Chinook Power Station Project

Project Description

Submitted to:

The Canadian Environmental Assessment Agency

Submitted by:

Saskatchewan Power Corporation (SaskPower)

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SaskPower Powering the future

Stantec

BURNS McDONNELL CANADA

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

Abbreviations and Acronyms

ACC	Air Cooled Condenser
BOP	Balance of Plant
CAAQS	Canadian Ambient Air Quality Standards
CCGT	Combined Cycle Gas Turbine
CCME	Canadian Council of Ministers of the Environment
CEAA	Canadian Environmental Assessment Agency
CEMS	Continuous Emission Monitoring System
CH_4	Methane
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_{2e}	Carbon Dioxide equivalent
EPC	Engineer-Procure-Construct
GHG	Greenhouse Gas
GJ/hr	Gigajoule per hour
GPM (US)	Gallons Per Minute (United States)
GTG	Gas Turbine Generator
HCB	Heritage Conservation Branch
HDD	Horizontal Directional Drilling

HDPE	High-Density Polyethylene
HRSG	Heat Recovery Steam Generator
IPP	Independent Power Producer
kJ/kWhr	Kilojoules per kilowatt hour
kt	Kilotonne
kV	Kilovolt
LAA	Local Assessment Area
LHV	Low Heating Value
MMBtu	Million British Thermal Units Per Hour
MOE	Ministry of Environment
MVA	Mega-Volt Ampere
MW	Megawatt
MWh	Megawatt hour
NO_X	Nitrogen Oxide
N_2O	Nitrous Oxide
NO_2	Nitrogen Dioxide
OEM	Original Equipment Manufacturer
PDA	Project Development Area
PM	Particulate Matter
PM_{10}	Particulate matter of 10 microns in diameter or smaller

$PM_{2.5}$	Particulate Matter of 2.5 microns in diameter or smaller
PPM	Parts Per Million
PRV	Pressure Relief Valves
PSL	Permissible Sound Level
RAA	Regional Assessment Area
RFP	Request for Proposals
RH	Relative Humidity
RM	Rural Municipality
RO	Reverse Osmosis
SAAQS	Saskatchewan Ambient Air Quality Standards
SKCDC	Saskatchewan Conservation Data Centre
SOMC	Species of Management Concern
SO_2	Sulphur Dioxide
STG	Steam Turbine Generator
ULN	Ultra-Low NO_X
VC	Valued Component
VOC	Volatile Organic Compound

1.0 INTRODUCTION

The scope of this document is to describe the potential effects of the Chinook Power Station Project (the Project) on environmental, socio-cultural and economic components, as well as to outline mitigation measures associated with the construction, operation and decommissioning phases of the combined cycle natural gas facility. In addition to the natural gas facility itself, ancillary Project components include a switchyard to interconnect to the 230 kV transmission system, a potable water pipeline from the City of Swift Current, a natural gas yard, and an access road. With the exception of the water pipeline, all structures and equipment will be located at SE 13-16-15-W3M, which is owned by SaskPower (Figure 1.1).

This document is intended to fulfill the requirements of a Project Description under the *Canadian Environmental Assessment Act, 2012*, Section 8(1) (CEAA 2012). The document is also intended to fulfill the requirements of a Technical Proposal under *The Environmental Assessment Act* of Saskatchewan (SKEAA).

1.1 DOCUMENT APPROACH AND ORGANIZATION

This document considers and reflects the requirements of the *Prescribed Information for the Description of a Designated Project Regulations* (CEA Agency 2012a) and the CEA Agency's *Guide to Preparing a Description of a Designated Project under the Canadian Environmental Assessment Act, 2012* (CEA Agency 2012b). This document also considers and reflects the guidance of the Saskatchewan Ministry of Environment's *Technical Proposal Guidelines, A Guide to Assessing Projects and Preparing Proposals under the Environmental Assessment Act* (Saskatchewan MOE 2014).

The document is organized into the following sections:

- Section 1 provides a brief introduction to the Project, including an overview of the Project, the Project proponent, the Project location and land status, the needs and benefits of the Project, and overview of the regulatory framework applicable to the Project.
- Section 2 provides a detailed description of the Project, describing physical works associated with the Project. As well, Section 2 gives details on emissions; discharges and waste; site facilities and supporting infrastructure; production capacity; human resource requirements; decommissioning plan; and Project schedule and activities. Potential environmental design features and SaskPower's overall approach to life-of-Project environmental management are also described.
- Section 3 describes engagement and consultation undertaken to date (including outcomes) and the planned approach to Aboriginal engagement and public consultation that will be implemented by SaskPower.

- Section 4 presents an overview of the regional setting and the valued components (VCs) that were considered for the assessment and rationale for their inclusion or exclusion; assessment areas, both spatial and temporal; and approach for addressing residual cumulative effects.
- Section 5 provides a discussion of potential residual Project environmental, socio-cultural and economic effects following planned mitigation. An overview of existing conditions for each VC is provided. These discussions take into consideration SaskPower's commitment to implement environmental and other management strategies for the Project as a whole and for each VC.
- Section 6 discusses potential residual cumulative effects.
- Section 7 discusses environmental monitoring procedures.
- Section 8 provides a conclusion.
- Section 9 lists the references used in the document.

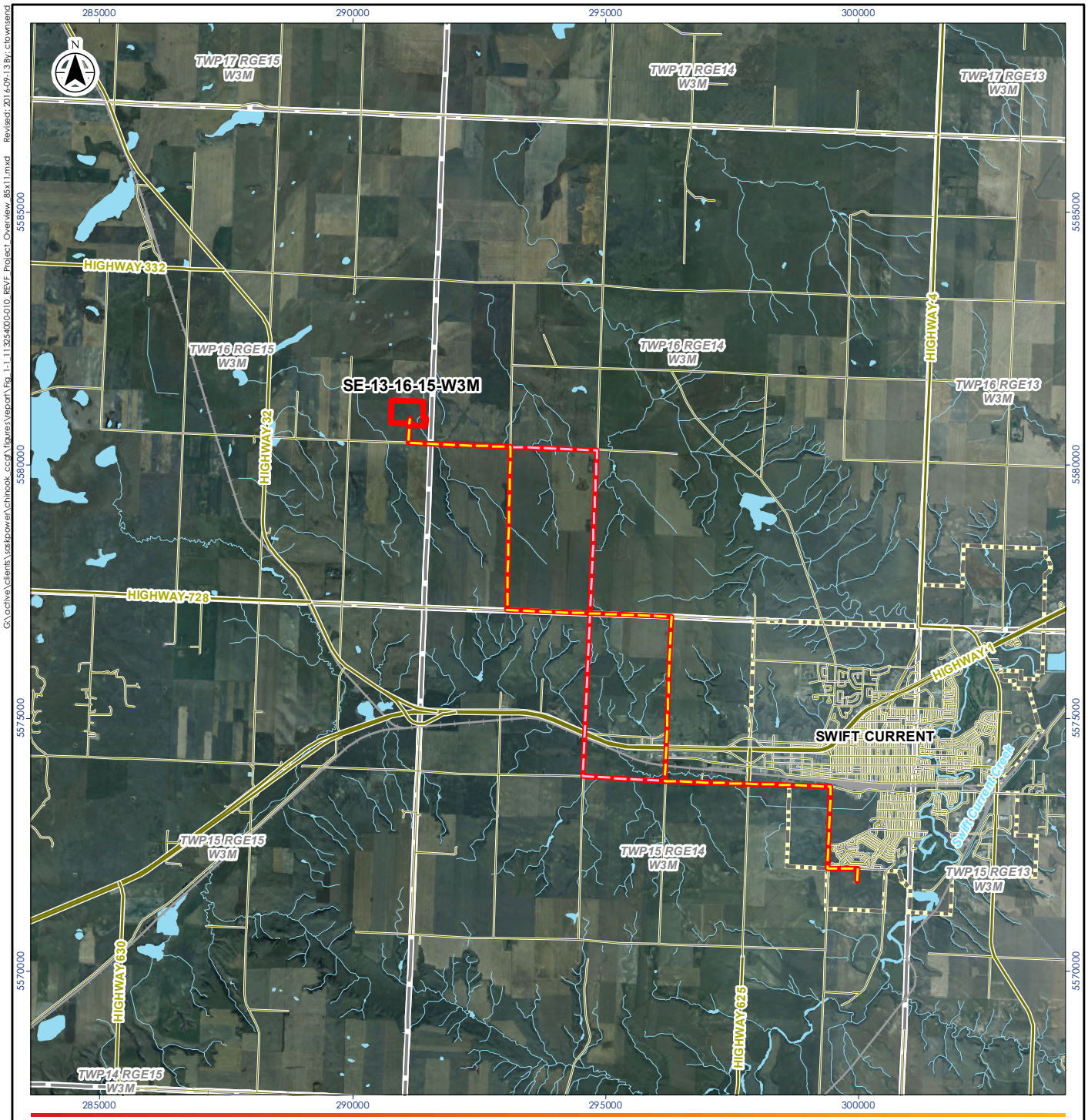
To facilitate the review of the document, a concordance table is provided in Appendix A to identify where the required information from the *Guide to Preparing a Description of a Designated Project under the Canadian Environmental Assessment Act, 2012* (CEA Agency 2012b) is presented within the document.

1.2 PROJECT OVERVIEW

To meet the growing demand for power in the province of Saskatchewan, provide replacement power for the retirement and/or refurbishment of conventional coal-fired generating units and allow for the integration of intermittent renewables, there is a need to build a new large-scale power plant in Saskatchewan that can generate electricity by 2019. The proposed Project is a nominal 350 megawatt (MW) combined cycle natural gas power station to be located near Swift Current, Saskatchewan.

Natural gas power stations that utilize a combined cycle design emit 40% as much carbon dioxide as conventional coal-fired generation in Saskatchewan and provide an ideal back-up to intermittent renewable generation options such as wind and solar. As such, once in service, this Project will play a key role in SaskPower's Greenhouse gas (GHG) emissions reduction strategy.

The Project will have one of the best-in-class heat rates, resulting in high efficiency and lower CO_2 emissions. The overall efficiency of the plant will approach 58% and is estimated to emit between 365 and 382 kilogram of carbon dioxide (CO_2) per megawatt hour (kg/MWh) when operating at full load assuming a new and clean condition. Nitrogen Oxides (NOx) emissions will meet or exceed the national emissions guidelines set out by the CCME (Canadian Council of Ministers of the Environment).



- Project Facility Footprint
- Water Pipeline Route Alternative 1
- Water Pipeline Route Alternative 2
- Major Road
- Minor Road
- Railway
- Town/City
- Watercourse
- Waterbody
- Township

0 1 2 Kilometers

1:115,000 (at original document size of 8.5x11)

Stantec SaskPower

Project Location
Near Swift Current, SK

113254000-010 REVF
Prepared by ctownsend on 2016-09-13
Technical Review by jhennig on 2016-09-13

Client/Project
SaskPower
Chinook Power Station Project

Figure No.
1.1

Title
Project Overview

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 13N
2. Base features produced under license from the Government of Saskatchewan
3. Orthoimagery: © SGIC 2008 - 2011

1.3 PROJECT BACKGROUND

SaskPower is investing approximately $1 billion annually for at least the next decade to upgrade and modernize the province's electricity system. This includes finding cleaner sources of power generation in order to comply with existing regulations, which mandate the phase-out of conventional coal-fired generation as well as new emission standards and emerging regulations. SaskPower has a number of initiatives underway to meet current anticipated supply needs including carbon capture technology, additional natural gas projects, life extensions to existing hydro (non GHG emitting) facilities, additional wind and hydro projects, utility scale solar projects, importation of clean hydro power from Manitoba and evaluating the potential for geothermal and biomass. These initiatives, combined with the development of more demand-side management and energy efficiency programs, will ensure SaskPower can continue to provide reliable, sustainable, cost-effective electricity to the people of Saskatchewan well into the future.

SaskPower is targeting a 40% reduction in GHG emissions from 2005 levels by 2030, exceeding the national target of a 30% reduction. To achieve this target, SaskPower will transition its conventional coal-fired generation facilities to lower GHG emitting supply options including carbon capture and sequestration, natural gas, and renewables. SaskPower recently announced plans to double its renewable generation capacity from 25% today to up to 50% by 2030. Included in these plans is an increase in wind capacity (target of 30% capacity by 2030) and solar. In order to integrate these renewable supply options that are intermittent by nature, a back-up generation source is required to match electricity generation with electricity demand. Natural gas generation is an ideal candidate as it can quickly ramp up or down as the renewable generation output fluctuates. For Saskatchewan, it is the only practical and economic option for integration of renewables in order to reach SaskPower's 40% emission reduction target by 2030, as other intermittent support options such as hydro are not currently available.

Natural gas generation is a key component to achieving both an increase in renewable capacity and GHG emissions reduction. The transition of conventional coal facilities as per current federal regulations will require that two of SaskPower's conventional coal-fired baseload generating units (Boundary Dam Units 4 and 5) be shut down or that a commitment to retrofit the units to carbon capture and storage be made by the end of 2019. In either case, the retirement or refurbishment of the units will leave a supply shortfall by the end of 2019 that must be backfilled by the construction of a new natural gas power station. Whether retired or refurbished, the transition of conventional coal-fired generating units to natural gas and/or carbon capture and storage represents a significant reduction in GHG and other criteria air contaminants.

SaskPower commenced an extensive review and analysis of potential sites for development of a new natural gas power station between 2011 and 2014. The site selection process included public consultation and analysis of technical requirements. On June 12, 2015, Premier Brad Wall and SaskPower President and CEO Mike Marsh, announced that a new natural gas power station will be built near Swift Current, Saskatchewan.

1.4 PROJECT PROPONENT

Saskatchewan Power Corporation (SaskPower) is a Crown Corporation of the Province of Saskatchewan with its corporate head office in Regina. SaskPower is the principal supplier of electricity in the province with an obligation to deliver power to the province in a safe, reliable, cost-effective, and environmentally responsible manner. SaskPower operates under the legislated mandate and authority of the provincial Government of Saskatchewan and its Board of Directors is accountable to the Minister responsible for SaskPower.

1.4.1 Proponent Contact Information

The Project name and proponent contact information are provided below:

Name of the designated project:	Chinook Power Station Project
Name of the proponent:	Saskatchewan Power Corporation (SaskPower)
Address of the proponent:	2025 Victoria Avenue, Regina, Saskatchewan S4P 0S1
Chief Executive Officer:	Mike Marsh President and Chief Executive Officer SaskPower Phone: 306-566-3271 MMarsh@saskpower.com
Principal contact person:	Yan Wang Project Manager SaskPower Phone: 306-566-6719 YWang@saskpower.com

1.4.2 Project Team

Burns & McDonnell Canada was selected to partner with SaskPower to build the Project. Burns & McDonnell has executed many combined cycle EPC projects including an F-class CCGT facility located in Ontario. Burns & McDonnell also has experience with combined cycle facilities within Saskatchewan, recently completing the expansion at the Queen Elizabeth Power Station in Saskatoon, SK.

SaskPower contracted Stantec Consulting Ltd. to evaluate the environmental effects of the Project and prepare the regulatory submission. Stantec has extensive experience in evaluating the effects of power projects both locally and across Canada.

Table 1-1 Key Project Personnel

SaskPower
Scott Bannerman, P.Eng. – Project Director
Yan Wang, MSc., P.Eng., PMP – Project Manager
Michael Dedman, P.Eng., PMP – Engineering and Commissioning Lead
Jennifer Sargent-Horbay – Environmental Assessment Lead
Gary Cooper – Site Manager
Tony Finn, P. Eng. – Construction Manager
Burns & McDonnell
Christopher Lehan – Project Director
Dave Newkirk – Project Manager
Weldon Stubbs, PE – Engineering Manager
Clarice Kinsella, PE – Conceptual Phase Project Manager
Stantec Consulting Ltd.
Neil Cory – Project Technical Director
Glenda Samuelson – Project Manager
Jordan Hennig – Environmental Planner
Chantal Eidem – Discipline Lead

1.5 PROJECT LOCATION AND LAND STATUS

The Project facility is located approximately 11 km northwest of Swift Current, Saskatchewan on private land that is owned by SaskPower (Appendix B). The Project facility is located entirely within one quarter section of land at SE 13-16-15 W3M (Figure 1.1). The quarter section is located within the Rural Municipality (RM) of Swift Current No. 137 and is zoned as Agricultural/Resource. The centre point of the facility is located at approximately 50° 20' 34.278", 107° 55' 55.185", subject to final siting and design.

The Project also includes a new underground water pipeline from the South Hill Reservoir located within the city limits of Swift Current (NW 13-15-14 W3M). There are currently two preliminary water pipeline route options being considered for the Project. Pipeline routing is still under discussion and the final pipeline route is dependent on results of regulatory consultation, engagement activities and preliminary routing studies. Regardless of the pipeline route that is chosen, the start and end points will be the same. The start and end points of the water pipeline are located at approximately 50° 15' 51.48", 107° 48' 25.20", and 50° 20' 35.288", 107° 56' 9.60", respectively.

The water pipeline will be routed within existing developed road allowances (i.e., ditches), where possible, that are owned by the Province of Saskatchewan (Her Majesty the Queen in Right of Saskatchewan). The road allowances in the Project area are operated by the Saskatchewan Ministry of Highways and Infrastructure, the RM of Swift Current or the City of Swift Current, depending on the location along the route. The road allowances along both water pipeline preliminary route options are adjacent to privately owned land zoned primarily for agricultural purposes and in many areas the cultivation extends into the road allowance. SaskPower will obtain written approval from the RM of Swift Current or the City of Swift Current prior to obtaining easements to build the pipeline within the developed road allowances.

The total disturbance for the Project facility footprint, including temporarily disturbed areas during construction, will be approximately 650 m x 450 m (29.2 ha). The footprint associated with the construction and operation of the water pipeline will be approximately 18 km in length x 12 m wide (21 ha), irrespective of the pipeline route that is chosen. The PDA and total footprint of the Project will be approximately 50.2 ha.

1.6 PROJECT NEED AND BENEFIT

SaskPower is faced with challenges including aging infrastructure and additional power demand. The goal is to ensure SaskPower is able to meet these challenges with reliable, sustainable and cost-effective power and the Project is well positioned to address these challenges. By 2019, an increase in demand for power of approximately 12% (450 MW) is expected compared to 2016 levels. After 2019, demand is expected to continue to grow at a rate of approximately 1.2% annually to 2030.

The Project, as proposed, is the most cost-effective solution to meet increasing electricity demand as well as replace existing conventional coal-fired generation within the timelines required. It will also result in an overall reduction of GHG and other air emissions. As SaskPower phases out conventional coal-fired generation, deploys carbon capture and storage technology, and adds natural gas and renewables into its system, GHG emission levels will significantly improve.

The Project is expected to take approximately 39 months to complete. During this time, the Project will provide employment opportunities with an estimated 1.2 million person-hours (equivalent to 160 full-time jobs) required. The Project will also bring financial benefits to the local area as goods and services such as food and lodging, construction materials, sewage disposal and snow removal will be required. During operation, the Project will provide employment opportunities for approximately 20 people including operators, engineers and support staff.

1.7 CONSEQUENCES OF DELAY

Delaying the in-service of the Project may result in the inability to service the existing load and new load growth in the province in a reliable manner. An expected shortfall of approximately 150 MW would be experienced if the Project were not in commercial operation on December 31, 2019. SaskPower would be required to backstop this shortfall with other generation, if available, with less optimal financial or environmental outcomes. Furthermore, if this Project is unable to achieve commercial operation in 2019, the expansion of renewable generation capacity will also likely be delayed.

1.8 ALTERNATIVES CONSIDERED

SaskPower has a number of generation supply options currently under consideration to meet the growing demand for power over the next 10-20 years. As opposed to a single technology, this Project is part of a sequenced portfolio, of which many other technologies are being considered including:

- Gas fired technology including simple cycle / combined cycle / cogeneration;
- Hydroelectric;
- Biomass;
- Solar, wind;
- Flare gas;
- Non emitting technologies such as clean coal, evaluation of nuclear; and
- Imported power from provinces with hydroelectric resources (Manitoba).

For SaskPower, the choice of developing a combined cycle natural gas facility is a critical enabler for the other technologies such as renewables and thus is a first choice.

Water management and efficiency has been a critical objective for the Project, and a key choice has been to employ an Air Cooled Condenser rather than water cooling. This alternative was chosen to minimize water usage.

SaskPower considered a number of alternative locations to develop the Project. SaskPower chose the Swift Current site from an initial list of twelve possible locations after public consultation and internal evaluation. SaskPower selected the site based on the load growth requirements near Swift Current and benefits of existing electrical transmission and natural gas infrastructure in the area.

SaskPower has purchased the quarter section (SE 13-16-15-W3) where the Project will be developed. Originally, the southeast corner of the quarter was selected by SaskPower based on the proximity to the landfill, road and powerline infrastructure. Based on initial assessments of the quarter section, the Project team is proposing to build the facility on the northwest corner of the quarter in order to avoid and minimize the environmental effects of the Project.

An alternative option considered for the water supply was to use groundwater wells in the local area. A preliminary groundwater sourcing study indicated that availability of groundwater onsite is limited. An additional groundwater investigation at neighboring properties occurred in May/June 2016 confirming the findings that there is insufficient groundwater supply in the area to support the facility.

1.9 REGULATORY FRAMEWORK

The Project has the potential to be regulated by federal and/or provincial jurisdictions. However, depending on the results of the screening, different regulatory pathways may result. A summary of the federal and provincial processes and "triggers" are described below. Additionally, descriptions of municipal, provincial and federal legislation, regulatory requirements and permits, licences and authorizations that may be applicable to the Project are provided in Section 1.9.4.

1.9.1 Federal Jurisdiction

Paragraph 2(a) of the *Regulations Designating Physical Activities* (Government of Canada 2014) states that a review needs to occur through the Minister of Environment under the CEAA 2012 for the construction, operation, decommissioning and abandonment of a new fossil fuel-fired electrical generating facility with a production capacity of 200 MW or more. The proposed Project is 350 MW in size and is therefore subject to a Screening by the Canadian Environmental Assessment Agency (the CEA Agency) under requirements of Section 10 of CEAA 2012, to determine if an Environmental Assessment (EA) is required.

The Project is not a component of larger Project that is not listed in the *Regulations Designating Physical Activities* (Government of Canada 2014).

This is a new project and neither the Project nor any of its components are an expansion under CEAA 2012.

The project location has not been part of a regional environmental study under Section 74 of CEAA 2012.

1.9.1.1 **Federal Financial Support, Lands, and Legislative or Regulatory Requirements**

There is no proposed or anticipated federal financial support that federal authorities will be providing to support the Project.

No federal lands will be used during the development or operation of the Project or any of its components.

SaskPower may be required to submit an Aeronautical Assessment Form for Obstruction Marking and Lighting for Transport Canada to determine the need for the application of marking and lighting of objects that may pose a hazard to aviation. Additionally, SaskPower may be required to submit a Land Use Submission Form to NAV Canada prior to Construction. There are no additional known federal permits, licences or other authorizations required for the development or operation of the Project.

1.9.2 Provincial Jurisdiction

In addition to federal jurisdiction, the Project may also constitute a "development" for the purposes of *The Saskatchewan Environmental Assessment Act* (SKEAA), as the term is defined by Section 2(d) of the *Act*.

Developments that are likely to have significant environmental implications must be granted approval from the Saskatchewan Ministry of Environment (SK MOE) - Environmental Assessment Branch (EAB) before proceeding with a project. This document will be submitted to the Saskatchewan MOE-EAB to inform their decisions regarding the acceptability of potential environmental effects from the Project. Following the review, the EA Commissioner will determine

if the Project is deemed a development and the submission of an Environmental Impact Statement (EIS) is required.

Through the submission of an EIS, if required, the EA process is intended to provide a detailed review of the biophysical, socio-economic and cultural issues associated with a proposed project. It allows for the public, potential stakeholders, and appropriate government agencies to be made aware of and comment on the potential environmental effects associated with a proposed project.

1.9.3 Federal-Provincial Jurisdictional Interaction

Based on SaskPower's current understanding of the Project and regulatory processes, the intent of this document is to meet the needs of both federal and provincial regulators in order to screen the Project and make a determination on whether the Project is subject to an EA. If the Project is subject to an EA both federally and provincially, it is anticipated that Canada and Saskatchewan will coordinate and cooperate in the exercise of their respective powers and performance of their respective duties in a timely, efficient and defensible manner.

1.9.4 Legislative and Regulatory Requirements

The Project will be subject to several legislative and regulatory requirements including permits, licences and authorizations. Project planning is at the early stages and consequently, all of the requirements for permits, licences, and authorizations are not currently known. A list of municipal, provincial and federal legislation; regulatory requirements; and permits, licences and authorizations that may be applicable to the Project is provided in Table 1-2. This list will be updated and refined as Project details are confirmed.

Table 1-2 Summary of Potential Legislative and Regulatory Requirements for the Project

Legislation/Regulations	Overseeing Agency	Relevance to Project
Municipal Authority		
Planning and Development Act	Rural Municipality of Swift Current No. 137	SaskPower may be required to apply for a zoning amendment prior to development. SaskPower will require a Development Permit from the RM. Given the Project is likely classified as a "design build project", three separate permit stages will be required for foundation, above grade structural and final design.

Table 1-2 Summary of Potential Legislative and Regulatory Requirements for the Project

Legislation/Regulations	Overseeing Agency	Relevance to Project
Provincial Authorities		
The Environmental Assessment Act	Saskatchewan MOE	Developments that are likely to have significant environmental implications must be granted approval from the Saskatchewan MOE-EAB before proceeding with a project. This document will be submitted to the Saskatchewan MOE-EAB to inform their decisions regarding the acceptability of potential environmental effects from the Project. Following the review, the EA Commissioner will determine if the Project is deemed a development. If the Project is deemed a development, an EA is required.
Environmental Management and Protection Act	Saskatchewan MOE	Air quality is regulated by the Saskatchewan MOE under the *Environmental Management and Protection Act* which regulates potentially harmful activities and substances to protect the air, land and water resources of the province. SaskPower will be required to meet the requirements of Chapter E.1.2, of the Saskatchewan Environmental Code, adopted pursuant to the *Environmental Management and Protection Act*. The Project will also require industrial works construction and operation approvals including approval to construct and store hazardous substances and/or waste dangerous goods from the Environmental Protection Branch.
Water Security Agency Act	Saskatchewan MOE – Landscape Stewardship Branch, Water Security Agency (WSA)	A permit was required from WSA prior to groundwater investigations taking place. The Project may require a water rights licence and approval to construct and operate works as well as an approval to construct and operate drainage works from WSA. In addition, an Aquatic Habitat Protection Permit may be required prior to beginning construction. Types of activities associated with the Project that may require an Aquatic Habitat Protection Permit include: Road development activities including, culvert installation, maintenance and removal, and temporary crossings; water pipeline construction; and riparian and aquatic vegetation removal.
Wildlife Act	Saskatchewan MOE – Fish and Wildlife Branch	Plant and animal species at risk as defined in the *Wildlife Act*, are protected from being disturbed, collected, harvested, captured, killed, sold or exported without a permit. Field permits were obtained from the SK MOE Fish and Wildlife Branch for field surveys conducted for the Project. Mitigation or avoidance may be required if species at risk are identified within the Project area.

Table 1-2 Summary of Potential Legislative and Regulatory Requirements for the Project

Legislation/Regulations	Overseeing Agency	Relevance to Project
Public Health Act, 1994	Ministry of Health - Cypress Health Region	The Project may require a permit from the local public health region to construct a sewage works given liquid domestic waste produced from the plant will be less than 18 cubic metres/day of non-industrial effluent.
Highways and Transportation Act, S.S. 1987, H-3.01	Ministry of Highways and Infrastructure (MHI)	The Project may require permits for the movement of oversized and overweight vehicles on provincial highways. Permits may also be required for on premise and off-premise identification signs. SaskPower will work with the Saskatchewan MHI to obtain necessary agreements or permits for work within existing road allowances and roadway crossings prior to water pipeline construction.
Heritage Properties Act	Ministry of Parks, Culture and Sport – Heritage Conservation Branch	The Heritage Conservation Branch (HCB) has designated each quarter section parcel within the southern half of the Province as either "sensitive" or "non-sensitive" for heritage resources. Developments occurring within a "non-sensitive" land parcel may proceed to development without needing to be submitted to the HCB for evaluation. The Chinook Power Station Project is within a non-sensitive parcel (SE 13-16-15 W3M). However, the associated water pipeline intersects some "sensitive" parcels. Based upon an agreed process with the HCB, SaskPower's in-house archaeologists have reviewed the Project and have determined that, depending on which side of the developed road allowance the pipeline is to be installed on, there is a potential risk of impacting a heritage resource (in the form of a known archaeological site). As such, the Project may require a heritage resource impact assessment (HRIA) to be conducted depending on the final routing of the water pipeline. The results of the HRIA, if required, will be provided to the HCB who will issue a letter granting clearance for the Project under the *Heritage Properties Act*.
The Occupational Health and Safety Act, 1993		The water pipeline trench will be designed and constructed in accordance with *The Occupational Health and Safety Regulations, 1996; Part XVII Excavations, Trenches, Tunnels and Excavated Shafts.*

Table 1-2 Summary of Potential Legislative and Regulatory Requirements for the Project

Legislation/Regulations	Overseeing Agency	Relevance to Project
Federal Authorities		
The Canadian Environmental Assessment Act, 2012 (CEAA 2012)	CEA Agency	The Project is a "designated project" and requires a screening under Sections 8 to 12 of the Act. The Agency may require an EA under CEAA 2012.
Fisheries Act	Fisheries and Oceans Canada (DFO)	The *Fisheries Act* defines requirements by which commercial, recreational and Aboriginal (CRA) fisheries are protected, including the prevention of "serious harm to fish" including fish habitats and to fish that support a CRA fishery. A review of available information indicates that no fish bearing waterbodies are expected to be affected by the Project.
Species at Risk Act	Environment and Climate Change Canada	The *Species at Risk Act* (SARA) lists species in Canada that are classified as being extirpated, endangered, threatened, or of special concern. These species are granted special measures to protect them. Federally listed species at risk may occur in the Project area. However, information review and field surveys to date indicate that no critical habitat for these species is expected to be affected by the Project.
Migratory Bird Convention Act	Environment and Climate Change Canada	The Migratory Birds Regulations and Migratory Birds Sanctuary Regulations define provisions which are meant to protect native species of migratory birds, nests, and eggs. The Project may interact with migratory birds and this document describes appropriate mitigation to avoid potential significant residual adverse environmental effects.
Aeronautics Act, Canadian Aviation Regulations, Standard 621	Transport Canada	SaskPower may be required to submit an Aeronautical Assessment Form for Obstruction Marking and Lighting for Transport Canada to determine the need for the application of marking and lighting of objects that may pose a hazard to aviation.
Aeronautics Act	NAV Canada	SaskPower may be required to submit a Land Use Submission Form to NAV Canada prior to Construction.

1.9.5 Federal Permits, Licences, and Authorizations

Current Project details indicate that a permit is likely required under the *Aeronautics Act* for marking the facility stacks. No other federal permits, licences or authorizations are expected at this point.

2.0 PROJECT DESCRIPTION

2.1 INTRODUCTION

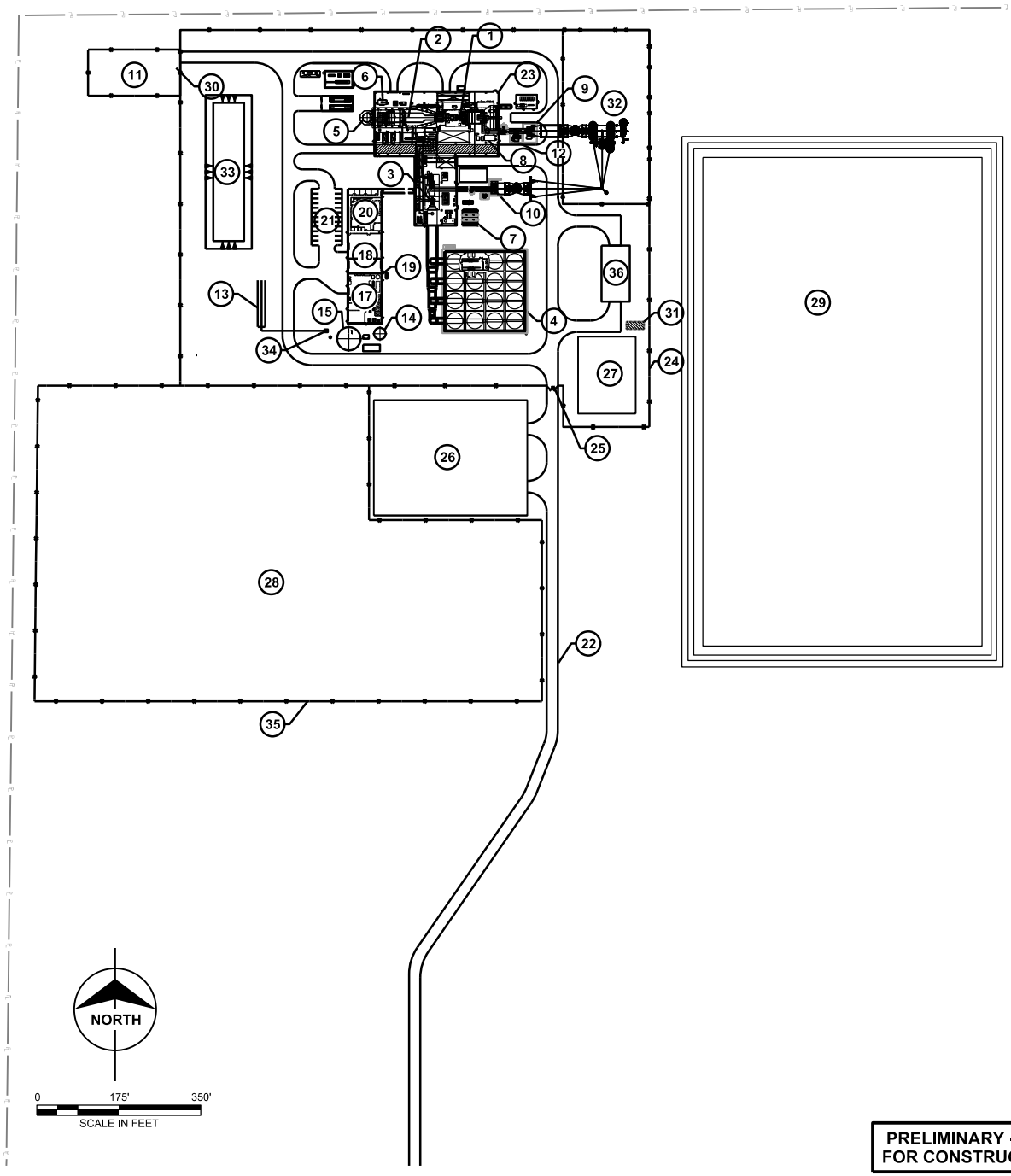
The proposed Project will be a power generation facility which utilizes state of the art combined cycle gas turbine (CCGT) technology to generate a nominal 350 MW of electricity. The basic principle of a CCGT plant is to combust natural gas to produce power in a gas turbine which can be converted to electrical power by a coupled generator. The hot exhaust gases from the gas turbine are then used to produce steam in a heat recovery steam generator (HRSG). This steam is supplied to the steam turbine generator to produce additional power. As a result, combined cycle facilities are one of the most efficient and reliable generation technologies available.

The facility will consist of one F-Class gas turbine generator (GTG), one steam turbine generator (STG), and one HRSG. The HRSG will be a horizontal, natural circulation, three-pressure, reheat type generator. The STG will exhaust to an air cooled condenser (ACC), which is cooled by ambient air utilizing fans. Steam condensed by the ACC will then return to the steam cycle as condensate. This closed cycle will not allow drift or plume, which is common with a plant that uses a mechanical draft wet cooling tower. Since the facility uses an ACC for heat rejection, water consumption is drastically lower compared to a facility using a wet cooling tower. Water consumption is further reduced by recycling process water within the plant.

2.2 DESCRIPTION OF PHYSICAL WORKS

The Project will include the power generation facility, a switchyard to interconnect to the 230 kilovolt (kV) transmission system, a potable water pipeline from the City of Swift Current, and a TransGas gas yard. With the exception of the water pipeline, all structures and equipment will be located at SE 13-16-15-W3M which is owned by SaskPower. The quarter section is currently a greenfield site with no existing structures. The site layout illustrates the proposed locations of the physical structures to be erected on the Project facility site (Figure 2.1).

The facility will consist of the powerhouse building, a multi-purpose building with main control/administration room, warehouse, workshop, and water treatment building, ACC, and switchyard. The total disturbance footprint, including temporarily disturbed areas during construction, will be approximately 650 m by 450 m (29.2 hectares).



KEY NOTES:

1. GAS TURBINE GENERATOR (GTG)
2. HEAT RECOVERY STEAM GENERATOR (HRSG)
3. STEAM TURBINE GENERATOR (STG)
4. AIR COOLED CONDENSER (ACC)
5. HRSG STACK
6. CONTINUOUS EMISSIONS MONITORING SYSTEM (CEMS) BUILDING
7. FIN FAN COOLER
8. AUXILIARY TRANSFORMER
9. GTG GENERATOR STEP-UP UNIT TRANSFORMER
10. STG GENERATOR STEP-UP UNIT TRANSFORMER
11. FUEL GAS YARD
12. OIL WATER SEPARATOR
13. LEACH FIELD
14. DEMIN WATER STORAGE TANK
15. SERVICE WATER STORAGE TANK
16. WASTEWATER STORAGE TANK
17. WATER TREATMENT BUILDING
18. WAREHOUSE
19. MAINTENANCE SHOP
20. ADMINISTRATION BUILDING
21. ADMINISTRATION PARKING
22. PLANT ACCESS ROAD
23. POWERHOUSE BUILDING
24. SITE SECURITY FENCE
25. SITE SECURITY FENCE DOUBLE SWING GATE
26. CONSTRUCTION PARKING
27. CONSTRUCTION TRAILERS
28. CONSTRUCTION LAYDOWN
29. EVAPORATION POND
30. TRANSGAS TIE-IN LOCATION
31. CONSTRUCTION POWER TRANSFORMER
32. 230 kV SUBSTATION
33. STORMWATER POND
34. SEPTIC TANK
35. TEMPORARY LAYDOWN FENCE
36. COLD STORAGE BUILDING

PRELIMINARY - NOT FOR CONSTRUCTION

BURNS McDONNELL | SaskPower | **FIGURE 2.1**

2.3 SITE FACILITIES AND INFRASTRUCTURE

2.3.1 Permanent Facilities and Infrastructure

2.3.1.1 **Powerhouse**

The powerhouse is a T-shape building which encloses the GTG, STG, HRSG and other balance of plant (BOP) electrical and mechanical equipment. The footprint of the building will be approximately 4,400 square m. The GTG/HRSG portion of the building will be approximately 80 m by 40 m, whereas the STG portion of the building will be approximately 45 m by 26 m. The exhaust stack is anticipated to be 43 m tall and will be constructed from steel. The height of the powerhouse building will range from approximately 15 m to 40 m.

In addition to the GTG, STG, and associated auxiliary equipment, other balance of plant equipment will be located in the powerhouse building. This includes the boiler feedwater pumps, HRSG blowdown tank, air compressors, dryers and receivers, sample panel room, etc. The Continuous Emission Monitoring system (CEMS) will also be located indoors in its own enclosure, and adjacent to the stack.

2.3.1.2 **Multipurpose Building**

A multi-purpose building will be constructed to house the operating and maintenance staff. The building is expected to be a pre-engineered steel frame structure with insulated metal panel siding and roof system. The preliminary dimensions of the areas within the multi-purpose building are as follows:

- Administration/Control Room: 29 m x 22 m
- Warehouse: 16.5 m x 22 m
- Maintenance Shop: 9.5 m x 22 m
- Water treatment area: 33 m x 22 m

The administration/control room building will contain offices, a lunch room, a distributed control system room, an operating control room and washroom facilities. The building will be occupied 24 hours a day by operating and support staff. The warehouse will be used for storage of all critical plant spare parts and day to day consumables that are required for plant operation. The maintenance shop will be used by trade staff to perform routine repair and maintenance for plant equipment.

The water treatment equipment will be located at the south end of the multipurpose building. The water treatment equipment will be used to treat potable water from the City of Swift Current and to recycle process water for reuse. The equipment will include mixed bed ion exchangers, a reverse osmosis system, ultrafilters, chemical storage totes, and chemical feed pumps for cycle chemical control. The mixed bed ion exchangers will be rental units with regeneration taking place offsite by the supplier.

An enclosed breezeway will be constructed to connect the multi-purpose building and the powerhouse.

A permanent parking lot will be located on the west side of the multipurpose building and will have approximately 20 electrified parking stalls to accommodate operation staff and visitors. The parking lot will be approximately 36.5 m by 20 m in size and the surface will consist of crushed rock.

2.3.1.3 **Balance of Plant Infrastructure**

A 10 m by 20 m pre-engineered fuel gas building will be located in the northwest corner of the Project site. Inside this building will be a performance gas heater where feedwater is used to heat up fuel gas, a fuel gas filter/separator and a knockout tank. This equipment will be used to prepare the natural gas for combustion in the gas turbine.

A water/glycol loop will be used in a closed-cycle cooling water system to cool various STG, GTG, and BOP equipment. The water/glycol loop is cooled by a fin-fan heat exchanger. Motor operated fans provide cooling air to the heat exchanger. The fin-fan heat exchanger measures approximately 9 m by 9 m and will be located outdoor adjacent to the powerhouse.

The ACC is a heat exchanger which condenses steam from the steam turbine to condensate. Fans, driven by electric motors, provide cooling air to the heat exchangers. The condensate collects in the condensate manifolds and gravity is used to drain the condensate to the main condensate tank. Condensate is then pumped from the condensate tank to the feedwater system to go through the steam cycle again. The ACC will be located south of the main power plant facility with an overall dimension of approximately 52 m by 52 m with a height of approximately 30 m.

The BOP electrical room and STG electrical room are separate buildings located close to the powerhouse.

An underground wash water drain tank will be located to the north of the GTG building. The 3 m by 5 m tank will collect water from the compressor wash and will be hauled off site periodically for disposal at an approved facility.

Two field erected water tanks: fire/service water and demineralized water, will also be located on site. The fire/service water tank will have a capacity of approximately 500,000 gallons (1,892,706 litres) whereas the demineralized tank is estimated to have a capacity of 100,000 gallons (378,541 litres). The water storage tanks serve to improve operational reliability of the unit in the event of interruption of service from the City, or equipment malfunction in producing demineralized water.

Two oil/water separators, one located near the powerhouse and the other near the multi-purpose building, are used to separate oil from the water that will be collected from the facility drains. The oil/water separator(s) will be designed to remove 20 micron and larger oil droplets to concentrations of less than 10 parts per million (ppm). It will be designed to store 1000 gallons

(3,785 litres) of oil. The oil/water separator will be constructed as a double walled buried tank and will have a leak monitor to detect a breach in the inner tank wall. Clean effluent will be recycled back to the fire/service water tank while the collected oil will be disposed offsite at an appropriate disposal facility periodically.

As indicated on the site general arrangement drawing (Figure 2.1), the project will include several other permanent small buildings or enclosures including the fire water pump building, emergency diesel generator, and three electrical equipment modules. Enclosures will be designed for equipment protection as well as applicable noise mitigation.

A site security fence will be constructed around the perimeter of the property. The fence will be erected to protect humans and animals from entering the site. The fence will be installed early in the construction period for added security and safety.

An evaporation pond and a stormwater pond will also be constructed for the facility. The evaporation pond is estimated to be approximately 15 acres (19 acres including the surrounding berm) and will contain any water that cannot be recycled through the plant system. A stormwater pond will be designed to retain all site drainage water. The pond is estimated to be 30 m by 100 m in size.

2.3.1.4 **Water Infrastructure**

The Project will require a water supply service for plant processes and domestic use. A variety of water sources were investigated during the early design stages including ground water, South Saskatchewan River water, City of Swift Current effluent water and City of Swift Current potable water. Potable water from the City of Swift Current was selected as it is cost effective and utilizes the existing water treatment infrastructure in Swift Current.

During normal operation, the facility will require approximately 180 litres/minute (L/m) of raw water. The city water from Swift Current will supply both potable water for domestic uses and makeup water to the steam cycle. Almost 70% of the process water (approximately 123 L/m) will be recovered and recycled through the steam generation/HRSG blowdown/cooling cycle. An estimated 60-70 L/m of makeup water supply will be required under normal operation conditions depending on ambient conditions. The facility design plan is to reduce the amount of water usage whenever possible.

Water for the plant will be obtained from the City of Swift Current via a new underground pipeline from the South Hill Reservoir. The South Hill Reservoir is an existing enclosed water containment structure that stores treated city water. The reservoir is fully contained and there is no access for wildlife or human activities. The City of Swift Current has an existing pumping station on the property used for city distribution and for interconnection to the North Hill Reservoir. The City of Swift Current requested that SaskPower construct a new booster pump station adjacent to the existing facilities in NW 13-15-14-W3M in order to connect the new water pipeline. The booster pump station will have a pump well, dedicated redundant pumps, instrumentation, as well as electrical and heating equipment for water distribution to the facility.

The booster pump station will be a pre-engineered building approximately 5 metres by 8 metres in size and will be constructed on City owned property in close proximity to the existing pump station to allow for tie-in to the City's infrastructure.

The water pipeline will be routed within existing developed road allowances, where possible. Public road allowances are not typically zoned and therefore, changes to zoning as a result of the water pipeline installation are not anticipated. The public road allowances to be used for the water pipeline are owned by the Province of Saskatchewan (Her Majesty the Queen in Right of Saskatchewan). The pipeline is expected to be approximately 18 km long with a capability of transporting water at a maximum of 100 Gallons Per Minute (United States) (GPM (US)) with a pressure not to exceed 200 pounds per square inch (psi).

A 1.9 million litre (500,000 US gallon) Service/Fire Water tank will be used for water storage. A combination of ultrafiltration and reverse osmosis (RO) will be used to treat the city water. Two x 100% 2-Pass RO filter systems will supply water to rental mixed bed deionizers and then the Demineralized Water Storage Tank for use throughout the plant. Demineralized water is used as makeup to the steam cycle. To further minimize waste water consumption and discharge, blowdown from the HRSG is recycled to the Service/Fire water tank after being cooled to a temperature acceptable for the water treatment equipment.

2.3.1.5 **Road**

The site access road that will be built on the Project quarter section will be an all-weather crushed rock road. The road will be constructed to avoid wetland areas on the site and will be approximately 500 m in length and 8 m wide. Other roads on site will be designed to allow year round access to all areas of the plant site for operation and maintenance activities. All road surfaces will consist of crushed rock.

2.3.2 Utilities and Infrastructure

2.3.2.1 **Electrical Power**

SaskPower will provide two overhead powerlines to the Project. The electrical infrastructure is considered to be complementary to the Project given the plant cannot operate without connecting to the SaskPower electrical grid and will be for the sole benefit of the plant. A 25 kilovolt (kV) overhead distribution powerline will be constructed on the east side of the property and will connect to a two mega-volt ampere (MVA) transformer for construction. A 230 kV overhead powerline will be constructed on the northeast corner of the site to interconnect the Project to the provincial electrical grid.

A team within SaskPower, outside of the Project team, will be responsible for routing, constructing and operating approximately 5 km of new 230 kV overhead powerline to interconnect the Project to the existing Swift Current switching station in SW 31-15-14-W3M. Transmission line routing, stakeholder engagement and regulatory approvals/permits and construction and operation are outside of the care and control of the Project team.

A team within SaskPower, outside of the Project team, will also be responsible for routing, constructing and operating the 25 kV construction power to the Project site. Construction power routing and regulatory approvals/permits, construction and operation are outside of the care and control of the Project team.

It is expected that both lines will be subject to a self-assessment under SKEAA.

2.3.2.2 **Fibre**

Telecommunications will be required for operation of the Project. Installation of this infrastructure is considered complementary to the Project and will be for the sole benefit of the facility. The Project load will be controlled remotely from SaskPower's Grid Control Centre in Regina. The primary method of communication with the plant will be through a Wide Area Network whose central medium for communication is fibre optics. Existing fibre optic cables are in place at the Swift Current switching station in support of SaskPower's existing switching station control systems. A team within SaskPower, outside of the Project team will be responsible for the fibre optic routing, regulatory approvals/permits, construction and operation and is therefore outside of the care and control of the Project team. The fibre optic line will likely be subject to a self-assessment under SKEAA to identify potential construction issues and mitigation.

2.3.2.3 **Natural Gas Infrastructure**

2.3.2.3.1 Gas Supply

The Project requires a natural gas supply of high pressure service to supply the gas turbine and low pressure service to supply the building heaters. The plant location was selected due to its proximity to an existing natural gas pipeline. The natural gas infrastructure is considered to be complementary to the Project and for the sole benefit of the facility. SaskPower will enter into a construction agreement with TransGas, a wholly owned subsidiary of SaskEnergy, for the pipeline construction and interconnection facilities. Once construction is complete, as per the TransGas tariff, SaskPower will enter into a service agreement with TransGas to transport the natural gas to the facility. As per *The SaskEnergy Act*, TransGas has the exclusive right to transport gas within Saskatchewan.

TransGas will be solely responsible for routing, constructing and operating the underground pipeline to provide the natural gas supply infrastructure to the tie-in location at the northwest corner of the facility and is therefore outside of the care and control of the Project team (See Figure 2.1). Pipeline routing within SaskPower's facility will be performed in collaboration between TransGas and SaskPower. Preliminary information obtained from TransGas indicates that the proposed natural gas pipeline will be approximately 11.6 km long and will tap off the existing Success – Moose Jaw TransGas pipeline north of the Project facility in NE 14-17-15-W3M. TransGas indicated that the proposed pipeline route is only conceptual at this stage and subject to change upon land and regulatory approvals. It is anticipated that the pipeline will be regulated under the *Pipelines Act* administered by the Government of Saskatchewan, Ministry of Economy and subject to a self-assessment under SKEAA. The Project team will not have the ability to direct

or influence TransGas regarding the installation of the gas pipeline infrastructure outside of the Project facility.

Fuel gas consumption of the gas turbine at full load ranges from 1,750 million British thermal units per hour (MMBtu/hr) (low heating value (LHV)) to 2,100 MMBtu/hr, depending on ambient conditions and will require 600 pounds per square inch gauge (psig) at the metering yard. Pressure requirements for gas fired building heaters are expected to be low. Building heat design pressure will be designed to 10 psig or less. Pressure requirement at the metering yard for low pressure supply is estimated to be a maximum of 60 psig. Consumption is estimated at 18 MMBtu/hr.

2.3.2.3.2 Plant Gas System

The plant natural gas system will begin at the downstream side of the fuel gas metering yard. An emergency stop valve, manually controlled from the control room, will be provided downstream of the metering yard to provide emergency shutoff capabilities in the event of an on-site gas system leak or major plant fire.

The pipeline gas will be filtered to remove particulate and trace oil prior to Project use. The gas will be heated above the dew point temperature with a natural gas fired dew point heater prior to pressure regulation. Gas for the gas turbine will be heated by a feedwater heater for performance improvements during normal operation. The heated gas will be routed through a scrubber after the performance heater to remove moisture from the gas in the event of a heater tube leak. Gas will be routed through another fuel gas filter/separator prior to the gas turbine to meet gas turbine manufacturer fuel gas quality requirements.

Moisture from knock out tanks and separators will be collected and stored in tanks local to each tank or separator. Tank waste condensables will be manually removed and shipped offsite for proper disposal at an approved facility.

2.3.2.4 **Roads**

The travel route to access the Project site from Swift Current has been identified by the Rural Municipality (RM) of Swift Current. Travelling from Swift Current, personnel will travel west along highway #1 then will turn north on highway 32 and travel approximately 6 km. Personnel will turn east on township road 162, and travel approximately 2 km to the Project site. Township road 162 is also used by the Newalta industrial landfill located on the quarter section east of the Project. A road maintenance agreement will be established with the RM of Swift Current for the construction and operation periods.

SaskPower and Burns & McDonnell will coordinate with the RM of Swift Current and the Saskatchewan Ministry of Highways and Infrastructure (MHI) to meet compliance with the applicable road restrictions and transportation requirements during the construction period.

2.3.3 Temporary Facilities and Infrastructure

To support the facility construction process, temporary facilities with be constructed. At the conclusion of the Project, temporary facilities and infrastructure will be removed from the site or converted to permanent facilities for long term operation and maintenance of the facility.

2.3.3.1 **Security**

Site security will be increased throughout the Project lifecycle. Currently a barbed wire fence surrounds the property. In the early construction phases, a permanent site security fence will be erected. A temporary fence surrounding the construction laydown area will also be constructed. Workers will be required to sign in and out of site. When trade staff levels require increased safety and monitoring onsite, temporary site security services will be implemented. This will include a turnstile and a digital access control system to assist with tracking manpower onsite. After commissioning is complete, a permanent closed circuit television system will be used to monitor and control site access.

2.3.3.2 **Construction Parking**

The craft construction parking lot will be located on the south side of the Project site as shown on the site layout drawing (See Figure 2.1). The craft parking area will be constructed by the site preparation subcontractor and will be approximately 100 m by 80 m. It is expected that construction management personnel at the superintendent level and above will be allowed to park on-site near the construction office trailers. The construction parking lot will remain after the project construction and commissioning to support future installation and maintenance needs of the facility.

2.3.3.3 **Construction Laydown**

The construction laydown area will be approximately 200 m by 325 m and is shown on the site layout drawing (Figure 2.1). The primary laydown area will be on the south side of the plant.

A portion of the main laydown area will be developed to provide on-site fabrication areas. Piping will be prefabricated at grade elevation in the fabrication area prior to being lifted to the final locations.

2.3.3.4 **Construction Management Facilities**

Construction management office trailers will be constructed early in the Project to house the Burns & McDonnell and SaskPower construction management personnel. A separate construction office trailer located near the Burns & McDonnell construction office will be provided for SaskPower site personnel. Prior to the installation of the permanent utilities, temporary facilities will be required such as a portable generator, portable toilets, and sanitary storage facilities.

Contractors will use trailers to house the contractor construction management personnel. Construction management trailers will be located on the east side of the site adjacent to the Burns & McDonnell and SaskPower trailers as indicated on the site plan drawing (Figure 2.1).

A construction trailer area will be installed near the construction management and craft parking areas. The construction trailer area will be approximately 40 m x 50 m and used by all the construction contractors. The construction trailer area will be large enough to house all the craft on site and it will be used for site wide safety meetings, training, and serving as the break area. The break structure will be turned over to SaskPower at the end of the Project to support maintenance activities during operation.

Contractor storage trailers and tool bins will be located by the contractors with approval from the construction management team. Storage trailers and tool bin locations will change as construction progresses.

2.3.3.5 **Construction Water**

A temporary water supply will be required during construction activities between late 2016 through to June 2018. Water will be trucked to site until the permanent water supply system is erected and stored in tanks. The overall estimate for construction water consumption is approximately 15 million litres (Table 2-1). Construction water will be used during site preparation and during foundation backfill construction. The water consumption estimates provided below are based on the civil quantities in the project estimate with water consumption for soil compaction based on typical values. It is estimated that one truck per day for four days per week will be required for dust suppression.

Table 2-1 Estimated Volume of Water Required During the Construction Phase

Construction Activity	Volume (litres)
Site Preparation	5,318,503
Foundations	2,839,058
Dust Suppression	5,678,117
Sanitary	567,811
Miscellaneous	946,352
Total	15,349,841

2.4 PRODUCTION CAPACITY

The Project has been designed to generate a net output of 350 MW which is greater than the 200 MW threshold established for new fossil fuel-fired electrical generating facilities under the *Regulations Designating Physical Activities* (Government of Canada 2014).

Output and heat rate for combined cycle technologies have improved incrementally over the years, primarily due to the advancement in the design of the gas turbine. For an intermediate to

base load combined cycle facility, a combined cycle using G, H, and J class gas turbines would have better efficiency. However, output of a combined cycle facility using these technologies would be higher than the 350 MW required by SaskPower. A plant using these larger gas turbine technologies could require derate of the plant to stay under the 350 MW, which in turn decreases the efficiency resulting in a higher heat rate.

The 1x1 F-class turbine configuration chosen for the Project is best suited to meet the 350 MW output. Since carbon capture technology is not used for combined cycle units, higher efficiency (lower heat rate) means that less carbon dioxide (CO_2) is generated for every kilowatt of electricity generated. The table below shows the estimated generation output and heat rate of the facility across various ambient conditions with the GTG operating at full load.

Table 2-2 Estimated Generation Output and Heat Rate of the Project Operating at Full Load

Ambient Conditions	-40°C 75% RH[a]	-7.4°C 86% RH	0°C 83.4% RH	15.8°C 69% RH	34.6°C 17% RH
Net Plant Output, MW	348.5	350	350	345.7	296.1
Net Plant Heat Rate (kJ/kWhr, LHV) [b]	6,380	6,210	6,210	6,220	6,510
Heat Input (GJ/hr, LHV) [c]	2,220	2,170	2,170	2,150	1,930
CO2 Emissions (kg/MWh)	373	365	365	365	382

[a] RH – Relative humidity
[b] kJ/kWhr, LHV – Kilojoules per kilowatt hour, low heating value
[c] GJ/hr, LHV – Gigajoule per hour, low heating value

Note: Output and heat rates are based on the unit in a new and clean condition, with no consideration for plant degradation during operation.

The facility is also capable of running at reduced loads to support the renewable portfolio. The following table shows the estimated output and heat rate of the unit while maintaining an emissions limit of nitrogen oxides (NOx) at 15 parts per million (ppm). The GTG will meet the 15 ppm NOx limit when operating above the outputs indicated in Table 2-3 at the corresponding ambient conditions. At 50% load, this facility will have enough reserve generating capacity to support the existing renewable portfolio during low or high wind regimes.

Table 2-3 Estimated Output and Heat Rate of the Project Operating at Less Than Full Load

Ambient Conditions	-40°C 75% RH[a]	-7.4°C 86% RH	4.3°C 76% RH	15.8°C 69% RH	34.6°C 17% RH
Net Plant Output, MW	179.8	178.2	179.9	180.9	173.1
Net Plant Heat Rate (kJ/kWhr, LHV) [b]	7,210	6,980	6,890	6,860	7,180
Heat Input (GJ/hr, LHV) [c]	1,300	1,240	1,240	1,240	1,240
CO2 Emissions (kg/MWh)	423	409	404	402	421

[a] RH – Relative humidity
[b] kJ/kWhr, LHV – Kilojoules per kilowatt hour, low heating value
[c] GJ/hr, LHV – Gigajoule per hour, low heating value
Note: Output and heat rates are based on the unit in a new and clean condition, with no consideration for plant degradation during operation.

