
  - Issue scoping
  - Engagement with public, First Nations, Métis groups and regulatory agencies
  - Baseline (or existing conditions) data collection and required scientific studies
  - Identifying recommended mitigation practices, procedures and policies
  - Analyzing and predicting positive and negative impacts
- The details of each component are presented to regulatory agencies and the public in a document referred to as an Environmental Impact Statement (EIS)
- Once the EIS has been submitted the regulatory agencies will determine if a project is acceptable and can proceed.
- The Project will be reviewed jointly by the Canadian Environmental Assessment Agency and the Saskatchewan Ministry of Environment.

How Long Will This Take?

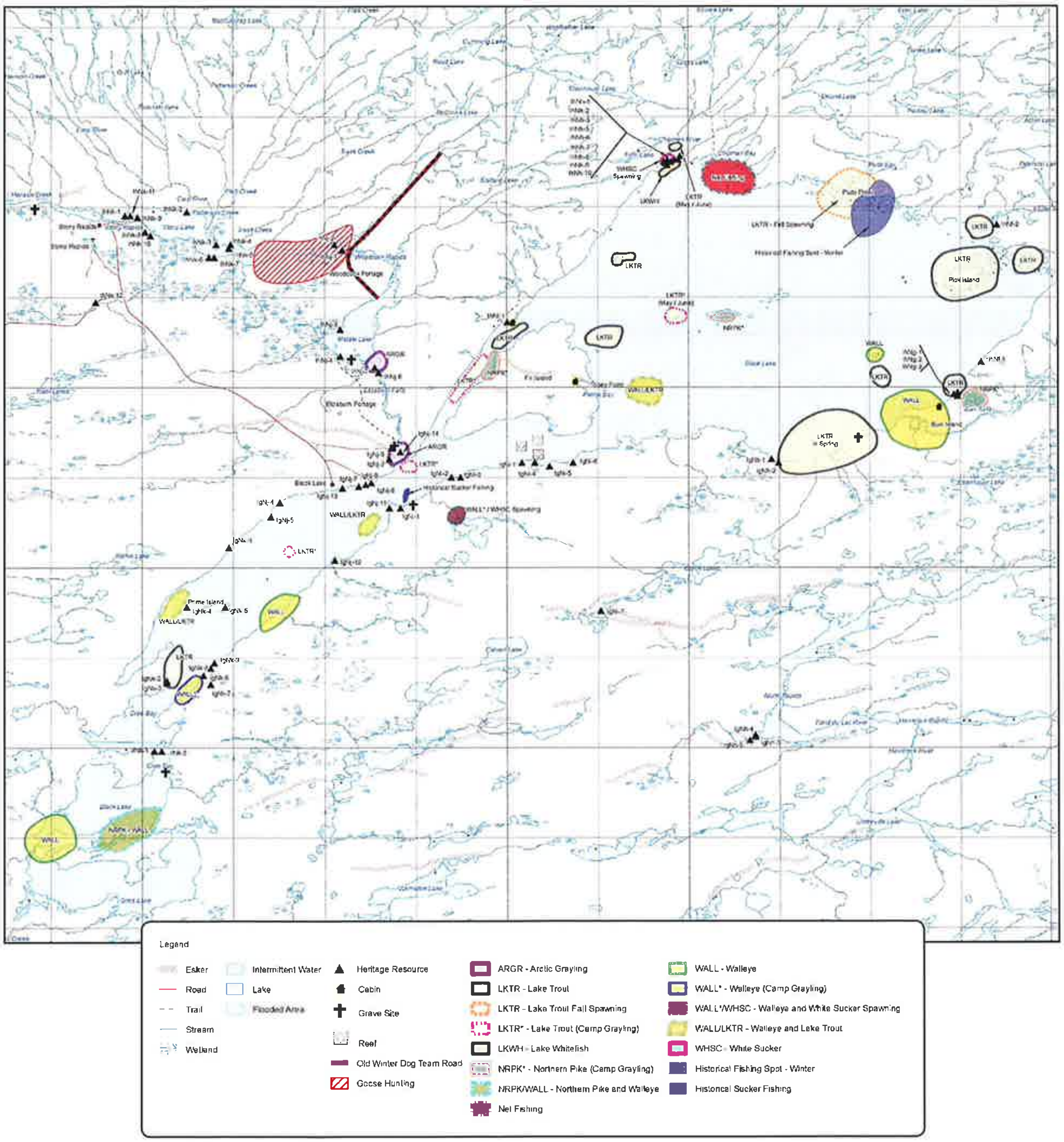
1. **Environmental Studies Commenced**
   (May 2010)
2. **Project Committed**
   (June 2011)
3. **Financing in place**
   (July 2012)
4. **Submit Draft Environmental Impact Study**
   (July 2012)
5. **Submit Fish Habitat Compensation Plan**
   (July 2012)
6. **Environmental Approval Received**
   (August 2013)
7. **First Nation Training Opportunities**
   (March 2011)
8. **EPC Contractor Approval - begin construction**
   (August 2013)
9. **Award Turbine and Generator Contract**
   (August 2013)
10. **Project Online**
    (December 2016)