2.5 PROCESSING

The basic principle of a CCGT plant is to combust natural gas to produce power in a gas turbine which can be converted to electrical power by a coupled generator. The hot exhaust gases from the gas turbine are then used to produce steam in a HRSG. This steam is supplied to the steam turbine generator to produce additional power. As a result, combined cycle facilities are one of the most efficient and reliable generation technologies available. The general process of the Project is described below (Figure 2.2).

Pipeline quality natural gas will be used as the only fuel for the unit. Prior to entering the gas turbine, the natural gas will be heated in accordance to Original Equipment Manufacturer (OEM) guidelines using the intermediate pressure feedwater. Increasing the temperature of the natural gas increases the cycle efficiency. The heated natural gas is then combusted in the gas turbine to drive the turbine to generate electricity. Electricity generated by the gas turbine generator will be stepped up to 230 kV using the generator step up transformer before interconnecting to the SaskPower transmission system. For this Project, an advanced F-class gas turbine has been selected for the facility. The advanced F-class gas turbine utilizes state-of-the-art technology to improve efficiency and boost output. The gas turbine is equipped with Ultra Low NOx (ULN) burners which optimizes the ratio of combustion air to fuel as well as combustion temperature to control NOx emissions from the natural gas combustion process.

Temperature of the exhaust gas from the gas turbine ranges from 590°C to 630°C at the outlet of the gas turbine exhaust. The hot exhaust gas is ducted to the HRSG via the GT exhaust transition piece to generate steam.

The HRSG is a waste heat boiler which produces high pressure, intermediate pressure and low pressure steam. The HRSG also provides a cooling medium to the kettle boiler for the gas turbine compressor air. High temperature air from the compressor is extracted and piped to the kettle boiler. The cooled rotor air is returned to the combustion turbine. The kettle boilers capture the waste heat from the rotor air to heat up low pressure and intermediate pressure feedwater thereby increasing the overall plant output. Amine, phosphate and ammonia are injected into the steam cycle along with continuous and intermittent boiler blowdown to maintain desired cycle chemistry to minimize corrosion and prevent scale formation.

Exhaust gas exits the HRSG via the stack. The stack is estimated to be approximately 43 m high based on findings from the air dispersion modelling performed specifically for the Project (See Section 2.6.1) to meet the Saskatchewan and Canadian Ambient Air Quality Standards.

Steam generated in the HRSG is used to drive a steam turbine and generator to produce electricity. Electricity generated by the STG will be stepped up to 230 kV using the generator step up transformer before interconnecting to the SaskPower transmission system. Steam from the low pressure part of the turbine exhausts into the air cooled condenser (ACC). Ambient air drawn from the surroundings by fans of the ACC condenses the exhaust steam and the condensate collects in the condensate tank. Condensate is then pumped by condensate pumps and boiler feedwater pumps to the HRSG and the steam cycle repeats.

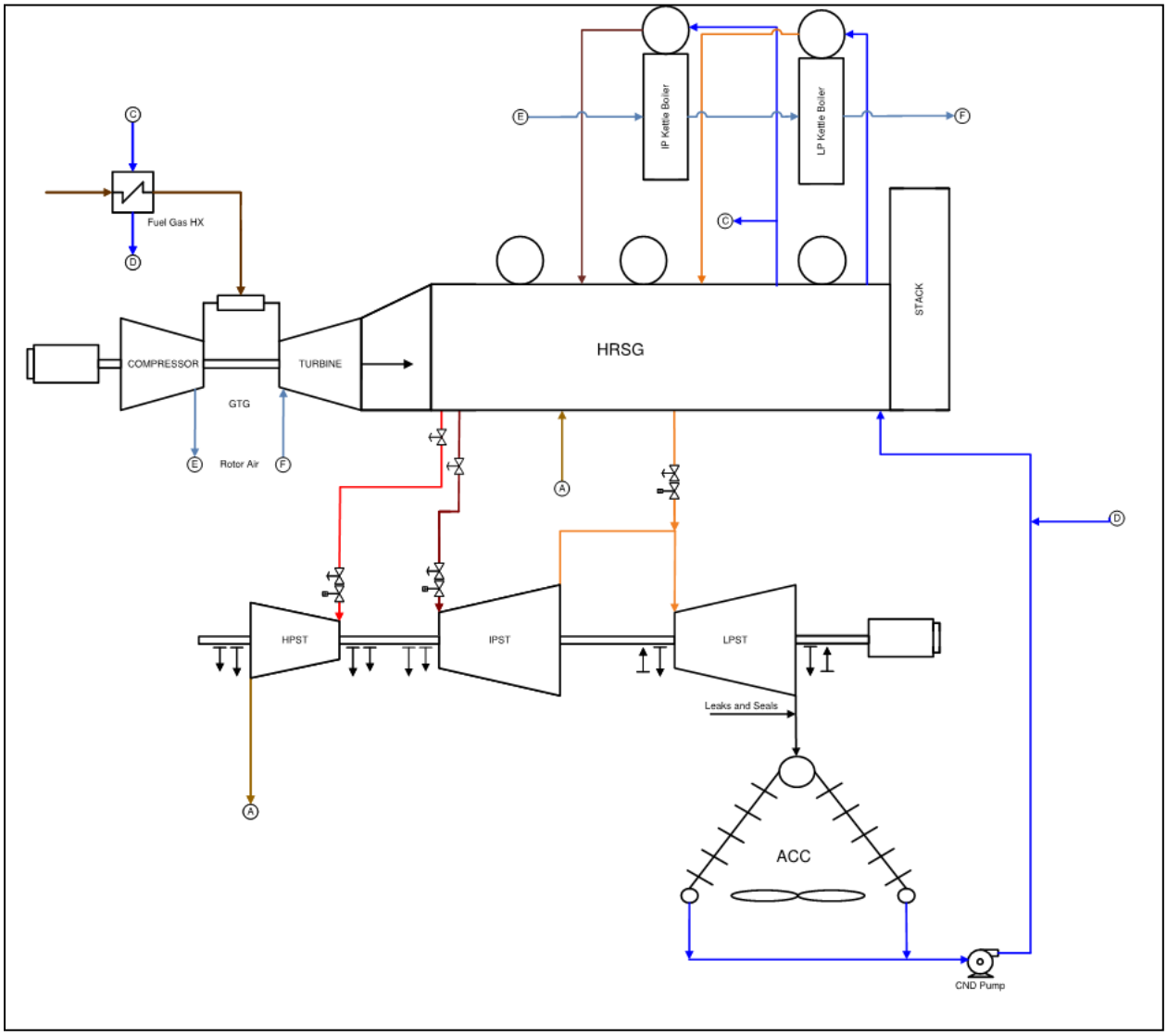
The HRSG boiler blowdown system collects continuous and intermittent blowdown from the HRSG and steam drains local to the HRSG. Drains are routed from the collection points to the boiler blowdown tank where the steam expands and cools and is recycled back to the service water tank for reuse, reducing the overall water consumption of the facility. The boiler blowdown drain, HRSG stack drain, and feedwater pressure relief valves (PRVs) are routed to the plant drains system where the collected drains will be pumped back to the Service/Fire Water Tank for reuse.

By adopting the process design above, the efficiency of the plant is almost 58% on an annual average ambient condition on a low heating value (LHV) basis. As a result, the CO_2 emissions of the facility are expected to be well below 420 kg/MWh across all ambient conditions when the GTG is operating at full load. CO_2 emissions are estimated to range between 370 kg/MWh to 400 kg/MWh when the GTG operates at 100% load. As the plant ages, the unit will experience degradation which decreases the plant efficiency thereby increasing CO_2 emissions per MWh. Future degradation will be mitigated by implementing a long term service agreement with the gas turbine supplier with contractual remedies on performance to ensure the facility will not exceed emission limits of 420 kg/MWh over the life of the facility.

The use of ACC saves water consumption by more than 90% compared to a wet cooled unit. However, the use of an ACC does impact the efficiency of the cycle, increasing the CO_2 emissions in kg/MWh. Due to the temperate climate at Swift Current, impact on heat rate using an ACC is much less than a location with a hot climate such as Phoenix, Arizona. A CEMS will be installed at the facility to measure and report emission data per the requirements of the annexed New Source Emission Guidelines for Thermal Electricity Generation, Paragraph 11

(Emissions Monitoring) (ECCC 2010), published in the Canada Gazette, Part 1, and for controlling the unit. The CEMS information will be in accordance with Protocol and Performance Specifications EPS 1/PG/7 referenced in the guidelines.

Figure 2-2 Process Flow Diagram of a Combined Cycle Natural Gas Generating Facility



2.6 EMISSIONS, DISCHARGES AND WASTE

2.6.1 Atmospheric Emissions

2.6.1.1 Construction Emissions

Air emissions generated during construction of the facility will result from several sources and activities. Particulate matter (PM) is the term used to refer to solid particles and liquid droplets found in the air. Particulate matter is reported according to the diameter of the particle size; PM_{10} refers to coarse dust particles 2.5 to 10 microns in diameter and typically includes crushing and grinding operations and dust from vehicles on roads. $PM_{2.5}$ refers to fine particles 2.5 microns or less in diameter and can only be seen with an electron microscope. Fine particles are produced from all types of combustion and some industrial processes. For conservativeness, it was assumed that all PM, PM_{10}, and $PM_{2.5}$ combustion emissions from the Chinook Power Station are equivalent to each other for the air emissions calculations.

Fugitive dust and fine particulate emissions will be generated from land clearing, site preparation, earth moving and material handling, and vehicles creating dust by traveling on land. In addition, off-road construction equipment (dozers, compressors, etc.) will release combustion by-products such as nitrogen oxides (NO_x), carbon monoxide (CO), and volatile organic compounds (VOCs) when they operate by combusting fuel. Fugitive dust emissions (particulate matter ($PM/PM_{10}/PM_{2.5}$)) will be higher during land clearing and site preparation and during active construction periods when there is increased vehicle traffic on the site from mobile equipment.

In general, the process of estimating construction emissions involves the use of activity parameters and emission factors based on those parameters along with appropriate correction factors. Activities and parameter data has been included in Table 2-4. Information is provided in the table for each piece of equipment associated with the various construction activities and a breakdown of hours each construction activity is expected for each of the three years of construction.

Table 2-4 Estimated construction equipment to be used for the Project

Equipment Type	Fuel Type	Quantity	Estimated Work Hours On-Site		
			Year 1 (hr/yr)	Year 2 (hr/yr)	Year 3 (hr/yr)
Vibratory Compactor	Diesel	2	1,750	0	0
Motor Grader	Diesel	1	975	1,950	650
Dump Truck	Diesel	2	1,250	0	0
Wheel Loader	Diesel	2	2,000	0	0
Dozer	Diesel	2	1,250	0	0
Excavator	Diesel	4	5,000	0	0
Scraper	Diesel	2	1,250	0	0
Pavers	Diesel	1	500	0	0
Trencher	Diesel	2	2,600	0	0
Skid Steer	Diesel	6	5,525	5,850	0
Concrete Truck	Diesel	2	500	4,000	0
Concrete Pump Truck	Gasoline	2	250	2,000	0
Flat Bed Truck	Diesel	1	813	1,625	0
Water Truck	Diesel	1	2,600	1,950	488
Forklift 5 Ton	Diesel	10	3,575	17,062.5	4,875
Generators/Compressors	Diesel	14	13,488	14,625	2,438
Pick-up Truck	Gasoline	8	6,500	14,138	3,738
ATV/Mule	Gasoline	12	17,063	27,300	11,538
Manlift	Diesel	16	0	24,538	8,450
Crawler Cranes <200T	Diesel	6	2,600	8,775	2,275
Crawler Cranes >200T	Diesel	8	6,175	7,963	325
RT Cranes	Diesel	12	7,962.5	23,238	5,525

Construction equipment will also emit GHG emissions. To estimate potential carbon dioxide equivalent (CO_2e) emissions from the construction equipment, emission factors for carbon dioxide (CO_2), methane (CH_4), and nitrous oxides (N_2O) were obtained from the US Environmental Protection Agency (EPA) Mandatory Greenhouse Gas Reporting Rule (40 CFR Part 98) and ratioed with their appropriate Global Warming Potentials (GWP). The potential greenhouse gas construction emissions were calculated using the parameter data shown in Table 2-4 and greenhouse gas emission factors. The potential emissions are summarized in Table 2-5.

Table 2-5 Estimated Maximum Potential Annual Greenhouse Gas Emission Rates of the Project During Construction

Pollutant	Construction Year 1 (tonnes per year)	Construction Year 2 (tonnes per year)	Construction Year 3 (tonnes per year)	Total Construction Emissions Over 3 years (tonnes)
CO_2	44,130	59,062	10,735	**113,927**
CH_4	1.8	2.4	0.4	**4.6**
N_2O	0.4	0.5	0.1	**1**
CO_2e	44,282	59,266	10,772	**114,320**

2.6.1.2 Operation Emissions

Emission of air contaminants during operation of the Project will result from the combustion of natural gas in the proposed combined-cycle combustion turbine. There will also be emissions of air contaminants generated from the emergency diesel generator, emergency diesel fire pump, and dew point heater. The maximum emissions from any operating load including start-up and shut down emissions for the combustion turbine were used to demonstrate the maximum potential emissions for each pollutant. The maximum potential air emissions associated with the Project, based on 8,760 hours per year of operation, including start-up and shut down emissions for the turbine and auxiliary equipment emissions can be found in Table 2-6.

Table 2-6 Estimated Maximum Potential Air Emissions Associated With the Project During Operation

Pollutant	Potential Air Emissions (tonnes per year)
NO_x	450.1
CO	462.7
$PM/PM_{10}/PM_{2.5}$	26.8
SO_2	28.7
CO_2	1,263,467

The above CO_2 estimate is based on a plant operating scenario of 100% load for 100% of the year which is not a realistic operating scenario. Given the plant is designed to be dispatched, under an operating scenario that represents a normal operating year (assuming 85% capacity of the gas turbine at 100% load), the CO_2 emissions would be approximately 1,037,437 tonnes/year (Table 2-7). This more realistic scenario assumes 7,446 operating hours of the gas turbine and the natural gas dew point heater, includes 50 starts a year based on cold start emissions and 100 operating hours for the emergency fire pump and emergency diesel generator. The estimated maximum potential GHG emissions associated with the Project during operation using this scenario can be found in Table 2-7.

For the combustion turbine, the carbon dioxide equivalent (CO_2e) emissions are due to carbon dioxide (CO_2), methane (CH_4) and nitrous oxides (N_2O) emissions. The CO_2e emission factors (for CO_2, CH_4, and N_2O) from the US Environmental Protection Agency (EPA) Mandatory Greenhouse Gas Reporting Rule (40 CFR Part 98) and Global Warming Potentials (GWP) were used to estimate CO_2e emissions. CO_2e emissions were estimated based on emission information from the gas turbine OEM for CO_2 and AP-42 emission factors for methane (CH_4) and nitrous oxide (N_2O) for natural gas. The GWP of methane and nitrous oxide emissions are normalized to the warming potential of carbon dioxide (as CO_2e) by multiplying the methane emissions by 25 and the nitrous oxide emissions by 298. Despite the higher warming potentials of methane and nitrous oxides compared to carbon dioxide, it is expected that carbon dioxide emissions will still account for over 99 percent of the CO_2e GWP for this combustion turbine.

Table 2-7 Estimated Maximum Potential Annual Greenhouse Gas Emissions Associated with the Project During Operation

Pollutant	Combined-Cycle Combustion Turbine[a] (tonnes per year)	Dew Point Heater (tonnes per year)	Emergency Diesel Fire Pump (tonnes per year)	Emergency Diesel Generator (tonnes per year)	Total (tonnes per year)
CO_2	1,035,610	1,735.1	17.9	73.4	1,037,437
CH_4	18.7	0.03	0.001	0.003	18.7
N_2O	1.9	0.003	0.0001	0.001	1.9
CO_2e	1,036,634	1,737	18	74	**1,038,463**

[a] Represents 100% annual average ambient unfired scenario

Natural gas power stations using combined cycle technology emit 40% as much carbon dioxide as conventional coal-fired generation in Saskatchewan. The two coal units at SaskPower's Boundary Dam Power Station that are scheduled for retirement or retrofitting by the end of 2019 emit approximately 2.3 million tonnes of CO_2 annually to generate 280 MW. The Project will result in a greater generation output of 350 MW with a lower GHG footprint as indicated in Table 2-7. As SaskPower phases out conventional coal-fired generation and adds natural gas and renewable generation to the system, the GHG emissions will continue to improve (i.e., diminish).

2.6.1.3 Gas Turbine Generator (GTG)

The F-Class GTG will have the most up-to-date technology which includes several technologies to keep emissions low. NOx emissions will be controlled by the use of Ultra Low NOx (ULN) burners. Emissions of particulates will be low due to the combustion of clean-burning natural gas. In addition, CO and VOC emissions will be controlled through the use of good combustion controls on the design of the combustion turbine. Further, natural gas has the lowest SO_2 emissions of any fuels. The Project is being designed with the best available control technology to achieve ground level impacts that will meet the Saskatchewan and Canadian Ambient Air Quality Standards.

Emissions from the F-Class GTG are dependent on the ambient temperature conditions and operating load, which can vary from 50 percent to 100 percent for combined-cycle operation. To account for representative seasonal climatic variations, potential emissions from the proposed combustion turbine was analyzed at 50, 75, and 100 percent load conditions for ambient temperatures ranging from negative 40 degrees Celsius (°C) to 35°C for combined-cycle operation. Projected emissions were based on data provided by the potential F-Class combustion turbine manufacturers and/or from AP-42 emission factors.

An F-Class GTG was selected based on the Saskatchewan grid load requirements. SaskPower requires a combined cycle plant smaller than 350 MW with the flexibility to meet SaskPower's renewable energy plan. The G-Class, H-Class and J-Class turbines all have outputs larger than 350 MW when installed in a 1x1 CCGT configuration. The H-class 1x1 CCGT is estimated to have output of more than 400 MW under ISO conditions, with an efficiency that is 1-2% better than a 1x1 F-class in an unfired plant. Using G, H, or J-class for the Project would necessitate the unit to be derated to produce less than 350 MW for the majority of the time.

Although the G, H, J-Class gas turbines generally have better efficiency and produce less CO_2 than the F-class on a pounds per MWh basis, derating the unit would adversely impact the efficiency advantage of these larger gas turbines. Moreover, the F-class gas turbine also has a lower NOx emission on a ppm basis compared to the H-class. The H-class turbine typically has 25 ppm NOx emission limit. SaskPower is committed to meeting a NOx emission of 15 ppm emission limit at the stack exit. The H-class gas turbine will not meet the NOx emission requirement in this case.

In addition to the combustion turbine, there will also be emissions of air contaminants generated from the emergency diesel generator, emergency diesel fire pump, and dew point heater. Detailed calculations of the combustion turbine and auxiliary equipment's emissions are provided in Appendix E.

2.6.1.4 **Natural Gas Dew Point Heater**

A 3.73 million British thermal units per hour (MMBtu/hr) natural gas-fired dew point heater will be used to heat the natural gas. The emissions are based on 8,760 hours of operation per year, which is the maximum. However, the estimated operational hours of the natural gas dew point heater is expected to be less than half of this estimate so emissions will be considerably less. AP-42 data was used to estimate the emissions from the heater.

2.6.1.5 **Emergency Diesel Fire Pump**

An emergency diesel fire pump will be built to support the Project in case of a fire. The emergency diesel fire pump is expected to have a maximum power output of 330 horsepower (hp) and will be fired solely by ultra-low sulfur # 2 fuel oil. The plant expects to operate the emergency diesel fire pump for up to 100 hours annually for testing and maintenance purposes, and therefore supports a limit on routine hours of operation of the emergency diesel fire pump. Vendor data and AP-42 emission factors were used to determine emissions for the fire pump.

2.6.1.6 Emergency Diesel Generator

An emergency diesel generator will be built to provide essential services to the plant in case of a power interruption. The emergency diesel generator is expected to have a maximum power output of 1,000 kilowatt (kW) and will be fired solely by ultra-low sulfur #2 fuel oil. The plant expects to operate the emergency diesel generator for up to 100 hours annually for testing and maintenance purposes, and therefore supports a limit on routine hours of operation of the emergency diesel generator. Vendor data and AP-42 emission factors were used to determine emissions from the emergency diesel generator.

The facility is expected to emit between 370 kg/MWh to 400 kg/MWh of CO_2 when operating at full load at various ambient conditions. These emission rates are based on the unit in a new and clean condition, with no consideration for plant degradation during operation. As mentioned in Section 2.5, the long term service agreements with the gas turbine supplier will remedy the performance degradation to ensure that CO_2 emissions will not exceed 420 kg/MWh during the life of the facility.

As discussed previously, improving the heat rate of the plant will reduce the CO_2 emission per MW of electricity generated. The plant has been designed with the following features to improve the plant heat rate:

- Selecting an advanced F-class turbine to meet the 350 MW requirement outlined by SaskPower
- Capturing waste heat from rotor air using kettle boiler to improve output and heat rate
- Increase temperature of fuel gas using feedwater to improve cycle efficiency
- Selecting a gas turbine capable of producing a maximum of 350 MW to meet SaskPower forecasted demand with no duct firing to maintain a lower plant heat rate across all operating scenario

Using an ACC does have a slight impact on CO_2 emission rates. However, considering the arid condition at the site, its temperate climate, and the large reduction in water consumption (90% or more compared to a wet cooling tower), it is deemed a worthwhile compromise.

2.6.2 Liquid Discharges

2.6.2.1 Construction Liquid Discharges

The main sources of plausible liquid discharge sources during the construction phase include sanitary waste, rain water, snowmelt and machinery fluids (e.g., diesel fuel, lubricating oils). Each source will be controlled differently to avoid spills and unplanned releases.

During the construction phase, portable toilets will be used by personnel. Sanitary waste will be stored in a septic tank with a holding capacity of approximately 7570 litres and will be pumped

and removed from site by licensed contractors and disposed of in accordance with federal, provincial, and municipal regulations.

Rain water and snowmelt will need to be monitored and controlled during construction. The developed Project site, including the construction laydown, parking and trailer areas, will be graded to drain site water to temporary ditches or the stormwater pond. The stormwater pond will be designed to collect surface water runoff only; therefore it is unlikely to come into contact with contaminants. The stormwater pond will be designed for a 25-year storm event and preliminary design anticipates the pond will be approximately 2,800 square meters and approximately 2 meters deep. There will be an overflow structure as part of the design in the event of a larger storm event. The overflow structure will allow for excess water to slowly release over a period of a few days, until the pond is returned to its normal depth of water. Stormwater discharge at a delayed rate will be done in accordance with a Drainage approval from the Water Security Agency. The release of stormwater will be designed to maintain existing drainage patterns so adjacent properties are not affected. Drainage from the stormwater pond will not affect fish or fish habitat. During execution, a detailed Stormwater Pollution Prevention Plan will be developed and implemented during construction. After construction is finished, the stormwater pond will be left open for permanent stormwater drainage.

Machinery will be kept in proper working order during construction to avoid spills of machinery fluids such as oils, fuels and coolants. The site procedures manual will identify proper spill handling techniques and spill reporting criteria for the Project.

2.6.2.2 **Operation Liquid Discharges**

The Project will contain various sources of possible liquid discharges that must be controlled during operation.

The Project will utilize an air cooled condenser which significantly reduces the water consumption and associated discharges. The estimated process wastewater that will be discharged during normal operation will range between 32 litres/minute and 35 litres/minute (46-50 cubic metres per day (m^3/day)) across various ambient conditions. Table 2-8 describes the estimated water quality for the waste stream. The waste water discharge stream will be limited to the waste stream from the ultrafilter and reverse osmosis system. The waste stream will be primarily cycled-up water with some chemical additives in the feedwater cycle. Since a rental mixed bed ion exchange system will be used, all regeneration will take place offsite at the supplier's facility, and no waste disposal is expected from the mixed bed.

The waste water generated from the facility will be discharged to an onsite evaporation pond. The evaporation pond will contain effluent water from the water treatment process and it is not expected to contain contaminants in concentrations that would negatively impact migrating birds or wildlife. The total footprint of the evaporation pond is estimated to be approximately 19 acres (77,000 square metres). The evaporation pond will be designed to have a high-density polyethylene (HDPE) or clay liner to prevent seepage into the soil. A berm approximately 1.2 metres high with a 3:1 slope will be constructed around the evaporation pond with a gravel

road on top. The pond will be sized based on the climate of the site including evaporation rate and is estimated to be approximately 14.5 acres (59,000 square metres) with a depth of approximately 2 m. The evaporation pond will be effectively sized to receive approximately 16,035 cubic metres (m^3) per year of wastewater, as well as to account for annual rainfall at the site conditions.

The evaporation pond will be designed using an average annual lake evaporation rate of 81 cm. The average annual precipitation rate for the area is assumed to be 36 cm, giving a net evaporation rate of 46 cm. After using a factor of safety of 1.5 and a correction for salinity of 0.90, a design evaporation rate of 1073 m^3 per year will be used. The minimum winter depth of the pond will be 15 cm with a yearly water level variation of 61 cm. There will be an added 15 cm of design depth to allow for the occurrence of a 100-year rainfall event along with an added 15 cm for salt storage. Given the evaporation pond depth is designed to account for the maximum operational storage plus additional depth for salt storage, allowance for a 100-year rainfall event, freeboard for wave run-up and average annual lake evaporation, it is not intended for the evaporation pond to drain. The total design life of the evaporation pond will be 30 years. No dredging of the pond is expected.

Table 2-8 Estimated Water Quality of the Waste Stream (mg/L) Discharged From the Facility to the Evaporation Pond During Operation

Parameter	Concentration (mg/L[a])
Total Dissolved Solids (TDS)	3981
Calcium (Ca)	373
Magnesium (Mg)	345
Sodium (Na)	361
Iron (Fe)	0.04
Ammonia (NH_3)	1.47
Cations	
M-Alkalinity (M-Alk)	402
Sulphate (SO_4)	705
Chloride (Cl)	34
Nitrate (NO_3)	1
Carbon dioxide (CO_2)	0
Silicon dioxide (SiO_2)	73
Anions	
Arsenic (As)	0.0011
Barium (Ba)	0.0692
Boron (B)	0.1275
Copper (Cu)	0.0018
Iron (Fe)	0.0137
Lead (Pb)	0.0002
Manganese (Mn)	0.02
Phosphorus (P)	11.8567
Selenium (Se)	0.0007
Uranium (U)	0.5463
Zinc (Zn)	0.0067

[a] mg/L = milligrams per litre

Note: Cations and anions are reported as $CaCO_3$, all others as ion.

During operation of the Project, sanitary waste will be collected and pumped to a new on-site septic system and absorption field. Given sanitary waste water generated during operation will be less than 18 m3 per day, the waste system will be regulated by The Plumbing and Drainage Regulations. The design of the absorption field will be in accordance with the Saskatchewan Onsite Wastewater Disposal Guide (Government of Saskatchewan, 2009) and will be permitted through the Cypress Health Region and comply with the requirements of the Public Health Act, 1994.

Pending further discussion with the Cypress Health Region to determine the most suitable wastewater system, the preliminary design of the absorption field is discussed below. The absorption field system will be designed for occupancy of 20 people or approximately 6000 litres

per day. The preliminary geotechnical report indicates that the soils in the Project area are silty sand. Using the effluent volume and soil loading rate, a soil absorption field of approximately 360 square metres will be required. The trenches will be designed to be approximately 358 metres in length, one metre wide and not more than one metre deep. There will be a minimum 30 cm depth of crushed rock in the bottom of the trenches with six 60 metre lateral pipes laid on top. Crushed rock will cover the pipes and the balance of the trench will be backfilled with the excavated materials. The piping used with the absorption field system will be a type that is acceptable to the Cypress Health Region. The absorption field will be located to comply with all setback requirements. It is also a requirement that the absorption field be designed to ensure no impact to the groundwater table and have at least 1.5 meters of vertical separation. The groundwater table for the Project site is at a depth of 12.2 meters and is therefore considered to be acceptable.

As mentioned in section 2.6.2.1, the stormwater pond will be designed for a 25-year storm event and preliminary design anticipates the pond will be approximately 2,800 square meters and approximately 2 meters deep. The stormwater pond will be left open for permanent stormwater drainage.

In addition to the liquid stream during operation, there are also other liquid waste streams associated with maintenance work. These streams are usually intermittent flows such as gas turbine compressor wash, ACC wash, lube oil, etc. (See Table 2-9).

2.6.2.3 **Accidents and Malfunctions**

In the event of a liquid discharge due to an accident or equipment malfunction, wastewater drains from the area around the equipment that have the potential to be contaminated will be gravity drained and directed through the oil/water separator(s). Oil water separator effluent will be pumped and discharged to the water treatment building sump for reuse. Oil will be stored in the separator and removed periodically by a vacuum truck and disposed of at an appropriate facility offsite.

Floor or equipment drains or trenches will be located near equipment which contains or uses oil. The floor trenches will be used to collect and convey drainage inside the facility. Containment curbs, floor trenches and underground piping will contain, collect, and transport oil contaminated drainage to the oil/water separator(s) for treatment. Oil containment areas will be provided with normally closed isolation valves and gravity drain to the oily drains system.

Secondary containment will be installed around all equipment, unloading pads or storage tanks that contain oil equal to or greater than 189 litres. The secondary containment will be designed to meet the local, provincial and federal requirements pertaining to oil storage. If possible, the secondary containment areas will be sloped. Containments will include a manual drain valve piped to the oil water separator.

Table 2-9- Summary of the Estimated Quantities of the Intermittent Liquid Waste Streams

Liquid Waste	Description	Volume		Containment	Disposal Method	Potential Effects on the Environment
		Normal	Maximum			
Waste effluent from HRSG blowdown	Blowdown from HRSG HP,IP, and LP drums. Used to maintain boiler chemistry by blowing down solids from the bottom of the boiler drums into a blowdown tank. Liquid effluent is quenched and sent to the plant sump and vapor is sent to an atmospheric vent.	3.2 m^3/hour	15.9 m^3/hour	Oil/Water Separator	Recycled back to service water storage tank and filtered in plant demineralizer	None
Waste effluent from demineralized water treatment plant	Water treatment plant discharge waste stream	2.1 m^3/hour	4.2 m^3/hour	Evaporation Pond	Effluent will be pumped to an evaporation pond	None; pond will be designed and permitted in accordance with the Saskatchewan Stormwater Guidelines EPB 322 produced by the Water Security Agency.
Sampling discharge	Sample panel drains	0.9 m^3/hour	0.9 m^3/hour	Oil/Water Separator	Recycled back to service water storage tank and filtered in plant demineralizer	None
Drainage within powerhouse building	Miscellaneous floor drains and equipment drains	2.3 m^3/hour	2.3 m^3/hour	Oil/Water Separator	Water will be sent through oil water separators and recycled back to the service water tank or sent to the evaporation pond	None; oil water separators will have oil level switches and pump interlock to prevent discharging oil laden water. Oil will be trucked offsite.
Gas turbine water wash	Gas turbine compressor water wash will be a combination of water and cleaning agent that will be collected in a drains tank and trucked offsite.	5.2 m^3/hour	7.9 m^3/hour	Water Wash Drains Tank	Will be treated as hazardous waste and trucked offsite.	None
Air cooled condenser water wash	Air cooled condenser fin wash to remove dust accumulation on the outside of the ACC fins	200 m^3 per wash (wash quantity dependent on weather cycles, est. 2 washes per year)	N/A	N/A	Plant storm water system	None; clean plant water is used in the pressure washer.
Used oil and other solvents (hazardous waste)	Used lube oil and control oil for turbines and other cleaners used in plant	TBD	TBD	Plastic totes or barrels	Oil will be sold or recycled to/by qualified carrier.	None
Sewage	Sanitary waste from admin building	5 m^3/day	N/A	N/A	Absorption field	None; absorption field will be designed in accordance with the Saskatchewan Onsite Wastewater Disposal Guide and will be permitted through the Cypress Health Region.

Notes:
1. Information in this table is preliminary and values will be updated as required during permit application process.

2.6.3 Types of Waste and Plans for Disposal

Solid wastes that will be generated during construction will be typical of activities associated with power generation construction, such as packing materials, office wastes, scrap lumber, excess concrete, metals, cables, glass, cardboard containers, and other miscellaneous debris. Solid waste will be collected in large waste containers, and hauled off and disposed of by licensed waste contractors in accordance with federal, provincial, and municipal regulations. Waste disposal will occur only at either locally or regionally approved facilities.

Solid wastes generated during the operation phase of the Project will be typical of activities associated with operation of a power generation facility. Wastes will include domestic and office waste generated by operations personnel, packaging wastes from supplies, as well as wastes from ongoing maintenance activities (e.g. oil containers, rags, etc.,). Wastes generated during operations will be disposed of by licensed waste contractors in accordance with federal, provincial and municipal regulations using approved facilities. Table 2-10 provides the estimated quantity of solid wastes that will be generated during operation of the Project.

Table 2-10 Estimated Quantity of Solid Wastes Generated From the Project during Operation

Waste Material	Disposal Method	Estimated Annual Quantity (tonnes)
Waste oil/filters/hazardous waste/oily rags/aerosol cans	Collected and disposed of through registered collectors and recovered/recycled through registered processors/disposal class 2 landfill.	3
Domestic waste	Municipal Landfill	3
Paper/cardboard/tin/plastic	Approved recycling facility	8-15
Scrap metal	Approved recycling facility	15

2.7 PROJECT SCHEDULE AND ACTIVITIES

The following project schedule assumes that no federal or provincial environmental assessment (EA) will be required. In the event that an EA is required, the Project milestones will be shifted accordingly based on the time required to conduct the EA.

Land and Geotechnical Surveys	September 2016
Permit Applications and Approval	October 2016 to January 2016
Site Clearing & Grubbing	November 2016 to March 2017
Site Preparation/Levelling	December 2016 to June 2017
Piling Installation	January 2017 to July 2017
Foundation and Underground Installation	January 2017 to December 2017
Building Erection	July 2017 to July 2018
Water Pipeline Construction	July 2017 to February 2018
Equipment Installation	October 2017 to February 2019
Commissioning & Start-up	February to October 2019
Decommissioning (after estimated 30 year Project life)	2049 to 2051

2.7.1 Pre-Construction

The Project site pre-construction activities are anticipated to start in the fall of 2016. Activities will include land and geotechnical surveys required for design and construction. Land surveys will identify site boundaries and topographic details required for site preparation and grading. Geotechnical surveys will be conducted to gather information on soil consistency and structure needed for piling and foundation design. A site procedure manual will also be developed and will include a site emergency response plan, an environmental management plan and site safety procedures.

2.7.2 Construction

2.7.2.1 **Site Preparation and Grading**

The main Project site preparation activities will be performed prior to any other construction work. Site preparation construction is expected to take approximately 4-5 months to complete, and it is ideal for the work to be performed outside of frozen ground conditions. The developed portion of the Site will be stripped of topsoil and organic matter. The topsoil will be stockpiled for use in landscaping. The Site will be excavated or filled, where required, to bring the Site to the required elevations. Excavated materials, where possible, will be used for fill. Soil excavated from the Site shall be stockpiled at a location onsite.

Approximately 30 cm of topsoil will be stripped from the area of the Project site to prepare for construction. It is assumed that 1.5 m of fill will be needed to level out the 68 acre Project site. The site will be graded to drain into main collection ditches. The Site surface will be graded to a slope of one vertical to 100 horizontal, where site conditions and elevations allow, permitting rapid removal of surface water. The main collection ditches will have a trapezoidal cross-section

shape, with a minimum bottom width of 1.2 m. The side slopes will be designed to the soil conditions present on Site. Ditches shall be designed to be adequately protected from erosion after excavation to maintain slope stability using vegetation or other engineered means.

The general sequence of the site preparation construction will be to begin work in the main plant area and in the construction management trailer area/craft parking lot area. Following the initial work, the balance of the site preparation construction scope will be performed, which includes installing the site fence, preparing the switchyard area, installing the evaporation pond, and installing the main construction roads on the site.

2.7.2.2 **Foundation Excavation and Construction**

Foundation construction will be performed during non-frozen ground conditions. It is preferable that all foundation construction and underground utility work be completed during one construction season, March to December. Piling construction work will begin in February 2017 followed by foundation/substructures construction beginning in April 2017. Using this approach, it is expected that all foundation construction work can be completed by November of the same year before winter begins.

Ductbank and grounding grid construction and underground piping installation work will be completed during the construction of the foundations in the same areas.

2.7.2.3 **Building and Equipment Installation**

Building construction will begin in late 2017 following completion of foundation construction. The mechanical equipment will be scheduled to be delivered immediately after the mechanical contractor(s) mobilize to site beginning with HRSG component deliveries planned to begin in late 2017. Mechanical construction progress will be scheduled to target all buildings be closed before winter to provide a better work environment for construction work during the winter.

Electrical construction will begin in March 2018. Electrical equipment installation work will be completed first followed by raceways installation and then cable installation.

Switchyard construction scope will include the above grade poles, line, and miscellaneous components for a complete function transmission line interface connection. Switchyard construction will begin in March 2018 and will be completed in time to support electrical backfeed targeted for October 1, 2018.

2.7.2.4 **Water Infrastructure**

The Project requires a pipeline and pump station to supply water to site. SaskPower will utilize a subcontractor to design and construct the water pipeline and pump station. The water pipeline will be installed within existing developed road allowances from the South Hill Reservoir to the Project site using trenching and Horizontal Directional Drilling (HDD) technology. HDD technology is an alternative to traditional pipeline construction methods, like trenching and backfilling, as it can minimize impacts to environmentally sensitive areas.

Conventional open trenching technology will be used to construct the majority of the water pipeline other than at crossings (e.g., highway, railway, utilities, etc.) and environmentally sensitive areas where HDD will be used. Design and construction of the trench will comply with Saskatchewan's *The Occupational Health and Safety Regulations, 1996*. Based on current soil information, the width of the trench at the bottom is expected to be approximately one metre and the depth is expected to be approximately 3 metres. The trench will be sloped to within 1.2 metres (4 ft.) of the bottom of the trench, with a slope at an angle not steeper than 45 degrees. The trench will be dug out using a small hydraulic excavator suitable for utility installation. Once the six inch pipeline is installed in the trench, the open trench will be backfilled using the excavated materials with sand bedding at the bottom of the trench. Additional work space will be required for temporary storage of spoil piles and equipment which need to be kept a minimum of one metre from the edge of the trench for safety reasons. The additional work space during construction will be obtained through traffic control and temporary right-of-way agreements with adjacent landowners.

Generally, the HDD process begins with boring a small, horizontal hole (pilot hole) under the crossing with a continuous string of steel drill rod. When the bore head and rod emerge on the opposite side of the crossing, a special cutter, called a back reamer, is attached and pulled back through the pilot hole. The reamer bores out the pilot hole so that the pipe can be pulled through. The pipe is usually pulled through from the side of the crossing opposite the drill rig. The bore-head will be tracked electronically so as to guide the hole to a pre-designed configuration. A drilling fluid usually made of bentonite clay is injected into the bore during cutting and reaming to stabilize the hole and remove soil cuttings.

The water pipeline will be installed below the frost depth in Swift Current which is estimated to be approximately 2.5 meters. A detailed geotechnical study will be performed to determine the HDD, trenching and pipeline design. Prior to the installation, the right-of-way (ROW) will be surveyed and strip limits will be established. Conventional trenches will conform to guidelines and specifications supplied by the City of Swift Current.

All underground utilities such as power and phone will be located and exposed along the determined route. Traditional excavation and backfill techniques will be used to cross any identified utility line. Recommended sixteen inch bored steel crossing(s) will be installed with casing spacers at the CP railway tracks and the Trans Canada No. 1 Highway crossing. Buried pipeline with valves, fittings and accessories will be installed either restrained or unrestrained based on stress calculations during the detailed design phase.

The construction of the water pipeline is expected to take approximately four to six months to complete and will be targeted for dry conditions outside of the migratory bird nesting window (April 26 -August 15; EC 2015), if possible. Temporary space will be rented to allow fusing and joining of long multiple segments of pipe in a continuous length. For 6" pipe, a mini drill rig will be sufficient for construction. The typical width of space beyond the exit point of pipe insertion is between 10 m to 15 m.

A pump station with intake structure will be installed at the South Hill Reservoir to connect the pipeline. As per initial discussions with the City of Swift Current, a dedicated pumping system to supply water to the Project will be installed at the reservoir including a new intake well, process piping, pumps, valves, electrical interconnection, controls, monitoring building foundation and structure.

After the pipeline and pump station are constructed and commissioned, the City of Swift Current will assume responsibility of the operation and maintenance services of the pipeline and facilities during the life of the Project.

2.7.2.5 **Commissioning and Testing**

Start-up and commissioning provides for a documented, safe, timely, and orderly testing, start-up and transfer of packages, systems, and facilities. Planning will begin in the engineering stage with the definition of Start-up Packages. Engineering, procurement, and construction planning will support early commissioning of as many start-up packages as practical. Early checkout and testing of as many packages as possible will distribute the start-up workload more efficiently, reducing the risks and uncertainties associated with facility start-up and commissioning.

The principal activities provided during this stage are the following:

- Perform Project Start-up Planning and Preparation
- Perform Start-up and Commissioning Process
- Start-up and Commissioning Management
- Operator Training Management
- Performance Testing

The entire startup and commissioning process, including system functional testing, is anticipated to take 12 months. In addition to system checkout and piping hydrotest, lube oil flushing will also be performed for the GTG and STG lube oil systems. Chemical cleaning will be utilized to remove grease and other contaminants in the HRSG. When fuel gas is available in March 2019, first fire of the GTG will occur. Steam generated by the GTG will be used to conduct steam blow. After steam blow is complete, the STG will be started to electrically synchronize to the grid. The project team will then tune the unit to optimize plant performance. The final activities in the commissioning process will be the plant testing. For the Project, it is anticipated that plant testing will include performance tests, demonstration tests, emission tests, and reliability tests.

2.7.3 Operation

The Project will be owned and operated by SaskPower. Day to day operation and maintenance will be provided by a staff of operators, engineers and support staff totaling approximately 20 people. Additional support staff will be available from the other natural gas plants in the SaskPower fleet.

The Project will operate as a baseload facility with a flexible control scheme to support SaskPower's emission reduction strategy. The facility will provide a regulation range of between 40% and 100% on a daily basis to compensate for the intermittent load from renewable generation and to maintain system reliability. The facility will be operated using Automatic Generation Control (AGC) for the purpose of load following variable renewable generation and will be monitored and controlled in the local control room as well as SaskPower's grid control centre. The facility is not expected to have more than 50 starts per year.

The estimated process wastewater that will be discharged during normal operation will range between 32 litres/minute and 35 litres/minute(46-50 cubic metres per day (m^3/day)) across various ambient conditions. Water that cannot be recycled will be sent to the evaporation pond. Details related to the operation of the evaporation pond are outlined in section 2.6.2.

Site water from rain, snowmelt and runoff will be managed through a series of ditches and culverts. In the power block area; there will be on-grade duct banks that will make routing water to ditches difficult. As a result, the storm water in the power block area will be drained to inlets and routed via underground pipes to tie into the new site ditches. Rerouting of surface drainage will be confined to the Project site only. A Stormwater Pollution Prevention Plan (SWPPP) will be developed during site preparation design to implement and control storm water discharge.

Major maintenance and refurbishment work on the steam turbine generator and gas turbine generator will be provided by the turbine and generator manufacturer to maintain reliability and efficiency of equipment. A comprehensive long term service agreement will cover the gas and steam turbine and generator equipment. As the plant is expected to operate as a baseload plant, the planned maintenance intervals are 16,600 hours. A typical maintenance schedule is provided in Table 2-11.

Table 2-11 Turbine Manufacturer's Typical Maintenance Schedule

Equivalent Base Hours* (EBH)	Combustion Turbine Outage	Outage Durations (Days)	Steam Turbine Outage
16,600	Combustion Inspection	8	Borescope Inspection
33,200	Hot Gas Inspection	14	Limited Inspection
49,800	Combustion Inspection	8	Borescope Inspection
66,400	Major Inspection	21	Major Overhaul
83,000	Combustion Inspection	8	Borescope Inspection
99,600	Hot Gas Inspection	14	Limited Inspection
116,200	Combustion Inspection	8	Borescope Inspection
132,800	Major Inspection	28	Major Overhaul
150,000	End of Term		N/A

*Hours are approximate at time of outage

During operation of the Project, the ongoing operation and maintenance of the water pipeline and associated equipment will be the responsibility of the City of Swift Current.

2.7.4 Decommissioning and Reclamation

Currently there are no structures or equipment at the proposed Project site.

Cleanup activities will be ongoing throughout construction. Upon completion of the construction work, SaskPower and contractor personnel will ensure that any remaining construction materials and other debris are removed. Areas disturbed during construction will be recontoured and covered with the stockpiled topsoil and reseeded with an appropriate seed mix. Appropriate mitigation and reclamation measures to address post-construction environmental concerns will be implemented (e.g., erosion control measures). The Project will be monitored post-construction for early detection of weed growth and any noxious, nuisance or prohibited weeds will be controlled according to SaskPower's Vegetation Management Policy (Appendix G).

Upon completion of the water pipeline construction, the subcontractor will confirm that any remaining construction materials or other debris are removed and any surface disturbance is reclaimed, where applicable (i.e., recontouring and application of seed and/or sod). In addition, any disturbed asphalt, gravel and driveway surfaces will be restored.

The new facility is expected to operate until at least 2049. Precise timing for the decommissioning of the facility cannot be predicted at this time as it depends solely on the mode of operation. However, all relevant environmental regulations in existence at the time of decommissioning will be adhered to. A Decommissioning and Reclamation Plan will be developed for the Project outlining the decommissioning and reclamation objectives.

It is expected that the facility and associated buildings will be removed from site. Foundations will be removed to one meter below grade and the excavation backfilled and rubble will be crushed for use as base material. The gravel surface will be stockpiled on site for possible sale and metal will be sold for salvage. It is anticipated that small diameter underground piping may be left in the ground but any above or below ground storage tanks will be removed. After the decommissioning has been completed, only the foundations one-meter below grade will remain on site. These will be identified in a caveat registered on the property title.

Prior to demolition, the following measures will be taken:

- Floor drains, trenches and sumps will be cleaned and any materials removed will be tested and disposed of at approved facilities, as required.
- Oil will be drained from the equipment and disposed of at approved facilities.
- Recycling of materials, rather than disposal in the landfill will be conducted, wherever practical.

At the closure of the Project, the site will be reclaimed in accordance with industry best standards and applicable environmental guidelines and regulations. It is expected that the site

will be graded, contoured and revegetated with an appropriate seed mix. Post-operation monitoring and an adaptive management approach will be taken to ensure reclamation success.

Given that once construction of the water pipeline is complete, care and control of the pipeline during the operation phase will be transferred to the City of Swift Current, any decommissioning and reclamation activities of the water pipeline post Project will be the sole responsibility of the City.

2.8 ENVIRONMENTAL MANAGEMENT FRAMEWORK

SaskPower is ISO 14001 environmental management system certified and is guided by existing commitments to environmental sustainability and best practice. SaskPower is committed to incorporating environmental management approaches and strategies into Project planning and execution so that not only is the Project compliant with regulatory requirements, but that it also enhances positive effects. SaskPower has consulted with provincial and federal regulators and will consult the public to better understand the issues that are of most concern to them, as well as to understand requirements for the preparation of this document.

SaskPower has experience developing, operating and maintaining power generation facilities in Saskatchewan. This experience will be used for the development of environmental management tools prior to Project construction to support the proactive management of potential environmental effects.

The incorporation of environmental management tools into Project planning has occurred in several ways, including in the design and selection of Project components and activities. Environmental management tools will be used to avoid or mitigate potential effects on natural features, (e.g., wetlands), and will include use of site selection criteria, conducting biophysical field surveys, and developing an Environmental Management Plan, to name a few. By integrating this environmental management framework into Project planning, several potential environmental effects can be avoided or appropriately managed prior to Project execution.

3.0 ABORIGINAL AND PUBLIC ENGAGEMENT

3.1 INTRODUCTION

SaskPower conducted an extensive site selection process between 2012 and 2015 to identify an optimal location in the Province for a new natural gas generating facility. The initial desktop evaluation considered 12 areas. Four of these areas were selected for further evaluation: Condie, Peebles, Swift Current and Wolverine (near Lanigan). Consultations with elected officials and landowners were conducted in each of these areas in June 2012. The consultation process provided information about the need for new generation, characteristics, design and schedule of the Project and provided opportunities for elected officials and landowners to learn about the Project and provide feedback to the Project team.

Public open house information sessions were held in the Guernsey School Gym in Guernsey on June 19, 2012, the Credit Union I-Plex Auditorium in Swift Current on June 20, 2013, the North West Leisure Centre in Regina on June 21, 2012, and the Community Rec Centre in Windthorst on June 27, 2012. Each of the open house information sessions were advertised in local papers and on local radio stations and ran from noon to 7 p.m.

In November 2012 stakeholders in all four areas were advised by letter that based on technical and cost evaluations and information gathered through the public consultation process, SaskPower had shortlisted two potential sites for further detailed evaluation: Swift Current and Wolverine.

In February 2014, stakeholders in the Swift Current area were invited to an open house to discuss two potential sites being evaluated. As a result of ongoing consultation, additional potential sites were identified. Preliminary analysis determined that one of these sites had advantages and merited further evaluation.

In October 2014, the RM and the City of Swift Current were advised by telephone that an additional site had been identified in the Swift Current area that warranted further evaluation and SaskPower would be proceeding to obtain an option on this site in order to conduct further analysis. No concerns were expressed by either the RM or the City.

In December 2014, SaskPower was able to secure an option on SE13-16-15 W3M. Subsequently, in January 2015, all landowners within a 5 km radius of this additional site, as well as all landowners previously consulted on the Project were advised by letter that SaskPower was currently evaluating an additional location in the Swift Current area.

Fourteen new landowners were contacted as a result of shifting the study area to be centered on the new location. Attempts were made to contact each of these newly affected landowners by telephone to confirm receipt of the letter and discuss the Project. Eleven of the fourteen new

landowners were contacted by telephone. Several of these landowners were already aware of the project when they received the letter.

In June 2015 an announcement was made that the Swift Current site had been selected for the new generation. The Swift Current site was determined to be the optimum site based on evaluation of the technical and cost considerations, including availability of natural gas supply and proximity for connection to SaskPower's transmission system, as well as the results of consultation with elected officials and landowners.

3.1.1 Key Comments and Concerns Expressed During Siting

Landowners were generally accepting of the need for the generation project. The main concern expressed was the amount of water required for the Project as landowners do not want the local water supply to be impacted. Landowners also expressed concern about air quality, noise levels, light pollution, increased construction traffic and property values. The owners of a small airstrip expressed concern about the potential impacts to aerial crop spraying as a result of routing of the transmission line which is necessary to connect the generation to the switching station.

3.2 PRELIMINARY ENGAGEMENT ACTIVITIES

The Project team undertook preliminary engagement activities starting in February 2016 to provide opportunities for elected officials and landowners to learn about the project and provide feedback to the project team. Activities included in-person and conference call discussions with municipal, provincial and federal government officials. In addition, letters were sent to all landowners within 5 km of the project site as well as other potentially interested stakeholders introducing the Project (75 in total). The letter included a questionnaire and postage-paid return envelope to offer the opportunity to provide feedback (Appendix C). The engagement process included information about the project need, scope, benefits and schedule.

3.2.1 Potentially Affected and/or Interested Aboriginal Communities

The Project team had a meeting with officials from the Lands and Consultation Branch of the Saskatchewan Government Relations Ministry on January 21, 2016 to discuss the proposed Project. Everyone in attendance agreed that this Project would not likely trigger the duty to consult and accommodate from a provincial perspective because the Project is being built on private land with limited effects on the surrounding area. There was also no Unoccupied Crown Land near the Project site.

Based on discussions with CEAA, the Project team identified the Aboriginal communities and organizations in Table 3-1 as having a potential interest and/or concern with the Project.

Table 3-1 Aboriginal communities with a potential interest in the Project

Aboriginal Community	Approximate Distance from Project Area	Address	Fax Number	Telephone Number
Nekaneet First Nation	113 km An Urban Reserve is located approximately 3 km from the Project area.	P.O. Box 548, Maple Creek, SK S0N 1N0	(306) 662-4160	(306) 662-3660
Wood Mountain First Nation	138 km	P.O. Box 1792, Assiniboia, SK S0H 0B0	(306) 266-2024	(306) 266-2039
Carry The Kettle First Nation	66 km	P.O Box 57, Sintaluta, SK S0G 4N0	(306) 727-2149	(306) 727-2135
File Hills Qu'Appelle Tribal Council	289 km (to Fort Qu'Appelle)	Room 222-740 Sioux Avenue, P.O. Box 985, Fort Qu'Appelle, SK, SOG 1S0		(306) 332-8200 (306) 332-1811
Prairie Dog Métis Local #123	2 km (to Swift Current address)	780-8th Avenue NE, Swift Current, SK S9H 2R5		(306) 773-4533
Métis Nation - Saskatchewan	220 km (to Saskatoon address)	406 Jessop Ave, Saskatoon, SK S7N 2S5		(306) 343-8285
Métis Nation - Saskatchewan Western Region III	The Project is located within Métis Nation - Saskatchewan Western Region III	3220 Dewdney Ave E. Regina, SK S4N 5E4	(306) 525-2106	(306) 787-3606

The Project team mailed project notification letters with a questionnaire and map on May 9, 2016 to the following aboriginal communities:

- Carry the Kettle Nakoda First Nation
- Wood Mountain First Nation
- Nekaneet First Nation

The File Hills Qu'Appelle Tribal Council was copied on these letters. A letter was also sent to the Prairie Dog Métis Local #123 and this letter was carbon copied to Métis Nation - Saskatchewan

and Métis Nation - Saskatchewan Western Region III. The Nekaneet First Nation and Wood Mountain First Nation are located approximately 110-120 kilometres southwest and southeast, respectively, of the Project area. Carry the Kettle Nakoda First Nation is located approximately 300 kilometres from the Project but has purchased land located approximately 60 kilometres northwest of the Project through the Treaty Land Entitlement process.

In the spirit of collaboration and reconciliation, the Project team has identified the Nekaneet First Nation as the main Aboriginal group in the Project area. The Nekaneet First Nation is a member of the File Hills Qu'Appelle Tribal Council, is located a little over 100 kilometers from Swift Current and also has a commercially developed Urban Reserve located in Swift Current. The Project team has opted to follow a protocol that recognizes the Nekaneet First Nation as the leading Aboriginal community in the overall Project area and SaskPower is currently working with the Nekaneet First Nation on cultural activities that will open the way and lay the groundwork for a successful Project.

SaskPower has signed a Project Support Agreement with the Nekaneet First Nation that includes Nekaneet providing ceremonial support for the Project. SaskPower is working with Nekaneet to design a training program that will be inclusive for community members. Given that Nekaneet is a prominent First Nation in the Swift Current region, SaskPower is working with Nekaneet to ensure that SaskPower is engaging all of the Aboriginal groups that need to be informed about the Project.

Table 3-2 Summary of Engagement with Aboriginal Communities

Aboriginal Community	Date	Means of Engagement
Nekaneet First Nation	February 1, 2016	Phone call, email
Nekaneet First Nation	February 8, 2016	Email
Nekaneet First Nation	February 10, 2016	Notification letter and survey sent by mail
Nekaneet First Nation	February 10, 2016	Phone call
Nekaneet First Nation	February 11, 2016	In person meeting
Nekaneet First Nation	March 22, 2016	Proposal letter received
Carry the Kettle Nakoda First Nation	May 6, 2016	Notification letter and survey sent by mail
Wood Mountain First Nation	May 6, 2016	Notification letter and survey sent by mail
File Hills Qu'Appelle Tribal Council	May 6, 2016	Notification letter and survey sent by mail
Prairie Dog Métis Local #123	May 6, 2016	Notification letter and survey sent by mail
Métis Nation - Saskatchewan	May 6, 2016	Notification letter and survey sent by mail

Table 3-2 Summary of Engagement with Aboriginal Communities

Aboriginal Community	Date	Means of Engagement
Métis Nation of Saskatchewan Western Region III	May 6, 2016	Notification letter and survey sent by mail
Métis Nation - Saskatchewan	May 17, 2016	Notification letter and survey sent by mail returned to SaskPower; mailed to an alternate address
Nekaneet First Nation	May 20, 2016	In person meeting
Nekaneet First Nation	August 18, 2016	In person meeting to discuss next steps in relationship building now that SaskPower has been awarded the opportunity to build the Project.
Carry the Kettle Nakoda First Nation	September 13, 2016	Phone call with the Land Manager to discuss whether there were any concerns with the Project. Emailed the notification letter that was originally mailed in May so that a follow-up conversation to discuss possible concerns could take place in a few days.
Prairie Dog Métis Local #123	September 13, 2016	Phone call with the President of the Prairie Dog Métis Local #123 about the Project. The President did raise expectations of work for some of the members. A commitment was made to keep her and the Prairie Dog Métis Local #123 updated about the Project.
Wood Mountain First Nation	September 15, 2016	Phone call with the Chief to discuss Wood Mountain's interest in the Project. The Chief did not express any concerns from an Aboriginal lands and resources perspective but referred SaskPower to File Hills Qu'Appelle Development Corporation for economic participation in the Project.
Carry the Kettle Nakoda First Nation	September 15, 2016	Follow-up phone call with the Land Manager to see if she had any comments or concerns with the Project. She did not have any comments regarding Carry the Kettle Nakoda First Nation's use of the lands in the Project area.
Carry the Kettle Nakoda First Nation	September 16, 2016	Phone call with the Economic Development Officer. Invitation extended to attend a supplier information session for the Project in Regina on September 21, 2016.

Table 3-2 Summary of Engagement with Aboriginal Communities

Aboriginal Community	Date	Means of Engagement
Nekaneet First Nation	September 16, 2016	Phone call to extend invitation to the Supplier Information event in Regina on September 21, 2016. Meeting with a Nekaneet representative where the signed Project Support Agreement was received.
Carry the Kettle Nakoda First Nation	September 20, 2016	Phone call to make arrangements for attendance at the Supplier Information event in Regina on September 21, 2016.
File Hills Qu'Appelle (FHQ) Development Corporation	September 20, 2016	Phone call with the CEO, File Hills Qu'Appelle Development Corporation to discuss the Project and the Supplier information event in Regina on September 21, 2016.
Carry the Kettle Nakoda First Nation	September 22, 2016	Project update letter including information on the proposed water line and a map of the water line study area sent by mail.
Wood Mountain First Nation	September 22, 2016	Project update letter including information on the proposed water line and a map of the water line study area sent by mail.
Prairie Dog Métis Local #123	September 22, 2016	Project update letter including information on the proposed water line and a map of the water line study area sent by mail.
Nekaneet First Nation	September 22, 2016	Project update letter including information on the proposed water line and a map of the water line study area sent by mail.
File Hills Qu'Appelle Tribal Council	September 22, 2016	Project update letter including information on the proposed water line and a map of the water line study area sent by mail.
Métis Nation - Saskatchewan	September 22, 2016	Project update letter including information on the proposed water line and a map of the water line study area sent by mail.
Métis Nation – Saskatchewan, Western Region III	September 22, 2016	Project update letter including information on the proposed water line and a map of the water line study area sent by mail.

Aboriginal engagement is conducted with respect for stakeholder's culture and values and recognition that their input is an integral component to the success of the Project. SaskPower is committed to continue engaging with the Nekaneet First Nation, Carry the Kettle Nakoda First Nation, the Prairie Dog Métis Local #123 and the Wood Mountain First Nation about the Project. As is a recognized best practice, SaskPower is now taking direction from these Aboriginal communities on how and when they would like to be engaged.

Due to the Project being built on private land in an industrial setting in proximity to an urban centre and within developed road allowances owned by the Province of Saskatchewan, there are no obvious impacts to Aboriginal and Treaty rights. There is no unoccupied Crown land in the Project area to allow Aboriginal people the right of access to carry out their Aboriginal or Treaty Rights. SaskPower is therefore of the opinion that a formal Aboriginal consultation plan is not necessary for this Project; however, SaskPower will continue to engage with the Aboriginal groups to address any concerns with the Project.

3.2.2 Key Comments and Concerns from Aboriginal Groups

Nekaneet submitted a letter dated March 22, 2016 and did not identify any specific environmental concerns. Nekaneet identified a desire to collaborate with SaskPower from a cultural perspective and also outlined participatory and economic benefit expectations of the Project.

SaskPower has engaged the Land Manager for Carry the Kettle Nakoda First Nation. The Land Manager did not raise any issues regarding environmental effects or impacts to Aboriginal or Treaty rights. SaskPower shared an invitation with the Economic Development Officer to attend a Supplier Information Session in Regina, SK. SaskPower will continue to engage with Carry the Kettle Nakoda First Nation regarding the Project.

SaskPower has engaged the Chief of the Wood Mountain First Nation. The Chief did not raise any specific concerns about the Project and referred SaskPower to FHQ Developments to discuss economic aspects of the Project. SaskPower will continue dialogue and engagement with the Chief and the Wood Mountain First Nation regarding the Project.

SaskPower engaged the President of Prairie Dog Métis Local #123. The President did not raise any issues regarding environmental effects or impacts to Aboriginal rights but did express a strong interest that members have the opportunity for gainful employment opportunities in the Project. In a survey that the President returned to SaskPower on September 20, 2016 the President did identify that the supply of clean reliable power, a good location (for the Project) and employment opportunities were her top three priorities for the Project. The President also mentioned that she would like to be consulted about the Project through written communications and by attending a Project open house. SaskPower has made a commitment to continue dialogue and consultation with the Prairie Dog Métis Local #123.

3.2.3 Jurisdictions and Other Parties

The jurisdictions and other parties that SaskPower has engaged regarding the Project are listed in the following table.

Table 3-3 Jurisdictions and Other Parties Engaged by the Project Team

Federal Government	Canadian Environmental Assessment Agency
Provincial Government	Saskatchewan Ministry of Environment Saskatchewan Water Security Agency (WSA) Saskatchewan Environment – Environmental Assessment Branch Saskatchewan Environment – Environmental Protection Branch Saskatchewan Ministry of Government Relations
Municipal Government	RM of Swift Current No. 137 City of Swift Current
Local Landowners	All landowners and residents within 5km of the project

3.2.4 Regulatory Engagement

The Project team began engaging with various municipal, provincial, and federal regulatory agencies in June 2015 to introduce the Project, discuss technical requirements, any potential concerns and permitting and approval processes. Table 3-4 provides a summary of the stakeholders that were consulted as well as the dates and means of consultation.

Meetings were held with the City of Swift Current, Saskatchewan Water Security Agency (WSA), and SaskWater to discuss the water requirements for the Project and potential supply options as well as associated permitting requirements. Information was exchanged with the Ministry of Environment-Lands Branch as well as the Ministry of Environment-Environmental Protection Branch (EPB) to understand potential environmental mitigations and permitting requirements. A meeting was also held with the RM of Swift Current to discuss routing options for the water pipeline required for the Project.

The Agencies that were specifically engaged during the preparation of this Project Description include the Canadian Environmental Assessment Agency (CEA Agency) and the Ministry of Environment – Environmental Assessment Branch (EAB). Several conference calls and/or in-person meetings took place between June 2015 and July 2016. Information that was shared in these meetings include an explanation of the Request for Proposal (RFP) process that SaskPower was undertaking, preliminary details about the Project design and components, as well as results of environmental field investigations and desktop analyses. The agencies provided feedback on their respective regulatory requirements and processes including timelines, aboriginal engagement approach, suggestions for additional field investigations to undertake and details on what specific information to include in the Project Description.

SaskPower also arranged meetings in June 2016 with CEA Agency, Ministry of Environment EAB, and Environment and Climate Change Canada (ECCC) to present information on SaskPower's

emissions target and strategy. During these meetings, SaskPower provided information on the integral role that natural gas generating facilities play in transitioning to a lower emitting power system, supporting intermittent renewable generation and the potential impacts to SaskPower of a delay in operation of the Project. The Agencies provided additional feedback on the type of information to include in the Project Description.

Discussions are currently underway with the Ministry of Environment – Lands Branch to discuss potential environmental mitigation options.

3.2.5 Key Comments and Concerns Expressed

The City of Swift Current and the RM of Swift Current have expressed support for the Project since the siting study consultation process began. The City of Swift Current discussions mainly involved their capacity to meet water supply demands for the Project. The City was very proactive in providing details of their potable water and effluent water systems. Discussions with the RM of Swift Current included road maintenance, lighting impacts, fire protection services, taxation and water supply options. Both the City and the RM look forward to the employment opportunities and economic benefits the Project will provide their communities. SaskPower is currently working with the RM of Swift Current on routing for the required water pipeline and preliminary feedback from the RM indicates they have no concerns with either route.

From the letters that were sent to the landowners within a 5 km radius of the Project site and interested stakeholders, 19 questionnaires (26%) were returned. The responses received indicated that employment opportunities, water use, noise levels and air quality were viewed as the top priorities for development of this project. Additional concerns identified by landowners included increased traffic during construction, garbage, access to water supply, and effects on farming and land values. One landowner called to offer water supply from his spring-fed dugouts. Table 3-5 summarizes the feedback received from local landowners that filled out the questionnaire.

Table 3-4 Summary of Engagement with Regulatory Agencies

Stakeholder Name	Meeting Date(s)	Means of Consultation
CEA Agency	June 25, 2015	Phone call
City of Swift Current	August 19, 2015	In person meeting
Saskatchewan WSA	August 26, 2015	Phone call, Email
Ministry of Environment-Lands Branch	September 1, 2015	Phone call
Saskatchewan WSA	September 1, 2015	In person meeting
City of Swift Current	September 4-9, 2015	Phone call
SaskWater	September 8, 2015	In person meeting
Saskatchewan WSA	September 22-24, 2015	Emails
Ministry of Environment-Lands Branch	September 29, 2016	Email
Ministry of Environment-EPB	October 19-21, 2015	Emails
Ministry of Environment-EAB	October 22, 2015	Email
CEA Agency	October 22, 2015	Email
CEA Agency	October 27, 2015	Conference call
Ministry of Environment-EPB	November 12, 2015	Phone call, Email
Ministry of Environment-EAB	November 18, 2015	In person meeting
City of Swift Current	January 5, 2016	In person meeting
Saskatchewan Public Health, Cypress Health Region	January 6-7, 2016	Emails
City of Swift Current - Facility Tours	January 7, 2016	In person meeting
RM of Swift Current No. 137	January 7, 2016	In person meeting
RM of Swift Current No. 137, Municode	January 11, 2016	Email
Ministry of Environment-EAB	January 14, 2016	Phone call
CEA Agency	January 21, 2016	Phone call
Ministry of Environment - Government Relations, Aboriginal Relations	January 21, 2016	In person meeting
RM of Swift Current No. 137, Councillors	February 4, 2016	In person meeting
CEA Agency	February 11, 2016	Conference call
Ministry of Environment-EAB	February 11, 2016	In person meeting
Saskatchewan WSA - Groundwater Investigation	February 26, 2016	Permit Application/Approval
CEA Agency	April 12, 2016	Conference call
CEA Agency, Ministry of Environment-EAB, ECCC	June 7, 2016	Conference call
RM of Swift Current No. 137	June 14, 2016	In person meeting
CEA Agency, ECCC	June 23, 2016	In person meeting
Ministry of Environment-EAB	July 14, 2016	In person meeting
Ministry of Environment- Lands Branch	July 21, 2016	Phone call and email

Table 3-5 Summary of Feedback Received from Local Landowners Regarding Priorities for Development

What are your top three priorities for development of this project?	
Options to choose from:	**Number of respondents that chose this as a priority**
Employment opportunities	10
Noise levels	9
Air quality	8
Water use	8
Land use	6
Cost of project	5
Other	5
Supply of clean, reliable power	4

3.2.6 Ongoing Engagement Activities

SaskPower believes that the majority of stakeholders in the study area are generally supportive of the Project as they understand the need for new generation to meet current and future demand in the area and that the Project will provide socioeconomic benefits for their community.

SaskPower commits to ongoing engagement with stakeholders to share information about the Project and ensure questions and concerns are understood and addressed. During preliminary consultations, landowners were asked how they wanted to be consulted. The results of the consultation are provided in Table 3-6.

Table 3-6 Summary of feedback received from local landowners regarding preferred methods for future consultation activities

What is your preferred method of consultation in the future?	
Options to choose from:	**Number of respondents that chose this as a priority**
Attending an open house	10
Written communications	8
Participating in a focus group	6
Electronic communications	4
Online surveys	1

Meetings are being scheduled with the City of Swift Current and the RM of Swift Current to continue discussions regarding the water supply, pipeline and related infrastructure. Communication between SaskPower, the RM and the City will continue throughout the phases of the Project.

Aboriginal and Public Engagement

Stakeholders will be contacted directly and invited to attend a public open house information session to be held in the fall of 2016 at a local community hall. Information on the design of the facility, proposed noise mitigation techniques and results of air dispersion modelling will be provided and stakeholders will have an opportunity to have their questions and concerns addressed directly by the Project team. Further ongoing engagement activities will be designed based on ongoing feedback received from stakeholders. As the Project progresses, information letters will be distributed to stakeholders informing them of the Project status.

SaskPower and Burns and McDonnell are also planning an economic opportunities forum in the fall of 2016. The forum will be a procurement event where vendors learn about the Project and the Project team can connect with suppliers and service providers.

4.0 Environmental Parameters

In this section, potential project interactions are described. The structure of the section reflects the process used to define the environmental parameters with potential to interact with the Project. These steps include:

- Describe the environmental setting for the project such that potential Project-environment interactions can be identified.
- Based on likely project-environment interactions, describe those environmental components that require additional assessment.
- Develop a preliminary list of Valued Components (VCs) and a list of VCs that are not carried forward due to there being no or very limited potential for interaction with the Project.
- Establish assessment boundaries, both spatially and temporally.
- Document process for evaluating residual effects.

Once the environmental parameters have been scoped, Section 5 describes the existing conditions at a site-specific level and the potential Project effects and mitigation for each VC.

4.1 ENVIRONMENTAL SETTING

4.1.1 Atmospheric Environment

Air quality and noise are generally characteristic of a rural environment, with agricultural activities accounting for much of the dust generated across the landscape. Most noise sources relate to use of vehicles and equipment, such as farm machinery. Grid roads are used for travel by local and regional traffic and are another source of noise and dust.

4.1.2 Terrain and Soil

The Project is situated within the Mixed Grassland ecoregion and in close proximity to the Gull Lake, Antelope Creek and Swift Current Plateau landscape areas. The Mixed Grassland ecoregion has a variable landscape with level to gently undulating plains, frequently interrupted by hilly uplands, sand dunes, and numerous creeks and valleys. Brown chernozems are the dominant soil type within this ecoregion. The landscape in the region consists predominantly of brown loam soils within the three landscape areas (Acton et al. 1998).

4.1.3 Hydrology and Hydrogeology

The Project is located within the South Saskatchewan River major drainage basin and watershed. The area of the South Saskatchewan River major drainage basin and watershed are

49,286 km² and 39,397 km², respectively. Swift Current Creek is the only watercourse in close proximity to the Project (i.e., greater than 1 km) with other ephemeral drainages occurring in ditches and across the landscape.

Aquifers are abundant within the ecoregion and consist of bedrock aquifers, glacial inter-till aquifers and surficial aquifers. These different types of aquifers significantly influence surface water quality in the region. Deep aquifers feed saline lakes and wetlands and shallow lakes fed by shallower aquifers typically contain fresher water (Acton et al. 1998). Generally, water quality in the region is expected to be similar to other wetlands and shallow waterbodies in the Prairie Pothole Region with low pH and variable salinity.

4.1.4 Vegetation and Wetlands

The majority of the Project area is cultivated. Any native prairie in the region is typically limited to gullies, coulees and valleys (Acton et al. 1998). The areas of native mixed-grass prairie support diverse plant communities. Within the Mixed Grassland ecoregion, native vegetation is typically comprised of mid-grasses (i.e., wheatgrasses and speargrasses) and short grasses (e.g., blue grama grass) on loamy soils, while sandy areas have a unique community of grasses and shrubs (Acton et al. 1998).

The Project lies within the Prairie Pothole Region which is characterized by numerous depressional wetlands that contribute substantially to the regional biodiversity. These wetlands provide important breeding and staging habitat to a wide variety of waterbirds (e.g., waterfowl, gulls, terns, shorebirds), raptors and wetland-associated migratory bird species (EC 2013).

4.1.5 Wildlife

The Mixed Grassland ecoregion supports a wide variety of wildlife species; 51 species of mammals, 198 species of birds and 13 species of amphibians and reptiles have been identified (Acton et al. 1998). Within the region, areas of native prairie, tame pasture and wetlands provide important breeding and staging habitats for a diverse number of wildlife species.

Baseline environmental information was collected in August 2015 and between April and July 2016 with site-specific biophysical surveys completed. All field data were supplemented with desktop information such as satellite imagery, digital base maps, existing databases, and other reports.A review of baseline information collected indicates that the Project area does not intersect any key areas of wildlife habitat. The nearest area is an Agri-Environment Services Branch (AESB) community pasture (Swift Current-Webb) located approximately 3 km west of the Project area.

Based on field surveys, roadside surveys and a review of satellite imagery, the Project area is dominated by cultivated land and tame pasture, with small areas of native prairie and wetlands/drainage areas.

Cultivated land provides minimal wildlife habitat. Tame pasture provides more suitable habitat for a wider range of species of management concern (SOMC) rather than cultivated lands. Native prairie provides important wildlife habitat for several SOMC and migratory birds. Wetlands are areas of high biological diversity that are used as breeding and/or rearing grounds for waterfowl and amphibians, staging areas for migratory birds, and refuge for a variety of wildlife moving through a landscape largely modified by agriculture (Semlitsch 2002).

4.1.6 Fish and Fish Habitat

Swift Current Creek, located approximately 1.1 km from the proposed water line, is the closest known fish bearing water feature to the Project. Swift Current Creek contains a variety of sportfish species including yellow perch (*Perca flavescens*), northern pike (*Esox Lucius*) and walleye (*Stizostedion vitreum vitreum*), as well as a variety of minnow and sucker species. Swift Current Creek will not be affected by the Project.

4.1.7 Land Use

The Project area is dominated by cultivated land and tame pasture, with small areas of native prairie and wetlands/drainage areas. Most land use in the area is related to agricultural uses of the land, either for crops or grazing. Some land is used for residential or urban development, as is the case for the city of Swift Current. Industrial facilities are also interspersed throughout the Project area.

The Project facility is proposed to be developed on land owned by SaskPower within the Rural Municipality (RM) of Swift Current No. 137. Land use within the Project facility footprint is tame pasture and a small isolated patch of modified native vegetation and is used primarily for grazing operations. Historical activities throughout the quarter section include haying operations, excavation activities and disposal of asphalt. The proposed water line, irrespective of the route alternative selected, will be situated in a developed road allowance which consists mostly of brome grasses, interspersed with wetlands. The ditch is likely hayed occasionally throughout the spring and summer months.

4.1.8 Groundwater and Surface Water Users

The nearest groundwater well is located 1.3 km northeast from the Project facility footprint (WSA 2014). No groundwater wells are located within 200 m of either of the two water pipeline route alternatives. The nearest surface water user is the City of Swift Current. The City of Swift Current obtains their water from the Duncairn Dam Reservoir, located southwest of Swift Current, which is supplied by the Swift Current Creek and controlled by Agriculture and Agri-Food Canada, Science and Technology Branch (Schmidt pers comm. 2016).

4.1.9 Regional Employment and Economy

The labour force in the RM of Swift Current is estimated to be approximately 1,420 people and the labour force participation rate (83.5%) is above the provincial average of Saskatchewan (Table 4-1). The employment rate (81.3%) in the RM of Swift Current is above the provincial average and the unemployment rate (2.5%) is below the provincial average (Table 4-1).

Table 4-1 Labour Force Indicators

Labour Force Indicators	RM of Swift Current	Saskatchewan
Labour Force Size (number of individuals)	1,420	812,505
Participation Rate (%)	83.5	69.2
Employment Rate (%)	81.3	65.1
Unemployment Rate (%)	2.5	5.9
Source: Statistics Canada 2016b		

The City of Swift Current is the largest community within the vicinity of the Project and has a population of 15,503 (Statistics Canada 2016a). The area surrounding the Project is predominantly used for agricultural operations and other resource-based industries, and comprises 29% of the industry within the RM (Statistics Canada 2016).

Tourism activities are available within the City of Swift Current area and include the casino, parks, sports facilities, shopping, golf courses and camping (City of Swift Current 2016).

4.1.10 Existing Infrastructure

Existing infrastructure includes various roadways and a railway line within the Project area. The nearest gas wells, operated by Husky Energy are located 176 m and 535 m from the Project area, depending on the water pipeline route (Saskatchewan Ministry of Economy 2016). Numerous other gas production wells are located directly in the vicinity of the Project. The Swift Current Newalta landfill, which accepts commercial and industrial waste, is located east of the Project facility footprint on the adjacent property. A private aerodrome is located approximately 3.3 km southwest of the Project.

4.1.11 Heritage Resources

Heritage Resources include archaeological sites and objects, spaces, landscapes and objects of cultural significance, and built features and structures of historical and cultural significance. The Heritage Conservation Branch (HCB) of the Saskatchewan Ministry of Parks, Culture and Sport has classified each quarter section parcel in southern Saskatchewan as either being "sensitive" or "non-sensitive" for heritage resources. Projects found to be in "sensitive" parcels need to be sent in to the HCB for review. This review process will determine if an HRIA is

necessary. The projects in "non-sensitive" parcels may proceed to development without being sent in for review.

The Project facility site is within a parcel (SE13-16-15-W3) that has been designated as "non-sensitive" (Appendix D). As such, the likelihood of impacting a heritage resource is considered to be very low and the Project facility site will not need to be reviewed by the HCB.

The two proposed water pipeline route alternatives run adjacent to a number of land parcels that are considered to be heritage "sensitive". Based on an approved process with the HCB, SaskPower's own in-house archaeologists have reviewed the Project to determine if an HRIA is warranted. The in-house review process determined that an HRIA may be warranted, depending on which side of the developed road allowance the water pipeline will be constructed on. The results of the HRIA, if required, will be provided to The Saskatchewan Ministry of Parks, Culture and Sport who will issue a letter granting clearance for the Project under the *Heritage Properties Act*.

Two areas of potential concern were identified during the heritage review: there are three known archaeological sites immediately adjacent to the road allowance along the south side of section 18-16-14-W3. Should the water pipeline be installed on the north side of this road allowance (the side closest to the archaeological sites), an HRIA will be required. The second area of concern is in the NE 8-16-14-W3, where there are another three archaeological sites located just off of the road allowance. Again, depending on which side of the road allowance the pipeline is installed, there is a potential to impact an archaeological resource and an HRIA may be required. In both cases, if the pipeline is installed on the opposite side of the gravel road from the archaeological sites, but still within the previously disturbed area of the developed road allowance, then an HRIA will not be required.

In the event that the HRIA determines that one of these known archaeological sites (or a previously unrecorded archaeological site) is in conflict with the waterline development, mitigation options will be explored with the input of the HCB. Given the proposed depth of the pipeline trench and the requirement to keep it within the road allowance, it is unlikely that site avoidance will be an option. Likely, excavation of the archaeological resource will be the best course of action; the size and scope of the excavation will be determined by the HCB and will be based on the condition of the resource.

There are no concerns with the remainder of either of the two proposed preliminary route options, provided they remain within the developed portion of the road allowances.

4.1.12 Aboriginal Land and Resource Use

While there is currently limited publicly available information regarding the traditional territory of Aboriginal Peoples in Saskatchewan, the Project is located within Treaty 4 territory and there is potential for any of the Treaty 4 First Nations to have once exercised traditional land use activities with the Project area. The Project is also within Métis Nation-Saskatchewan, Western

Region III with the nearest Local being Prairie Dog #123. SaskPower has engaged those communities with Treaty Entitlement land or residential communities within about 140 km of the Project and have notified three representative political and service delivery organizations. These include:

- Nekaneet First Nation
- Wood Mountain First Nation
- Carry The Kettle First Nation
- File Hills Qu'Appelle Tribal Council
- Prairie Dog Métis Local #123
- Métis Nation-Saskatchewan
- Métis Nation-Saskatchewan Western Region III

SaskPower has chosen to undertake voluntary Aboriginal engagement and the details of this engagement to date are provided in Section 3. An important aspect of voluntary engagement is the identification of traditional territories in relation to the Project area. The Government of Saskatchewan defines traditional territories as: "geographic areas within which First Nations and Métis communities historically exercised Treaty and Aboriginal rights and undertook traditional uses and continue to do so today" (Government of Saskatchewan 2013:6).

Aboriginal people often have a long history on the land and can possess in-depth knowledge of the land and the resources of the territory in which they make their home. This knowledge, sometimes called Traditional Knowledge, is an important part of a study of land and resource use. Traditional Knowledge about the land (e.g., information on hunting, fishing, trapping, berry picking, plant gathering for food or medicinal purposes, wood gathering, or cultural sites or sites of spiritual significance, etc.) can provide important information about the biophysical world, including historical information that might not otherwise be evident. As well, it can help identify potential environmental effects, and can be incorporated into regulatory applications to improve and strengthen decision-making.

In the 17th century, Assiniboines had territory that stretched westward from Lake Winnipeg and the Forks of the Red and Assiniboine rivers across much of southern and central Saskatchewan. The history of movement of different tribes and people on the Plains was very dynamic and changed throughout different periods of time. "By the mid-19th century Assiniboine territory extended east from the Moose and Wood mountains to the Cypress Hills, and north to south from the North Saskatchewan River to the Milk and Missouri rivers" (Miller 2007). Contemporary Assiniboine First Nations in Saskatchewan include: Carry the Kettle First Nation, Mosquito-Grizzly Bear's Head-Lean Man First Nation, White Bear (shared with some Ojibwa, Cree and Dakota), Pheasant Rump Nakota, Piapot and Ocean Man First Nations (Miller 2007, Getty 2015). These Nations have traditional territory that includes much of southern Saskatchewan. The closest established community of these First Nations is approximately 273 km from the Project area.

These First Nations may have had historical connections to southern Saskatchewan; however, given the distance of their current home communities range between 273 km and 451 km from the Project area, SaskPower has not identified these communities as potentially affected by the Project. As it is assumed that Aboriginal people living closer to the Project will be more likely to use lands and resources in its vicinity, SaskPower has engaged communities within approximately 140 km.

The Nekaneet First Nation is a Plains Cree community and is the only First Nation in Saskatchewan with an established residential community in the Saskatchewan Cypress Hills Region, approximately 120 km southwest of the Project area. Nekaneet also has a commercially developed urban reserve within the City of Swift Current.

Wood Mountain Lakota Nation, a Lakota/Sioux First Nation whose contemporary reserve lands are in southern Saskatchewan, identify traditional hunting, fishing, and gathering territory on the Missouri Coteau, a prairie upland across southern Saskatchewan (Omani 2010). The main community of the Wood Mountain Lakota Nation is approximately 140 km southeast of the Project area.

The main community of Carry the Kettle Nakoda Nation is approximately 300 km east of the Project area. Carry the Kettle has several parcels of Treaty Entitlement Lands approximately 60 km northwest of the Project area.

The Project area also overlaps with the Métis Nation – Saskatchewan, Western Region III and the Prairie Dog Métis Local 123.

The Gray Burial Site (EcNx-1), north of Swift Current, is a traditional burial ground used as long ago as 5,000 years. The site was excavated during the early 1970s revealing the remains of several hundred individuals (SARR 1963). The site is generally associated with the Oxbow complex and although it has not been linked to contemporary Aboriginal communities, the site is near the Project area and shows Aboriginal use of the area up to approximately 5,000 years ago (Fafard and Millar 2014).

Due to the paucity of publicly available Traditional Knowledge information from these First Nations, few existing conditions can be concluded beyond what is outlined above. Nekaneet First Nation offered to share their Traditional Land Use Study with SaskPower; however, SaskPower has yet to receive it. To date, none of the Aboriginal groups have indicated that they currently use the Project area for traditional purposes.

Construction and operation of the Project may have potential effects on traditional territory of Aboriginal Peoples in Saskatchewan. However, the Project facility is located on a quarter section that has been privately owned since at least 1919 and is currently owned by SaskPower and the water pipeline will be installed within developed road allowances owned by the Province of Saskatchewan. The road allowances along both water pipeline preliminary route options are adjacent to privately owned land zoned primarily for agricultural purposes and in many areas

the cultivation extends into the road allowance. It is unlikely that the quarter section is and pipeline route options are currently in use for traditional purposes as the land cover and shape and size of the potential areas (e.g., ditches) are not suitable or conducive for activities such as the harvest of country foods. Furthermore, it is unlikely that the pipeline route options would be used for hunting due to potential safety implications. To date, no concerns regarding potential effects have been raised through engagement with Aboriginal communities, 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.

4.2 SELECTION OF VALUED COMPONENTS

VCs are important aspects of the environmental, socio-cultural and economic environments that are considered to be important by the public, Aboriginal communities, and regulators. Following the guidance of the CEA Agency *Guide to Preparing a Description of a Designated Project under the Canadian Environmental Assessment Act, 2012* (CEA Agency 2012) and the Saskatchewan Ministry of Environment *Technical Proposal Guidelines* (SK MOE 2014), the information in this section outlines the VC selection process and provide rationale as to why each VC was selected for assessment. VCs have been selected to focus on features of the environment that are valued, and are most likely to interact with the Project.

The selection of VCs is influenced by a number of factors, including:

- Consultation with the public and regulators;
- Aboriginal engagement;
- An understanding of potential Project-environment interactions and potential effects; and
- An understanding of the sensitivity of the environmental features.

SaskPower has reviewed the baseline information for the Project setting and has selected five VCs, reflecting the anticipated Project-environment interactions. Additional site-specific baseline information is provided for each of these VCs to better understand the potential environmental effects. The VCs considered for the Project are:

- **Atmospheric Environment –** The Project will result in air emissions, including GHGs and sound. Based on the scale of the Project, and the type and amount of potential emissions, atmospheric environment (inclusive of air and noise) is proposed as a VC.
- **Terrain and Soil –** The Project has the potential to affect terrain and soil through a change in terrain integrity and soil quality and quantity. Potential effects pathways include rutting, admixing, compaction, as well as wind and water erosion as a result of soil exposed during site preparation, grading and excavation.

- **Vegetation and Wetlands –** The Project will result in ground disturbance that will affect vegetation, including temporary effects to wetland habitat along the preliminary water pipeline route. The Project is expected to result in some unavoidable environmental effects on vegetation.
- **Wildlife –** Potential effects on wildlife and wildlife habitat from Project construction and operation and maintenance activities may include a change in availability (e.g., direct loss of habitat) and suitability of wildlife habitat (e.g., increased noise levels from construction may make adjacent habitats no longer suitable).
- **Human Environment –** The Project has the potential to affect land use, groundwater and surface water users, regional employment and economy and existing infrastructure. Elevated noise levels from construction and operation related activities may cause inconvenience to residences in proximity to the Project.

Based on the results of desktop reviews and field visits to the proposed Project location, the following VCs have not been considered for further assessment. Interactions between the environment and these VCs are unlikely to occur or can be addressed through standard, well-established and accepted mitigation measures:

- **Hydrology and Hydrogeology –** Groundwater use activities (i.e., water well use) occur throughout the region. No domestic use wells are located within the proposed Project footprint. Construction activities may interact with groundwater and surface water resources potentially causing changes to quality and quantity of water. These construction activities may include temporary dewatering of ditches and high pressure horizontal directional drilling during water pipeline installation activities. Due to the relatively shallow installation depth of the water supply pipeline; groundwater quality and quantity are not expected to be affected during Project construction activities. SaskPower will avoid construction in wetlands and limit ground disturbance to the extent feasible. Planning and standard mitigation measures will limit potential effects and existing drainage patterns will be maintained, to the extent possible. Changes in localized flows and drainage patterns or areas are not expected. Once the need for dewatering activities has been better defined for the water pipeline construction, SaskPower will re-evaluate the potential for effects on surface water and groundwater. Site-specific protection measures to prevent construction-related effects to water quality or quantity at these locations will be developed at this time, if required.
- **Fish and Fish Habitat –** A review of available information indicates that the closest fish-bearing water feature is Swift Current Creek, located greater than 1 km away from the Project and therefore, no fish bearing water features are expected to be affected by the Project.
- **Heritage Resources –** It is expected that siting the final water pipeline route on the opposite sides of the road allowances from archaeologically sensitive areas where known heritage resources are located will mitigate potential effects to these resources. If the pipeline is installed on the opposite side of the gravel road from the archaeological

sites, but still within the previously disturbed area of the developed road allowance, the likelihood of affecting archaeological resources is considered to be low given the existing disturbance.

- **Aboriginal Land and Resource Use –** The Project site is located within Treaty No. 4 lands and Métis Nation – Saskatchewan Western Region III; however, there are no unoccupied Crown lands that grant a right of access to carry out Aboriginal or Treaty Rights in the Project area. The Project facility is located on a quarter section that has been privately owned since at least 1919 and is currently owned by SaskPower and the water pipeline will be installed within developed road allowances owned by the Province of Saskatchewan. The road allowances along both water pipeline preliminary route options are adjacent to privately owned land zoned primarily for agricultural purposes and in many areas the cultivation extends into the road allowance. Given the narrow width of the road allowance, the existing and ongoing disturbance (e.g., cultivation and maintenance of the ditch (i.e., mowing)) and the safety issues associated with exercising traditional activities adjacent to roads, it is therefore unlikely that the quarter section and road allowances used for the Project are currently in use for traditional purposes. Development of the Project is not expected to affect the heath of Aboriginal peoples. To date, no concerns regarding potential effects have been raised through engagement with Aboriginal communities; however, SaskPower will continue to engage with the Aboriginal communities and organizations to address any concerns.

4.3 ASSESSMENT BOUNDARIES

4.3.1 Spatial Boundaries

The VCs included in this document were screened to determine the spatial boundary over which an effect could be reasonably evaluated. Spatial boundaries have been developed for the scope of the Project, including two water supply pipeline route alternatives, and are defined below (Figure 4.1).

Project Development Area (PDA) – The PDA represents the area that could be affected by equipment during Project construction and operation and includes the Project facility footprint and water pipeline ROW. The footprint associated with construction and operation of the Project facility is approximately 650 m x 450 m (29.2 ha). The footprint associated with the construction and operation of the water pipeline will be approximately 18 km in length x 12 m wide (21 ha), regardless of the final pipeline route that is chosen. The PDA and total footprint of the Project will be approximately 50.2 ha. (Note: Henceforth in this report the term Project facility PDA is used in some instances to focus the discussion of results specifically on the plant facility site only, as a sub-set to the overall PDA.)

Local Assessment Area (LAA) – The LAA represents the spatial extent within which the Project could have effects on a VC. Due to the differences in the spatial extent of potential effects on a VC, different LAA sizes have been used for the assessment and presentation of baseline data.

For terrain and soil, and vegetation and wetlands, the LAA comprises a 300 m buffer of the PDA. For wildlife, the LAA comprises a 1,000 m buffer of the PDA.

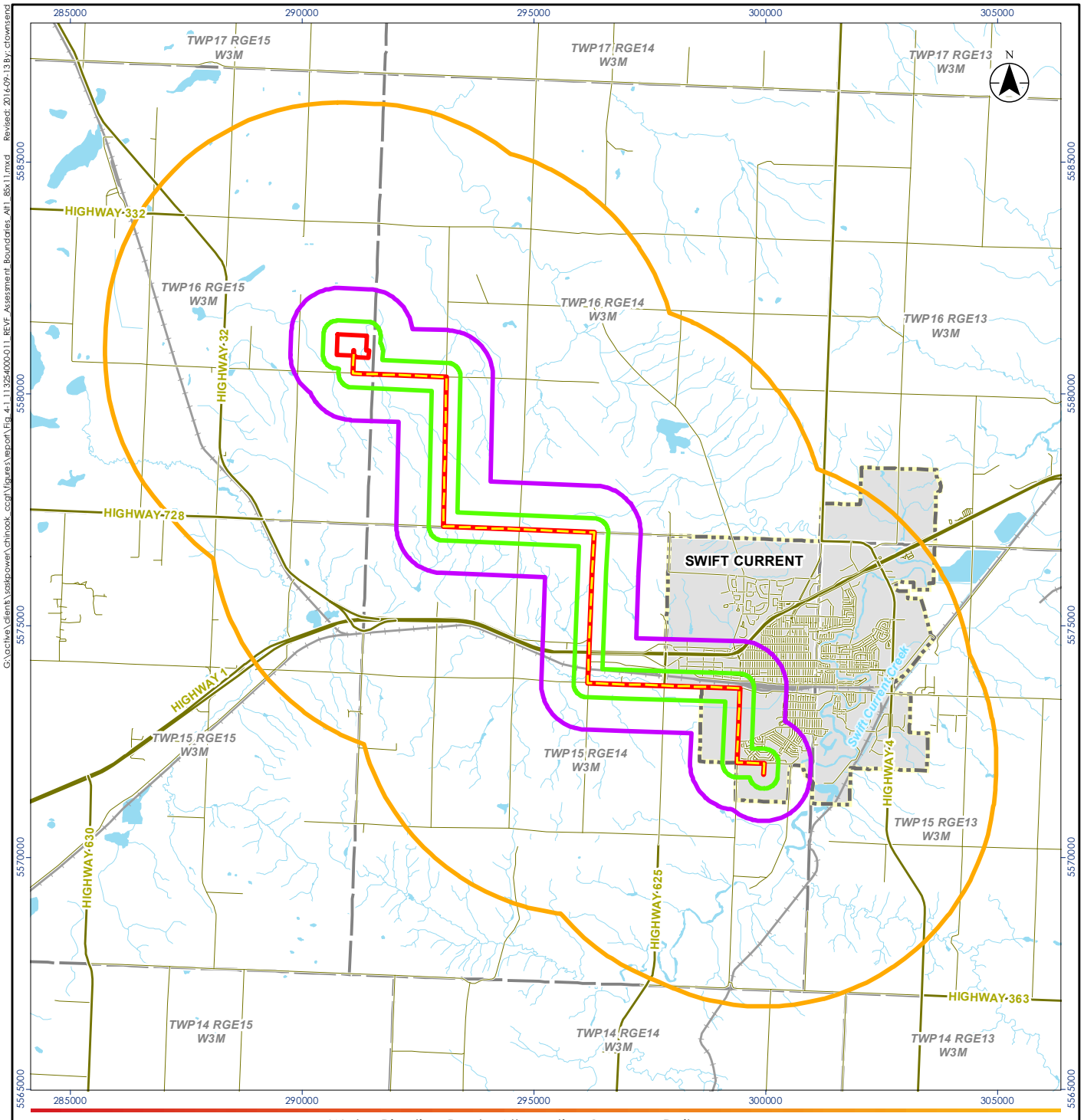
Regional Assessment Area (RAA) – The RAA represents the regional context over which cumulative effects may occur and can be examined for biophysical, human, cultural and economic VCs. A buffer of 5,000 m from the Project footprint was used as an area over which cumulative effects can be assessed.

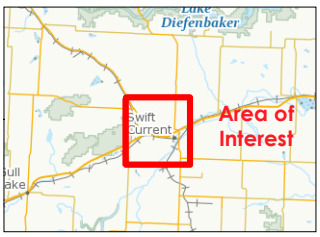
4.3.2 Temporal Boundaries

The temporal scope for the Project consists of the construction and operation phases. The decommissioning and reclamation phase is also considered at a conceptual level. The construction phase is expected to last approximately 36 months with full commercial operation scheduled for October 2019. Upon commissioning and energization of equipment, the operation and maintenance phase will begin. The anticipated operating lifespan for the Project is assumed to be at least 30 years. At the end of the Project life, decommissioning and reclamation will occur and will take approximately 6 months to two years. Section 2.7 describes the activities associated with each phase of the Project.

4.4 EVALUATION OF RESIDUAL EFFECTS

The assessment of each VC begins with a description of the pathways whereby specific Project activities could result in an environmental effect (i.e., the effects pathways). Where effects pathways are identified, mitigation measures are considered to reduce or avoid potential effects. Following the identification of effects pathways and mitigations measures, the residual effects of the Project activities are evaluated and discussed for each valued component. Available data are analyzed to quantify (where possible) and qualify the potential residual effects of Project interactions with each valued component. Residual environmental effects (i.e., the environmental effects that remain after mitigation has been applied) are described, taking into account how the proposed mitigation will alter or reduce the effect.





- Water Pipeline Route Alternative 1
- Project Facility Footprint
- Vegetation/Wetlands and Terrain/Soil Local Assessment Area
- Wildlife Local Assessment Area
- Regional Assessment Area
- Major Road
- Minor Road
- Railway
- Watercourse
- Waterbody
- Town/City
- Township

0 1 2 Kilometers

1:125,000 (at original document size of 8.5x11)

Stantec SaskPower

Project Location
Near Swift Current, SK

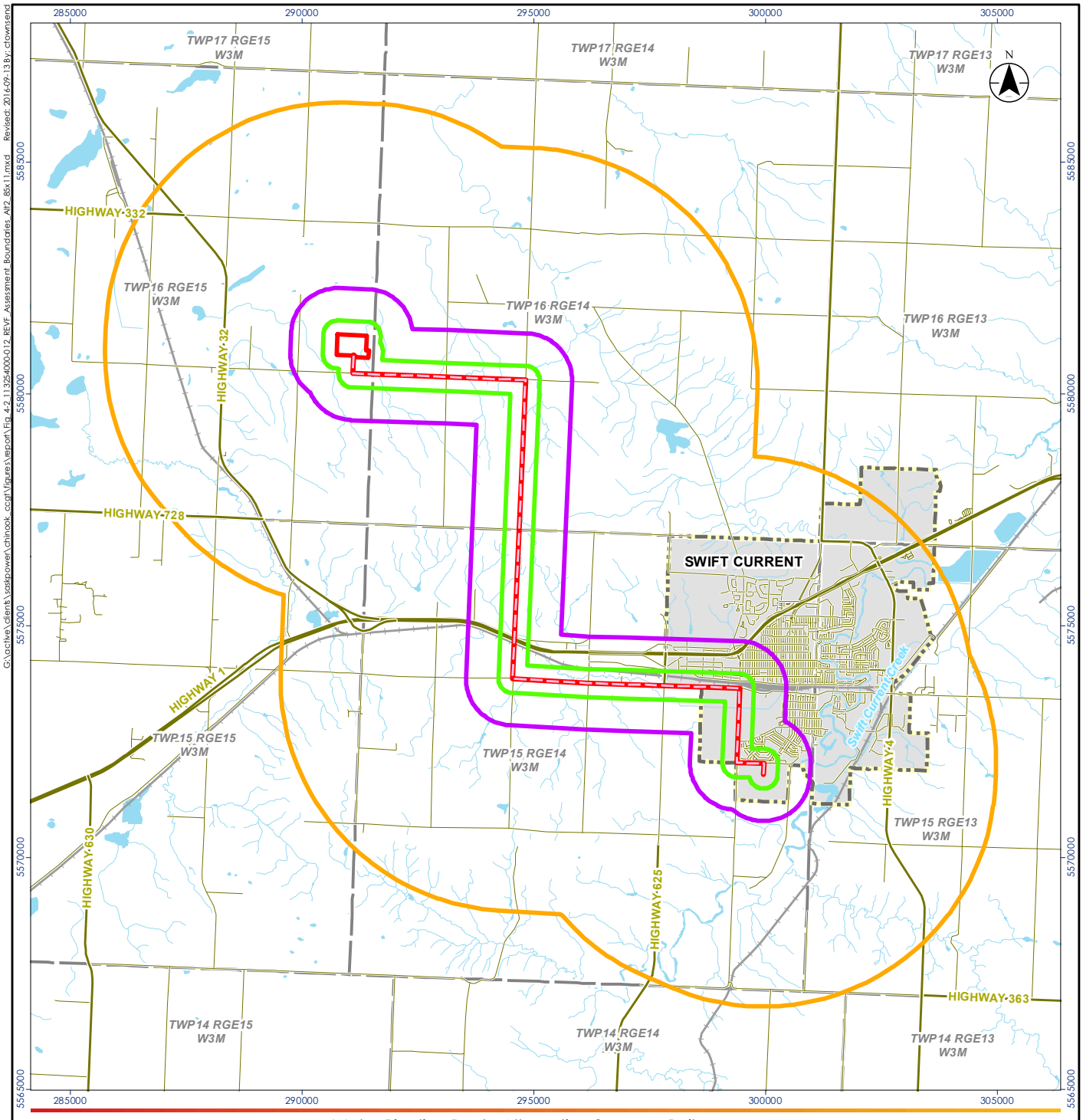
113254000-011 REVF
Prepared by ctownsend on 2016-09-13
Technical Review by jhennig on 2016-09-13

Client/Project
SaskPower
Chinook Power Station Project

Figure No.
4.1

Title
Assessment Boundaries for Water Pipeline Route Alternative 1

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 13N
2. Base features produced under license from the Government of Saskatchewan



- Water Pipeline Route Alternative 2
- Project Facility Footprint
- Vegetation/Wetlands and Terrain/Soil Local Assessment Area
- Wildlife Local Assessment Area
- Regional Assessment Area
- Major Road
- Minor Road
- Railway
- Watercourse
- Waterbody
- Town/City
- Township

0 1 2 Kilometers

1:125,000 (at original document size of 8.5x11)

Stantec SaskPower

Project Location
Near Swift Current, SK

113254000-012 REVF
Prepared by ctownsend on 2016-09-13
Technical Review by jhennig on 2016-09-13

Client/Project
SaskPower
Chinook Power Station Project

Figure No.
4.2

Title
Assessment Boundaries for Water Pipeline Route Alternative 2

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 13N
2. Base features produced under license from the Government of Saskatchewan

5.0 EXISTING CONDITIONS, POTENTIAL EFFECTS AND MITIGATION

The subsequent sections describe each potential VC. Specifically, a summary of existing conditions, in addition to information provided in the environmental setting (Section 4) is given as well as a description of the potential effects and mitigation strategies.

Sections 5.1 to 5.6 describe each VC with a focus on the LAA and PDA with respect to the biophysical and social components and includes information on the methods and data sources used.

5.1 AIR

This section addresses air quality in the context of the Project. This section outlines the methods and results of the desktop review in addition to identifying potential effect pathways, and mitigation strategies.

5.1.1 Methods

The focus of the following discussion is primarily on Project operations because the operation phase has the most potential to produce adverse air quality effects. Air emissions associated with Project construction are expected to be minor and occur only for short intervals. Refer to Section 2.6.1 for further detail. Also, information about construction-related emissions can be found in Appendix E.

The effects of air emissions from Project operations are evaluated using plume dispersion modelling, which accounts for physical characteristics of emission sources, topographic effects, and hourly variations in meteorological conditions. The plume dispersion modelling was undertaken by Burns & McDonnell (2016), and predicts ground-level concentrations for each substance modelled. A detailed description of the dispersion modelling methods is provided in Appendix E. Model results are compared to the Saskatchewan Ambient Air Quality Standards (SAAQS) (SK MOE 2016) and the Canadian Ambient Air Quality Standards (CAAQS) (CCME 2012).

Greenhouse gas emissions (GHG) are not modelled; instead, estimated Project GHG emissions are compared to existing provincial and national totals, to put Project-related GHG emissions in to context. This approach is consistent with CEA Agency guidance (CEAA 2003). Project GHG emissions are calculated based on a predicted normal operating year defined as 7,446 operating hours of the gas turbine and the natural gas dew point heater, and 100 operating hours for the emergency fire pump and emergency diesel generator. See Section 2.6.1 for further detail.

5.1.2 Existing Conditions

The plume dispersion modelling assessment provided in Appendix E summarizes the existing air quality conditions for the southwest region of the province, as established by the Saskatchewan Ministry of Environment (SK MOE 2012) through their regional background concentrations. These accepted background concentrations are based on data collected by a series of SK MOE air quality monitoring stations and are considered to be representative of the Project location.

Existing conditions for GHGs emissions are based on the data available on a provincial and national basis from the Environment and Climate Change Canada national reporting system. The provincial and national GHG emissions for the years 2005 to 2013 are provided in Table 5-1. As Table 5-1 shows, Saskatchewan accounted for approximately 10% of Canada's overall GHG emissions in 2013.

Table 5-1 National and Provincial GHG Emissions (kt CO2e), 2005–2013

Region	2005	2009	2010	2011	2012	2013
Canada	749,000	699,000	707,000	709,000	715,000	726,000
Saskatchewan	69,500	70,200	69,800	69,200	71,700	74,800

NOTE: Years 2005, 2009, 2010, 2011, 2012, 2013 are presented as these are the data provided in the most recent national inventory report (Environment Canada 2015)

SOURCE: Environment Canada (2015)

5.1.3 Effect Pathways and Mitigation Strategies

The Project will result in the release of substances of interest that will change ambient air quality.

The focus of the air quality assessment is on Project operations because the operation phase has the most potential to produce adverse air quality effects. Air emissions associated with Project construction are expected to be minor and occur only for short intervals. Construction emission sources are expected to include typical construction equipment (e.g., graders, trucks). A list of anticipated construction equipment is provided in Section 2.6.1. Construction equipment is generally diesel-fired and emits nitrogen oxides (NO_X), fine particulate matter ($PM_{2.5}$), carbon monoxide (CO), sulphur dioxide (SO_2), and GHGs.

Multiple control measures will be implemented during construction to minimize air emissions and potential effects. After grading, the untraveled or lightly travelled locations will be watered, mulched, overlain with a crushed stone layer, or vegetated to minimize fugitive PM emissions. Activities that potentially generate fugitive PM emissions will be monitored visually by construction personnel. If fugitive emissions become visible, water will be sprayed on the affected areas.

Potential air quality effects from construction activities will vary depending on the level of activity, the specific operations, site conditions, control measures, and prevailing weather

conditions. The maximum effects due to construction are expected to occur in areas within the immediate vicinity of the Project site. Many of the site preparation and construction activities such as land clearing, filling, and grading, will be intermittent and of short duration. These aspects of the construction activities as well as control measures, will serve to reduce potential effects.

The air quality assessment is limited to the consideration of substances for which there are applicable air quality objectives and standards adopted by either or both of the Canada or Saskatchewan regulatory agencies (i.e., SAAQS and CAAQS). The predicted effects are assessed relative to these criteria. For this assessment, nitrogen dioxide (NO_2), SO_2, CO, and particulate matter ($PM_{2.5}$, PM_{10}, and PM) are the primary substances of interest. These substances of interest are combustion by-products emitted by the Project sources. Project sources are described in Section 2.6.1.

The primary air quality mitigation measure for the Project during operation is the use of Ultra Low NOx (ULN) burners in the combustion turbine, which optimizes the ratio of combustion air to fuel as well as combustion temperature to control NO_X emissions from the natural gas combustion process. Nitrogen oxide emissions will not exceed the national emissions guidelines set out by the CCME (Canadian Council of Ministers of the Environment). Compliance with the CCME guidelines will be verified through the installation of a continuous emission monitoring (CEMS) system. In addition, the intermittent sources (i.e., the emergency generator and fire pump) will burn ultra-low sulphur fuel.

5.1.4 Summary of Residual Effects: Air

Following mitigation, some residual effects on air quality are expected to occur as a result of the Project.

Plume dispersion modelling, as described in Appendix E (Burns & McDonnell 2016), shows that maximum predicted concentrations of the substances of interest are below the relevant regulatory objectives (SAAQS and CAAQS) for all averaging periods. Maximum predicted concentrations are expected to occur in close proximity to the Project, and decrease with increasing distance from the fence line. The dispersion modelling indicates that the operation of the Project will not cause or contribute to a significant degradation of ambient air quality (Burns & McDonnell 2016).

The Project GHG emissions during construction, as described in Section 2.6.1, are estimated to be 114,320 tonnes of carbon dioxide equivalent (CO_2e) over the three year construction period. Additional information on how this estimate was calculated can be found in Section 2.6.1 and Appendix E.

The Project GHG emissions during operations, as described in Section 2.6.1, are estimated to be 1,038,463 tonnes CO_2e per year. This is calculated based on a predicted normal operating year defined as 7,446 operating hours of the gas turbine and the natural gas dew point heater, and

100 operating hours for the emergency fire pump and emergency diesel generator. This represents approximately 1.4% and 0.14% of provincial and national GHG emissions for 2013, respectively.

The facility is expected to emit between 365 kg/MWh and 382 kg/MWh of CO_2 when operating at full load assuming a new and clean condition (refer to Section 2.4 for more information). The facility will have a best in class heat rate, resulting in high efficiency and lower CO_2 emissions. The overall efficiency of the plant will approach 58%, resulting in an emission rate far below 420 kilogram (kg) CO_2e per megawatt hour (MWh).

5.2 NOISE

This section addresses noise in the context of the Project. This section outlines the methods and results of the desktop review in addition to identifying potential effect pathways, and mitigation strategies.

5.2.1 Methods

There are no provincial noise regulations or guidelines in the Province of Saskatchewan. However, based on past precedent (e.g., previous environmental assessment filings with the Saskatchewan MOE EAB), noise assessment for projects follow the requirements set out in the guideline published by the Alberta Utilities Commission (AUC) – Rule 012: Noise Control (AUC 2013). Rule 012 is a receptor oriented regulation in Alberta and has been used for this Project. Rule 012 prescribes permissible sound level (PSL) limits due to operation noise effect from a project. The PSL is applicable at dwelling locations within 1.5 km of a project fence line. If there are no dwelling locations, the PSL is applicable at any point along the 1.5 km boundary from the project fence line.

Dwelling locations were identified in accordance with Rule 012. The PSL is applicable for both the daytime (07:00 to 22:00) and nighttime (22:00 to 07:00) periods and is determined based on local conditions including dwelling unit density in the area and proximity to busy transportation routes (e.g., roadways and rail lines).

Rule 012 does not provide quantitative limits for construction noise effects. Noise assessment of construction activities can be based on Health Canada (HC) guidance provided in the document *Useful Information for Environmental Assessments* (Health Canada 2010). However, since no dwelling units or noise sensitive receptors (e.g., hospital, schools) are located within the study area, a construction noise assessment is not included.

Acoustic modelling was undertaken by Burns & McDonnell (2016), in order to predict the Project noise effects and to determine the status of compliance of the Project with the PSLs (Appendix F). Acoustic modelling was completed in accordance with the International Organization for Standardization (ISO) 9613-2, Acoustics – Sound Attenuation during Propagation Outdoors (ISO 1996) using Computer Aided Design for Noise Abatement (CadnaA) software.

5.2.2 Existing Conditions

The existing condition is quantified by the baseline sound level. Baseline sound level within the study area includes the combined noise effects from ambient sound level and other existing and approved regulated facilities. In accordance with Rule 012, regulated facilities pertain to energy-related facilities only. No such existing or approved facilities were identified within the study area.

No ambient sound measurements were conducted within the study area. The ambient sound level was determined in accordance with Rule 012. The Project is located in a rural area with no dwelling units within 1.5 km of the fence line. Therefore, the baseline sound level of 45 dBA and 35 dBA was used for daytime and nighttime, respectively.

5.2.3 Effect Pathways and Mitigation Strategies

The Project noise effects will affect the existing acoustic environment. The severity of the noise effect decreases with increasing distance from the noise sources. At further distance, the Project noise effect will diminish to a level below the baseline sound level.

During the Project operation, noise emissions will result from the turbine, power generator, combustion air intake, air ventilation inlets and outlets, process cooler, transformers, and combustion exhaust stacks. A complete inventory of noise emission sources considered in the assessment is provided in the Burns & McDonnell memorandum SaskPower Chinook Power Station – Sound Assessment (Burns & McDonnell 2016) provided in Appendix F.

In order to comply with Rule 012, the following acoustic specifications are required:

- Building walls meet a minimum sound transmission class (STC) rating of 35
- Air Cooled Condenser (ACC) to meet 65 dBA at 400 feet (122 m)
- Heat Recovery Steam Generator (HRSG) stack exit to meet 110 dBA sound power level without directivity
- Inlet filter face to meet 104 dBA sound power level
- Gas compressors to meet 85 dBA at 3 feet (0.9 m)
- Transformers to meet 85 dBA at 3 feet (0.9 m)
- All other equipment limited to 85 dBA at 3 feet (0.9 m)

The noise emission specifications are targets for the equipment suppliers. If the noise specifications are not achievable by the suppliers, additional mitigation requirements will be considered to ensure compliance with AUC Rule 012.

5.2.4 Summary of Residual Effects: Noise

A summary sound level contour is provided in Appendix F.

5.3 TERRAIN AND SOIL

This section addresses terrain and soil in the context of the Project. This section outlines the methods and results of the desktop review in addition to identifying potential effect pathways, and mitigation strategies.

5.3.1 Methods

Existing data were used to conduct a desktop analysis of baseline terrain and soil conditions within the PDA and LAA. Baseline terrain conditions were obtained from the Canadian Digital Elevation Data (CDED) (Natural Resources Canada 2000). Baseline soil conditions were obtained from the Saskatchewan Soil Information Database Version 4 (SKSID 4.0) (Saskatchewan Land Resource Unit 2009). The databases provide a regional overview of terrain and soil resources for most of Saskatchewan. In addition to these databases, published information and reports were reviewed to confirm and supplement the results of the database data analysis (Agriculture and Agri-Food Canada [AAFC] 2009, Ayres et al. 1985, Summit Liability Solutions Inc., 2015).

The desktop review focused on a general classification and identification of terrain and soil characteristics in the PDA and LAA. These characteristics included slope, topsoil texture and depth, wind and water erosion potential, soil salinity, surface stoniness, and soil agricultural capability ratings. The slopes were based on the CDED with the slope classes based on the SKSID 4.0 user manual (AAFC 2009). SKSID 4.0 slope classes were further combined due to the low slopes and minor variability of topography within the PDA and LAA. Soil agricultural capability ratings were based on published values associated with SKSID 4.0 (Saskatchewan Land Resource Unit 2009). The SKSID 4.0 soil agricultural capability class ratings follow the Canada Land Inventory (CLI) rating system (CLI 1972) of soil capability classification for agriculture. The CLI system rates climate, terrain and soil factors independently, as each factor can control the suitability of a tract of land for crop production. Soil agricultural capability class ratings were considered for the Project facility footprint and a 1.0 km buffer of this area as the preliminary water pipeline route alternatives are located within existing road allowances and are not considered practical for agricultural purposes.

5.3.2 Existing Conditions

Baseline terrain and soil conditions for the PDA and LAA were generally found to be similar. Soils in the PDA and LAA consist mainly of Orthic Brown Chernozemic soils. Soil textures within the PDA and LAA are predominantly a type of loam, including sand and clay loams.

Gentle slopes within the 2-5% slope range are the most prevalent within the PDA and LAA, regardless of the water pipeline route alternative that is chosen for the Project. Very gentle

slopes (0-2%) are also common within the PDA and LAA; however, moderate slopes (5-10%) are more prevalent in the PDA and LAA for the water pipeline route alternative two. Strong slopes (10-15%) are limited within the PDA and LAA. Slope classes within the PDA and LAA are presented in Table 5-2.

Table 5-2 Slope Classes within the PDA and LAA

Slope Class	Proportion of PDA (using Water Pipeline Route Alternative 1) (%)	Proportion of LAA (using Water Pipeline Route Alternative 1) (%)	Proportion of PDA (using Water Pipeline Route Alternative 2) (%)	Proportion of LAA (using Water Pipeline Route Alternative 2) (%)
Very Gentle (0-2%)	13.6	24.6	8.7	15.6
Gentle (2-5%)	73.9	48.5	72.0	46.9
Moderate (5-10%)	6.5	13.7	13.5	25.6
Strong (10-15%)	1.5	2.1	1.3	1.8
Unclassified	4.5	11.1	4.5	11.0

The soil agricultural capability ratings for soils in the Project facility footprint and a 1.0 km buffer of this area range from Class 3 (moderately severe) to 5 (very severe) with Class 4 (severe) consisting of 80% of the footprint and 78% of the 1 km buffer. Class 4 soils have severe limitations due to a range of potential soil characteristics; however, specific limitations related to water-holding capacity and erosion potential have been identified within the Project facility footprint (CLI 1972).

The PDA and LAA have substantial areas of high potential for wind erosion within the PDA and lower potential for wind erosion within the LAA. Wind erosion potential is presented in Table 5-3 below.

Table 5-3 Wind Erosion Potential within the PDA and LAA

Wind Erosion Potential	Proportion of PDA (using Water Pipeline Route Alternative 1) (%)	Proportion of LAA (using Water Pipeline Route Alternative 1) (%)	Proportion of PDA (using Water Pipeline Route Alternative 2) (%)	Proportion of LAA (using Water Pipeline Route Alternative 2) (%)
Low	21.6	40.9	13.3	28.1
Moderate	15.8	29.5	20.6	34.2
High or Very High	57.4	17.3	58.7	18.9
Extremely High	0.0	0.1	1.6	3.9
Unclassified	5.1	12.2	5.8	14.9

The PDA and LAA are considered to have low potential for water erosion regardless of the water pipeline route that is chosen for the Project. Water erosion potential considers the typical rainfall for the area, soil type, soil texture, infiltration rate, slope length, land use, and farming practices.

Areas of saline and stony soils are limited within the PDA and LAA when considering both water pipeline route alternatives with approximately 75% or greater of these areas being rated as non-stony or slightly stony. Soil within the entire PDA and LAA for the Project are considered nonsaline or have weak or moderate salinity ratings.