Environmental Studies

- Baseline studies examine the existing environment and socio-economic conditions.
- The information collected as part of the baseline program includes:
  - Heritage Resources
  - Landscape and Soils
  - Socio-Economic
  - Surface Water
  - Water Quality
  - Fish and Aquatic Life
  - Wildlife and Plants
  - Aesthetics
  - Traditional Knowledge
- Baseline studies were started in 2010 and include:
  - Fish and aquatic life
  - Water quality and quantity
  - Rare plants and soil condition

Traditional Knowledge



Engagement in the EA Process

- Public engagement and involvement is an important part of the EA and permitting process.
- EFHLP is initiating early communication and involvement with non-regulatory and regulatory groups and organizations, including:
  - Public, First Nations and Métis Communities (local communities, and other concerned members of the public)
  - Non-governmental organizations
  - Governmental and regulatory agencies
- The intent of these engagement activities are to:
  - Provide information on the Elizabeth Falls Hydroelectric Project to potentially impacted people and other concerned members of the public
  - To actively seek comments from the general public, First Nations and Métis communities regarding existing environmental and socio-economic conditions in the local area
  - Document and incorporate public issues in the EIS

Engagement Activities

- Engagement activities that EFHLP has and will continue to use include:
  - Information sessions/open house meetings
  - Community visits
  - Formal and informal discussions at public meetings
  - Meetings/workshops and targeted discussions with governmental and regulatory agencies and non-governmental organizations

Economic Benefits and Employment Opportunities

- The proposed Elizabeth Fall Hydro Project will provide revenue for the Black Lake First Nation, which will help them move closer to economic independence, provide a foundation for other economic initiatives/ opportunities and contribute to better quality of life and social benefits for the residents of Black Lake and surrounding communities.
- A hydroelectric project requires skilled labour.
- The Project will provide local residents with opportunities to train and participate directly and indirectly in the construction of the Project to the fullest extent possible.
- Further training initiatives would be provided to assist Black Lake First Nation and other community members in attaining jobs during the operations phase of the power Project.

Contact Information

If you would like to receive additional information about EFHLP's proposed Elizabeth Falls Hydroelectric Project please fill out a comment form with your name and address,

or

Contact us:

Chief Donald Sayazie
Black Lake First Nation
Tel: 306.284.2044

Ted de Jong
Acting CEO, EFHLP
Tel: 302.922.0099

Al Schreiner
Project Manager, EFHLP
Tel: 306.537.3172

At Golder Associates we strive to be the most respected global company providing consulting, design, and construction services in earth, environment, and related areas of energy. Employee owned since our formation in 1960, our focus, unique culture and operating environment offer opportunities and the freedom to excel, which attracts the leading specialists in our fields. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees who operate from offices located throughout Africa, Asia, Australasia, Europe, North America, and South America.

Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 55 21 3095 9500

solutions@golder.com
www.golder.com

Golder Associates Ltd.
1721 8th Street East
Saskatoon, Saskatchewan, Canada S7H 0T4
Canada
T: +1 (306) 665 7989

Golder Associates