5.3.3 Effect Pathways and Mitigation Strategies

The Project has the potential to affect terrain and soil through changes in terrain integrity and soil quality and quantity. Terrain integrity includes surface expressions that are influenced by changes in slopes. Soil quality can be measured as agricultural capability because it is based on a number of soil features including soil classification, texture, topsoil depth, erosion, salinity and stoniness. The effect pathways and mitigation strategies for potential effects are described below.

5.3.3.1 **Change in Terrain Integrity**

Change in terrain integrity has the potential to occur during the construction phase of the Project. During construction, slopes within the facility PDA will be disturbed during site grading. Grading is not expected to occur as part of the water pipeline installation. Grading can change the terrain, creating new surface expressions on the landscape. Potential changes to terrain integrity are expected to be limited as steep slopes within the PDA are limited. Soil exposure from grading activities can lead to changes in soil quality through increased soil erosion, mass movement and changes in natural drainage patterns. The disturbance of the soil structure could possibly initiate or accelerate erosional processes. No grading activities are expected to occur during the operation and maintenance phase of the Project and no additional changes to terrain integrity will occur.

5.3.3.2 **Change in Soil Quality and Quantity**

Change in soil quality and quantity will occur predominantly during the construction phase of the Project and can be measured as change in soil agricultural capability. Soil agricultural capability influences land use, as lower soil quality can restrict the productivity of land. Changes in soil quality and quantity can be caused by loss of topsoil, admixing, erosion, compaction and rutting. The construction activities that have the potential to affect soil quality include soil stripping, excavation, trenching, grading, piling installation, and heavy equipment and vehicle traffic.

Topsoil loss can be caused by improper soil handling techniques during soil stripping and grading activities. Soil stripping will remove vegetation, organic materials and topsoil at locations where excavation and/or grading activities are required. Excavation would be necessary with the installation of project-related infrastructure and building foundations. Grading will be required to level the Project facility footprint for proper drainage purposes and to facilitate construction activities. Topsoil may be lost during soil stripping activities if topsoil becomes incorporated into the subsoil layer.

Admixing could occur if the topsoil and subsoil are not stripped and/or stored separately. The admixing of subsoil with topsoil can decrease the quality of the topsoil through the loss of organic matter, changing soil chemistry (e.g., increasing soil salinity levels), and increasing stoniness.

The PDA has a high potential for wind erosion. The potential for erosion will be further increased through the exposure of soil. Soil will be exposed during the construction phase of the Project from activities such as soil stripping, grading and stockpiling. The combination of exposed soil with strong wind and/or precipitation weather events may further increase erosion potential.

Repetitive heavy equipment and vehicle traffic within the PDA can create the risk for admixing, erosion and topsoil loss through compaction and rutting. Compaction can result in admixing of the topsoil with subsoil and cause changes to infiltration capacity, water-holding capacity and bulk density of the soil. Reduced water-holding capacity can increase the surface runoff that could lead to water erosion. Rutting creates exposed soil that provides the opportunity for erosion and soil loss. Rutting increases when the soil is saturated, especially during high precipitation events and spring-melt conditions.

Soil disturbance activities are not expected to occur during the operation and maintenance phase of the Project and no additional changes to soil quality and quantity will occur.

5.3.3.3 **Mitigation for Change in Terrain Integrity**

Mitigation for potential Project related effects on terrain will focus on avoiding areas with poor slope stability. Geotechnical investigations will be completed within the facility PDA, as required, prior to construction and will provide information on slope stability within the PDA. Areas of steep slopes will be avoided during water pipeline construction activities by using HDD methods for pipe installation, if necessary. Site-specific reclamation plans will be prepared for areas with potential for slope instability, if required.

5.3.3.4 **Mitigation for Change in Soil Quality and Quantity**

Proper soil handling techniques such as stripping and storing topsoil and subsoil separately and maintaining adequate distance between topsoil and subsoil stockpiles are examples of effective mitigation measures for preventing topsoil loss. Topsoil loss and admixing will be reduced by using colour change as a guide for stripping topsoil and subsoil layers separately. Saline and stony soils are not expected to be found within the PDA. If saline or stony soils are encountered during construction activities, these soils will be stored separately to prevent adverse changes to soil quality and quantity.

Erosion control measures and trenchless methods (i.e., HDD) in areas of steep terrain will reduce or avoid soil erosion in areas of high risk. Options to control erosion of soil piles include installation of silt fencing around soil piles, leveling soil piles, and reducing the time between stripping and replacement.

Soil compaction and rutting will be mitigated by restricting heavy equipment and vehicle use to dry or frozen soil conditions where feasible. When saturated soil conditions are observed during construction, mitigation measures will be implemented including installing matting, avoidance, and/or temporary shutdowns of constructions activities.

5.3.4 Summary of Residual Effects: Terrain and Soil

Project activities have the potential to cause qualitative changes in terrain integrity and soil quality and quantity through processes such as loss of topsoil, admixing, erosion, compaction, and rutting. These changes could lead to a reduction in slope stability and soil agricultural capability.

Given the low slopes and minor variability in topography that occur within the PDA, as well as the use of HDD methods during water pipeline construction, the changes in terrain integrity will be limited. Residual changes in soil quality and quantity are also expected to be limited due to the existing soil agricultural capability limitations within the PDA. Changes to terrain integrity and soil quality and quantity can be addressed through the implementation of the proposed mitigation measures.

5.4 VEGETATION AND WETLANDS

This section addresses vegetation and wetland resources in the context of the Project. These resources include vegetation, wetlands, plant species of management concern (SOMC), and weed species. This section outlines the methods and results of the desktop review and field surveys and includes a discussion of potential effects and mitigation strategies.

5.4.1 Methods

5.4.1.1 **Desktop Review**

Provincial databases, aerial photography, and literature sources were reviewed for existing data on vegetation and wetlands. The desktop review determined probable land cover and wetlands within the LAA. The desktop review included a review of plant SOMC and weed species with the potential to occur in the LAA. Results of the desktop review were used to guide the selection of rare plant and wetland field survey locations.

Plant SOMC are defined as federally and provincially legislated species at risk and species identified in federal and provincial tracking lists and activity restriction guidelines, including species:

- Listed under Schedule 1, Schedule 2, or Schedule 3 of the federal SARA as *endangered*, *threatened* or *special concern* (Government of Canada 2002);
- Listed in *The Wildlife Act* of Saskatchewan as *endangered*, *threatened* or *vulnerable* (Government of Saskatchewan 1998);

- Listed by the COSEWIC as *endangered*, *threatened* or *special concern* (COSEWIC 2016a) but not yet listed under SARA;
- Assigned a ranking of S1, S2, or S3 (or a combination of these rankings) by the SKCDC (SKCDC 2015a, 2015b); and
- Included in the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SK MOE 2015).

Ranking definitions are provided in Appendix H.

Existing information was reviewed to determine known occurrences of plant SOMC in the LAA. The following sources of information were reviewed:

- SKCDC database search (SKCDC 2016);
- Saskatchewan Power Corporation Swift Current Combined Cycle Gas Turbine Generating Facility: Pre-disturbance Site Assessment Report (Summit Liability Solutions Inc. 2015).

Probable land cover and wetlands were reviewed in order to select survey locations and determine potential habitat for plant SOMC within the LAA. The following sources of information were reviewed:

- Google Earth ® (2015)
- Annual crop inventory (AAFC 2014)
- Ortho imagery (60 cm) (SGIC 2008-2011)
- Saskatchewan Power Corporation Swift Current Combined Cycle Gas Turbine Generating Facility: Pre-disturbance Site Assessment Report (Summit Liability Solutions Inc. 2015).

The *Weed Control Regulations* (SK MOE 2010a) under the *Weed Control Act* (SK MOE 2010b) designate some plant species as prohibited, noxious, or nuisance weeds. Using these sources, a list of known weeds under the *Weed Control Act* was compiled.

5.4.1.2 **Field Surveys**

Late season vegetation and wetland surveys were conducted within the Project facility footprint on August 17, 2015 (Summit 2015). Early season vegetation and wetland surveys were conducted within the Project facility footprint on May 31, 2016. In addition to early and late vegetation and wetland surveys, a roadside reconnaissance survey was conducted on the preliminary water pipeline route alternatives on July 21 and 22, 2016. Land cover was confirmed during field surveys within the PDA and the adjacent quarter sections to the Project facility footprint and water pipeline alternatives.

Rare plant surveys were conducted in accordance with the SK MOE's *Species Detection Survey Protocol: Rare Prairie Plant Surveys* (SK MOE 2015). An SK MOE scientific research permit was obtained prior to conducting surveys (permit #16FW101) and acquired data will be reported to SK MOE in accordance with permit conditions. Rare plant surveys included a meandering transect and 6 detailed quadrats (0.5 m x 0.5 m). Walking surveys were conducted by two experienced vegetation ecologists. All vascular plant species observed were recorded until no new species were found. Detailed quadrats included a complete species list and estimates of percent ground cover. Weed species occurrences were documented with GPS coordinates and the approximate density, distribution and the number of individuals was recorded.

Wetland surveys were conducted at the wetlands within SE 13-16-15-W3M identified during desktop review and by Summit (2015). The wetland classes were confirmed in the field based on the dominant vegetation and water permanency classes following Stewart and Kantrud (1971) (Appendix I). Wetlands were also classified and delineated for the preliminary water pipeline route alternatives during the roadside reconnaissance survey. Photographs of each wetland were taken (Appendix I) and wetland boundaries were recorded.

5.4.2 Existing Conditions

5.4.2.1 **Desktop Review**

5.4.2.1.1 Historical Records of Plant SOMC

A search of the SKCDC database found four historical records of plant SOMC within the PDA and five historical records of plant SOMC within the LAA (SKCDC 2016). Fifteen plant SOMC have historical occurrences within 10 km of the PDA (Appendix I). The accuracy of the location of the historical records of plant SOMC within the PDA is uncertain due to the large polygon size of the data source and age of the historical records (SKCDC 2016).

5.4.2.2 **Field Surveys**

5.4.2.2.1 Confirmation of Land Cover and Wetlands

The Project facility PDA is dominated by tame pasture (27.0 ha of the 29.2 ha) consisting of pasture land sown to perennial grasses and legumes and used for livestock grazing (see Table 5.4, Photo 5-1). Dominant species include crested wheat grass (*Agropyron cristatum* ssp. *pectinatum*), fringed brome (*Bromus ciliates*) and alfalfa (*Medicago sativa*). Within the Project facility PDA there is a small isolated patch of modified native vegetation (2.2 ha) located in the northeast corner (Figure 5.1). Dominant species include western snowberry (*Symphoricarpos occidentalis*), Kentucky bluegrass (*Poa pratensis*), and small-leaved everlasting (*Antennaria parvifolia*). Based on field surveys, roadside surveys and a review of satellite imagery, the LAA is dominated by cultivated land and tame pasture, with small areas of native prairie and wetlands/drainage areas.

Table 5-4 Land cover classes within the PDA

Land Cover Type	Land Cover within the Project Facility PDA (ha)	Land Cover within Preliminary Water Pipeline Route Option 1 (ha)*	Land Cover within Preliminary Water Pipeline Route Option 2 (ha)*
Cultivated	-	4.6 - 5.2	1.1 – 2.7
Tame Pasture	27.0	10.0 – 11.2	13.6 -14.4
Hay	-	0.0 - 1.4	0.5 – 1.5
Treed	-	0.0 - 0.2	0.0 - 0.2
Wetland	-	3.8 – 4.7	4.0 – 4.1
Modified Native Prairie	2.2	-	-
Total	**29.2**	**20.3 – 21.0**	**21.0**

*Range is dependent on the side of the road that the water pipeline is routed on.

Photo 5-1 Tame Pasture within the Project Facility Footprint

The two preliminary water pipeline route alternatives are located within existing road allowances that are primarily adjacent to agricultural land. Land cover within the preliminary pipeline route alternative footprints is characteristic of previously disturbed road allowances consisting primarily of tame grasses (i.e. *bromus spp.*) and invasive species (Table 5.4). Areas of native vegetation adjacent to the two preliminary water pipeline route alternatives are typically limited to coulee bottoms in areas of topographical relief and comprise less than 500 m of either route option (Photo 5-2).

Photo 5-2 Native Vegetation in a Coulee Bottom adjacent to Preliminary Water Pipeline Route Alternative 2

No wetlands were observed within the Project facility PDA. Five wetlands were identified within the same quarter section, SE 13-16-15-W3M, including one Class I wetland, two Class II wetlands, one Class III wetland and one Class IV wetland, which is associated with a dugout (Photo 5-3).

Wetlands of varying size and class occur along both of the preliminary water pipeline route alternatives with a high proportion of the wetlands occurring near the south end of the pipeline routes near Swift Current.

5.4.2.2.2 Rare plant surveys

A total of 97 unique plant species were observed during field surveys (Appendix I). There were no plant SOMC observed during early or late season field surveys.

Photo 5-3 Class IV Wetland associated with a dugout within the LAA in SE 13-16-15-W3M

5.4.2.2.3 Weed species

Canada thistle was observed at one location within the Project facility PDA. Within the LAA within SE 13-16-15-W3M there were four noxious weed species observed during field surveys (Figure 5.1 and Table 5-5). An additional two noxious weed species were identified during the roadside reconnaissance survey for the preliminary water pipeline route alternatives. There were no prohibited weeds observed during field surveys.

Table 5-5 Weed Species Observed during 2015 and 2016 Field Surveys in the Vegetation LAA

Provincial Scientific Name	Provincial Common Name	Weed Designation[1]
Artemisuim absinthum	Absinthe	noxious
Cirsium arvense	Canada thistle	noxious
Euphorbia esula var.esula	leafy spurge	noxious
Malva pusilla	round-leaved mallow	noxious
Lactuca serriola	prickly lettuce	noxious
Sonchus arvensis ssp.arvensis	field sow-thistle	noxious

Note: [1] Weeds are designated under the *Weed Control Act* (SK MOE 2010b).

5.4.3 Effect Pathways and Mitigation Strategies

This section addresses the potential effects on vegetation and wetland resources as a result of project construction and operation and maintenance. The effect pathways and mitigations of these effects are described below.

5.4.3.1 Change in Vegetation and Wetlands

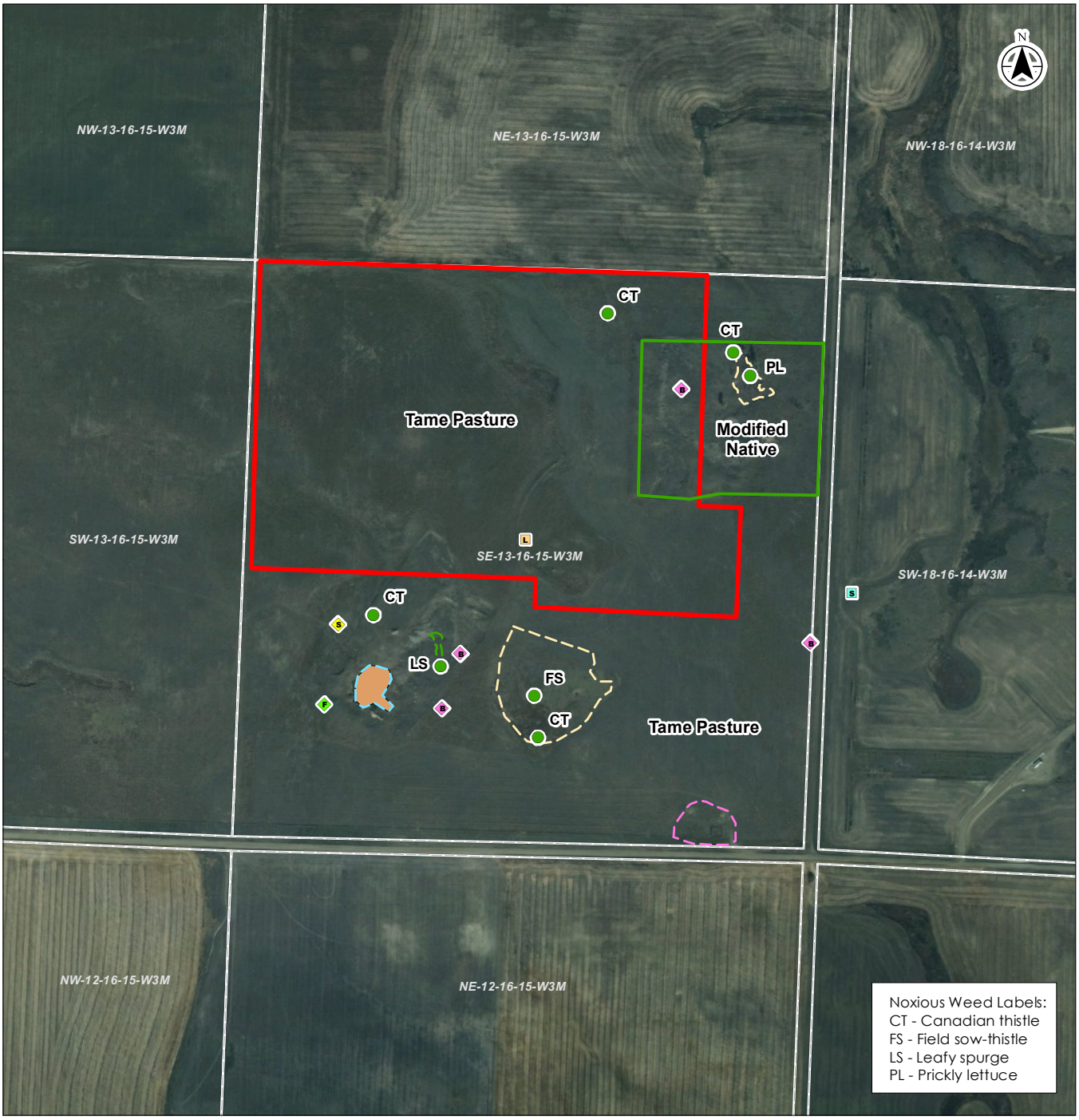
The Project facility site is sited in an area that is dominated by tame pasture (92.5%), with a small isolated patch of modified native vegetation (7.5%). The two preliminary pipeline route alternatives are located within existing developed road allowances. Vegetation composition within the preliminary water pipeline route alternative PDAs are characteristic of previously disturbed road allowances consisting mainly of invasive species. Areas of native vegetation adjacent to the two preliminary water pipeline route alternatives are limited to coulee bottoms in areas of topographical relief and adjacent to wetlands.

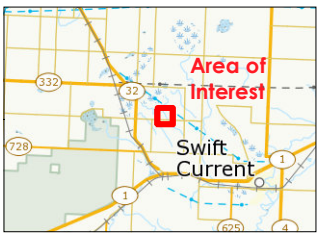
Project construction will result in a loss of tame pasture and a small portion of modified native vegetation during site clearing activities within the Project facility PDA. Construction of the water pipeline will predominantly affect previously disturbed road allowances. The water pipeline PDA will be reclaimed after construction and it is expected that vegetation composition will return to pre-construction levels during operation. Project construction and operation and maintenance activities and vehicle traffic could introduce or spread existing weed species occurrences.

Although wetlands were not observed within the Project facility PDA, wetlands of various sizes and classes occur along both of the preliminary water pipeline route alternatives with a high proportion of the wetlands occurring at the south end of the routes near Swift Current. There is the potential for the temporary alteration of wetlands to occur during Project construction. Mitigation measures to reduce or avoid effects to wetlands are provided in Section 5.4.3.3.

5.4.3.2 Change in Plant SOMC

Plant SOMC were not observed within the Project facility PDA during field surveys. Four historical records of plant SOMC occur within the PDA associated with the water pipeline and five historical records of plant SOMC occur within the LAA. There is potential habitat for plant SOMC within the tame pasture, modified native vegetation, as well as wetland areas located in the preliminary water pipeline route alternatives. Project construction activities may result in the loss of plant SOMC during site clearing activities or through increased competition due to the introduction or spread of weed species. Vehicle traffic during project operation and maintenance may also increase competition due to the introduction or spread of weed species.





Noxious Weed
Modified Native

Wildlife Species Observed
- Baird's Sparrow
- Bobolink
- Loggerhead Shrike
- Northern Leopard Frog
- Sharp-Tailed Grouse Lek

Northern Leopard Frog Breeding Wetland

Wetland Class
- 1 - Ephemeral
- 2 - Temporary
- 3 - Seasonal
- 4 - Semi-permanent

Project Facility Footprint
Qtr Section

0 100 200 Meters
1:8,500 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 UTM Zone 13N
2. Base features produced under license from the Government of Saskatchewan
3. Orthoimagery: © SGIC 2008 - 2011

Stantec SaskPower

Project Location
Near Swift Current, SK

113254000-013 REVE
Prepared by ctownsend on 2016-09-13
Technical Review by jhennig on 2016-09-13

Client/Project
SaskPower
Chinook Power Station Project

Figure No.
5.1

Title
Vegetation and Wildlife Survey Results 2015-2016

5.4.3.3 Mitigation for Vegetation and Wetlands

There are several mitigation measures that have already and/or will be implemented to avoid or reduce Project effects to vegetation and wetlands including, but not limited to:

- Avoidance or mitigation of Project effects through careful siting. The Project team designed the facility in the north part of the quarter section to avoid effects on the wetlands in the LAA.
- Pre-construction plant SOMC and weed surveys.
- Staking features (e.g., plant SOMC, if observed, and weed infestations) within the PDA prior to construction.
- Inspecting vehicles so that they are clean and free of weeds before entering and leaving the Project area.
- Using HDD methods for water pipeline installation in wetland areas, or trenching during frozen or dry conditions.
- SaskPower and its contractors will follow the Vegetation Management Policy (Appendix G), which includes measures to reduce or avoid changes to the distribution and abundance of native vegetation, plant SOMC and weeds.
- Reclaiming disturbed areas, including topsoil replacement and seeding when ground conditions and moisture levels permit.
- Reseeding areas if native vegetation has been removed or damaged using a native seed mix immediately following construction.
- Monitoring the success of native vegetation reclamation if applicable and weed species control.

5.4.4 Summary of Residual Effects: Vegetation and Wetlands

Subsequent to mitigation, some residual effects are expected to occur as a result of the Project. Project construction will result in the loss of tame pasture (27.0 ha) and a small portion of modified native vegetation (2.2 ha) during site clearing activities for the Project facility site. Tame pasture, modified native vegetation and wetlands located within the PDA are potential habitat for plant SOMC, however no plant SOMC were observed within the PDA or LAA during field surveys.

No wetlands were observed within the Project facility site; however, wetlands of varying sizes and classes occur along the two preliminary water pipeline route alternatives. Wetlands within the pipeline ROW will be avoided through the use of HDD methods or temporarily affected by constructing during dry or frozen conditions. Through the implementation of the above mitigation measures, permanent loss or alteration/destruction of wetlands along the water pipeline ROW is not expected.

It is expected that mitigation measures implemented pre-construction, during construction and throughout operation and maintenance will mitigate Project effects due to the loss of tame pasture, modified native vegetation and wetlands. Additionally, when decommissioning occurs, the site will be reclaimed following the regulatory requirements and best practices of the day.

5.5 WILDLIFE

Under CEAA 2012, potential interactions of the Project with environmental components focus on fish, fish habitat and migratory birds. This section addresses terrestrial wildlife and wildlife habitat resources in the context of the Project. While all wildlife species and their habitats are considered as part of the assessment, there is an added focus placed on SOMC and migratory birds that are known to occur or have the potential to occur in the LAA. This section outlines the methods and results of the desktop review and field surveys, and includes a discussion of potential effects and mitigation strategies. Additionally, migratory birds are discussed in Section 4.1.5 and Section 5.7. Fish and fish habitat are discussed in Section 4.1.6 and Section 5.7.

5.5.1 Methods

5.5.1.1 **Desktop Review**

Existing information from provincial and federal databases, remotely-sensed imagery and literature sources were used for the desktop review. All wildlife species were considered that could occur in the RAA, including common species such as Canada goose, mallard, red-tailed hawk, and white-tailed deer (SKCDC 2015a). A focus was placed on determining known occurrences of wildlife SOMC and migratory birds and availability of their habitat within the LAA (see Section 4.2). Habitat suitability was evaluated to determine the SOMC and migratory birds that have potential to occur in the LAA.

Migratory birds are those protected under the *Migratory Birds Convention Act, 1994*. Wildlife SOMC are defined as federally and provincially legislated species at risk and species identified in federal and provincial tracking lists and activity restriction guidelines, including species:

- Listed under Schedule 1, Schedule 2, or Schedule 3 of the federal SARA as *endangered*, *threatened* or *special concern* (Government of Canada 2002);
- Listed in *The Wildlife Act* of Saskatchewan as *endangered*, *threatened* or *vulnerable* (Government of Saskatchewan 1998);
- Listed by the COSEWIC as *endangered*, *threatened* or *special concern* (COSEWIC 2016) but not yet listed under SARA;
- Assigned a ranking of S1, S2, or S3 (or a combination of these rankings) by the SKCDC (SKCDC 2015b, 2015c); and
- Included in the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SK MOE 2015).

Ranking definitions are provided in Appendix H.

The following sources of information were reviewed:

- SKCDC wildlife database searched within a 1,000 m buffer from the edge of the PDA (SKCDC 2016)
- SKCDC vertebrate taxa lists (SKCDC 2015a, 2015b, 2015c)
- Saskatchewan Power Corporation Swift Current Combined Cycle Gas Turbine Generating Facility: Pre-disturbance Site Assessment Report (Summit 2015)
- COSEWIC database (COSEWIC 2016)
- Species at Risk Public Registry (Government of Canada 2016)
- Birds of North America Online database (Cornell Lab of Ornithology and the American Ornithologists' Union 2016)
- Land cover data from the Saskatchewan Southern Digital Land Cover (SRC 1997)
- Satellite imagery such as FlySask (Saskatchewan Geospatial Imagery Collaborative [SGIC] 2012) and Google Earth Pro (2016)
- Publicly available GIS spatial layers of protected lands. The Saskatchewan Representative Area Network spatial layer includes Ducks Unlimited Canada (DUC) project areas, conservation easements, provincial parkland, national parks, national wildlife areas, Prairie Farm Rehabilitation Administration (PFRA) community pastures, provincial community pastures, ecological reserves, Saskatchewan watershed authority lands, special management areas, *Wildlife Habitat Protection Act* (WHPA) lands, migratory bird sanctuaries, wildlife refuges, fish and wildlife development fund lands, and games preserves (GeoSask 2014)

These data sources provided information about potential and historical SOMC occurrences, sensitive wildlife habitat features (e.g., perennially used nests), and habitat types present within the LAA (i.e., land cover classes). In addition to the historical occurrences of SOMC, the availability of wildlife habitat within the LAA, in combination with a species' range, was used to determine wildlife SOMC and migratory birds with the potential to occur in the LAA (see Appendix J and Appendix J). Wildlife habitat availability was evaluated based on land cover data, as well as a review of satellite imagery and existing reports documenting Project site conditions (Summit 2015). Because land cover classes represent broad habitat types (i.e., are at a coarse scale), a habitat association approach was used to estimate habitat availability. Specifically, each land cover class was evaluated to determine whether or not it provided suitable habitat using knowledge of seasonal habitat requirements for each SOMC or migratory bird (see Appendix J). Information gathered from existing data sources was also used to identify the types of wildlife surveys required (i.e., target SOMC).

5.5.1.2 **Field Surveys**

A pre-disturbance site assessment was conducted in summer 2015 and wildlife surveys were conducted in spring 2016 targeting SOMC. Surveys did not target non-SOMC species as occurrences of these species are typically well documented; however, incidental observations of any wildlife species were recorded. Wildlife surveys followed SK *Species Detection Survey Protocols: Grassland Bird Surveys* or designated alternate protocols (Government of Alberta 2013, SK MOE 2014a-c). An SK MOE scientific research permit was obtained prior to conducting wildlife surveys (permit #16FW101) and acquired data will be reported to SK MOE in accordance with permit conditions. Incidental wildlife observations were also made during the road reconnaissance survey for the preliminary water pipeline route alternatives.

A list of all species observed in 2015 and 2016 and site photographs are presented in Appendix J.

5.5.1.2.1 Pre-disturbance Site Assessment

A pre-disturbance site assessment was conducted by Summit Liability Solutions on August 17, 2015, to document existing wildlife and wildlife habitat in SE-13-16-15-W3M. The general wildlife assessment focused on burrowing owl (*Athene cunicularia*), prairie raptors, amphibians, and grassland birds.

5.5.1.2.2 Lek Survey

Stantec completed sharp-tailed grouse (*Tympanuchus phasianellus*) lek surveys to document the presence of active leks (traditional dancing grounds used during mating season) in SE-13-16-15-W3M. Two repeat survey visits were scheduled between mid-April and mid-May to capture the peak lekking period.

Surveys were conducted following the Saskatchewan MOE's guidelines which refer to the Alberta Environment and Sustainable Resource Development *Sensitive Species Inventory Guidelines: Sharp-tailed Grouse* (Government of Alberta 2013). Surveys were conducted between a half hour before sunrise until three hours after sunrise, under acceptable weather conditions (i.e., winds less than 20 km/hr and no precipitation). At each site, there was a two minute waiting period upon arrival to allow disturbance associated with site access to subside. This was followed by a five minute observation period during which the observer uses their binoculars to scan the horizon looking for grouse. If a lek was observed the number of male and female grouse were recorded as well as information about the surrounding habitat.

5.5.1.2.3 Amphibian Auditory Survey

Amphibian auditory surveys were conducted by Stantec to gather information on amphibian presence and distribution, targeting northern leopard frogs (*Lithobates pipiens*). Three survey visits were scheduled between April 15 and May 15, spaced out evenly within the calling period of the target species. Locations where amphibians were heard calling during surveys were noted as breeding wetlands.

Amphibian auditory surveys were conducted at point count locations near target wetlands (i.e., all wetlands within SE-13-16-15-W3M). Survey locations were scouted during the day before the start of surveys to determine an access point and general habitat characteristics. Surveys followed the Saskatchewan MOE's *Species Detection Survey Protocols: Amphibian Auditory Surveys* (SK MOE 2014a). Surveys were conducted between 30 minutes after sunset and 0100, and under acceptable weather conditions (i.e., winds less than 20 km/hr; ambient air temperature a minimum of 6°C for the first visit, 10°C for the second visit, and 13°C for the third visit; and rain no heavier than a drizzle). Each survey consisted of a two minute waiting period to allow disturbance associated with site access to subside, followed by a three minute listening period. While listening, the observer recorded all species that were heard and estimated distance and bearing of each call from the observer. The number of amphibians calling was estimated using an adapted calling index, as outlined in SK MOE's *Species Detection Survey Protocols: Amphibian Auditory Surveys* (SK MOE 2014a).

5.5.1.2.4 Breeding Bird Survey

Breeding bird surveys were conducted by Stantec to document the presence and abundance of bird species, particularly SOMC, and their associated habitat. Three survey visits were conducted between the last week of May and the end of June, spaced seven to 10 days apart, in accordance with the SK MOE's *Species Detection Survey Protocols: Grassland Bird Surveys* (SK MOE 2014b).

Surveys were conducted in SE-13-16-15-W3M between sunrise and no more than four hours after sunrise, under acceptable weather conditions (i.e., temperatures above 0°C, winds less than 20 km/hr and rain no heavier than a drizzle). At each site, there was a two minute waiting period upon arrival to allow disturbance associated with site access to subside. This was followed by a 10 minute observation period during which all birds detected by sight and/or sound were recorded. Detection efforts were focused on a 100 m radius from the centre point of the survey location. Birds detected outside the 100 m radius were recorded as incidental observations. For each observation point, the habitat composition within the 100 m radius was recorded.

5.5.1.2.5 Burrowing Owl Survey

Burrowing owl (*Athene cunicularia*) surveys were conducted by Stantec in conjunction with the breeding bird surveys to detect the presence of burrowing owls and active burrows. Surveys targeted areas of suitable habitat (i.e., modified native or tame pasture). Three survey visits were conducted between the last week of May and the end of June, in accordance with the Saskatchewan MOE's *Species Detection Survey Protocols: Burrowing Owl Surveys* (SK MOE 2014c).

Surveys were conducted between sunrise and 10 am, in weather conditions with winds less than 20 km/hr and no rain. The highest vantage point within the quarter section as the pre-planned survey location was selected to allow for the best possible view of the surrounding landscape. At each site, observers performed a three-minute scan of the surroundings for burrowing owls. If burrowing owls were detected during the first three minutes, the survey continued silently for a

second three-minute period. If no burrowing owls were detected, a burrowing owl call was broadcast for three minutes while observers continued to scan for owls. After completing the broadcast, observers performed a silent one-minute scan of the landscape. After completing the survey, the location of any detected owls was approached to assess the presence or absence of a nest or roost burrow to note any indications of recent activity (e.g., presence of pellets) (SK MOE 2014c).

5.5.2 Existing Conditions

5.5.2.1 **Desktop Review**

5.5.2.1.1 Historical Records of Wildlife SOMC in the LAA

A search of the SKCDC database found two historical records of wildlife SOMC within the LAA, northern leopard frog (*Lithobates pipiens) and* long-billed curlew (*Numenius americanus* (SKCDC 2016).

5.5.2.1.2 Key Areas of Wildlife Habitat

Key areas of wildlife habitat are those that retain a higher conservation value and environmental sensitivity than the surrounding land. These areas typically provide good quality wildlife habitat (e.g., high proportion of native prairie) and are often designated by the province to reflect their value to wildlife. The LAA does not intersect any key areas of wildlife habitat. The nearest area is an Agri-Environment Services Branch (AESB) community pasture (Swift Current-Webb) located approximately 3 km west of the LAA.

5.5.2.1.3 Wildlife Habitat Availability

The PDA is dominated by tame pasture with a small isolated patch of modified native vegetation (including a patch of trees) located in the northeast corner (see Figure 5.1). Five wetlands have been identified on the quarter section within the LAA including one Class I wetland, two Class II wetlands, one Class III wetland and one Class IV wetland associated with a dugout. Based on field surveys, roadside surveys and a review of satellite imagery, the LAA is dominated by cultivated land and tame pasture, with small areas of native prairie and wetlands/drainage areas.

Cultivated land provides minimal wildlife habitat. Native prairie provides important wildlife habitat for several SOMC and migratory birds, including Sprague's pipit (*Anthus spragueii*), ferruginous hawk (*Buteo regalis*), and Baird's sparrow (*Ammodramus bairdii*). Overall, 25 of 50 (50%) SOMC with potential to occur in the LAA are associated with native prairie habitat (see Appendix J). Depending upon the prevalence of native plant species and disturbance regime (e.g., grazing intensity), wildlife habitat availability in tame pasture can be moderate (Coppedge et al. 2008; Olff and Ritchie 1998). Tame pasture provides more suitable habitat for a wider range of SOMC rather than cultivated lands: 16 of 50 (32%) SOMC with potential to occur in the LAA are associated with tame pasture, including monarch (*Danaus plexippus*), sharp-tailed grouse, and common nighthawk (*Chordeiles minor*) (see Appendix J).

Wetlands are areas of high biological diversity that are used as breeding and/or rearing grounds for waterfowl and amphibians, staging areas for migratory birds, and refugia for a variety of wildlife moving through a landscape largely modified by agriculture (Semlitsch 2002). Wetlands provide habitat for SOMC; 25 of 50 (50%) SOMC with potential to occur in the LAA are associated with wetlands, including northern leopard frog (*Lithobates pipiens*), horned grebe (*Podiceps auritus*), and bank swallow (*Riparia riparia*) (see Appendix J).

5.5.2.2 **Field Surveys**

5.5.2.2.1 Pre-disturbance Site Assessment

The pre-disturbance site assessment in 2015 documented 15 avian and one mammalian species in the immediate Project area (Table 5-6). One SOMC, a loggerhead shrike (*Lanius ludovicianus excubitorides*), was incidentally observed in the LAA adjacent to the eastern edge of the Project in SW-18-16-14-W3M. Potential breeding habitat was identified for ferruginous hawk, northern leopard frog, burrowing owl and sharp-tailed grouse; however, due to the timing of the assessment, breeding activity was not documented.

5.5.2.2.2 Lek Survey

A lek survey was conducted on April 19, 2016. One lek, with approximately 50 adults, was detected in the LAA (13U 291141 5580884; see Figure 5.1). Since a lek was detected during the first visit, a second survey was not completed for this site, in accordance with the survey protocol (Government of Alberta 2013).

5.5.2.2.3 Amphibian Auditory Survey

Three amphibian auditory surveys were completed on April 18, May 3, and May 19, 2016. Due to weather delays, the last survey visit was conducted outside of the northern leopard frog survey window (April 15 to May 15).

One northern leopard frog was detected on May 3, 2016, in the Class IV wetland, associated with a dugout, located in the LAA (13U 290858 5580652; Figure 5.1). According to the survey protocol (SK MOE 2014a), subsequent visits are not necessary once a target species has been detected. However, a third amphibian auditory survey was conducted at this site due to the presence of sandy soils in the PDA and its potential for the presence of Canadian toads (*Bufo hemiophrys*). No Canadian toads were detected.

5.5.2.2.4 Breeding Bird Survey

Three breeding bird surveys were conducted on May 31, June 5, and June 15, 2016. Overall, 20 species were detected during the surveys, two of which are SOMC: Baird's sparrow and bobolink *(Dolichonyx oryzivorus)* (Table 5-7 and Figure 5.1).

Table 5-6 List of Wildlife Species Identified during the 2015 Pre-disturbance Site Assessment

Common Name[1]	**Scientific Name**
Birds	
Gadwall	*Anas strepera*
Blue-winged teal	*Anas discors*
Swainson's hawk	*Buteo swainsoni*
Sharp-tailed grouse	*Tympanuchus phasianellus*
Killdeer	*Charadrius vociferus*
Wilson's snipe	*Gallinago delicata*
Eastern kingbird	*Tyrannus tyrannus*
Western kingbird	*Tyrannus verticalis*
Loggerhead shrike	***Lanius ludovicianus excubitorides***
Clay-colored sparrow	*Spizella passerine*
Chipping sparrow	*Spizella passerine*
Vesper sparrow	*Pooecetes gramineus*
Western meadowlark	Sturnella neglecta
Red-winged blackbird	*Agelaius phoeniceus*
Mammals	
White-tailed jackrabbit	*Lepus townsendii*
NOTE: [1] Bold names indicate an SOMC.	

Table 5-7 Avian Species Observed during 2016 Breeding Bird Surveys

Common Name[1]	Scientific Name	No. of Individuals Observed[2]
Mallard	*Anas platyrhynchos*	2
Gadwall	*Anas strepera*	2
American wigeon	*Anas americana*	4
Northern shoveler	*Anas clypeata*	1
Blue-winged teal	*Anas discors*	2
American coot	*Fulica americana*	4
Sharp-tailed grouse	*Tympanuchus phasianellus*	1
Killdeer	*Charadrius vociferus*	2
Marbled godwit	*Limosa fedoa*	1
Eastern kingbird	*Tyrannus tyrannus*	5
Clay-colored sparrow	*Spizella pallida*	8
Vesper sparrow	*Pooecetes gramineus*	3
Savannah sparrow	*Passerculus sandwichensis*	6
Grasshopper sparrow	*Ammodramus savannarum*	2
Baird's sparrow	***Ammodramus bairdii***	1
Western meadowlark	*Sturnella neglecta*	4
Bobolink	***Dolichonyx oryzivorus***	4
Brown-headed cowbird	*Molothrus ater*	4
Red-winged blackbird	*Agelaius phoeniceus*	1
Brewer's blackbird	*Euphagus cyanocephalus*	1

NOTES:

[1] Bold names indicate an SOMC.

[2] To accurately document breeding birds in a prairie environment, the following BBS data was excluded from the final dataset: a) pelicans, cormorants, gulls, terns, raptors, and corvids because these species have large territories or habitually feed far from their breeding territory; b) duplicate observations between the 1st and 2nd five-minute survey period to avoid double counting; c) unknown species; d) all fly-by observations; and e) observations located outside of the 100 m observation radius; these observations are considered incidentals.

5.5.2.2.5 Burrowing Owl Survey

Burrowing owl surveys were conducted on May 31, June 5, and June 15, 2016, in conjunction with breeding bird surveys. No burrowing owls or active burrows were detected during targeted surveys or as incidental observations.

5.5.2.2.6 Incidental Observations

A total of eight species were observed as incidental detections when conducting the targeted wildlife surveys, none of which are SOMC. The following species were observed: Canada goose (*Branta canadensis*), northern harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicensis*), gray

partridge (*Perdix perdix*), Wilson's snipe (*Gallinago delicata*), black-billed magpie (*Pica hudsonia*), horned lark (*Eremophila alpestris*), and western meadowlark (*Sturnella neglecta*).

The following incidental wildlife observations were recorded during the roadside reconnaissance survey for the preliminary water pipeline route alternatives: western kingbird (*Tyrannus verticalis*), black-necked stilt (*Himantopus mexicanus*), yellow-headed blackbird (*Xanthocephalus xanthocephalus*), red-winged blackbird (*Agelaius phoeniceus*), sora (*Porzana carolina*), northern shoveler (*Anas clypeata*), pied-billed grebe (*Podilymbus podiceps*), and eared grebe (*Podiceps nigricollis*). Additionally, a Franklin's gull (*Leucophaeus pipixcan*) colony was observed in a Class IV wetland in NE-22-15-14-W3M, two long-billed curlew (*Numenius americanus*) in NE-6-16-14-W3M, and 13 pronghorn (*Antilocapra americana*) (9 adults and 3 young) in SE-7-16-14-W3M.

5.5.3 Effect Pathways and Mitigation Strategies

This section addresses the potential effects on wildlife (including migratory birds) and wildlife habitat resources as a result of Project construction and operation and maintenance including a change in availability and suitability of wildlife habitat (i.e., change in wildlife habitat), and wildlife mortality risk. The effect pathways of these potential effects are described below.

5.5.3.1 **Change in Wildlife Habitat**

Vegetation loss associated with construction activities (e.g., vegetation clearing from the PDA, vehicle and equipment use, development of the access road, water pipeline installation, etc.) has the potential to result in direct habitat loss and alteration for wildlife. Construction has the potential to decrease the availability of suitable habitat for wildlife, including SOMC and migratory birds, which require tame pasture (e.g., bobolink and barn swallow [*Hirundo rustica*]). The water pipeline has been routed to occur within existing developed road allowances, which typically have low wildlife habitat potential. Changes in wildlife habitat related to the construction of the water pipeline are expected to be limited and any habitat that is disturbed will return to pre-construction conditions following reclamation. Wetlands within the LAA provide suitable breeding and foraging habitat for numerous species of waterbirds, including migratory birds, and amphibians. Construction is not expected to result in the permanent loss or alteration of wetland habitat with the application of mitigation measures such as using HDD methods for water pipeline installation under wetland areas, or trenching during frozen or dry conditions, as well as other mitigation measures outlined in Section 5.4.3.3. As such, habitat availability for wetland-associated species, including migratory birds, is expected to remain the same once construction is completed.

Temporary sensory disturbances associated with construction activities (e.g., noise from increased vehicle traffic, heavy equipment, lights) has the potential to result in indirect habitat loss due to reduced habitat effectiveness (i.e., avoidance). Wildlife species that reside near the Project may be deterred from using traditional travel corridors during construction. Construction can also affect breeding and rearing success for some wildlife species (Bayne et al. 2008; Francis

and Barber 2013) if construction occurs during the nesting season. Responses will vary by species and individuals and may result in some species avoiding the PDA during construction because of noise, vibrations and increased human activity (Habib et al. 2007). For example, male sharp-tailed grouse have shown intolerance to human presence near leks (Baydack 1986), and increased human activity in an area can cause raptors like ferruginous hawks to desert their nests (White and Thurow 1985).

Direct habitat loss is not expected to occur during the operation and maintenance for the Project. Sensory disturbance during operation and maintenance may continue to result in indirect habitat loss by altering wildlife habitat availability. The increase in noise levels near the facility during operation and maintenance may result in the displacement of wildlife; however, some species may return after a period of acclimatization.

Construction of the stormwater pond and evaporation pond will create potential habitat for wildlife, particularly amphibians, waterbirds and waterfowl (including migratory birds). The stormwater pond is designed to collect surface water runoff from the Project facility site and is expected to hold water seasonally. When larger rain events occur, the pond will be discharged at a set flow rate until it returns to the normal pond elevation.

The evaporation pond will contain a minimum of 15 cm of water year round. Given the design capacity of the evaporation pond, no drainage will be required. To evaluate potential quality of habitat in the evaporation pond, from the perspective of water quality, the predicted aquatic concentrations of released elements were compared to the water quality guideline values for the protection of freshwater aquatic life (CCME 2008). All applicable parameters that had a screening level listed in the guidelines were below the ecological screening levels for freshwater aquatic life except for iron. The predicted iron concentration (400 ug/L) was 100 ug/L higher than the CCME guideline of 300 ug/L for the protection of freshwater aquatic life. The CCME guidelines for iron do not have a toxicological basis; it is equivalent to the drinking water quality guideline, which is based on aesthetic considerations (CCME 2008). The US EPA water quality criteria for freshwater aquatic life is significantly higher at 1,000 ug/L (US EPA 2016, US EPA 1986).

Iron is the fourth most abundant element, by weight, and is an essential element to plants and animals (US EPA 1986). The natural range of environmental concentrations of iron in western Canadian surface water ranges from 20 to 14,000 ug/L (n = 1926; CCME 2008), and Driver and Peden (1977) reported concentrations ranging from <5 to 630 ug/L in natural wetlands near Bradwell and St. Denis, SK. Therefore, the predicted iron concentration of 400 ug/L in the evaporation pond falls within the natural range of concentrations in prairie wetlands, and with other modeled elements being below CCME water quality guidelines for freshwater aquatic life, the water quality within the evaporation pond will be similar to other natural habitats.

5.5.3.2 **Change in Wildlife Mortality Risk**

Project construction has the potential to result in an increased direct mortality risk for wildlife, including migratory birds. In particular, construction activities (e.g., vegetation clearing, vehicle traffic, trenching for the water pipeline) during the breeding season can result in the destruction of migratory bird nests, as well as den sites and burrows. Ground-nesting birds (e.g., Sprague's pipit, bobolink) are particularly vulnerable during construction in open fields throughout the breeding season. Wildlife mortality of young may also occur if active nests and burrows have been abandoned due to sensory disturbance and the young may not be able to escape the area. Wildlife with decreased mobility (i.e., amphibians, nesting birds, and small mammals) are also more susceptible to direct mortality if individuals are unable to escape construction activities.

There is also an increased mortality risk for wildlife, including migratory birds, due to potential vehicle collisions at the Project site, along the access road and roads in the LAA that will be used to bring in equipment and materials to the Project site. This may occur during both the construction and operation phases.

Increased activity and noise during construction may cause an indirect increase in mortality risk from disturbance to wildlife resulting in behavioural changes and increased predation efficiency. Some wildlife species (e.g., amphibians) might move from cover (i.e., behavioural change) because of disturbance from noise and vibration, putting them at greater risk of predation and mortality from exposure.

5.5.3.3 **Mitigation for a Change in Wildlife Habitat**

Project-specific mitigation measures, along with standard industry practices and avoidance measures will be implemented during construction and operation and maintenance to reduce potential effects on wildlife habitat. Direct loss of habitat will be mitigated by minimizing the extent of vegetation cleared where possible. Direct loss of habitat for water pipeline construction will be mitigated by installing sections of pipe using HDD technology at wetlands or trenching during dry or frozen conditions. Temporary indirect habitat loss due to sensory disturbance during construction will be mitigated by using standard noise abatement equipment on machinery (i.e., mufflers) to control noise levels. Noise during operation and maintenance will be mitigated by building the facility to acceptable noise standards (i.e., AUC Rule 012 – Noise Control). Wildlife, including migratory birds, may become habituated to the facility noise once construction is completed and resume using the wildlife habitat in the PDA.

Mitigation measures typically include applying the guidelines for species-specific setback distances and restricted activity periods (MOE 2015) for key wildlife features that have been identified and those that may be identified in future pre-construction surveys. For the sharp-tailed grouse lek, the guidelines state that activities be restricted from March 15 to May 15 within 400 m of the lek (setback for high disturbance activities) and, for the northern leopard frog

breeding wetland, activities be restricted year round within 500 m of the wetland (setback guideline for high disturbance activities).

Based on the current construction schedule, it will not be possible to abide by these guidelines for setbacks and timing restrictions. The Project team explored potential options to minimize effects to the lek including redesigning the Project components as well as establishing an exclusion buffer around the lek during construction. However, based on discussions with the SK MOE, taking into account the proximity of the lek in relation to the Project components and the sensory disturbance that will occur during construction and operation activities, direct effects to the lek are anticipated. SaskPower will continue to work with SK MOE to develop an acceptable plan to address the effects to this lek.

Given the location of the wetland in relation to the Project infrastructure, the Project team is currently investigating opportunities to avoid or minimize effects to the northern leopard frog including consideration of potential redesign of Project components (e.g., relocating the access road). The Project team has initiated discussions with the SK MOE and will continue to work with the SK MOE to develop acceptable mitigation plans, to address how best to proceed with construction while limiting the potential effects to the northern leopard frog.

The stormwater pond and evaporation pond will create habitat that can potentially be used by wildlife, including migratory birds. Water quality in the ponds are expected to be similar to other natural habitats; as such, mitigation measures to discourage use of the stormwater pond and evaporation pond by wildlife, including migratory birds, is not deemed necessary.

5.5.3.4 **Mitigation for a Change in Wildlife Mortality Risk**

The primary strategy to mitigate wildlife mortality during construction includes timing construction outside of the migratory bird nesting period, outlined by Environment and Climate Change Canada (April 26 to August 15; EC 2016) to avoid mortality of ground-nesting or slow-moving wildlife during this sensitive period (i.e., nesting and rearing). However, given that construction of a natural gas plant takes a minimum of 32 months to construct and there is a need for the Project to be operational by the fall of 2019, construction will need to occur at the Project facility site year round and it will not be possible to shutdown construction activities during the migratory bird nesting period. Rather, the proposed plan will be to conduct site clearing activities prior to the migratory bird nesting period to remove the habitat in order to discourage ground-nesting birds from inhabiting the Project facility footprint. Regular inspections of the Project site will be conducted by the contractor and the environmental monitor during construction to monitor for species and their nests and if one is encountered, work in that area will temporarily shut down until an acceptable mitigation plan is approved by SK MOE. The water pipeline construction is expected to be completed outside of the migratory bird nesting period.

Regular inspections of the Project facility site and surrounding area within the quarter section will be conducted by the contractor and the environmental monitor, a qualified wildlife biologist, during construction activities that occur during the migratory bird nesting period to monitor for

active nests and other wildlife features and/or their sign (i.e., individuals displaying nesting behaviour). If an active wildlife feature is encountered, a species appropriate buffer will be applied and work in that area will temporarily shut down until an acceptable mitigation plan is approved by the Saskatchewan Ministry of Environment (SK MOE).

Wildlife mortality will also be mitigated by maintaining speed limits on and off the Project site to limit the risk of vehicle collisions with wildlife. Speed limits will be reduced in areas where species wildlife concerns or movement corridors have been identified. Collisions with wildlife will be reported to provincial regulators.

Construction and operation and maintenance personnel will not be permitted to harass or feed wildlife. Nuisance wildlife will be reported to the appropriate authorities (e.g., SK MOE conservation officer).

5.5.4 Summary of Residual Effects: Wildlife

Subsequent to mitigation, some residual effects on wildlife and wildlife habitat are expected to occur as a result of the Project. The residual effects relate to a change in wildlife habitat and mortality risk, and are summarized below.

5.5.4.1 **Change in Wildlife Habitat**

The Project facility PDA (29.2 ha) will remain disturbed for the life of the Project; as such, habitat loss in that area is considered permanent. Construction of the Project will result in a permanent loss of tame pasture and a small portion of modified native vegetation. SOMC and migratory birds could potentially be affected by the direct loss of wildlife habitat. Tame pasture is available within the LAA and can provide suitable habitat for mobile and tame pasture-dependent species (i.e., sharp-tailed grouse) that may be displaced during construction.

Construction of the water pipeline will predominantly affect previously disturbed road allowances. Previously disturbed road allowances are typically less suitable habitat for wildlife; however, some habitat does occur (e.g., wetlands, natural drainage areas, etc.).These areas will be avoided through the use of HDD pipeline installation methods where feasible. If HDD methods cannot be used, potential effects will be mitigated by trenching during frozen or dry conditions. The water pipeline PDA will be reclaimed after construction and it is expected that areas of suitable habitat will return to pre-construction levels during operation. No Permanent alteration or destruction of wetlands or wildlife habitat are expected to result from water pipeline construction activities.

Construction of an evaporation pond will create potential habitat for wildlife species. With wetland loss continuing throughout prairie Canada (Government of Canada 1991), this created habitat will benefit wildlife species.

Upon decommissioning, facilities will be removed and will be reclaimed to the regulatory requirements and standards of the day. This process will result in wildlife habitat being reclaimed where the Project infrastructure once was.

5.5.4.2 **Change in Wildlife Mortality Risk**

During construction, direct mortality of wildlife could occur within the PDA through vegetation clearing and vehicle collisions after mitigation measures are applied. The likelihood of Project activities interacting with wildlife is greater in areas where important habitat features exist (e.g., sharp-tailed grouse lek, northern leopard frog breeding wetland) but the risk is decreased with the implementation of mitigation measures.

Mortality risk to SOMC and migratory birds during construction will be reduced through implementation of a mitigation plan acceptable to SK MOE, including timing clearing activities prior to the migratory bird nesting period and ongoing monitoring during construction to identify SOMC occurrences. Reduced speed limits on and off the Project site and installation of signage where specific wildlife concerns have been identified are also expected to reduce mortality risk to SOMC.

Mortality risk to wildlife due to vehicle collisions will be very limited with the implementation of mitigation measures (e.g., reducing speed limits, maintaining a no wildlife harassment policy on site).

5.6 HUMAN ENVIRONMENT

This section addresses the human environment including baseline conditions on land use, groundwater and surface water users, regional economy and employment, and existing infrastructure. Potential issues related to human health are not discussed in this section, but are discussed in the context of the air and noise disciplines (see Sections 5.2 and 5.3). This section will outline the methods and results of the desktop review in addition to identifying potential effect pathways, mitigation strategies, and residual effects.

5.6.1 Methods

Existing information from provincial and federal databases, remotely-sensed imagery and literature sources were reviewed to determine baseline information for this assessment. The following sources of information were reviewed:

- Land cover data from the Saskatchewan Southern Digital Land Cover (SRC 1997) and Annual Crop Inventory (AAFC 2014)
- Designated land data from the Representative Areas Network, Saskatchewan Ministry of Environment (SK MOE 2015)

- Rural and urban municipalities, road networks and quarter section data from Geosask (ISC 2015)
- Oil and gas well information from the Vertical Wells Dataset (Saskatchewan Ministry of Economy 2016)
- Groundwater well data from the Water Well Drillers Report Database (Water Security Agency 2014)
- Websites to obtain information about the City of Swift Current and Rural Municipality of Swift Current (City of Swift Current 2016, AECOM 2010a, AECOM 2010b)
- Population and employment information for the affected areas from the 2011 Community Profiles program (Statistics Canada 2016a) and the 2011 National Household Survey (Statistics Canada 2016b)
- Saskatchewan Power Corporation Swift Current Combined Cycle Gas Turbine Generating Facility: Pre-disturbance Site Assessment Report (Summit 2015)

5.6.2 Existing Conditions

5.6.2.1 **Land Use**

The Project facility footprint occurs on land owned by SaskPower within the Rural Municipality (RM) of Swift Current No. 137. Pipeline routing is still under discussion and is subject to change based on the results of consultation and engagement and preliminary routing studies; however, the preliminary water pipeline route alternatives are located within existing developed road allowances owned by Her Majesty the Queen in Right of Saskatchewan and operated by the Saskatchewan Ministry of Highways and Infrastructure.

An official community plan and zoning bylaw has been established within the RM (Table 5-8). These documents set out the policies for future physical, economic, and social development of the municipal planning area. Official community plans establish development and conservation objectives and policies, assign priorities and set out social and financial guidelines for a community. Zoning bylaws regulate development on individual properties, and serve as a tool to carry out the policies of the official plan. The land associated with the Project facility is zoned as Agricultural and Resource District to accommodate agricultural and agriculture-related development and subdivisions. Public road allowances are not typically zoned and therefore, changes to zoning as a result of the water pipeline installation are not expected. Development and building permits will be required for construction within the RM.

The water pipeline, irrespective of the route alternative selected, occurs in a developed road allowance which consists mostly of brome grasses, interspersed with wetlands. The ditch is likely hayed occasionally throughout the spring and summer months.

Table 5-8 Rural Municipality within the PDA

Rural Municipality	Administration Centre	Community Plan	Zoning Bylaw
RM of Swift Current No. 137	Swift Current	RM of Swift Current No. 137 Official Community Plan, Schedule "A" to Bylaw No. 05-2010 (AECOM 2010a)	RM of Swift Current No. 137 Zoning Bylaw No. 6 – 2010 (AECOM 2010b)

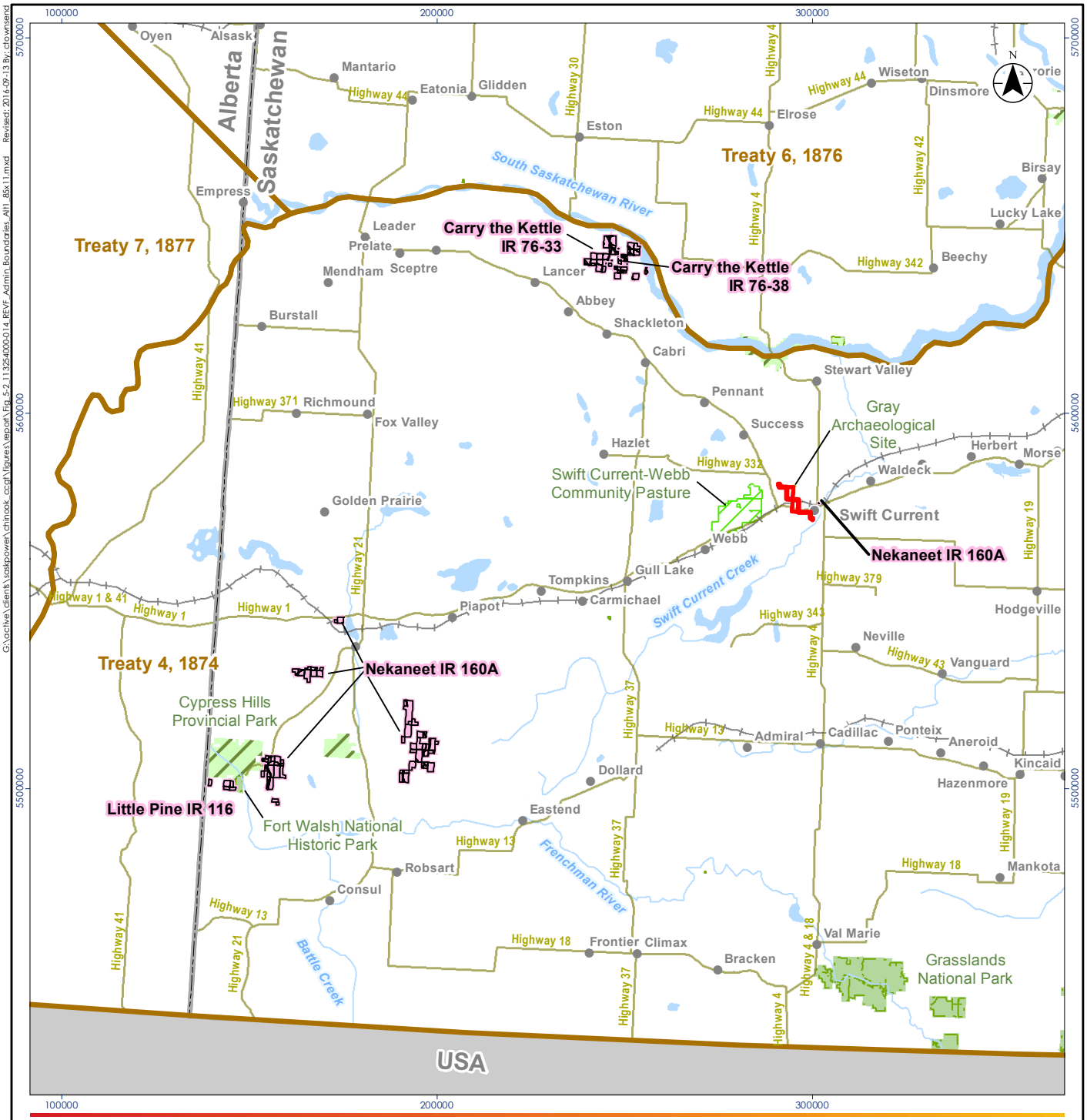
Table 5-9 lists the latest population estimates, based on Statistics Canada community profiles (2011), for the City of Swift Current and the RM of Swift Current. Figure 5.2 shows the location of the communities located near the Project.

Table 5-9 RM of Swift Current Population Estimates

Municipality	Status	Population in 2011 Census	Percentage Change from 2006 Census
Swift Current	City	15,503	3.7
RM of Swift Current	Rural Municipality	2,032	28.0
Source: Statistics Canada 2016a			

The location of all rural residences within proximity to the Project facility were mapped from aerial photography and verified through field reconnaissance. There are no residences located within the PDA. Twenty-three rural residences and one outbuilding were confirmed to be located within 5 km of the Project facility PDA. The outbuilding, consisting of grain bins, is located 1.6 km west of the PDA and the nearest residence is located 2.3 km northeast of the Project facility footprint.

The PDA does not intersect any provincial or federal designated land. The Gray Burial Site (EcNx-1x), designated a Provincial and National Historic site, is located approximately 3.5 km east of the Project facility footprint, 1.8 km from water pipeline route alternative one and 0.5 km from the water pipeline route alternative two. The Swift Current-Webb Community Pasture, which is currently federal land managed by Agriculture and Agri-Food Canada and expected to be transferred to provincial control between 2017 and 2018, is located approximately 4.2 km west of the PDA, regardless of the final water pipeline route (Figure 5.2). There are four quarter sections of Agricultural Crown Land managed by the Saskatchewan Ministry of Agriculture located within the RAA and one quarter section of *Wildlife Habitat Protection Act* land, located 3.3 km from the PDA.



Project Development Area
Indian Reserve
First Nations Treaty Boundary
City/Town

Provincial Boundary
Major Road
Railway
Watercourse
Waterbody
Swift Current-Webb Community Pasture
National Park
Provincial Park
Protected Area (Other)

0 25 50 Kilometers
1:1,550,000 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 UTM Zone 13N
2. Base features produced under license from the Government of Saskatchewan

Stantec SaskPower

Project Location
Near Swift Current, SK

113254000-014 REVF
Prepared by ctownsend on 2016-09-13
Technical Review by jhennig on 2016-09-13

Client/Project
SaskPower
Chinook Power Station Project

Figure No.
5.2

Title
Administrative Boundaries for The Project Area

The Project facility PDA is located predominantly within tame pasture and used primarily for grazing operations. Historical activities throughout the quarter section include haying operations, excavation activities and disposal of asphalt. Photos 5-4 to 5-6 (taken by Summit, 2015 and SaskPower, 2016) are within SE 13-16-15 W3M but are outside of the Project Facility PDA. Historical air photos of agricultural and excavation activities from 1955 to 2010 are provided in Appendix B. The land use to the immediate east and west of the Project facility footprint is tame pasture, to the north of the Project facility footprint is hayland and south of the Project facility footprint is cultivated land. The area surrounding the Project is mainly used for agricultural production as well as a mix of industrial facilities, rural farms and residences and existing infrastructure.

A subsurface rights holder, Prairiesky Royalty Ltd., holds the petroleum and natural gas rights within SE-13-16-15-W3M.

Human environment baseline features are presented in Figure 5.3.

Photo 5-4 Asphalt mound in SE 13-16-15-W3M

Photo 5-5 Surface staining in SE 13-16-15-W3M

Photo 5-6 Potential previous development in SE 13-16-15-W3M

5.6.2.2 **Groundwater and Surface Water Users**

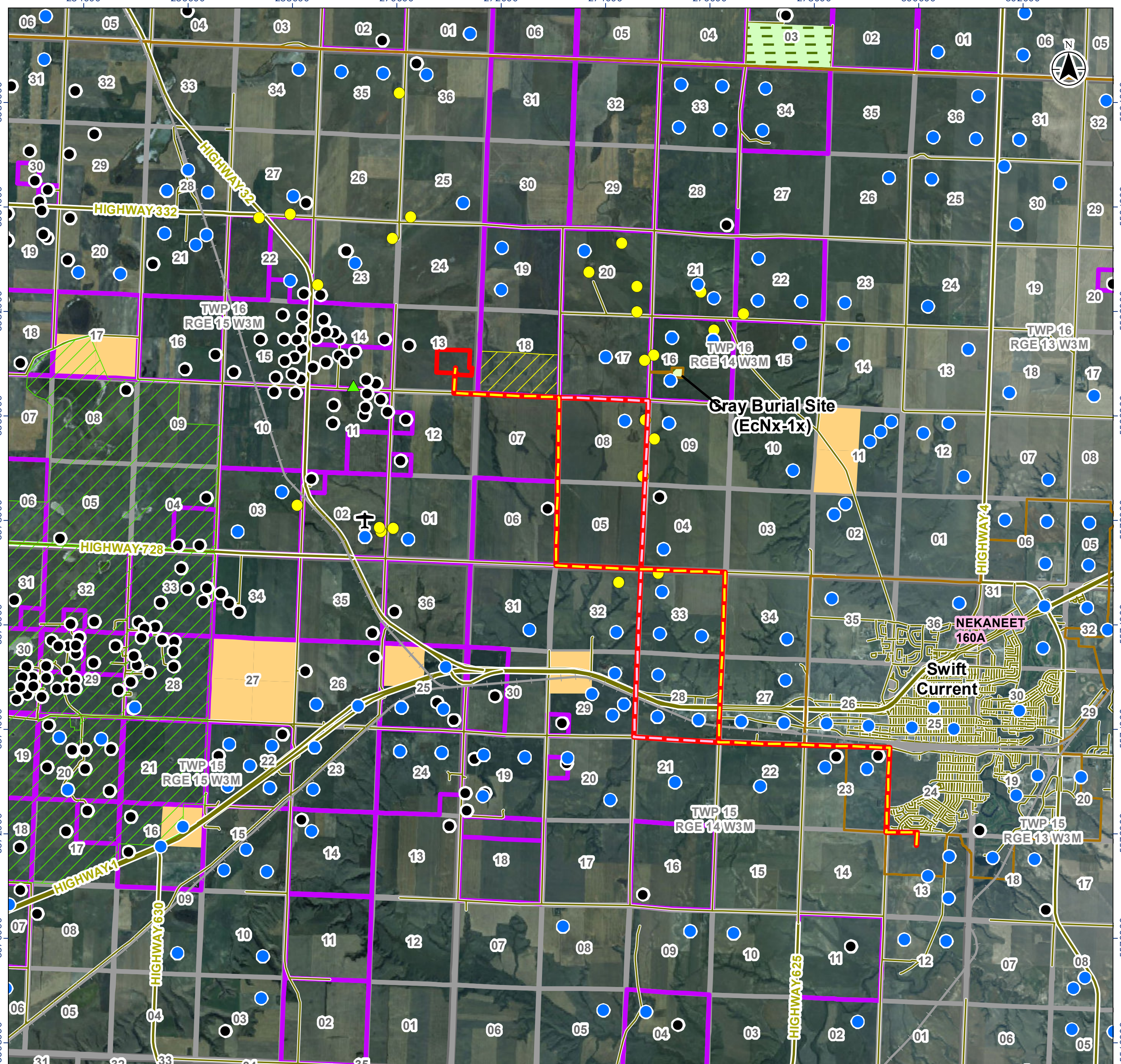
Refer to Section 4.1.3.2 for information on groundwater and surface water.

5.6.2.3 **Regional Employment and Economy**

Refer to Section 4.1.3.3 for information on regional employment and the local economy.

5.6.2.4 **Existing Infrastructure**

Refer to Section 4.1.3.4 for information on existing infrastructure.



Stantec SaskPower

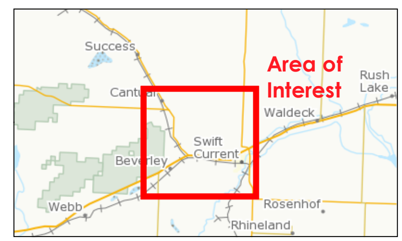
- Project Facility Footprint
- Water Pipeline Route Alternative 1
- Water Pipeline Route Alternative 2
- Private Aerodrome
- Water Well
- Residence
- Outbuilding
- Oil/Gas Well
- Indian Reserve
- Agricultural Crown Land (MOA)
- Swift Current-Webb Community Pasture
- Gray Burial Site (EcNx-1x)
- Wildlife Habitat Protection Act Lands
- Major Road
- Minor Road
- Railway
- Oil and Gas Dispositions
- Swift Current Newalta Landfill Site
- Section
- Township
- Rural Municipality

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 13N
2. Base features produced under license from the Government of Saskatchewan
3. Orthoimagery © SGIC, 2008 - 2011

0 1,500 3,000 metres

1:115,000 (At Original document size of 8.5 x 11)



Project Location
Near Swift Current, SK

113254000-007 REVN
Prepared by ctownsend on 2016-08-15
Technical Review by jhenning on 2016-08-15

Client/Project
SaskPower
Chinook Power Station Project

Figure No.
5.3

Title
Human Environment Baseline Features

5.6.3 Effect Pathways and Mitigation Strategies

5.6.3.1 Change in Land Use

The Project facility site is currently zoned as an Agricultural and Resource District and will not conflict with the current zoning; public utilities, including electricity generation, are permitted uses in the District (AECOM 2010b). The Project facility site is located on land used for grazing operations. The construction, operation and decommissioning and reclamation will limit the use of the land for future grazing operations within the Project facility site for the duration of the Project.

The two preliminary water pipeline route alternatives are located within existing developed road allowances and a change in land use is not anticipated.

Soil handling during construction (e.g., topsoil stripping) may change the soil capability for agriculture. At the facility site, other than foundations and pilings associated with the Project, there will be no subsurface development and therefore the subsurface rights held by Prairiesky Royalty Ltd. will not be affected. The only other subsurface effects relate to the trenching in the road allowance associated with the water pipeline. The Project does not intersect any designated land.

Mitigation measures that will be followed to avoid or reduce the potential change to land use activities during construction, operation and decommissioning and reclamation, include:

- Posting appropriate signage in advance during construction, indicating access restrictions and duration of the restrictions.
- Using fencing to restrict livestock access to active areas within the PDA.
- Using topsoil handling measures outlined in the Project-specific EPP.
- Posting signs at areas identified as having noxious weed infestations before starting construction.
- Conducting vehicle and equipment cleaning before moving equipment from any locations identified as having noxious weed infestation, to avoid the introduction or spread of weeds.
- Stripping topsoil from the PDA on lands where localized weed infestations are encountered. Store soil piles containing noxious weeds separately to prevent mixing with the surrounding soil during regrading and final clean up.
- Completing reclamation of all disturbed agricultural land following construction.
- Seeding disturbed areas using an appropriate seed mix.

5.6.3.2 **Change to Groundwater and Surface Water Users**

The Project will require a water supply service for plant processes and domestic use. The Project will use potable water from the City of Swift Current via a new underground water pipeline from the South Hill Reservoir, located south of Swift Current. A temporary water supply will be required during construction activities and it is proposed that water will be trucked to the Project site and stored in tanks until the permanent water supply system is completed. A total of 15 million litres of water is estimated for construction water consumption between late 2016 and June 2018. Construction water will be used during site preparation and during foundation backfill, as well as for dust suppression. Allocation of water will be done in accordance with the permit from the Water Security Agency (WSA) so as to not affect other water users; therefore, additional mitigation is not expected. No adverse effects to groundwater or surface water users are expected as a result of the Project.

5.6.3.3 **Change to Employment and Economy**

The short-term nature of Project construction and decommissioning and reclamation will result in temporary employment during the construction period, whereas operations related employment will be permanent for the duration of the Project. Project expenditures on goods and services will generate opportunities for local businesses and the Project will generate government revenue.

Mitigation measures to avoid or reduce the potential negative change to employment and economy during construction, operation and decommissioning and reclamation, may include:

- Developing Project labour agreements for construction work that respect provincial labour laws and established practices for labour training and supply.
- Prioritizing the hiring of local construction workers first, subject to labour availability, cost, and quality considerations followed by workers from within the province, then from the rest of Canada, then North America, and then overseas countries.
- Supplementing the local labour force with mobile workers when needed to avoid displacing currently employed individuals in the area.
- Developing employment and procurement programs that actively promote local opportunity, including for Aboriginal workers and businesses, taking into consideration the competitiveness and relative capacity of local suppliers. Before starting work, communities in the immediate area, including Aboriginal communities, will be contacted to gain an understanding of the resources available.

5.6.3.4 **Change to Existing Infrastructure**

The Project may increase traffic on local roads through the transportation of workers, equipment and materials and may also generate solid waste and sewage requiring disposal.

During operation the Project may limit the availability of the land for other infrastructure, including oil and gas and other industrial activities. The Project is not anticipated to change access to existing operations and change the area of lands available for industrial uses. Decommissioning and reclamation will result in a positive effect because removal of Project components will potentially alleviate restrictions for other industrial uses.

Mitigation measures to avoid or reduce the potential change to existing infrastructure during construction, operation and maintenance, and decommissioning and reclamation may include:

- Informing all appropriate federal and provincial resource agencies and interested municipal officials of Project developments, as warranted.
- Obtaining all necessary licences, crossing agreements and approvals before the commencement of construction.
- Notifying all adjacent landowners and lessees of the intended Project schedule before the start of construction to prevent or reduce effects on their operations or activities.
- Using multi-passenger vehicles for the transport of crews to and from job sites, where practical.
- Collecting all construction debris and other waste materials and dispose of them daily at an approved facility unless otherwise authorized by the environmental inspector or designate.
- Implementing a waste management plan
- Posting appropriate signage in advance of construction, indicating access restrictions and duration of the restrictions.
- Reclaiming disturbed areas following completion of construction to restore access.

5.6.4 Summary of Residual Effects: Human Environment

5.6.4.1 Change in Land Use

The Project will occur within tame pasture and modified native vegetation used for grazing operations. The land is owned by SaskPower, therefore reaching land access agreements with landowners and tenure holders is not necessary, however, engaging adjacent landowners and lessees will occur. The Project will result in agricultural land being taken out of production over the footprint of the Project facility site. Soil will be salvaged from these areas and stored. Land use is not expected to change along the water pipeline route.

5.6.4.2 Change to Groundwater and Surface Water Users

No residual effects are expected from use of the water source for the Project. Water allotments and permitting will require that there are no adverse effects to other water users.

5.6.4.3 Change in Employment and Economy

Potential effects on employment will occur as a result of direct employment and Project expenditures during construction. The Project will also generate indirect employment as a result of capital expenditures on goods and services generated during the construction and decommissioning and reclamation period. Direct and indirect employment generated by the Project will be temporary and will be most prevalent during the construction and decommissioning and reclamation phase, and less during operation and maintenance.

If the skillsets of the local labour force are available and with the array of businesses in retail, trade and other services within the City of Swift Current, it is expected that direct and indirect economic benefits from the Project related to capital expenditures on construction worker salaries and goods and services will be captured within the surrounding area. Capital expenditures and indirect expenditures will be subject to federal and provincial taxes and duties related to the purchase of goods and services and the employment of individuals. Government revenue thus collected is used to fund infrastructure, services programs and initiatives from the level of the municipality up to the federal level.

5.6.4.4 Change in Existing Infrastructure

Potential effects of the Project on existing infrastructure may arise through transportation of personnel, equipment and materials during construction and disposal of solid waste, including hazardous waste and recyclable materials, and sewage from Project construction.

During construction, an increase in traffic on Highway 1 and Highway 32 is expected as a result of material and equipment deliveries and commuting by Project personnel. The increase in traffic would be minimal considering the existing capacity of these highways and existing traffic levels.

The Project also has the potential to affect infrastructure as a result of disposal requirements for solid waste generated by construction and decommissioning and reclamation activities. Solid waste would consist of construction waste, recyclable materials and some hazardous waste. During the construction phase, sewage generated onsite will be disposed of at an approved off-site sewage disposal facility.

It is anticipated that the Project will have no effect on the private aerodrome southwest from the PDA since the buildings associated with the Project will only be between 15 m to 40 m in height and the exhaust stack is estimated to be approximately 43 m in height.

5.7 CHANGES THAT MAY BE CAUSED BY THE PROJECT TO FISH AND FISH HABITAT, LISTED AQUATIC SPECIES, MIGRATORY BIRDS AND FEDERAL LANDS OR OTHER JURISDICTIONS

5.7.1 Fish and Fish Habitat, as Defined in the *Fisheries Act*

No fish or fish habitat as defined by the *Fisheries Act* will be affected by the Project.

5.7.2 Aquatic Species, as Defined in the Species at Risk Act (SARA)

There are no known aquatic species at risk within the Project area.

5.7.3 Migratory Birds, as Defined in the *Migratory Birds Convention Act*

This section addresses the potential effects on migratory birds and their habitat resources as a result of Project construction and operation and maintenance activities. Migratory birds are those protected under the *Migratory Birds Convention Act, 1994*.

Project construction has the potential to result in an increased mortality risk for migratory birds. In particular, construction activities (e.g., vegetation clearing, vehicle traffic, trenching for the water pipeline) during the breeding season can result in the destruction of migratory bird nests and young. Ground-nesting birds (e.g., Sprague's pipit, bobolink) are particularly vulnerable during construction in open fields throughout the breeding season. Wildlife mortality of young may also occur if active nests have been abandoned due to sensory disturbance and the young may not be able to escape the area. Nesting migratory birds are also more susceptible to mortality if individuals are unable to escape construction activities.

There is also an increased mortality risk for migratory birds due to potential vehicle collisions at the Project site, along the access road and roads in the Project area that will be used to bring in equipment and materials to the Project site and during water pipeline installation activities along the developed road allowances. The primary strategy to mitigate wildlife mortality during construction includes timing clearing outside of the migratory bird nesting period, outlined by Environment and Climate Change Canada (April 26 to August 15; EC 2016) to avoid mortality of ground-nesting or slow-moving wildlife during this sensitive period (i.e., nesting and rearing). However, given construction of a natural gas plant takes a minimum of 32 months to construct and there is a need for the Project to be operational by the fall of 2019, construction will need to occur at the Project facility site year round. As such, it will not be possible to avoid construction activities at the Project facility site during the migratory bird nesting period.

The proposed plan to mitigate potential effects to migratory birds at the Project facility site will be to conduct site clearing activities prior to the migratory bird nesting period to develop the area and remove the habitat in order to discourage migratory birds from establishing nests within the Project facility footprint. The noise and activity that will be occurring at the Project facility site prior to, and during, the migratory bird nesting period will likely discourage birds with a

low tolerance for disturbance from inhabiting the area around the Project facility. Birds that are less susceptible to disturbance may choose to inhabit the areas within the quarter section adjacent to the Project facility footprint. Construction equipment will be confined to travelling within the established site boundary and access road.

Regular inspections of the Project facility site and surrounding area within the quarter section will be conducted by the contractor and the environmental monitor, a qualified wildlife biologist, during construction activities that occur during the migratory bird nesting period to monitor for active nests and/or their sign (i.e., individuals displaying nesting behavior). If an active nest is encountered, a species appropriate buffer will be applied and work in that area will temporarily shut down until the young have naturally left the vicinity of the nest (i.e., fledged) and/or an acceptable mitigation plan is approved by the Saskatchewan Ministry of Environment (SK MOE) in consultation with Environment and Climate Change Canada.

Wildlife mortality will also be mitigated by maintaining speed limits on and off the Project site and along the water pipeline route to limit the risk of vehicle collisions with wildlife. Speed limits will be reduced in areas where species wildlife concerns or movement corridors have been identified. Collisions with wildlife will be reported to provincial regulators.

Construction of the water pipeline near migratory bird habitat (e.g., native prairie, tame pasture, wetlands) is scheduled to occur outside of the migratory bird nesting period, where possible. Construction is scheduled to begin in August 2017 and will continue into the winter of 2017/2018. The sensory disturbance associated with the water pipeline installation will be of short duration (4-5 months) and outside of the migratory bird nesting period.

The Project facility footprint (approximately 29.2 hectares) will remain disturbed for the life of the Project. Construction of the Project facility will result in a permanent loss of tame pasture and the loss of a small section of modified native vegetation (2.2 hectares). Given the careful siting of the Project facility, the wetlands located within the quarter section will remain undisturbed, thereby providing potential habitat for migratory birds during operation. Tame pasture is available within the Project area and can provide suitable habitat for migratory birds that may be displaced during construction and operation. Construction of a stormwater pond and evaporation pond with similar water quality as other natural habitats (see Table 2-8 and Section 5.5.3.1) will create habitat for wetland associated wildlife species including migratory birds. With wetland loss continuing throughout prairie Canada (Government of Canada 1991), this created habitat will benefit wetland associated wildlife species and migratory bird species.

Construction of the water pipeline will predominantly affect previously disturbed road allowances (i.e., ditches). Previously disturbed road allowances are typically less suitable habitat for migratory birds given the existing disturbance that occurs within, along and adjacent to the road allowances (e.g., vehicle traffic, maintenance activities such as grading and mowing, agricultural operations, etc.); however, some migratory bird habitat does occur along the water pipeline route alternatives (e.g., wetlands, natural drainage areas, etc.). The water pipeline will be installed underground and where a wetland or drainage area is encountered, either

horizontal directional drilling (HDD) methods will be used to install the pipeline under the wetland to avoid altering the wetland; or construction will occur during dry or frozen conditions to ensure minimal effects to the wetland. An Aquatic Habitat Protection Permit (AHPP) that outlines specific mitigation measures will be obtained from SK MOE prior to construction occurring near wetlands and SaskPower will follow any permit conditions issued to ensure minimal effects to the bed, bank and boundary of wetlands. The water pipeline right-of-way will be reclaimed after construction and it is expected that areas of suitable habitat (i.e., wetlands) will return to pre-construction levels during operation.

Direct habitat loss for migratory birds is not expected to occur during the operation and maintenance phases for the Project. Sensory disturbance during operation and maintenance may continue to result in indirect habitat loss by altering migratory bird habitat availability. The increase in noise levels near the facility during operation and maintenance may result in the displacement of migratory birds; however, some species may return after a period of acclimatization. No specific noise mitigation measures other than those proposed in the Noise Assessment in order to meet AUC Rule 012 – Noise Control are currently proposed (Appendix F).

Project-specific mitigation measures, along with standard industry practices and avoidance measures will be implemented during construction and operation and maintenance to reduce potential effects on migratory birds.

5.7.4 Environmental Effects on Federal Lands or to Other Jurisdictions

The Project facility is located on private land owned by SaskPower. The Project also includes a new underground water pipeline from the South Hill Reservoir located within the city limits of Swift Current. There are currently two preliminary water pipeline route alternatives being considered for the Project. The water pipeline will be routed within existing developed road allowances (i.e., ditches), where possible, that are owned by the Province of Saskatchewan (Her Majesty the Queen in Right of Saskatchewan). The road allowances in the Project area are operated by the Saskatchewan Ministry of Highways and Infrastructure, the RM of Swift Current or the City of Swift Current, depending on the location along the route. The road allowances along both water pipeline preliminary route options are adjacent to privately owned land zoned primarily for agricultural purposes. No federal lands are located along either of the potential pipeline options; therefore, changes to the environment are not expected to occur on federal lands as a result of carrying out the Project. The Project is not expected to cause any changes in the environment that would adversely affect lands outside of Saskatchewan.

5.8 CHANGES THAT MAY BE CAUSED BY THE PROJECT TO ABORIGINAL PEOPLES RESULTING FROM CHANGES TO THE ENVIRONMENT

Carrying out the Project is not expected to change the environment such that it would affect Aboriginal peoples, including impacts to Treaty Rights, health or 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. Additional detail is provided below.

- The Project facility is located on a quarter section that is owned by SaskPower. The water pipeline will be installed within developed road allowances owned by the Province of Saskatchewan. The road allowances along both water pipeline preliminary route options are adjacent to privately owned land zoned primarily for agricultural purposes and in many areas the cultivation extends into the road allowance. As such, the Project will not affect the ability of Aboriginal people to exercise Treaty Rights, or use, access or develop lands and resources currently used for traditional uses by Aboriginal peoples.

- Air dispersion modelling conducted for the Project shows that maximum predicted concentrations of the substances of interest are below the relevant regulatory objectives (SAAQS and CAAQS) for all averaging periods. The dispersion modelling indicates that the operation of the Project will not cause or contribute to a significant degradation of ambient air quality and that the predicted concentrations of Project related emissions will decrease with distance from the Project (Appendix E). The nearest Aboriginal home community is located approximately 120 km from the Project facility and therefore, adverse health effects to Aboriginal groups are not anticipated.

- Given that the Project will comply with AUC Rule 012 – Noise Control and that the nearest Aboriginal home community is located approximately 120 km from the Project facility, adverse noise effects on Aboriginal peoples are not expected.

- Swift Current Creek, located approximately 1.1 km from the proposed water line, is the closest known fish bearing water feature to the Project. Swift Current Creek will not be affected by the Project and therefore, adverse effects to fish and fish habitat and water are not anticipated.

- For water quality, the predicted aquatic concentrations of released elements to the evaporation pond were compared to the water quality guideline values for the protection of freshwater aquatic life (CCME 2008). All applicable parameters that had a screening level listed in the guidelines were below the ecological screening levels for freshwater aquatic life except for iron. However, the predicted iron concentration in the evaporation pond falls within the natural range of concentrations in prairie wetlands.

Adverse effects to water quality or wildlife that may temporarily use the evaporation ponds are not expected.

- The Project facility site is within a parcel (SE 13-16-15 W3M) that has been designated as "non-sensitive" for heritage resources (Appendix D). As such, the likelihood of impacting a heritage resource at the Project facility site is considered to be very low. Two areas of concern were identified along the two preliminary water pipeline route options. An HRIA may be required if the pipeline is proposed to be installed at either of these locations. If an HRIA is required and determines that one of these known archaeological sites (or a previously unrecorded archaeological site) is in conflict with the waterline development, mitigation options will be explored with the input of the HCB. There are no concerns with the remainder of either of the two proposed route alternatives, provided they remain within the developed portion of the road allowances. No other structures, sites or things that are of historical archaeological, paleontological, or architectural significance are currently known to exist within the Project facility or proposed water pipeline route options.

6.0 CUMULATIVE EFFECTS

6.1 EVALUATION OF CUMULATIVE EFFECTS

Cumulative environmental effects are residual effects on the environment that may result from the combined residual effects of the Project with the residual effects of other past, present and reasonably foreseeable future projects (SK MOE 2014a). Two criteria must be met to pursue an assessment of cumulative environmental effects:

- The Project is predicted to have residual effects on the resource feature.
- The Project's residual effects are predicted to act cumulatively with effects of other projects or physical activities.

These two criteria are assessed for each component following the assessment of Project effects. If these criteria are not met, there is no expectation that the Project will contribute to cumulative effects, and further evaluation is not warranted. If the two criteria are met, then the evaluation of cumulative effects is undertaken.

The focus of the evaluation of cumulative effects is on future conditions. Section 5 discusses current conditions, effects pathways, and residual effects for each of the VCs. The potential for cumulative effects is discussed in Section 6.

6.2 PAST, PRESENT AND KNOWN FUTURE PROJECTS

Past, present and known future projects (those that are licensed, under regulatory review or publicly announced) and activities within the RAA that could overlap spatially and temporally with residual Project effects are listed in Table 6-1. This inclusion list is current as of October 2016.

Table 6-1 Project and Activity Inclusion List

Activity Type	General Location	Description
Past and Present Activities and Resource Uses		
Agricultural Conversion	Dispersed throughout the area	Current and past agricultural conversion.
Residential Developments	Dispersed throughout the area	Residential and urban developments.
Linear Developments	Dispersed throughout the area	Roads, access trails, pipelines and railways.
Power Transmission Developments	Dispersed throughout the area	Electrical transmission lines, distribution lines and substations.
Other Resource Extraction Activities	Dispersed	Gravel pits, oil and gas facilities.
Swift Current Newalta Landfill Site	Adjacent to Project area	Existing landfill located directly east of the Project.
Future Activities		
Natural Gas Line	Project area	Connection to the Project.
Electrical Transmission Line	Project area	Connection to the Project.
Pasqua to Swift Current 230 kV Transmission Line	Between Moose Jaw and Swift Current, SK	Installation of new 230 kV transmission line.

The evaluation considers the interaction of the Project's residual effects with past and present activities and resource uses and future activities within the RAA. Residual effects from these other physical activities and projects may interact with those of the Project. Where residual effects from the Project have the potential to act cumulatively with those from other physical activities and projects, the cumulative effects are discussed further.

6.3 PROJECT EFFECTS WITH POTENTIAL TO ACT CUMULATIVELY

Of the Project residual effects discussed in Section 5, four are likely to act in a cumulative manner with other activities and projects in the RAA:

- Change in ambient air quality;
- Change in vegetation and wetlands;
- Change in wildlife habitat; and
- Change in land use.

Other Project residual effects are not expected to act in a cumulative manner as mitigation measures are expected to reduce the Project's effects to levels that are unlikely to interact with those of the other Projects or activities.

6.3.1 Cumulative Effects Assessment and Mitigation

Each residual Project effect with potential to act in a cumulative manner is discussed below. Additional mitigation options available to manage cumulative effects are discussed, where appropriate.

6.3.1.1 Cumulative Effect Mechanisms and Mitigation for Change in Ambient Air Quality

In general, air quality within the RAA is considered to be good with periodic reductions in air quality primarily related to farming and nearby oil and gas activities. Construction and operation and maintenance of the Project are expected to cause a change in ambient air quality within the RAA. Although the concentrations of Project related emissions will decrease with the distance from the PDA, it is expected that these emissions will act cumulatively with emissions from nearby oil and gas operations and the Swift Current Newalta Landfill located to the east of the Project. Additionally, it is expected emissions from the Project will act cumulatively with dust and emissions from adjacent farming and agricultural activities. Dispersion modelling indicates that the emissions during the construction and operation and maintenance phases of the Project are below the relevant regulatory objectives. Given that the Project is sited within a primarily agricultural landscape with limited activity, cumulative effects on air quality are not expected to exceed regulatory objectives in the RAA.

6.3.1.2 Cumulative Effect Mechanisms and Mitigation for Change in Vegetation and Wetlands

The Project will result in a change in vegetation, including the loss of approximately 2.2 ha of modified native vegetation, which is approximately 7.5% of the PDA. Wetlands along the water pipeline will be avoided through the use of HDD installation under the wetlands, where feasible. Where not feasible, construction will occur during dry or frozen conditions and effects will be temporary. Other past, present and future projects in the RAA, such as land conversion for agriculture, the proposed Pasqua to Swift Current 230 kV Transmission Project and residential developments have the potential to cause changes in vegetation land cover.

Most cumulative effects on vegetation typically occur during construction of these projects, with lesser effects remaining during operation. Development projects such as the proposed Pasqua to Swift Current 230 kV Transmission Project will be subject to reclamation or natural recovery, as required. As a result, the total amount of vegetation land cover to be affected by the Project and other projects and activities in the RAA is relatively small and the cumulative effects on vegetation and wetlands are expected to be negligible.

6.3.1.3 Cumulative Effect Mechanisms and Mitigation for Change in Wildlife Habitat

The RAA is predominantly agricultural land (tame pasture). Project-related changes in wildlife habitat abundance or suitability relate to the loss of tame pasture and modified native vegetation which could be used by some wildlife species. As well, vegetation along the water

pipeline route can provide some wetland habitat. Future projects such as transmission line construction within the RAA have the potential to result in a loss of vegetation land cover, potentially affecting wildlife habitat availability. For known projects, this represents a very small percentage of wildlife habitats available in the RAA. Cumulative habitat loss is not expected to have population-level effects on wildlife in the RAA.

6.3.1.4 Cumulative Effect Mechanisms and Mitigation for Change in Land Use

Land use within the Project area is primarily agricultural with a small amount of native land cover. At the Project facility site, construction and operation and maintenance of the Project will take 27 ha of agricultural land (tame pasture) out of production and cause the removal of 2.2 ha of modified native vegetation. Land use is not expected to change along the water pipeline route.

Other projects and activities within the RAA may also affect land use during their construction and operation and maintenance phases. However, projects such as the proposed Pasqua to Swift Current 230 kV Transmission Project will be subject to reclamation activities and therefore most changes to land use will be temporary. Other future Projects have potential to affect land use and agricultural activities; however, the majority of the land use within the RAA is agricultural and the extent of cumulative effects on the change in land use will cover only a small portion of the RAA.

6.3.2 Residual Cumulative Effects

Within the RAA, the only known future projects include the proposed Pasqua to Swift Current 230 kV Transmission Project, and potential water and natural gas pipelines that are required for the operation of the Project. Under such existing and future development conditions, the potential environmental effects expected to overlap with other projects are expected to be limited and short-term in nature.

The residual cumulative environmental effects of a change in air quality during all phases of the Project is expected to be within regulatory standards. During construction and operation of the Project, the amount of wildlife habitat to be affected is a small proportion of the RAA.

It is expected that other projects will have made reasonable commitments to mitigate environmental effects and may be subject to additional mitigation measures related to the conditions of approval.

7.0 ENVIRONMENTAL MONITORING PROCEDURES

This section outlines the environmental monitoring procedures that will be used during construction and operation of the Project. To minimize and monitor the effects of construction on the environment, evaluate mitigation effectiveness, and plan for post-construction reclamation, SaskPower will use experienced, independent, third party environmental monitors. The environmental monitors' principal roles and responsibilities are to provide on-site environmental guidance to contractors and crews on behalf of SaskPower. This includes confirming that construction contractors are aware of environmental concerns, that the necessary mitigation measures related to construction are in place and unexpected environmental issues are addressed in collaboration with SaskPower's Environment Department.

7.1 GENERAL CONSTRUCTION MONITORING

Environmental monitors will work collaboratively with SaskPower and Project personnel to identify and address environmental issues and confirm compliance with specific regulatory requirements for the Project. The environmental monitors will be provided with a list of mitigation and environmental protection measures specific to this Project, which may include environmental permits and conditions that must be followed, field studies data, and any other pertinent information. SaskPower will conduct a pre-construction start-up meeting for all personnel prior to construction commencing and environmental issues will be discussed. The environmental monitors will be responsible for managing the environmental aspects of construction in collaboration with the contractor and SaskPower. The SaskPower construction manager will support the environmental monitor in enacting environmental protection and mitigation measures.

Environmental monitors will perform ground patrols and regularly report environmental issues and/or concerns to SaskPower Environment. This includes the effects of construction activities on soil, vegetation, wetlands, and wildlife. A key role of the monitor will be to provide guidance to the contractors so Project activities do not result in disturbances beyond what is necessary and mitigation measures are implemented to reduce adverse environmental effects. Environmental monitors will also work with SaskPower staff and construction contractors and crews to proactively identify environmental issues and/or concerns. Environmental monitors will have the written authority to temporarily halt activities that may cause unacceptable environmental effects or result in non-compliance with Project specific permit conditions, laws and regulations. Environmental monitors, on behalf of SaskPower, will observe and confirm that:

- Construction equipment is clean and in good working condition prior to construction activities commencing;
- Proactive observation and contingency planning are used to identify and mitigate unforeseen impacts;

- No-equipment zones are flagged prior to construction occurring in or near sensitive areas (e.g., wetlands);
- Regulatory agencies are kept informed of environmental issues that may arise during construction;
- Mitigation measures identified in this proposal are implemented; and
- Effectiveness of mitigation measures are evaluated and where necessary, improved upon.

Depending on the timing of construction, environmental monitors will be present during construction activities near the wetlands and listed wildlife occurrences. During construction, the environmental monitors will perform the following duties:

- Conduct site inspections of identified environmentally sensitive areas before, during, and after construction activities;
- Identify any new environmentally sensitive areas not previously accounted for to accommodate seasonal variations;
- Provide guidance to SaskPower and contractors with regard to site-specific mitigation procedures;
- Compile data and descriptive information pertinent to environmental mitigation for inclusion in a post-construction report; and
- Communicate regularly with SaskPower Environment regarding construction progress and implementation of mitigation measures.

7.2 WILDLIFE MONITORING

Environmental monitoring will be used to see that potential adverse environmental effects to wildlife are reduced. Monitoring will be used to provide specific advice and feedback during construction in relation to wildlife and wildlife habitat. Given construction will occur during the nesting period for migratory birds and sensitive bird species, regular inspections of the Project site will be conducted by either the contractor and/or the environmental monitor to monitor for species and their nests and if one is encountered, work in that area will temporarily shut down until an acceptable mitigation plan is approved by SK MOE.

7.3 POST-CONSTRUCTION MONITORING

Post-construction monitoring will be carried out to confirm that reclamation, weed control or other implemented mitigation measures requiring monitoring are successful. Areas disturbed during the Project will be inspected the following growing season to assess the success of any reclamation efforts undertaken and to assess the necessity for any remedial follow-up work. Guidelines for determining reclamation success will follow those outlined by current industry accepted standard documents that include, but are not limited to, provincial guidelines (e.g.,

Saskatchewan Agriculture and Food 1997), as well as those outlined in SaskPower's Environmental Best Management Practices Manual.

7.4 MONITORING DURING OPERATIONS

It is anticipated that ongoing environmental monitoring requirements during operation of the Project will be established during the permitting stage. SaskPower anticipates monitoring groundwater quality at the evaporation pond and absorption field and implementing corrective actions if effects on groundwater occur. In addition, air emissions will be monitored through the Continuous Emissions Monitoring System (CEMS) and reported on a regular basis to SK MOE.

8.0 CONCLUSION

To meet the growing demand for power in the province of Saskatchewan, provide replacement power for the retirement and/or refurbishment of conventional coal-fired generating units and allow for the integration of intermittent renewables, there is a need to build a new large-scale power plant that can generate electricity by 2019. SaskPower is proposing to build a new nominal 350 MW combined cycle natural gas facility northwest of Swift Current, Saskatchewan. The Project, as proposed, is the most cost-effective solution to meet increasing electricity demand as well as replace existing conventional coal-fired generation within the timelines required. It will also result in an overall reduction of GHG and other air emissions.

SaskPower is targeting a 40% reduction in GHG emissions from 2005 levels by 2030, exceeding the national target of a 30% reduction. To achieve this target, SaskPower will transition its conventional coal-fired generation facilities to lower GHG emitting supply options including carbon capture and sequestration, natural gas, and renewables. Natural gas generation is a key component to achieving both an increase in renewable capacity and GHG emissions reduction given that natural gas power stations that utilize a combined cycle design emit 40% as much carbon dioxide as conventional coal-fired generation in Saskatchewan and provides an ideal back-up to intermittent renewable generation options such as wind and solar. As SaskPower phases out conventional coal-fired generation, deploys carbon capture and storage technology, and adds natural gas and renewables into its system, GHG emission levels will significantly improve.

SaskPower has developed this Project Description to describe the Project and to meet both federal and provincial requirements. This document identifies existing environmental conditions, potential environmental effects pathways, and proposed mitigation. SaskPower is committed to ensuring that the Project is compliant with regulatory requirements, and commitments made in this document.

Potential environmental effects of the Project include effects to the atmospheric environment. However, plume dispersion modelling completed for the Project shows that maximum predicted concentrations of the substances of interest are below the relevant regulatory objectives (i.e., SAAQS and CAAQS) for all averaging periods.

The facility is expected to emit between 365 kg/MWh and 382 kg/MWh of CO_2 when operating at full load assuming a new and clean condition. The facility will have a best in class heat rate, resulting in high efficiency and lower CO_2 emissions. The overall efficiency of the plant will approach 58%, resulting in an emission rate below 420 kilogram (kg) CO_2e per megawatt hour (MWh). The Project GHG emissions represent approximately 1.4% and 0.14% of provincial and national GHG emissions for 2013, respectively.

Based on the predicted Project noise emissions and the mitigation strategies to be compliant with AUC Rule 012, effects to the acoustic environment are anticipated to be limited.

Conclusion

The Project is not expected to affect terrain integrity, and with mitigation, residual effects on soil quality are not expected. The primary concern for vegetation is the loss of a small portion of modified native vegetation. Similarly, this is the primary concern for wildlife due to the habitat associated with these land cover types. To mitigate these effect pathways, the Project has been sited predominantly on agricultural land (tame pasture), in existing developed road allowances, and to avoid wetlands and watercourses. Discussions are currently underway with regulators to examine mitigation options for species of management concern and features that are present in the Project area including the lek and northern leopard frog.

No fish or fish habitat as defined by the *Fisheries Act* will be affected by the Project. No aquatic species listed under SARA occur within the Project area. Potential effects to migratory birds, as defined in the *Migratory Birds Convention Act,* will be mitigated through the implementation of project-specific mitigation measures, along with standard industry practices and avoidance measures during construction and operation and maintenance.

Effects on the human environment, including land use, will be limited because SaskPower owns the quarter section designated for development of the Project and the water pipeline will be installed where possible within developed road allowances owned by the Province of Saskatchewan. The Project is expected to have positive effects on the economy, especially during construction. Crown lands do not occur within the PDA and no effects to these resources are expected.

No federal lands are located within the Project facility site or along the two preliminary water pipeline options; therefore changes to the environment are not expected to occur on federal lands as a result of carrying out the Project. The Project is also not expected to cause any changes in the environment that would adversely affect lands outside of Saskatchewan.

Carrying out the Project is not expected to change the environment such that it would affect Aboriginal peoples, including impacts to Treaty Rights, health or 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.

Environmental design measures have been implemented into Project planning in several ways, including during Project siting and the selection of Project components and activities in order to reduce or avoid potential effects to biophysical resources. SaskPower has engaged regulatory agencies, the public, and other stakeholders (e.g., RMs, local communities, etc.) to provide input on the Project and to identify issues. This engagement has allowed SaskPower to better understand specific Project issues and opportunities, which has facilitated Project planning. SaskPower will continue to engage stakeholders in order to understand and address any issues or concerns throughout the planning, construction and operation of the Project.

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Appendix A CONCORDANCE TABLE

Appendix A Concordance Table

	Required Information as Stated in the *Guide to Preparing a Description of a Designated Project under the Canadian Environmental Assessment Act, 2012*	**Location of Information in the Project Description**
1.1	Describe the nature of the designated project, and proposed location.	1.2, 2.1, 2.5
1.2	Proponent contact information.	1.4.1
1.2.1	Name of the designated project.	1.4.1
1.2.2	Name of the proponent.	1.4.1
1.2.3	Address of the proponent.	1.4.1
1.2.4	Chief Executive Officer or equivalent (including name, official title, email address and telephone number).	1.4.1
1.2.5	Principal contact person for purposes of the Project Description (include name, official title, email address and telephone number).	1.4.1
1.3	List of any jurisdictions and other parties including Aboriginal groups and the public that were consulted during the preparation of the project description.	3.1, 3.2.1, 3.2.4
1.4	Information on whether the designated project is subject to the environmental assessment and/or regulatory requirements of another jurisdiction(s).	1.9.2, 1.9.3, 1.9.4
1.5	Information on whether the designated project will be taking place in a region that has been the subject of an environmental study.	1.9.1
2.1	General description, including the context and objectives of the project. Indicate whether the designated project is a component of a larger project that is not listed in the *Regulations Designating Physical Activities*.	1.9.1
2.2	Provisions in the *Regulations Designating Physical Activities* that describe the designated physical activities that are proposed to be carried out as a part of the designated project.	1.9.1
2.3	**Components and Activities**	
2.3.1	Describe the 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.	2.2, 2.3
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. The production capacity does not refer to the planned production capacity of a project but the maximum production capacity based on the project's design and operating conditions.	2.4
2.3.3	If the designated project or one component of the designated project is an expansion, describe the size and nature of the expansion with reference to the thresholds set out in the *Regulations Designating Physical Activities*.	1.9.1

Appendix A Concordance Table

	Required Information as Stated in the *Guide to Preparing a Description of a Designated Project under the Canadian Environmental Assessment Act, 2012*	**Location of Information in the Project Description**
2.3.4	Description of the physical activities that are incidental to the designated project. In determining such activities, the following criteria shall be taken into account: • nature of the proposed activities and whether they are subordinate or complementary to the designated project; • whether the activity is within the care and control of the proponent; • if the activity is to be undertaken by a third party, the nature of the relationship between the proponent and the third party and whether the proponent has the ability to "direct or influence" the carrying out of the activity; • whether the activity is solely for the benefit of the proponent or is available for other proponents as well; and, • the federal and/or provincial regulatory requirements for the activity.	2.3.2
2.4	**Emissions, discharges and waste**	
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.	2.6.1
2.4.2	Sources and location of liquid discharges.	2.6.2
2.4.3	Types of wastes and plans for their disposal (e.g., landfill, licenced waste management facility, marine waters, or tailings containment facility).	2.6.3
2.5	**Construction, operation, decommissioning and abandonment phases and scheduling.**	
2.5.1	Anticipated scheduling, duration and staging of key project phases, including preparation of the site, construction, operation, decommissioning and abandonment.	2.7.1, 2.7.2, 2.7.3, 2.7.4
2.5.2	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).	2.5, 2.7
3.1	**Description of the designated project's location**	
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.	1.5
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.	Table 2.1 and Figure 2.1

	Required Information as Stated in the *Guide to Preparing a Description of a Designated Project under the Canadian Environmental Assessment Act, 2012*	**Location of Information in the Project Description**
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: • watercourses and waterbodies with names where they are known; • linear and other transportation components (e.g., airports, ports, railways, roads, electrical power transmission lines and pipelines); • other features of existing or past land use (e.g., archaeological sites, commercial development, houses, industrial facilities, residential areas and any waterborne structures); • location of Aboriginal groups, settlement land (under a land claim agreement) and, if available, traditional territory; • federal land including, but not limited to National parks, National historic sites, and reserve lands; • nearby communities; • permanent, seasonal or temporary residences; • fisheries and fishing areas (i.e., Aboriginal, commercial and recreational); • 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, • provincial and international boundaries.	Figures 1.1, 4.1, 4.2, 5.2, 5.3 and 5.4
3.1.4	Photographs of work locations to the extent possible.	5.4.2, Appendix I and Appendix J
3.1.5	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.	4.1.12 and 5.6.2.1
3.2	**Land and Water Use:**	
3.2.1	Information on zoning designations.	1.5, 1.9.4, 5.6.2.1 and 5.6.3.2
3.2.2	Legal description of land to be used (including information on sub-surface rights) for the designated project, including the title, deed or document and any authorization relating to a water lot.	Appendix B
3.2.3	Any applicable land use, water use (including ground water), resource management or conservation plans applicable to or near the project site. Include information on whether such plans were subject to public consultation.	5.6.2.1

Appendix A Concordance Table

	Required Information as Stated in the *Guide to Preparing a Description of a Designated Project under the Canadian Environmental Assessment Act, 2012*	**Location of Information in the Project Description**
3.2.4	Description on 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.	4.1.12, 5.8
4.1	Description on if there is any proposed or anticipated federal financial support that federal authorities are, or may be, providing to support the carrying out of the designated project.	1.9.1.1
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).	1.9.1.1, 5.7.4
4.3	List of any federal permits, licences or other authorizations that may be required to carry out the project.	1.9.1.1, 1.9.4, 1.9.5
5.1	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).	4.1
5.2	Description of any changes that may be caused as a result of carrying out the designated project to: (a) fish and fish habitat, as defined in the *Fisheries Act*; (b) marine plants, as defined in the *Fisheries Act;* and, (c) migratory birds, as defined in the *Migratory Birds Convention Act, 1994*.	5.7.1, 5.7.2, 5.7.3
5.3	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.	5.7.4
5.4	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.	3.2, 4.1.11, 4.1.12, 5.8
6.1	List of Aboriginal groups that may be interested in, or potentially affected by, the designated project.	3.2.1
6.2	Description of the engagement or consultation activities carried out to date with Aboriginal groups, including: • 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).	3.2.1

	Required Information as Stated in the *Guide to Preparing a Description of a Designated Project under the Canadian Environmental Assessment Act, 2012*	**Location of Information in the Project Description**
6.3	Overview of key comments and concerns expressed by Aboriginal groups identified or engaged to date, including any responses provided to these groups.	3.2.2
6.4	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).	3.2.1, 3.2.6
7.1	An overview of key comments and concerns expressed to date by stakeholders and any responses that have been provided.	3.2.5
7.2	An overview of any ongoing or proposed stakeholder consultation activities.	3.2.6
7.3	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.	3.2.3, 3.2.4

Appendix B LEGAL LAND TITLE AND HISTORICAL AIR PHOTOS

1955 AERIAL PHOTO	SE 13–16–15 W3 NEAR SWIFT CURRENT, SK	SCALE 1:6,000

8.5"X11" PLOT SCALE: 1:1

1961 AERIAL PHOTO	SE 13–16–15 W3 NEAR SWIFT CURRENT, SK	SCALE 1:7,500

8.5"X11" PLOT SCALE: 1:1

1987 AERIAL PHOTO	SE 13–16–15 W3 NEAR SWIFT CURRENT, SK	SCALE 1:8,000

8.5"X11" PLOT SCALE: 1:1

1997 AERIAL PHOTO	SE 13–16–15 W3 NEAR SWIFT CURRENT, SK	SCALE 1:8,000

8.5"X11" PLOT SCALE: 1:1

2010 AERIAL PHOTO	SE 13–16–15 W3 NEAR SWIFT CURRENT, SK	SCALE 1:6,000

8.5"X11" PLOT SCALE: 1:1

Information Services Corporation

Quick Search Results

Search By: Land Description

With Criteria: Quarter Section = SE
Section = 13
Township = 16
Range = 15
Meridian = 3
As Of Date = 25 May 2016 12:11:50

Title Information

Download To Spreadsheet (.CSV)

Land Description
SE 13-16-15-3 Ext 2

Owner(s)
SASKATCHEWAN POWER CORPORATION

	Number	Share	Title Lock Information
Title	$147942849	1/1	N/A

Last Amendment Date	Old Land Description
02 Mar 2016 13:55:44.053	

Parcel	Parcel Type	Municipality	Ties
203197574	Surface Regular	RM OF SWIFT CURRENT NO. 137	

Validated Ties	Commodity / Unit	Linked to Unit
	N/A	N/A

Land Description
Blk/Par A-Plan 102210208 Ext 0

Owner(s)
SASKATCHEWAN POWER CORPORATION

	Number	Share	Title Lock Information
Title	$147942850	1/1	N/A

Last Amendment Date	Old Land Description
02 Mar 2016 13:55:44.187	

Parcel	Parcel Type	Municipality	Ties
203197585	Surface Regular	RM OF SWIFT CURRENT NO. 137	

Validated Ties	Commodity / Unit	Linked to Unit
	N/A	N/A

Land Description
Blk/Par H-Plan 102015155 Ext 0

Owner(s)
Her Majesty The Queen in Right of Saskatchewan

	Number	Share	Title Lock Information
Title	$140496475	1/1	N/A

Last Amendment Date	Old Land Description
30 Mar 2011 16:20:04.377	

Parcel	Parcel Type	Municipality	Ties
165218306	Surface Regular	RM OF SWIFT CURRENT NO. 137	

Validated Ties	Commodity / Unit	Linked to Unit
	N/A	N/A

Land Description
SE 13-16-15-3 Ext 0
As described on Certificate of Title 95SC01720.

Owner(s)			
Her Majesty the Queen in Right of Saskatchewan			
	Number	**Share**	**Title Lock Information**
Title	123102289	1/2	Uncertified Mineral Title-Producing Area-Transfer Permitted

Last Amendment Date	Old Land Description
21 Aug 2007 08:27:23.317	

Parcel	Parcel Type	Municipality	Ties
151618732	Mineral	RM OF SWIFT CURRENT NO. 137	

Validated Ties	Commodity / Unit	Linked to Unit
	All mines and minerals as referenced on Certificate of Title 95SC01720	N/A

Land Description
SE 13-16-15-3 Ext 0 As described on Certificate of Title 95SC01720.

Owner(s)			
PRAIRIESKY ROYALTY LTD.			
	Number	**Share**	**Title Lock Information**
Title	134248215	1/2	N/A

Last Amendment Date	Old Land Description
21 Aug 2007 08:27:23.533	

Parcel	Parcel Type	Municipality	Ties
151618732	Mineral	RM OF SWIFT CURRENT NO. 137	

Validated Ties	Commodity / Unit	Linked to Unit
	All mines and minerals as referenced on Certificate of Title 95SC01720	N/A

4 Records

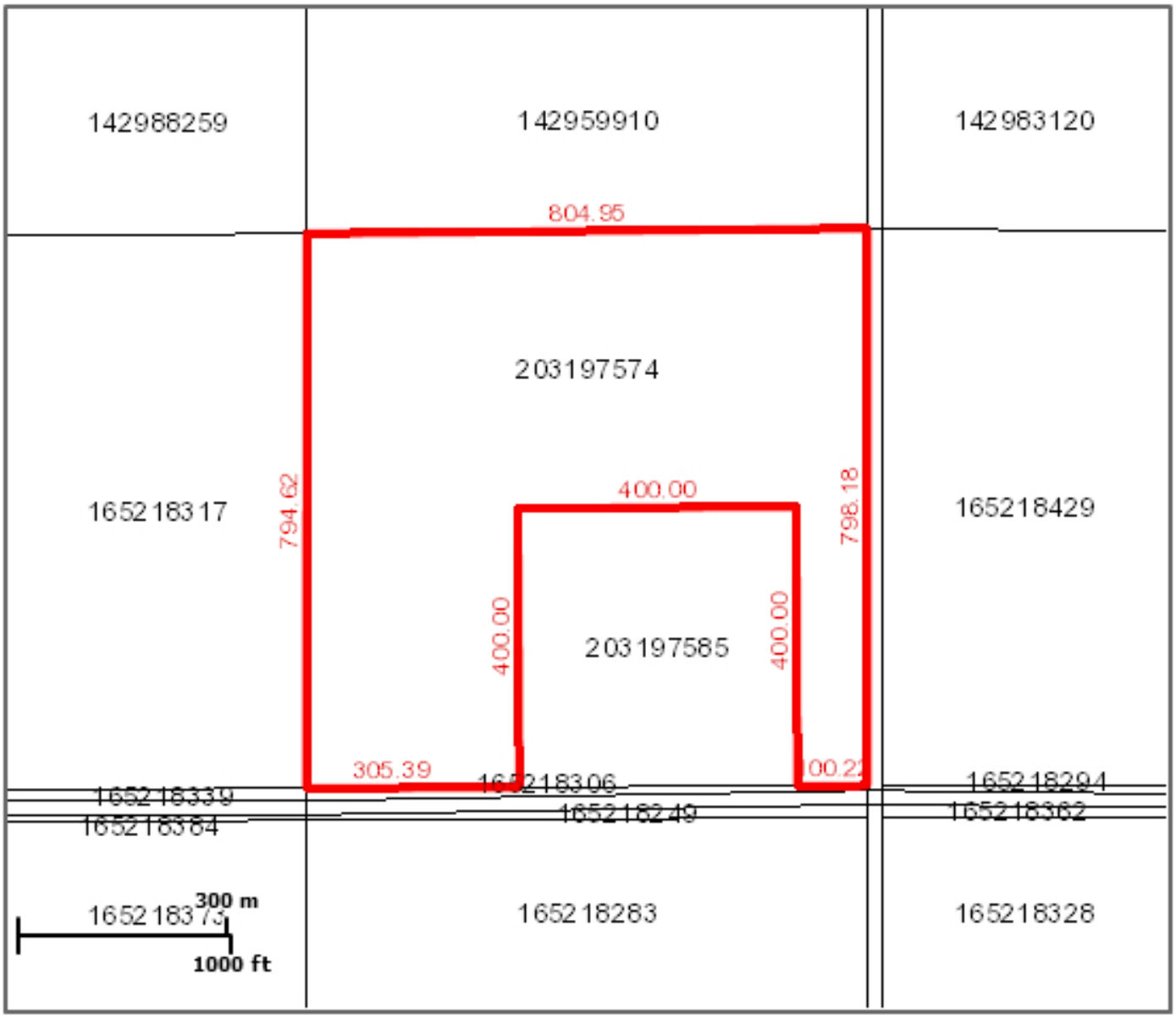
Back to Search

Back to top

Information Services Corporation

Surface Parcel Number: 203197574

REQUEST DATE: Wed May 25 12:16:10 GMT-0600 2016



Scale: 1:18056

Owner Name(s): SASKATCHEWAN POWER CORPORATION

Municipality: RM OF SWIFT CURRENT NO. 137

Area: 48.13 hectares (118.93 acres)

Title Number(s): 147942849

Converted Title Number: 73SC06094

Parcel Class: Parcel (Generic)

Ownership Share: 1:1

Land Description: SE 13-16-15-3 Ext 2

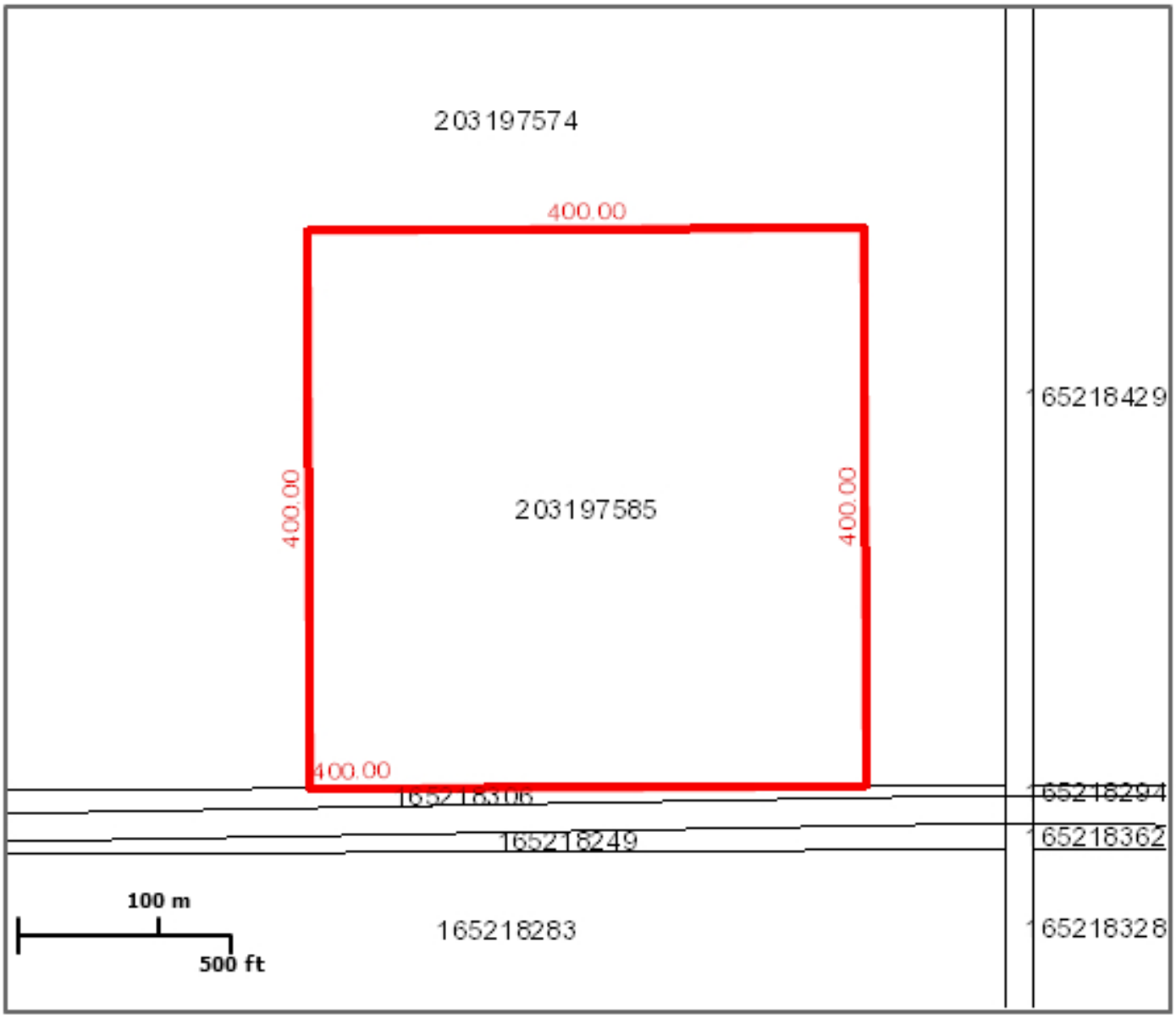
Source Quarter Section: SE-13-16-15-3

Commodity/Unit: Not Applicable

Information Services Corporation

Surface Parcel Number: 203197585

REQUEST DATE: Wed May 25 12:17:15 GMT-0600 2016



Scale: 1:9028

Owner Name(s): SASKATCHEWAN POWER CORPORATION

Municipality: RM OF SWIFT CURRENT NO. 137

Area: 16 hectares (39.54 acres)

Title Number(s): 147942850

Converted Title Number: 73SC06094

Parcel Class: Parcel (Generic)

Ownership Share: 1:1

Land Description: Blk/Par A-Plan 102210208 Ext 0

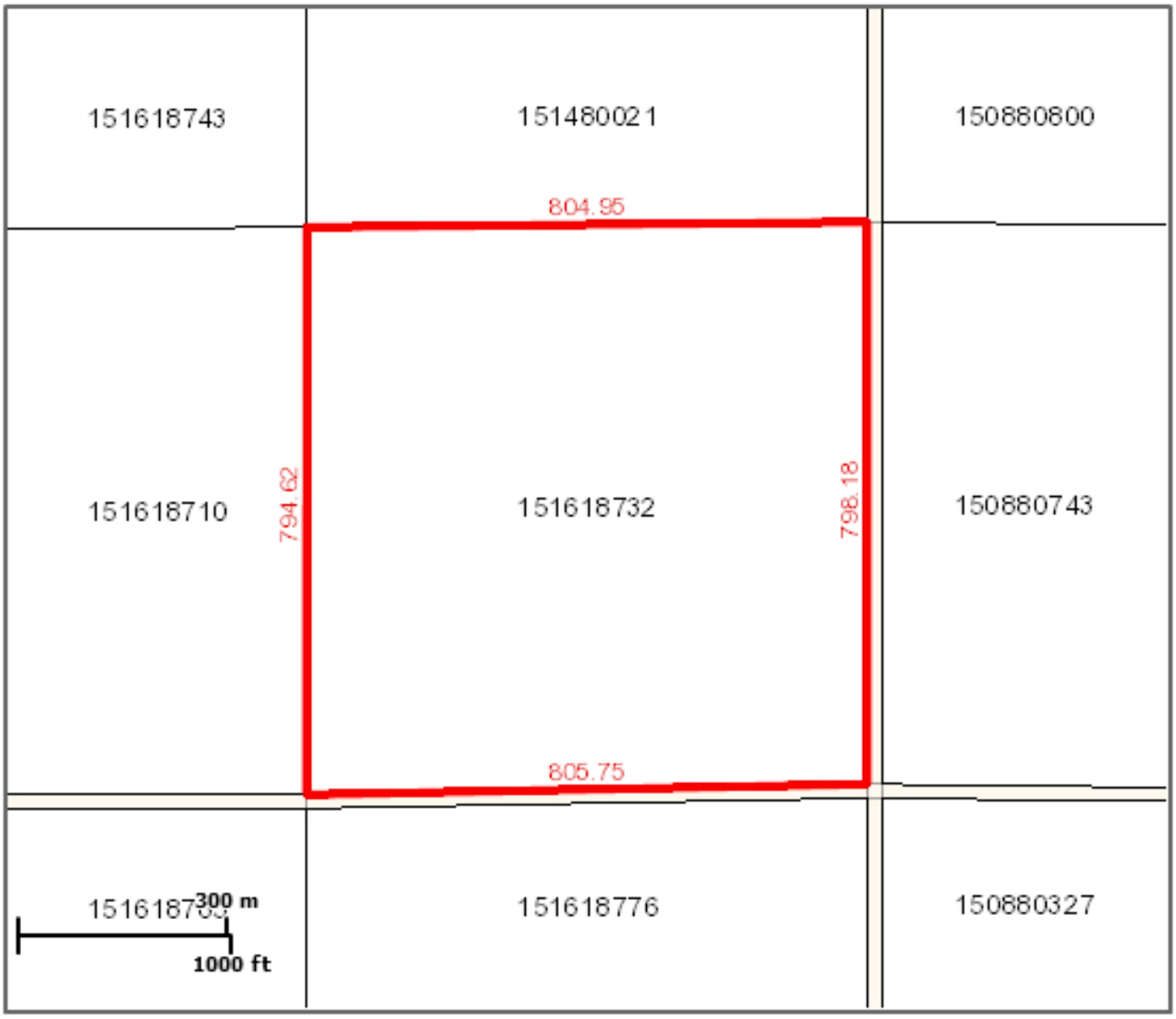
Source Quarter Section: SE-13-16-15-3

Commodity/Unit: Not Applicable

Information Services Corporation

Mineral Parcel Number: 151618732

REQUEST DATE: Wed May 25 12:18:15 GMT-0600 2016



Scale: 1:18056

Owner Name(s): Multiple

Municipality: RM OF SWIFT CURRENT NO. 137

Title Number(s): Multiple

Parcel Class: Mineral

Land Description: SE 13-16-15-3 Ext 0

Source Quarter Section: SE-13-16-15-3

Commodity/Unit: Multiple

Area: 65.15 hectares (160.99 acres)

Converted Title Number: N/A

Ownership Share: N/A

Appendix C STAKEHOLDER LETTER

Stakeholder Engagement
8SE – 2025 Victoria Avenue
Regina SK Canada S4P 0S1
Phone 306-566-1008
Fax 306-566-3131
Toll-Free 855-566-1008

February 10, 2016

LETTER TO STAKEHOLDERS

Dear Sir and/or Madam:

Re: Combined Cycle Gas Turbine Facility

To meet the growing demand for power in the Province, there is a need to build a new large-scale power plant that can generate electricity by 2019. On June 12, 2015, Premier Brad Wall and SaskPower President and CEO Mike Marsh, announced that a new natural gas power plant will be built near Swift Current. The future plant will be located on a 158-acre site adjacent to the Swift Current industrial landfill.

In order to ensure the best value for the province, SaskPower is conducting a competitive procurement process to determine if the project will be built by SaskPower or by an independent power producer. The Crown Investment Corporation (CIC) will be monitoring and evaluating the process. There are six companies participating in this process, one of which is SaskPower.

Initial consultation with potentially affected and interested stakeholders is an important component of SaskPower's bid submission. If SaskPower wins the bid to develop this project, further consultation will be undertaken to share information about the project and ensure questions and concerns are understood and addressed.

SaskPower's proposal for this project includes:

- construction of a facility with one gas and one steam turbine, generating between 250 and 350 megawatts (MW) of power
- construction of supporting infrastructure including an access road, exhaust stack and administration building
- water supply from one of the following options:
    - water wells
    - potable water from the City of Swift Current – if selected a pipeline will be built to the City Water Reservoir
    - effluent water from the City of Swift Current – if selected a pipeline will be built to the City Water Treatment Plant
- noise and air quality parameters well within established industry standards
- installation of a continuous emissions monitoring system that will ensure Provincial and Federal emission regulations are met
- permanent operating staff of approximately 20 employees
- local business opportunities for maintenance and site services

… /2

- options for Aboriginal participation
- operation date of October 1, 2019

Additional infrastructure required for the plant includes a gas line supplied by Transgas and a new transmission line supplied by SaskPower.

Development of this new natural gas power plant will require review and approval from the Saskatchewan Ministry of Environment (MOE) and the Canadian Environmental Assessment Agency (CEAA) and must comply with all applicable municipal, provincial and federal legislation and regulations. During operation of the plant, the project must comply with well-established air emissions standards including Saskatchewan's Ambient Air Quality Standards (AAQS) and Canada-Wide Standards (CWS).

We would like to hear from you. Attached is a brief survey form and postage-paid return envelope. We would appreciate if you would take a few minutes to provide us with your initial thoughts on our proposal for this project and any questions or concerns you may have.

Thank you for your interest and we look forward to hearing from you.

Sincerely,

Myrna Broadfoot
Stakeholder Engagement

COMBINED CYCLE GAS TURBINE PROJECT

We appreciate your interest in the new natural gas power plant project. To enable us to understand your priorities and concerns about this project, it would be helpful if you could take a few moments to answer the following questions.

Based on your knowledge of natural gas generation, do you have any concerns about the development of this project near Swift Current?

_____

_____

_____

What are your top three priorities for development of this project?

- ☐ Cost of project
- ☐ Supply of clean, reliable power
- ☐ Employment opportunities
- ☐ Water use
- ☐ Land use
- ☐ Air quality
- ☐ Noise levels
- ☐ Other (Please specify):

_____

How would you like to be consulted on the development of this project?

- ☐ Attending an open house
- ☐ Written communications
- ☐ Participating in a Focus Group
- ☐ Electronic communications
- ☐ Online surveys
- ☐ Other (Please specify):

_____

Please provide the following information:

Name _____

Mailing Address _____

Postal Code _____Phone _____ Email _____

Contact us at:

Mail: SaskPower, Stakeholder Engagement
8SE, 2025 Victoria Avenue, Regina, SK. S4P 0S1
Phone: 1-855-566-1008
Fax: 1-306-566-3131
Email: mbroadfoot@saskpower.com

Appendix D HERITAGE SCREENING RESULTS

Government of Saskatchewan

PARKS, CULTURE AND SPORT

ABOUT PARKS, CULTURE AND SPORT

Inquiry was made on May 24, 2016 at 3:31 PM
You are inquiring about the heritage sensitivity of the following land location:

Quarter-section:
SE
Section:
13
Township:
16
Range:
15
Meridian:
3

This quarter-section is NOT heritage sensitive.

It is not necessary to submit the project to the Heritage Conservation Branch for screening. These results can be printed for submission to other regulatory bodies (e.g. Saskatchewan Environment, Saskatchewan Industry and Resources). Please email **arms@gov.sk.ca** if you have any questions.

Inquiry was made on May 24, 2016 at 3:31 PM

Appendix E AIR

E.1 DETAILED CO_{2E} EMISSION CALCULATIONS

Maximum Annual Emission Rates - Tonnes Per Year

Pollutant	Combined-Cycle Combustion Turbine[a] (tonnes per year)	Dew Point Heater (tonnes per year)	Emergency Diesel Fire Pump (tonnes per year)	Emergency Diesel Generator (tonnes per year)	Total (tonnes per year)
CO_2	1,035,610	1,735.1	17.9	73.4	1,037,437
CH_4	18.7	0.03	0.001	0.003	18.7
N_2O	1.9	0.003	0.0001	0.001	1.9
CO_2e	1,036,634	1,737	18	74	**1,038,463**

a) Represents 100% annual average ambient unfired scenario

Assumptions

Unit	Limitation	Units
Combined Cycle Operation	7,446	Hours Per Year
Number of Cold Startups per year	50	Events Per Year
Hours of Startup/Shutdowns per year	85	Hours Per Year
Natural Gas Dew Point Heater	7,446	Hours Per Year
Emergency Diesel Fire Pump	100	Hours Per Year
Emergency Diesel Generator	100	Hours Per Year

Combined Cycle Combustion Turbine

Operating Load: 1x100% Annual Avg Ambient Unfired

Pollutant	Emission Factor[A] (lb/MMBtu)	CO_2 Emission Rate (lb/hr)	CO_2 Emission Rate (tons/yr)	Startup/ Shutdown (tons/yr)	Max Total Turbine Emissions
CO_2	--	308,915.2	1,136,962.4	4,602.3	1,141,564.7
CH_4	0.0022	5.5	20.4	0.2	20.6
N_2O	0.00022	0.6	2.0	0.0	2.1

A Federal Register - Subpart C of Part 98

Dew Point Heater

Size	3.73	MMBtu/hr
HHV	1,020	Btu/cf
Operation	8,760	hours/year

Pollutant	Emission Factors		Emissions	
	lb/MMBtu	Source	lb/hr	tpy
CO_2	117.0	Federal Register	436.7	1,912.6
CH_4	0.0022	Federal Register	0.008	0.04
N_2O	0.00022	Federal Register	0.001	0.004
CO_2e	--	--	437.1	1,914.6

Federal Register - Subpart C of Part 98

Emergency Fire Pump

Size	330.0	HP
	2.4	MMBtu/hr
	17.50	gal/hr
Operation	100	hours/year

Pollutant	Emission Factors		Emissions	
	lb/MMBtu	Source	lb/hr	tpy
CO_2	163.1	Federal Register	393.8	19.7
CH_4	0.0066	Federal Register	1.6E-02	8.0E-04
N_2O	0.00132	Federal Register	3.2E-03	1.6E-04
CO_2e	--	--	395.1	19.8

Federal Register - Subpart C of Part 98

Emergency Generator

Size	1000.0	KW
	745.7	hp
	71.9	gal/hr
	9.9	MMBtu/hr
Operation	100	hours/year

	Emission Factors		Emissions	
Pollutant	**lb/MMBtu**	**Source**	**lb/hr**	**tpy**
CO_2	163.1	Federal Register	1,617.9	80.9
CH_4	0.0066	Federal Register	6.6E-02	3.3E-03
N_2O	0.00132	Federal Register	1.3E-02	6.6E-04
CO_2e	--	--	1,623.4	81.2

Federal Register - Subpart C of Part 98

CO_2 Equivalent Ratios

Greenhouse Gas			**CO_2 Equivalent Ratio***
Carbon Dioxide	124-38-9	CO_2	1
Methane	74-82-8	CH_4	25
Nitrous Oxide	10024-97-2	N_2O	298
Hydrofluorocarbons	Various	CHF (various)	12 - 11700
Perfluor0carbons	Various	CF (various)	6500 - 17340
Sulfur Hexafluoride	2551-62-4	SF_6	23900
Chlorofluorocarbons	Various	CCIF (various)	Not Available

Estimated Maximum Potential Annual Greenhouse Gas Emission Rates of the Project During Construction

Estimated Construction Equipment Emissions (3-year Period)

Equipment Type	Fuel Type	Quantity	Motor Size (hp)	Gal/hr	Hours of Operation Year 1 (hr/yr)	Hours of Operation Year 2 (hr/yr)	Hours of Operation Year 3 (hr/yr)	Fuel Use (All Units) Year 1 (gal/yr)	Fuel Use (All Units) Year 2 (gal/yr)	Fuel Use (All Units) Year 3 (gal/yr)	Emission Factors - GHGs 40 CFR Part 98 Table C-1 and C-2 CO2 kg/mmBtu	CH4 kg/mmBtu	N2O kg/mmBtu	Construction Emissions Year 1 CO2 tonnes per year	Year 1 CH4	Year 1 N2O	Year 1 CO2e	Year 2 CO2 tonnes per year	Year 2 CH4	Year 2 N2O	Year 2 CO2e	Year 3 CO2 tonnes per year	Year 3 CH4	Year 3 N2O	Year 3 CO2e
Vibratory Compactor	Diesel	2	175	87.0	1,313	0	0	114,188	0	0	73.96	0.003	0.0006	1,165	0.05	0.01	1,169	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Motor Grader	Diesel	1	175	87.0	731	1,463	488	63,619	127,238	42,413	73.96	0.003	0.0006	649	0.03	0.01	652	1,299	0.05	0.01	1,303	433	0.02	0.00	434
Dump Truck	Diesel	2	400	199	938	0	0	186,429	0	0	73.96	0.003	0.0006	1,903	0.08	0.02	1,909	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wheel Loader	Diesel	2	600	298	1,500	0	0	447,429	0	0	73.96	0.003	0.0006	4,567	0.19	0.04	4,582	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozer	Diesel	2	350	174	938	0	0	163,125	0	0	73.96	0.003	0.0006	1,665	0.07	0.01	1,671	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator	Diesel	4	350	174	3,750	0	0	652,500	0	0	73.96	0.003	0.0006	6,660	0.27	0.05	6,683	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scraper	Diesel	2	300	149	938	0	0	139,821	0	0	73.96	0.003	0.0006	1,427	0.06	0.01	1,432	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pavers	Diesel	1	125	62	375	0	0	23,304	0	0	73.96	0.003	0.0006	238	0.01	0.00	239	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trencher	Diesel	2	50	25	1,300	0	0	32,314	0	0	73.96	0.003	0.0006	330	0.01	0.00	331	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Skid Steer	Diesel	6	100	50	2,763	2,925	0	137,336	145,414	0	73.96	0.003	0.0006	1,402	0.06	0.01	1,407	1,484	0.06	0.01	1,489	0.00	0.00	0.00	0.00
Concrete Truck	Diesel	2	350	174	250	2,000	0	43,500	348,000	0	73.96	0.003	0.0006	444	0.02	0.00	446	3,552	0.14	0.03	3,564	0.00	0.00	0.00	0.00
Concrete Pump Truck	Gasoline	2	300	149	125	1,000	0	18,643	149,143	0	70.22	0.003	0.0006	164	0.01	0.00	164	1,309	0.06	0.01	1,314	0.00	0.00	0.00	0.00
Flat Bed Truck	Diesel	1	300	149	406	813	0	60,589	121,179	0	73.96	0.003	0.0006	618	0.03	0.01	621	1,237	0.05	0.01	1,241	0.00	0.00	0.00	0.00
Water Truck	Diesel	1	200	99	650	488	122	64,629	48,471	12,130	73.96	0.003	0.0006	660	0.03	0.01	662	495	0.02	0.00	496	124	0.01	0.00	124
Forklift 5 Ton	Diesel	10	75	37	1,788	8,531	2,438	66,648	318,094	90,884	73.96	0.003	0.0006	680	0.03	0.01	683	3,247	0.13	0.03	3,258	928	0.04	0.01	931
Generators/Compressors	Diesel	14	50	25	12,139	13,163	2,194	301,746	327,182	54,542	73.96	0.003	0.0006	3,080	0.12	0.02	3,090	3,339	0.14	0.03	3,351	557	0.02	0.00	559
Pick-up Truck	Gasoline	8	300	149	975	2,121	561	145,414	316,287	83,624	70.22	0.003	0.0006	1,276	0.05	0.01	1,281	2,776	0.12	0.02	2,786	734	0.03	0.01	737
ATV/Mule	Gasoline	12	25	12	2,559	4,095	1,731	31,810	50,895	21,510	70.22	0.003	0.0006	279	0.01	0.00	280	447	0.02	0.00	448	189	0.01	0.00	189
Manlift	Diesel	16	75	37	0	12,269	4,225	0	457,458	157,532	73.96	0.003	0.0006	0	0.00	0.00	0	4,669	0.19	0.04	4,685	1,608	0.07	0.01	1,613
Crawler Cranes <200T	Diesel	6	250	124	1,950	6,581	1,706	242,357	817,955	212,063	73.96	0.003	0.0006	2,474	0.10	0.02	2,482	8,348	0.34	0.07	8,377	2,164	0.09	0.02	2,172
Crawler Cranes >200T	Diesel	8	400	199	4,631	5,972	244	920,957	1,187,625	48,471	73.96	0.003	0.0006	9,400	0.38	0.08	9,432	12,121	0.49	0.10	12,163	495	0.02	0.00	496
RT Cranes	Diesel	12	250	124	3,981	11,619	2,763	494,813	1,444,076	343,339	73.96	0.003	0.0006	5,050	0.20	0.04	5,068	14,739	0.60	0.12	14,790	3,504	0.14	0.03	3,516
							Total	**4,351,170**	**5,859,017**	**1,066,508**			**Total**	**44,130**	**1.8**	**0.4**	**44,282**	**59,062**	**2.4**	**0.5**	**59,266**	**10,735**	**0.4**	**0.1**	**10,772**

Fuel High Heat Values - Table C1 of 40 CFR Part 98		
Diesel HHV	0.138	mmBtu/gal
Gasoline HHV	0.125	mmBtu/gal

Global Warming Potentials - 40 CFR Part 98	
CO_2	1
Methane	25
N_2O	298

Total Construction Emissions (3 years)	tonnes per year
CO2	113,927
CH4	4.6
N2O	1
CO2e	114,320

E.2 CHINOOK POWER STATION AIR DISPERSION MODELLING

Chinook Power Station
Air Dispersion Modelling

SaskPower

Chinook Power Station Project
Project No. 87674

September 2016

Chinook Power Station
Air Dispersion Modelling

prepared for

SaskPower
Chinook Power Station Project
Saskatchewan, Canada

Project No. 87674

September 2016

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

TABLE OF CONTENTS

Page No.

LIST OF TABLES

Page No.

LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
µg/m^3	microgram per cubic meter
AERMAP	AMS/EPA Regulatory Model's terrain pre-processor
AERMOD	AMS/EPA Regulatory Model
ARM	Ambient Ratio Method
BPIP-PRIME	Building Profile Input Program – Plume Rise Model Enhancements
CAAQS	Canadian Ambient Air Quality Standards
CO	carbon monoxide
g/s	grams per second
GEP	Good Engineering Practice
hp	horsepower
HRSG	heat recovery steam generator
kW	kilowatt
lb/hr	pound per hour
m/s	meters per second
Ministry	Saskatchewan Ministry of Environment
MMBtu/hr	million British thermal units per hour
MW	megawatt
NAD 83	North American Datum of 1983
NO_2	nitrogen dioxide
NOx	nitrogen oxides
ºC	degrees Celsius

Abbreviation	Term/Phrase/Name
OLM	Ozone Limiting Method
PM	particulate matter
PM_{10}	particulate matter of 10 microns in diameter or smaller
$PM_{2.5}$	particulate matter of 2.5 microns in diameter or smaller
ppm	parts per million
SaskPower	Saskatchewan Power
SO_2	sulphur dioxide
U.S. EPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator

1.0 INTRODUCTION

Pursuant to the Saskatchewan air quality regulatory requirements, Saskatchewan Power (SaskPower) has performed air dispersion modelling to determine compliance with ambient air quality standards for a proposed combined-cycle power plant. The Chinook Power Station Project (Project) is anticipated to be a nominal 345 megawatts (MW) gas-fired power plant which will consist of one F-Class combustion turbine with heat recovery steam generator (HRSG), one steam turbine and associated equipment. The Project will be located west of Swift Current, Saskatchewan. The combustion turbine will be designed to utilize pipeline-quality natural gas only. In addition to the combustion turbine, one natural gas-fired dew point heater, an emergency diesel fire pump, and an emergency diesel generator will also be included as part of the Project. The location of the Project is shown in Figure A-1 (Appendix A) and a plot plan of the Project is shown in Figure A-2 (Appendix A).

Emission of air contaminants will result from the combustion of natural gas in the proposed combined-cycle combustion turbine. There will also be emissions of air contaminants generated from the emergency diesel generator, emergency diesel fire pump, and dew point heater. Table 1-1 shows the maximum potential air emissions associated with the Project including start-up and shut down emissions for the turbine and auxiliary equipment emissions. The maximum emissions from any operating load and including start-up and shut down emissions for the combustion turbine were used to demonstrate the maximum potential emissions for each pollutant.

Table 1-1. Project Potential Emissions

Pollutant	Project Potential Emissions (tonnes per year)
NO_x	450.1
CO	462.7
$PM/PM_{10}/PM_{2.5}$	26.8
SO_2	28.7

1.1 Combustion Turbine

Emissions from the F-Class combustion turbine are dependent on the ambient temperature conditions and operating load, which can vary from 50 percent to 100 percent for combined-cycle operation. To account for representative seasonal climatic variations, potential emissions from the proposed combustion turbine was analyzed at 50, 75, and 100 percent load conditions for ambient temperatures ranging from negative 40 degrees Celsius (°C) to 35°C for combined-cycle operation. Projected emissions were based on data

provided by the potential F-Class combustion turbine manufacturer and/or from AP-42 emission factors. Detailed calculations of the combustion turbine and auxiliary equipment's emissions are provided in Appendix B. Start-up and shut down emissions were based on the start-up profile and 260 start-up/shut down events[1] per year.

1.2 Auxiliary Equipment

Emissions of air contaminants generated from the emergency diesel generator, emergency diesel fire pump, and dew point heater.

1.2.1 Natural Gas Dew Point Heater

A 3.73 million British thermal units per hour (MMBtu/hr) natural gas-fired dew point heater will be used to heat the natural gas and will be permitted for 8,760 hours of operation per year. AP-42 data was used to estimate the emissions from the heater. Detailed emissions calculations are provided in Appendix B.

1.2.2 Emergency Diesel Fire Pump

An emergency diesel fire pump will be built to support the Project in case of a fire. The emergency diesel fire pump will have a maximum power output of 330 horsepower (hp) and will be fired solely by ultra-low sulfur # 2 fuel oil. The applicant proposes to operate the emergency diesel fire pump for up to 100 hours annually for testing and maintenance purposes, and therefore supports a limit on routine hours of operation of the emergency diesel fire pump. Vendor data and AP-42 emission factors were used to determine emissions for the fire pump. Detailed calculations of diesel fire pump emissions are provided in Appendix B.

1.2.3 Emergency Diesel Generator

An emergency diesel generator will be built to provide essential services to the plant in case of a power interruption. The emergency diesel generator will have a maximum power output of 1,000 kilowatt (kW) and will be fired solely by ultra-low sulfur # 2 fuel oil. The applicant proposes to operate the emergency diesel generator for up to 100 hours annually for testing and maintenance purposes, and therefore supports a limit on routine hours of operation of the emergency diesel generator. Vendor data and AP-42 emission factors were used to determine emissions from the emergency diesel generator. Detailed calculations of diesel generator emissions are provided in Appendix B.

[1] One start-up/shut down event is equal to one start-up plus one shut down. All start-ups were conservatively assumed to be cold start-ups.

2.0 AIR DISPERSION MODELLING

Pursuant to the Saskatchewan air quality regulatory requirements, an air dispersion modelling analysis is required for each regulated pollutant. An air quality analysis was performed for NOx, CO, SO_2 and $PM/PM_{10}/PM_{2.5}$ using the U.S. Environmental Protection Agency (EPA)-approved AMS/EPA Regulatory Model (AERMOD). The Saskatchewan Air Quality Modelling Guideline was used to conduct the air dispersion modelling analysis for this Project. A summary of the models, the modelling techniques, and modelling results for the Project are discussed in the following sections.

2.1 Air Dispersion Model

Air dispersion modelling was performed using the latest version of the AERMOD model (Version 15181). The AERMOD model is a steady-state Gaussian air dispersion model that is designed to estimate downwind ground-level concentrations from single or multiple sources using detailed meteorological data. AERMOD is a model currently approved for industrial sources. The Saskatchewan Air Quality Modelling Guideline approves the use of AERMOD and SaskPower has chosen to demonstrate regulatory compliance through its use.

Details of the modelling algorithms contained in the AERMOD model may be found in the User's Guide for AERMOD. The regulatory default option was selected for this analysis.

The following default model options were used:

- Gradual Plume Rise
- Stack-tip Downwash
- Buoyancy-induced Dispersion
- Calms and Missing Data Processing Routine
- Calculate Wind Profiles
- Calculate Vertical Potential Temperature Gradient
- Rural Dispersion

2.2 Model Parameters

Modelling runs were conducted at full load and partial loads of the combustion turbine to confirm that operation of the Project will not result in impacts greater than the Canadian Ambient Air Quality Standards (CAAQS) and the Saskatchewan Ambient Air Quality Standards (SAAQS). The expected hourly emission rates and modelling parameters for the combustion turbine are shown in Table 2-1. These emission rates represent projected worst-case ambient conditions under various operating loads and

include start-up and shut down emissions. The annual emissions are based on worst-case annual emissions.

Table 2-1. Combustion Turbine Maximum Emissions and Modelling Parameters

Pollutant	100% Load	75% Load	50% Load	Start-up/ Shut down
	grams per second (g/s)			
NO_x	14.2	11.3	8.2	18.9[a] (14.2[b])
CO	2.9	2.3	3.8	341.5[a]
$PM/PM_{10}/PM_{2.5}$	0.8	0.7	0.6	0.8 (0.8[b])
SO_2	0.9	0.7	0.5	0.9[a] (0.9[b])
Stack Parameters				
Stack temperature (ºC)[c]	88.9	83.3	79.4	88.2
Exit velocity (m/s)[c]	22.0	16.0	13.3	21.4
Stack height (meters)	42.7	42.7	42.7	42.7
Stack diameter (meters)	6.4	6.4	6.4	6.4

(a) Maximum 1-hour start-up emissions (worst-case combustion turbine emissions during start-up)
(b) Maximum annual emission rate ratioed for 8,760 hours per year
(c) m/s = meters per second, ºC = degrees Celsius

The expected hourly emission rates and modelling parameters for the auxiliary equipment are shown in Table 2-2. Annual emissions for the emergency diesel fire pump and emergency diesel generator were based on operation of 100 hours per year.

Table 2-2. Auxiliary Equipment Emissions and Modelling Parameters

Pollutant	Dew Point Heater	Diesel Fire Pump	Diesel Generator
	grams per second (g/s)		
NO_x	0.047	0.27 (3.12×10^{-3})[a]	1.8 (2.03×10^{-2})[a]
CO	0.039	0.24	0.97
$PM/PM_{10}/PM_{2.5}$	3.78×10^{-3}	0.014 (1.56×10^{-4})[a]	0.055 (6.34×10^{-4})[a]
SO_2	2.77×10^{-4}	0.086 (9.73×10^{-4})[a]	0.19 (2.20×10^{-3})[a]
Stack Parameters			
Stack temperature (ºC)[b]	162.8	573.3	476.7
Exit velocity (m/s)[b]	13.4	78.6	117.3
Stack height (meters)	4.6	4.6	4.6
Stack diameter (meters)	0.36	0.13	0.20

(a) Equivalent g/s emissions averaged over 8,760 hours per year, based on operation of 100 hours, used for annual averaging periods only.
(b) m/s = meters per second, ºC = degrees Celsius

2.3 Modelling Methodology and Parameters

The modelling methodology used for this analysis is summarized in the sections below.

2.3.1 Good Engineering Practice

Emission sources are subject to Good Engineering Practice (GEP) stack height requirements outlined in Section 5.7 of the Saskatchewan Air Modelling Guideline. As GEP height is calculated as the greater of 65 meters (measured from the ground level elevation at the base of the stack) or the height resulting from the following formula:

$$GEP = H + 1.5L$$

Where

H = the height of nearby structure(s) measured from the ground level elevation at the base of the stack; and

L = the lesser dimension (height or projected width) of nearby structure(s) (i.e., building height or the greatest crosswind distance of the building - also known as maximum projected width).

To meet stack height requirements, the proposed point sources will be evaluated in terms of their proximity to nearby structures. The purpose of this evaluation is to determine if the discharge from each stack will become caught in the turbulent wake of a building or other structure, resulting in downwash of the plume. Downwash of the plume can result in elevated ground-level concentrations. In *Guideline for Determination of Good Engineering Practice Stack Height* (EPA 1985), EPA provides guidance for determining whether building downwash will occur. The downwash analysis was performed consistent with the methods prescribed in this guidance document.

Calculations for determining the direction-specific downwash parameters were performed using the most current version of the EPA's Building Profile Input Program – Plume Rise Model Enhancements (Version 04274), otherwise referred to as the BPIP-PRIME downwash algorithm. The BPIP-PRIME model provides direction-specific building dimensions to evaluate downwash conditions. The Project is located in a rural area and the only buildings that could potentially affect emissions from the Project are the on-site structures.

After running the BPIP-PRIME model, it was determined that the GEP stack height for this Project will not exceed 65 meters. A stack height of 42.67 meters (140 feet) was used in the AERMOD modelling. The major on-site buildings and their dimensions are provided in Appendix B.

2.3.2 Receptor Grid

The overall purpose of the modelling analysis is to demonstrate that operation of the Project will not result in, or contribute to concentrations above the SAAQS and the CAAQS. The modelling runs were conducted using the AERMOD model in simple and complex terrain mode within a 10- by 10-kilometer Cartesian grid and is shown in Figure C-1 (Appendix C). The grid incorporates the receptor spacing specified in Table 2-3. Receptors were also placed along the fence line boundary at a spacing of 20 meters.

Table 2-3: Receptor Spacing from Fence Line Boundary

Distance from Fence Line (kilometers)	Receptor Spacing (meters)
0 - 0.5	50
0.5 – 2	250
2 – 5	500
5 – 10	1,000

The appropriate Canadian terrain data was downloaded from GeoBase Canada and were used to obtain the necessary receptor elevations. North American Datum of 1983 (NAD 83) was used to develop the Universal Transverse Mercator (UTM) coordinates for this Project.

AERMOD has a terrain preprocessor (AERMAP) which uses gridded terrain data for the modelling domain to calculate not only a XYZ coordinate, but a representative terrain-influence height associated with each receptor location selected. This terrain-influenced height is called the height scale and is separate for each individual receptor. AERMAP (Version 11103) utilized the electronic terrain data to populate the model with receptor elevations.

2.3.3 Meteorological Data

Meteorological data obtained from the Saskatchewan Regional Meteorological Data Sets were used for the modelling analysis. Integrated Surface Hourly meteorological data from Swift Current and upper air data from Glasgow were used for years 2003 to 2007. A profile base elevation of 818 meters was used.

2.3.4 Land Use Parameters

The existing land use for a three-kilometer area surrounding the Project is more than 50 percent rural, and the population density is less than 750 people per square kilometer for the same area. Therefore, rural dispersion coefficients were used in the AERMOD models.

2.3.5 Background Existing Ambient Air Quality

The air quality standards are set up to protect the air quality for all sensitive populations. As such, there is an existing concentration of each criteria pollutant that is present in ambient air that must be included in an analysis to account for items such as mobile source emissions that are not accounted for in the model. Monitored ambient concentrations will be added to the modeled ground level impacts to account for these sources.

For the Project, background values for each pollutant were identified from the representative monitors in the area. The Saskatchewan Ministry of Environment (Ministry) provides regional background air contaminant concentrations for five divisions of Saskatchewan. The values listed in Table 2-4 will be used as background levels and will be added to the modeled impacts for each pollutant for modelling compliance determinations. Per the modelling guideline, for refined modelling, the 90th percentile value from the cumulative frequency distribution of the background monitoring data was used for the 1-hour and 24-hour averaging times. For the annual distribution the 50th percentile was used.

Table 2-4. Southwest Region Background Concentration

Pollutant	Averaging Period	Percentile	Background Concentration[a]		Region
			ppm	µg/m³	
CO	1-hour	90	0.6	720.0	Southeastern
	8-hour	90	0.6	720.0	
NO_2	1-hour	90	0.019	36.0	Southwestern
	24-hour	90	0.016	30.0	
	Annual	50	0.005	9.4	
SO_2	1-hour	90	0.001	2.6	Southwestern
	24-hour	90	0.001	2.6	
	Annual	50	0.000	0.0	
$PM_{2.5}$	24-hour	90	--	6.6	Southwestern
	Annual	50	--	3.3	
PM_{10}	24-hour	90	--	36.3	Southeastern
PM[b]	24-hour	90	--	6.6	Southwestern
	Annual	50	--	3.3	

Source: Saskatchewan Air Quality Modelling Guideline, 2012
(a) ppm = parts per million; µg/m^3 = micrograms per cubic meter
(b) No PM background was listed in the modelling guidance; therefore, the Southwestern region background was used.

2.3.6 Modelling Thresholds

The SAAQS and the CAAQS for the modelled pollutants are shown in Table 2-5. The modeled impacts will be compared to the more stringent of the two standards.

Table 2-5: Saskatchewan and Canadian Ambient Air Quality Standards

Pollutant	Averaging Period	SAAQS	CAAQS
		micrograms per cubic meter (µg/m³)	
CO	1-hour	15,000	--
	8-hour	6,000	--
NO_2	1-hour	300	--
	24-hour	200	--
	Annual	45	--
SO_2	1-hour	450	--
	24-hour	125	--
	Annual	20	--
$PM_{2.5}$	24-hour	28	28 (2015) 27 (2020)[a]
	Annual	10	10 (2015) 8.8 (2020)[a]
PM_{10}	24-hour	50	--
PM	24-hour	100	--
	Annual	60	--

Source: SAAQS, https://envonline.gov.sk.ca/Pages/SEQS/Table20-SEQS-SAAQS.pdfCAAQS (column 3), http://www.ec.gc.ca/default.asp?lang=En&n=56D4043B-1&news=A4B2C28A-2DFB-4BF4-8777-ADF29B4360BD (column 4)
(a) The 2020 Canadian Ambient Air Quality Standard is the more stringent threshold and will be used for this analysis.

2.3.7 Intermittent Sources

The emergency diesel generator and emergency diesel fire pump will operate less than 100 hours annually and are considered intermittent sources; therefore, these sources will not be included in the NO_2 and SO_2 1-hour modelling analysis. These operations will not contribute significantly to the annual distribution of the daily maximum 1-hour concentrations. Intermittent sources will be included in the model for all other modelled averaging periods and pollutants.

2.3.8 NO_2 Modelling – Multi Tiered Screening Approach

The AERMOD model predicts ground-level concentrations of any generic pollutant without chemical transformations. Thus, the modeled NO_X emission rate will give ground-level modeled concentrations of NO_X. The modelling concentration standards are presented as NO_2.

The recommended methods for estimating NO_2 concentrations presented in the order of the most conservative first are:

1. Total conversion, or all $NO_x = NO_2$
2. Ambient Ratio Method (ARM) - use a default NO_2/NO_x ratio
3. Ozone Limiting Method (OLM)

The ambient impact of NO_x predicted by the model was assumed to be all NO_2.

2.4 Refined Modelling Results

Refined modelling was performed for CO, NO_x, SO_2 and $PM/PM_{10}/PM_{2.5}$ for the Project. After examining the modelling results at all load levels, it was determined that no exceedances of the SAAQS and CAAQS occurred. The maximum modeled concentrations for each pollutant and averaging period are presented in Table 2-6.

Table 2-6. Maximum Modelled Concentrations

Pollutant	Averaging Period	UTM Coordinates[a]		Year	Predicted Concentration	Background Concentration	Total Concentration	SAAQS Threshold
		Easting (meters)	Northing (meters)		micrograms per cubic meter (µg/m³)			
CO	1-hour	291,075.2	5,581,249.6	2007	2,362.5	720.0	3,082.5	15,000
	8-hour	291,056.1	5,581,250.7	2003	1,704.3	720.0	2,424.3	6,000
NO_2	1-hour	291,075.2	5,581,249.6	2007	130.8	36.0	166.8	300
	24-hour	290,960.6	5,581,256.0	2003	150.8	30.0	180.8	200
	Annual	291,056.1	5,581,250.7	2003	7.8	9.4	17.2	45
SO_2	1-hour	291,056.1	5,581,250.7	2003	6.4	2.6	9.0	450
	24-hour	290,998.8	5,581,253.9	2003	16.7	2.6	19.3	125
	Annual	291,056.1	5,581,250.7	2003	0.5	0.0	0.5	20
$PM_{2.5}$	24-hour	290,960.6	5,581,256.0	5 years	4.2	6.6	10.8	27
	Annual	291,056.1	5,581,250.7	2003	0.5	3.3	3.8	8.8[b]
PM_{10}	24-hour	290,979.7	5,581,254.9	2004	5.2	36.3	41.5	50[b]
PM	24-hour	290,979.7	5,581,254.9	2004	5.2	6.6	11.8	100
	Annual	291,056.1	5,581,250.7	2003	0.5	3.3	3.8	60

(a) Universal Transverse Mercator NAD83
(b) 2020 Canadian Ambient Air Quality Standard (more stringent threshold)

The following highs were used for each modelled averaging period:

- 1-hour average used the 9th highest concentration
- 8-hour average used the 5th highest concentration
- 24-hour average used the 2th highest concentration for CO, NO_2, SO_2, PM_{10}, and PM
- 24-hour $PM_{2.5}$ used the 8th highest concentration averaged over 5 years

- Annual average used the 1st highest concentration

Isopleths of the maximum impact concentrations for each pollutant and averaging period are shown in Figures C-2 to C-14 in Appendix C. Model input and output files for each pollutant are provided in Appendix D on CD-ROM.

2.5 Conclusion

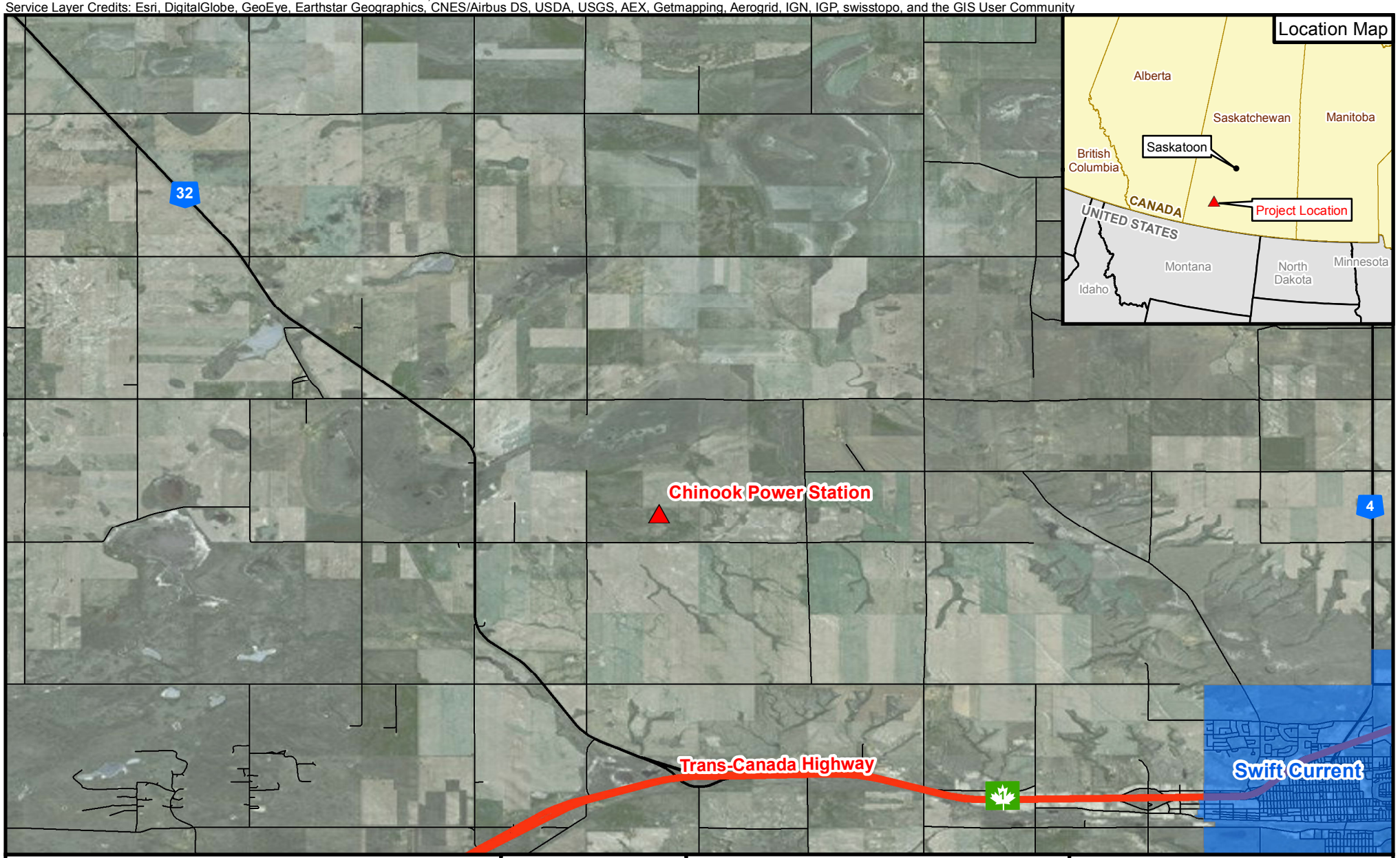
The modelling results shown in Table 2-6 demonstrate that no exceedances of the NO_2, CO, SO_2, or $PM_{2.5}$/PM_{10}/PM modelling levels are predicted; consequently, the Project will not cause or contribute to any modeled exceedances of the CAAQS or SAAQS.

The operation of the Project will not cause or contribute to a significant degradation of ambient air quality. After examining the results of the model, it has been determined that the modelling requirements for CO, NO_2, SO_2, and PM/PM_{10}/$PM_{2.5}$ have been fulfilled, and no further modelling is required.

APPENDIX A - FIGURES

Path: Z:\Clients\ENR\SaskPwr\87674_Chinook\Studies\Geospatial\DataFiles\ArcDocs\Project_Location.mxd kasamuelson 2/11/2016

Service Layer Credits: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Legend

- Project Location
- Municipal Boundary
- Trans-Canada Highway
- Highway
- Road

NORTH

0 1.5 3

Kilometers

BURNS McDONNELL CANADA

Figure A-1
Area Map
Chinook Power Station Project
SaskPower

Source: ESRI, Geobase, Burns & McDonnell

Issued: 2/11/2016

EQUIPMENT IDENTIFICATION AND LOCATION LIST	
DWG REF	DESCRIPTION NEW SITE EQUIPMENT
001	MAIN CONTROL ROOM / ADMINISTRATION ROOMS (GA3001)
002	WAREHOUSE
003	MAINTENANCE SHOP
004	WATER TREATMENT BUILDING (GA3002)
005	GAS TURBINE GENERATOR (GTG)
006	HEAT RECOVERY STEAM GENERATOR (HRSG)
007	STEAM TURBINE GENERATOR (STG)
008	BOILER FEEDWATER PUMPS
009	CEMS ENCLOSURE
010	FUEL GAS BURNER SKID
011	PERFORMANCE GAS HEATER
012	KNOCKOUT TANK / DRAINS TANK
013	FILTER - SEPARATOR
014	FEEDWATER PREHEATER CIRCULATION PUMP SKID
015	HRSG MCC PCM
016	PHOSPHATE CHEMICAL FEED SKID
017	AMMONIA CHEMICAL FEED SKID
018	HRSG BLOWDOWN TANK
019	BLOWDOWN DRAIN SUMP & PUMPS
020	SAMPLE PANEL ROOM
021	STG ELECTRICAL PCM
022	LIFTING BAY
023	GTG MAINTENANCE AREA
024	WASH WATER SKID
025	TURNING GEAR
026	TURBINE ENCLOSURE
027	LUBE OIL PACKAGE
028	GTG AIR INLET FILTER
029	ELECTRICAL PACKAGE
030	SFC CROSSOVER SWITCH CUBICLE
031	FIRE PROTECTION PACKAGE
032	WASH WATER DRAIN TANK (UNDERGROUND)
033	EMERGENCY DIESEL GENERATOR
034	BOP ELECTRICAL ROOM
035	GENERATOR CIRCUIT BREAKER (GTG)
036	EXCITATION TRANSFORMER (GTG)
037	LCI TRANSFORMER (GTG)
038	GTG AUXILIARY TRANSFORMER
039	GTG GSU TRANSFORMER
040	AIR COOLED CONDENSER (ACC)
041	ACC - POWER CONTROL MODULE
042	ACC - SUS TRANSFORMERS
043	STG FLASH TANK
044	MISCELLANEOUS DRAINS TANK
045	DRIP POT PUMPS
046	VACUUM PUMP SKID
047	CONDENSATE TANK
048	CONDENSATE PUMPS
049	STEAM TURBINE LUBE OIL SKID
050	GLAND SEAL CONDENSER
051	DRY AIR RECEIVER
052	AIR DRYER SKIDS
053	WET AIR RECEIVER
054	AIR COMPRESSORS
055	GENERATOR CIRCUIT BREAKER (STG)
056	GENERATOR STEP UP TRANSFORMER
057	EXCITATION TRANSFORMER
058	DEW POINT HEATER
059	GTG ISOPHASE BUS
060	STG ISOPHASE BUS
061	GENERATOR ROTOR PULL
062	SAFETY SHOWER
063	CLOSED COOLING WATER FIN FAN COOLER
064	CLOSED COOLING WATER PUMPS
065	OIL / WATER SEPARATOR 1
066	FIRE PUMP BUILDING
067	NOT USED
068	DEMINERALIZED WATER STORAGE TANK
069	SERVICE / FIRE WATER STORAGE TANK
070	STG AUXILIARY TRANSFORMER
071	HYDROGEN GAS TRAILERS
072	GTG CRANE
073	STG CRANE
074	BLOWDOWN COOLER
075	NITROGEN BOTTLE RACK
076	CARBON DIOXIDE BOTTLE RACK
077	SEWAGE LIFT STATION
078	OIL / WATER SEPARATOR 2
079	SEE / SFC PACKAGE
080	SFC TRANSFORMER
081	SEE TRANSFORMER
082	VT & SURGE CUBICLE WITH SFC SWITCH
083	INLET DUCT AND SILENCER
084	EXHAUST TRANSITION DUCT
085	AIR COMPRESSOR
086	LUBE OIL COOLERS
087	CONTROL OIL PACKAGE
088	FUEL GAS MAIN FILTER / SEPARATOR
089	FUEL GAS PILOT FILTER / SEPARATOR
090	ROTOR AIR COOLER

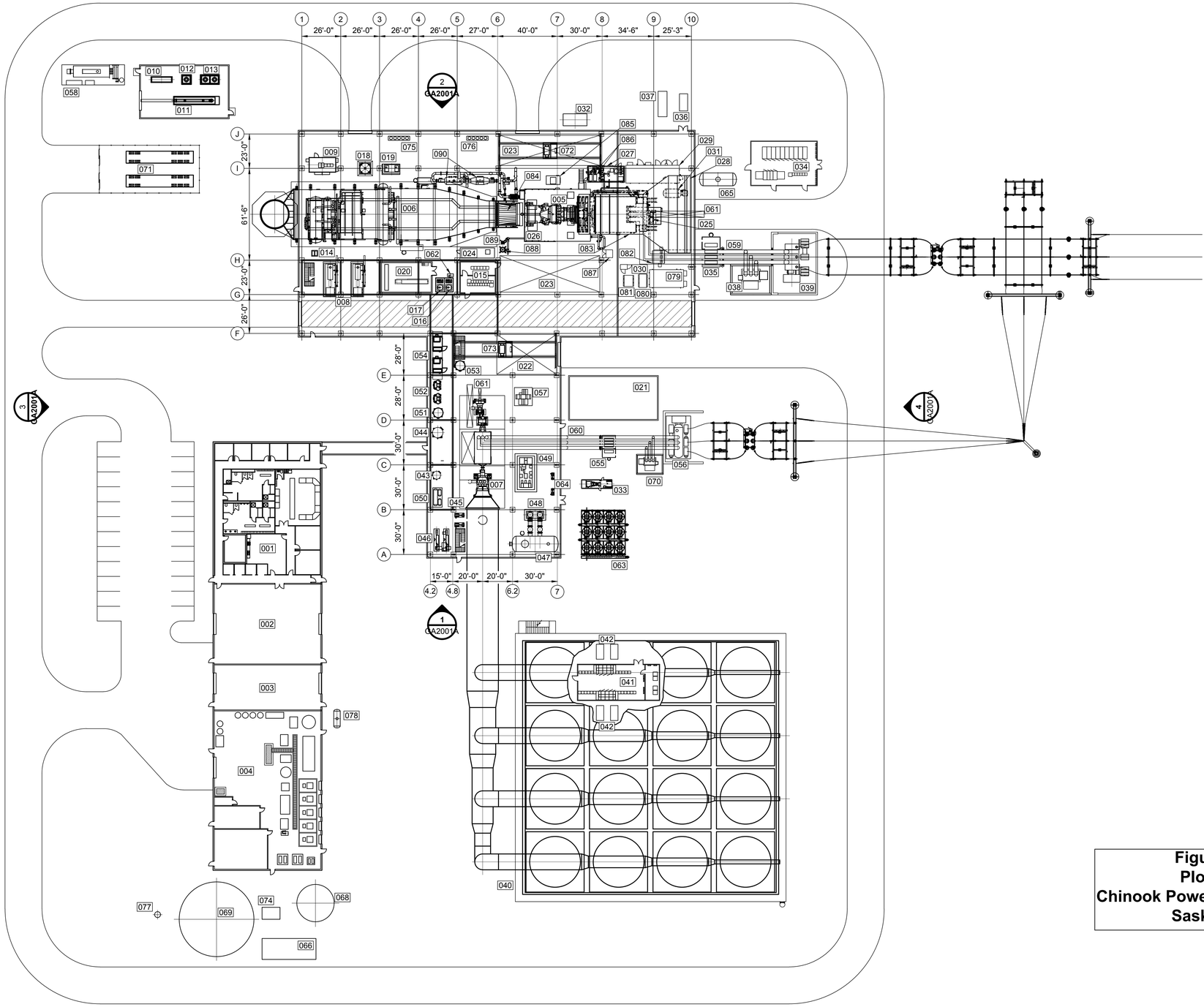


Figure A-2
Plot Plan
Chinook Power Station Project
SaskPower

PRELIMINARY - NOT FOR CONSTRUCTION

no.	date	by	ckd	description
A	01/15/15	MAA		WORKING COPY

NORTH
0 30' 60'
SCALE IN FEET

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400

designed R. VERING | detailed M. ATHERTON

SaskPower
CHINOOK POWER STATION

CHINOOK POWER STATION
GENERAL ARRANGEMENT
SIEMENS STG6-5000F - GROUND PLAN

project 87674 | contract
drawing GA1001B | rev. –A
sheet 1 of 1 sheets
file 87674-GA1000.dwg

Scale For Microfilming: Millimeters / Inches

Z:\CLIENTS\ENR\SASKPWR\87674_CHINOOK\DESIGN\MECH\GNRL_ARRANGMNT\PRELIM\87674-GA1000.DWG 1/15/2016 9:45 AM MATHERTON

APPENDIX B – EMISSIONS ESTIMATES

Chinook Power Station Project
Overall Project Emissions

Maximum Annual Emission Rates

Pollutant	Combined-Cycle Combustion Turbine[a] (tonnes per year)	Dew Point Heater (tonnes per year)	Emergency Diesel Fire Pump (tonnes per year)	Emergency Diesel Generator (tonnes per year)	Total (tonnes per year)
NOx	447.93	1.45	0.098	0.64	**450.1**
CO	461.06	1.22	0.086	0.35	**462.7**
PM	26.62	0.11	0.005	0.020	**26.8**
PM_{10}	26.62	0.11	0.005	0.020	**26.8**
$PM_{2.5}$	26.62	0.11	0.005	0.020	**26.8**
SO2	28.55	0.01	0.031	0.069	**28.7**

(a) Represents worse-case emissions scenario

Assumptions

Unit	Limitation	Units
Combined Cycle Operation	8,760	Hours Per Year
Number of Cold Startups per year	260	Events Per Year
Hours of Startup/Shutdowns per year	440	Hours Per Year
Natural Gas Dew Point Heater	8,760	Hours Per Year
Emergency Diesel Fire Pump	100	Hours Per Year
Emergency Diesel Generator	100	Hours Per Year
Heating Value of Natural Gas		
Natural Gas	1,020	MMBtu/MMCF

Combined Cycle Combustion Turbine

Hours per year: 8,760
Number of Units: 1

Source Description	Operating Load	NOx Emission Rate (g/s)	CO Emission Rate (g/s)	$PM/PM_{10}/PM_{2.5}$ Emission Rate (g/s)	SO2 Emission Rate (g/s)
Turbine\ HRSG	100%	14.2	2.9	0.8	0.9
	75%	11.3	2.3	0.7	0.7
	50%	8.2	3.8	0.6	0.5

Emissions Including Startup/Shutdown Operation
Predicted Annual Emission Rates - Combined Cycle Combustion Turbine

Pollutant	Emissions (Tonnes per year) per Turbine		
	Normal Operation	Startup/ Shutdown	Max Total Turbine Emissions
NOx	424.46	23.47	447.93
CO	86.15	374.91	461.1
$PM/PM_{10}/PM_{2.5}$	25.29	0.83	26.11
SO2	27.12	0.48	27.60

Emissions Including Normal Operation Only
Predicted Annual Emission Rates - Combined Cycle Combustion Turbine

Pollutant	Emissions (Tonnes per year) per Turbine		
	Normal Operation	Startup/ Shutdown	Turbine Emissions
NOx	446.90	--	446.90
CO	90.70	--	90.70
$PM/PM_{10}/PM_{2.5}$	26.62	--	26.62
SO2	28.55	--	28.55

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Client SaskPower
Project SaskPower Self Build Combined Cycle
Date: 1/11/2016
Prepared By AJC
Checked By
Preliminary ✓
Final

PRELIMINARY Combined Cycle Startup Emissions Estimate
1x1 5000F5ee Configuration

	CO		NOx		VOC		CO2		SO2		PM	
	g/Start		g/Start		g/Start		g/Start		g/Start		g/Start	
	GT1	GT2	GT1	GT2	GT1	GT2	GT1	GT2	GT1	GT2	GT3	GT4
Cold Start	1,275,502	N/A	71,214	N/A	176,901	N/A	54,958,616	N/A	1,269.4	N/A	2,268.0	N/A
Warm Start	1,033,737	N/A	53,977	N/A	119,295	N/A	44,115,490	N/A	997.6	N/A	1,814.4	N/A
Hot Start	266,259	N/A	16,783	N/A	32,205	N/A	18,926,596	N/A	400.8	N/A	453.6	N/A
Shutdown	166,468	N/A	19,051	N/A	21,047	N/A	28,544,116	N/A	568.4	N/A	907.2	N/A

	CO		NOx		VOC		CO2		SO2		PM	
	g/s		g/s		g/s		g/s		g/s		g/s	
	GT1	GT2	GT1	GT2	GT1	GT2	GT1	GT2	GT1	GT2	GT1	GT2
Cold Start	341	N/A	19	N/A	48	N/A	14,326	N/A	0.33	N/A	0.62	N/A
Warm Start	323	N/A	16	N/A	38	N/A	13,404	N/A	0.31	N/A	0.56	N/A
Hot Start	198	N/A	13	N/A	24	N/A	12,804	N/A	0.30	N/A	0.49	N/A
Shutdown	275	N/A	20	N/A	35	N/A	15,539	N/A	0.36	N/A	0.60	N/A

Notes

1) Startup for the Permit is defined as the operation period beginning when continuous fuel flow to the gas turbine is initiated and ending when stack emissions compliance is achieved.

2) Startup for the Contract is defined as the operation period beginning when the gas turbine start is initiated and ending when the steam turbine is accepting full steam flow.

Startup Times

	Permit Time	Contract Time
	Minutes	
Cold Start	70	296
Warm Start	53	195
Hot Start	22	104
Shutdown	32	32

Chinook Power Station Project
Auxiliary Combustion Sources Emissions Calculations

Dew Point Heater

Size	3.73	MMBtu/hr
HHV	1,020	Btu/cf
Operation	8,760	hours/year

Dew Point Heater Stack Parameters

Height (meters)	Temp. (ºC)	Velocity (m/s)	Diameter (meters)	Stack Discharge Type	Fuel
4.6	162.8	13.4	0.36	Vertical	Natural Gas

	Emission Factors			Emissions	
Pollutant	lb/MMcf	lb/MMBtu	Source	g/s	tonnes per year
NO_X	100.0	0.0980	AP-42[A]	0.047	1.45
CO	84.0	0.0824	AP-42[A]	0.039	1.22
$PM/PM_{10}/PM_{2.5}$	7.6	0.0075	AP-42[A]	3.78E-03	0.11
SO_2	0.6	0.0006	AP-42[A]	2.77E-04	0.01

[A] AP-42 Section 1.4 (7/98)

Emergency Fire Pump

Size	330.0	HP
	2.4	MMBtu/hr
	17.50	gal/hr
Operation	100	hours/year

Emergency Fire Pump Stack Parameters

Height (meters)	Temp. (ºC)	Velocity (m/s)	Diameter (meters)	Stack Discharge Type	Fuel
4.6	573.3	78.6	0.13	Vertical	Diesel

	Emission Factors				Emissions		
Pollutant	g/kw-hr	g/hp-hr	lb/hp-hr	Source	g/s	tonnes per year	g/s Equivalent
NO_X	4.0	3.0	--	NSPS[B]	0.27	0.098	3.12E-03
CO	3.5	2.6	--	NSPS[B]	0.24	0.086	--
$PM/PM_{10}/PM_{2.5}$	0.2	0.15	--	NSPS[B]	0.014	0.005	1.56E-04
SO_2	--	--	2.05E-03	AP-42[A]	0.086	0.031	9.73E-04

[A] AP-42 Section 3.3 (10/96)

[B] NSPS 40 CFR Part 60, Subapart IIII Limits

NSPS Limits - 40 CFR Part 60, Subapart IIII, (40 CFR 60 Table 4)

	NOx + VOM	CO	PM
g/kW-hr	4.0	3.5	0.20
g/hp-hr	3.0	2.6	0.15

Emergency Generator

Size	1000.0	KW
	745.7	hp
	71.9	gal/hr
	9.9	MMBtu/hr
Operation	100	hours/year

Emergency Generator Stack Parameters

Height (meters)	Temp. (ºC)	Velocity (m/s)	Diameter (meters)	Stack Discharge Type	Fuel
4.6	476.7	117.3	0.20	Vertical	Diesel

	Emission Factors				Emissions		
Pollutant	g/kw-hr	g/hp-hr	lb/hp-hr	Source	g/s	tonnes per year	g/s Equivalent
NO_X	6.4	4.8	--	NSPS[B]	1.0	0.64	2.03E-02
CO	3.5	2.6	--	NSPS[B]	0.97	0.35	--
$PM/PM_{10}/PM_{2.5}$	0.2	0.15	--	NSPS[B]	0.055	0.020	6.34E-04
SO_2	--	--	2.05E-03	AP-42[A]	0.19	0.069	2.20E-03

[A] AP-42 Section 3.3 (10/96)

[B] NSPS 40 CFR Part 60, Subapart IIII Limits

NSPS Limits - 40 CFR Part 60, Subapart IIII, (40 CFR 60.4202(a)(2) and 40 CFR 89.112 - Table 1)

	NOx + VOM	CO	PM
g/kW-hr	6.4	3.5	0.2
g/hp-hr	4.7725	2.6099	0.15

Chinook Power Station Project
Air Dispersion Modeling Inputs

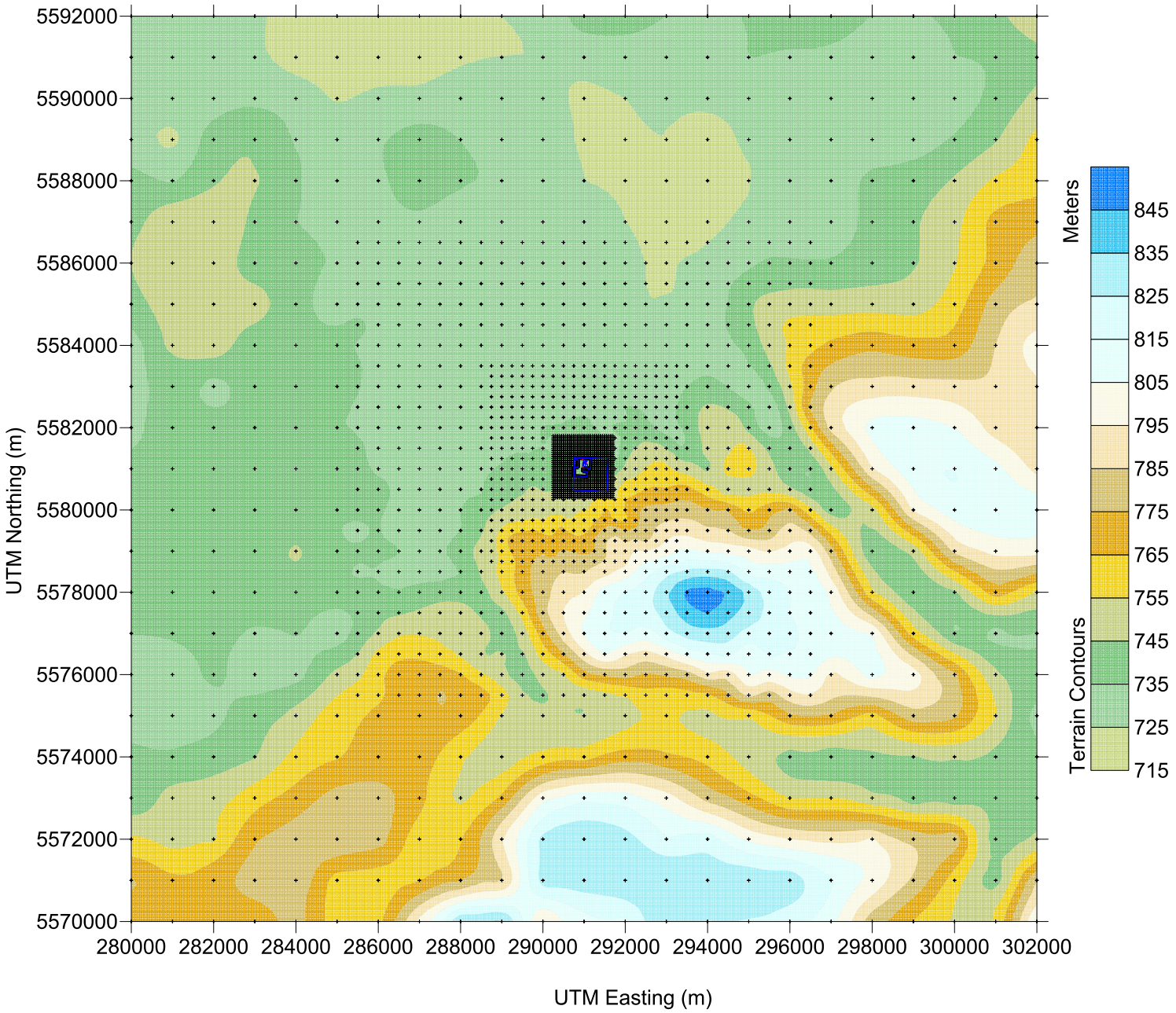
Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Stack Height (m)	Temperature (°C)	Exit Velocity (m/s)	Stack Diameter (m)	NO_2 (g/s)	CO (g/s)	PM (g/s)	PM_2.5 (g/s)	PM_10 (g/s)	SO_2 (g/s)
EP01_100	Turbine 100%	290,983.86	5,581,197.97	750.0	42.7	88.9	22.0	6.40	14.2	2.9	0.8	0.8	0.8	0.9
EP01_75	Turbine 75%	290,983.86	5,581,197.97	750.0	42.7	83.3	16.0	6.40	11.3	2.3	0.7	0.7	0.7	0.7
EP01_50	Turbine 50%	290,983.86	5,581,197.97	750.0	42.7	79.4	13.3	6.40	8.2	3.8	0.6	0.6	0.6	0.5
EP01_SS	Turbine - Starts Short Term	290,983.86	5,581,197.97	750.0	42.7	88.2	21.4	6.40	18.9	341.5	0.8	0.8	0.8	0.9
EP01_SL	Turbine - Starts Long Term	290,983.86	5,581,197.97	750.0	42.7	88.2	21.4	6.40	14.2		0.8	0.8	0.8	0.9
EU02_DPH	Dew Point Heater	290,966.24	5,581,226.23	750.0	4.6	162.8	13.4	0.36	0.047	0.039	3.78E-03	3.78E-03	3.78E-03	2.77E-04
EU03_EGS	Emergency Generator	291,048.83	5,581,136.56	750.0	4.6	476.7	117.3	0.20	1.8	0.97	0.055	0.055	0.055	0.19
EU03_EGL	Emergency Generator	291,048.83	5,581,136.56	750.0	4.6	476.7	117.3	0.20	2.03E-02		6.34E-04	6.34E-04	6.34E-04	2.20E-03
EU04_FPS	Emergency Fire Pump	290,975.17	5,581,057.23	750.0	4.6	573.3	78.6	0.13	0.27	0.24	0.014	0.014	0.014	0.086
EU04_FPL	Emergency Fire Pump	290,975.17	5,581,057.23	750.0	4.6	573.3	78.6	0.13	3.12E-03		1.56E-04	1.56E-04	1.56E-04	9.73E-04

Chinook Power Station Project
Buildings

Building ID	Building Name	Number of Tiers	Tier Number	Base Elevation (m)	Tier Height (m)	Number of Corners	Corner 1 East (X) (m)	Corner 1 North (Y) (m)	Corner 2 East (X) (m)	Corner 2 North (Y) (m)	Corner 3 East (X) (m)	Corner 3 North (Y) (m)	Corner 4 East (X) (m)	Corner 4 North (Y) (m)
CT2	Gas Turbine Generator	1	1	749.9604	10.668	4	291,055.86	5,581,210.95	291,071.25	5,581,210.02	291,068.97	5,581,167.28	291,053.51	5,581,168.27
CT1	HRSG Building	2	1	749.9604	21.336	4	290,990.22	5,581,214.74	291,055.86	5,581,210.98	291,053.48	5,581,168.28	290,987.85	5,581,172.43
CT1	*	*	2	*	39.624	4	290,990.22	5,581,214.74	291,028.30	5,581,212.46	291,026.04	5,581,169.87	290,987.85	5,581,172.43
ST1	Steam Turbine Building	1	1	749.9604	15.24	4	291,013.75	5,581,170.26	291,041.42	5,581,168.68	291,038.85	5,581,124.00	291,011.18	5,581,125.58
ACC	Air Cooled Condenser	1	1	749.9604	30.1752	4	291,028.77	5,581,108.97	291,084.13	5,581,105.81	291,080.96	5,581,051.05	291,025.61	5,581,054.21
CNTRL	Control Room/Warehouse/ Maintenance Shop	1	1	749.9604	7.62	4	290,968.87	5,581,152.07	290,992.00	5,581,150.89	290,987.06	5,581,070.03	290,964.32	5,581,071.61

APPENDIX C – MODELLING FIGURES

Figure C-1: 10 km by 10 km Receptor Grid and Elevation Map



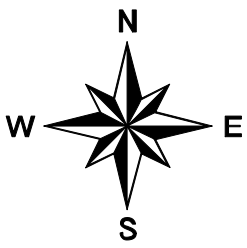


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Figure C-2: CO 1-Hour Concentration Plot
Start-up/Shutdown Operation

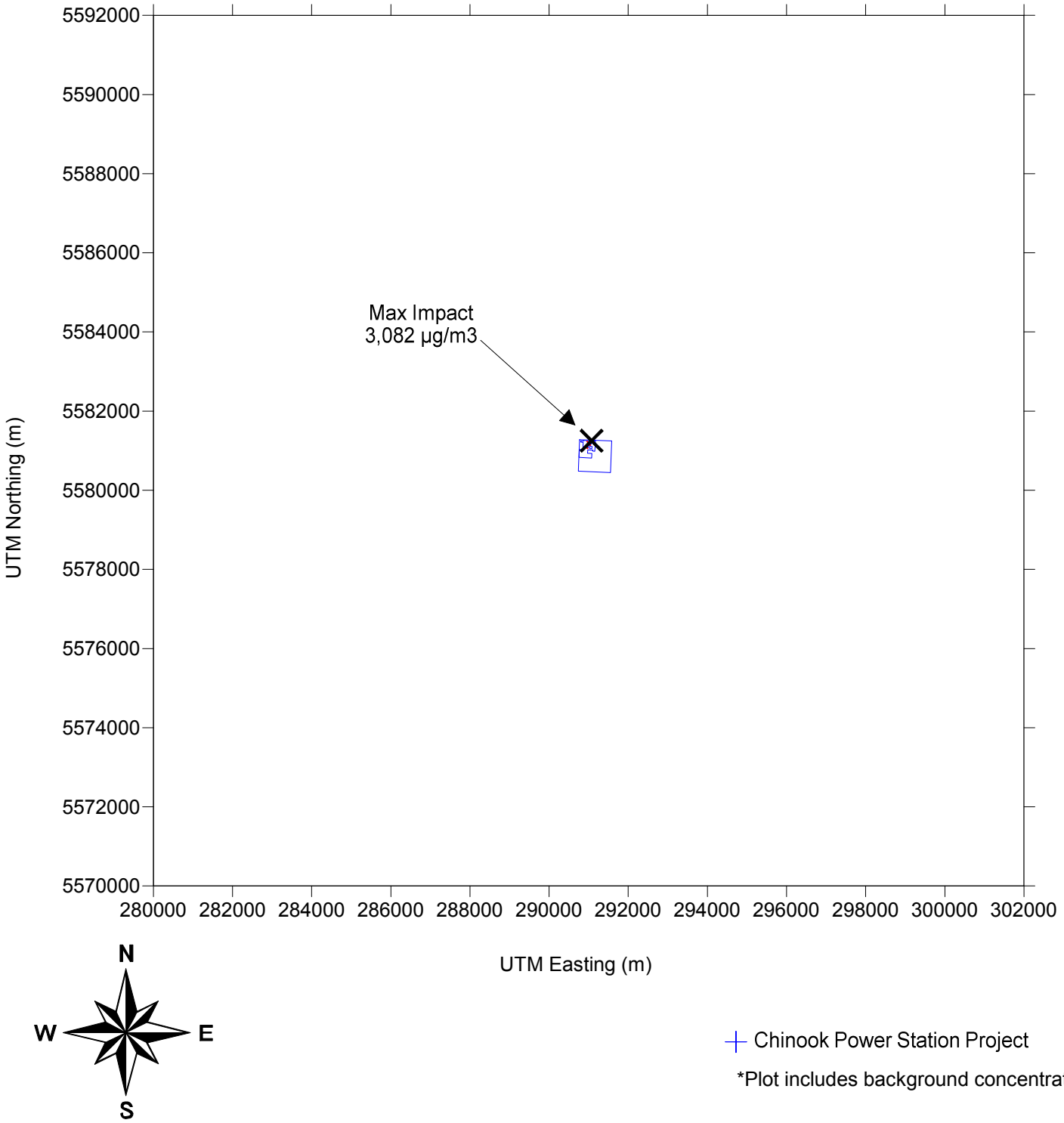

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Figure C-3: CO 8-Hour Concentration Plot
Start-up/Shutdown Operation

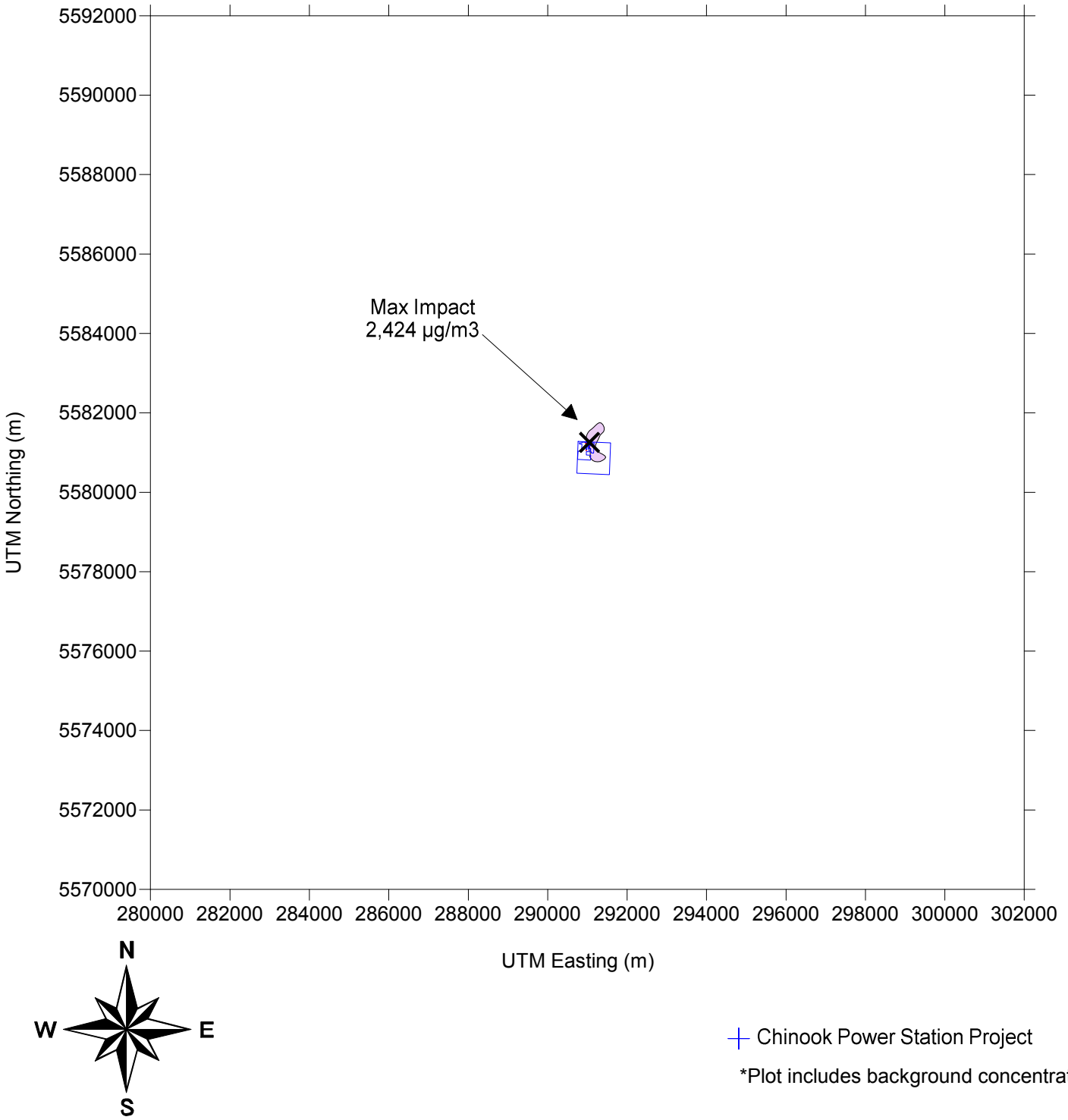

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Figure C-4: NO_2 1-Hour Concentration Plot
Start-up/Shutdown Operation

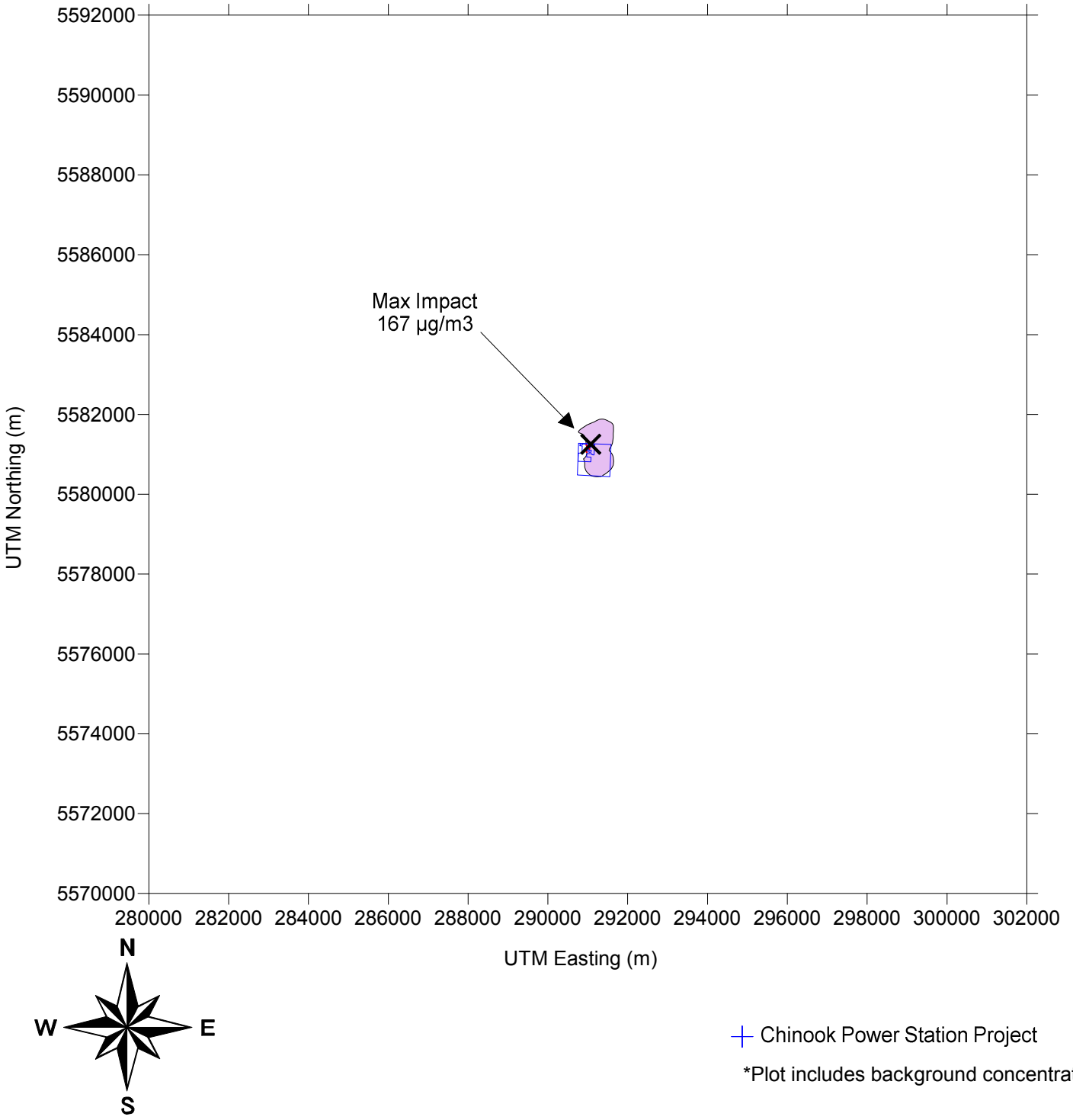

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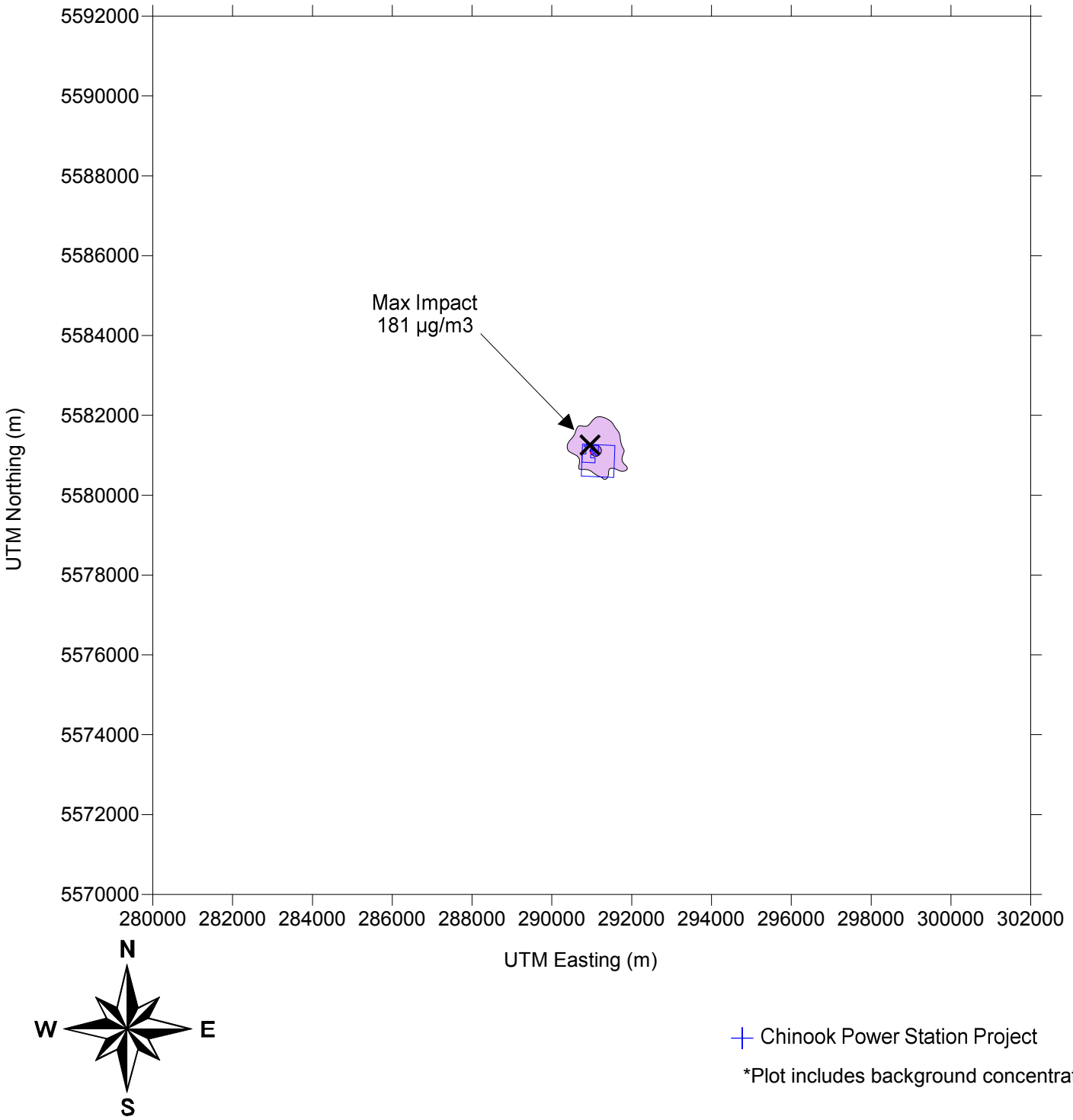
Figure C-5: NO_2 24-Hour Concentration Plot
50% Load Operation



Chinook Power Station Project

*Plot includes background concentration

Modeled Concentrations (µg/m³)

0 50 100 150 200

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Figure C-6: NO_2 Annual Concentration Plot
50% Load Operation

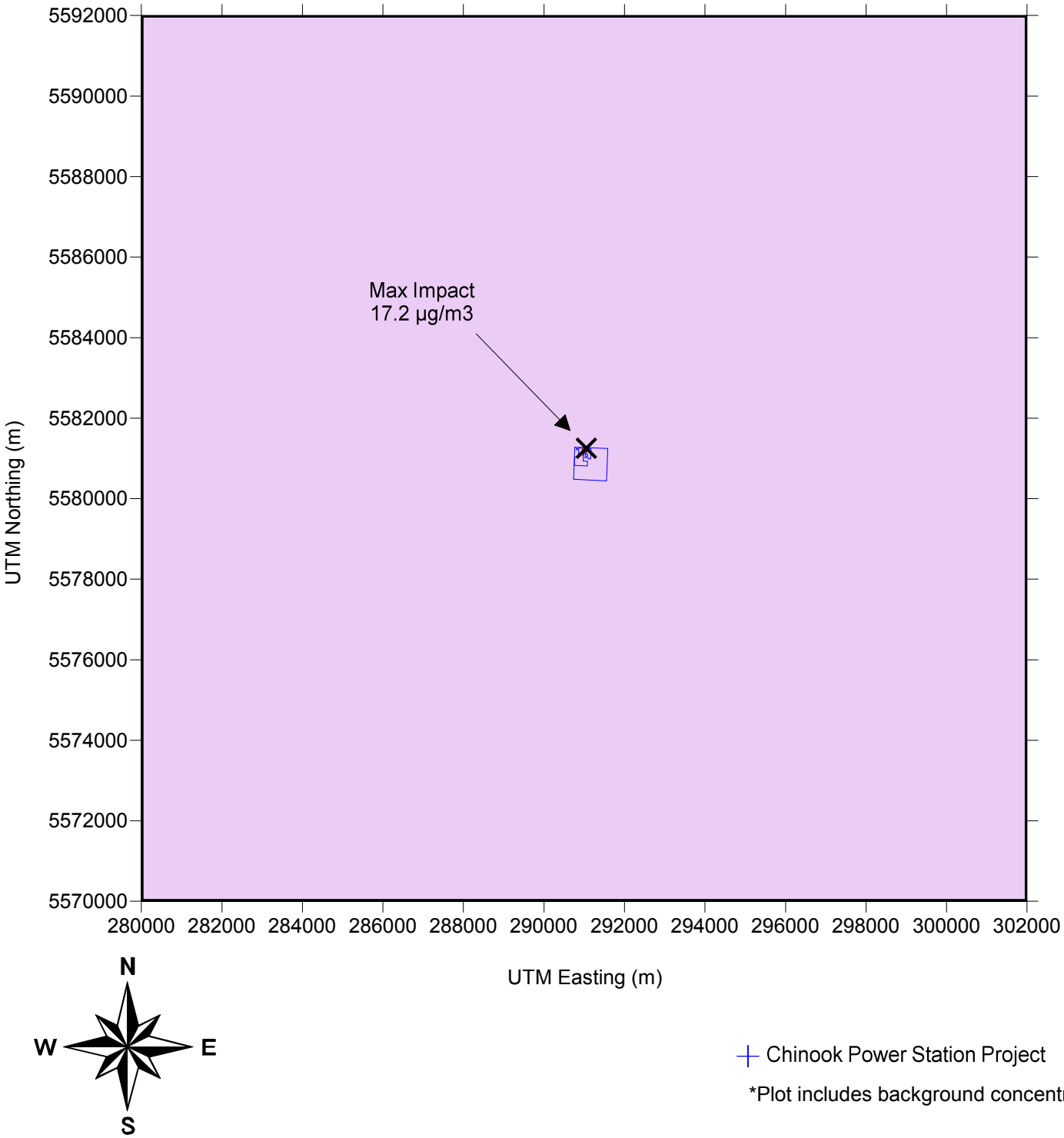

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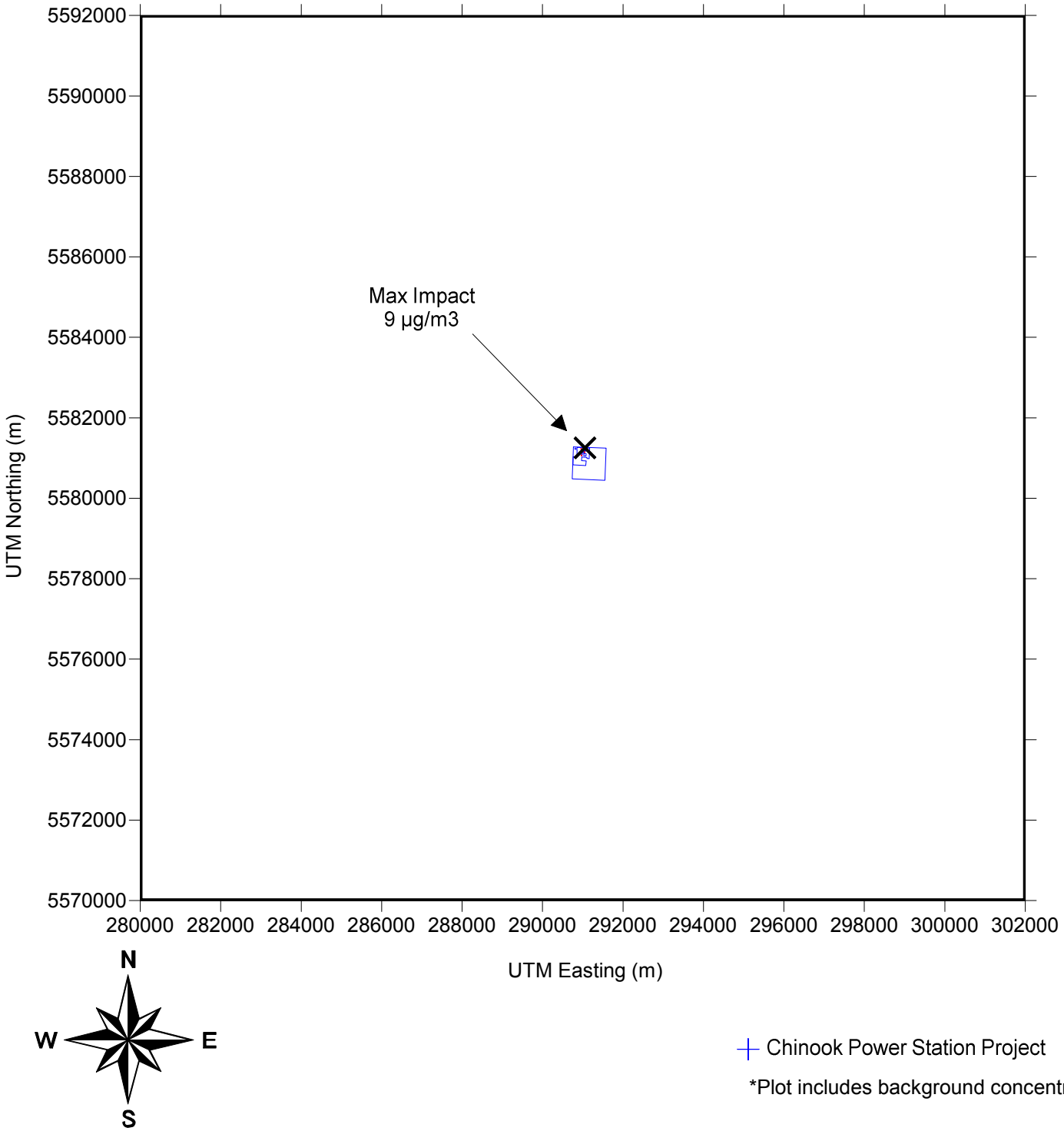
Figure C-7: SO_2 1-hour Concentration Plot
75% Load Operation



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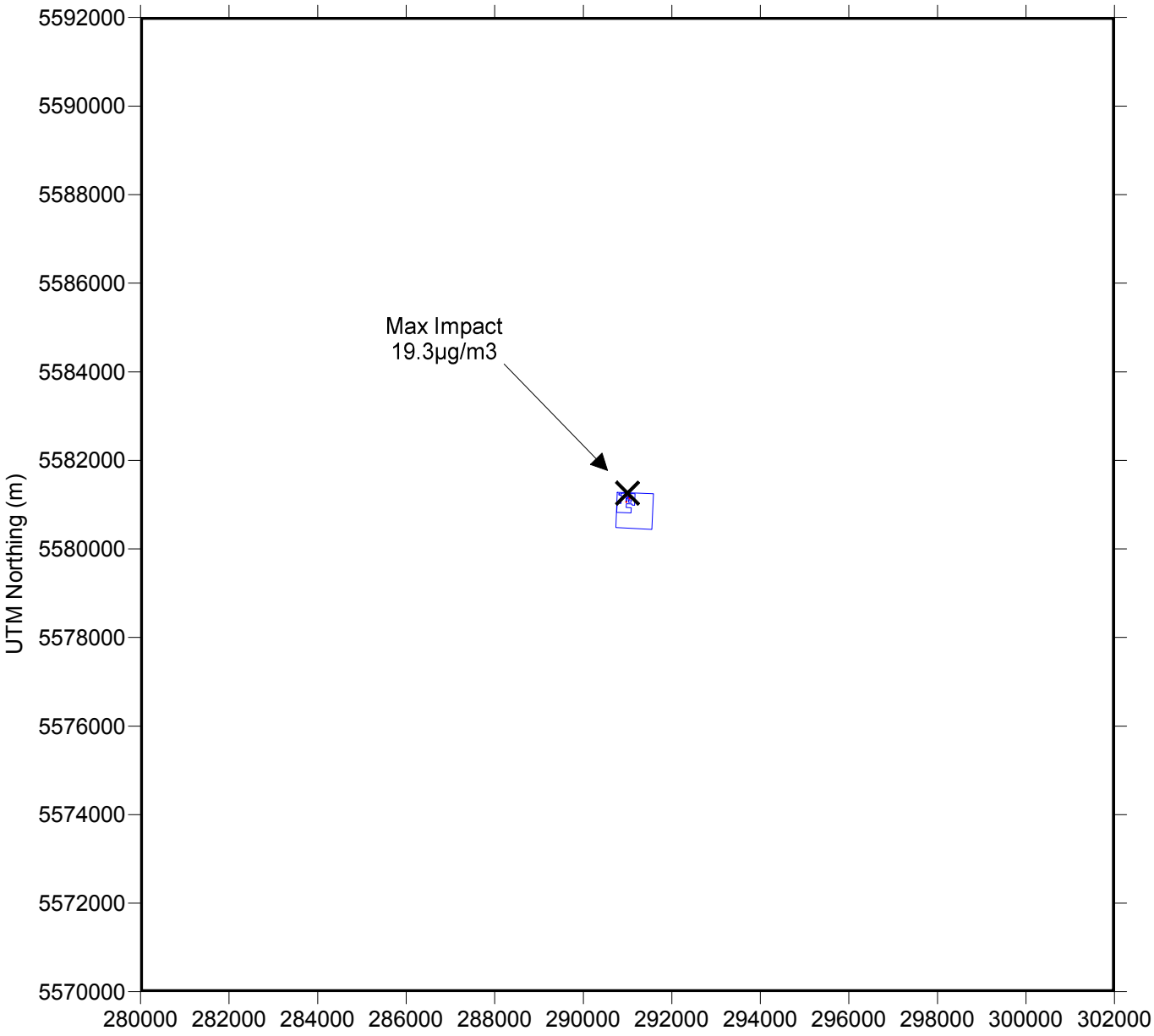
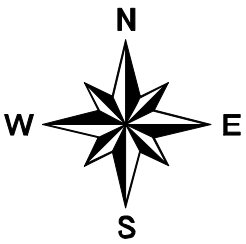
SaskPower

Figure C-8: SO_2 24-hour Concentration Plot
50% Load Operation





Chinook Power Station Project

*Plot includes background concentration

Modeled Concentrations (µg/m³)

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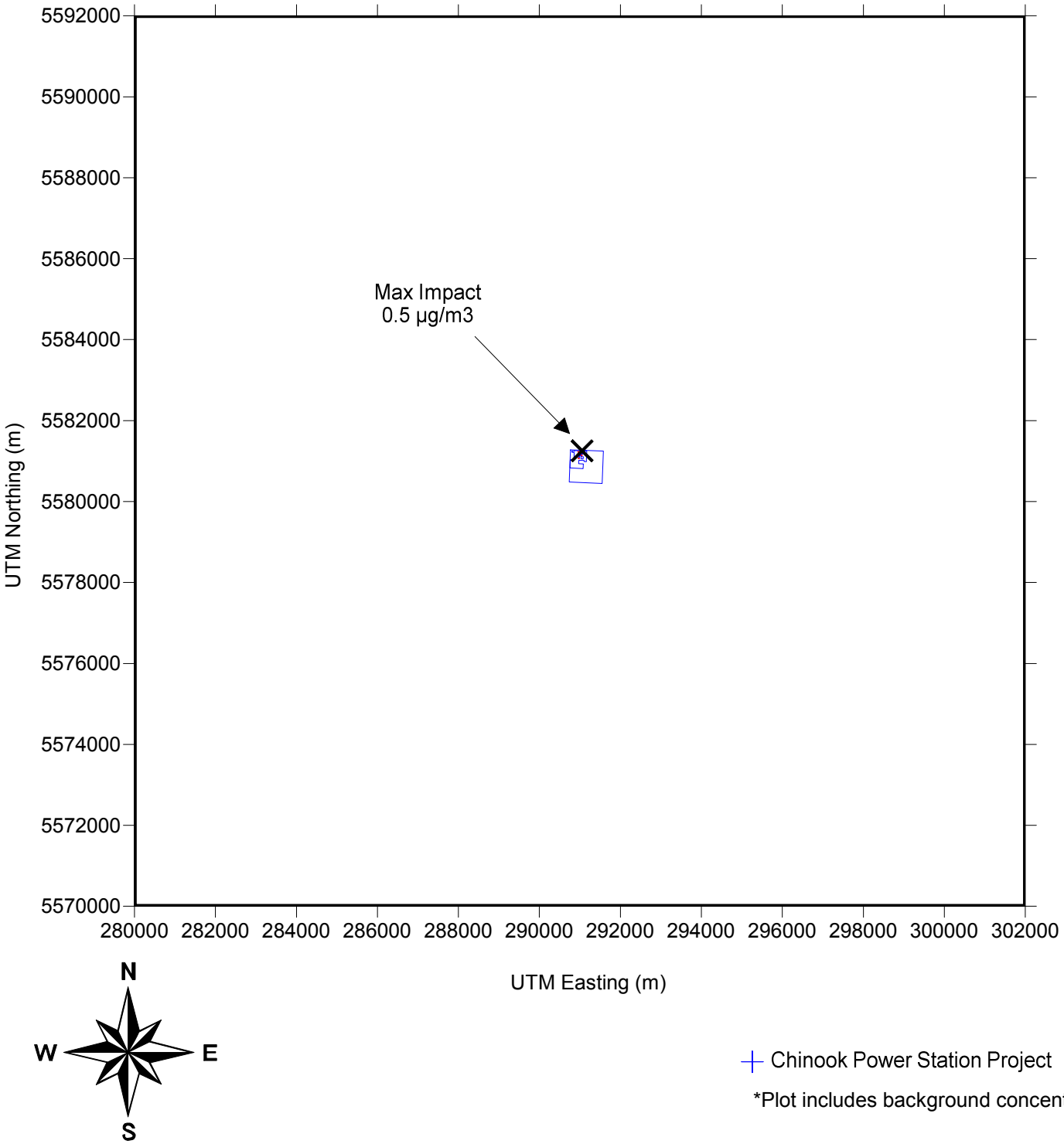
Figure C-9: SO_2 Annual Concentration Plot
50% Load Operation



BURNS McDONNELL CANADA

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Figure C-10: $PM_{2.5}$ 24-hour Concentration Plot
50% Load Operation

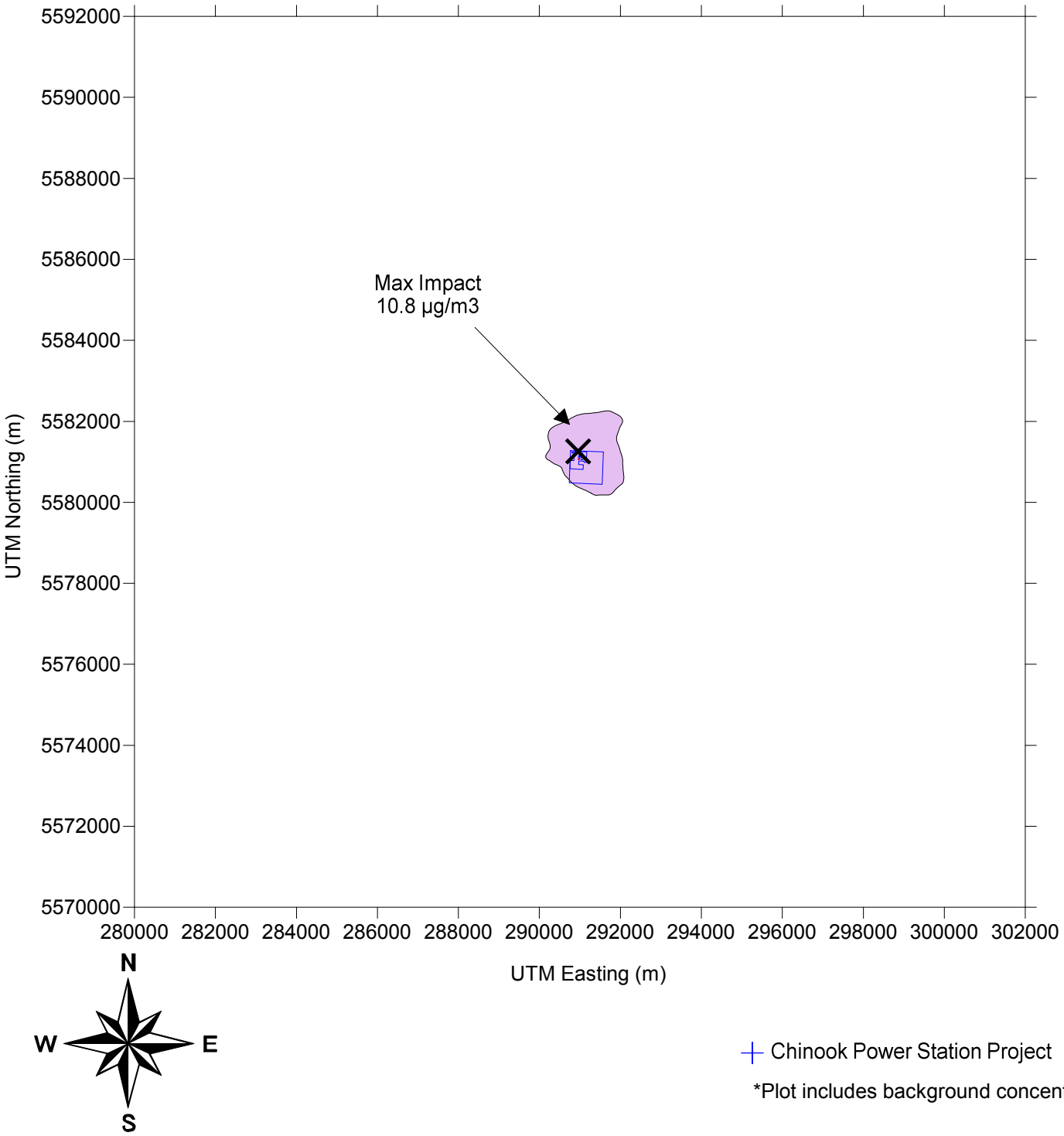

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Figure C-11: $PM_{2.5}$ Annual Concentration Plot
50% Load Operation

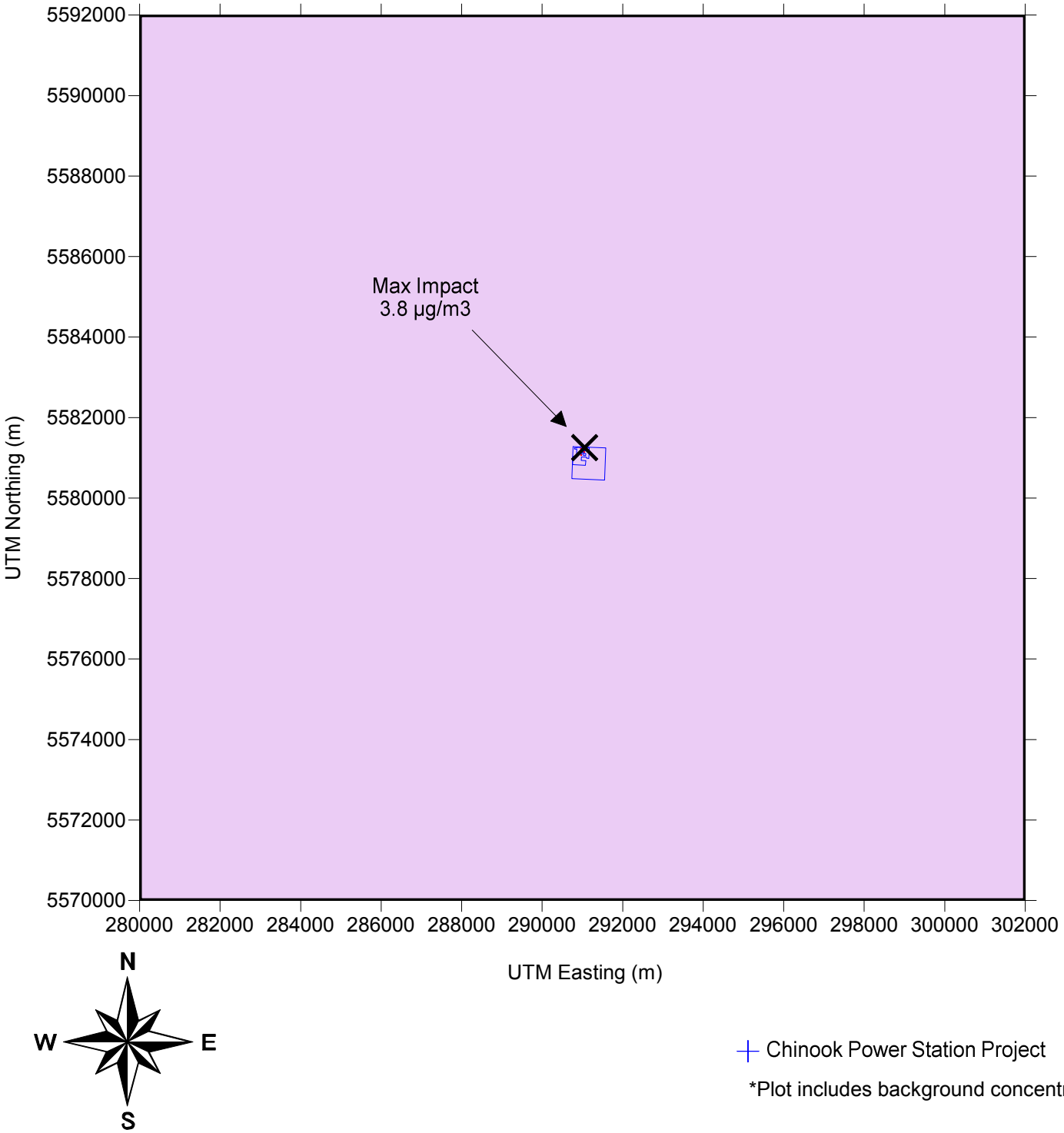

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Figure C-12: PM_{10} 24-hour Concentration Plot
50% Load Operation

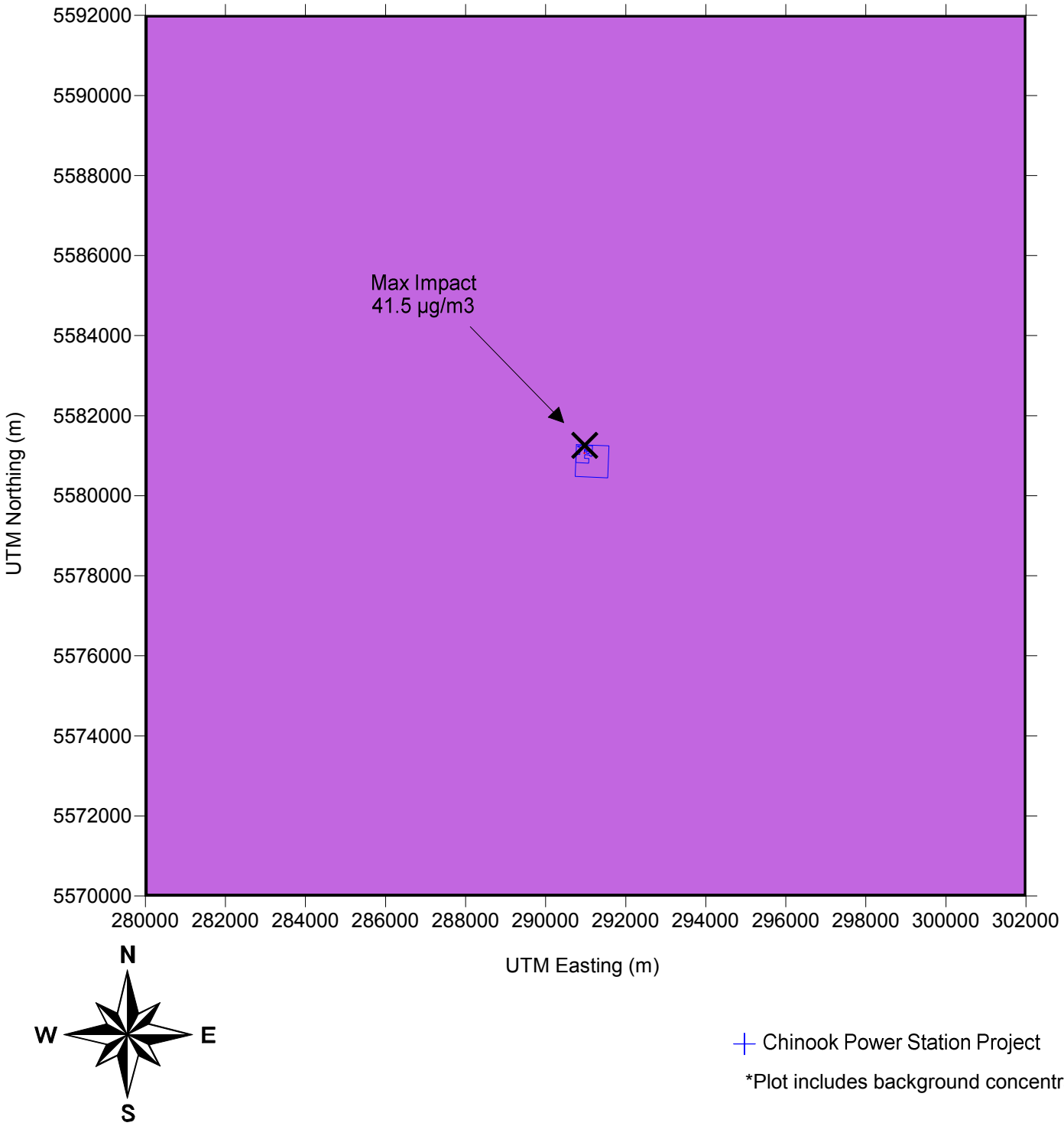

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Figure C-13: PM 24-hour Concentration Plot
50% Load Operation

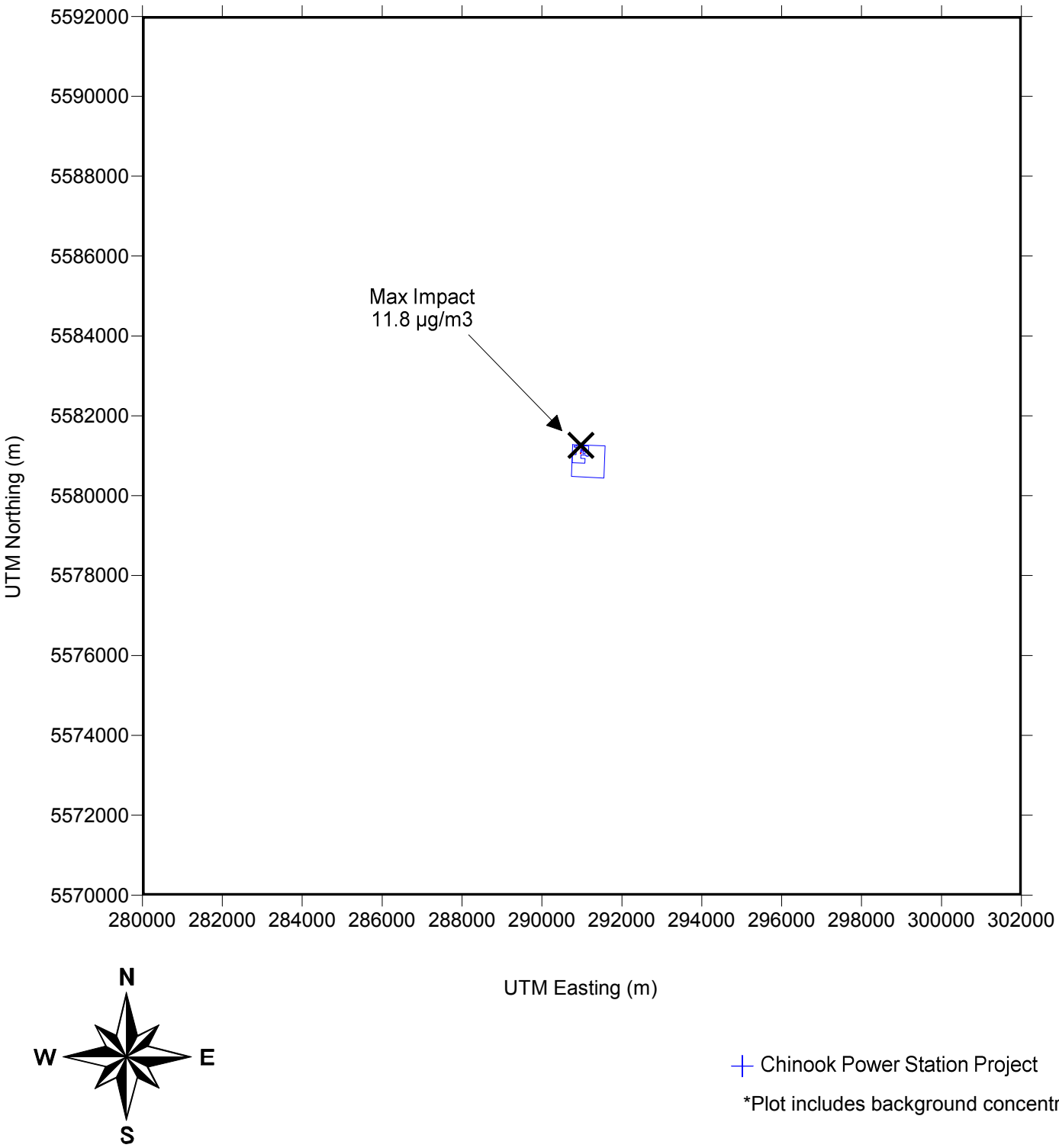

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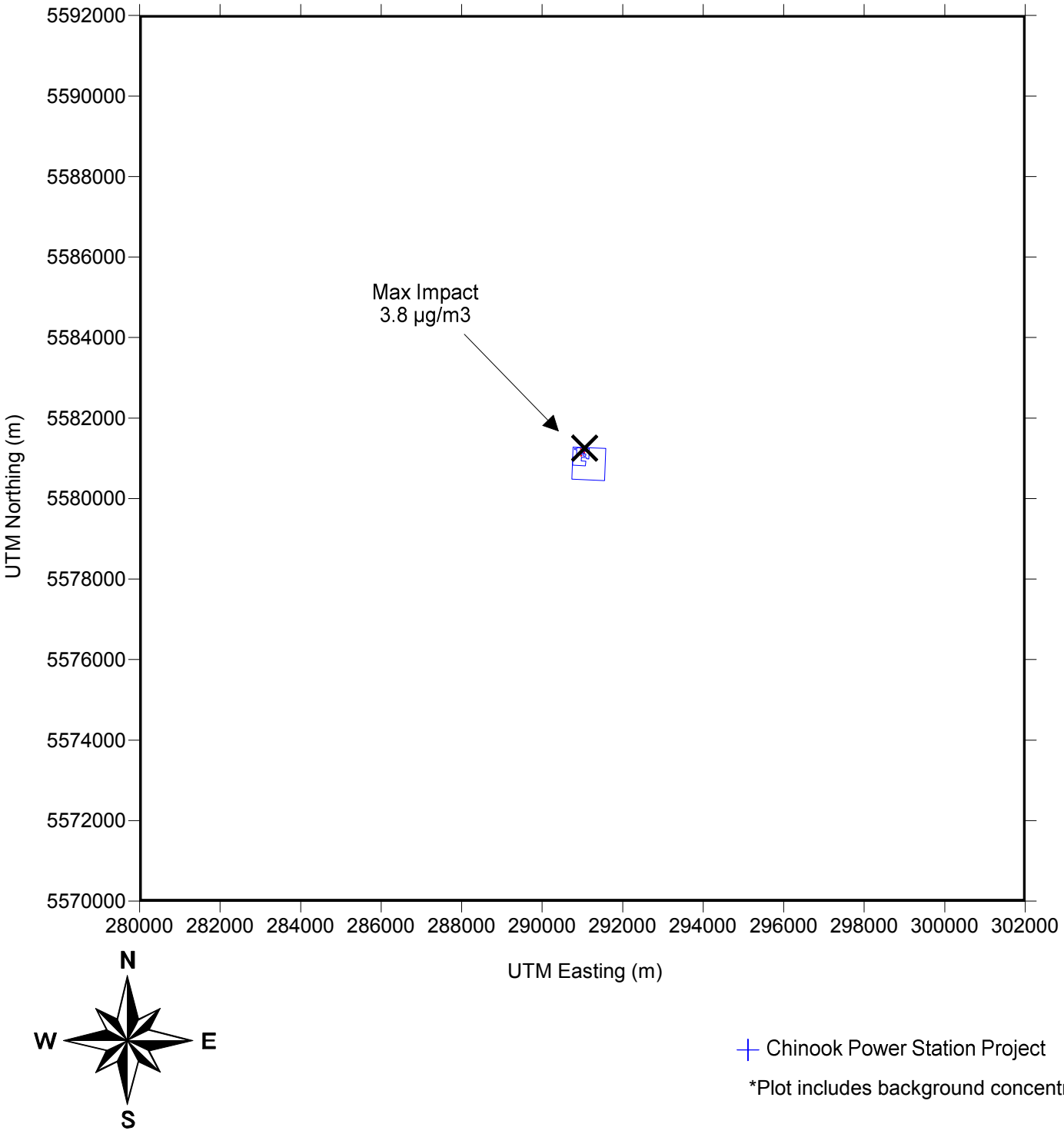
Figure C-14: PM Annual Concentration Plot
50% Load Operation



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APPENDIX D – MODELLING CD

BURNS McDONNELL CANADA

CREATE AMAZING.

Burns & McDonnell Canada, Ltd.
Radisson Centre Suite 210
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Appendix F NOISE

Memorandum

Date: September 2016

To: Chinook Power Station Proposal Team

From: Gabriel Weger and Ian Brewe

Subject: Chinook Power Station – Sound Assessment

Burns & McDonnell conducted a sound assessment for the proposed Chinook Power Station (Facility) located near Swift Current, Saskatchewan, Canada. Major equipment to be installed at the 1x1 combined cycle project consists of one combustion turbine (CTG), one heat recovery steam generator (HRSG), one steam turbine (STG) and an air cooled condenser (ACC). The following sections detail the sound assessment.

Requirements

The Facility will be located in Saskatchewan, Canada. Saskatchewan does not have any numerical noise limits applicable to the Facility. At the request of the Project Team, the Facility is to be designed to meet the Alberta Utilities Commission (AUC) noise limits.

Operational noise limits for the Facility are contained within AUC Rule 012 - Noise Control. The Facility shall be designed, constructed, operated, and maintained such that during steady state operations, sound emissions from the Facility will not be in excess of the Permissible Sound Levels (PSL) determined in accordance with AUC Rule 012. Abnormal operating modes of the plant such as bypass, startup, shutdown, and equipment failure/trip were excluded from this analysis. Because ambient sound levels have not been measured, they are assumed to be 35 dBA in accordance with the average ambient nighttime sound level in rural Alberta as stated in AUC Rule 012.

The PSL is determined for the most impacted dwelling(s) from the boundary of the Facility property. If there are no dwellings within 1.5 kilometers (km) from the facility property then the PSL is applicable at 1.5 km from the facility property. The PSL for the new combined cycle Facility is determined by taking the sum of the basic sound level and the adjustments for daytime hours, wintertime conditions, ambient sound levels, and temporary noise sources. The cumulative sound level includes the assumed or measured ambient sound level, any existing and approved, but not yet constructed energy-related facilities, and the predicted sound level from the applicant's proposed facility. The applicable basic sound level used to calculate the PSLs, based on proximity to transportation and population density, is 40 dBA L_{eq} during nighttime hours.

No ambient sound level measurements have been conducted at the proposed Facility. Therefore, AUC Rule 012 assumes that the ambient noise level is 5 dBA below the basic sound level, and the A2 adjustment for ambient sound is 0 dBA. No adjustments have been made for daytime hours or winter conditions.

Based on Rule 012, the Facility must meet a 40 dBA sound level limit at any point located 1.5 km from the Facility property line during steady state operations.

Predictive Modeling

Burns & McDonnell performed predictive noise modeling for the proposed Facility using the Computer Aided Design for Noise Abatement (CadnaA), Version 4.5.151, published by DataKustik, Ltd., Munich, Germany. Air absorption, ground absorption, and reflections and shielding for each piece of noise-emitting equipment were considered for predicting downwind sound pressure levels per International Organization for Standardization (ISO) 9613-2, Acoustics – Sound Attenuation during Propagation Outdoors (ISO, 1996).

Ground attenuation was conservatively assumed to be 0.50 for the Facility and all other areas outside of the Facility. The default meteorological conditions were applied. All physical structures such as buildings, berms, or walls, and that are expected to stay after completion of the new Facility, were included in the models.

Each piece of equipment associated with the proposed Facility was modeled with its expected sound power levels for the power block. The ACC was designed to meet 62 dBA at 400 feet and the balance of plant equipment was adjusted to meet 85 dBA at 3 feet horizontally from the sound emitting equipment. Vendor-provided input sound levels for all equipment were not available; therefore, historical data was used when required. The historical data was taken from projects of similar scope and size including GE and Siemens power block data. Attachment 1 provides the sound power level inputs for the model.

To meet the PSLs at 1.5 km beyond the property line some of the equipment will be required to include noise control measures to meet the following design criteria:

- Building walls meet a minimum sound transmission class (STC) rating of 35
- ACC to meet 62 dBA at 400 feet.
- HRSG Stack Exit to meet 110 dBA sound power level without directivity
- Inlet filter face to meet 107 dBA sound power level
- Gas Compressors to meet 85 dBA at 3 feet
- Transformers to meet 85 dBA at 3 feet
- All other equipment limited to 85 dBA at 3 feet

The model was used to predict the sound levels at 1.5 km from the property line. The locations of the receivers selected and the estimated sound levels generated by the Facility can be seen graphically in Figure 1, in Attachment 2. Each of the receivers is located approximately 1.5 km from the Facility property line. The figure shows sound generated from the Facility, projected outward to the property line and neighboring properties, represented in 5-dB contours. The

contours represent the expected sound levels of the Facility only, without the influence of sound generated by extraneous sources. The predicted sound levels of the Facility at all points 1.5 km from the property line are below 40 dBA with the assumed background added to the Facility generated sound levels.

Table 1: Permissible Sound Levels at 1.5 km Beyond the Property Line

Measurement	Modeled Sound Level (dBA)	Assumed Ambient Sound Level (dBA)	Predicted Sound Level (dBA)
PSL - North 1.5km	37.3	35.0	39.3
PSL - East 1.5km	38.3	35.0	40.0
PSL - South 1.5km	37.2	35.0	39.2
PSL - West 1.5km	37.8	35.0	39.6

Results

The Facility must meet a 40 dBA sound level limit at any point located 1.5 km from the Facility property line during steady state operations. Modeling results show that with the required mitigation and the additional measures listed above the sound levels will meet the nighttime limit. Graphical sound-level contours are shown in Figure 1, in Attachment 2. These are the expected sound levels of the new equipment only, and do not include any contributions ambient sound sources.

The Facility with mitigation listed in this memorandum is predicted to emit less than 40 dBA at 1.5 km from the property lines with ambient sound added in and comply with AUC Rule 012 noise limits.

GDW/IRB

Attachments

Memorandum

Attachment 1
Model Sound Level Inputs

Attachment 1
Model Sound Level Inputs

Source Type	Name	Number of Sources	Model Inputs - Source Sound Power Levels (dB)										
			Octave Band Center Frequency (Hz)									Overall	
			31.5	63	125	250	500	1000	2000	4000	8000	A	lin
Point	HRSG Stack	1	107.6	118.6	121.6	115.6	103.6	88.6	71.6	54.6	37.6	110.0	124.2
	Fuel Gas Yard Compressor	3	0.0	116.0	124.0	125.0	127.0	133.0	129.0	127.0	116.0	136.0	136.5
	ACC Header	4	97.6	104.2	106.2	102.1	97.8	92.0	86.2	81.4	72.3	101.2	117.7
Area	HRSG Roof	1	114.0	112.0	108.0	93.0	82.0	81.0	72.0	66.0	55.0	102.0	112.4
	East Building Roof	1	88.0	80.0	81.0	71.0	68.0	52.0	34.0	26.0	17.0	113.9	114.8
	Steam Tubine Building Roof	1	118.0	109.0	108.0	88.0	81.0	69.0	61.0	55.0	44.0	92.0	98.5
	STG GSU Transformer	1	101.0	101.0	105.0	105.0	105.0	89.0	84.0	77.0	72.0	108.9	109.8
	Fin Fan Cooler	1	86.5	113.0	112.0	109.0	104.0	102.0	96.0	90.0	84.0	113.9	114.8
	Oil Water Seperator	1	95.5	94.5	96.5	96.5	96.5	96.5	96.5	93.5	86.5	118.4	119.3
	STG GSU Transformer	1	101.0	101.0	105.0	105.0	105.0	89.0	84.0	77.0	72.0	108.9	109.8
	Oil Water Seperator	1	95.5	94.5	96.5	96.5	96.5	96.5	96.5	93.5	86.5	118.4	119.3
	ACC	1	114.7	107.7	105.7	100.7	97.7	94.7	86.7	82.7	78.7	99.7	116.2
	Aux Trans	1	87.0	87.0	91.0	88.0	94.0	86.0	76.0	71.0	65.0	101.2	117.7
Vertical Area	HRSG Building	1	121.0	118.0	114.0	99.0	89.0	88.0	81.0	76.0	68.0	100.1	123.3
	East Building	1	89.6	89.6	89.6	98.6	110.0	109.5	104.0	105.5	106.0	113.9	114.8
	Air Intake	1	115.8	118.8	118.8	102.8	96.8	97.8	100.8	93.8	81.8	107.0	122.9
	Steam Tubine Building	1	91.0	90.0	92.0	92.0	89.0	86.0	82.0	83.0	80.0	92.0	98.5
	STG GSU Transformer	1	84.6	84.6	84.6	93.6	105.0	104.5	99.0	100.5	101.0	108.9	109.8
	Oil Water Seperator	1	94.1	94.1	94.1	103.1	114.5	114.0	108.5	110.0	110.5	118.4	119.3
	STG GSU Transformer	1	84.6	84.6	84.6	93.6	105.0	104.5	99.0	100.5	101.0	108.9	109.8
	Oil Water Seperator	1	94.1	94.1	94.1	103.1	114.5	114.0	108.5	110.0	110.5	118.4	119.3
	Fin Fan Cooler	1	89.6	89.6	89.6	98.6	110.0	109.5	104.0	105.5	106.0	113.9	114.8
	ACC	1	114.7	107.7	105.7	100.7	97.7	94.7	86.7	82.7	78.7	99.7	116.2
	Aux Trans	1	116.2	109.2	107.2	102.2	99.2	96.2	88.2	84.2	80.2	101.2	117.7

Attachment 2
Sound Modeling Figures

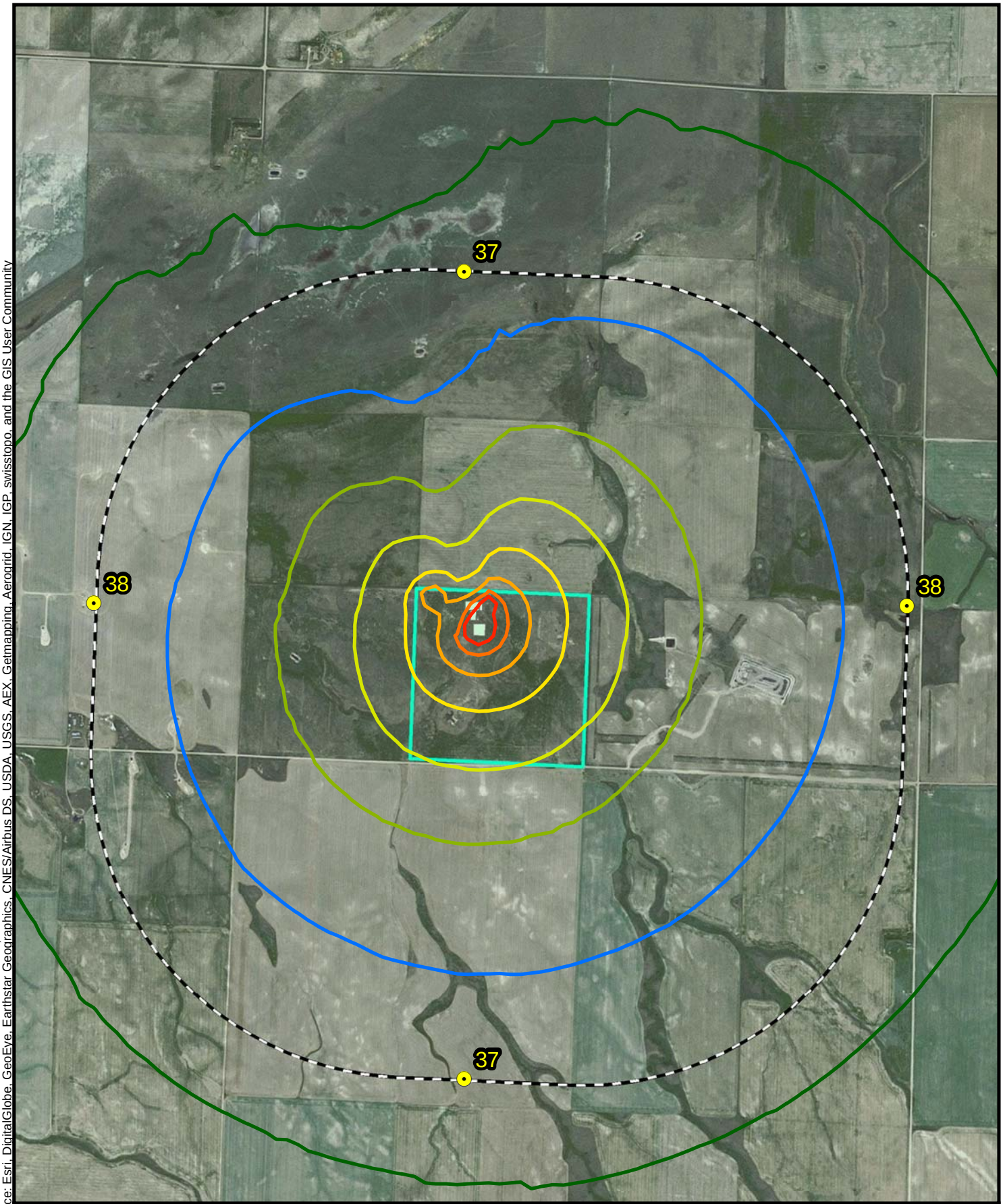

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Figure 1
Sound Level Contours

Source: Burns & McDonnell Engineering Company Inc

Issued: 8/2/2016

Appendix G SASKPOWER VEGETATION MANAGEMENT POLICY

SaskPower Vegetation Management Policy

Policy

SaskPower is committed to protecting the environment while providing safe, reliable and sustainable power to our customers.

Control of vegetation on power line rights-of-way and SaskPower properties is crucial for maintaining safe access for employees and reliability of service to customers by reducing the risk of power outages and fires.

It is SaskPower policy that vegetation management is conducted in a manner that is environmentally responsible, respectful of our customers and the public, and in accordance with all legal requirements.

Purpose

The purpose of this Policy is to provide guidelines to SaskPower personnel and contractors for the environmentally responsible management of vegetation associated with all SaskPower facilities and operations.

This Policy has been developed in accordance with the framework of SaskPower's Board-approved Environmental Policy and vegetation management methods endorsed by the Saskatchewan Ministry of Environment.

Principles

SaskPower uses an integrated vegetation management approach that reduces the dependence on any single control method by combining an understanding of plant ecology with a wide range of management tools in order to manage vegetation in an effective, economical and environmentally responsible manner.

SaskPower will manage vegetation in a manner that:

- Uses an ecological approach;
- Is cost-effective;
- Considers community values in establishing standards of maintenance for SaskPower properties;
- Receives landowner consent;
- Uses herbicides responsibly and in compliance with all relevant federal, provincial and municipal legislation;
- Uses herbicides that persist at phytotoxic levels in the soil for no longer than two years;
- Uses only herbicides that are registered for use in Canada by the authority of the federal *Pest Control Products Act* and in the manner prescribed by the product label; and,
- Ensures that herbicides are applied by certified commercial contractors or by SaskPower personnel, who hold a current Pesticide Applicators license issued under the authority of the *Pest Control Products (Saskatchewan) Act*.

Roles and Responsibilities

Business units shall be responsible for the development of vegetation management plans in accordance with this Policy and the SaskPower Vegetation Management Procedures and Operational Controls document.

Business units shall provide input into the annual review of this policy and supporting documents.

Environmental Programs, in consultation with SaskPower business units, shall be responsible for the annual review and ongoing maintenance of this policy and the following supporting documents:

- Vegetation Management Procedures and Operational Controls
- Appendix A: Approved Herbicides List
- Vegetation Management Notification Procedure
- Vegetation Management Incident Report

The SaskPower Vegetation Management Policy shall be reviewed and approved annually by the SaskPower executive.

Appendix H PROVINCIAL AND FEDERAL SPECIES RANKING DEFINITIONS

Table H-1 Ranking Definitions

Category	Definition
SKCDC[1]	
S1	Critically imperiled – may be especially susceptible to extirpation because of some factor of its biology.
S2	Imperiled – may be susceptible to extirpation because of some factor of its biology.
S3	Vulnerable – may be susceptible to extirpation by large scale disturbances.
S4	Apparently secure – uncommon, not rare but may be of long-term concern.
S5	Secure – common, widespread, and abundant.
Modifiers for SKCDC Ranks	
A	Accidental or causal in the province, including species recorded infrequently that are far outside their range (birds or butterflies).
B	For migratory species, rank applies to the breeding population in the province.
N	For migratory species, rank applies to the non-breeding population in the province.
M	For migratory species, rank applies to the transient population.
H	Historical occurrence but without recent verification (e.g., within 20 years).
U	Status uncertain and species unrankable due to lack of information.
X	A species that is believed to be extinct or extirpated.
NA	Conservation status is not applicable to this species (e.g., exotic species).
NR	Species is not yet ranked.
?	Can be added to any rank to denote an inexact numeric rank (e.g., S1? = believed to be 5 or fewer occurrences, but some doubt exists concerning status).
SK Wildlife Act[2]	
Extirpated	A species that no longer exists in the wild in Saskatchewan but exists in the wild outside the province.
Endangered	A species facing imminent extirpation or extinction.
Threatened	A species likely to become endangered if limiting factors are not reversed.
Vulnerable	A species of special concern because of low or declining numbers due to human activities or natural events but that is not endangered or threatened.
SARA[3]	
Extinct	A wildlife species that no longer exists.
Extirpated	A wildlife species that no longer exists in the wild in Canada, but exists elsewhere in the wild.
Endangered	A wildlife species that is facing imminent extirpation or extinction.

Appendix H Provincial and Federal Species Ranking Definitions

Category	Definition
Threatened	A wildlife species that is likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction.
Special Concern	A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.
COSEWIC[4]	
Extinct	A wildlife species that no longer exists.
Extirpated	A wildlife species that no longer exists in the wild in Canada, but exists elsewhere in the wild.
Endangered	A wildlife species facing imminent extirpation or extinction.
Threatened	A wildlife species likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
Special Concern	A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.
Data Deficient	A wildlife species for which there is insufficient information to resolve a species' suitability for assessment or to permit an assessment of the species' risk of extinction.
Not At Risk	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

SOURCES:

[1] SKCDC 2015d.

[2] SK MOE 2013.

[3] Government of Canada 2002.

[4] COSEWIC 2015a.

Appendix I SUPPLEMENTARY BIOLOGICAL INFORMATION - VEGETATION AND WETLANDS

I.1 STEWART AND KANTRUD (1971) WETLAND CLASSIFICATION

Wetland Class	Central Zone	Description
Class I – ephemeral ponds	low prairie zone	Ephemeral ponds occur in small swales and contain species such as Kentucky bluegrass (*Poa pratensis*).
Class II – temporary ponds	wet meadow zone	In freshwater temporary ponds, the central wet meadow zone is the deepest part of the wetland area and is usually dominated by western wheatgrass (*Pascopyrum smithii*) and foxtail barley (*Hordeum jubatum* ssp. *jubatum*).
Class III – seasonal ponds	shallow marsh zone	Seasonal ponds are wetlands with a shallow marsh zone dominating the deepest part of the wetland area. These ponds are frequently surrounded by a ring of willows with a wet center containing sedges (*Carex* spp.).
Class IV – semi-permanent ponds	deep marsh zone	In semi-permanent ponds and lakes, the deep marsh zone dominates the deepest part of the wetland area. Common cattail (*Typha latifolia*) and bulrushes (*Scirpus* spp.) are typical emergent species.
Class V – permanent ponds	permanent open water zone	The permanent open water zone dominates the deepest part of the wetland area and is devoid of emergent vegetation.
Class VI – alkali ponds	intermittent-alkali zone	The intermittent-alkali zone is the deepest part of the wetland area. This zone may be devoid of emergent vegetation or beaked ditch grass (*Ruppia maritima*) may be present.

I.2 SKCDC HISTORICAL OCCURRENCES OF PLANT SOMC

Scientific Name	Common Name	COSEWIC Status	SARA Status	SKCDC Rank	Number of Occurrences		
					PDA	LAA	Within 10km of PDA
Ambrosia acanthicarpa	Bur ragweed	_	_	S2	0	0	1
Astragalus kentrophyta var. kentrophyta	Spiny milk- vetch	_	_	S2	0	0	1
Danthonia californica var. American	California Wild Oat Grass	_	_	S3	0	0	1
Danthonia unispicata	Few-flowered oat-grass	_	_	S3	1	0	0
Delphinium bicolor ssp. bicolor	Flat-head larkspur	_	_	S3	0	0	6
Dodecatheon conjugens var. viscidum	Bonneville shootingstar	_	_	S3	1	0	0
Gentiana fremontii	Moss gentian	_	_	S3	0	0	1
Lupinus pusillus ssp. pusillus	Small lupine	_	_	S3	0	0	1
Navarretia saximontana	Rocky mountain pincushion-plant	_	_	S3	0	0	1
Oenothera caespitosa ssp. caespitosa	Gumbo evening primrose	_	_	S3	0	0	2
Penstemon confertus	Yellow beardtongue	_	_	S2	0	1	0
Pterygoneurum kozlovii	Alkaline wing-nerved moss	Threatened	Threatened	S1	0	0	1
Schedonnardus paniculatus	Tumble Grass	_	_	S3	1	0	1
Shinnersoseris rostrata	Beaked annual skeleton-weed	_	_	S2	0	0	1
Viola pedatifida	Crowfoot	_	_	S3	1	0	1

I.3 ALL PLANT SPECIES OBSERVED DURING 2015 AND 2016 VEGETATION AND WETLAND SURVEYS

Scientific Name	Common Name	SKCDC Rank
Achillea millefolium	Common yarrow	S5
Agropyron cristatum ssp. pectinatum	Crested wheatgrass	SNA
Allium textile	Prairie onion	S4
Amaranthus retroflexus	Red-root pigweed	SNA
Androsace occidentalis	Western pygmyflower	S4
Anemone canadensis	Canada anemone	S4
Antennaria parvifolia	Small-leaved everlasting	S4
Artemesia absinthe	Absinthe	
Artemisia biennis var. biennis	Sagewort	SNA
Artemisia cana ssp. cana	Hoary sagebrush	S5
Artemisia frigida	Pasture sage	S5
Artemisia ludoviciana ssp. ludoviciana	Prairie sage	S5
Asclepias speciosa	Common milkweed	S4
Bassia scoparia	Kochia	SNA
Boechera grahamii	Rockcress	S4
Boechera retrofracta	Reflexed rockcress	S4
Bromus inermis	Smooth brome	SNA
Bromus ciliatus	Fringed brome	S4
Carex aquatilis var. aquatilis	Water sedge	S4
Carex atherodes	Awned sedge	S4
Carex pellita	Woolly sedge	S4
Chenopodium album var. album	Lamb's-quarter's	SNA
Chenopodium rubrum var. rubrum	Red goosefoot	S4
Cirsium arvense	Canada thistle	SNA
Cirsium flodmanii	Flodman's thistle	S4
Crepis tectorum	Annual hawksbeard	SNA
Cyclachaena xanthiifolia	False ragweed	S4
Descurainia sophia	Flixweed	SNA
Eleocharis erythropoda	Bald spikerush	S4

Scientific Name	Common Name	SKCDC Rank
Elymus canadensis var. canadensis	Canadian wild rye	S4
Elymus lanceolatus	Northern wheatgrass	S5
Elymus trachycaulus ssp. trachycaulus	Slender wheatgrass	S5
Equisetum arvense	Common horsetail	S5
Equisetum hyemale var. affine	Common scouring-rush	S4
Equisetum laevigatum	Smooth scouring-rush	S4
Erigeron caespitosus	Tufted fleabane	S4
Erysimum asperum	Western wallflower	S4
Euphorbia esula var. esula	Leafy spurge	SNA
Gaura coccinea	Scarlet gaura	S5
Geum triflorum var. triflorum	Old-man's-whiskers	S5
Glycyrrhiza lepidota	Wild licorice	S4
Grindelia squarrosa var. serrulata	Tar weed	S5
Gutierrezia sarothrae	Broomweed	S4
Helianthus annuus	Common annual sunflower	S4
Heterotheca villosa var. villosa	Hairy false golden-aster	S5
Hordeum jubatum ssp. jubatum	Foxtail barley	S5
Juncus balticus	Baltic rush	S4
Koeleria macrantha	June grass	S5
Lactuca serriola	Prickly lettuce	SNA
Lappula occidentalis var. occidentalis	Flat-spine sheepbur	S4
Lepidium densiflorum var. densiflorum	Miner's pepperwort	SNA
Leymus innovatus ssp. innovatus	Hairy wild-rye	S4
Lithospermum incisum	Narrow-leaved puccoon	S4
Lygodesmia juncea	Skeleton-weed	S5
Malva pusilla	Round-leaved mallow	
Medicago sativa ssp. sativa	Alfalfa	SNA
Melilotus alba	White sweet-clover	SNA
Melilotus officinalis	Yellow sweet-clover	SNA
Mentha arvensis	Wild mint	S4
Mulgedium pulchellum	Common blue lettuce	S4
Orthocarpus luteus	Owl's-clover	S4

Scientific Name	Common Name	SKCDC Rank
Pascopyrum smithii	Western wheatgrass	S5
Persicaria amphibia var. emersa	Water smartweed	S4
Phalaris arundinacea	Reed canary grass	S4
Phlox hoodii ssp. hoodii	Moss phlox	S5
Plantago major	Common plantain	SNA
Poa palustris	Fowl blue grass	S4
Poa pratensis	Kentucky bluegrass	S5
Populus balsamifera ssp. balsamifera	Balsam poplar	S5
Potentilla argentea var. argentea	Silver-leaf cinquefoil	SNA
Potentilla norvegica	Rough cinquefoil	S4
Prunus virginiana var. virginiana	Chokecherry	S5
Puccinellia nuttalliana	Nuttall's salt-meadow grass	S4
Ranunculus cymbalaria	Seaside buttercup	S4
Ratibida columnifera	Prairie coneflower	S4
Rosa acicularis ssp. sayi	Prickly rose	S5
Rosa arkansana	Prairie rose	S5
Rumex crispus	Curled dock	SNA
Salix amygdaloides	Peachleaf willow	S4
Schoenoplectus acutus var. acutus	Hard-stemmed bulrush	S4
Schoenoplectus tabernaemontani	Soft-stem bulrush	S4
Scirpus sp.	Bulrush	
Selaginella densa var. densa	Dense spike-moss	S4
Sisymbrium loeselii	Tall hedge mustard	SNA
Solidago altissima	Tall goldenrod	S5
Solidago lepida var. salebrosa	Graceful Canada goldenrod	S5
Solidago missouriensis var. fasciculata	Low goldenrod	S5
Solidago mollis	Soft goldenrod	S4
Stellaria longipes ssp. longipes	Long-stalked starwort	S4
Symphoricarpos occidentalis	Western snowberry	S5
Symphyotrichum falcatum var. falcatum	White prairie aster	S4
Taraxacum officinale ssp. officinale	Common dandelion	SNA
Thlaspi arvense	Stinkweed	SNA

Scientific Name	Common Name	SKCDC Rank
Tragopogon dubius	Yellow goat's-beard	SNA
Triglochin maritima	Seaside arrow-grass	S4
Urtica dioica ssp. gracilis	Stinging nettle	S4
Viola adunca var. adunca	Sand violet	S5

I.4 PHOTOGRAPHS – VEGETATION AND WETLANDS

May 31, 2016

PHOTO 1 View of tame pasture in SE-13-16-15-W3M looking north.

May 31, 2016

PHOTO 2 View of modified native vegetation in SE-13-16-15-W3M looking south.

May 31, 2016

PHOTO 3 View of Class I wetland in SE-13-16-15-W3M looking north.

May 31, 2016

PHOTO 4 View of Class II wetland in SE-13-16-15-W3M looking west.

May 31, 2016

PHOTO 5 View of Class III wetland in SE-13-16-15-W3M looking west.

May 31, 2016

PHOTO 6 View of Class IV wetland and associated dugout, in SE-13-16-15-W3M looking west.

July 21, 2016

PHOTO 7 View of drainage channel in NW-24-15-14-W3M looking east.

July 21, 2016

PHOTO 8 View of Class IV wetland in NE-23-15-14-W3M looking south.

July 21, 2016

PHOTO 9 View of Class II/III wetland in SW-26-15-14-W3M looking north.

July 21, 2016

PHOTO 10 View of Class IV wetland in NE-22-15-14-W3M looking south.

July 21, 2016

PHOTO 11 View of cultivated lands in NW-34-15-14-W3M looking east.

July 22, 2016

PHOTO 12 View of coulee habitat with native prairie in NE-31-15-14-W3M looking west.

July 21, 2016

PHOTO 13 View of Class IV wetland in SE-28-15-14-W3M looking north.

July 21, 2016

PHOTO 14 View of Class II wetland/drainage channel in SW-28-15-14-W3M looking north.

July 21, 2016

PHOTO 15 View of industrial development in NW-28-15-14-W3M looking east.

July 21, 2016

PHOTO 16 View of native prairie in coulee habitat in SE-32-15-14-W3M looking west.

	
July 21, 2016 PHOTO 17 View of hayland in NW-28-15-14-W3M looking east.	July 22, 2016 PHOTO 18 View of hayland with gravel pit in SW-18-16-14-W3M looking north.

Appendix J SUPPLEMENTARY BIOLOGICAL INFORMATION - WILDLIFE

J.1 WILDLIFE SOMC WITH THE POTENTIAL TO OCCUR IN THE WILDLIFE LAA

Common Name	Scientific Name	SARA[1]	COSEWIC[2]	SK MOE[3]	SKCDC[4,5]	Key Wildlife Feature	Activity Restriction Setback (Recommended Distance for Medium Disturbance Activity)[6]
INSECTS							
Monarch	*Danaus plexippus*	Special Concern	Special Concern		S3B		
Verna's flower moth	*Schinia verna*	Threatened	Threatened		SH		
Pale yellow dune moth	*Copablepharon grandis*	Special Concern	Special Concern		SNR		
Dusky dune moth	*Copablepharon longipenne*	Endangered	Endangered		SNR		
Uncas skipper	*Hesperia uncas*				S3		
Checkered white	*Pontia protodice*				S2		
West coast lady	*Vanessa annabella*				S1M		
AMPHIBIANS							
Western tiger salamander	*Ambystoma mavortium*		Special Concern		S5		
Plains spadefoot toad	*Spea bombifrons*	No Status	Not at Risk		S3	Breeding and overwintering habitat	90 m
Great Plains toad	*Anaxyrus cognatus*	Special Concern	Special Concern		S3	Breeding and overwintering habitat	400 m
Canadian toad	*Anaxyrus hemiophrys*	No Status	Not at Risk		S4	Breeding and overwintering habitat	90 m
Northern leopard frog	*Lithobates pipiens*	Special Concern	Special Concern		S3	Breeding and overwintering habitat	200 m
UPLAND GAME BIRDS							
Sharp-tailed grouse	*Tympanuchus phasianellus*				S5	Lek	400 m
RAPTORS							
Turkey vulture	*Cathartes aura*				S2B, S2M, S2N		
Golden eagle	*Aquila chrysaetos*	No Status	Not at Risk		S3B, S4M, S3N	Nest site	1,000 m
Ferruginous hawk	*Buteo regalis*	Threatened	Threatened		S4B, S4M	Nest site	750 m
Short-eared owl	*Asio flammeus*	Special Concern	Special Concern		S3B, S2N	Breeding bird	300 m
Burrowing owl	*Athene cunicularia*	Endangered	Endangered	Endangered	S2B	Breeding bird	200 m (July 16 – March 31) or 300 m (April 1 – July 15), depending on time of year

Common Name	Scientific Name	SARA[1]	COSEWIC[2]	SK MOE[3]	SKCDC[4,5]	Key Wildlife Feature	Activity Restriction Setback (Recommended Distance for Medium Disturbance Activity)[6]
MIGRATORY BIRDS							
Horned grebe	*Podiceps auritus*		Special Concern		S5B		
Eared grebe	*Podiceps nigricollis*				S5B	Nesting colony	200 m
American bittern	*Botaurus lentiginosus*				S4B	Breeding bird	150 m
Great blue heron	*Ardea herodias*				S3B	Nesting colony	1,000 m
Black-crowned night-heron	*Nycticorax nycticorax*				S5B	Nesting colony	1,000 m
Yellow rail	*Coturnicops noveboracensis*	Special Concern	Special Concern		S3B, S2M	Breeding bird	150 m
Whooping crane	*Grus americana*	Endangered	Endangered	Endangered	SXB, S1M	Staging area	1,000 m
Long-billed curlew	*Numenius americanus*	Special Concern	Special Concern		S3B, S4M	Breeding bird	200 m
Bonaparte's gull	*Chroicocephalus philadelphia*				S4B, S4M	Nesting colony	400 m
Franklin's gull	*Leucophaeus pipixcan*				S4B, S4M	Nesting colony	400 m
Herring gull	*Larus argentatus*				S5B, S5M	Nesting colony	400 m
Black tern	*Chlidonias niger*	No Status	Not At Risk		S4B	Nesting colony	400 m
Common tern	*Sterna hirundo*	No Status	Not At Risk		S5B, S5M	Nesting colony	400 m
Forster's tern	*Sterna forsteri*	No Status	Data Deficient		S4B	Nesting colony	400 m
Common nighthawk	*Chordeiles minor*	Threatened	Threatened		S4B, S4M	Breeding bird	100 m
Loggerhead shrike	*Lanius ludovicianus excubitorides*	Threatened	Threatened		S3B	Breeding bird	250 m
Barn swallow	*Hirundo rustica*	No Status	Threatened		S5B, S5M		
Bank swallow	*Riparia riparia*	No Status	Threatened		S5B, S5M		
Sprague's pipit	*Anthus spragueii*	Threatened	Threatened		S3B	Breeding bird	200 m
Chestnut-collared longspur	*Calcarius ornatus*	Threatened	Threatened		S5B	Breeding bird	100 m
McCown's longspur	*Rhynchophanes mccownii*	Special Concern	Threatened		S3B	Breeding bird	100 m
Baird's sparrow	*Ammodramus bairdii*	No Status	Special Concern		S4B		
Bobolink	*Dolichonyx oryzivorus*	No Status	Threatened		S5B		
MAMMALS							
Little brown myotis	*Myotis lucifugus*	Endangered	Endangered		S4B, S4N	Roost/foraging site	500 m
Long-eared myotis	*Myotis evotis*				S2B	Roost/foraging site	500 m
Big brown bat	*Eptesicus fuscus*				S5	Roost/foraging site	500 m
Silver-haired bat	*Lasionycteris noctivagans*				S5B	Roost/foraging site	500 m

Common Name	Scientific Name	SARA[1]	COSEWIC[2]	SK MOE[3]	SKCDC[4,5]	Key Wildlife Feature	Activity Restriction Setback (Recommended Distance for Medium Disturbance Activity)[6]
Hoary bat	*Lasiurus cinereus*				S5B	Roost/foraging site	500 m
American badger	*Taxidea taxus taxus*	No Status	Special Concern		S3		
Olive-backed pocket mouse	*Perognathus fasciatus*	No Status	Not at Risk		S3		
Pronghorn	*Antilocapra Americana*				S3		

NOTE:
[1] Government of Canada 2016.
[2] COSEWIC 2016.
[3] SK MOE 2013.
[4] SKCDC 2015b.
[5] SKCDC 2015c.
[6] SK MOE 2015.

J.2 HABITAT ASSOCIATIONS FOR SOMC WITH THE POTENTIAL TO OCCUR IN THE WILDLIFE LAA

SOMC	Land Cover Classes					
	Cultivated	**Agricultural - Hay/Forage**	**Shrub/Treed**	**Tame Pasture**	**Native Prairie**	**Wetland**
INSECTS[1]						
Monarch				X	X	
Verna's flower moth					X	
Pale yellow dune moth					X	
Dusky dune moth					X	
Uncas skipper					X	
Checkered white	X	X		X		
West Coast Lady	X	X		X		
AMPHIBIANS[2]						
Western tiger salamander						X
Plains spadefoot toad						X
Great Plains toad						X
Canadian toad						X
Northern leopard frog						X
UPLAND GAME BIRDS[3]						

SOMC	Land Cover Classes					
	Cultivated	**Agricultural - Hay/Forage**	**Shrub/Treed**	**Tame Pasture**	**Native Prairie**	**Wetland**
Sharp-tailed grouse			X	X	X	
RAPTORS[3]						
Turkey vulture				X	X	
Golden eagle			X	X	X	
Ferruginous hawk			X	X	X	
Short-eared owl				X	X	X
Burrowing owl				X	X	
MIGRATORY BIRDS[3]						
Horned grebe						X
Eared grebe						X
American bittern						X
Great blue heron						X
Black-crowned night-heron						X
Yellow rail						X
Whooping crane	X					X
Long-billed curlew					X	
Bonaparte's gull						X
Franklin's gull						X
Herring gull						X
Black tern						X

SOMC	Land Cover Classes					
	Cultivated	**Agricultural - Hay/Forage**	**Shrub/Treed**	**Tame Pasture**	**Native Prairie**	**Wetland**
Common tern						X
Forster's tern						X
Common nighthawk			X	X	X	
Loggerhead shrike			X	X	X	
Barn swallow				X	X	X
Bank swallow						X
Sprague's pipit				X	X	
Chestnut-collared longspur					X	
McCown's longspur					X	
Baird's sparrow					X	X
Bobolink		X		X	X	X
MAMMALS[4]						
Little brown myotis			X			X
Long-eared myotis			X			
Big brown bat	X	X	X	X	X	
Silver-haired bat			X			X
Hoary bat			X			
American badger	X			X	X	
Olive-backed Pocket Mouse					X	

SOMC	Land Cover Classes					
	Cultivated	**Agricultural - Hay/Forage**	**Shrub/Treed**	**Tame Pasture**	**Native Prairie**	**Wetland**
Pronghorn			X		X	

NOTE:
[1] Layberry et al. 1998, COSEWIC 2007a, COSEWIC 2007b.
[2] Canadian Herpetological Society 2014.
[3] Cornell Lab of Ornithology and the American Ornithologists' Union 2016.
[4] Naughton 2012.

J.3 MIGRATORY BIRDS WITH THE POTENTIAL TO OCCUR IN THE WILDLIFE LAA

Common Name[1,2]	Scientific Name	SARA[3]	COSEWIC[4]	SK MOE[5]	SKCDC[6]
Pied-billed grebe	*Podilymbus podiceps*				S5B
Horned grebe	*Podiceps auritus*	No Status	Special Concern		S5B
Eared grebe	*Podiceps nigricollis*				S5B
American bittern	*Botaurus lentiginosus*				S4B
Great blue heron	*Ardea herodias*				S3B
Black-crowned night-heron	*Nycticorax nycticorax*				S5B
Tundra swan**	*Cygnus columbianus*				S5M
Greater white-fronted goose**	*Anser albifrons*				S5M
Canada goose	*Branta canadensis*				S5B, S5M, S2N
Mallard	*Anas platyrhyncos*				S5
Gadwall	*Anas strepera*				S5B, S5M, S2N
Northern pintail	*Anas acuta*				S5B, S5M, S4N
American wigeon	*Anas Americana*				S5B, S5M, S2N
Northern shoveler	*Anas clypeata*				S5B, S5M

Common Name[1,2]	Scientific Name	SARA[3]	COSEWIC[4]	SK MOE[5]	SKCDC[6]
Cinnamon teal	*Anas cyanoptera*				S4B, S4M
Blue-winged teal	*Anas discors*				S5B, S5M
Green-winged teal	*Anas crecca*				S5B, S5M, S2N
Canvasback	*Aythya valisineria*				S5B, S5M, S2N
Redhead	*Aythya Americana*				S5B, S5M, S2N
Ring-necked duck	*Aythya collaris*				S5B, S5M
Lesser scaup	*Aythya affinis*				S5B, S5M, S3N
White-winged scoter	*Melanitta fusca*				S5B, S3M
Ruddy duck	*Oxyura jamaicensis*				S5B
Yellow rail	*Coturnicops noveboracensis*	Special Concern	Special Concern		S3B, S2M
Virginia rail	*Rallus limicola*				S4B
Sora	*Porzana carolina*				S5B
American coot	*Fulica americana*		Not at Risk		S5B
Sandhill crane	*Grus canadensis*				S2B, S4M
Whooping crane	*Grus americana*	Endangered	Endangered	Endangered	SXB, S1M
Piping plover	*Charadius melodus circumcinctus*	Endangered	Endangered	Endangered	S3B

Common Name[1,2]	Scientific Name	SARA[3]	COSEWIC[4]	SK MOE[5]	SKCDC[6]
Killdeer	*Charadrius vociferous*				S5B
American avocet	*Recurvirostra americana*				S5B, S5M
Greater yellowlegs**	*Tringa melanoleuca*				S5B, S5M
Lesser yellowlegs**	*Tringa flavipes*				S5B, S5M
Solitary sandpiper**	*Tringa solitaria*				S5B, S4M
Willet	*Tringa semipalmata*				S5B, S4M
Spotted sandpiper	*Actitis macularius*				S5B, S5M
Upland sandpiper	*Bartramia longicauda*				S5B, S5M
Long-billed curlew	*Numenius americanus*	Special Concern	Special Concern		S3B, S4M
Marbled godwit	*Limosa fedoa*				S5B, S5M
Wilson's snipe	*Gallinago delicate*				S5B
Wilson's phalarope	*Phalaropus tricolor*				S5B, S5M
Franklin's gull	*Leucophaeus pipixcan*				S4B, S4M
Ring-billed gull	*Larus delawarensis*				S5B, S5M
California gull	*Larus californicus*				S5B, S5M
Herring gull**	*Larus argentatus*				S5B, S5M
Common tern	*Sterna hirundo*	No Status	Not at Risk		S5B, S5M
Forster's tern	*Sterna forsteri*	No Status	Data Deficient		S4B

Common Name[1,2]	Scientific Name	SARA[3]	COSEWIC[4]	SK MOE[5]	SKCDC[6]
Black tern	*Chlidonias niger*	No Status	Not at Risk		S4B
Mourning dove	*Zenaida macroura*				S5B
Common nighthawk	*Chordeiles minor*	Threatened	Threatened		S4B, S4M
Ruby-throated hummingbird	*Archilochus colubris*				S5B, S4M
Downy woodpecker	*Picoides pubescens*				S5
Hairy woodpecker	*Picoides villosus*				S5
Northern flicker	*Colaptes auratus*				S4
Olive-sided flycatcher**	*Contopus cooperi*	Threatened	Threatened		S4B, S4M
Western wood-pewee	*Contopus sordidulus*				S5B
Least flycatcher	*Empidonax minimus*				S5B, S5M
Eastern phoebe	*Sayornis phoebe*				S5B, S5M
Say's phoebe	*Sayornis saya*				S5B, S5M
Western kingbird	*Tyrannus verticalis*				S5B, S5M
Eastern kingbird	*Tyrannus tyrannus*				S5B, S5M
Loggerhead shrike	*Lanius ludovicianus excubitorides*	Threatened	Threatened		S3B
Northern shrike*	*Lanius excubitor*				S1B, S4N
Warbling vireo	*Vireo gilvus*				S5B
Horned lark	*Eremophila alpestris*				S5B, S5M, S5N

Common Name[1,2]	Scientific Name	SARA[3]	COSEWIC[4]	SK MOE[5]	SKCDC[6]
Tree swallow	*Tachycineta bicolor*				S5B, S5M
Bank swallow	*Riparia riparia*	No Status	Threatened		S5B, S5M
Barn swallow	*Hirundo rustica*	No Status	Threatened		S5B, S5M
Black-capped chickadee	*Poecile atricapillus*				S5
Red-breasted nuthatch*	*Sitta canadensis*				S5
Brown creeper*	*Certhia americana*				S4B, S3N
House wren	*Troglodytes aedon*				S5B
Golden-crowned kinglet**	*Regulus satrapa*				S4B
Ruby-crowned kinglet**	*Regulus calendula*				S5B
Mountain bluebird	*Sialia currucoides*				S5B
Black-billed cuckoo	*Coccyzus erythropthalmus*				S5B
Veery	*Catharus fuscescens*				S5B
Gray-cheeked thrush**	*Catharus minimus*				S4B
Swainson's thrush**	*Catharus ustulatus*				S5B
Hermit thrush**	*Catharus guttatus*				S4B
American robin	*Turdus migratorius*				S5B
Gray catbird	*Dumetella carolinensis*				S5B
Brown thrasher	*Toxostoma rufum*				S5B
American pipit	*Anthus rubescens*				S5N
Sprague's pipit	*Anthus spragueii*	Threatened	Threatened		S3B

Common Name[1,2]	Scientific Name	SARA[3]	COSEWIC[4]	SK MOE[5]	SKCDC[6]
Bohemian waxwing*	*Bombycilla garrulus*				S4B
Cedar waxwing	*Bombycilla cedrorum*				S5B
Tennessee warbler	*Oreothlypis peregrina*				S5B
Orange-crowned warbler**	*Oreothlypis celata*				S5B
Yellow warbler	*Setophaga petechial*				S5B
Yellow-rumped warbler**	*Setophaga coronata*				S5B
Palm warbler**	*Setophaga palmarum*				S5B
Blackpoll warbler**	*Setophaga striata*				S5B
Black-and-white warbler	*Mniotilta varia*				S5B
American redstart	*Setophaga ruticilla*				S5B
Ovenbird	*Seiurus aurocapilla*				S5B
Common yellowthroat	*Geothlypis trichas*				S5B
Wilson's warbler*	*Cardellina pusilla*				S5B
Yellow-breasted chat	*Icteria virens*				S4B
Western tanager*	*Piranga ludoviciana*				S5B
Rose-breasted grosbeak**	*Pheucticus ludovicianus*				S5B
Lazuli bunting	*Passerina amoena*				S5B
Spotted towhee	*Pipilo maculatus*				S5B
American tree sparrow**	*Spizella arborea*				S5B
Chipping sparrow	*Spizella passerine*				S5B

Common Name[1,2]	Scientific Name	SARA[3]	COSEWIC[4]	SK MOE[5]	SKCDC[6]
Clay-coloured sparrow	*Spizella pallida*				S5B
Vesper sparrow	*Pooecetes gramineus*				S5B
Lark sparrow	*Chondestes grammacus*				S5B
Lark bunting	*Calamospiza melanocorys*				S4B
Savannah sparrow	*Passerculus sandwichensis*				S5B
Grasshopper sparrow	*Ammodramus savannarum*				S4B
Baird's sparrow	*Ammodramus bairdii*	No Status	Special Concern		S4B
Le Conte's sparrow	*Ammodramus leconteii*				S4B
Nelson's sparrow	*Ammodramus nelsoni*		Not at Risk		S5B
Fox sparrow**	*Passerella iliaca*				S5B
Song sparrow	*Melospiza melodia*				S5B
Lincoln's sparrow**	*Melospiza lincolnii*				S5B
White-throated sparrow**	*Zonotrichia albicollis*				S5B
Harris' sparrow	*Zonotrichia querula*				S5B
White-crowned sparrow**	*Zonotrichia leucophrys*				S5B
Dark-eyed junco*	*Junco hyemalis*				
McCown's longspur	*Rhynchophanes mccownii*	Special Concern	Threatened		S3B
Lapland longspur**	*Calcarius lapponicus*				S4N

Common Name[1,2]	Scientific Name	SARA[3]	COSEWIC[4]	SK MOE[5]	SKCDC[6]
Smith's longspur**	*Calcarius pictus*				S4M
Chestnut-collared longspur	*Calcarius ornatus*	Threatened	Threatened		S5B
Snow bunting*	*Plectrophenax nivalis*				S5N
Western meadowlark	*Sturnella neglecta*				S5B
Bobolink	*Dolichonyx oryzivorus*	No Status	Threatened		S5B
Baltimore oriole	*Icterus galbula*				S5B
Red crossbill*	*Loxia curvirostra*				S4B, S5N
White-winged crossbill*	*Loxia leucoptera*				S4B, S3N
Common redpoll*	*Acanthis flammea*				S4
Hoary redpoll*	*Acanthis hornemanni*				S5N
Pine siskin*	*Spinus pinus*				S5
American goldfinch	*Spinus tristis*				S5B

NOTE:

[1] Species listed only include migratory birds that are protected under the *Migratory Birds Convention Act*.

[2] The majority of the species listed have the potential to occur within the LAA during breeding season; however some species may only occur within the LAA during winter (*) and some species may only occur within the LAA during migration (**).

[3] Government of Canada 2016.
[4] COSEWIC 2016.
[5] SK MOE 2013.
[6] SKCDC 2015c.

J.4 ALL SPECIES OBSERVED DURING 2015 AND 2016 WILDLIFE SURVEYS

Common Name	Scientific Name	SKCDC[1]	SARA[1]	COSEWIC[1]
Amphibians				
Northern leopard frog	*Lithobates pipiens*	S3	Special Concern	Special Concern
Birds				
Canada goose	*Branta canadensis*	S5B, S5M, S2N		
Mallard	*Anas platyrhynchos*	S5		
Gadwall	*Anas strepera*	S5B, S5M, S2N		
American wigeon	*Anas americana*	S5B, S5M, S2N		
Northern shoveler	*Anas clypeata*	S5B, S5M		
Blue-winged teal	*Anas discors*	S5B, S5M		
Northern harrier	*Circus cyaneus*	S5B, S4M, S2N		Not at Risk
Swainson's hawk	*Buteo swainsoni*	S4B		
Red-tailed hawk	*Buteo jamaicensis*	S5B, S5M, S1N		Not at Risk
Gray partridge	*Perdix perdix*	SNA		
Sharp-tailed grouse	*Tympanuchus phasianellus*	S5		
American coot	*Fulica americana*	S5B		Not at Risk
Killdeer	*Charadrius vociferus*	S5B		
Willet	*Catoptrophorus semipalmatus*	S5B, S4M		
Marbled godwit	*Limosa fedoa*	S5B, S5M		
Wilson's snipe	*Gallinago gallinago*	S5B		
Wilson's phalarope	*Phalaropus tricolor*	S5B, S5M		
Eastern kingbird	*Tyrannus tyrannus*	S5B, S5M		
Western kingbird	*Tyrannus verticalis*	S5B, S5M		
Loggerhead shrike	*Lanius ludovicianus excubitorides*	S3B	Threatened	Threatened
Black-billed magpie	*Pica hudsonia*	S5		
Horned lark	*Eremophila alpestris*	S5B, S5M, S5N		
Clay-colored sparrow	*Spizella pallida*	S5B		
Chipping sparrow	*Spizella passerina*	S5B		
Vesper sparrow	*Pooecetes gramineus*	S5B		
Savannah sparrow	*Passerculus sandwichensis*	S5B		
Grasshopper sparrow	*Ammodramus savannarum*	S4B		
Baird's sparrow	*Ammodramus bairdii*	S4B	No Status	Special Concern

Common Name	Scientific Name	SKCDC[1]	SARA[1]	COSEWIC[1]
Western meadowlark	*Sturnella neglecta*	S5B		
Bobolink	*Dolichonyx oryzivorus*	S5B	No Status	Threatened
Red-winged blackbird	*Agelaius phoeniceus*	S5B		
Brewer's blackbird	*Euphagus cyanocephalus*	S5B		
Brown-headed cowbird	*Molothrus ater*	S5B		
Mammals				
White-tailed jackrabbit	*Lepus townsendii*	S4		

NOTE:
[1] See Appendix H for provincial and federal ranking definitions.

J.5 PHOTOGRAPHS – WILDLIFE

April 19, 2016

PHOTO 1 Sharp-tailed grouse survey location (LEK-01) in SE-13-16-15-W3M looking north. Lek located north of survey location.

April 18, 2016

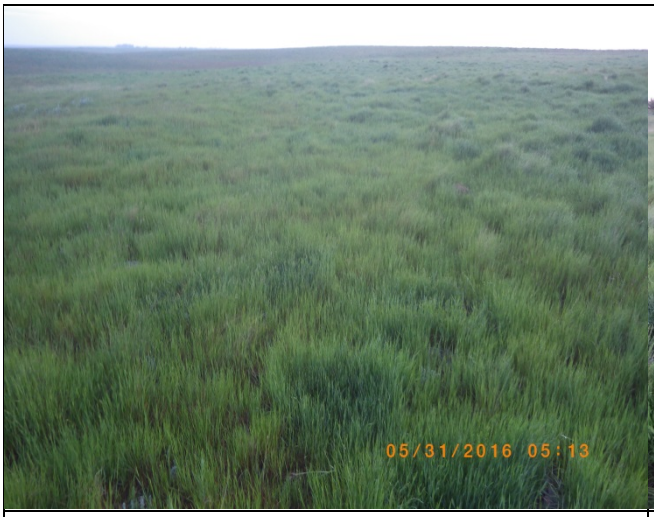
PHOTO 2 Amphibian survey location (AMP-01) in SE-13-16-15-W3M looking west.

May 31, 2016

PHOTO 3 Breeding bird survey location (BBS-01) in SE-13-16-15-W3M looking west.

May 31, 2016

PHOTO 4 Burrowing owl survey location (BUOW-01) in SE-13-16-15-W3M looking north.



May 31, 2016

PHOTO 5 Breeding bird (BBS-02) and burrowing owl (BUOW-02) survey locations in SE-13-16-15-W3M looking north.

May 31, 2016

PHOTO 6 Breeding bird (BBS-03) and burrowing owl (BUOW-03) survey locations in SE-13-16-15-W3M looking east.

May 31, 2016

PHOTO 7 Northern leopard frog in Class 4 wetland in SE-13-16-15-W3M.